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THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 488

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File: 541 460.000d
D.C.

488

FINAL

Memphis Depot

Main Installation

Remedial Investigation Report

Volume III

(Appendices A – M)

January 2000

CH2MHILL

U.S. Army Engineering
and Support Center, Huntsville

U.S. Army Engineering and Support Center, Huntsville
Contract No. DACA87-94-D-0009
Delivery Order No. 11

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Main Installation Remedial Investigation Report

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Prepared for
Defense Logistics Agency

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Appendix A

Project Technical Memorandums, Meeting Minutes, and Staff

APPENDIX A

Project Technical Memorandums, Meeting Minutes, and Staff

Appendix A contains the following:

- Records Search Technical Memorandum
- Meeting Minutes for EPA Meeting, November 1998, in Atlanta
- Meeting Minutes from February 9, 1999, Meeting to discuss EFU
- Human Health and Ecological Risk Assessment Approach Memphis Depot Main Installation
- Results of Pesticide Vertical Profile Sampling TM
- Major Project Staff
- TDEC Letter, October 16, 1985–Meeting Summary
- *Draft Final Basis for NFA Recommendations*

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Results of Records Search for Industrial Facilities Surrounding the Memphis Depot

PREPARED FOR U.S. Army Engineering and Support Center, Huntsville

PREPARED BY CH2M HILL

COPIES The Memphis Depot

DATE April 12, 1999

Background

In October 1992, the former Defense Distribution Depot, hereafter referred to as the Memphis Depot, was placed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (EPA). A remedial investigation/feasibility study (RI/FS) is being prepared to assess the nature and extent of contamination, to evaluate the risk to human health and the environment, and to screen potential cleanup actions. The Memphis Depot is surrounded by industrial facilities that may have had contaminant releases in the past. The purpose of this technical memorandum is to present a preliminary assessment for the potential of contaminant migration onto the Memphis Depot from the surrounding industrial facilities.

Approach

On December 16, 1994, a tour of facilities around the perimeter of the Memphis Depot was conducted with Ulysses Truitt, a former employee of the Memphis Depot. The tour revealed three dry cleaning facilities, two paint shops, two junk yards, two electric shops, one printer, three gas stations, two equipment repair shops, and one salvage business.

On December 12, 1994, Agency Information Consultants (AIC) conducted a records search of industrial facilities for 13 zip codes surrounding the Memphis Depot. The search revealed 388 industries. Industries located within 3 miles of the Memphis Depot were selected for a records search conducted at the Tennessee Department of Environment and Conservation (TDEC).

On the basis of the AIC search, 35 facilities within the 3-mile radius were recommended for further investigation. TDEC had existing files for 22 of the facilities. The files were copied and a summary for each site was prepared and is included herein.

On January 30 and 31, 1995, a records search was conducted at the Region IV EPA building in Atlanta, Georgia, of the 35 facilities mentioned above. The EPA had files on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites surrounding the Memphis Depot. The information was copied and added to the existing data collected at TDEC.

Table 1 presents the facilities encountered on the tour of the Memphis Depot perimeter Table 2 presents the information concerning the facilities for which a records search was conducted at TDEC and Region IV EPA. Figure 1 shows the approximate location of most of the industrial facilities listed in Tables 1 and 2.

Summary Paragraphs

Gould, Inc.

Gould, Incorporated, a manufacturer of lead acid automotive batteries, is located 0.4 mile north of the Memphis Depot. Hazardous wastes generated by the plant are lead, cadmium, arsenic, and sulfuric acid rinse water. A routine inspection of the facility in September 1981 indicated that the rinse water was being neutralized and released into the sewer system, and that the sludge was removed via a septic tank pump and discharged into the sewer. A closed loop recycling system was then implemented to reduce the amount of sludge released into the sewer and to meet TDEC's regulatory requirements. An inspection the following year (1982) showed the facility to be in compliance with state regulations. Also in 1982, 3 feet of soil below an old acid farm were removed because of contamination and sent to a hazardous waste landfill.

During May 1994, three monitoring wells (MWs) were installed and sampled. Samples from all three wells contained metals. Groundwater samples from upgradient well MW-1 contained several chlorinated organic compounds. The final conclusion from the September 1994 Halliburton NUS site investigation (SI) report was to further investigate the groundwater because of the high levels of cadmium present.

Old Estech General Chemical

Old Estech General Chemical is located about a mile northeast of Dunn Field. During the 1950s and 1960s, this corporation manufactured organic phosphate and chlorinated hydrocarbon pesticides. According to interviews with employees who worked at the facility, the only contamination present would be from accidental spills around the facility.

During the week of August 9, 1993, the B&V Waste Service and Technology Corporation (BVWST) field team took six surface soil samples around the facility. The soils contained polynuclear aromatic hydrocarbon (PAH) and pesticide contamination. No groundwater studies were performed because of the depth to the surficial aquifer. However, the Cochran Corporation has an on-site well that is 590 feet deep. This well is tested periodically, and no contaminants are present. All spills were reported and cleaned up; all of the SIs were found to require no further action when closure was complete.

It is unlikely that soil contamination at this facility has affected the Memphis Depot. The low mobilities of PAHs and pesticides from soil to groundwater, combined with the distance from the Memphis Depot, preclude any effects from operations at Old Estech General Chemical to the Memphis Depot.

TABLE 1

Summary of Industrial Facilities Adjacent to Memphis Depot

Memphis Depot Main Installation RI

Site	Address	Approximate Location Relative to DDMT	Areas of Concern	Suspected Contaminants	Type of Investigation	Last Known Status	Map ID
Bellevue Rally Service Station	2100 Elvis Presley Blvd	0 75 mi west	UST Lines Leaking	BTX and TPH	Monitoring Wells Soil Borings	11/94 Recommended for cleanup	1
Memphis Furniture Manufacturing Co	2400 Frisco Ave	0 4 mi East	Spillage	Naphthalene	Walkthrough	NFA	2
Goodyear Tire and Rubber Co	2295 Park Ave	1 0 mi Northeast	UST Removal	None	Excavation Samples	Final Closure Granted	3
Vickers Gas Station	2986 Lamar Ave	1 5 mi East	Gas Line Leak	Benzene TPHs	Monitoring Wells Soil Borings	9/93 Wells with Product Skimmers	4
Forest Hill Cemetery	1661 Elvis Presley Blvd	1 0 mi Northwest	UST Removal	Mg,Fe and TPHs	Monitoring Wells Soil Borings	Product Bailed Weekly Nla	5
Serv O-Matic	2630 Midland Ave	2 25 mi Northeast	UST Removal	TPHs	Monitoring Wells Soil Borings	NFA (10/91)	6
Gould Inc	Person Ave	0 4 mi North	Battery Acid Waste Sludges	BTX and TPH	Monitoring Wells Soil Borings	Action Recommended (9/94)	7
Bulk Mail Center	1921 Elvis Presley Blvd	0 5 mi West	UST Removal	BTX and TPH	Excavation Samples	NFA (3/92)	8
Old Estech Chemicals	221 Deadrick Ave	1 0 mi Northeast	UST Removal	PAHs and pesticides	Surface Soil Samples	Action Recommended (2/94)	9
AutoZone	1471 Rozelle	0 5 mi North	UST Removal	TPHs	Excavation Samples	NFA (7/93)	10
AutoZone	1700 Dunn Ave	SW corner Dunn Field	Broken Fuel Line	TPHs	Excavation Samples	NFA (8/93)	11
Memphis Coca Cola Bottling Co	299 S Hollywood St	2 25 mi Northeast	Broken Fuel Line	TPHs	Excavation Samples	NFA (1988)	12
Kellogg Co	2168 Frisco Ave	0 25 mi North	Data Not Available	Data Not Available	Site Inspection	NFA	13
Memphis Board of Education	1363 E Person Ave	1 0 mi West	Data Not Available	Data Not Available	Site Inspection	NFA	14
Direct Motor Express	2100 Kellogg Ave	0 5 mi East	Data Not Available	Data Not Available	None	Waste Generator Number	15
Rexham Corporation	2000 Latham ST	1 0 mi, West	Non-halogenated Solvent Storage	Non halogenated Solvents	Site Inspection	Groundwater Inspection Recommended	
Charlie Brown Body Shop	2435 Frisco Ave	0 5 mi East	Data Not Available	Data Not Available	None	Waste Generator Number	17
Buckeye Memphis South	2227 Deadrick Ave	1 0 mi Northeast	Data Not Available	Data Not Available	None	NPDES Permit (1993)	18
Ralston Purina	1725 Airways Blvd	0 75 North	Data Not Available	Data Not Available	None	Existing Fuel Tank	19
Tension Envelope	3058 Southwall St	1 5 mi East	22 Drums stored	Hazardous Substances	Drum Characterization	Drums Still Present	20
Enpack Inc	1699 Airways Blvd	0 75 mi North	Damaged Drums	Lead Oxide	Data Not available	Corrective Action Plan (8/94)	21
Schering Plough Health Care Products	3030 Jackson Ave	Data Not Available	Data Not Available	Data Not Available	Data Not available	Data Not Available	

TABLE 2
Summary of Industrial Facilities Adjacent to Memphis Depot Investigated During Tour
Memphis Depot Main Installation RI

Site	Address	Comments	Map ID
Sunshine Uniform Co.	1835 Mclean St		23
Bensons Body Shop	2008 Person Ave.		24
Previous Gulf Service Station	1731 Castalia Rd		25
Pigue Tire Shop	1701 Castalia Rd		26
Contract Painting and Sandblasting Co.	2213 Filmore		27
Electric Repair Shop	Alcy Rd		28
Shaof Motor Corporation	2261 Airways Blvd.	Heavy equipment repair shop	29
Kerr McGee Corporation	2236 Airways Blvd.		30
Chezita Gardens Laundry	2113 Alcy Rd	Former Dry Cleaners	31
Scipio's Grocery and Gas Station	1578 Person Ave.		32
Automotive and Radiator Shop	1580 B Person Ave		33
Junkyard	Rozelle and Person Ave		34
QO Grain Processing	Rozelle at I C & G RR		35
MLG&W Asset Reclamation Yard	1629 Rozelle Rd	Stored transformers	36
Production Specialty Inc.	1782 E Person Ave	Retrofit street lights	37
General Machine Works Inc	2001 Wabash		38
Kellogg Inc	2168 Frisco Ave	Burns propane	39
Nahunal	2129 Frisco Ave.	Manufactures and fabricates propane tanks	40
Bar-H Body Shop	2199 Frisco Ave.		41
Leath Painting Co	2203 Freemont Ave		42
JRP Painting	2308 Freemont Ave		43
Jaco Bryant Printers	2214 Freemont Ave		44
Choctaw Construction Co	2193 Freemont Ave.	Existing gas tank	45
Diamond Steel	2217 Freemont Ave	Existing Kerosene tank	46
Junkyard	2160 Dunn Road		47
Magnetic Electric Co.	1992 Airways Blvd .		48
A-1 Tire and Alignment	2030 Airways Blvd.	Formerly Exxon	49
Mobile Process Technology	Airways Blvd	Formerly Frito-Lay	50
Unnamed Dry Cleaners	1574 Alcy Rd	Closed for about 20 years	51

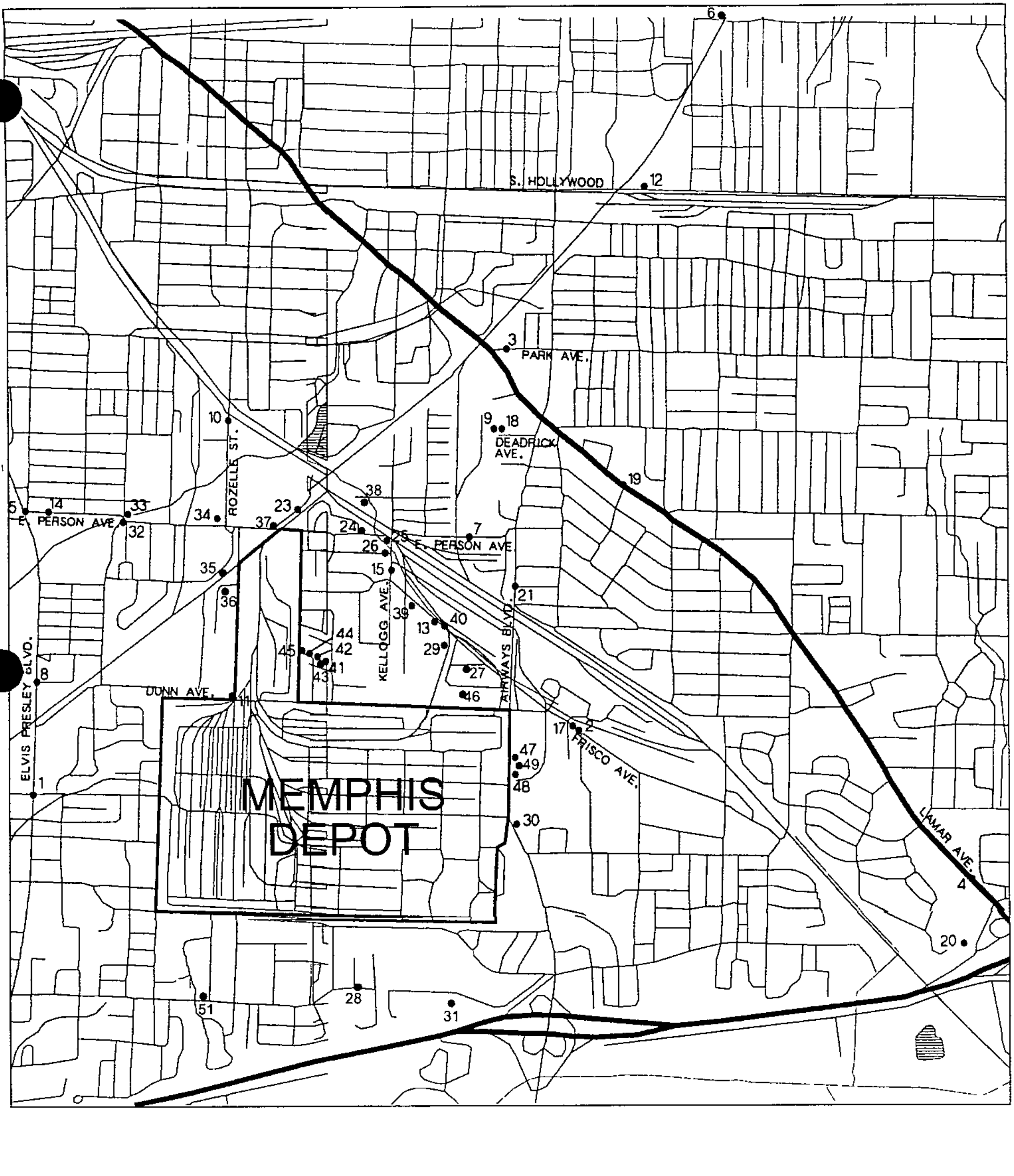

Figure 1
Location of Industrial Facilities Surrounding the Memphis Depot

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Rexham Corporation

The Rexham Corporation, located 1 mile west of the Memphis Depot, manufactures flexible food wrappers. Waste generated during the manufacturing process includes non-halogenated solvents and inks. The facility reported that it uses approximately 110,000 pounds (lbs) of solvents annually. Records indicate that no waste was stored at the site for longer than 90 days.

Groundwater flow from the Rexham Corporation is south toward Nonconnah Creek. The closest drinking water well is 0.75 mile east of the site, located in the Allen Well Field. Because of the proximity of the Allen Well Field, further groundwater investigation was recommended by Halliburton NUS in a September 1993 SI Report. However, because the groundwater flow direction from the site is toward the south, the Rexham Corporation poses no threat of leaching onto the Memphis Depot.

Enpack, Inc.

Enpack, Inc., is located 0.75 mile north of the northeastern corner of the Memphis Depot boundary. On August 24, 1994, Enpack was issued a Corrective Action Order by TDEC to address the problem of lead oxide contamination. Before 1975, lead oxide was delivered to the facility by rail car, where it was unloaded manually. Drums often were broken during transport and off loading, spilling the contents onto the ground. Cleanup procedures were not adopted and the Corrective Action Plan was not available at the time of the TDEC and EPA record search. Because of the lack of cleanup procedures and the unavailability of a corrective action plan as follow-up to TDEC's Corrective Action Order, it is not known if cleanup of this site has been sufficient. Because of this situation and because of the proximity to the Memphis Depot, this facility could be a potential contributor to contamination at Dunn Field.

Memphis Furniture Manufacturing Company

The Memphis Furniture Manufacturing Company has been in operation since 1892. In 1980, there was evidence of spillage onto concrete and bare ground from drums containing materials used in the painting process and general machinery maintenance. On the basis of this information, the potential contaminants were determined to be naphthalene and trichloroethylene (TCE).

The site is located 0.4 mile east of the Memphis Depot boundary. Black & Veatch Waste Science, Inc., investigated the site in 1994 and found it to be a low-exposure risk along surface water and surface soil pathways. The groundwater pathway was designated as the area of greatest concern, but the depth to the Memphis Sand Aquifer is large enough to minimize the effects of release. On the basis of this information, no further action was recommended for the Memphis Furniture Manufacturing Company. However, no investigation was conducted regarding the possibility of a release to the shallow Fluvial Aquifer, which is not a source of drinking water. Because of the proximity of the Memphis Furniture Manufacturing Company to the Memphis Depot, the known potential for contamination, and the absence of substantial sampling information, this site cannot be ruled out as a possible contributor to groundwater contamination.

Auto Zone

The Auto Zone at 1471 Rozelle is located 0.5 mile north of the Memphis Depot. In July 1993, Murphy Environmental Services, Incorporated, performed an underground storage tank (UST) closure at this site. During tank removal, "obvious contamination" was encountered. Laboratory results indicated total petroleum hydrocarbon (TPH) levels of 3.16 milligrams per kilogram (mg/kg) and 10.0 mg/kg. Contaminated soils were disposed off-site at the North Shelby Landfill in Millington, Tennessee.

The Auto Zone at 1700 Dunn Avenue is located on the southwestern corner of the Operable Unit (OU)-1 boundary to the Memphis Depot. During the installation of a UST at this location on October 16, 1978, a line was broken, spilling approximately 300 to 500 gallons of diesel fuel. Spillage was contained in the excavation site. The area was sandbagged and plans were made to begin pumping spillage out of the excavation site the next day.

In July 1993, the UST was removed and the excavated soil tested above state limits for TPH. The soil was disposed off-site at the North Shelby Landfill in Millington, Tennessee.

Because of the removal efforts at both Auto Zone locations, it is unlikely that the threat of leaching exists associated with the two incidents.

Goodyear Tire and Rubber Company

The Goodyear Tire and Rubber Company is located about 1 mile northeast of Dunn Field. The site contained a 550-gallon steel tank that contained waste oil and was removed in December 1990. The soil samples taken from the UST excavation did not indicate any soil contamination (TPH). As of October 2, 1991, Goodyear requested that TDEC grant final closure for this location. The UST appears to have been removed appropriately and without release to the underlying soil. It is therefore believed that this site has had no effect on the Memphis Depot.

Memphis Coca Cola Bottling Company

The Memphis Coca Cola Bottling Company is located 2¼ miles northeast of the Memphis Depot. In November 1988, a diesel line leak occurred. Laboratory testing indicated TPH levels above state cleanup levels. Excavation was performed, and no further action was recommended. An SI conducted later by EPA found and documented only empty drums containing broken glass around the excavation site. On the basis of the removal efforts and the SI results, there is no evidence of contamination at this site.

Serv-O-Matic

Serv-O-Matic, 2630 Midland Avenue, is located 2¼ miles northeast of the Memphis Depot. In February 1990, samples collected from soil borings around a UST indicated TPH levels in excess of state contamination cleanup levels. Further investigation included the installation of four monitoring wells and four additional borings. The reported contamination appeared to be the result of improper drilling, equipment decontamination, or sample collection. No further action was recommended for the site. On the basis of this information and the distance of the site from the Memphis Depot boundary, this UST site should have no effect on the Memphis Depot.

Bellevue Rally Service Station

Bellevue Service Station is located 0.75 mile west of the Memphis Depot. The facility contained three diesel USTs and two gasoline USTs. The tanks were removed from the site in July 1990. The tank lines contained holes that leaked product into the surrounding soils and groundwater. Soil borings and wells were installed at the site, and one monitoring well was installed off-site, hydrologically upgradient from the property. The contaminated soils from the tank excavations were stockpiled on plastic at the site to be aerated.

The northwest tank pit soils contained benzene, toluene, ethyl benzene, and xylene (BTEX) and TPH at concentrations above state cleanup levels. Excavation activities were limited by the building foundation. Therefore, the pit had to be filled even though the existing contaminant levels exceeded the state cleanup criteria. The wells on-site contain levels of BTEX and TPHs above the state cleanup criteria. As of November 15, 1994, the environmental assessment had been issued to TDEC for recommended cleanup procedures.

The service station possibly is hydrologically upgradient to the Memphis Depot. The absence of any petroleum hydrocarbons in groundwater samples from upgradient wells on the western boundary of the Memphis Depot suggests that contamination from the service station has not affected groundwater flowing beneath the Memphis Depot.

Bulk Mail Center

The Bulk Mail Center is located about 0.5 mile west of the Memphis Depot. During the week of March 4, 1992, four tanks were removed from the site. During the excavation, 250 cubic yards (yd^3) of soil were removed. No groundwater was encountered during the excavation activities.

The soil around the tank pit was over excavated horizontally until no contaminants were detected by laboratory analyses. The vertical extent of sampling was conducted until the tank anchoring pad was encountered; the pad was removed and the soils beneath the pad showed no contamination. The pit was then filled. The excavated soil showed moderate levels of BTEX and TPH contamination. An aeration basin was constructed on-site and the excavated soil was allowed to aerate until the soils showed no detection of contaminants. The soil was then graded in place. It is therefore unlikely that the Memphis Depot has been affected by the leaking tanks.

Forest Hill Cemetery

Environmental assessment activities were conducted at Forest Hill Cemetery, approximately 1 mile northwest of the Memphis Depot. After the removal of two USTs in March 1991, the assessment isolated petroleum contaminant effects on site soils and groundwater above the state regulatory limits. Analytical results of groundwater sampling also indicated iron and manganese levels in excess of secondary standards for drinking water. Over excavation was used as a partial solution along only the northern boundary. Alternative methods proposed to remove the TPH contamination were pump and treat, vapor extraction, or bioremediation.

During routine groundwater level measurements in February 1994, free product was detected in the northernmost Recovery Well. Product was bailed and drummed on a weekly basis. In August 1994, samples collected were below detection levels for BTEX and TPH. No further action was recommended for the site.

This cemetery is not upgradient to the Memphis Depot and its closest edge is 1 mile from the facility. Therefore, it is unlikely that the cemetery poses a threat of leaching onto the Memphis Depot boundary.

Vickers Gas Station

Vickers Service Station, located 1.5 miles east of the Memphis Depot, reported a gas line leak on July 31, 1989. A leak detector tripped and shut the pumping system off; therefore, it was suspected that only minor amounts of product had been released. However, although the soils around the line were excavated, free product flowed into the excavation pit. Wells and soil borings were installed around the facility in the shallow (approximately 20-foot) and deep (approximately 35-foot) aquifers.

The environmental assessment activities conducted at the service station have isolated petroleum contamination above regulatory limits for groundwater, but not for soils. The state regulatory limits for benzene and TPHs were exceeded in groundwater samples These parameters extend in an irregular circular pattern within a 100-foot radius only in the shallow aquifer. The wells, which had free product layers of 0.5 to 1.5 inches, were bailed and the product was taken off-site to a recycling facility As of September 1993, two wells still contain product and skimmers have been placed in the wells to continuously remove the product.

Because of the distance of Vickers Service Station from the Memphis Depot (1.5 miles) and the size of the contamination plume (200 feet in diameter), it is doubtful that this incident has affected groundwater at the Memphis Depot.

Tension Envelope Corporation

The Tension Envelope Corporation is 1.5 miles east of the southeastern corner of the Memphis Depot and is an inactive hazardous substance site. During October 1986, O. H. Materials sampled and over packed 22 drums located at the facility. The results of the drum sampling indicated that the drums contained hazardous substances. One well (Brooks Well) located on the property also was sampled. The groundwater sample revealed that no contamination was present. As of 1986, no further information about the drums is known. Because of the lack of information pertaining to any releases at this location, its effect on the Memphis Depot cannot be evaluated.

Other Facilities

The remaining seven facilities–including Charlie Brown Body Shop and Sales, Buckeye Memphis South, Ralston Purina, Schering-Plough Health Care Products, Direct Motor Express, Memphis Board of Education, and Kellogg USA–have EPA generator numbers assigned to them and are subject to site inspection. Records indicate that there is no reason to suspect that these locations have affected environmental conditions at the Memphis Depot.

Former Businesses

During the perimeter drive-by inspection, the locations of two former dry cleaning businesses were identified. One is located at 2113 Alcy Road, approximately 2,000 feet southwest of the southeastern corner of the Memphis Depot; this business is now a coin-operated laundry. Dry cleaning activities ceased approximately 9 years ago. A second dry cleaning business was located at 1574 Alcy Road, approximately 1,200 feet south-southeast of the southwestern corner of the Memphis Depot. It was estimated that this business has been closed for nearly 20 years. Chlorinated solvents commonly are used in the dry cleaning industry. Chlorinated solvents have been detected in groundwater samples collected from monitoring wells in the vicinity of these former businesses; therefore, they cannot be ruled out as a possible source of volatile organic compound (VOC) contamination.

Conclusions

Activities at some industrial facilities neighboring the Memphis Depot have affected the environment to the extent of requiring cleanup measures. The records indicate that contamination has been local and, in most instances, well defined. The likelihood of these locations contributing to soil contamination at the Memphis Depot is low. Groundwater at some locations also has been affected; however, the plumes have been confined to a small geographic area at the facilities upgradient of the Memphis Depot and groundwater plumes have not been established The potential effect on groundwater from former activities (such as dry cleaning businesses) is unknown.

Memphis Depot Main Installation Risk Assessment Approach Meeting

ATTENDEES:	Ted Simon/USEPA Turpin Ballard/USEPA Ruth Chen/TDEH Jordan English/TDEC Shawn Phillips/DDSP-FE Dorothy Richards/CEHNC	Scott Bradley/CEHNC John Martin/CH2M HILL Vijaya Mylavarapu/CH2M HILL Leslie Shannon/CH2M HILL Greg Underberg/CH2M HILL
COPIES:	Sharon Thoms/USEPA Sue Freiberger/CH2M HILL	Sharon Belser/CH2M HILL Betsey Garland/CH2M HILL

TO: Project File

FROM: Leslie Shannon/CH2M HILL
Greg Underberg/CH2M HILL
Vijaya Mylavarapu/CH2M HILL

DATE. November 17, 1998

A meeting was held at the U.S. EPA offices in Atlanta on November 16, 1998 to discuss and agree upon the risk assessment approach for the Memphis Depot Main Installation. Topics discussed during the meeting are summarized below according to Action Items, Decisions Made, and Other Issues.

Action Items

- The meeting minutes and phone call logs will be included as an appendix to the RI Report. The purpose of including the minutes is to provide the EPA contractors that will review the report an understanding of the decisions made that influenced preparation of the report.
- CH2M HILL will redo the RI Report outline, based on a functional unit rather than operable unit (OU) subdivision, and submit to EPA for a preliminary review. EPA and TDEC will determine what administrative changes, if any, need to occur to shift from OU to functional unit groupings.
- The Natural Resource Trustees (e.g. U.S. Fish and Wildlife Service) will be notified in writing of all meetings and the proposed screening levels. This needs to be accomplished now. Shawn Phillips and John Martin will contact the involved parties and prepare a letter of information necessary.

- CH2M HILL will involve Jordan English in the screening process to select the surrogate site for each functional unit and each exposure scenario, at his request.
- Dr. Vijaya Mylavarapu agreed to fax the new Interim Guidance on Toxicity Equivalency Factors to Drs. Simon and Chen, who will then have a conference call with Dr. Mylavarapu. Their decision on how to handle the PAHs will then be appended to the meeting minutes, and included in the RI Report.
- Dr. Simon will provide Drs. Vijaya Mylavarapu and Chen with a copy of the new draft national guidance on dermal toxicity criteria. Newer guidance modifies the intake estimates through adjustment of the adherence or adsorption factors, which will be implemented in the dose calculations. These three individuals will then hold a conference call and relay their decisions, which will be appended to these meeting minutes.
- The site lead target concentrations will be determined by an IEUBK model for an adult. Dr. Simon provided CH2M HILL with a copy of the guidance.
- Dr. Simon strongly urged CH2M HILL to submit the interim deliverables now from the ecological risk assessment, and get the agreement of the Natural Resource Trustees for the first Scientific Management Decision Point (SMDP), otherwise the RI process could be slowed down.
- Dr. Simon will send John Martin a copy of the latest guidelines or information regarding ecological soil benchmarks. These included the Canadian and Dutch soil values.
- Jordan English will determine who from TDEC will review the Ecological Risk Assessment, and provide this name to CEHNC.
- Shawn Phillips will send a copy of the base Reuse Plan to Vijaya Mylavarapu .
- CH2M HILL will send a copy of the Background Report to Dr. Chen.
- Jordan English will provide a letter on TDEC letterhead that identifies the background levels of arsenic in western Tennessee. This letter will be provided to EPA to support selection of a Memphis Depot-specific arsenic background level. If available, the analytical data will be provided which will be included the arsenic background statistics.
- Greg Underberg will provide documentation of derivation of the existing 20 mg/kg of arsenic background value.

Issues Discussed and Decisions Made

General Issues

- EPA indicated that risk communication issues will be dealt with after the risk assessment is conducted. We will prepare the risk assessment following established guidelines and procedures and manage communication to the public later.

- Dr. Simon mentioned that there is a new document in progress entitled "Process for Ecological Assessments at Federal Facilities in Region IV", but it is not yet available.
- Regarding ecological risk, Dr. Simon mentioned that the COPCs are typically negotiated at the second SMDP (in Step 3).
- EPA indicated that the purpose of the OU is to facilitate risk reduction. CH2M HILL proposed using Functional Units (FUs) in place of OUs to represent the contaminant nature and extent and risk evaluations from BRAC parcels, and individual RI and SS sites. Therefore, the RI Report will be reorganized around functional units as chapters.
- The RI sites within a functional unit will be evaluated and prioritized in terms of human health risk using the Preliminary Risk Evaluation (PRE) methodology reported in the *Final Preliminary Risk Evaluation* (CEHNC; April, 1998). CH2M HILL will evaluate the site(s) with the highest PRE risk that also cover the contaminants of concern identified by the PRE methodology for all sites within the functional unit. To reduce the number of site-specific risk assessments, baseline risk assessment will be performed only on the worst site(s) thus providing a conservative surrogate risk for the remaining sites.
- PRE results will be included as an appendix to the RI Report.
- The Exposure Point Concentration (EPC) will be calculated for a functional unit, and for the site listed as highest priority in the PRE for scenario-specific intake estimated.
- A residential scenario should be evaluated. Institutional controls will not be invoked during the risk assessment. Region IV and TDEC assume that there are no institutional controls in place.
- At sites that have already been remediated, CH2M HILL will conduct a residual risk assessment using post-remediation sampling data only. The report will clearly state that this risk assessment represents post-removal conditions.
- Groundwater at the site will be evaluated as one site with multiple plumes. Organic chemicals will be evaluated as plumes and inorganic chemicals, if they do not occur as plumes, will be evaluated as one site and estimate the 95% UCL for exposure quantitation.
- EPA Region IV and TDEC both agree that the RAGS Part D format **will not be** implemented in this Baseline Risk Assessment or RI Report.
- Since lead has no toxicity factor, it will be screened against the screening criteria for residential and industrial receptor protective values. High lead sites will be evaluated using IEUBK model for adult receptors.
- The new dermal guidance scheduled to be out shortly lowers some of the dermal exposure factors such as the adherence factor, resulting in lower intake through dermal exposure pathway. EPA recommends using this newer guidance at Memphis Depot. After CH2M HILL reviews the guidance, a conference call may be scheduled to discuss.
- CH2M HILL will add a child exposure scenario to the Exposure Factor Table 3.

Conceptual Site Model

- The conceptual site model will be a flow chart similar to the one presented at the meeting. An example of the flow chart will be included with the Example Functional Unit document.
- The CSM will present the potentially complete pathways based on the information available on a site to date. EPA suggested adding/keeping the incomplete pathways on the figure to indicate all the pathways have been considered in the evaluation. Ecological and human receptors will be presented in the same flow chart.

Guidance to be followed for RA

- The latest available guidance will be followed.
- No Tennessee risk assessment guidance exists. Tennessee follows the EPA Region IV guidance. TDEC indicated that the project should follow the EPA risk assessment guidance.

Data Evaluation

- All the analytical data collected by CH2M HILL will be used for COPC selections and quantitative evaluations.
- Historical data collected in 1990 by Law Engineering will not be used in the risk assessment due to the lack of supporting QA/QC data. Also because CH2M HILL could not confirm the previously reported concentrations by Law through resampling.

Exposure Assessment

- Exposure pathways to be evaluated include a worker scenario for the current land use, evaluating a current maintenance worker exposure. Future exposure scenarios will include a default worker and resident.
- When exposure factor exposure time (ET) is modified for smaller sites, EPA suggested using the fraction ingested (FI) term for ingestion, provided an explanation of how the number was derived is given in the text. Other similar terms will be included for dermal and inhalation pathways with proper explanation.
- The dermal exposures should be estimated using the latest adherence/adsorption factors which results in dermal intakes lower than oral intakes. The new draft national guidance on dermal exposure will be used in this risk assessment, as soon as it is available.
- Exposures will be evaluated for a maintenance worker from a FU, and from a site listed with high potential risks from PRE results. Future worker and residential scenarios will also be evaluated for the FU and 'worst-case' site. This selected site conservatively represents the worst-case exposures from a FU, to account for potential higher concentration areas within the FU. Dr. Chen expressed concern that the risk assessment

should consider multiple exposures – for example, a golfer at Memphis Depot may also be an employee that works in one of the parcels. Other multiple exposure scenarios include the worker/resident or resident/ballplayer scenarios. The exposure assessment discussion should include these scenarios.

- The site management decisions will be based on future land use, which is likely to be industrial. The proposed future land use will be documented using the existing Base Reuse Plan.
- A future residential land use will also be evaluated and included in the report. The narrative should state that this scenario was included for comparison purposes only. Fugitive dust exposure to offsite residents will be evaluated for sites near the perimeter of Memphis Depot.
- Exposure point concentrations are the UCL95% concentration on the mean. For groundwater, the EPCs are the average the well concentrations from center of the plume (i.e., well with the highest total contamination) for organic constituents and UCL95% estimates of all well concentrations within the aquifer for the inorganic chemicals. Each contaminant plume will be evaluated separately.

Toxicity Assessment

- Toxicity factors will be obtained from EPA databases (EPA Region IV does not prefer the values from EPA Region III RBC Tables).
- PAHs are proposed to be evaluated by applying the TEF factors to the concentrations, pending EPA's final decision on this issue.

Remedial Goal Options

RGOs will be calculated for both industrial and residential scenarios following the EPA Region IV guidance.

Ecological Risk Assessment

- CH2M HILL will use exclusively the EPA Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, June 1997 Interim Final for preparing the ecological risk assessment.
- Steps 1, 2, and 3 will be conducted as necessary for the RFI. Steps 4 through 8 will not be conducted.
- An environmental checklist will be completed that is based on a site visit and existing site-specific information.
- The screening benchmark levels proposed for the ecological risk assessment are:

  -Surface Water – EPA Region IV, TN Surface Water Quality Standards

  -Sediment – EPA Region IV guidelines

-Surface Soil – Canadian Soil Quality Criteria, Dutch Soil Cleanup Criteria

- The Screening Level Risk Calculation Results include: COPCs with HQs $\geq$ 1 will be considered in Step 3; COPCs with HQs < 1 will no longer be considered COPCs, and COPCs without benchmarks will be considered in Step 3. If the screening benchmarks were based on detection limits, these COPCs will also be carried forward into Step 3.
- Step 3 allows for risk management decisions to be made regarding COPCs, whereas in Steps 1 and 2 risk management is not involved.
- The group is in general agreement that there is minimal ecological habitat at the facility.

General Site-wide Issues Discussion and Decisions Made

- The site PAHs are widely distributed at the Main Installation and appear to be from non-point sources. The documentation and site management decisions should be based on PAH levels in background and potential source material such as asphalt.

- Railroad tracks and general low levels along the roadways are considered non-point sources.
- Based on PAH levels in the asphalt sample and railroad ties wood samples from other sites, PAHs detected at the site may not be site-related. It was decided that the occurrence of PAHs at railroad yards will be included in the risk assessment uncertainty discussion to provide a perspective for the risk managers. New samples collected for asphalt will be used to determine if the site PAH data appear to be similar to these source material PAH contents.
- PAHs in the background comparisons should be included as part of nature and extent and possibly in the uncertainty section of the RA
- Arsenic is a naturally occurring inorganic typically observed in the background above health-based criteria. Single background concentration value comparisons may be exceeded at some of the sampling location, thus selecting arsenic as a COPC for the site. CH2M HILL proposed to evaluate the distribution of the arsenic data and identify elevated concentrations that are associated with a suspected arsenic source or are indicative of a release as identified via spatial co-location of elevated concentrations above background. These values will be removed from the onsite population of arsenic values. This trimmed onsite and the background arsenic population will be tested statistically to determine if the onsite population, less elevated concentrations associated with specific CERCLA sites, is significantly different from background. If the test does not show that the onsite dataset is statistically different from background, then risk assessment will not be included as arsenic at that location is not a COPC.

  EPA (Dr. Simon) suggested to consider using two tests to conduct the onsite to background statistical evaluation. For each COPC, both the Gehan test (a version of the Wilkoxson test corrected for nondetects) and a nonparametric tolerance interval of the lower concentration level at the 5th percentile lower confidence limit of the 0.9 quartile would be used. If either of these tests is positive, then it cannot be shown that the onsite data are from the same distribution as the background data. Outliers could be discussed in the uncertainty section of the risk assessment.

- Dr. Simon indicated he could accept a population test for arsenic, provided an adequate documentation of the decisions made was maintained, particularly documenting the elevated levels of arsenic due to pesticide applications across the west Tennessee region. Dr. Simon requested that TDEC provide a letter, on TDEC letterhead, documenting the background levels of arsenic found in western Tennessee. He also requested that if the analytical data was available, it be tested against the 22-sample Memphis Depot dataset and, if the populations were determined to be the same, they be combined into one background dataset to improve the power of the background to onsite population tests.

- The derivation of the arsenic background value developed by CH2M HILL will be attached to these meeting minutes.

- The following decisions regarding sitewide **dieldrin** were either made or reiterated:

  -The Region III industrial land use criteria of 360 ug/kg (ppb) is essentially a surrogate background value for dieldrin derived from the BCT evaluation of the dieldrin population testing.

  -Any detected dieldrin concentration above 360 ppb is a COPC and subject to risk assessment, anything below 360 ppb is a not a COPC.

  -With regard to functional units and pesticide management sites, if the UCL is greater than 360 ppb, then more risk assessment or other investigation is needed. If the UCL is less than 360 ppb, this site is finished and may go to No Further Action. Text describing this issue should be placed in the RI Report.

  - Because of its ubiquitous application at Memphis Depot, dieldrin will be evaluated as a site-wide constituent with the exception of those sites where dieldrin was specifically handled or stored.

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Memphis Depot Example Functional Unit Review Meeting Minutes

ATTENDEES:

Shawn Phillips/DDSP-FE (901) 544-0611
Turpin Ballard/USEPA (404) 562-8553
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Ted Simon/UEPA (404) 562-8642
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Dorothy Richards/CEHNC (256) 895-1463
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Kurt Braun/CESAM (334) 690-3415
Vijaya Mylavarapu/CH2M HILL (352) 335-5877
Leslie Shannon/CH2M HILL (334) 271-1444
Greg Underberg/CH2M HILL (423) 483-9032

FROM: Greg Underberg

DATE: February 20, 1999

Vijaya Mylavarapu opened the session with a discussion of the surrogate site selection process. She said that the highest risk site was selected in each Functional Unit (FU) based on the original Preliminary Risk Evaluation (PRE). Remedial Goal Options applicable to the entire FU will be calculated based on a surrogate, highest risk site.

There was some discussion about the use of tables for selection of constituents of potential concern (COPC). Ted Simon commented that the tables that were presented did not follow the guidance offered by EPA Region IV. Table 11-4 should show the maximum, minimum, average, and number of detects for all chemicals that were detected. Tables supporting the discussion of nature and extent should address all chemicals, not just those that exceed screening criteria. It was determined that these tables should consist of the right section of Table 11-4 combined with the left section of the Appendix A Tables. Ted Simon referred to the tables identified in the EPA guidance.

The nature and extent discussion should address all chemicals. There was some discussion that the screening criteria were needed to focus the nature and extent, particulary since the Main Installation has numerous sites to address. However, Ted Simon said that EPA guidance requires all chemicals to be considered in the nature and extent section.

Ted Simon and Turpin Ballard said that the figures provided in the EFU presented too much information and were difficult to review. They suggested use of more figures, colors, contouring and other techniques to reduce the data clutter. It was suggested that the text bridge tabular presentation of all the data with the graphics.

The chemical concentrations presented in Section 7.4.4.1 (Page 7-16) should not be referred to as the Reasonably Maximum Expected (RME) Concentration. The term RME refers to the scenario that produced the Exposure Point Concentrations (EPC), not the concentration itself.

Ted Simon said that it is EPA Region IV's policy to be conservative and therefore the maximum rather than average concentrations should be used for exposure calculations.

The methodology for calculating the residential exposure was discussed. It was determined that within each FU, the maximum risk sample would be identified based on a rerun of the PRE methodology including new data. Exposure concentrations would be calculated based on the COPC concentrations within this maximum sample. The maximum risk sample would be representative of the RME for a typical residential lot. A ½ acre lot would be placed over the sample, but this would be for presentation purposes and would not affect the calculations.

The RGO will be based on the UCL95 (average) of the site and therefore will not be interpreted as a maximum, not to exceed criteria.

The industrial risk will be calculated on the FU and the surrogate site basis. The surrogate site industrial risk will be based on the maxium risk site, considering all samples as determined in the PRE rerun. The FU-level industrial risk will consider all samples within the area of the FU.

The PRE will have to be rerun to include new data. The PRE tables and discussion should be included as an appendix in the RI.

The number of exposure scenarios listed in Figures 11-9 and 11-21 was reduced. Two residential land use scenarios will be evaluated: the Onsite Maintenance Worker, including groundskeeper factors, and the hypothetical Onsite Resident. Two industrial land use scenarios will be evaluated: the Onsite Industrial Worker and the Onsite Utility Worker.

A risk assessment will be performed only for the surrogate RI site in Parcel 3, the golf course and recreational areas. The streamlined risk assessment performed as part of the Parcel 3 EE/CA is acceptable as the FU level risk assessment.

Ted Simon suggested that little maps showing the exposure units should be imbedded in the text to enhance readability. Ted Simon also suggested that only one to two authors have responsibility for the text to prevent it from being segmented and choppy.

Calculation of groundwater risk was discussed. For parameters that occur in a plume (organics at the Main Installation), the Region IV guidance will be followed that uses the average concentration from approximately 3 wells located in the highest concentrated region of the plume as the EPC. In the case of the Main Installation, the well with the highest organic concentrations in each of the three areas of organic contamination will be averaged as representative of organic constituents across the Main Installation. The EPC for constituents that do not occur as a plume, principally inorganics, will be represented as the UCL95 concentration. Greg Underberg discussed the sporatic nature of inorganic contamination observed in wells over the five time periods of sampling. Ted Simon said to perform the UCL95 calculation with time varying data, but to discuss the nature of

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inorganic contamination in the uncertainty section. It should be discussed in the text that the UCL95 calculation incorporates uncertainty in well location.

Ted Simon does not like the nature and extent discussion to make a distinction between organic and inorganic groundwater contamination. Both residential and industrial uses of groundwater should be considered in the risk assessment.

Jordan English said that the City of Memphis has a covenant preventing drilling of a fluvial aquifer well for drinking water purposes. Greg Underberg will talk to Carter Gray regarding the enforceability of this restriction. Jordan English later said that the City will not permit a well for drinking water purposes if there is a City water drinking supply available within 300 feet.

Groundwater risk should be included in each FU risk assessment.

Ted Simon suggested that because of the unique characteristrics of the Memphis Depot risk assessment, Vijaya Mylavarapu stay in contact with him and RC throughout the risk assessment development.

Data from offsite drainages, railroad tracks, and grassy areas will be included in each FU risk assessment. Therefore, there will not be separate chapters for sitewide constituents.

Turpin Ballard, LS, and Greg Underberg discussed the organization of the nature and extent sections. CH2M HILL had proposed providing nature and extent sections for each site, as was performed in the Letter Report submissions. Turpin Ballard suggested that a better approach would be to organize nature and extent along FUs and not each screening or RI site. It was agreed that this would be a better way to organize the document and CH2M HILL would reorganize nature and extent discussions to an FU-wide basis.

The group discussed if the changes proposed during the EFU review could be incorporated and still meet the May 14th milestone for delivery to EPA/TDEC/Memphis Depot for review. Greg Underberg replied that CH2M HILL would have to meet and discuss the implications of these changes on the schedule. Turpin Ballard allowed that a partial deliverable consisting of Chapters 1-7, the groundwater FU, and one soil FU could be submitted, with the other 5 FUs submitted at a later date.

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Human Health and Ecological Risk Assessment Approach Memphis Depot Main Installation

1.0 Introduction

A baseline human health and ecological risk assessment will be conducted at the Main Installation of Memphis Depot, following EPA and State of Tennessee guidance. The risk assessment will document the potential adverse effects to human health and the environment, under both current and future land use conditions. The results of this risk assessment will serve as the basis for site decisions by the site risk managers. A RAGS Part D formatting for human health risk tables will not be implemented at this site.

2.0 Human Health Risk Assessment Approach

The following documentation discusses the general approach for the human health risk assessment to be conducted at each of the RI sites, screening sites, and the Functional units that include groups of BRAC Parcels. The specific details of the exposure scenarios, complete pathways, exposure assumptions, land use, acceptable risk levels etc., will be discussed with the regulatory agencies prior to implementing in the risk assessment. The risk assessment will use methods recommended by the EPA guidance as listed in the following and other applicable regional EPA (Region IV) and Tennessee state guidances:

- United States Environmental Protection Agency,. 1989. *Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A).* EPA/540/1-89/002.
- United States Environmental Protection Agency. 1989) *Risk Assessment Guidance for Superfund (RAGS), Volume II, Environmental Evaluation Manual.* EPA-540/1-89/001.
- United States Environmental Protection Agency. 1990. *Guidance for Data Usability in Risk Assessment.* EPA/540/G-90/008.
- United States Environmental Protection Agency. 1997. *Exposure Factors Handbook.* August 1997. //www.epa.gov/ncea/exposfac.htm.
- United States Environmental Protection Agency. 1989. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments).* Publication 9285.7-01D, January, 1998.

The human health risk assessment will include the four major components in the evaluation process:

- Identification of COPCs
- Exposure assessment
- Toxicity assessment and
- Risk characterization

A conceptual site model will be developed for an overview of site conditions, potential migration pathways, receptors and exposure routes identification purposes. This will serve as the basis for the exposure pathway evaluations in the human health (and ecological risk) assessments.

As appropriate, a discussion of remedial goal options (RGOs) will be included for the sites presenting excess risk or hazard, for risk management decision purposes.

2.1 Identification of Constituents of Potential Concern

Existing analytical data from each of the sites will be evaluated for a quantitative risk assessment. Data are assumed to be in electronic form and have been through a data quality evaluation process. The constituents of potential concern (COPCs) that represent site conditions will be selected using the monitoring data from each site. The selection process will include chemicals that are a direct exposure concern and chemicals that may be of interest from migration to groundwater, air and/or surface water bodies. The screening process conducted for PRE estimations will be used as the basis for COPC selection.

The groundwater data from unfiltered samples will be used for quantitative risk assessment. Any filtered samples will be used to assess the potential migration in the aquifer.

2.2 Exposure Assessment

An exposure assessment will evaluate the potential exposure to the site media and identify the potential receptor population for each site. The exposure assessment will be conducted to identify potential exposure pathways for human receptors, assess the potential routes of exposure, and document the behavior of the assumed receptor into exposure factors for quantitation of the potential exposure. The specific assumptions will be discussed with the risk assessors from reviewing agencies prior to inclusion in the quantitative risk assessments, preferably in a meeting. A conceptual site model will be developed to identify the source, migration pathways and the potential receptors at each site.

Site and its surrounding land use will be documented in the best possible manner, as the onsite land use is subject to change in the near future due to the property leasing that is underway. The offsite well information will be document based on the available information for the local government records. Land use assumptions for current and future land uses at each site and area surrounding Main Installation will be discussed. Since the future land use may be unlimited, a default residential scenario will be evaluated for each site. Although a residential scenario will be evaluated, its applicability for the site management decisions shall be carefully assessed. Since the majority of the MI is industrial, a default future industrial scenario will also be evaluated.

Tables 1, 2 and 3 present a preliminary list of the default exposure factors that will be used in the future industrial and residential exposure scenario risk estimations. Additionally, current exposure scenarios will include a site-specific most likely use scenario and will be evaluated for each site, as appropriate. For areas that may involve recreational use, a recreational scenario will be evaluated (e.g. Ponds at Site 25 and 26). Site visit notes and photographs will be consulted in determining current and possible future land uses for the sites.

TABLE 1
Exposure Factors for Soil
Memphis Depot Main Installation RI

Symbols	Parameter	Future									
		Maintenance Worker		Utility Worker		Industrial Worker		Onsite Resident (Adult)		Onsite Resident (Child)	
BW	Body Weight (kg)	70	a	70	a	70	a	70	a	15	a
IR_Inh	Inhalation Rate (m^3/day)	20	a	20	a	20	a	20	a	15	a
IR_Inh_adj	Inhalation Rate_ age-adjusted	N/A		N/A		N/A		12 86	a m	N/A	
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	70x365	a	70x365	a	N/A	a
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	25x365	a	25x365	a	30x365	a	6x365	a
	Soils										
IR_Ing	Incidental Ingestion Rate (mg/day)	50	p	100	p	50	p	100	p	200	p
IR_adj_Ing	Age adjusted Incidental Ingestion Rate (mg/day)	N/A		N/A		N/A		114 29	p n	N/A	
FI	Fraction Ingested	0 5	b	0 5	b	1	b	1	b	1	b
SA	Skin Surface Area (cm^2)	2,679	c	2 679	c	2 679	c	5 049	d	2 351	e
SA_adj	Age-adjusted Skin Surface Area (cm^2)	N/A		N/A		N/A		2 671	d,o	N/A	
AF	Adherence Factor for dry soil (mg/cm^2)	0 03	f	0 1	g	0 03	f	0 03	f	0 15	h
PEF	Particulate Emission Factor (m^3/kg)	1 32E+09	i	1 32E+09	i	1 32E+09	i	1 32E+09	i	1 32E+09	i
ET	Exposure Time (hours/day)	8	a	6	a	8	a	4	j	4	j
EF	Exposure Frequency (days/year)	50	k	24	l	250	a	350	a	350	a
ED	Exposure Duration (years)	25	a	25	a	25	a	30	a	6	a

Notes Exposure factors shown here reflect what was used in the human health risk assessment
All current scenario exposure factors are subject to reevaluation based on site-specific information

a Default exposure factors adapted from EPA Human Health Evaluation Manual Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25 1991

b Fraction injested assumed by the nature of the activity

c Worker soil exposure is adapted from EPA Exposure Factor Handbook August 1997 & is protective of 1/2 head (face) hands & forearms (see Appendix L)

d Residential adult soil exposure is adapted from EPA Exposure Factor Handbook August 1997 & is protective of 1/2 head (face), hands, forearms & lower legs (see Appendix L)

e Residential child soil exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands forearms, lower legs & feet (see Appendix L)

f 0 03 = Groundskeeper No 2 (exposure scenarios similar to urban horticulture center campus grounds, arboretum) AFs chosen from Soil Loading calculations (see Appendix L)

g 0 1 = Construction Worker (heavy digging exposure to mixed bare earth concrete surfaces, dust & debris) AFs chosen from Soil Loading calculations (see Appendix L)

h 0 15 = Daycare Kids No 1b (indoor exposure to linoleum outdoor exposure to grass, bare earth no shoes) AFs chosen from Soil Loading calculations (see Appendix L)

i PEF adapted from EPA 1996, Soil Screening Guidance Technical Background Document

j 4 hours soil exposure are assumed for residential dermal contact and inhalation exposure time

k Worker soil exposure is assumed to be once a week per year, minus vaction time

l Worker soil exposure is assumed to be twice a month

m Age-adjusted inhalation rate for residential adult $IR\ Inh\ adj = \frac{IR\text{-}Inhc \times EDc}{BWc} + \frac{IR\ Inha \times (EDa - EDc)}{BWa} = \frac{15 \times 6}{15} + \frac{20 \times (30\text{-}6)}{70} = 12\ 86\ (m^3\text{-year})/(kg\text{-day})$

n Age-adjusted ingestion rate for residential adult $IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30\text{-}6)}{70} = 114\ 29\ (mg\text{-year})/(kg\text{-day})$

o Age adjusted dermal contact for residential adult $SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{2351 \times 6}{15} + \frac{5049 \times (30\text{-}6)}{70} = 2671\ (cm^2\text{-year})/(kg)$

p Ingestion rates adapted from EPA Supplemental Guidance to RAGS Region 4 Bulletins Human Health Risk Assessment Interim November 1995

cm^2 centimeters squared
days/year days per year
hours/day hours per day
kg kilograms
m^3/day cubic meters per day
m^3/kg cubic meters per kilogram
mg/cm^2 milligrams per centimeters squared
mg/day milligrams per day
N/A Not applicable for this receptor

TABLE 2

Exposure Factors for Groundwater

Memphis Depot Main Installation RI

		Future					
Symbols	Parameter	Industrial Worker		Onsite Resident (Adult)		Onsite Resident (Child)	
BW	Body Weight (kg)	70	a	70	a	15	a
IR_Inh	Inhalation Rate (m^3/day)	*		*		*	
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	N/A	
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	30x365	a	6x365	a
	Groundwater						
IR_Ing	Ingestion Rate of Water (L/day)	1	a	2	a	1	a
IR_adj_Ing	Age-adjusted Incidental Ingestion Rate (L/day)	N/A		1 1	a,f	N/A	
SA	Skin Surface Area (cm^2)	2679	b	20,000	c	6,557	d
SA_adj	Age-adjusted Skin Surface Area (cm^2)	N/A		9480	c,g	N/A	
ET	Exposure Time (hours/day)	0 007	e	0 007	e	0 007	e
EF	Exposure Frequency (days/year)	250	a	350	a	350	a
ED	Exposure Duration (years)	25	a	30	a	6	a

Notes: Exposure factors shown here reflect what was used in the human health risk assessment

* Inhalation exposures to volatiles in the groundwater are equal to the ingestion exposures as per EPA Region IV policy

a Default exposure factors adapted from EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b Worker groundwater exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands & forearms (see Appendix L)

c Residential adult total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix L)

d Residential child total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix L)

e Calculation for Shower dermal exposure time 10 minute event x 1 hour/60 minutes x 1 day/ 24 hours = 0 007 event/day

f Age-adjusted ingestion rate for residential adult $IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70} = 1\,09$ *(L-year)/(kg-day)*

g Age-adjusted dermal contact for residential adult $SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70} = 9480$ *(cm^2-year)/(kg)*

cm^2	centimeters squared
days/year	days per year
hours/day	hours per day
kg	kilograms
L/day	liters per day
m^3/day	cubic meters per day
N/A	Not applicable for this receptor

TABLE 3
Exposure Factors for Sediment and Surfacewater
Memphis Depot Main Installation RI

Symbols	Parameter	Future: Maintenance Worker		Future: Industrial Worker		Future: Residential/ Recreational (Adult)		Future: Residential/ Recreational (Youth)	
BW	Body Weight (kg)	70	a	70	a	70	a	45	a
IR_Inh	Inhalation Rate (m^3/day)	20	a	20	a	20	a	20	a
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	70x365	a	70x365	a
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	25x365	a	30x365	a	10x365	a
	Surface Water								
IR_Ing_w	Incidental Ingestion - Wading (L/hour)	0 01	b	0 01	b	N/A		N/A	
IR_Ing_s	Incidental Ingestion - Swimming (L/hour)	N/A		N/A		0 05	c	0 05	c
SA_w	Skin Surface Area - Wading (cm^2)	2 679	d	2,679	d	N/A		N/A	
SA_s	Skin Surface Area -Swimming (cm^2)	N/A		N/A		20,000	e	13,118	f
ET	Exposure Time (hours/day)	4	g	4	g	6	h	6	h
EF	Exposure Frequency (days/year)	12	i	250	a	45	j	45	j
ED	Exposure Duration (years)	25	a	25	a	30	a	10	j
	Sediments								
IR_Ing	Incidental Ingestion - Wading (mg/day)	50	k	50	k	100	k	100	k
FI	Fraction Ingested	1	l	1	l	1	l	1	l
SA	Skin Surface Area - Wading (cm^2)	2,679	d	2,679	d	5,671	m	4,785	n
AF	Adherence Factor for wet soil (mg/cm^2)	0 1	o	0 1	o	0 1	o	0 1	o
ET	Exposure Time (hours/day)	4	g	4	g	6	h	6	h
EF	Exposure Frequency (days/year)	12	i	250	a	45	j	45	j
ED	Exposure Duration (years)	25	a	25	a	30	a	10	j

Notes Exposure factors shown here reflect what was used in the human health risk assessment
All current scenario exposure factors are subject to re-evaluation based on site-specific information

a Default exposure factors adapted from EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b Surface water ingestion while wading adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
c Surface water ingestion while swimming adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
d Worker surface water/sediment exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands & forearms (see Appendix L)
e Recreational adult total body surface area is adapted from EPA Exposure Factor Handbook August 1997 & is protective of all body parts (see Appendix L)
f Recreational youth total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix L)
g 4 hours surface water/sediment exposure are assumed for workers based on the nature of the activities
h 6 hours surface water/sediment exposure are assumed for recreational adults/youths based on the nature of the activities
i Worker surface water/sediment exposure is assumed to be once a month
j Recreational factors adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
k Sediment ingestion rates adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
l Fraction injested assumed by the nature of the activity
m Recreational adult sediment exposure is adapted from USEPA Exposure Factor Handbook, August 1997 & is protective of hands, forearms, lower legs & feet (see Appendix L)
n Recreational youth sediment exposure is adapted from USEPA Exposure Factor Handbook, August 1997 &is protective of hands, forearms, lower legs & feet (see Appendix L)
o 0 1 = Construction Worker (heavy digging, exposure to mixed bare earth, concrete surfaces, dust & debris) AFs chosen from Soil Loading calculations (see Appendix L)

cm^2 centimeters squared
days/year days per year
hours/day hours per day
kg kilograms
L/hour liters per hour
m^3/day cubic meters per day
m^3/kg cubic meters per kilogram
mg/cm^2 milligrams per centimeters squared
mg/day milligrams per day
N/A Not applicable for this receptor

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A minimum of one site-specific and one default future exposure scenario will be evaluated using the site-specific land use information for each site. Fate and transport of the COPCs identified for each media will be evaluated, and discussions will be provided. Much of the fate and transport discussions will be qualitative, and no quantitative modeling is currently identified as needed for the site media at the Main Installation.

The dose (chronic daily intakes [CDIs]) will be estimated using exposure point concentrations for each receptor and exposure route for the identified complete exposure pathways. Exposure pathways for risk assessment will be selected based on the site activities and surrounding area and the site conceptual model developed prior to risk assessment. Exposure pathways to be quantified will be determined based on the United States Environmental Protection Agency (EPA) guidance and will include the direct exposure pathways to soil, groundwater, sediments, and surface water as appropriate. Appropriate representative exposure pathways will be included for quantitative analysis and other potentially complete less–conservative pathways will be discussed qualitatively.

The exposure point concentrations will be the upper 95% confidence limit estimates on the mean concentrations (UCL95%). The non-detect samples will be included at half the detection limit levels in these UCL95% estimates. These estimations will be performed using the underlying data distributions (normal versus log-normal), according to the EPA guidance. The lower of the maximum detected concentration and the UCL95% estimated will be selected as the exposure point concentrations. For groundwater, an average of the three highest detected concentrations will be selected as the exposure point concentration. For downgradient locations, individual well concentrations may be used as exposure point concentrations on a site-specific basis. Groundwater is currently not in use. Future potential use will be evaluated.

A fate and transport evaluation will include discussion of environmental behavior of the COPCs identified during the nature and extent investigations in the surface and subsurface soils, sediment, and surface water, and potential impacts to site groundwater. The behavior of the chemicals shall be determined by both individual chemical properties, as well as by facility characteristics including water flow velocity, soil permeability, infiltration, temperature, and presence of conditions that support microbial population. Potential pathways—including air emissions, transport, or persistence—shall be assessed based on site-specific information and chemical properties. Fate and transport evaluation will include potential offsite impacts from the site contaminants by evaluating the site COPCs and their potential for offsite migration through groundwater or surface runoff or volatilization from the site media. This will be a qualitative evaluation. The groundwater monitoring data will serve as the indicator for quantitative assessment of the potential migration. No quantitative modeling will be performed as part of this fate and transport evaluation.

2.3 Toxicity Assessment

The human health evaluation will include a toxicity assessment section that compiles the toxicity criteria for risk and hazard index estimates. The toxicity criteria will be obtained from the EPA toxicity databases (e.g., IRIS, and HEAST). Any interim values from EPA available through other sources (e.g. EPA Region III RBC tables) will be used in the absence of a value in the EPA toxicity databases. Uncertainties associated with the toxicity criteria estimations will be discussed. The target organs for the selected toxicity factors will be selected from the existing toxicity databases, as suggested by EPA. The toxicity equivalency factors (TEFs) will be used for PAHs and dioxins as appropriate. For PCBs three sets of toxicity factors are available. The conservative set of toxicity factors will be used for risk estimations.

2.4 Risk Characterization

The exposure and toxicity information from the previous sections will be integrated in this section to estimate the potential risks and HIs. The estimated risks and HIs represent the site (unit) being investigated, for site-specific risk management decisions. The cumulative risks and HIs will be compared against the acceptable risk ranges. Summary and conclusions will be provided for each of the receptor populations and sites. Risks will be totaled by medium and combined risks across media and pathways will be presented as appropriate.

3.0 Ecological Risk Assessment Approach

An ecological risk assessment (ERA) will be conducted to document the potential adverse effects to the environment as a result of contamination present at the Memphis Depot Main Installation. The EPAs program guidance for ecological risk assessments, *Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments*. Interim Final, June 5, 1997 (EPA 540-R-97-006), will be the primary ERA guidance. The stepwise process outlined in this guidance will serve as the basic framework for the ERA portion of the RFI. Steps 1, 2, and 3 of the guidance will be followed in the RFI, and are outlined below.

3.1 Step 1 - Screening Level Problem Formulation and Ecological Effects Evaluation

The screening level problem formulation and ecological effects evaluation are part of the initial stage of the ecological risk screening assessment. This step includes all the functions of a problem formulation, but at a screening level.

The screening level problem formulation will include the development of a conceptual site model. The model will include; (1). A description of the environmental setting and contaminants known to exist at the site, (2). Contaminant fate and transport mechanisms that might exist at the site, (3). Categories of ecological receptors and the mechanisms of ecological toxicity associated with the contaminants, (4). Identifies complete exposure pathways, and (5) selects endpoints to screen for ecological risk.

The environmental setting will include a land use map that illustrates the land use characteristics on and near the Memphis Depot facility. Land use types may include industrial, residential, undeveloped, and natural habitats. Observed or potentially occurring plant and animal species will be identified, as well as potentially occurring protected species or critical habitats. Contaminants identified in site media will also be presented.

Potential contaminant migration pathways, such as stormwater runoff, will be addressed. For the screening level risk assessment, the maximum contaminant concentrations measured at the site will be documented for each medium.

An understanding of the toxic mechanisms of the contaminants will be developed to evaluate the importance of potential exposure pathways and focus the selection of assessment endpoints for the ERA. For example, some chemicals may affect vertebrate animals and not terrestrial plants.

Identification of exposure pathways is one of the primary tasks of the screening ERA. For an exposure pathway to be complete, a contaminant must be able to travel from the source to ecological receptors and be taken up by the receptors. Identifying complete exposure pathways allows the ERA to focus on only those contaminants that may reach ecological receptors. It may be possible to determine that present and future ecological impacts are negligible since complete exposure pathways do not exist and could not exist in the future.

Assessment and measurement endpoints will be defined. Assessment endpoints are those environmental values to be protected and can represent any adverse effects on ecological receptors, where receptors are plant and animal populations, communities, habitats, and sensitive environments. Measurement endpoints will be based on available literature regarding toxicity and will be used to establish screening ecotoxicity values.

The preliminary ecological effects evaluation involves the identification of conservative screening ecotoxicity values. The ecotoxicity values chosen for the screening level assessment are those that have recently been recommended by EPA Region 4. For surface soil, these criteria include the Canadian Soil Quality Criteria and the Dutch Government soil cleanup values. For surface water, criteria will include Tennessee freshwater chronic criteria, Region IV water quality criteria, and Federal ambient water quality criteria. For sediment, the Florida sediment quality criteria and the NOAA effects-range-low values will be used. For terrestrial wildlife (i.e. birds and mammals), screening ecotoxicity values will be those that represent no-observed-adverse-effect-levels (NOAEL) as reported in various literature sources.

Uncertainty Assessment

Uncertainty is inherent in each step of the screening level ecological risk assessment. Professional judgement will be used to determine the uncertainty associated with information taken from the literature and any extrapolations used in developing screening ecotoxicity values.

3.2 Step 2 - Screening Level Exposure Estimate and Risk Calculation

This step includes estimating contaminant exposure levels and screening them against the previously identified ecotoxicity values to determine the potential for ecological risk. The process concludes with a scientific/management decision point that identifies the adequacy of the information and the level of ecological risk.

3.2.1 Screening Level Exposure Estimates

To ensure that potential ecological threats are not missed, the exposure estimates used for the screening process will be the maximum detected contaminant values in site media. These media will include only those for which a complete exposure pathway has been identified.

3.2.2 Screening Level Risk Calculation

A quantitative screening level risk will be estimated using the maximum exposure concentrations and the screening ecotoxicity values previously outlined. Comparisons to screening ecotoxicity values will be in a step-wise hierarchy, and will follow the same order presented previously. For example, maximum surface soil concentrations will first be compared to the Canadian guidelines, followed by the Dutch guidelines if Canadian guidelines are not available.

The hazard quotient (HQ) approach, which compares point estimates of screening ecotoxicity values and exposure values, will be used to estimate screening-level ecological risk. Thus, for each contaminant, the HQ can be expressed as the estimated environmental concentration divided by the screening ecotoxicity value. An HQ less than one indicates that the contaminant alone is unlikely to cause adverse ecological effects. An HQ of one is the threshold level at which effects may occur.

All contaminants with an HQ greater than 1 will be considered COPCs and carried forward into the Step 3 of the ERA process. In addition, any contaminant for which a screening ecotoxicity value does not exist will also be carried forward to Step 3 as COPCs. Risk management information such as other screening ecotoxicity values, frequency of detection, and background comparisons will not be considered within Step 2, but will be considered in Step 3 as part of the refinement of COPCs.

3.2.3 Scientific Management Decision Point (SMDP)

At the end of Step 2, the results of the preliminary ERA are presented to the risk manager. A decision will then be made regarding whether the information available is adequate to make a risk management decision. The three possible decisions at this point are as follows;

1. There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk.
2. The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue to Step 3.
3. The information indicates a potential for adverse effects, and a more thorough assessment is warranted.

3.3 Step 3 Baseline Risk Assessment Problem Formulation

Step 3 refines the screening level problem formulation phase of the ERA, and with input from the stakeholders and other involved parties, expands on the ecological issues of concern at the site. In the screening level assessment, conservative assumptions were used where site-specific information was lacking. In Step 3, the screening assessment results and additional site-specific information are used to determine the scope and goals of the baseline ERA.

The first activity in Step 3 is the refinement of preliminary contaminants of ecological concern. In Steps 1 and 2, it is likely that several contaminants were eliminated from further consideration. Because of the conservative nature of the screening process, some contaminants carried forward into Step 3 may also pose negligible risk. Therefore more realistic assumptions will be considered, such as reasonable maximum or average exposure concentrations, frequency of detection, background concentrations, and terrestrial wildlife site usage factors. For those contaminants for which the HQ drops to near or below 1, agreement between the risk assessor and risk manager may lead to dropping the affected COPCs from further consideration.

In Step 3, information gathered in the screening level assessment is expanded upon. A literature search will be conducted to fill in data gaps regarding identification of NOAELs, lowest-observed-adverse-effect-levels (LOAELs), exposure-response functions, and mechanisms of toxic responses. Exposure pathways and the ecosystems associated with the assessment endpoints that were retained in the screening risk assessment are evaluated in more detail. Refined evaluations are conducted of fate and transport mechanisms, ecological setting, magnitude and extent of contamination, and reconsideration of complete exposure pathways. Finally, a formal identification of assessment endpoints based is conducted.

Within Step 3, it is possible that the refinement of COPCs has lead to a recommendation for no further action. If COPCs are identified to be carried through the baseline risk assessment, Step 3 will be completed. At the conclusion of Step 3, the problem formulation will have been defined. A SMDP will then be required and will consist of an agreement on four items; contaminants of concern, assessment endpoints, exposure pathways, and risk questions or testable hypotheses. The results of the SMDP will indicate how the baseline risk assessment is to progress, however this additional work (Steps 4 through 7) is not part of the existing scope of work.

4.0 Remedial Goal Options (RGOs)

The remedial goal options (RGOs) will be estimated for the pathway and the receptor that is identified to have excessive risks. Media with risks and HIs below the acceptable levels will not be further evaluated in this section. A Remedial Goal Option (RGO) will be estimated for media presenting excess risk (e.g. $>10^{-4}$) or an unacceptable HI (>1.0). A quantitative cleanup level will not be estimated for the media presenting low human health or ecological risks. Concentrations will be compared with available ARARs, and discussion of remedial options by media for each site will be provided.

4.1 Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) Requirements

The existing ARARs and TBC requirements will be reviewed and modified, as necessary. ARARs and TBCs will be used to evaluate subsequent proposed remedial actions. Location-specific ARARs and activity-specific ARARs will be developed. Applicability of the ARARs and TBCs for these RCRA sites will determined by site risk managers.

4. 2 Risk Based RGOs

For sites presenting excess human health or ecological risk, remedial goal options will be developed as per EPA Region IV guidance. A quantitative RGO will be calculated for those media and chemicals presenting excess cancer risk or HI above an acceptable risk range or HI value. Chemicals and media that represent low risks and HIs will not be included for an RGO estimation.

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Results of Pesticide Vertical Profile Sampling

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DATE: May 18, 1998

Introduction

Previous surface soil sampling at the Defense Depot Memphis, Tennessee (DDMT) has indicated that pesticide concentrations, particularly dieldrin, exceed risk-based human health criteria across the DDMT Main Installation. As a result, soil removal may be required in numerous locations. However, samples collected before the Pesticide Vertical Profile Sampling were composited from the 0-1 foot interval. As a result, it was not established how deep the pesticides actually penetrated into the soil column. It was believed that the pesticides were sorbed onto only the upper few inches of organic rich soil, which would result in significant cost savings if soil removal was required. On February 11th, 1998, a discussion between staff from the Defense Depot Susquehanna, Pennsylvania; the Corps of Engineers Huntsville Division; and CH2M HILL indicated the need to characterize the vertical concentration of dieldrin in surface soil.

Soil samples were collected at DDMT from March 30, 1998 through April 1, 1998. Sampling was performed in three areas with a history of distinct soil management practices. The three groups identified within the Main Installation of DDMT were: 1) the Golf Course Area where pesticides were likely applied in broadcast fashion; 2) the Warehouse Areas where pesticides were likely applied in around the perimeter of buildings; and 3) the Open Grassy Areas where pesticides were likely applied in broadcast fashion, but were not subject to the same degree of spray irrigation as the Golf Course Area.

Within each of the three groups, two sample locations were selected for vertical profiling. The locations were adjacent to previously sampled areas so that the initial pesticide concentrations were known. Dieldrin was the primary pesticide of concern and was used as a primary criterion for selecting the locations of the vertical profiling. However, one of the two sample locations was partially based on the known concentrations of DDT and its degradation products DDE and DDD. The dieldrin-only locations were analyzed for dieldrin using modified SW-846 Method 8081. Samples from the dieldrin/DDT borings were analyzed for the complete list of SW-846 Method 8081 organochlorine pesticides (Pesticide Suite). To evaluate other soil properties that might influence vertical transport of pesticides, samples were also analyzed for pH, total organic carbon (TOC), moisture content, and clay content (fraction passing a #200 sieve) (clay content not yet available).

Samples were collected with a Shelby tube that was inserted by either pounding or augering. The root zone was removed and analyzed as the uppermost sample of the profile. Samples were collected below the root zone at 4 inch intervals for the uppermost foot. These samples characterized the vertical profile of pesticides within the top foot the surface soil. When possible, a composite sample was collected from 12-24" interval. This sample represented concentrations that would be left in-situ if the top foot of soil were to be removed. Samples from the 8-12" and 12"-24" sample intervals were only analyzed if significant concentrations were detected in shallower samples.

Summary of Field Sampling

Soil samples were collected at the DDMT from March 30, 1998 through April 1, 1998. The soil samples were analyzed for dieldrin, pesticides, moisture content, clay content, total organic carbon (TOC), and pH. The following locations, identified in Figure 1, were sampled.

Location: **S(3.5)V**

Golf Course Area

Sampled: 3/30/98 – 16:40

Samples were located approximately 150 feet south of the intersection of K Street and 2nd Street on the west side of 2nd Street. Because of the density of the soil, a maximum depth of 12 inches was achieved with the hand auger; therefore, the bottom 1 foot composite sample was not obtained. Two holes were augered to provide enough root zone material, and one of these holes was used for the remainder of the samples. All of the samples were grab samples from the specified intervals except for the 8-12" interval, which was a composite sample. The following samples were collected at this location.

Depth Interval	Sample ID	Analyses
0 – 2" (Root Zone)	S35V1	Pesticide Suite Moisture Content Clay Content TOC pH
2 – 4"	S35V2	Pesticide Suite Moisture Content Clay Content TOC pH
4 – 8"	S35V3	Pesticide Suite Moisture Content Clay Content TOC pH
8 – 12"	S35V4	Pesticide Suite Moisture Content Clay Content TOC pH
12 - 14"	S35V5	Pesticide Suite Moisture Content Clay Content TOC pH

Location: **B(3.5)V**

Golf Course Area

Sampled: 3/31/98 – 17:40

Samples were located approximately 30 feet west of 1st Street on the golf course, near the edge of the DDMT reservation. A hand auger was used and samples were collected to a depth of 21 inches. Four holes were augered to provide enough root zone material, and one of these holes was used for the remainder of the samples. All of the samples were grab samples from the specified intervals except for the 12–21″ interval, which was a composite sample. The following samples were collected at this location.

Depth Interval	Sample ID	Analyses
0 – 2″ (Root Zone)	B35V1 B35V1D B35V1MS B35V1MSD	Dieldrin Moisture Content Clay Content TOC pH
0 – 4″	B35V2	Dieldrin Moisture Content Clay Content TOC pH
4 – 8″	B35V3	Dieldrin Moisture Content Clay Content TOC pH
8 – 12″	B35V4	Dieldrin Moisture Content Clay Content TOC pH
12 – 21″	B35V5	Dieldrin Moisture Content Clay Content TOC pH

Location: **A(10.2)V**

Warehouse Areas

Sampled: 4/1/98 - 09:15

Samples were located approximately 45 feet south of E Street and 150 feet east of 5th Street next to building 549. A hand auger was used and samples were collected to a depth of 24 inches. Two holes were augered to provide enough material for the root zone sample and the 0–4" sample, and one of these holes was used for the remainder of the samples. All of the samples were grab samples from the specified intervals except for the 12–24" interval, which was a composite sample. The following samples were collected at this location.

Depth Interval	Sample ID	Analyses
0 – 2" (Root Zone)	A102V1	Pesticide Suite Moisture Content Clay Content TOC pH
0 – 4"	A102V2 A102V2D A102V2MS A102V2MSD	Pesticide Suite Moisture Content Clay Content TOC pH
4 – 8"	A102V3	Pesticide Suite Moisture Content Clay Content TOC pH
8 – 12"	A102V4	Pesticide Suite Moisture Content Clay Content TOC pH
12 – 24"	A102V5	Pesticide Suite Moisture Content Clay Content TOC pH

Location: **A(15.6)V**

Warehouse Areas

Sampled: 4/1/98 – 11:30

Samples were located approximately 50 feet north of the railroad tracks which are north of buildings 529 and 429. A hand auger was used and samples were collected to a depth of 23.5 inches. Two holes were augered to provide enough material for the root zone sample, and one of these holes was used for the remainder of the samples. All of the samples were grab samples from the specified intervals except for the 12–23.5" interval, which was a composite sample. The following samples were collected at this location.

Due to the previous day's rain, there was some standing water on the surface.

Sampling at this location was video taped by DDMT personnel.

Depth Interval	Sample ID	Analyses
0 – 2" (Root Zone)	A156V1	Dieldrin Moisture Content Clay Content TOC pH
0 – 4"	A156V2	Dieldrin Moisture Content Clay Content TOC pH
4 – 8" (2-photos taken)	A156V3	Dieldrin Moisture Content Clay Content TOC pH
8 – 12"	A156V4	Dieldrin Moisture Content Clay Content TOC pH
12 – 23.5"	A156V5	Dieldrin Moisture Content Clay Content TOC pH

Location: **A(2.7)V**

Open Grassy Areas

Sampled: 3/31/98 – 17:40

Samples were located approximately 10 feet southwest of the front porch of the west unit in the northern most row of housing units. A hand auger was used and samples were collected to a depth of 23 inches. Two holes were augered to provide enough root zone material, and one of these holes was used for the remainder of the samples. All of the samples were grab samples from the specified intervals except for the 12–23" interval, which was a composite sample. The following samples were collected at this location.

Depth Interval	Sample ID	Analyses
0 – 2" (Root Zone)	A27V1	Pesticide Suite Moisture Content Clay Content TOC pH
0 – 4"	A27V2	Pesticide Suite Moisture Content Clay Content TOC pH
4 – 8"	A27V3	Pesticide Suite Moisture Content Clay Content TOC pH
8 – 12"	A27V4	Pesticide Suite Moisture Content Clay Content TOC pH
12 – 23"	A27V5	Pesticide Suite Moisture Content Clay Content TOC pH

Location: J(3.5)V

Open Grassy Areas

Sampled: 3/30/98 – 17:35

Samples were located approximately 90 feet east of 1st Street and near L Street. A hand auger was used and samples were collected to a depth of 24 inches. Two holes were augered to provide enough root zone material, and one of these holes was used for the remainder of the samples. All of the samples were grab samples from the specified intervals except for the 12–24" interval, which was a composite sample. The following samples were collected at this location.

Depth Interval	Sample ID	Analyses
0 – 2" (Root Zone)	J35V1	Dieldrin Moisture Content Clay Content TOC pH
0 – 4"	J35V2	Dieldrin Moisture Content Clay Content TOC pH
4 – 8"	J35V3	Dieldrin Moisture Content Clay Content TOC pH
8 – 12"	J35V4	Dieldrin Moisture Content Clay Content TOC pH
12 – 24"	J35V5	Dieldrin Moisture Content Clay Content TOC pH

Vertical Profile Results

The analytical results of the Pesticide Vertical Profile Sampling are presented in Table 1. Dieldrin, DDT, DDE, and DDD were detected in the samples collected during the investigation. Samples from the Golf Course Area contained detectable concentrations of dieldrin, DDT, DDE, and DDD. Samples from the Warehouse and Open Grassy Areas contained detectable concentrations of dieldrin, DDT, and DDE.

As shown in the Table 1, the pesticide results were compared to the EPA Region III Risk-Based Concentrations (RBCs) dated April 15, 1998 for soil at an industrial site. Dieldrin was the only analyzed constituent which exceeded a RBC. The concentrations in eight samples collected from the Golf Course Area and Open Grassy Areas exceeded the RBC for dieldrin of 360 µg/kg: S(3.5)V (0-2"), S(3.5)V (8-12"), J(3.5)V (0-2"), B(3.5)V (0-2"), B(3.5)V (0-2") Duplicate, B(3.5)V (0-4"), B(3.5)V (4-8"), A(2.7)V (0-2"). No concentration from a sample collected in the Warehouse Areas exceeded a RBC.

The vertical profile of the concentrations varied between areas and is described below:

Golf Course Area - The concentrations of the dieldrin, DDT, DDE, and DDD show an overall decrease below the 0-2" sample interval. However, dieldrin, DDT, and DDD are consistently detected throughout the 14" and 21" inch sample depths.

The vertical profile of the dieldrin, DDT, DDE, and DDD concentrations for S(3.5) V is shown in Figure 1 and a dieldrin and TOC vertical profile for S(3.5) V is shown in Figure 2. Dieldrin concentrations in the 0-2" and 8-12" sample intervals exceeded the RBC for dieldrin. Dieldrin concentrations show an initial decrease in S(3.5)V below the 0-2" sample interval. However, a possibly anomalous concentration of 550 µg/kg exists in the 8-12" interval. This concentration is located beneath a concentration of 150 µg/kg in the 4-8" interval and above a concentration of 76 µg/kg in the 12-24" interval. This increased value at the 8-12" interval can possibly be attributed to sample cross-contamination with the upper 0-2" sample interval resulting from the use of a hand auger in the relatively stiff clay

Dieldrin concentrations in B(3.5)V decreased below the 0-2" sample interval. However, the concentrations in the samples from the 0-4" and 4-8" sample intervals remained above the RBC for dieldrin. Sample concentrations from the 8-12" and 12-21" intervals were detected but decreased below the RBC. A Dieldrin and TOC Vertical Profile for B(3.5)V is shown in Figure 3.

Based on the sample results from B(3.5)V and S(3.5)V, the dieldrin concentrations in the Golf Course Area may exist at levels exceeding the RBC to a depth of 8-12". However, due to the sampling method, cross-contamination may have existed between the upper root zone and the lower zones.

Warehouse Areas - The concentrations of dieldrin, DDT, and DDE decreased significantly below the 0-2" sample interval. The vertical profile of the dieldrin, DDT, DDE, and DDD concentrations for A(10.2) V is shown in Figure 4. The aforementioned pesticides were detected throughout the sample intervals to a depth of 4-8". However, the highest concentrations were limited to the 0-2" sample interval which corresponded with high TOC concentrations (46,200 mg/kg and 31,400 mg/kg). No sample concentrations exceeded a RBC in the Warehouse Areas.

Open Grassy Areas - As observed in the Warehouse Areas, the detected concentrations of dieldrin, DDT, and DDE decreased significantly below the 0-2" sample interval which contained significantly higher TOC concentrations (42,800 mg/kg and 22,600 mg/kg). The vertical profile of the dieldrin, DDT, DDE, and DDD concentrations for A(2.7) V is shown in Figure 5 and a dieldrin and TOC vertical profile for A(2.7)V and J(3.5)V are shown in Figures 6 and 7, respectively. One anomalous DDT concentration of 3,500 µg/kg was observed in the sample from A(2.7)V 4-8". This concentration was located below the 2-4" interval DDT concentration of 740 µg/kg. Two dieldrin concentrations of 850 µg/kg and 980 µg/kg exceeded the RBC for dieldrin of 360 µg/kg but were limited to the 0-2" sample interval.

Conclusions

Dieldrin, DDT, DDE, and DDD were detected in soil samples collected during the investigation. In general, the higher dieldrin, DDT, DDE, DDD concentrations were limited to the 0-2" sample intervals corresponding to the highly organic root zone. As shown in Table 1, many of the aforementioned pesticides were detected at the lowest depths of the investigation. However, the concentrations of each pesticide decrease significantly below the 0-2" sample interval. No DDT, DDE, or DDD concentration was detected above its respective RBC. No dieldrin concentration was detected above its RBC in samples collected in the Warehouse Areas. Dieldrin concentrations were detected above the RBC in samples collected from the 0-2" interval of the Open Grassy Areas. Samples collected from the Golf Course Area suggest that the dieldrin concentration in soil in the Golf Course Area may exceed the RBC for dieldrin to a depth of 8-12". However, this conclusion may be influenced by possible cross-contamination resulting from the type of investigation method (hand augering) and the consistency of the soil material (stiff clay).

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Pesticide Vertical Profile Sampling
Defense Depot Memphis Tennessee

Area	Location	Depth Interval	Sample ID	% Moisture	pH	TOC mg/kg	Dieldrin ug/kg	4,4' - DDT ug/kg	4,4' - DDE ug/kg	4,4' - DDD ug/kg
	EPA Region III RBC (Industrial)						**360**	**17000**	**17000**	**24000**
Golf Course	S(3.5)V	0-2"	S35V1	15	6.8	8490	830	350 J	680	140 J
		2-4"	S35V2	17	7.0	3900	110	110	120	13 J
		4-8"	S35V3	34	6.8	4460	150	93	110	17 J
		8-12"	S35V4	18	6.8	3100	550	220	480	67 J
		12-14"	S35V5	19	7.3	3190	76	380	120	61 U
	B(3.5)V	0-2"	B35V1	24	6.0	20200	1200			
		0-2"	B35V1D	23	5.9	19700	2100			
		0-4"	B35V2	18	6.0	9650	620			
		4-8"	B35V3	18	5.9	7010	790			
		8-12"	B35V4	19	5.2	6530	64			
		12-21"	B35V5	19	5.0	2500	85			
Warehouse	A(10.2)V	0-2"	A102V1	20	6.5	46200	820 U	400 J	320 J	820 U
		0-4"	A102V2	16	6.7	3230	20 U	10 J	5.9 J	20 U
		0-4"	A102V2D	16	6.9	2020	4.6 J	10 J	7.1 J	16 U
		4-8"	A102V3	18	6.8	1720	3.7 J	6.4 J	3.9 J	16 U
		8-12"	A102V4				NA	NA	NA	NA
		12-24"	A102V5				NA	NA	NA	NA
	A(15.6)V	0-2"	A156V1	23	6.5	31400	240			
		0-4"	A156V2	21	6.8	7630	20			
		4-8"	A156V3	19	6.9	2570	3.1 J			
		8-12"	A156V4				NA			
		12-23.5"	A156V5				NA			
Open Grassy	A(2.7)V	0-2"	A27V1	23	5.7	42800	850	2000	880	430 U
		0-4"	A27V2	18	6.0	2470	91 J	740	120 J	160 U
		4-8"	A27V3	18	5.9	3210	600 U	3500	600 U	600 U
		8-12"	A27V4				NA	NA	NA	NA
		12-23"	A27V5				NA	NA	NA	NA
	J(3.5)V	0-2"	J35V1	27	6.1	22600	980			
		2-4"	J35V2	15	6.2	10100	67			
		4-8"	J35V3	17	6.5	2880	11			
		8-12"	J35V4				NA			
		12-24"	J35V5				NA			

Notes:
NA = Not analyzed due to low concentrations in samples at shallower depths
RBC = Risk-Based Concentration
Shaded values exceeded the RBC.

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Figure 1
S(3.5)V Pesticide Vertical Profile

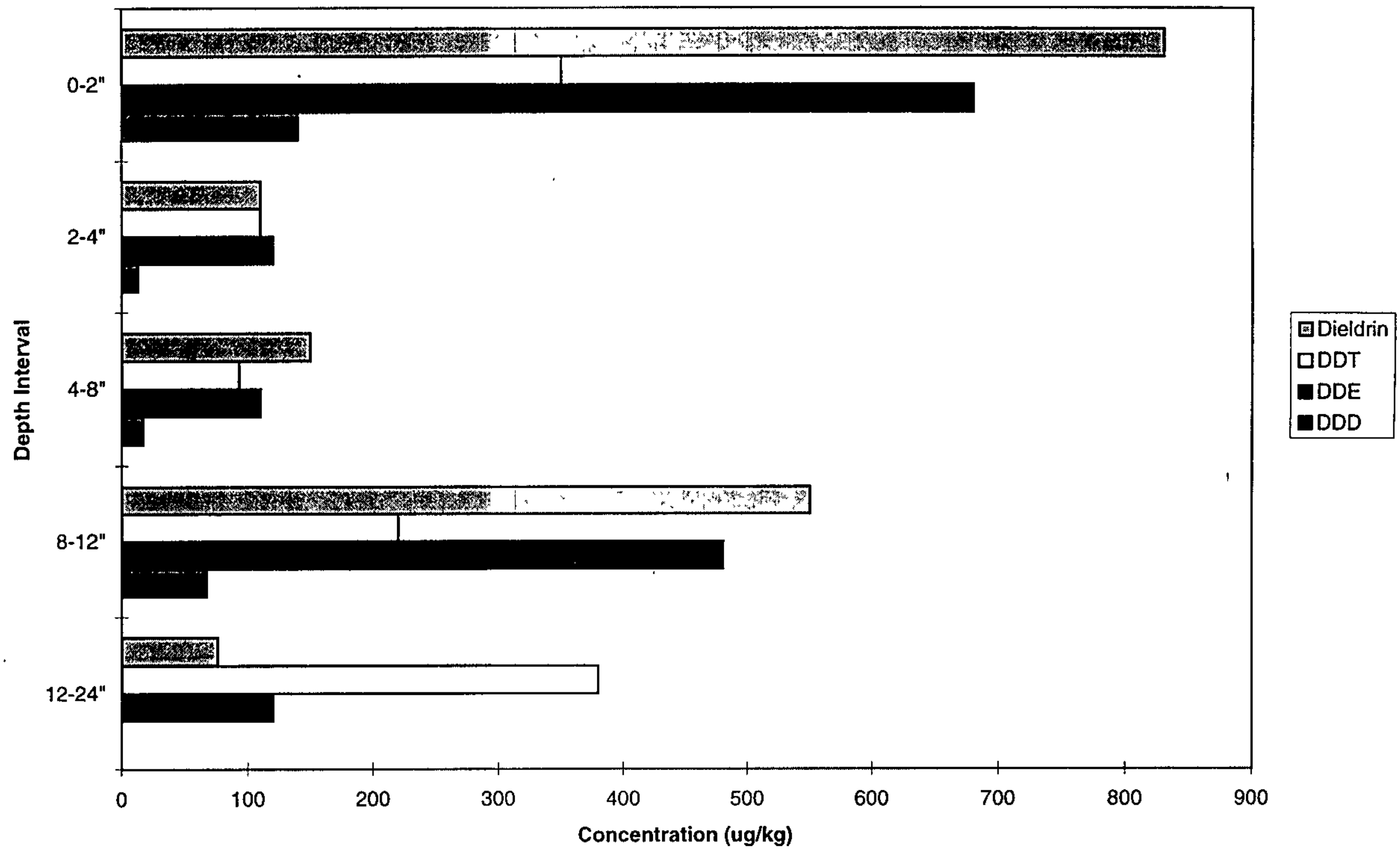


Figure 2
S(3.5)V Dieldrin and TOC Vertical Profile

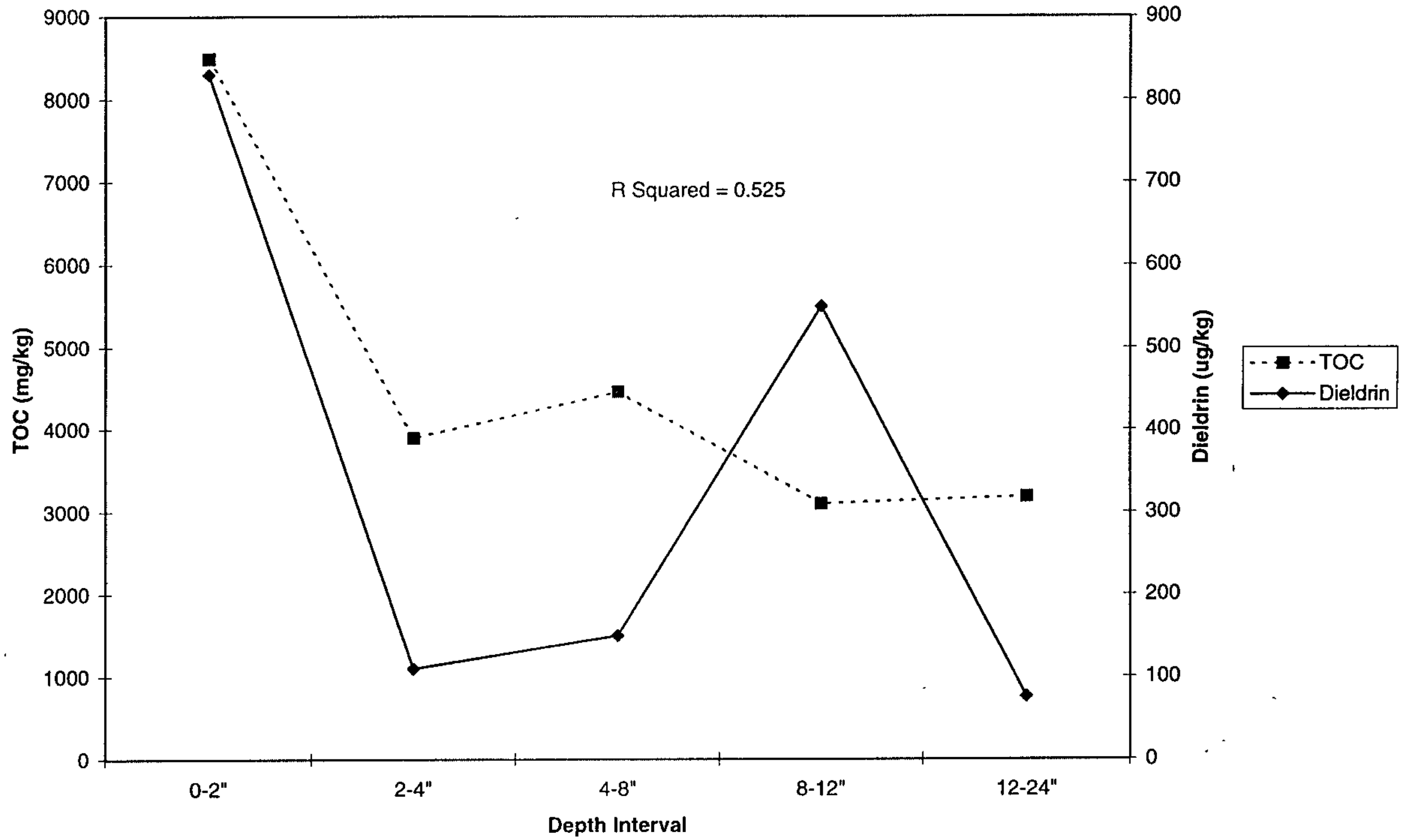


Figure 3
B(3.5)V Dieldrin and TOC Vertical Profile

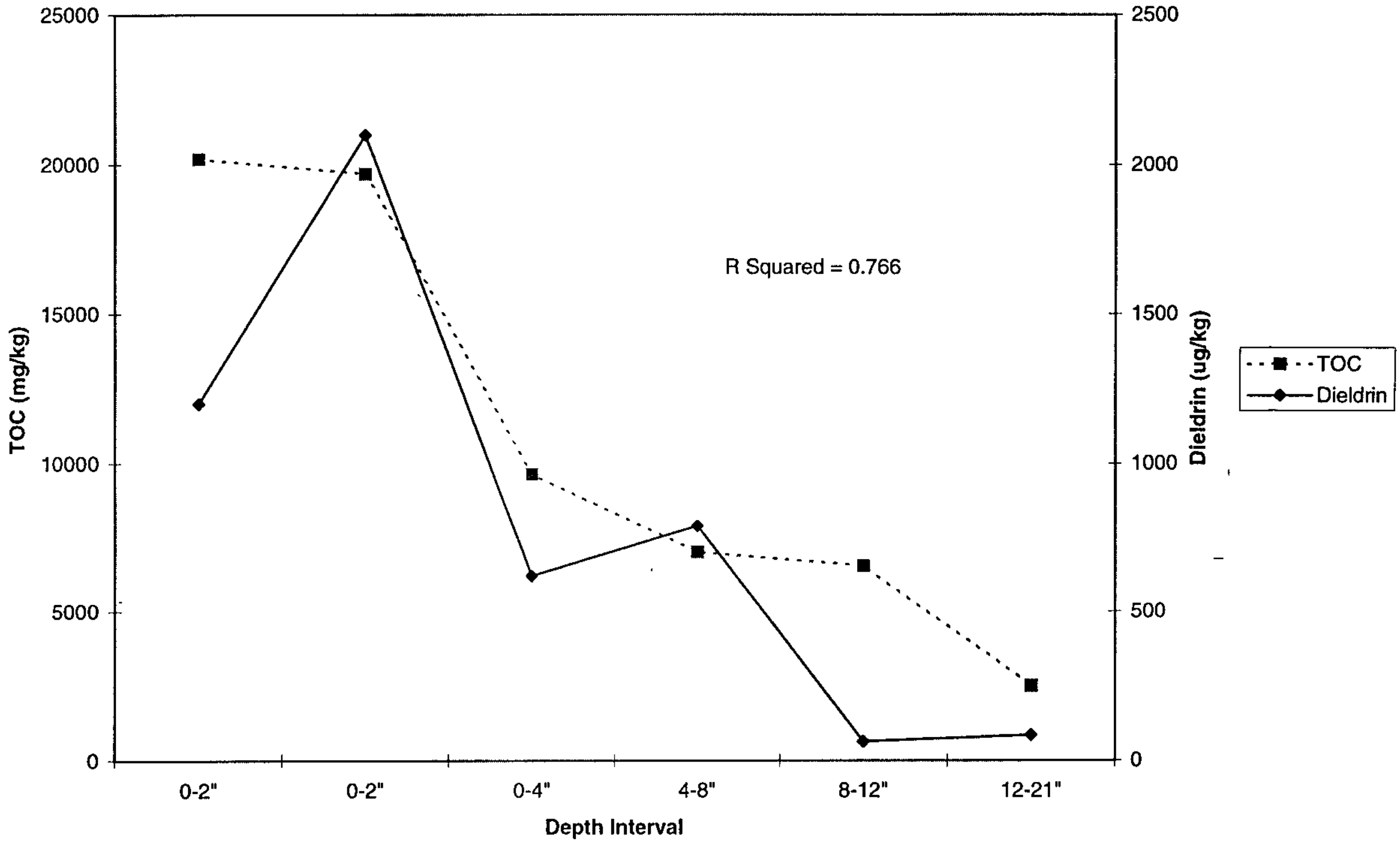


Figure 4
A(10.2)V Pesticide Vertical Profile

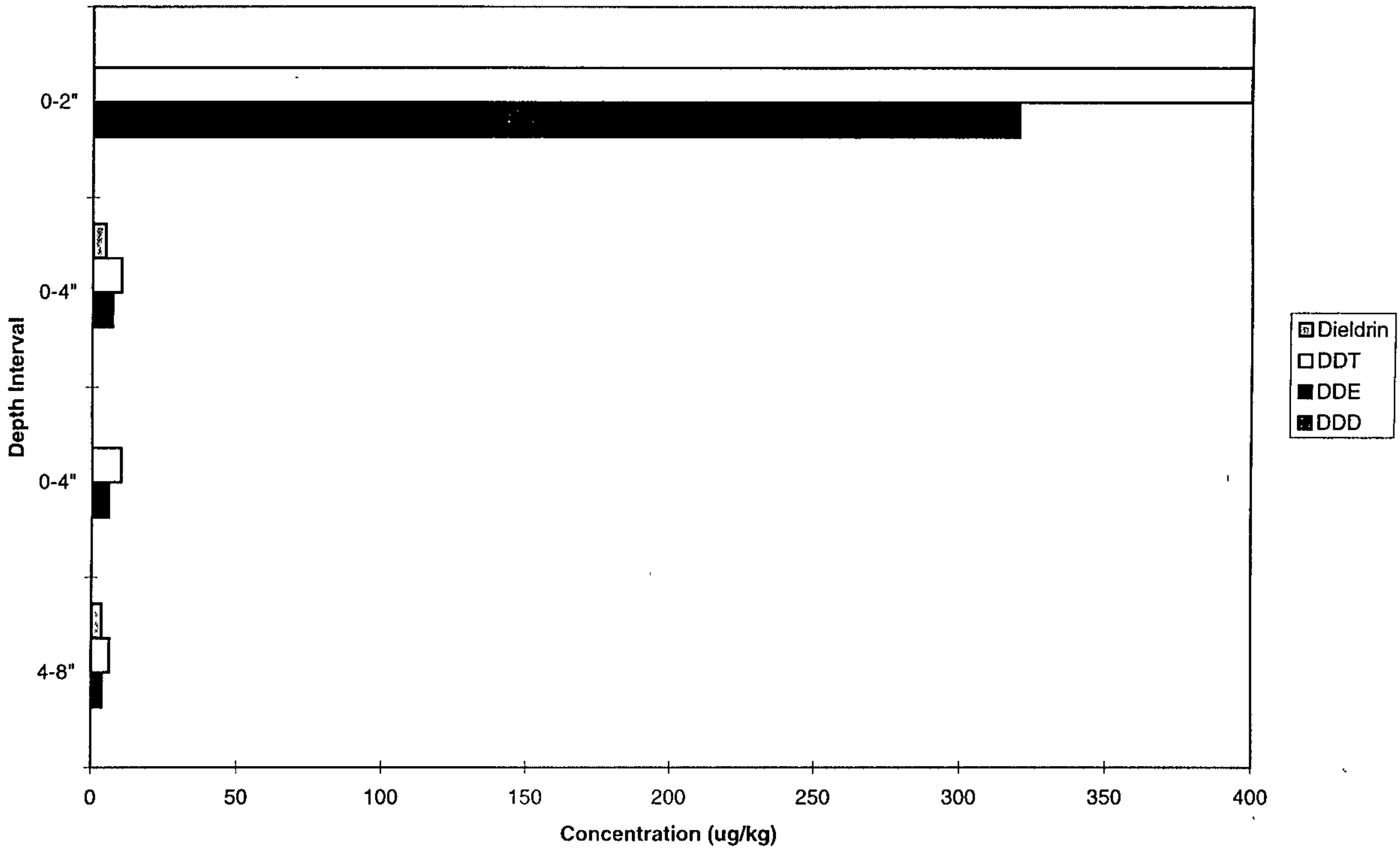


Figure 5
A(2.7)V Pesticide Vertical Profile

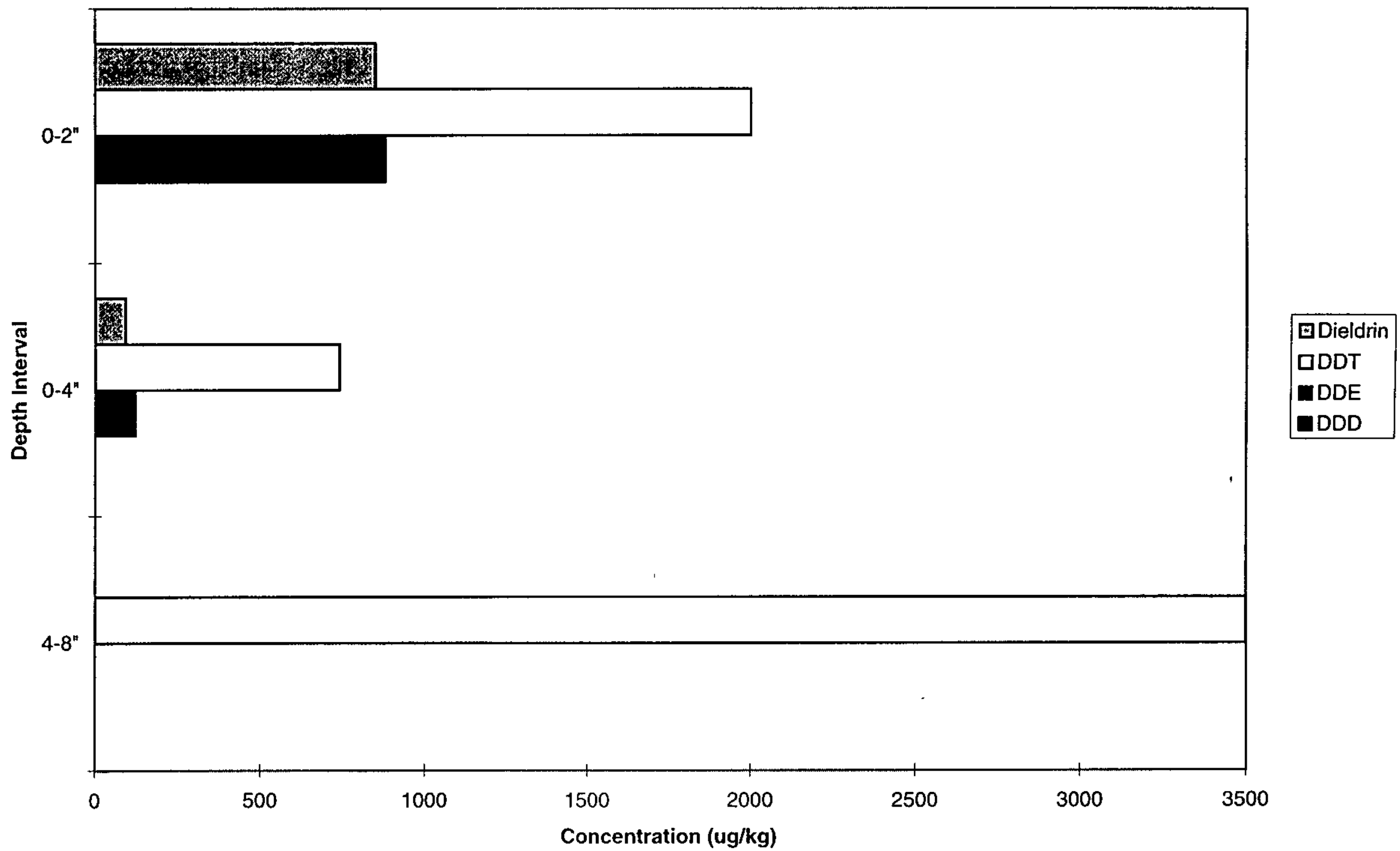


Figure 6
A(2.7)V Dieldrin and TOC Vertical Profile

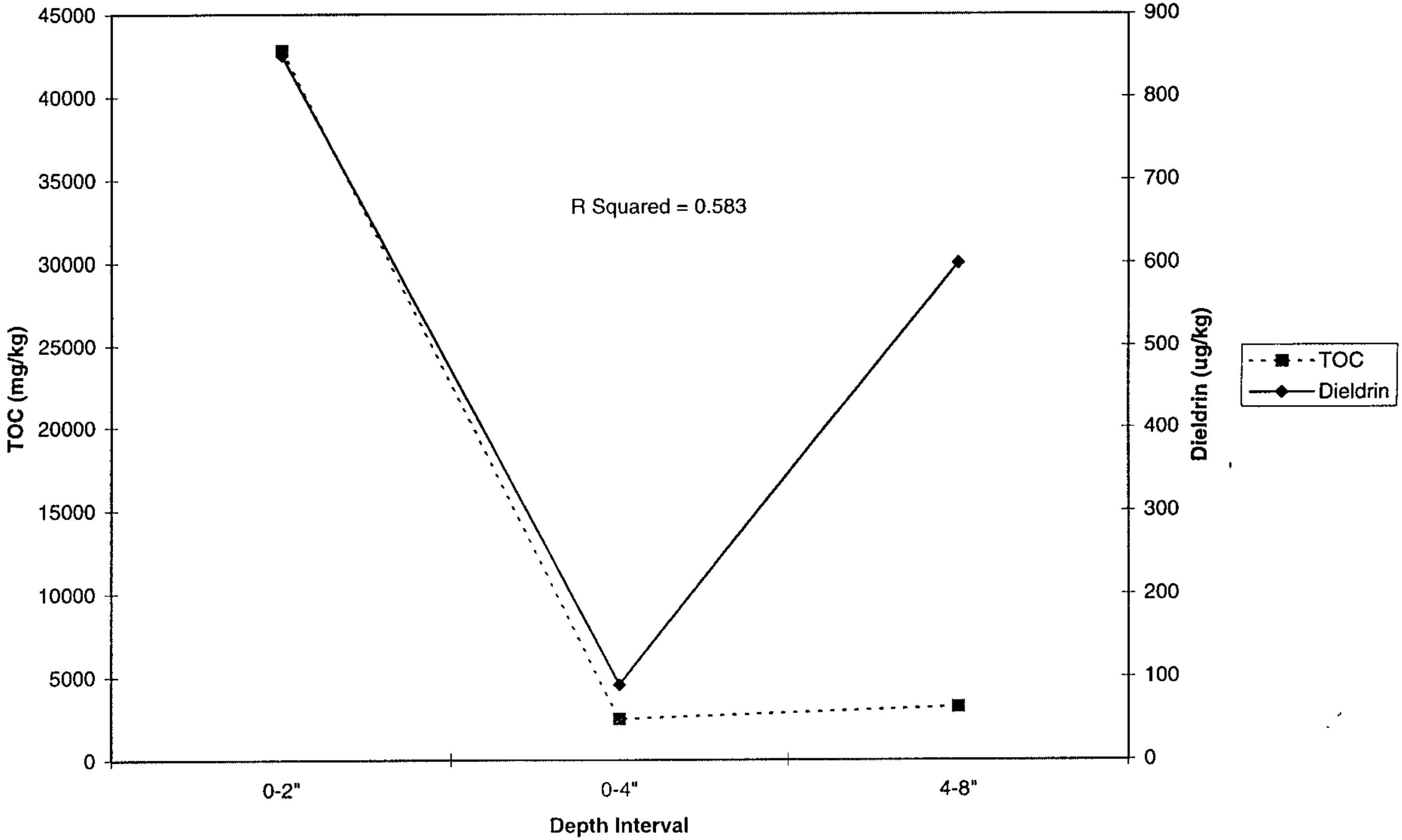
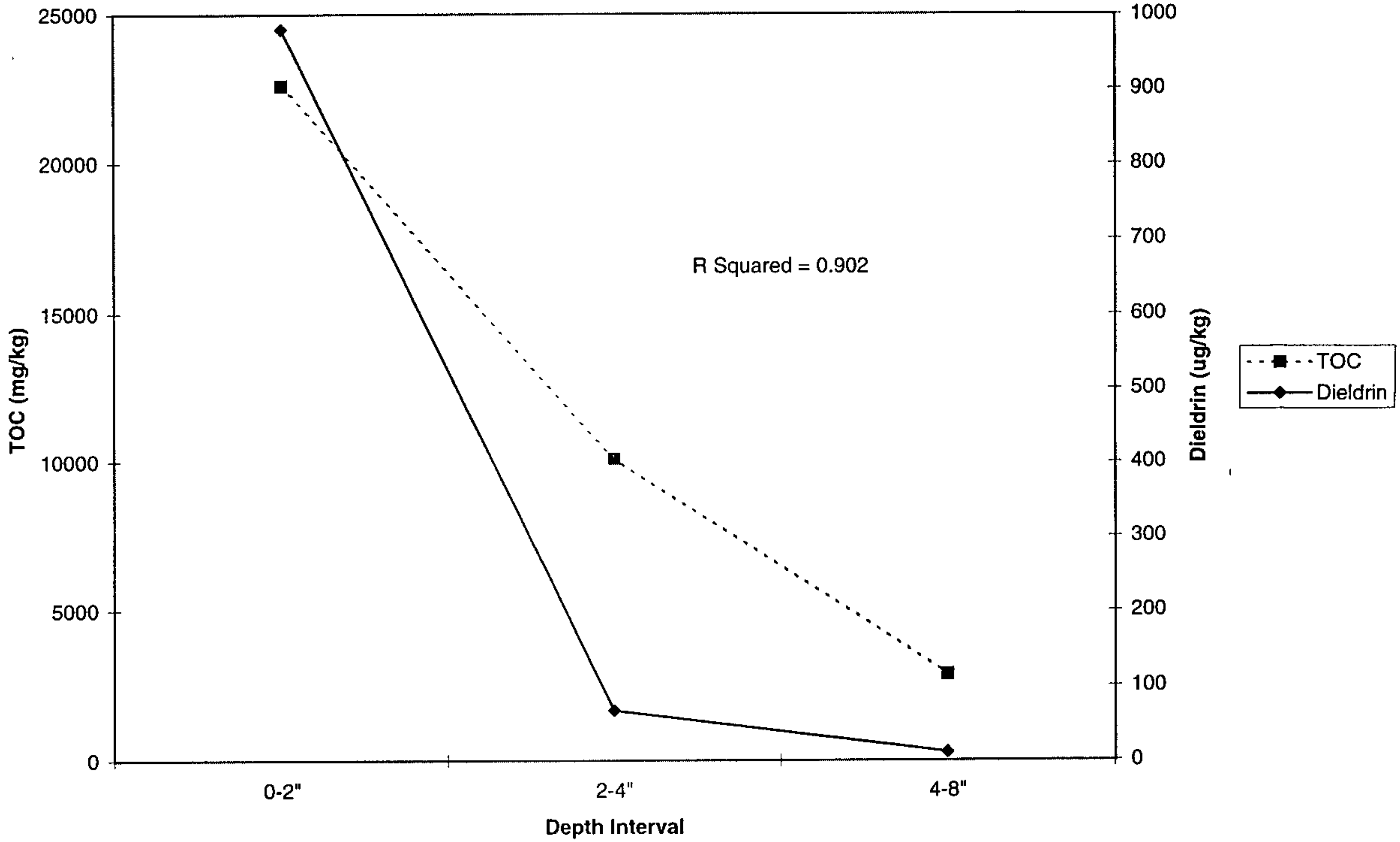
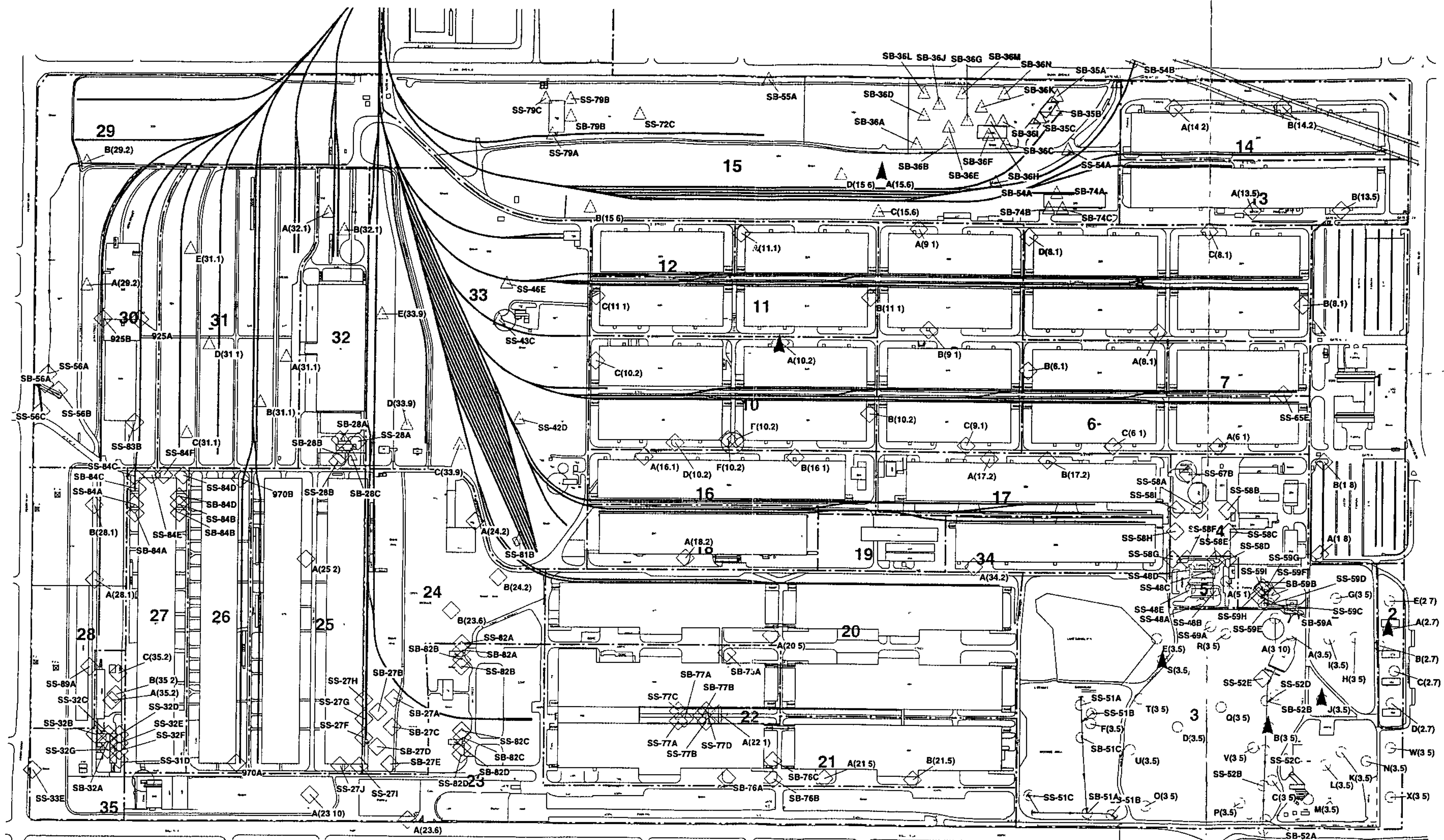


Figure 7
J(3.5)V Dieldrin and TOC Vertical Profile





LEGEND

- ○ GOLF COURSE AREA
- △ RR TRACKS & OPEN AREA
- ⁄⁄ WAREHOUSE AREA
- ▲ VERTICAL PROFILE SAMPLE LOCATION

MAP SCALE 1" = 500'

FIGURE 1

DIELDRIN SAMPLE LOCATIONS AND GROUPS

DEFENSE DISTRIBUTION DEPOT MEMPHIS, TENNESSEE

CH2MHILL

Major Project Staff for Memphis Depot Main Installation RI Report

The following CH2M HILL staff, in alphabetical order, had significant, specific input into the preparation or review of this report:

Staff Member	Title	Office Location
Sharon Belser	Project Engineer	SAN
Rick Dobbins	Project Chemist	GNV
David Dunagan	Editor	ATL
Elizabeth Garland	Risk Assessor	GNV
Ed Leach	Sr. Risk Assessor	SEA
Dan Marion	Hydrogeologist	ATL
John Martin	Ecologist	GNV
Ron McComb	Hydrogeologist	ORO
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Vijaya Mylavarapu	Sr. Risk Assessor	GNV
Vicky Potter	Editor	ATL
Jimmy Scott	Project Engineer	MGM
Leslie Shannon	Project Manager	MGM
Ed Svastits	Sr. Chemist	GNV
Greg Underberg	Program Manager	ORO

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TENNESSEE DEPARTMENT OF HEALTH AND ENVIRONMENT
Bureau of Environment
Room 1101, State Office Building
170 North Mid America Mall
Memphis, Tennesee 38103

October 16, 1985

Corlyn J. Troyer, Colonel
United States Air Force
Commander, Defense Logistics Agency
Defense Depot Memphis
2163 Airways Boulevard
Memphis, Tennessee 38114

Dear Colonel Troyer:

This letter shall document the meeting held on October 1, 1985 at the Defense Logistics Agency - Memphis. The subject of that meeting was to discuss the dioxin contaminated areas on the Defense Logistics Agency - Memphis property as referenced in my September 26, 1985 letter along with a review of the proposed remedial action plan for the contaminated sites. Those in attendance were:

- Jack Heller - US Army Environmental Hygiene Agency
- James E. Fleming - Tennessee Department of Health and Environment
- Paul Patterson - Tennessee Department of Health and Enviroment
- Ulysses Truitt - Defense Logistics Agency
- Lt. Colonel John Krosnes - Defense Logistics Agency
- Curt Gionther - Defense Logistics Agency
- Terri Kirby - Defense Logistics Agency
- Rick Bowlus - US Army Environmental Hygiene Agency
- Doug Lamothe - Defense Logistics Agency
- Cheryl Poirier- Memphis Shelby County Health Department
- Bob Cibulskis - US Environmental Protection Agency - ERT
- Jane Rogers - US Environmental Protection Agency - Region IV

The remedial action as planned for the areas exhibiting levels of 2,3,7,8 tetrachlorodibenzo-dioxin (TCDD) below the EPA action level (5-6 ppb) consisted of covering the areas with 6-8" of soil and stabilization. This proposal was discussed in detail and evaluated based upon the levels of TCDD present and the potential for harm to the public health and environment. Basically the group agreed that the plan was more than sufficient to eliminate any potential problems from the site.

Corlyn J. Troyer, Colonel
Defense Depot Memphis
Page two

Representatives from the Defense Logistics Agency - Memphis, however, did request consideration for approval of an alternate remedial plan. Lt. Colonel John Krosnes and Major Doug Lamothe suggested the placement of 6-8" of compacted gravel in those areas which exhibited levels below the EPA action level. This action would be more suitable in the event the Defense Logistics Agency wishes to concrete the area for future storage capacity. In consideration of the pathways for exposure (dermal and/or inhalation) their request was approved with the following conditions:

1. The graveled area must be placed "off limits" to any and all vehicular traffic .

2. The area must be indicated as a "non-use" area on the facility development plat.

3. Future plans for utilization of the area must be approved by the Department.

4. Prior to placement of gravel, the entire area should be sprayed with water to prevent dusting.

Therefore, please accept this letter as written approval to implement the previously referenced remedial actions. If you have any questions concerning this letter or if I may be of further assistance, please do not hesitate to contact me at (901) 529-6695.

Sincerely,

Paul Patterson

Paul Patterson
Division of Solid Waste Management

DRAFT FINAL

Basis for NFA Recommendations

The Memphis Depot
Memphis, Tennessee

PREPARED FOR

U.S. Army Engineering and Support Center

Huntsville, Alabama

Contract No. DACA87-94-D-0009
Delivery Order 0011

PREPARED BY
CH2M HILL

147543 RD 01

SEPTEMBER 1999

488 68

TECHNICAL MEMORANDUM

CH2MHILL

PREPARED FOR:	Memphis Depot Caretaker Division U.S. Environmental Protection Agency, Region IV Tennessee Department of Environment and Conservation U.S. Army Engineering and Support Center
PREPARED BY:	CH2M HILL
DATE:	September 14 1999
SUBJECT:	Main Installation–Sites Proposed for NFA as of September 1998

Executive Summary

The Memphis Depot was a major field installation of the Defense Logistics Agency (DLA), U.S. Department of Defense (DOD). Its primary mission was to provide material support to all U.S. military services and some civil agencies. The Memphis Depot was engaged in a variety of operations dealing with hazardous substance transportation, shipment, and disposal.

As a result of past practices and environmental contamination, the Memphis Depot was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) on October 14, 1992 (199 *Federal Register* 47180). This action followed the issuance of a Resource Conservation and Recovery Act (RCRA) Part B Permit (No. TN4 210 020 570) to the facility on September 28, 1990. As an enforcement activity of the RCRA permit, a RCRA Facility Assessment (RFA) was conducted in January 1990 by the U.S. Environmental Protection Agency (EPA) (A. T. Kearney, Subcontractor). Other activities conducted under regulatory jurisdiction include the following:

Activity	Company	Dates
PCP Dip Vat Remediation	O. H. Materials	February 1996
Remedial Investigation	Law Environmental	August 1990
Feasibility Study	Law Environmental	September 1990
Groundwater Removal Engineering Report	Engineering Science, Inc.	July 1994
Groundwater Removal Engineering Assessment	Engineering Science, Inc.	August 1993
Screening Sites Investigation	CH2M HILL	March 1998
Remedial Investigation/Feasibility Study	CH2M HILL	May 1998-present

During the above-mentioned investigations and enforcement activities, individual sites that pose no threat to human health and the environment were identified by operable unit (OU). This technical memorandum (TM) describes the sites identified in OUs-2, 3, and 4 within the Main Installation of the Memphis Depot that pose no environmental threats based on the investigations conducted as of September 1998. Table ES-1 presents a summary of the sites proposed for no further action (NFA). This decision is the only remedial action identified for the sites.

Additional TMs documenting other sites that qualified for NFA after September 1998 will be provided in the future. The additional TMs will discuss the screening sites that were sampled previously during the Screening Sites Investigation, but for which additional sampling was required to further characterize the site and to provide sufficient data to support the proposed NFA status for the site. Furthermore, upon completion of the Remedial Investigation/Feasibility Study (RI/FS), historical RI sites probably could be proposed for NFA.

TABLE ES-1
Sites Recommended for No Further Action
Memphis Depot Main Installation NFA

Site No.	Description	Document Supporting NFA Recommendation
30	Paint Spray Booths	1
40	Safety Kleen Locations	1
41	Satellite Drum Accumulation Areas	1
44	Former WWTU Area	1
45	Former Contaminated Soil Staging Area	1, 2
47	Former Contaminated Soil Drum Staging Area	1, 2
49	Expired Medical Supplies Storage Area	1
53	X-25 Flammable Solvents Storage Area	1
69	Flamethrower Liquid Fuel	3
74	Flammables and Toxics	3
76	Unknown Wastes Near Building 690	3
81	Building 765, Fuel Oil AST	3

Notes:
Supporting documents are as follows.
1–RCRA Facility Assessment conducted by A. T. Kearney (January 1990)
2–Dip Vat Remediation Report by O. H. Materials (February 1986)
3–Screening Sites Letter Report, CH2M HILL (March 1998)

On the basis of the information provided in this report, it was determined that the proposed NFA remedy for the 12 identified sites is protective of human health and the environment and that no unacceptable short-term risks are caused. Therefore, the selected remedial alternative for the sites is intended to be NFA. This alternative will consist of leaving the sites as they are. No additional sampling or monitoring will be necessary (under CERCLA), because the conditions at the sites are protective of human health and the environment. This remedial alternative will have no remedial action or assessment costs associated with it.

Contents

Tables

Figures

Acronyms

AOC	Area of concern
AST	Aboveground storage tank
BCT	BRAC Cleanup Team
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
DLA	Defense Logistics Agency
DOD	Department of Defense
DRMO	Defense Reutilization and Marketing Organization
EPA	U.S. Environmental Protection Agency
FFA	Federal Facilities Agreement
FOSL	Finding of Suitability to Lease
FOST	Finding of Suitability to Transfer
FR	*Federal Register*
ft	Feet
IRP	Installation Restoration Program
NCP	National Oil and Hazardous Pollution Contingency Plan
NFA	No Further Action
NPL	National Priorities List
OU	Operable unit
PAH	Polycyclic aromatic hydrocarbon
PCP	Pentachlorophenol
POL	Petroleum, oil, and lubricants
POTW	Publicly owned treatment works
PRE	Preliminary risk evaluation
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SWMU	Solid waste management unit
TDEC	Tennessee Department of Environment and Conservation
TM	Technical memorandum
USAESCH	U.S. Army Engineering and Support Center
WWTU	Wastewater treatment unit

1.0 Introduction

This technical memorandum (TM) has been prepared to propose a list of sites in the Main Installation of the Memphis Depot that do not present a significant risk to human health or the environment. This document is not intended to provide a formal Record of Decision (ROD) for these sites, although it does provide most of the necessary information for developing a ROD. The information and recommendations documented herein formalize the intention of the Memphis Depot Base Realignment and Closure (BRAC) Cleanup Team (BCT) that these sites will not require further action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The sites will be formally proposed for no further action (NFA) status under CERCLA during the proposed planning and ROD processes, which include public review and comment, at a later date.

The proposed NFA recommendation is made for these sites because the sites are already in a protective state, meaning that they do not pose a current or potential threat to human health or the environment. Preliminary assessments and site investigations were conducted at some of the sites by the U.S. Environmental Protection Agency (EPA) and Law Environmental in 1990 and by CH2M HILL from 1996 through 1997; the investigations concluded that no remedial actions were necessary at the sites herein proposed for NFA. It is intended that other TMs will be provided for additional sites intended for NFA as additional data and the results of risk-based analyses become available.

In cases where environmental sampling was performed at proposed NFA sites, the NFA recommendations in this document are based on the results of soil, surface water, and sediment analyses. The NFA recommendation does not include the potential for groundwater contamination below the NFA-candidate sites, either from the site itself or from upgradient sources of groundwater contamination. Groundwater contamination from the site itself is unlikely, considering the lack of evidence of a contaminant release to the environment from the proposed NFA sites. Groundwater contamination from upgradient sources is being evaluated under the site-wide groundwater monitoring program currently ongoing in Operable Unit (OU)-4 (*Operable Unit 4 Field Sampling Plan,* U.S. Army Engineering and Support Center [USAESCH], September 1995) and the CH2M HILL Remedial Investigation/Feasibility Study (RI/F). NFA recommendations within this document are based on an evaluation of the surface soil, surface water, and sediment environmental pathways. Groundwater evaluation is ongoing and will be reported in the Main Installation RI Report. The ongoing evaluation of subsurface soil data has not identified potential subsurface sources to groundwater contamination.

1.1 Facility Description and History

This subsection describes the location and characteristics of the Memphis Depot facility and the history of CERCLA activities at the Memphis Depot.

1.1.1 Memphis Depot Facility Description and Location 488 75

The Memphis Depot covers 642 acres of land in Memphis, Tennessee (Shelby County), in the extreme southwestern portion of the state. The installation contains approximately 118 buildings, 26 miles of railroad track, and 28 miles of paved streets, the majority of which lie within the Main Installation. Approximately 5.5 million square feet (ft) are covered storage space and approximately 6.0 million square ft are open storage space. The land and buildings are owned by the U.S. Army and were leased by the Defense Logistics Agency (DLA).

The DLA, an agency of the U.S. Department of Defense (DOD), provides logistics support to military services. The Memphis Depot is a major field installation of the DLA. The former duties of the Memphis Depot were to receive, warehouse, and distribute supplies common to all U.S. military services and some civil agencies located primarily in the southeastern United States, Puerto Rico, and Panama. Supplies for storage and distribution included food, clothing, electronic equipment, petroleum products, construction materials, and industrial, medical, and general supplies. Figure 1-1 presents the facility location map.

The Memphis Depot is located approximately 5 miles east of the Mississippi River and just northeast of the Interstate 240–Interstate 55 junction. The Memphis Depot is in the south-central section of Memphis, approximately 4 miles southeast of the Central Business District and 1 mile northwest of Memphis International Airport. Airways Boulevard borders the Memphis Depot on the east and provides primary access to the installation. Dunn Avenue, Ball Road, and Perry Road serve as the northern, southern, and western boundaries, respectively.

The Memphis Depot is divided into four OUs for CERCLA evaluation purposes. Dunn Field is designated as OU-1 and the Main Installation consists of OUs-2, 3, and 4 Again, this TM only focuses on the proposed NFA sites in OUs-2, 3, and 4 (the Main Installation) as of September 1998. Sites within OU-1 will be evaluated for NFA after RIs in Dunn Field are complete.

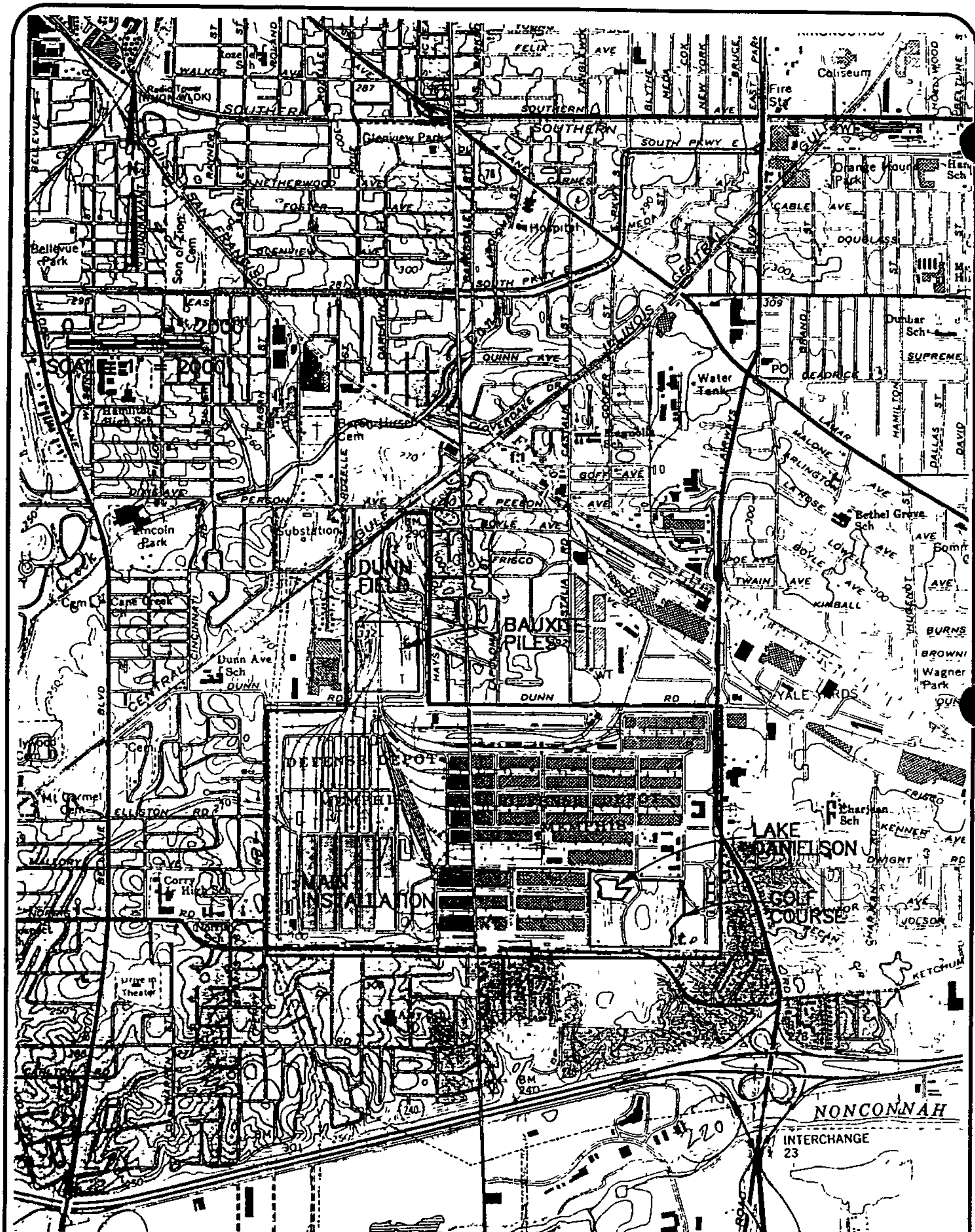
1.1.2 Facility Characteristics

1.1.2.1 Physiography and Climatology

The Memphis Depot and eastern Memphis are situated within the Gulf Coastal Plain Subdivision of the Atlantic Coastal Plain Physiographic Province. This area is characterized by dissected loess-covered uplands and generally lacks distinct features. The erosion-controlled land surface appears nearly level with local slopes, ranging from level to approximately 10 percent.

The Main Installation consists primarily of highly developed, urban land that has been graded, paved, and built on, with the major exception of the facility's golf course. Undeveloped areas are used for open storage of equipment.

488 76



Source: USGS 7.5 Series Topographic Quadrangle Maps - South West Memphis Tenn. - Ark. and Southeast Memphis, Tenn..

FIGURE 1-1
FACILITY LOCATION MAP
MEMPHIS DEPOT MAIN INSTALLATION NFA

2717_99 (boarder/title)

CH2MHILL

The Memphis Depot is located in the West Tennessee Climatic Division, with a typical climate of humid, warm summers and cold winters. The annual mean temperature is 62 degrees Fahrenheit; the daily mean temperature ranges from approximately 40 degrees in January to 82 degrees Fahrenheit in July. The area receives an average of 50 inches of precipitation a year, with the heaviest periods during the winter and early spring; thunderstorms are typical during late spring and early summer. The net annual precipitation (rainfall-evaporation) estimated for the Memphis area is 9 inches. Prevailing winds are from the south at less than 11 miles per hour.

1.1.2.2 Soils and Stratigraphy

The predominant surface soil association found in the Memphis Depot site before its development was the Memphis-Granda-Loring Association, characterized by yellow-brown to dark brown color. The association is generally sloping, well-drained to moderately well-drained, and has silt deposits varying in thickness from 6 to 8 inches. Construction of the facility resulted in an altering of the surface soil to a type classified as graded land with silty materials. Exceptions include the northeastern corner of Dunn Field and the southeastern corner of the golf course.

The facility is located in the north-central part of the Mississippi embayment, which is a broad trough or geosyncline. The axis of the trough roughly parallels the Mississippi River and plunges to the south. The sediments in the study area are primarily Tertiary and Quaternary unconsolidated sands, silts, and clays, with minor amounts of lignite. The uppermost geologic unit is loess. Loess is an eolian deposit consisting of silt, silty clay, sand, or a mixture of the materials The deposits at the Memphis Depot range from 6 to 40 ft.

Quaternary and possibly Tertiary-age fluvial deposits underlie the loess throughout the facility beneath the upland areas and the valley slopes. The deposits consist primarily of sand and gravel, with lenses of clay. The fluvial deposits range in thickness from approximately 45 ft to 98 ft at the Memphis Depot.

The Jackson formation and the upper part of the Claiborne Group lie beneath the fluvial deposits. These units consist primarily of clay, silt, and fine sands, with minor lenses of lignite. The clays are primarily montmorillonitic. The Jackson formation and the upper Claiborne Group form a regionally significant confining unit for the underlying Memphis Sand, which is an important drinking water aquifer in the region.

1.1.2.3 Groundwater

The facility is underlain by a layer of loess that varies in thickness. Terrace deposits underlie the loess. The lower, saturated portion of the terrace deposits is referred to as the fluvial aquifer, which is the uppermost aquifer beneath the installation. Perched groundwater also exists in the terrace deposits above small clay lenses at elevations above the fluvial aquifer However, these perched water zones are temporal and are not considered part of the fluvial aquifer. The fluvial aquifer is not used as a drinking water source within the City of Memphis. The Memphis Sand Aquifer underlies the fluvial aquifer and is the primary source of drinking water for the City of Memphis. Additional discussions of groundwater flow and the extent of contamination are provided in the *Groundwater Monitoring Report* (USAESCH, March 1998).

1.1.2.4 Surface Water

Most of the facility is level with or above the surrounding terrain, and therefore, receives little or no runoff from adjacent properties. Stormwater drainage from Dunn Field is mainly through overland flow to the north and west or through a concrete-lined storm sewer (which also conveys stormwater from an adjacent, upgradient residential neighborhood) that directs flow northward to Cane Creek, a tributary of the Nonconnah Creek. The Main Installation's drainage is through overland flow into a storm drainage system. The system directs flow into several outfalls to one perennial and two intermittent streams that drain to Nonconnah Creek (0.75 mile south). Nonconnah Creek, in turn, discharges into McKellar Lake (approximately 4 miles from the creek), which empties directly into the Mississippi River.

In addition, there are two permanent surface waters at the Memphis Depot–Lake Danielson and the Golf Course Pond. Lake Danielson is a 4-acre lake that receives a significant amount of stormwater runoff. The lake overflows intermittently through a concrete-lined channel at the dam and, as with the overflow from the Golf Course Pond, is directed through an unnamed tributary to Nonconnah Creek. Conversations with facility personnel indicate that overflows occur when net precipitation is above normal.

No surface water intakes are located within 15 miles downstream of the facility; however, the streams and lake are used for recreational purposes. The facility is not located in the 100-year floodplain and no portions are subject to flooding.

1.2 History of CERCLA Activities at the Memphis Depot

As a result of past practices and environmental contamination, the Memphis Depot was placed on the CERCLA National Priorities List (NPL) on October 14, 1992 (199 *Federal Register* [FR] 47180). Moreover, CERCLA NPL sites must undergo necessary corrective action processes to protect human health and the environment. The Memphis Depot has entered into a Federal Facilities Agreement (FFA) under CERCLA that provides the basis for implementing corrective action processes at the Memphis Depot. As established in the National Oil and Hazardous Pollution Contingency Plan (NCP) (40 *Code of Federal Regulations* [CFR] Part 300.120), the DOD is the lead agency at NPL sites involving federal facilities. Accordingly, EPA and the Tennessee Department of Environment and Conservation (TDEC) have been identified as support agencies in this process. This subsection further describes the designation of the Memphis Depot as an NPL site, the FFA that governs corrective actions at The Memphis Depot, and the NFA site classification process.

1.2.1 RCRA Part B Permit and Designation as an NPL Site

In 1989 and 1990, as a part of the DOD Installation Restoration Program (IRP), The Memphis Depot initiated an RI/FS of several known and suspected sources of contamination. This study was performed by Law Environmental through a contract with the USAESCH. The final work plan for this effort was provided to EPA in April 1989. The study was performed in two phases, referred to as Phase I (primarily activities in 1989) and Phase II (primarily activities in 1990). The final *Remedial Investigation Report* was provided to EPA in August 1990, and the final *Feasibility Study Report* was submitted in September 1990. The Memphis

Depot was issued a Resource Conservation and Recovery Act (RCRA) Part B permit (No. TN4 210 020 570) by EPA, Region IV, and TDEC on September 28, 1990. Subsequently, EPA added the Memphis Depot to the NPL by publication in the *Federal Register*, 199 FR 47180, on October 14, 1992.

1.2.2 Federal Facilities Agreement

The Memphis Depot entered into an FFA among the DLA of the DOD, EPA, and TDEC on March 6, 1995. The agreement establishes a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions at the Memphis Depot in accordance with existing regulations and with achieving RCRA/CERCLA integration. Because of the Memphis Depot's status as an NPL site, it was agreed that the investigation of all applicable sites (those requiring RI) would proceed under the CERCLA process for remediation (which includes RI, FS, proposed plan and ROD, remedial design, and remedial action) and that this process would meet RCRA requirements.

For NFA sites–those sites in which no action is required to protect human health and the environment from past activities–the FFA integrates both CERCLA and RCRA and requires that adequate written documentation be submitted by DLA to support NFA decisions. Sections 2, 3,and 4 of this TM present this information for the OUs-2, 3, and 4 proposed NFA sites, respectively.

1.2.3 Base Realignment and Closure

The decision to close the Memphis Depot was made as part of the Base Realignment and Closure Act of 1995 (BRAC 95, subsequently referred to as BRAC). The facility was closed as of September 17, 1997. As part of the BRAC process, the equipment and supplies, including the material stockpiles, have been removed from the Memphis Depot.

The facility was divided into 35 parcels based on the environmental condition of the property. The properties defined as BRAC parcels are being transferred from government control to other private- and public-sector uses. Data and information gathered from the CERCLA-governed screening sites and RIs have been organized and presented by BRAC parcel to support parcel leasing. The facility must complete the investigations and cleanup under CERCLA and other environmental programs before the facilities can be transferred to new owners. Early risk-based evaluation of BRAC parcel and CERCLA site environmental data is needed to establish a Finding of Suitability to Lease (FOSL) or Finding of Suitability to Transfer (FOST), which permits the lease or transfer of parcels and buildings. The decision for NFA, when final, means that no further action under CERCLA is necessary for the identified sites. However, there may be other sites that require further action within a parcel or other compliance actions necessary to complete the BRAC process for a parcel.

1.2.4 Site Classification to NFA

Several reports document the sites where past waste disposal activities have occurred at the Memphis Depot. The RCRA Facility Assessment (RFA), which was performed by EPA in 1990, identified 49 solid waste management units (SWMUs) and 8 areas of concern (AOCs) at the Memphis Depot. The RFA was performed subsequent to the Memphis Depot's application for a RCRA Part B permit. Upon completion, the RFA specified the level of additional investigation necessary for each SWMU and AOC (for example, NFA, RCRA

Facility Investigation [RFI], and Preliminary RFI/Confirmatory Samplin ;). Eight sites were identified in 1990 during the RFA that posed no threat to human health and the environment; subsequently, these sites were identified and recommended as NFA sites. The eight sites are listed in Table 1-1.

TABLE 1-1
Proposed NFA Sites Identified During the 1990 RFA
Memphis Depot Main Installation NFA

Site 30–Paint Spray Booths	Site 45–Former Cont ninated Soil Staging Area
Site 40–Safety-Kleen Locations	Site 47–Former Con'aminated Soil Drum Area
Site 41–Satellite Drum Accumulation Areas	Site 49–Expired Me ical Supplies Storage Area
Site 44–Former WWTU Area	Site 53–X-25 Flam able Solvents Storage Area

In 1990, an RI conducted by Law Environmental, Inc., identifie 75 sites of potential contamination and some general storage sites. In 1995, CH2M HILL began planning for another RI to investigate the sites that were not investigated p eviously and to fill data gaps at sites previously investigated by Law Environmental. The sites with known releases were identified as RI sites and those sites where hazardous materials may have been managed and a release had been suspected, but not confirmed, were classified as screening sites. The 1997 CH2M HILL investigations at screening sites resulted either in the site being elevated to RI status or being proposed for NFA status.

Soil, surface water, and sediment environmental sampling to support RI and screening site characterization was performed between December 5, 199 , and January 23, 1997. Additional soil samples were taken with BRAC parcels fr m October 15 through October 19, 1996, to evaluate the environmental condition of the parc l; however, these data points are not associated with sites defined under CERCLA.

Summary reports were prepared to present the data and the rationale for further RI/FS activities, if needed (*Screening Sites Letter Reports*, CH2M HILL, March 1998; *Remedial Investigation Letter Reports*, CH2M HILL, May 1998; and *BRAC Parcel Summary Reports*, CH2M HILL, April, 1998). Data collected for both the ERCLA and BRAC programs were reviewed by the BCT during meetings in July, Augus and October 1997. A preliminary risk evaluation (PRE) also was performed using the data rom the CH2M HILL field investigations to evaluate potential risks posed by contaminants that have been found in soil, surface water, and sediment within each BRAC parcel and CERCLA site. As a result of this data evaluation and preliminary risk assessment, four screening sites were identified and recommended as NFA sites, as shown in Table 1-2.

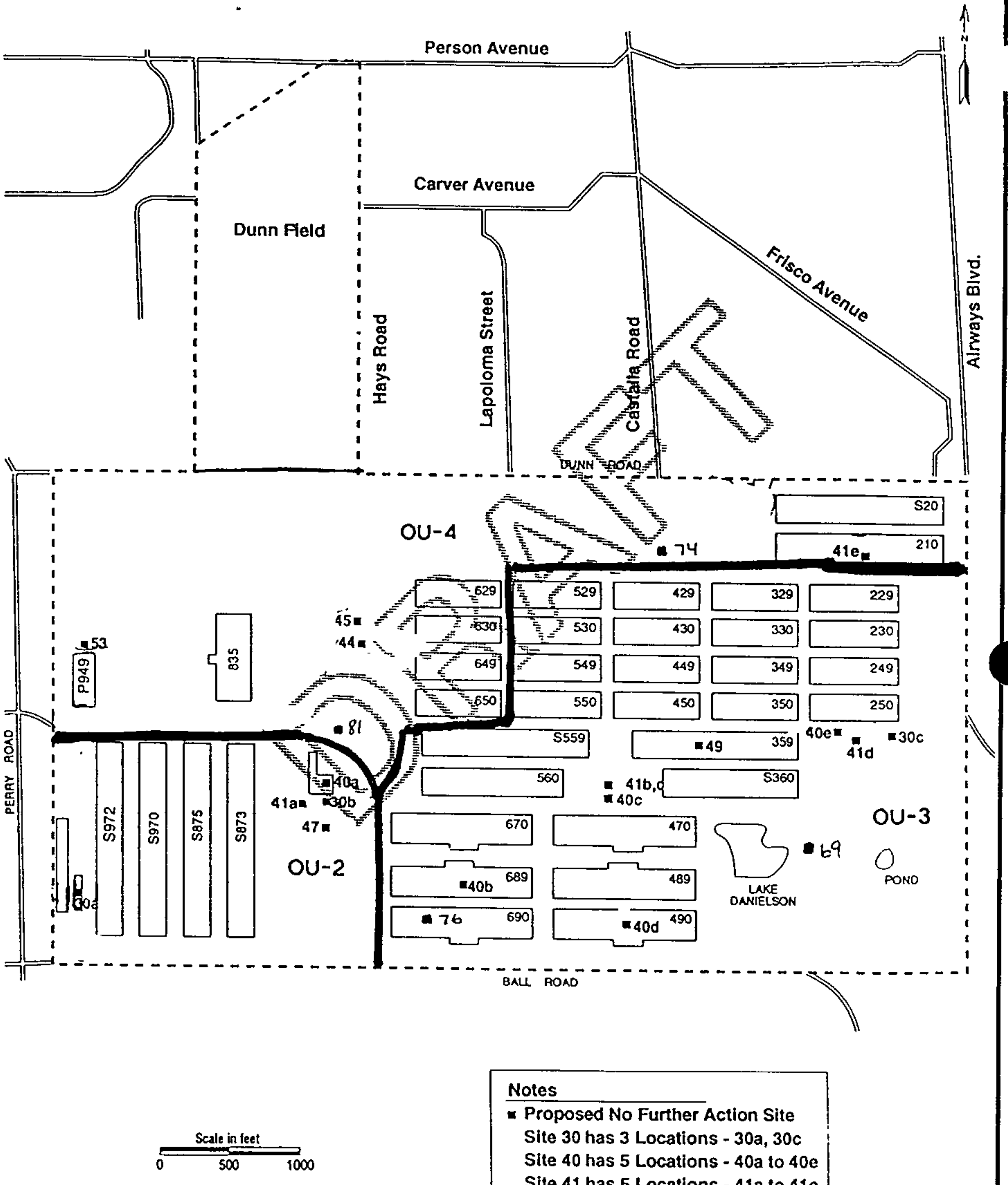
TABLE 1-2
Proposed NFA Sites Identified During the Screening Sites Investigation, 1996 through 1997
Memphis Depot Main Installation NFA

Site 74–Flammables and Toxics Storage	Site 69–Flamethrower Liquid Fuel
Site 81–Fuel Oil Building 765	Site 76-Unknown Wastes near Building 690

The following sections provide a description for each proposed NFA site by OU and discuss the rationale for designating the sites for NFA. In some cases, the proposed NFA site consists of a number of buildings that perform the same types of operations. As a result, the site is located in more than one OU. In such cases, the site will be discussed in all OUs that contain a building listed under that site.

The proposed NFA sites as of September 1998 are shown on Figure 1-2 by OU.

488 82



Notes

- Proposed No Further Action Site

Site 30 has 3 Locations - 30a, 30c

Site 40 has 5 Locations - 40a to 40e

Site 41 has 5 Locations - 41a to 41e

Source: Corps of Engineers/Huntsville Division

FIGURE 1-2
SITE LOCATIONS MAP (BY OU)
MEMPHIS DEPOT MAIN INSTALLATION NFA

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2.0 OU-2 Proposed NFA Soil Sites

OU-2 is located in the southwestern quadrant of the Main Installation at the Memphis Depot and consists of about 108 acres. It is bounded by G Street on the north, 6th Street on the east, Ball Road on the south (installation boundary), and Perry Road on the west (installation boundary). OU-2 is characterized as an industrial area where maintenance and repair activities have taken place (see Figure 1-2 for the location of OU-2).

Sites in OU-2 proposed for NFA status as of September 1998 include Sites 30, 40, 41, and 47. These sites were designated as NFA sites during the 1990 RFA. The following subsections describe the sites in OU-2 that have been designated for NFA and provide supporting information.

2.1 NFA Summary for Site 30–Paint Spray Booths

2.1.1 Site Name, Location, and Description

Site 30 consisted of three Paint Spray Booths located in Buildings 1086 (OU-2), 770 (OU-2), and 260 (OU-3) (see Figure 2-1 for the site locations). Emissions from the areas were controlled by filters located on the back or side walls of the booths, which range in size from 8 ft x 10 ft to 24 ft x 10 ft. Paint from spraying operations passed through the filters as a fan, located on the opposite side of the filter, and forced air into a vent system.

2.1.2 Site History and Enforcement Activities

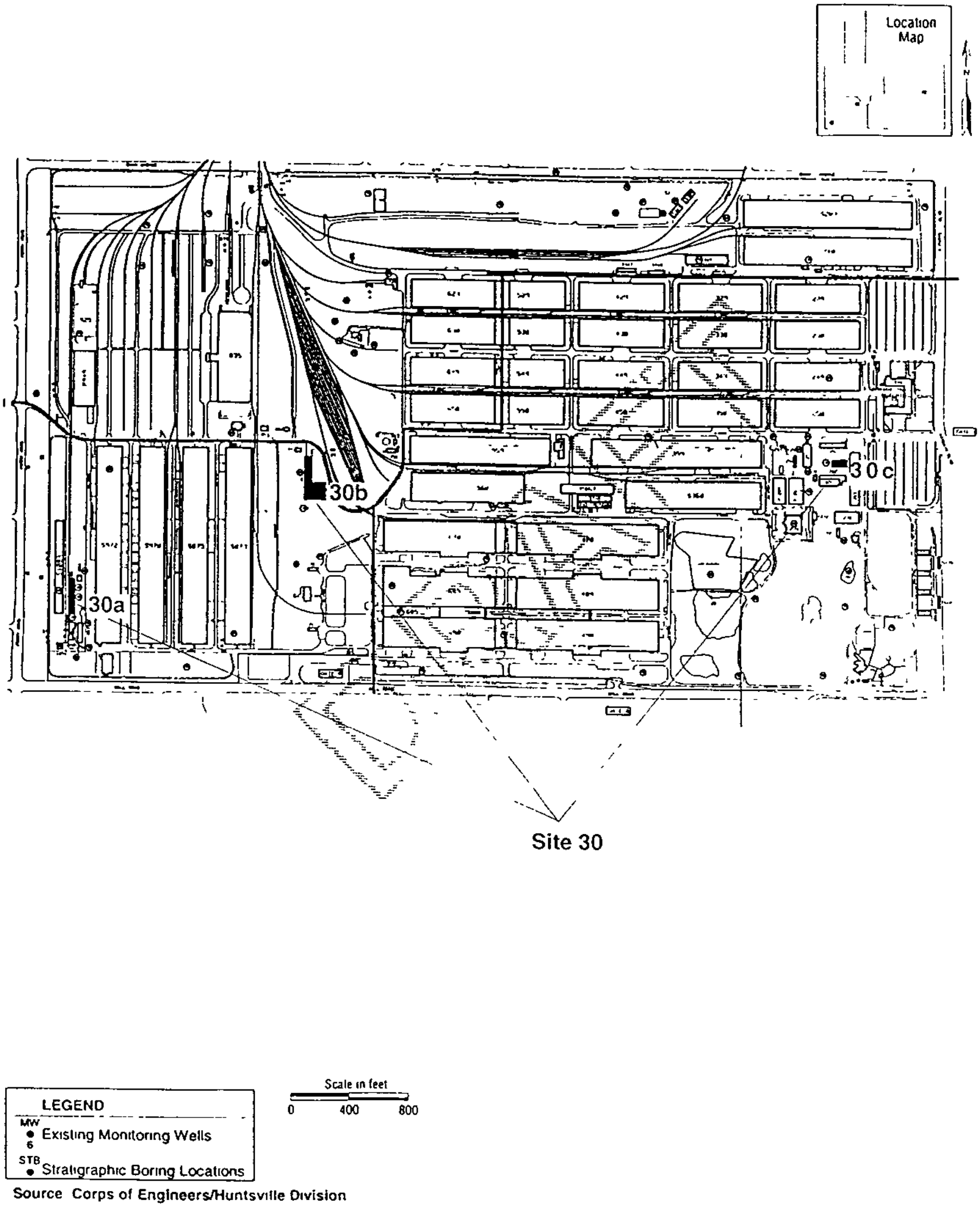
A variety of paints have been used in the Paint Spray Booths, which have been used for an unknown period of time. Discarded filters are placed in dumpsters and disposed as nonhazardous waste. No evidence of release has been identified at the sites of the paint booths.

The site was evaluated during the RFA conducted in 1990, with the results indicating that the potential for release from all release pathways was low. During the RFA, there was no evidence of leaks or spills noted, and the site was designated for NFA. Additionally, the site has been designated for NFA in the FFA.

There are no analytical data associated with Site 30.

2.1.3 Summary of Site 30 Risks

Because of the pollution control equipment used at the site (filters) and the lack of hazardous or toxic materials released at the site, there appears to be no significant risk to human health or the environment from the site. Therefore, it is concluded that no remedial actions are necessary for the protection of human health or the environment.



Source Corps of Engineers/Huntsville Division

FIGURE 2-1
SITE 30, PAINT SPRAY BOOTHS
MEMPHIS DEPOT MAIN INSTALLATION NFA

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2.2 NFA Summary for Site 40–Safety Kleen Locations

2.2.1 Site Name, Location, and Description

Site 40 was comprised of nine locations where Safety-Kleen solvent parts cleaning stations were located. The units consist of steel holding tanks supported by steel legs, ranging in size from 20 to 40 gallons. The units were located in buildings and were self-contained. Five units were located in Building 770 (OU-2) and one unit was located in each of Buildings 689 (OU-3), 490 (OU-3), 253 (OU-3), and 469 (OU-3) (see Figure 2-2 for the site locations).

The Safety-Kleen units were used for carburetor and cold parts cleaning. New cleaning material contained 11.9 percent cresylic acids, 31.7 percent methylene chloride, and 81.3 percent ortho-di-chlorobenzene. Used material generally was contaminated with various oils and greases from the parts themselves. A vendor, Safety-Kleen, supplied the units, brought in the cleaning solutions, periodically returned to remove the used material, and provided new solution. Safety-Kleen handled the manifesting, transporting, and recycling of the material. Unusual material, by loss or gain of volume, color or odor change, or other physical change, was noted and investigated by Safety-Kleen.

2.2.2 Site History and Enforcement Activities

Safety-Kleen Corporation leased and maintained the units, which were used since 1985 in various locations within the Main Installation.

The site was evaluated during the RFA conducted in 1990, with the results indicating that the potential for release from all pathways was low. There was no history or evidence of uncontrolled leaks or spills, the units appeared to be in good condition, and the site was designated for NFA. Additionally, the FFA designates this site as an NFA site.

There are no analytical data available for Site 40.

2.2.3 Summary of Site 40 Risks

A minimal level of risk exists because hazardous materials were handled in these units These risks were controlled through the design and handling criteria regulated under RCRA. Because of the equipment design and procedural controls, there is no significant risk to human health or the environment.

2.3 NFA Summary for Site 41–Satellite Drum Accumulation Areas

2.3.1 Site Name, Location, and Description

Five satellite drum storage areas made up Site 41, the Satellite Drum Accumulation Areas. The areas had been used since 1985 to store drums of waste materials. The units varied in the number and size of drums they contained, but all of the units were located on concrete floors near Buildings 770 (OU-2), 210 (OU-4), 260 (OU-3), and 469 (OU-3) (see Figure 2-3 for site locations).

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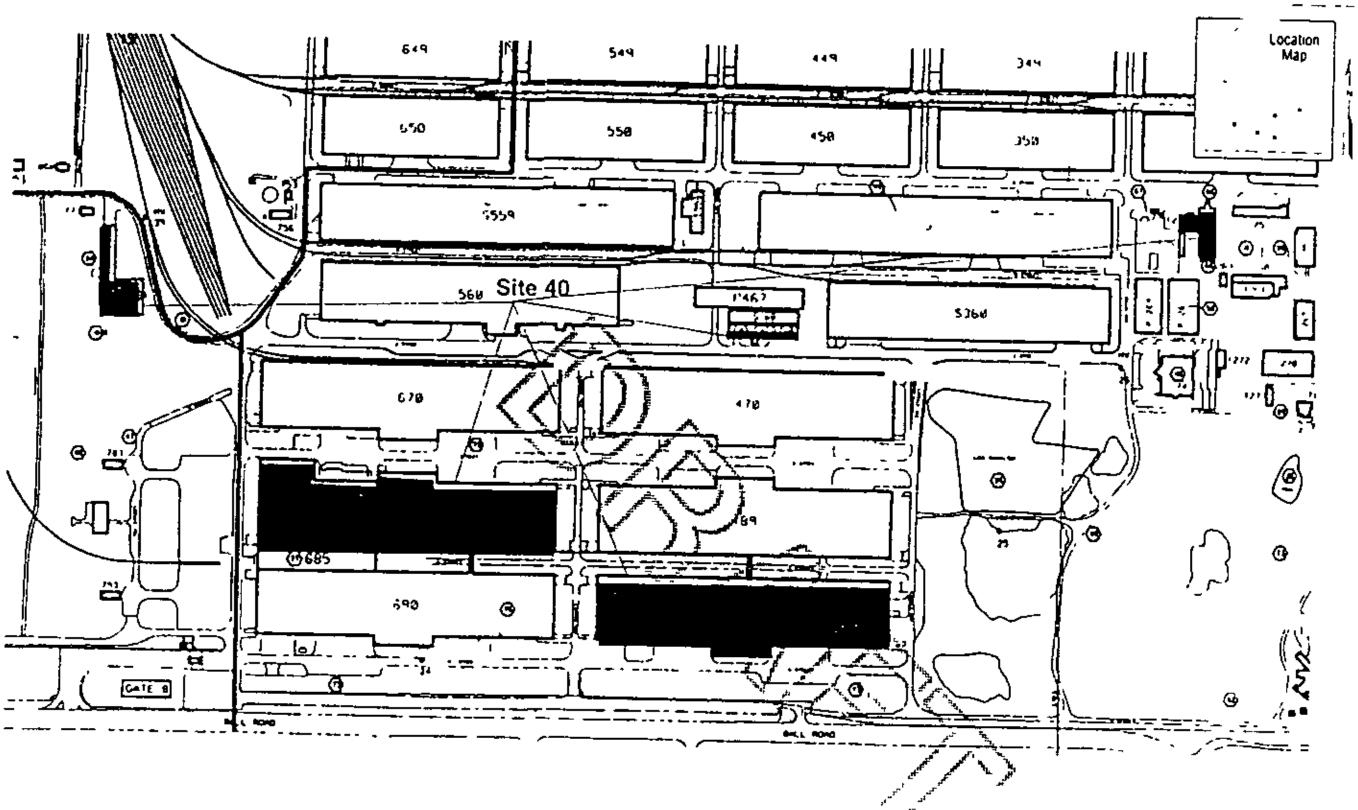

LEGEND
MW Existing Monitoring Wells
STB Stratigraphic Boring Locations

Scale in feet
0 200 400

Source Corps of Engineers/Huntsville Division

FIGURE 2-2
SITE 40, SAFETY KLEEN LOCATIONS
MEMPHIS DEPOT MAIN INSTALLATION NFA

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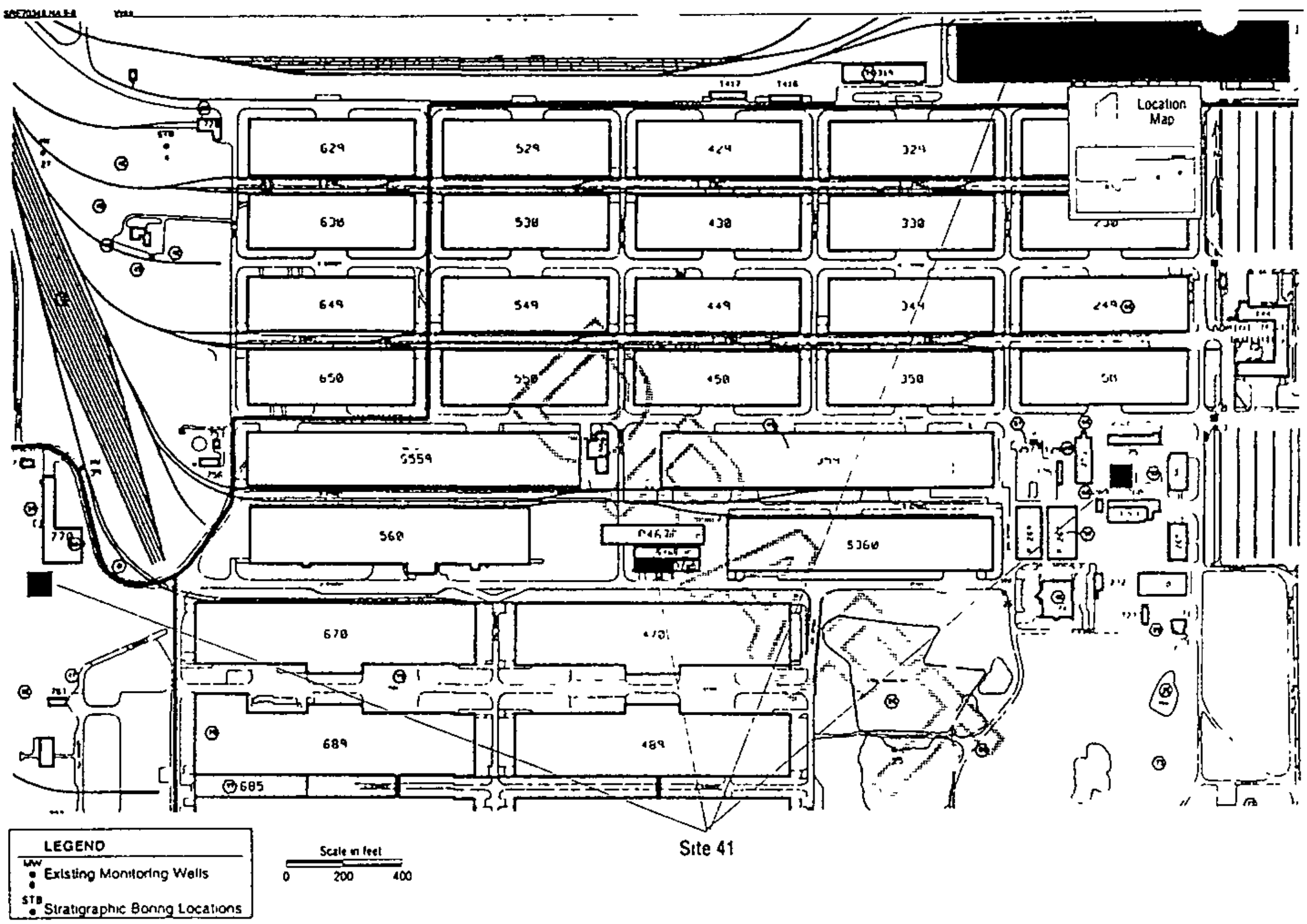


Source Corps of Engineers/Huntsville Division

FIGURE 2-3
SITE 41, SATELLITE DRUM ACCUMULATION AREA
MEMPHIS DEPOT MAIN INSTALLATION NFA

2717_99 (boarder/title)

CH2MHILL

The drums and areas were maintained in good condition and were regulated. All wastes collected in these areas were transported to the Defense Reutilization and Marketing Office (DRMO) before off-site disposal.

2.3.2 Site History and Enforcement Activities

The areas had been used since 1985 to store drums of waste materials.

The site was evaluated during the RFA conducted in 1990, with the results indicating that the potential for release from all pathways was low. There was no history or evidence of uncontrolled leaks or spills, the units appeared to be in good condition, and the site was designated for NFA in the RFA.

No analytical data are available for this site.

2.3.3 Summary of Site 41 Risks

A minimal level of risk existed from the handling of hazardous materials in these units. During the operation of the drum storage area, releases to the environment were prevented through the design and handling criteria regulated under RCRA. Because of the design and procedural controls governing the operation of the facility, there is no significant risk to human health or the environment. Therefore, it is concluded that no remedial actions are necessary for the protection of human health or the environment.

2.4 NFA Summary for Site 47–Contaminated Soil Drum Storage Area

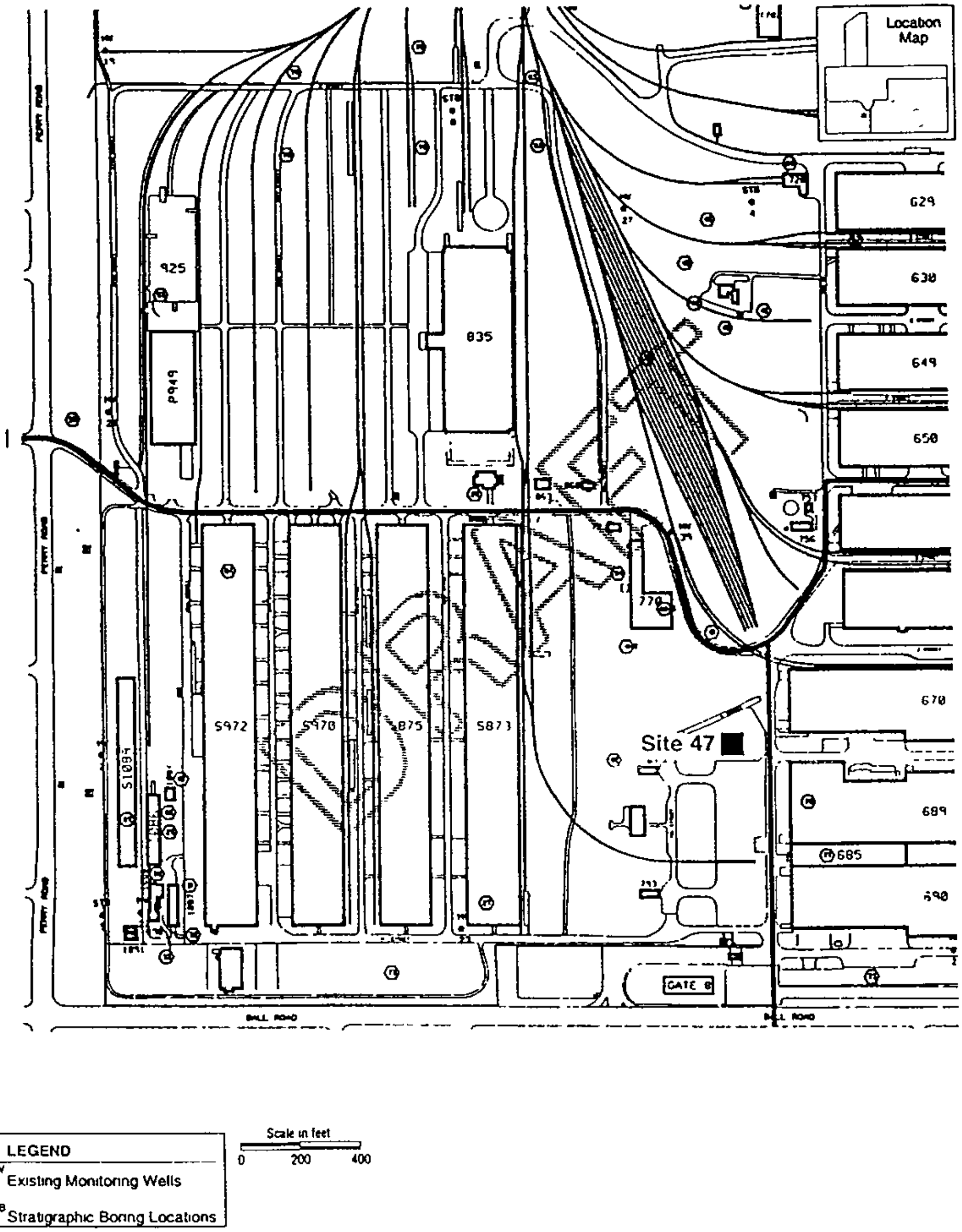
2.4.1 Site Name, Location, and Description

Site 47, the Former Contaminated Soil Drum Storage Area, was a temporary drum storage/staging area. The unit is located in the southwestern part of the Main Installation, approximately 300 ft west of Building 689. Figure 2-4 presents the site location.

The site was used to store approximately 800 drums of various materials. Most of the drums were filled with material from remedial activities from Sites 42, 43, and the associated treatment units. This material included contaminated soil (containing pentachlorophenol [PCP], dioxin, and furan), sludge from the bottom of the vat and storage tank, and contaminated carbon from a temporary treatment unit (Site 44) before shipment to an off-site facility for final disposal.

2.4.2 Site History and Enforcement Activities

The former contaminated soil drum storage area was a temporary drum storage/staging area used from 1986 to the spring of 1988 to hold materials from the remedial activities at Sites 42 and 43. The unit consisted of a dirt-covered, concrete igloo building normally used for explosives storage. The igloo has a concrete floor and all drainage exits were sealed.



Source Corps of Engineers/Huntsville Division

FIGURE 2-4
SITE 47, FORMER CONTAMINATED SOIL DRUM STAGING AREA
MEMPHIS DEPOT MAIN INSTALLATION NFA

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CH2MHILL

The site was evaluated during the RFA conducted in 1990, with the results indicating that the potential for release from all pathways was low. There was no history or evidence of uncontrolled leaks or spills, the units appeared to be in good condition, and the site was designated for NFA. In addition, this site has been listed for NFA under the FFA.

2.4.3 Summary of Site 47 Risks

Although contaminated materials were stored in Site 47, there is no evidence that a release occurred or the building containment was otherwise compromised. On the basis of the lack of a potential source or contaminants released to the environmental media, there is no risk to human health and the environment from this site. Therefore, it is concluded that no remedial actions are necessary for the protection of human health or the environment.

3.0 OU-3 Proposed NFA Soil Sites

OU-3 consists of approximately 320 acres and is located in the southeastern quadrant of the Main Installation at the Memphis Depot. It is bounded by C Street on the north, 5th and 6th Streets on the west, Ball Road on the south (installation boundary), and Airways Boulevard on the east (installation boundary) (see Figure 1-2 for the location of OU-3).

Sites in OU-3 currently proposed as NFA are Sites 30, 40, 41, 49, 69, and 76. Sites 30 through 49 were identified as NFA sites during the 1990 RFA. Sites 69 and 76 were proposed as NFA from the screening site investigation. The following subsections describe each one of the sites in OU-3 that has been proposed for NFA and provides supporting information. Note that descriptions and supporting information for NFA Sites in OU-3 that have buildings located in OU-2 are discussed in Section 2.

3.1 NFA Summary for Site 30–Paint Spray Booths

3.1.1 Site Name, Location, and Description

Site 30 consisted of three Paint Spray Booths located in Buildings 1086 (OU-2), 770 (OU-2), and 260 (OU-3). Detailed information about this site is provided in Section 2.1.1 through 2 1.3 (see Figure 3-1 for site locations).

3.1.2 Site History and Enforcement Activities

See Section 2.1 2.

3.1.3 Summary of Site 30 Risks

See Section 2.1.3.

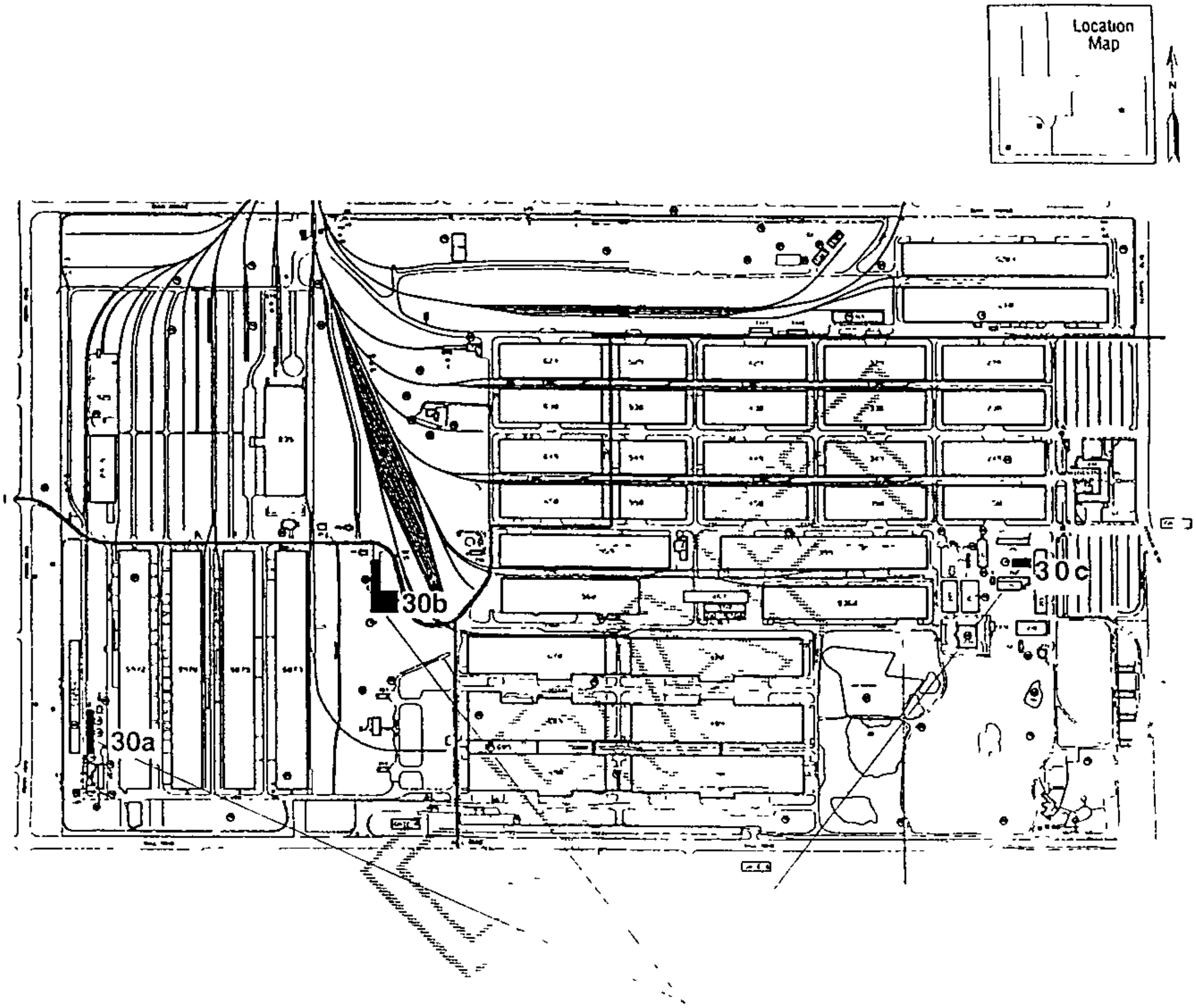
3.2 NFA Summary for Site 40–Safety Kleen Locations

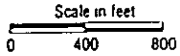
3.2.1 Site Name, Location, and Description

Site 40 is comprised of nine locations where Safety-Kleen solvent parts cleaning stations were located. The units consisted of steel holding tanks supported by steel legs, ranging in size from 20 to 40 gallons. The units were located in buildings and are self-contained. Five units are located in Building 770 (OU-2), and one unit is located in each of Buildings 689 (OU-3) 490 (OU-3), 253 (OU-3), and 469 (OU-3). Detailed information about this site is provided in Sections 2.2.1 through 2.2.3 (see Figure 3-2 for site locations).

3.2.2 Site History and Enforcement Activities

See Section 2.2.2.





LEGEND

MW 6 • Existing Monitoring Wells

STB • Stratigraphic Boring Locations

Source Corps of Engineers/Huntsville Division

FIGURE 3-1
SITE 30, PAINT SPRAY BOOTHS
MEMPHIS DEPOT MA N INSTALLATION NFA

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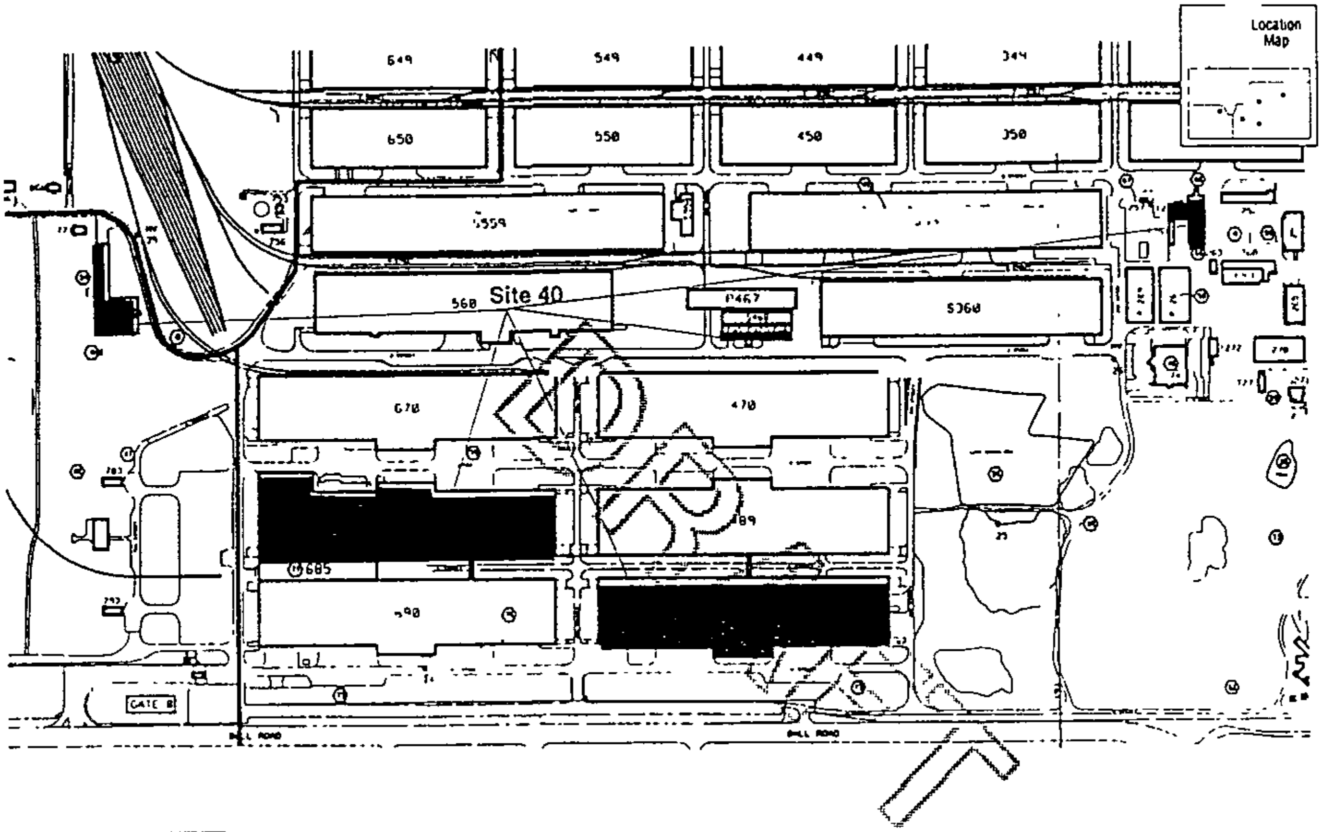

LEGEND

MW Existing Monitoring Wells

STB Stratigraphic Boring Locations

Scale in feet 0 200 400

Source Corps of Engineers/Huntsville Division

FIGURE 3-2
SITE 40, SAFETY KLEEN LOCATIONS
MEMPHIS DEPOT MAIN INSTALLATION NFA

CH2MHILL

3.2.3 Summary of Site 40 Risks

See Section 2.2.3.

3.3 NFA Summary for Site 41–Satellite Drum Accumulation Areas

3.3.1 Site Name, Location, and Description

Five satellite drum storage areas made up Site 41, Satellite Drum Accumulation Areas. The areas have been used since 1985 to store drums of waste materials. The units vary in the number and size of drums they contain, but all units are located on concrete floors within Buildings 770 (OU-2), 210 (OU-4), 260 (OU-3), and 469 (OU-3). Detailed information about this site is provided in Sections 2.3.1 through 2.3.3 (see Figure 3-3 for site locations).

3.3.2 Site History and Enforcement Activities

See Section 2.3.2.

3.3.3 Summary of Site 41 Risks

See Section 2.3.3.

3.4 NFA Summary for Site 49–Expired Medical Supplies Storage Area

3.4.1 Site Name, Location, and Description

The Expired Medical Supplies Storage Area is a warehouse storage area. The unit is located near the center of Building 359 and consists of a concrete-floored storage bay (approximately 50 ft by 30 ft) (see Figure 3-4). Materials are stored in the manufacturer's containers, on pallets or shelves throughout the unit, until transported or disposed.

3.4.2 Site History and Enforcement Activities

The Expired Medical Supplies Storage Area is a warehouse storage area that was used from an unknown date through the base closure for medical supplies with an expired shelf life.

The site was evaluated during the RFA conducted in 1990, with the results indicating that the potential for release from all pathways was low. There was no history or evidence of uncontrolled leaks or spills, the units appeared to be in good condition, and the site was designated for NFA. In addition, this site has been listed for NFA under the FFA.

No analytical data are available for Site 49.

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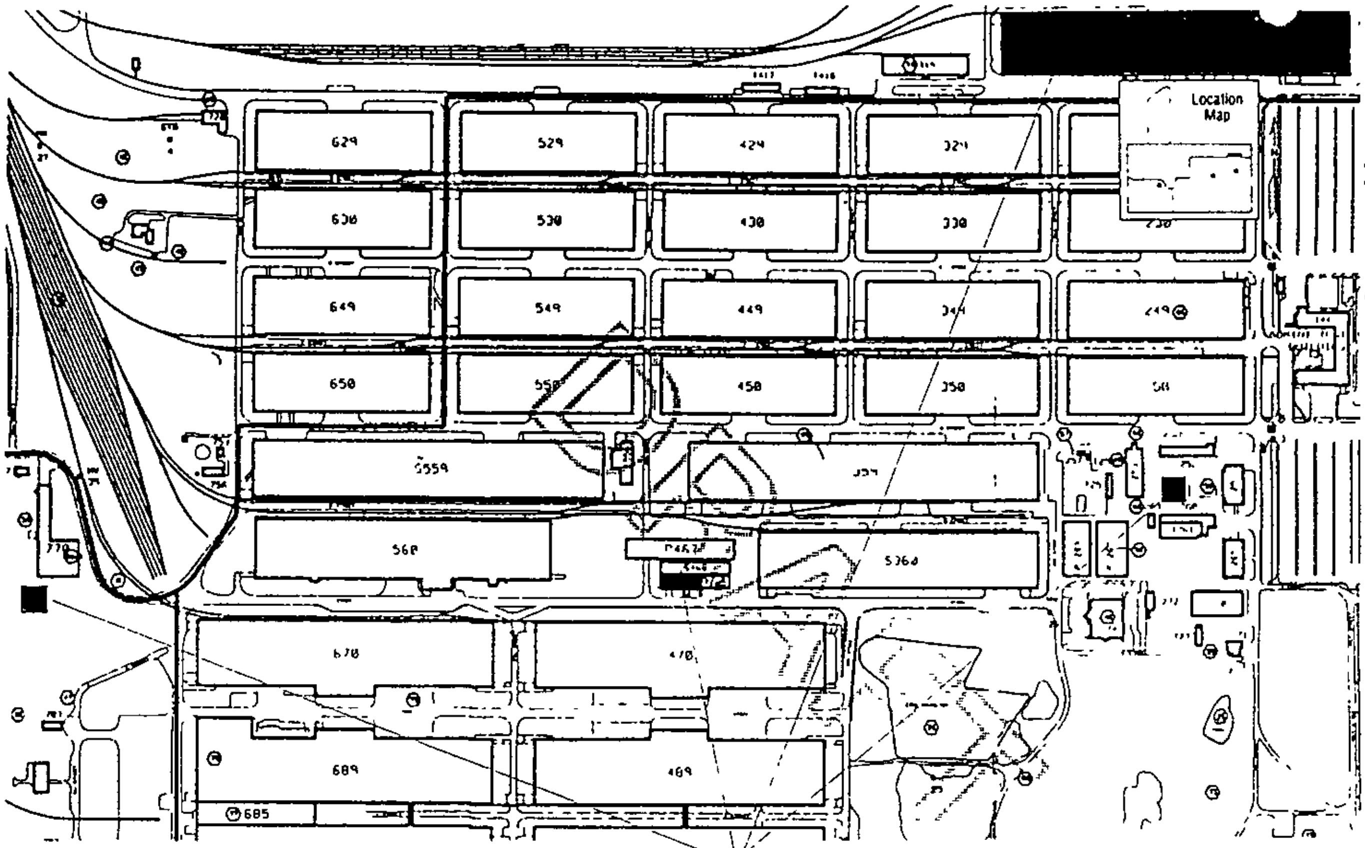

LEGEND

MW
Existing Monitoring Wells

STB
Stratigraphic Boring Locations

Scale in feet
0 200 400

Source Corps of Engineers/Huntsville Division

FIGURE 3-3
SITE 41, SATELLITE DRUM ACCUMULATION AREA
MEMPHIS DEPOT MAIN INSTALLATION NFA

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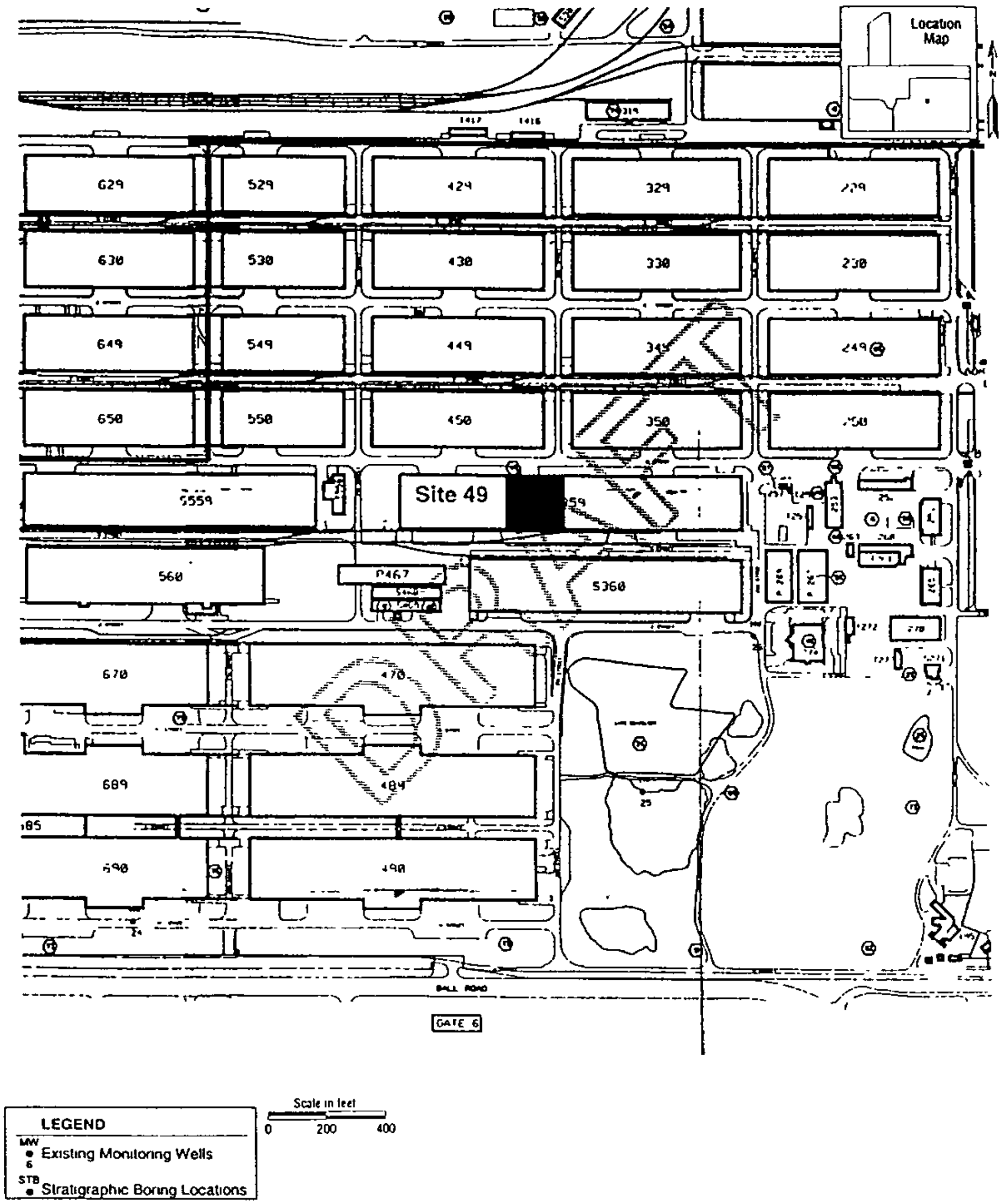

Source: Corps of Engineers/Huntsville Division

2717_99 (boarder/title)

FIGURE 3-4
SITE 49, EXPIRED MEDICAL SUPPLIES STORAGE AREA
MEMPHIS DEPOT MAIN INSTALLATION NFA

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3.4.3 Summary of Site 49 Risks

Because of the lack of hazardous or toxic materials disposed or released at the site, there is no source area of contamination at the site. On the basis of the lack of a potential source or contaminants in a media, there is no risk to human health and the environment from this site. Therefore, it is concluded that no remedial actions are necessary for the protection of human health or the environment.

3.5 NFA Summary for Site 69–Flamethrower Liquid Fuel

3.5.1 Site Name, Location, and Description

Screening Site 69–Flamethrower Liquid Fuel Application is located within Parcel 3 on the eastern side of the installation, approximately 100 ft east of Lake Danielson (see Figure 3-5). The site currently is used as a golf course.

3.5.2 Site History and Enforcement Activities

Screening Site 69 primarily was used to test flamethrower fuels. Flamethrowers were tested using diesel fuel. Fire fighting techniques also were practiced at this site after surface ignition of the fuel. The site currently comprises part of the Memphis Depot golf course.

Site 69 previously was investigated as a screening site. According to the March 1998 *Screening Sites Letter Reports* (CH2M HILL), the pesticide dieldrin and the polycyclic aromatic hydrocarbon (PAH) benzo(a)pyrene were found in surface soil at concentrations similar to those observed across the Main Installation, resulting from the facility-wide application of pesticides and PAH residual from the railroad tracks. The risks from these contaminants are being addressed on a facility-wide basis.

3.5.3 Summary of Site 69 Risks

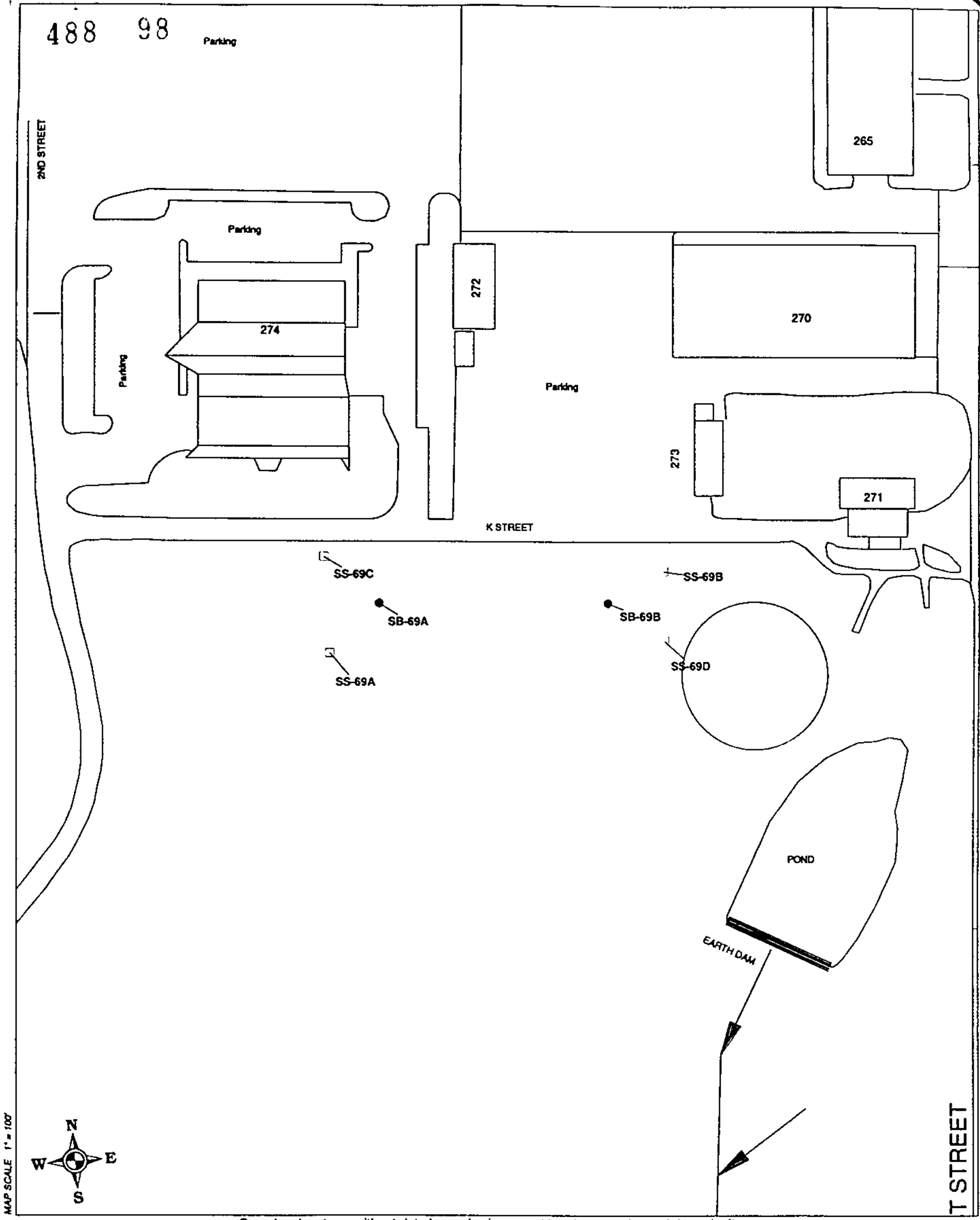
There do not appear to be risks associated with Screening Site 6, and NFA is proposed. However, dieldrin and benzo(a)pyrene were found in surface site soil and risks are being addressed on a facility-wide basis. Because of the absence of any other contaminant levels above background, no risks or systemic toxicity ratios were estimated (USAESCH, 1998). Therefore, NFA is recommended at this site.

3.6 NFA Summary for Site 76–Unknown Wastes Near Building 690

3.6.1 Site Name, Location, and Description

Screening Site 76, Building 690, was used to store hazardous materials before shipment. The building was constructed in 1953 and includes 218,000 square ft of space. The building is located in the southwestern portion of OU-3, near 5th and M Streets (see Figure 3-6 for the site location). Building 690 is used to store material-handling equipment and materials awaiting shipment.

488 98



Sampling locations without data boxes had no constituents exceeding risk-based criteria

LEGEND

- □ Surface Soil Sampling Location (mg/kg)
- ● Soil Boring Sampling Location (mg/kg)

FIGURE 3-5
SITE 69, FLAME-THROWER LIQUID FUEL APPLICATION CONSTITUENTS EXCEEDING RISK-BASED CRITERIA
MEMPHIS DEPOT MAIN INSTALLATION NFA

2717_99 (boarder/title)

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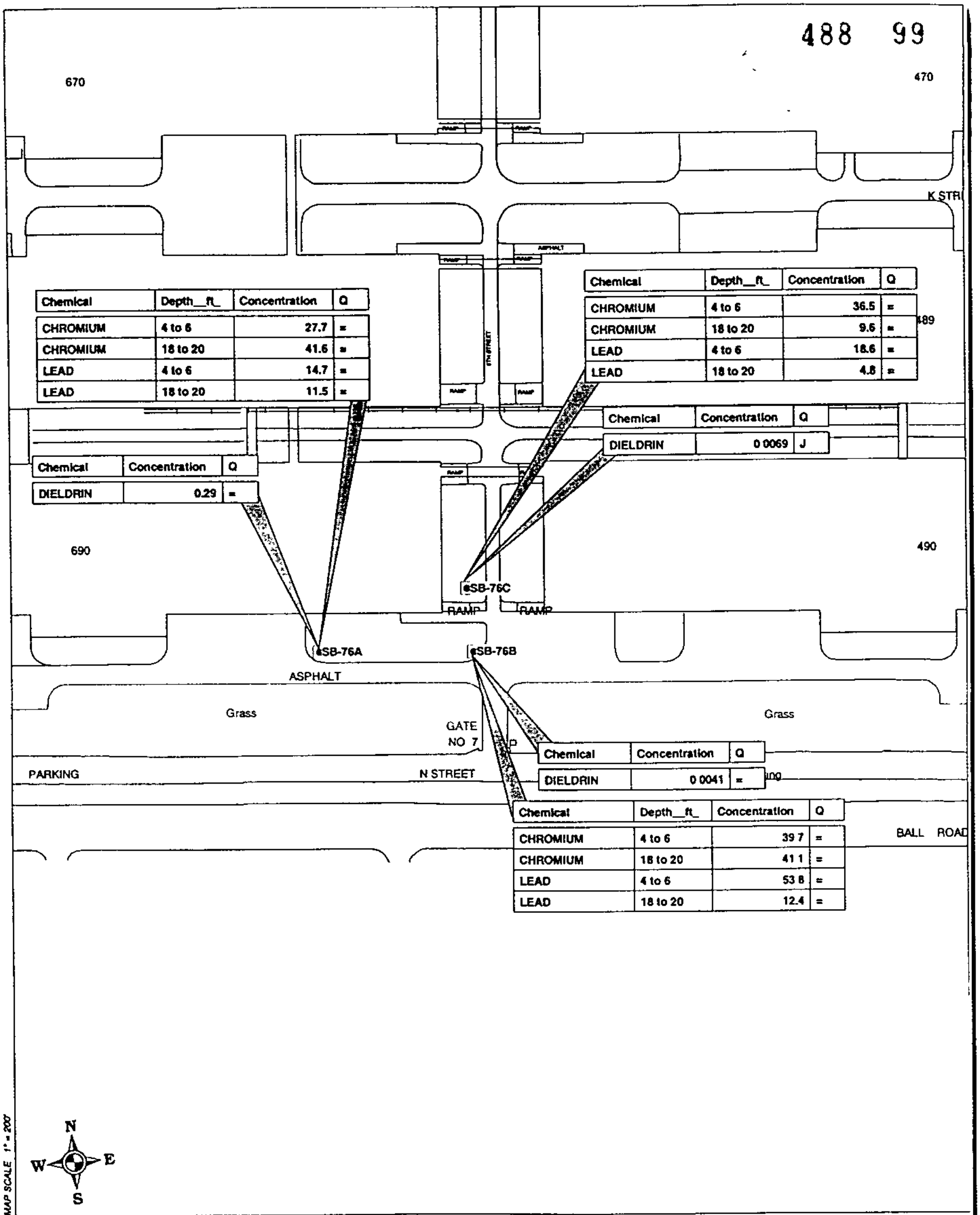


SB-76A:

Chemical	Depth_ft_	Concentration	Q
CHROMIUM	4 to 6	27.7	=
CHROMIUM	18 to 20	41.6	=
LEAD	4 to 6	14.7	=
LEAD	18 to 20	11.5	=

Chemical	Concentration	Q
DIELDRIN	0.29	=

SB-76C:

Chemical	Depth_ft_	Concentration	Q
CHROMIUM	4 to 6	36.5	=
CHROMIUM	18 to 20	9.6	=
LEAD	4 to 6	18.6	=
LEAD	18 to 20	4.8	=

Chemical	Concentration	Q
DIELDRIN	0.0069	J

SB-76B:

Chemical	Concentration	Q
DIELDRIN	0.0041	=

Chemical	Depth_ft_	Concentration	Q
CHROMIUM	4 to 6	39.7	=
CHROMIUM	18 to 20	41.1	=
LEAD	4 to 6	53.8	=
LEAD	18 to 20	12.4	=

Sampling locations without data boxes had no constituents exceeding risk-based criteria

LEGEND

- □ Surface Soil Sampling Location (mg/kg)
- ● Soil Boring Sampling Location (mg/kg)

(Q) Qualifier Definitions

= - indicates unqualified detection

J - indicates estimated value above detection limit, but below reporting limit

FIGURE 3-6
SITE 76, UNKNOWN WASTES NEAR BUILDING 690 CONSTITUENTS EXCEEDING RISK-BASED CRITERIA
MEMPHIS DEPOT MAIN INSTALLATION NFA

2717_99 (boarder/title)

CH2MHILL

3.6.2 Site History and Enforcement Activities

At times in the past, unknown wastes and vehicle maintenance supplies were stored in the warehouse. No enforcement activities have taken place at this site.

Site 76 previously was investigated as a screening site. According to the March 1998 *Screening Sites Letter Reports* (CH2M HILL), dieldrin was detected at an elevated concentration in surface soil, and lead and chromium were detected at elevated concentrations in the subsurface soil. Risks from dieldrin are being addressed on a facility-wide basis. The levels of lead and chromium are representative of natural conditions.

3.6.3 Summary of Site 76 Risks

There do not appear to be risks associated with Screening Site 76, and NFA is proposed. However, dieldrin was found in surface site soil and risks are being addressed on a facility-wide basis. In accordance with the PRE, there are no human health risks of concern for this site (USAESCH, 1998).

4.0 OU-4 Proposed NFA Soil Sites

OU-4 consists of approximately 168 acres and is located in the north-central section of the Main Installation at the Memphis Depot (see Figure 1-2 for its location). OU-4 includes former and current hazardous materials storage buildings and the DRMO buildings and stock yards. The former PCP Dip Vat area sites also are located in OU-4.

Sites in OU-4 currently proposed for NFA status are Sites 41, 44, 45, 53, 74, and 81. Sites 41, 44, 45, and 53 were identified as NFA sites during the 1990 RFA. Sites 74 and 81 were proposed as NFA sites after the screening site investigation. The following subsections describe those sites in OU-4 that have been proposed for NFA and provide supporting information. Note that descriptions and supporting information for proposed NFA sites in OU-4 that have buildings located in OU-2 are discussed in Section 2.

4.1 NFA Summary for Site 41–Satellite Drum Accumulation Areas

4.1.1 Site Name, Location, and Description

Five satellite drum storage areas make up Site 41, Satellite Drum Accumulation Areas. The areas have been used since 1985 to store drums of waste materials. The units vary in the number and size of drums they contain, but all units are located on concrete floors within Buildings 770 (OU-2), 210 (OU-4), 260 (OU-3), and 469 (OU-3). Detailed information about this site is provided in Sections 2.3.1 through 2.3.3 (see Figure 4-1 for the site locations).

4.1.2 Site History and Enforcement Activities

See Section 2.3.2.

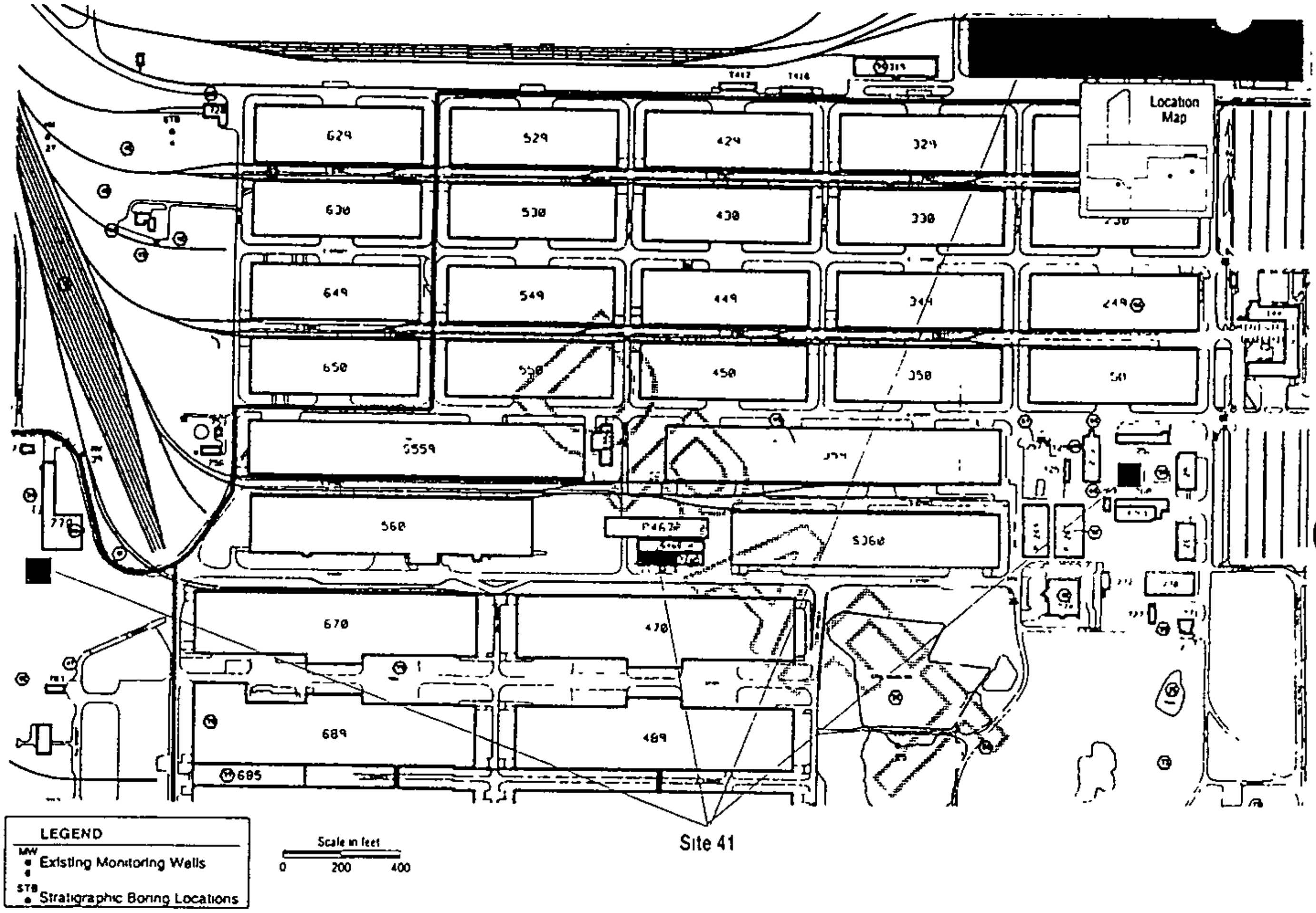
4.1.3 Summary of Site 41 Risks

See Section 2.3.3.

4.2 NFA Summary for Site 44–Former Wastewater Treatment Unit

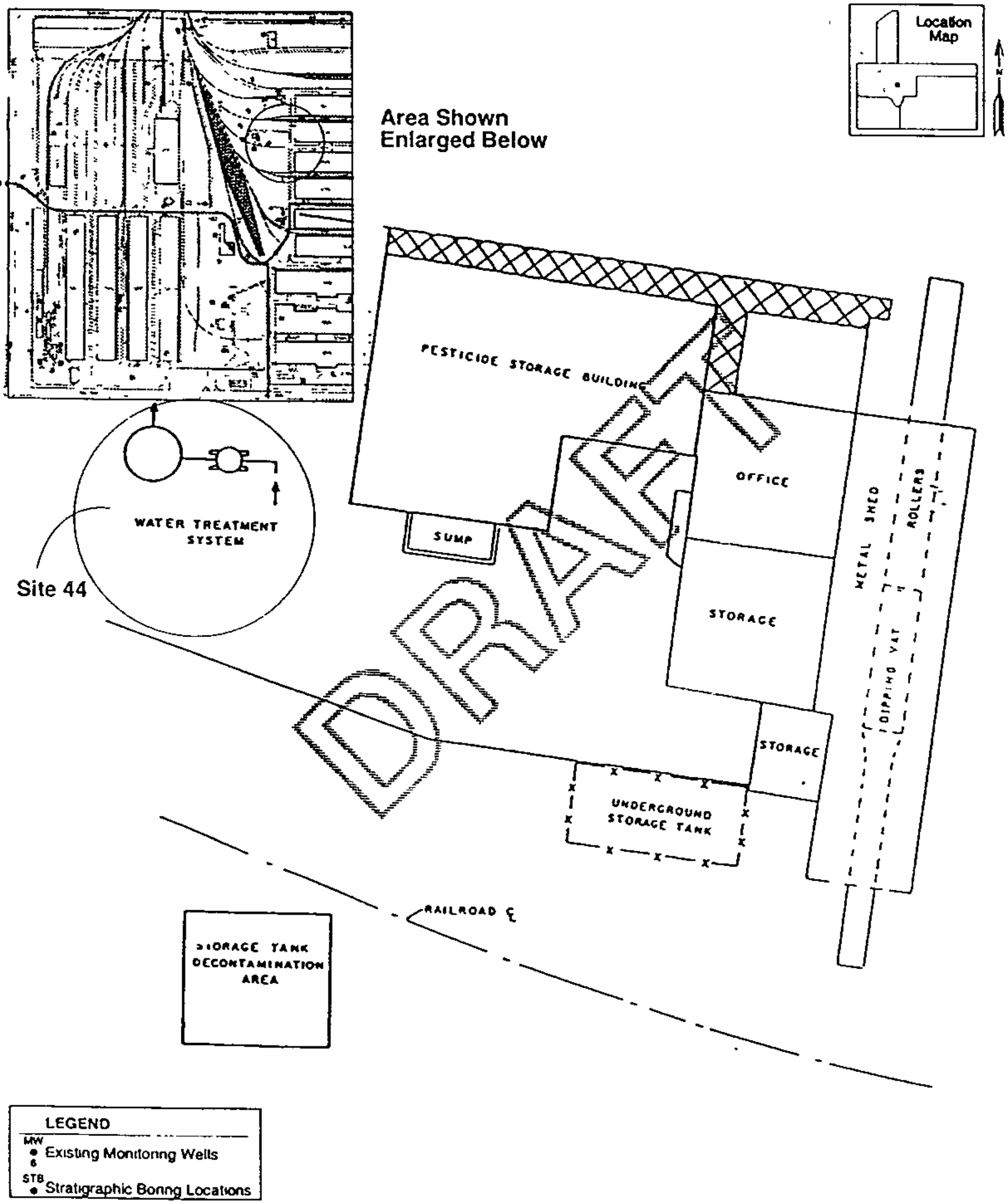
4.2.1 Site Name, Location, and Description

The former Wastewater Treatment Unit (WWTU) Area was the location of a temporary wastewater treatment unit used in the remediation of Sites 42 and 43 in 1986. The unit was located just west of Building S-737. The sump, located adjacent to the pesticide storage building, was used as a holding basin until enough wastewater was retained for treatment. Figure 4-2 illustrates the site location. The WWTU consisted of a 12,000-gallon portable pool with vinyl liner, pumps, medium capacity carbon cell, and associated piping on a concrete pad



Source Corps of Engineers/Huntsville Division

FIGURE 4-1
SITE 41, SATELLITE DRUM ACCUMULATION AREA
MEMPHIS DEPOT MAIN INSTALLATION NFA



Source: Corps of Engineers/Huntsville Division

FIGURE 4-2
SITE 44, FORMER WWTU AREA
MEMPHIS DEPOT MAIN INSTALLATION NFA

4.2.2 Site History and Enforcement Activities

The WWTU was used to treat rainwater mixed with PCP-contaminated oil and rinse waters from equipment decontamination during remedial actions and cleanup operations of the pesticide shop. Sample results of the treated wastewater held in the portable pool were below allowable levels for sewer discharge, and 8,000 gallons of water was discharged to the publicly owned treatment works (POTW) operated by the City of Memphis Public Works Department. Upon completion of the water treatment, 27 drums of contaminated carbon were removed. After treatment was completed, the unit was dismantled and removed.

The site was evaluated during the RFA conducted in 1990, with the results indicating that the potential for release to all environmental pathways was low. There was no history or evidence of uncontrolled leaks or spills, the units appeared to be in good condition, and the site was designated for NFA.

4.2.3 Summary of Site 44 Risks

Because of the lack of hazardous or toxic materials disposed or released at the site, there is no source area or contamination at the site to cause releases to the environment. Therefore, there is no risk to human health and the environment from Site 44.

4.3 NFA Summary for Site 45–Contaminated Soil Staging Area

4.3.1 Site Name, Location, and Description

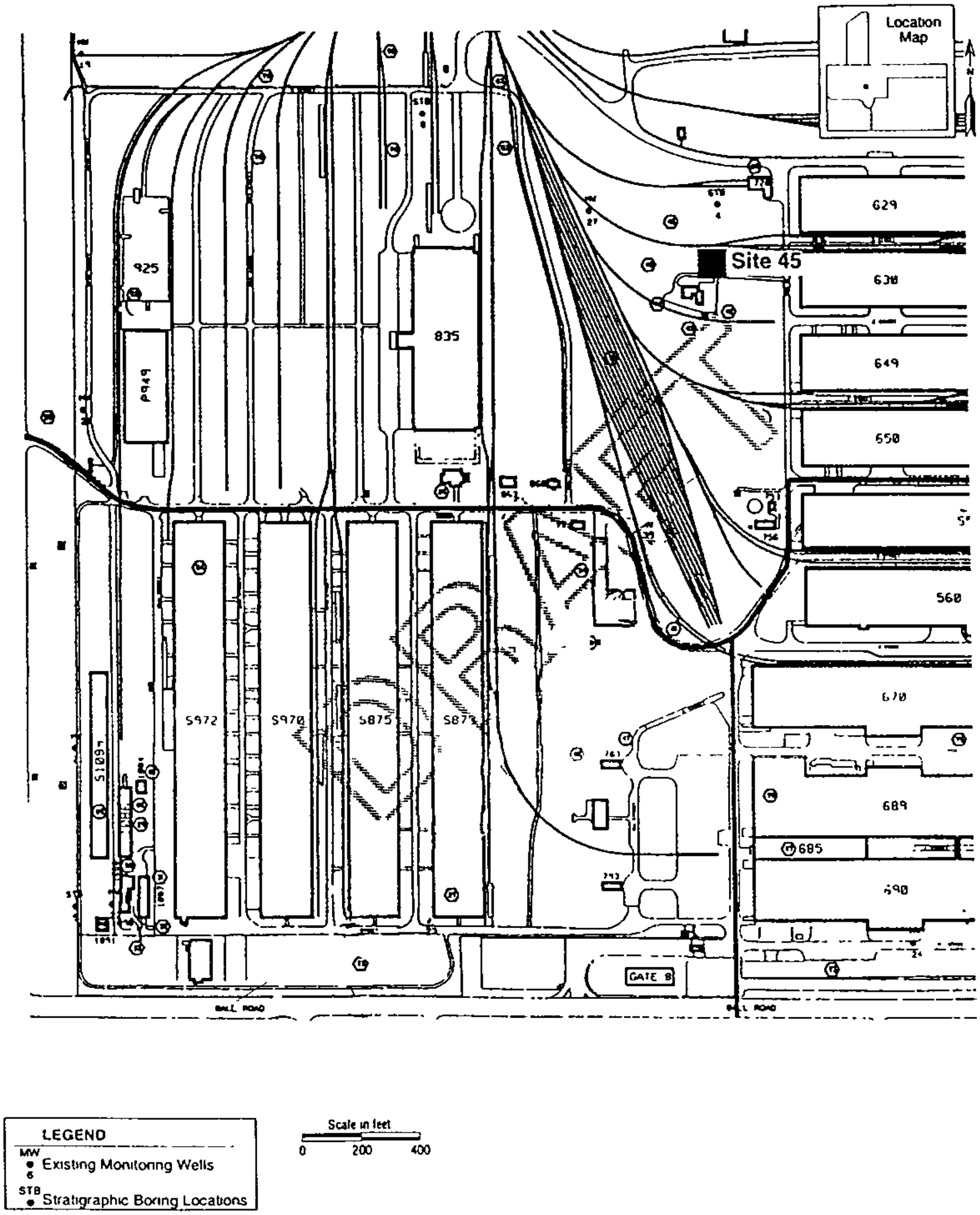
The former Contaminated Soil Staging Area was a temporary storage area used from 1986 through 1988 to hold waste from the PCP tank and vat area remediation while it awaited off-site transportation and disposal. The location was a gravel area to the northwest of Building S-737 that measured approximately 200 ft by 100 ft. Figure 4-3 presents the site location.

Roll-off containers were stored in the area. The containers were prepared to receive contaminated soil by having the seams filled with a foam material and being lined with plastic. After each container was filled with contaminated soil, it was covered with plastic.

4.3.2 Site History and Enforcement Activities

Up to 39 roll-off containers, each with a capacity of 24 to 30 cubic yards, were placed in the area. The containers were filled with contaminated soil (containing PCP, dioxin, and furan) from Sites 42 and 43 before shipment to a final off-site disposal facility.

The site was evaluated during the RFA conducted in 1990, with the results indicating that the potential for release from all pathways was low. There was no history or evidence of uncontrolled leaks or spills, the units appeared to be in good condition, and the site was designated for NFA.



Source Corps of Engineers/Huntsville Division

FIGURE 4-3
SITE 45, FORMER CONTAMINATED SOIL STAGING AREA
MEMPHIS DEPOT MAIN INSTALLATION NFA

2717_99 (boarder/title)

CH2MHILL

4.3.3 Summary of Site 45 Risks

Because of the lack of hazardous or toxic materials disposed or released at the site, there is no source area or contamination at the site to cause releases to the environment. Therefore, there is no risk to human health or the environment from Site 45.

4.4 NFA Summary for Site 53–Flammable Solvents Storage Area

4.4.1 Site Name, Location, and Description

The X-25 Flammable Solvents Storage Area Site is the result of a product storage area spill. The spill occurred in the northernmost petroleum, oil, and lubricants (POL) concrete-bermed storage area, located in the northwestern section of the Main Installation. The area measures approximately 175 ft by 125 ft. The unit is designed with a concrete floor that slopes to the south to retain material. The site location is illustrated on Figure 4-4.

The containment unit was designed specifically to contain spills from the operational units in the storage area. The spill was cleaned up, with material recovered as soon as possible, at the time it occurred.

4.4.2 Site History and Enforcement Activities

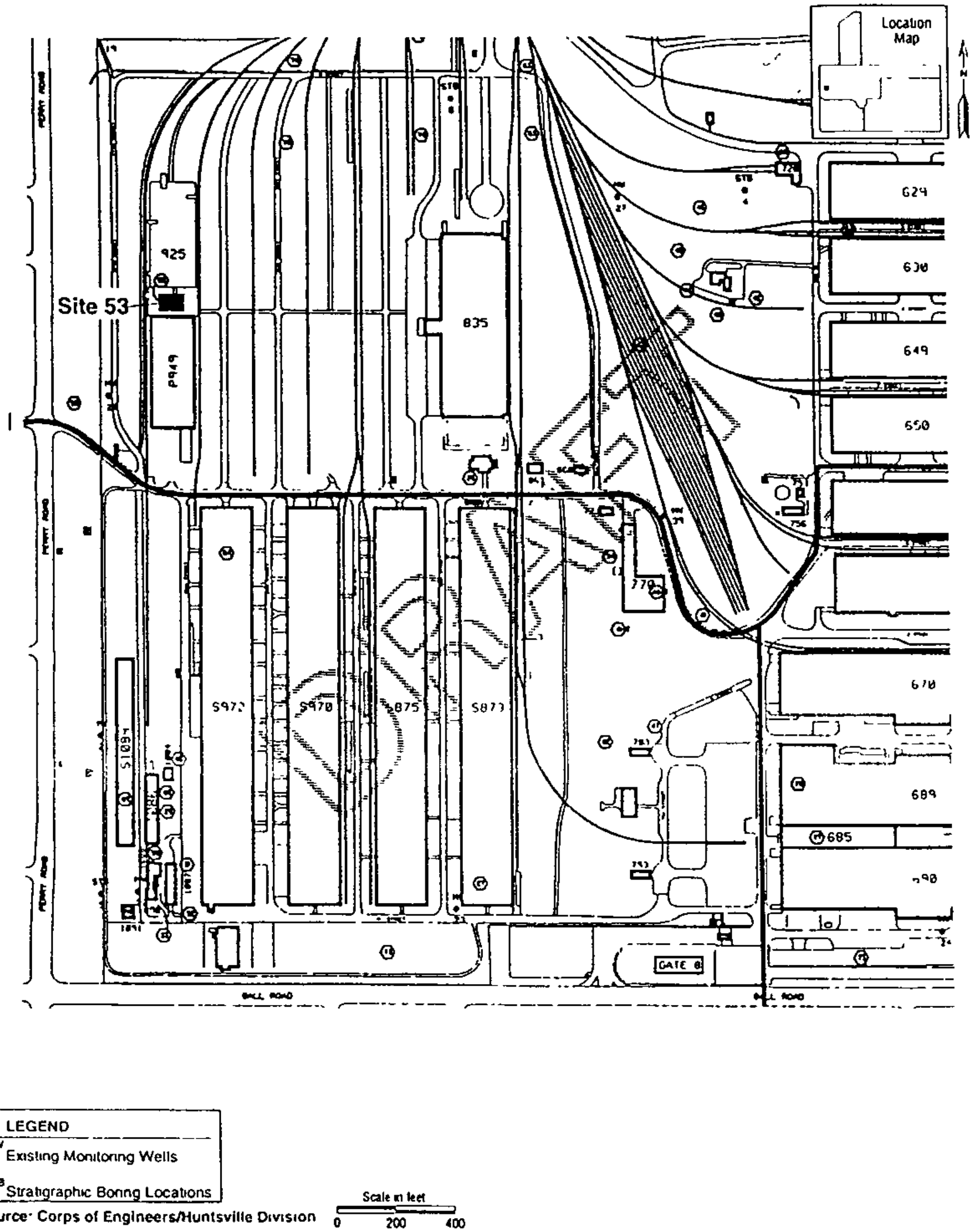
The 36,000-gallon spill occurred on January 19, 1988. The spill occurred inside the containment unit and consisted of a mixture of highly flammable solvents, including xylene and toluene. The spill was cleaned up, with material recovered as soon as possible, at the time it occurred.

The site was evaluated during the RFA conducted in 1990, with the results indicating that the potential for release from all pathways was low. At the time of the site visit, the unit appeared to be in good condition with no evidence of soil staining or stressed vegetation near the unit. On the basis of the response action and the recorded history, the site was designated for NFA.

No analytical data are available for this site.

4.4.3 Summary of Site 53 Risks

Because the release was in a unit designed to contain such a release and the proper response actions were taken at the time of the release to recover and remove the material, there is no indication of a release to the environment. Therefore, there is no risk to human health or the environment from this site.



Source: Corps of Engineers/Huntsville Division

FIGURE 4-4
SITE 53, FLAMMABLE SOLVENTS STORAGE AREA
MEMPHIS DEPOT MAIN INSTALLATION NFA

2717_99 (boarder/title)

CH2MHILL

4.5 NFA Summary for Site 74–Flammables and Toxics

4.5.1 Site Name, Location, and Description

Screening Site 74, the Flammables and Toxics Area, is located on the western end of Building 319, off of C Street (see Figure 4-5). Screening Site 74 was used for the storage of flammable and toxic materials.

4.5.2 Site History and Enforcement Activities

Site 74 previously was investigated as a screening site. According to the March 1998 *Screening Sites Letter Reports* (CH2M HILL), lead and chromium were detected in the subsurface soil. However, the concentrations were representative of natural conditions.

No enforcement activities have taken place at this site.

4.5.3 Summary of Site 74 Risks

Lead and chromium were detected in the subsurface soil at Site 74 at concentrations above the groundwater protection values. However, the detected levels appear to be naturally occurring at these depths across the Memphis Depot. There were no other chemicals detected at Screening Site 74 above the background levels. Because the site is free of any measurable contamination, NFA is recommended for this site.

4.6 NFA Summary for Site 81–Building 765, Fuel Oil AST

4.6.1 Site Name, Location, and Description

Screening Site 81, Building 765, is approximately 2,200 ft east of the western boundary and 1,350 ft south of the northern boundary of the installation (shown on Figure 4-6). Building 765 contained an aboveground fuel oil storage tank. Building 765 and the aboveground storage tank (AST) have been removed.

4.6.2 Site History and Enforcement Activities

Site 81 previously was investigated as a screening site; according to the March 1998 *Screening Sites Letter Reports* (CH2M HILL), PAH compounds were found in surface soil. The risks from these contaminants are associated with railroad operations and will be addressed on a facility-wide basis. There were no other contaminants detected at Site 81 above background levels.

4.6.3 Summary of Site 81 Risks

There were no contaminants detected at Site 81 that are attributable to the site. The PRE risk ratios at the site were below risk levels for both the residential and industrial scenario, because none of the chemicals exceeded background (USAESCH, 1998). Therefore, NFA is recommended at this site.

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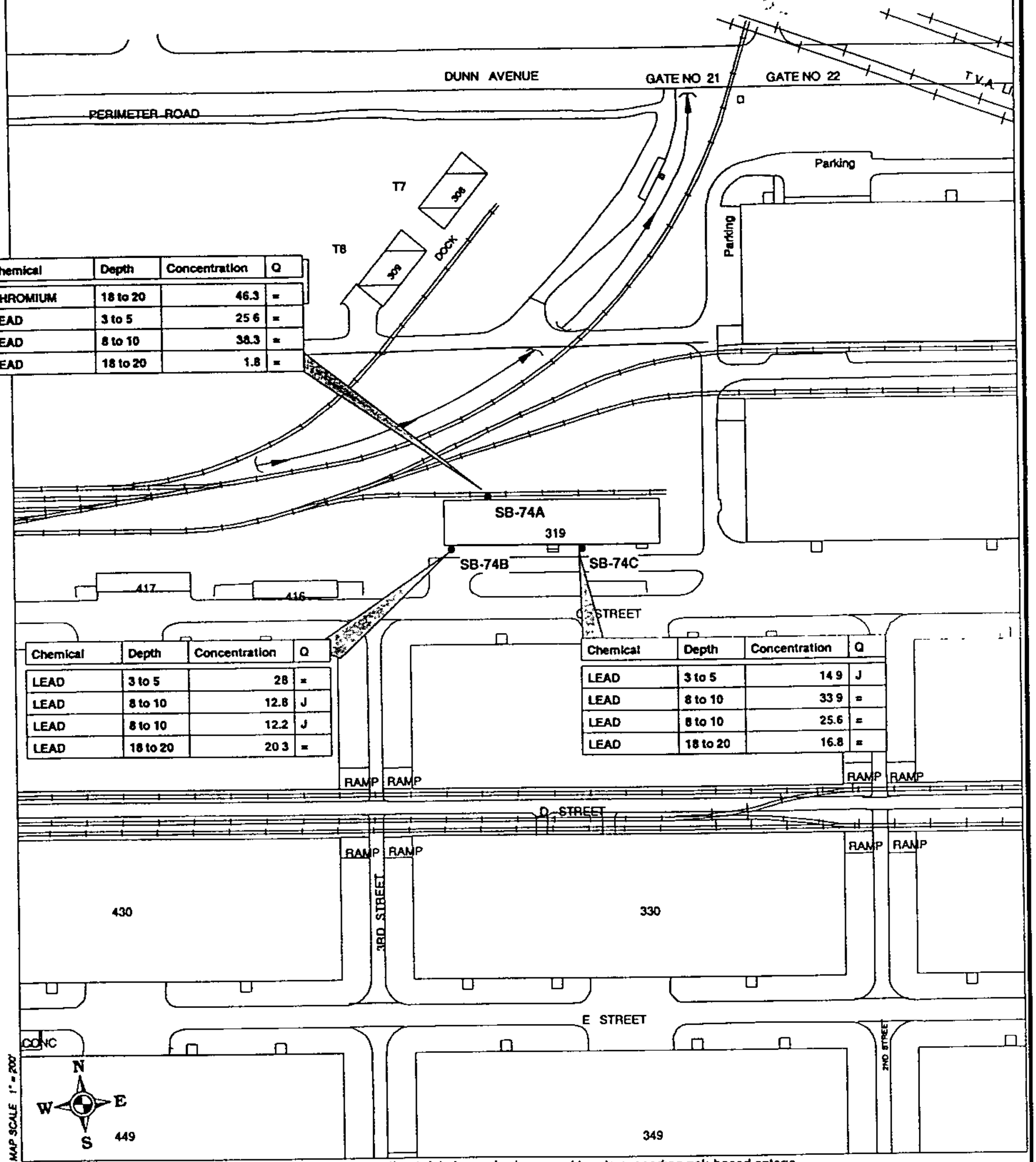


Chemical	Depth	Concentration	Q
CHROMIUM	18 to 20	46.3	=
LEAD	3 to 5	25.6	=
LEAD	8 to 10	38.3	=
LEAD	18 to 20	1.8	=

Chemical	Depth	Concentration	Q
LEAD	3 to 5	28	=
LEAD	8 to 10	12.8	J
LEAD	8 to 10	12.2	J
LEAD	18 to 20	20.3	=

Chemical	Depth	Concentration	Q
LEAD	3 to 5	14.9	J
LEAD	8 to 10	33.9	=
LEAD	8 to 10	25.6	=
LEAD	18 to 20	16.8	=

Sampling locations without data boxes had no constituents exceeding risk-based criteria

LEGEND

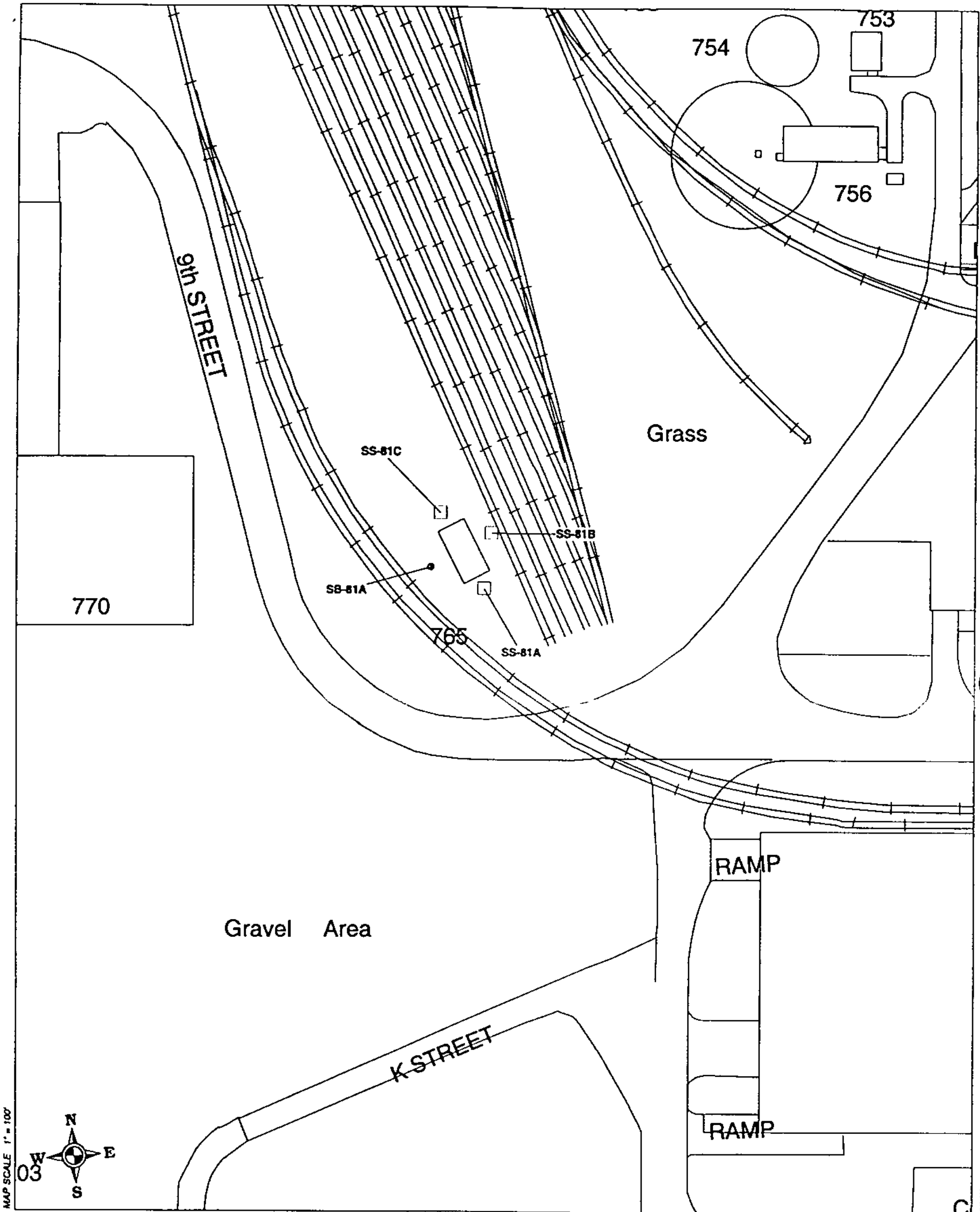
- ● Soil Boring Sampling Location (mg/kg)

(Q) Qualifier Definitions
= - indicates unqualified detection
J - indicates estimated value above detection limit, but below reporting limit.

FIGURE 4-5
SITE 74, WEST ENDING BUILDING 319 CONSTITUENTS EXCEEDING RISK-BASED CRITERIA
MEMPHIS DEPOT MAIN INSTALLATION NFA

CH2MHILL

2717_99 (boarder/title)



Sampling locations without data boxes had no constituents exceeding risk-based criteria

LEGEND

- □ Surface Soil Sampling Location (mg/kg)
- ● Soil Boring Sampling Location (mg/kg)

FIGURE 4-6
SITE 81, FUEL OIL BUILDING 765
SAMPLING LOCATIONS
MEMPHIS DEPOT MAIN INSTALLATION NFA

2717_99 (boarder/title)

CH2MHILL

5.0 References

CH2M HILL. May 1997. *Remedial Investigation Letter Reports*. Draft. Prepared for U.S. Army Engineering and Support Center, Huntsville, Alabama.

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TAB

Appendix B

Well Construction and Stratigraphy

APPENDIX B

Well Construction and Stratigraphy

This appendix contains well completion diagrams for the following:

- MW-43
- TW-43
- MW-62
- MW-63
- MW-64
- MW-65
- MW-66
- PZ-1
- PZ-2
- PZ-3
- PZ-4
- PZ-5
- PZ-6
- PZ-7
- PZ-8

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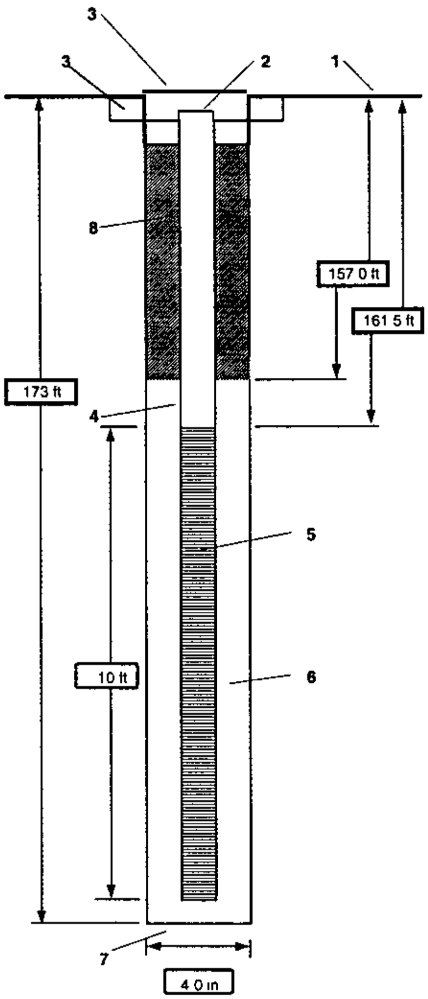
PROJECT NUMBER	WELL NUMBER		
113630.01.ZZ	MW-43	SHEET 1	OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN
DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN
DRILLING METHOD AND EQUIPMENT USED Rotasonic, 4 in x 6 in
WATER LEVELS 128 38 ft (11/12/98) START 10/26/98 END 10/26/98 LOGGER T Proper/ATL



1- Ground elevation at well	285 53 ft
2- Top of casing elevation	284 99 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	2-inch PVC
5- Type/slot size of screen	0 010 slot PVC
6- Type screen filter	Filter Sil™ -10/20 sand
a) Quantity used	200 lbs (4 bags)
7- Type of seal	Shur Pel™ bentonite pellets (1/4 in)
	(Pellets used to seal confining unit if penetrated)
a) Quantity used	238 lbs (16 ft)
8- Grout	
a) Grout mix used	Quik Grout™ (100 lbs), 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 236 gal
Development method	Pump with Grundfos pump
Development time	6 5 hours
Estimated purge volume	800 gal

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 171 6 ft
Final field parameters collected during well development (11/8/98)
pH = 6 14
conductivity = 0 333 mS/cm
temperature = 18 6°C

Note Diagram not to scale

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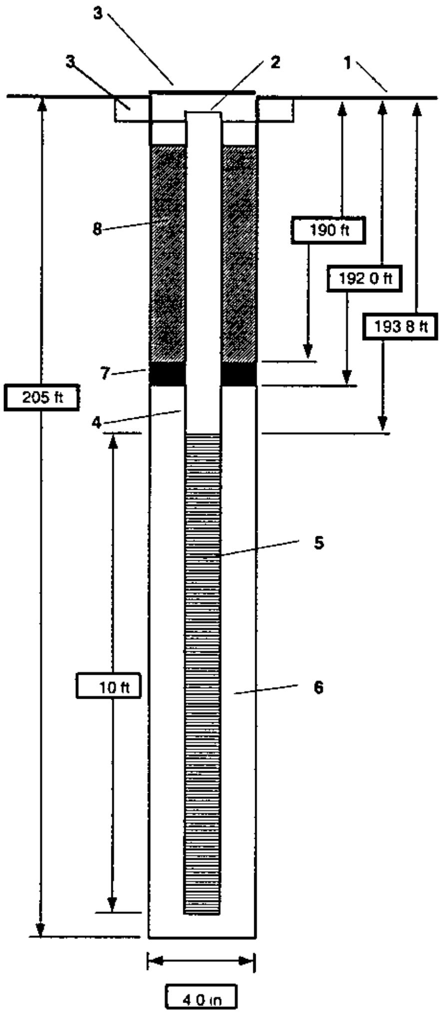
CH2MHILL

PROJECT NUMBER	WELL NUMBER
113630.01.ZZ	TW-43 SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN
DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN
DRILLING METHOD AND EQUIPMENT USED Rotasonic, 4 in x 6 in
WATER LEVELS 132 70 ft (10/22/98) START 10/22/98 END 10/22/98 LOGGER T Proper/ATL



1- Ground elevation at well	285 53 ft (MW-43)
2- Top of casing elevation	284 99 ft (MW-43)
3- Wellhead protection cover type	NA
b) concrete pad dimensions	NA
4- Dia./type of well casing	2-inch PVC
5- Type/slot size of screen	0 010 slot PVC
6- Type screen filter	Filter Sil™ -10/20 sand (+ formation sand) (Boundary between formation sand and Filter Sil™ - 202 ft)
a) Quantity used	100 lbs (2 bags)
7- Type of seal	Shur Pel™ bentonite pellets (1/4 in)
a) Quantity used	13 lbs
8- Grout	
a) Grout mix used	Did not grout temporary well
b) Method of placement	NA
c) Vol of well casing grout	NA
Development method	Pump with Grundfos pump
Development time	5 hours
Estimated purge volume	625 gal

Comments Mud weight = NA
Total Depth (BTOC) = 204 0 ft
Final field parameters collected during well development (10/23/98)
pH = 6 71
conductivity = 0 439 mS/cm
temperature = 19 1°C

Note Diagram not to scale

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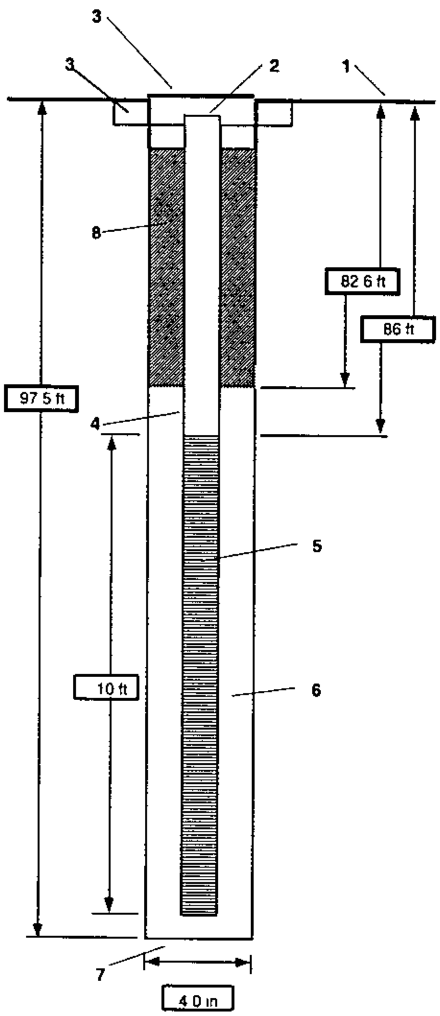
CH2MHILL

PROJECT NUMBER	WELL NUMBER
113630.01.ZZ	MW-62 SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN
DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN
DRILLING METHOD AND EQUIPMENT USED Rotasonic, 4 in x 6 in
WATER LEVELS 93 99 ft (11/12/98) START 10/14/98 END 10/14/98 LOGGER T Proper/ATL



1- Ground elevation at well	293 98 ft
2- Top of casing elevation	293 60 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	2-inch PVC
5- Type/slot size of screen	0 010 slot PVC
6- Type screen filter	Filter Sil™ -10/20 sand
a) Quantity used	250 lbs (5 bags)
7- Type of seal	Shur Pel™ bentonite pellets (1/4 in)
	(Pellets used to seal confining unit if penetrated)
a) Quantity used	70 lbs (15 ft)
8- Grout	
a) Grout mix used	Quik Grout™ (100 lbs), 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 125 gal
Development method	Bailed with disposable bailer (slow recovery)
Development time	20 minutes (over the course of 4 days)
Estimated purge volume	1 8 gal

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 97 13 ft
Final field parameters collected during well development (10/25/98)
pH = 7 90
conductivity = 0 185 mS/cm
temperature = 18 8°C

Note Diagram not to scale

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CH2MHILL

PROJECT NUMBER	WELL NUMBER
113630.01.ZZ	MW-63 SHEET 1 OF 1

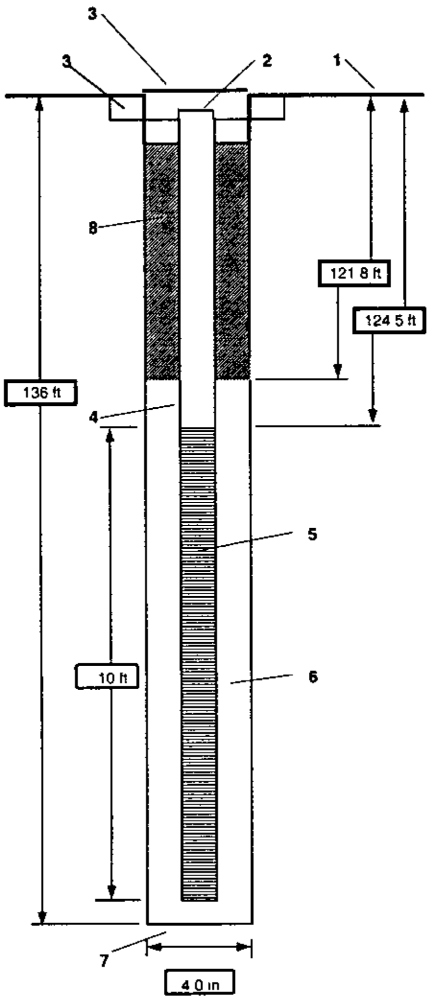
WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN

DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED Rotasonic, 4 in x 6 in

WATER LEVELS 102 25 ft (11/12/98) START 10/13/98 END 10/13/98 LOGGER T Proper/ATL



1- Ground elevation at well	305 10 ft
2- Top of casing elevation	304 58 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	2-inch PVC
5- Type/slot size of screen	0 010 slot PVC
6- Type screen filter	Filter Sil™ -10/20 sand
a) Quantity used	200 lbs (4 bags)
7- Type of seal	Shur Pel™ bentonite pellets (1/4 in)
	(Pellets used to seal confining unit if penetrated)
a) Quantity used	38 lbs (7 ft)
8- Grout	
a) Grout mix used	Quik Grout™ (100 lbs), 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 185 gal
Development method	Pump with Grundfos pump
Development time	1 5 hours
Estimated purge volume	275 gal

Comments Mud weight = 9 4 lbs/gal (not measured)

Total Depth (BTOC) = 135 3 ft

Final field parameters collected during well development (10/21/98)

pH = 6 07

conductivity = 0 354 mS/cm

temperature = 19 2°C

Note Diagram not to scale

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
113630.01.ZZ	MW-64	SHEET 1	OF 1

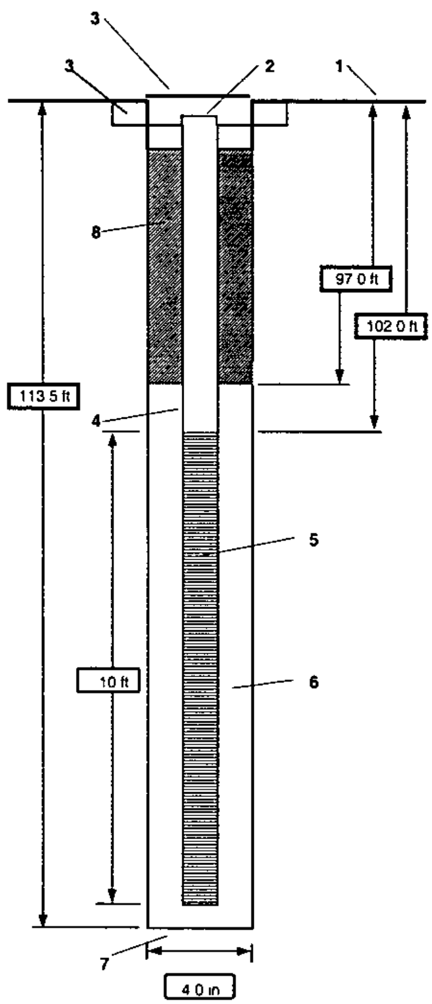
WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN

DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED Rotasonic 4 in x 6 in

WATER LEVELS 106 53 ft (11/12/98) START 10/15/98 END 10/15/98 LOGGER T Proper/ATL



Note Diagram not to scale

1- Ground elevation at well: 304 63 ft

2- Top of casing elevation: 304 24 ft

3- Wellhead protection cover type: Flush mount vault
   b) concrete pad dimensions: 3 ft x 3 ft

4- Dia /type of well casing: 2-inch PVC

5- Type/slot size of screen: 0 010 slot PVC

6- Type screen filter: Filter Sil™ -10/20 sand
   a) Quantity used: 200 lbs (4 bags)

7- Type of seal: Shur Pel™ bentonite pellets (1/4 in)
   (Pellets used to seal confining unit if penetrated)
   a) Quantity used: 25 lbs (2 5 ft)

8- Grout
   a) Grout mix used: Quik Grout™ (100 lbs), 48 gal water
   b) Method of placement: Pumped
   c) Vol of well casing grout: Approx 146 gal

Development method: Bailed with disposable bailer (slow recovery)

Development time: 6 hours (intermittently)

Estimated purge volume: 33 gal

Comments: Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 112 8 ft
Final field parameters collected during well development (10/24/98)
pH = 6 82
conductivity = 0 324 mS/cm
temperature = 18 4°C

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PROJECT NUMBER	WELL NUMBER
113630.01.ZZ	MW-65 SHEET 1 OF 1

CH2MHILL

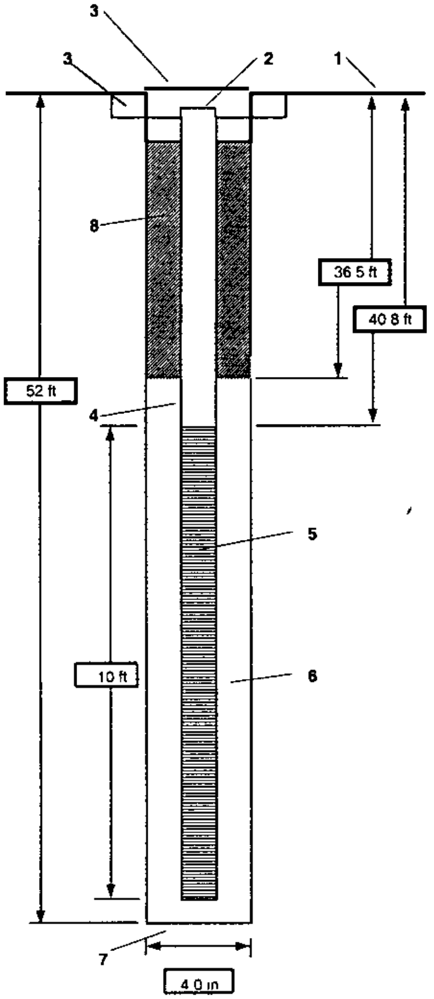
WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN

DRILLING CONTRACTOR Boart Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED Rotasonic, 4 in x 6 in

WATER LEVELS 50 86 ft (11/12/98) START 11/6/98 END 11/6/98 LOGGER T Proper/ATL



1- Ground elevation at well	263 57 ft
2- Top of casing elevation	263 22 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	2-inch PVC
5- Type/slot size of screen	0 010 slot PVC
6- Type screen filter	Filter Sil™ -10/20 sand
a) Quantity used	200 lbs (4 bags)
7- Type of seal	Shur Pel™ bentonite pellets (1/4 in) (Pellets used to seal confining unit if penetrated)
a) Quantity used	38 lbs (4 ft)
8- Grout	
a) Grout mix used	Quik Grout™ (100 lbs), 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 55 gal
Development method	??
Development time	??
Estimated purge volume	??

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = ?? ft
Final field parameters collected during well development (11/??/98)
pH = ??
conductivity = ??mS/cm
temperature = ??°C

Note Diagram not to scale

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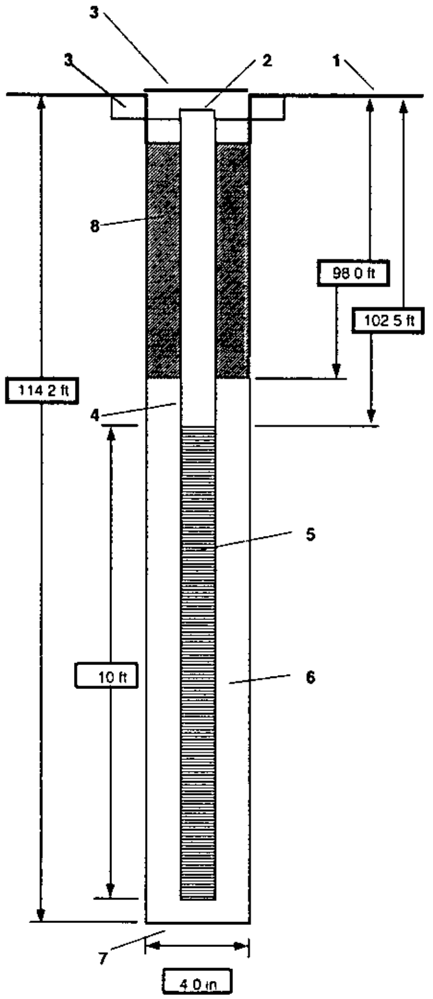
PROJECT NUMBER	WELL NUMBER		
113630.01.ZZ	MW-66	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN
DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN
DRILLING METHOD AND EQUIPMENT USED Rotasonic, 4 in x 6 in
WATER LEVELS 80 06 ft (11/12/98) START 11/10/98 END 11/10/98 LOGGER T Proper/ATL



1- Ground elevation at well: 289 15 ft

2- Top of casing elevation: 288 70* ft

3- Wellhead protection cover type: Flush mount vault
b) concrete pad dimensions: 3 ft x 3 ft

4- Dia /type of well casing: 2-inch PVC

5- Type/slot size of screen: 0 010 slot PVC

6- Type screen filter: Filter Sil™ -10/20 sand
a) Quantity used: 250 lbs (5 bags)

7- Type of seal: Shur Pel™ bentonite pellets (1/4 in)
(Pellets used to seal confining unit if penetrated)
a) Quantity used: 113 lbs (10 8 ft)

8- Grout
a) Grout mix used: Quik Grout™ (100 lbs), 48 gal water
b) Method of placement: Pumped
c) Vol of well casing grout: Approx 147 gal

Development method: ??

Development time: ??

Estimated purge volume: ??

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = ?? ft
Final field parameters collected during well development (11/??/98)
pH = ??
conductivity = ??mS/cm
temperature = ??°C
*+/- 0 10' ft (will verify)

Note Diagram not to scale.

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CH2MHILL

PROJECT NUMBER	WELL NUMBER	
113630.01.ZZ	PZ-1	SHEET 1 OF 1

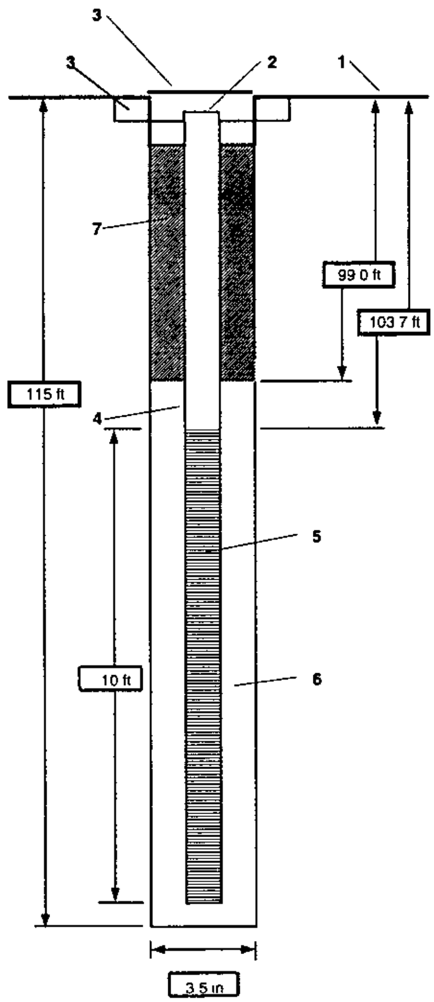
WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN

DRILLING CONTRACTOR Boart-Longyear Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED Rotasonic, O D = 3 5 in , I D = 2 25 in

WATER LEVELS Not measured START 10/27/98 END 10/27/98 LOGGER T Proper/ATL



1- Ground elevation at well	308 32 ft
2- Top of casing elevation	307 76 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	3/4-inch PVC
5- Type/slot size of screen	0 010 slot PVC (pre-packed)
6- Type screen filter	Filter Sil™ -10/20 sand (+ formation sand)
	(Boundary b/t formation sand and Filter Sil™ - 105 ft)
a) Quantity used	25 lbs (1/2 bag)
7- Grout	
a) Grout mix used	Quik Grout™ (100 lbs), 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 149 gal
Development method	Did not develop
Development time	Did not develop
Estimated purge volume	Did not purge (Driller estimated 100 gal of water added during PZ installation)

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 114 2 ft
PZ installed at HY-6 location

Note Diagram not to scale

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CH2MHILL

PROJECT NUMBER	WELL NUMBER		
113630.01.ZZ	PZ-2	SHEET 1	OF 1

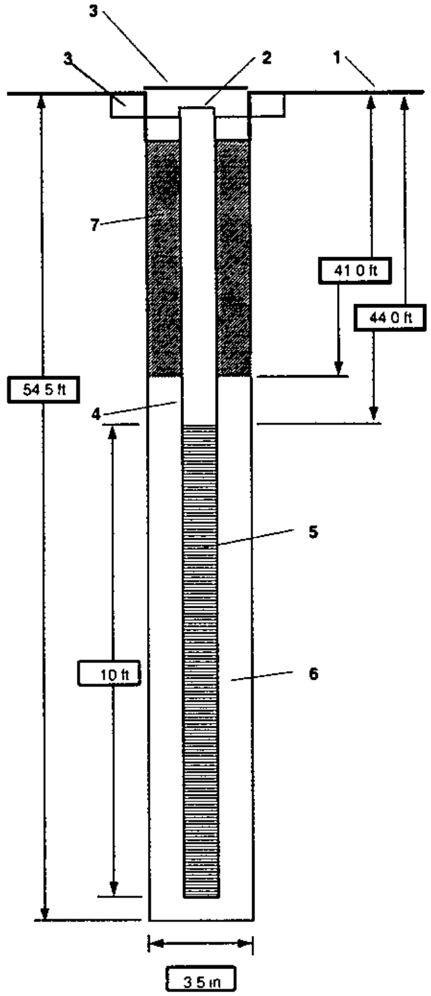
WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN

DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED Rotasonic, O D = 3 5 in I D = 2 25 in

WATER LEVELS Not measured START 10/28/98 END 10/28/98 LOGGER T Proper/ATL



Note Diagram not to scale

1- Ground elevation at well	284 82 ft
2- Top of casing elevation	284 39 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	3/4 inch PVC
5- Type/slot size of screen	0 010 slot PVC (pre-packed)
6- Type screen filter	Filter Sil™ -10/20 sand (+ formation sand) (Boundary b/t formation sand and Filter Sil™ - 51 ft)
a) Quantity used	50 lbs (1bag)
7- Grout	
a) Grout mix used	Quik Grout™ (100 lbs) 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 103 gal
Development method	Did not develop
Development time	Did not develop
Estimated purge volume	Did not purge (Driller estimated 20 gal of water added during PZ installation)

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 54 5 ft
PZ installed at HY-12 location

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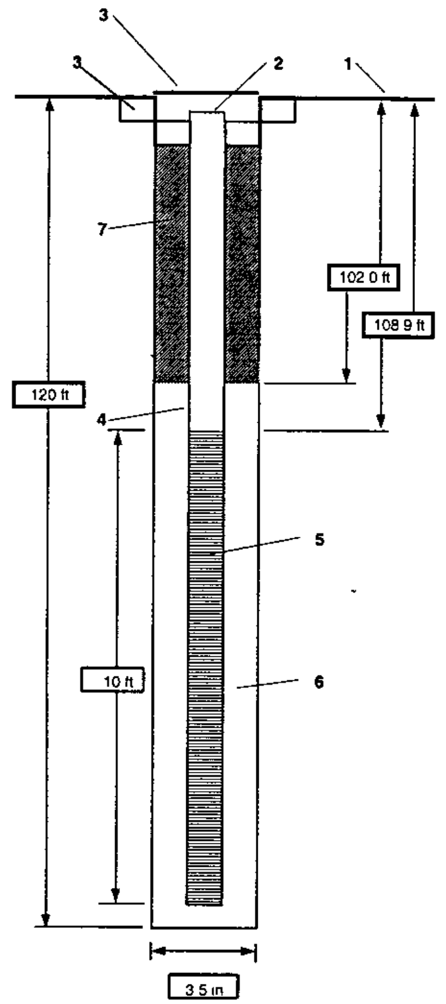
PROJECT NUMBER	WELL NUMBER
113630.01.ZZ	PZ-3 SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN
DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN
DRILLING METHOD AND EQUIPMENT USED Rotasonic O D = 3 5 in I D = 2 25 in
WATER LEVELS Not measured START 10/29/98 END 10/29/98 LOGGER T Proper/ATL



1- Ground elevation at well	298 73 ft
2- Top of casing elevation	298 31 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	3/4-inch PVC
5- Type/slot size of screen	0 010 slot PVC (pre-packed)
6- Type screen filter	Filter Sil™ -10/20 sand (+ formation sand) (Boundary b/t formation sand and Filter Sil™ - 106 ft)
a) Quantity used	50 lbs (1 bag)
7- Grout	
a) Grout mix used	Quik Grout™ (100 lbs), 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 153 gal
Development method	Did not develop
Development time	Did not develop
Estimated purge volume	Did not purge (Driller estimated 30 gal of water added during PZ installation)

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 119 4 ft
PZ installed at HY-78A location

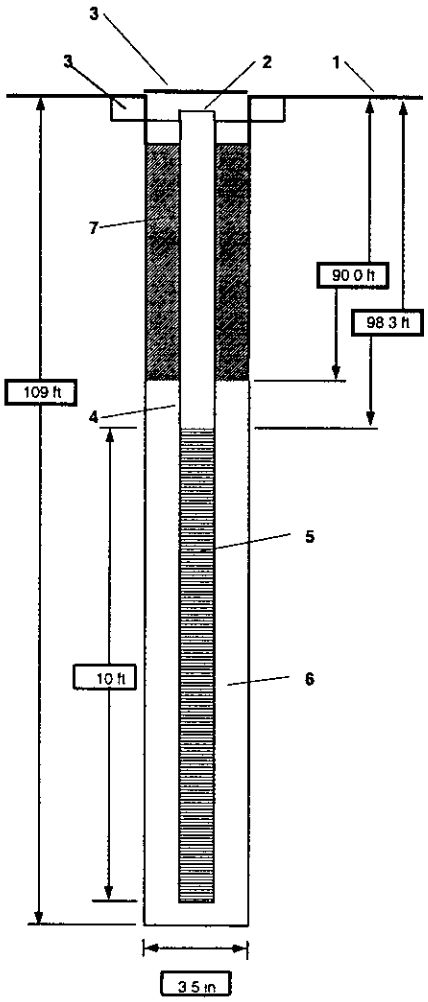
Note Diagram not to scale

PROJECT NUMBER	WELL NUMBER	
113630.01.ZZ	PZ-4	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN
DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN
DRILLING METHOD AND EQUIPMENT USED Rotasonic, O D = 3 5 in , I D = 2 25 in
WATER LEVELS Not measured START 11/3/98 END 11/3/98 LOGGER T Proper/ATL



1- Ground elevation at well	302 68 ft
2- Top of casing elevation	302 30 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	3/4-inch PVC
5- Type/slot size of screen	0 010 slot PVC (pre-packed)
6- Type screen filter	Filter Sil™ -10/20 sand (+ formation sand) (Boundary b/t formation sand and Filter Sil™ - 100 ft)
a) Quantity used	50 lbs (1 bag)
7- Grout	
a) Grout mix used	Quik Grout™ (100 lbs) 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 135 gal
Development method	Did not develop
Development time	Did not develop
Estimated purge volume	Did not purge (Driller estimated 30 gal of water added during PZ installation)

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 108 8 ft
PZ installed at HY-8 location

Note Diagram not to scale

488 126

PROJECT NUMBER	WELL NUMBER
113630.01.ZZ	PZ-5 SHEET 1 OF 1

CH2MHILL

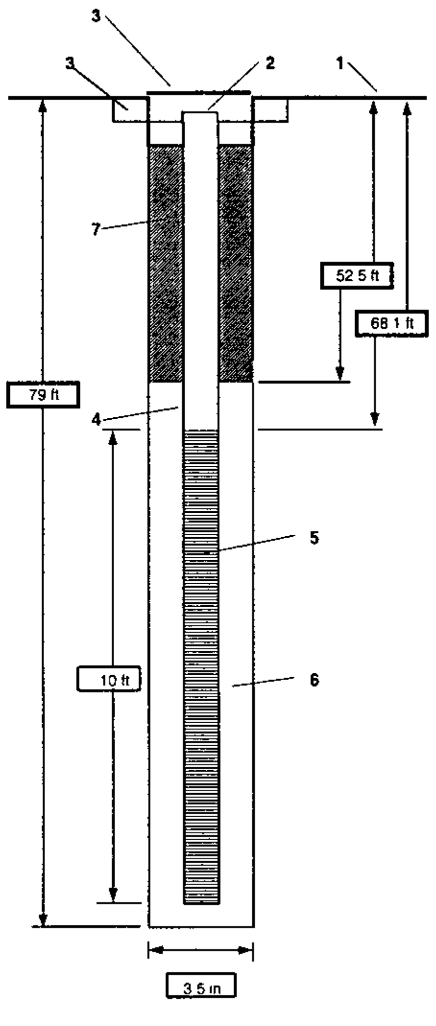
WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN

DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED Rotasonic, O D = 3 5 in , I D = 2 25 in

WATER LEVELS Not measured START 11/5/98 END 11/5/98 LOGGER T Proper/ATL



1- Ground elevation at well	256 55 ft
2- Top of casing elevation	256 04 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia./type of well casing	3/4-inch PVC
5- Type/slot size of screen	0 010 slot PVC (pre-packed)
6- Type screen filter	Filter Sil™ -10/20 sand (+ formation sand)
	(Boundary b/t formation sand and Filter Sil™ - 67 ft)
a) Quantity used	100 lbs (2 bags)
7- Grout	
a) Grout mix used	Quik Grout™ (100 lbs), 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 79 gal
Development method	Did not develop
Development time	Did not develop
Estimated purge volume	Did not purge (Estimated gal of water added during PZ installation unknown)

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 78 6 ft
PZ installed at HY-5 location

Note Diagram not to scale

PROJECT NUMBER	WELL NUMBER
113630.01.ZZ	PZ-6 SHEET 1 OF 1

CH2MHILL

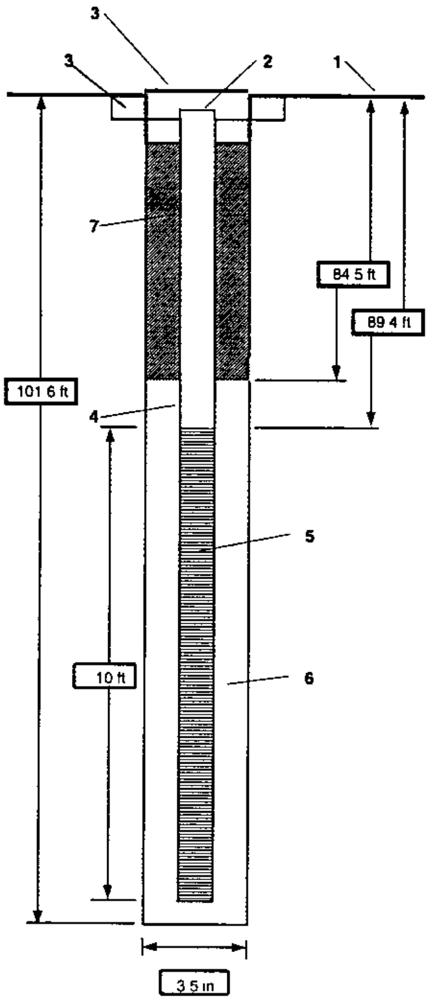
WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN

DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED Rotasonic, O D = 3 5 in , I D = 2 25 in

WATER LEVELS Not measured START 11/8/98 END 11/8/98 LOGGER T Proper/ATL



1- Ground elevation at well	303 19 ft
2- Top of casing elevation	302 74 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	3/4-inch PVC
5- Type/slot size of screen	0 010 slot PVC
6- Type screen filter	Filter Sil™ -10/20 sand
	(Boundary b/t formation sand and Filter Sil™ - 101 6 ft)
a) Quantity used	50 lbs (1 bag)
7- Grout	
a) Grout mix used	Quik Grout™ (100 lbs) 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 127 gal
Development method	Did not develop
Development time	Did not develop
Estimated purge volume	Did not purge (Driller estimated 70 gal of water added during PZ installation)

Comments Mud weight = 9 4 lbs/gal (not measured)

Total Depth (BTOC) = 99 9 ft

PZ installed at HY-36A location

Note Diagram not to scale

488 128

CH2MHILL

PROJECT NUMBER	WELL NUMBER
113630.01.ZZ	PZ-7 SHEET 1 OF 1

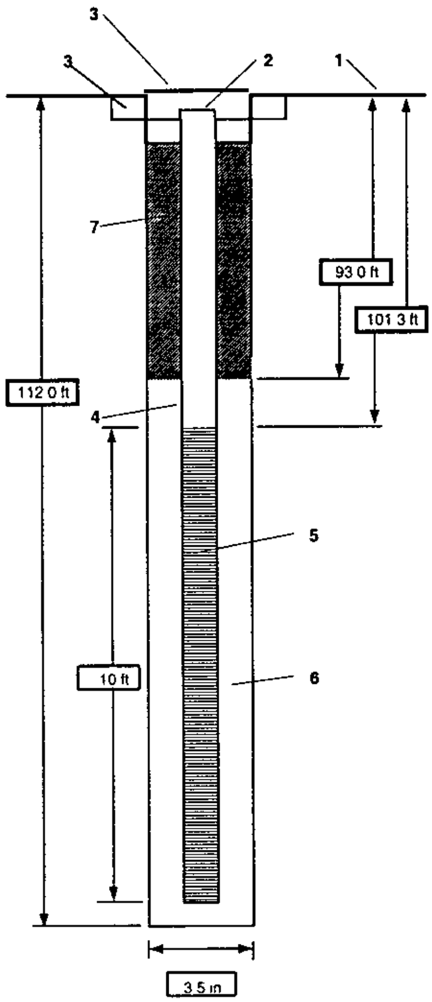
WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN

DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN

DRILLING METHOD AND EQUIPMENT USED Rotasonic, O D = 3 5 in , I D = 2 25 in

WATER LEVELS Not measured START 11/9/98 END 11/9/98 LOGGER T Proper/ATL



1- Ground elevation at well: 304 93 ft

2- Top of casing elevation: 304 50 ft

3- Wellhead protection cover type: Flush mount vault
b) concrete pad dimensions: 3 ft x 3 ft

4- Dia /type of well casing: 3/4-inch PVC

5- Type/slot size of screen: 0 010 slot PVC

6- Type screen filter: Filter Sil™ -10/20 sand (Boundary b/t formation sand and Filter Sil™ - 112 ft)
a) Quantity used: 75 lbs (1 5 bags)

7- Grout
a) Grout mix used: Quik Grout™ (100 lbs), 48 gal water
b) Method of placement: Pumped
c) Vol of well casing grout: Approx 140 gal

Development method: Did not develop

Development time: Did not develop

Estimated purge volume: Did not purge (Driller estimated 50 gal of water added during PZ installation)

Comments: Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 111 8 ft
PZ installed at HY-67A location

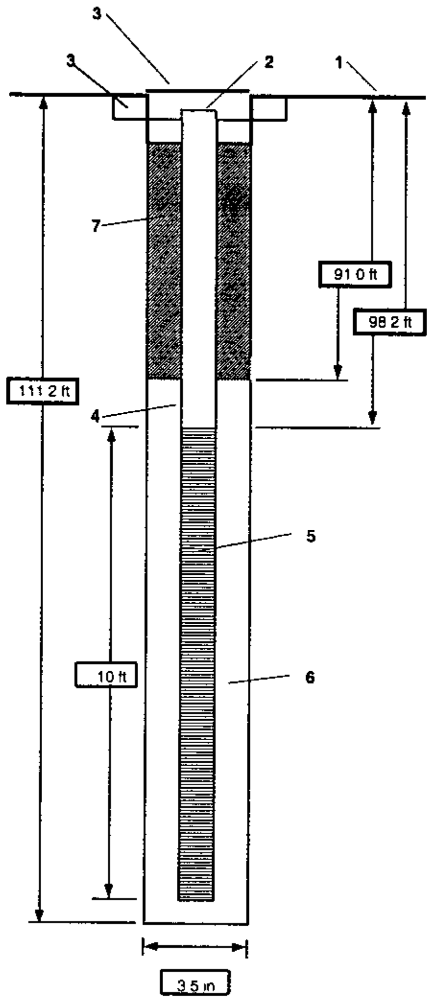
Note Diagram not to scale

PROJECT NUMBER	WELL NUMBER	
113630.01.ZZ	PZ-8	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT DDMT October 1998 Well Installation LOCATION Memphis, TN
DRILLING CONTRACTOR Boart-Longyear, Little Falls, MN
DRILLING METHOD AND EQUIPMENT USED Rotasonic, O D = 3 5 in , I D = 2 25 in
WATER LEVELS Not measured START 11/11/98 END 11/11/98 LOGGER T Proper/ATL



1- Ground elevation at well	289 91 ft
2- Top of casing elevation	289 35 ft
3- Wellhead protection cover type	Flush mount vault
b) concrete pad dimensions	3 ft x 3 ft
4- Dia /type of well casing	3/4-inch PVC
5- Type/slot size of screen	0 010 slot PVC
6- Type screen filter	Filter Sil™ -10/20 sand (+ formation sand) (Boundary b/t formation sand and Filter Sil™ - 94 ft)
a) Quantity used	75 lbs (1 5 bags)
7- Grout	
a) Grout mix used	Quik Grout™ (100 lbs), 48 gal water
b) Method of placement	Pumped
c) Vol of well casing grout	Approx 137 gal
Development method	Did not develop
Development time	Did not develop
Estimated purge volume	Did not purge (Estimated gal of water added during PZ installation unknown)

Comments Mud weight = 9 4 lbs/gal (not measured)
Total Depth (BTOC) = 108 7 ft
PZ installed at HY-11 location

Note Diagram not to scale

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TAB

Appendix C

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Appendix C

Quality Assurance / Quality Control

APPENDIX C

Quality Assurance/Quality Control

Appendix C contains the following:

- C-1: Memphis Depot BRAC Data Quality Evaluation Memorandum
- C-2: Data Quality Evaluation Report–Memphis Depot Screening Sites Project
- C-3: Data Quality Evaluation Report for the Defense Depot Memphis, Tennessee, Remedial Investigation Project
- C-4: Memphis Depot Main Installation RI/FS Data Quality Evaluation

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Appendix C-1

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MEMORANDUM CH2MHILL

Memphis Depot BRAC Data Quality Evaluation (DQE)

Introduction

Surface and subsurface soil and sediment samples were collected during October 1996 Field QC samples included field duplicates, field blanks, trip blanks (analyzed for VOCs only), equipment rinsate blanks, and matrix spikes. The samples were analyzed for the following analytical fractions

- Volatile organic compounds (VOCs) by SW-846 method 8020
- Volatile organic compounds (VOCs) by SW-846 method 8260
- Semivolatile organic compounds (SVOCs) by SW-846 method 8270
- Organochlorine Pesticides/PCBs by SW-846 method 8080
- Total petroleum hydrocarbons (IR) by EPA method 418 1
- Metals by SW-846 methods 6010, 7470, and 7471

The purpose of the data quality evaluation process (DQEP) is to assess the effect of the overall analytical process on the usability of the data The two major categories of data evaluation are laboratory performance and matrix interferences Evaluation of laboratory performance is a straight-forward check of compliance with the method requirements, either the laboratory did, or did not, analyze the samples within the limits of the analytical method. Evaluation of matrix interferences is more subtle and involves the analysis of several areas of results including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

DQE for the Screening Sites data consisted of the following two principal activities:

- Hard copy "validation" of the EPA Level 3 data packages (as a note, it is not possible to "validate" the EPA Level 2 data because there is no QC summary data to evaluate)

- Database-wide evaluation of the trends in data quality (for example, trends in surrogate spike recovery)

It is important to note that *"data validation"* is the assessment of the hard-copy data base deliverables in terms of method compliance, and *"data quality evaluation"* is the qualitative evaluation of overall trends in the project-specific database. Areas evaluated in the DQE include the following.

- Potential "blank contamination" (i e. the effect on the usability of data for target compounds and analytes detected in both the field or laboratory blank samples and the corresponding field samples)

- Laboratory performance (i.e. recovery for spiked blank samples and other laboratory checks such as calibration and laboratory control samples)

- Matrix interferences (i e. recovery for spiked field samples)

- Usability of metals results at, or near, the instrument detection limits

This DQE technical memorandum (TM) includes the following

- Results of the database-wide DQE queries (summary tables are included at the end of this report)

- Assessment of the overall usability of the data to support the project decision-making process

The focus of the hard-copy data validation was to review each of the QC summary sheets, note nonconformances on the DV worksheets, qualify the data as appropriate, and summarize the results of this review. These completed worksheets are included in the project file and are available upon request

Data Evaluation Criteria

Before the analytical results were released by the laboratory, both the sample and QC data were carefully reviewed to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations Additionally, the QC data were reduced and the resulting data were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Any non-conforming data were discussed in the data package cover letter and case narrative.

The data EPA level 3 QC packages were reviewed by the project chemists using the process outlined in the Environmental Protection Agency (EPA) guidance document *USEPA CLP National Functional Guidelines for Inorganic (Organic) Data Review* (February, 1994) The data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decision-making processes. Areas of review included (when applicable to the method) holding time compliance, calibration verification, blank results, matrix spike precision and accuracy, method accuracy as demonstrated by LCSs, field duplicate results, surrogate recoveries, internal standard performance, and interference checks. A data review worksheet was completed for each data package.

Data that were not within the acceptance limits were appended with a qualifying flag, which consists of a single or double-letter abbreviation that reflects a problem with the data Although the qualifying flags originate during the database query process, they are included in the final data summary tables deliverable so that the data will not be used indiscriminately. The following flags were used in this text

TABLE C.1-1
Data Qualification Flags
BRAC Data Quality Evaluation
Memphis Depot Main Installation RI

Qualifier	Description
U	Undetected. Analyte was analyzed for but not detected above the method detection limit.
UJ	Detection limit estimated. Analyte was analyzed for and qualified as not detected. The result is estimated.
J	Estimated The analyte was present, but the reported value may not be accurate or precise.
R	Rejected. The data are unusable (NOTE: Analyte/compound may or may not be present)

Inorganic numerical sample results that are greater than the method detection limit (MDL) but less than the laboratory reporting limit (RL) are qualified with a "J" for estimated as required by the EPA Functional Guidelines for Evaluating Data Quality

"R" qualifiers are used to reject data that have been determined unusable during data validation. Poor MS/MSD recovery, poor surrogate recovery, poor laboratory control sample recovery, missed holding times, and gross contamination are some of the cases where "R" qualifiers may be applied to data.

Once the data review and validation process was completed, the entire data set were reviewed for chemical compound frequencies of detection, dilution factors that might affect data usability and patterns of target compound distribution. The data set was also evaluated to identify potential data limitations, uncertainties, or both in the analytical results.

Potential Field Sampling and Laboratory Contamination

Four types of blank samples were used to monitor potential contamination introduced during field sampling, sample handling, shipping activities, as well as sample preparation and analysis.

- **Trip Blank (TB)** A sample of ASTM Type II water that is prepared in the laboratory prior to the sampling event. The water is stored in VOC sample containers and is not opened in the field, and travels back to the laboratory with the other samples for VOC analysis This blank is used to monitor the potential for sample contamination during the sample container trip. One trip blank should be included in each sample cooler that contained samples for VOC analysis. Eight trip blanks were submitted to the laboratory with these samples.

- **Equipment Rinsate Blank (ERB)** A sample of the target-free water used for the final rinse during the equipment decontamination process. This blank sample is collected by rinsing the sampling equipment after decontamination and is analyzed for the same analytical parameters as the corresponding samples This blank is used to monitor potential contamination caused by incomplete equipment decontamination. One equipment rinsate blank should be collected per day of sampling, per type of sampling equipment. Two equipment rinsate blanks were submitted to the laboratory for analysis

- **Field Blank or Ambient Blank (FB or AB)**: The field blank is an aliquot of the source water used for equipment decontamination. This blank monitors contamination that may be introduced from the water used for decontamination. One field blank should be collected from each source of decontamination water and analyzed for the same parameters as the associated samples Two field blanks were collected during this sampling event.

- **Laboratory Method Blank or Method Blank (MB)**· A laboratory method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process. One method blank was prepared and analyzed for every twenty samples or per analytical batch, whichever was more frequent.

Evaluation of QC Blank Results according to the EPA Functional Guidelines, concentrations of common organic contaminants detected in samples at less than ten times the concentration of the associated blanks can be attributed to field sampling and laboratory contamination rather than environmental contamination from site activities. Common organic contaminants include acetone, methylene chloride, 2-butanone (MEK), and the phthalates For other inorganic and organic contaminants, five times the concentration detected in the associated blanks rather than ten is used to qualify results as potential field and/or laboratory contamination rather than environmental contamination. A detailed list of contaminant found in the field and laboratory blanks is provided in Table C 1-2a The frequency and range of targets detected in the samples, after qualification based on blank contamination, is provided in Table C 1-2b.

Acetone, 2-butanone, 2-hexanone, and 4-methyl-2-pentanone (ketone family or class) are often associated with equipment rinsate solvents, such as methanol, as solvent contaminants Incomplete drying of the rinsate solvent can cause carryover of these contaminants. Acetone and methylene chloride are extraction solvents and are common laboratory contaminants. Phthalates are ubiquitous laboratory contaminants. Phthalates are used as plasticizers and are often introduced into samples during handling. Gloves used in the field and the laboratory may contribute to the presence of phthalate compounds Other apparatus and reagents used in the field and/or laboratory may contain phthalates.

- Acetone (extraction solvent and common lab contaminant) was detected in one equipment rinsate blank, one field blank, three trip blanks, and 11 laboratory method blanks All acetone detects in the field samples were less than 10 times the level of the associated blanks and were therefore qualified as non-detected (U)

- Methylene chloride (extraction solvent and common lab contaminant) was detected seven laboratory method blanks Methylene chloride was not detected in any of the field QC samples All methylene chloride detects in the field samples were less than 10 times the level of the associated blanks and were therefore qualified as non-detected (U)

- 2-Butanone (common lab contaminant) was found in one equipment rinsate blank and one field blank. All 2-butanone detects in the field samples were less than 10 times the level of the associated blanks and were therefore qualified as non-detected (U)

- Phthalates are common lab contaminants and were detected in a number of blanks Benzyl butyl phthalate was detected in one laboratory blank Five laboratory method blanks had bis-2-ethylhexyl)phthalate (BEHP) present Diethyl phthalate was detected in one field blank and one equipment rinsate blanks. Additionally, di-n-butyl phthalate (DNBP) was detected in one field blank and eight laboratory blanks. Due to the widespread detection of BEHP and DNBP, global flags were applied to these samples. Several phthalates were detected in samples greater than 10 times the highest associated blank levels. These results may be anomalies, therefore care should be exercised when using these data.

Phenol was the only other organic compound detected in any blank It was found in one equipment rinsate blank Phenol was detected above the MDL in one sample that was not associated with this equipment rinsate blank

When evaluating any significant amount of data such as this, there may be instances in which common laboratory contaminants are reported at low levels in samples, but are not detected in any associated blank samples. Therefore, they can not be qualified as "U" (undetected) based upon blank evaluation. However, the reported levels of these compounds must be evaluated carefully to determine if they are truly indicative of environmental conditions, or low level contamination from the field or laboratory. Several phthalates (benzyl butyl phthalate, bis(2-etylhexyl phthalate, di-n-octylphthalate, and dimethylphalate) were found in samples, but not in the associated blanks and were therefore not qualified as undetected These are common laboratory contaminants and may possibly be due to low level contamination, rather than environmental conditions However, several phthalates are present at levels significantly above the report limit In particular, sample AA0049DL was diluted solely in order to have bis(2-ethylhexyl)phthalate response within the calibration range These results may be true contaminants, therefore care should be exercised when using these data

A number of metals were detected in various blanks Many of these metals are ubiquitous at low levels (chromium, copper, nickel, manganese, and lead) Chromium and nickel are associated with alloys of steel Copper is the primary metal used in conduits, tubing, and some electrical wiring Lead is associated with many alloys or solder combinations. Other metals such as arsenic, cadmium, selenium, silver, thallium, and mercury are not common contaminants and generally are quantitated just above the MDL and are usually false positives associated with instrument noise. Samples were qualified for metallic blank contamination on an SDG applicable basis and not globally. Any sample concentration falling under the five times blank rule was qualified as not detected.

Matrix Effects

Surrogate Spike Recovery

Surrogate spike compounds were added to every sample analyzed for the organic parameters including field and laboratory blanks as well as field environmental samples. Surrogate spikes consist of organic compounds which are similar to the method targets in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.

Surrogate spike recoveries were used to monitor both laboratory performance and matrix interferences Surrogate spike recoveries from field and laboratory blanks were used to evaluate laboratory performance because the blanks should represent an "ideal" sample matrix Surrogate spike recoveries for field samples were used to evaluate the potential for matrix interferences.

Per SW-846, the laboratory should develop in-house performance criteria for surrogate recoveries Once established, control limits and warning limits for surrogates should be updated at least semi-annually Table C.1-3 summarizes the VOC, SVOC, and pesticide/PCB surrogate recovery control limits reported by the laboratory, as well as the ranges of reported surrogate recoveries

Based on the database query, the average VOC recovery was 103.8%. When the laboratory VOC control limits were applied, more than 95% of the recoveries were within laboratory acceptance criteria

A greater variation (and hence broader range of recoveries) in surrogate spike recovery was observed for the SVOC analyses, but this is typical and is reflected by the broader method target acceptance limits One sample had extremely low surrogate recovery and was re-extracted with acceptable results. The SVOC acid surrogate recovery averaged 77% recovery. The base-neutral surrogate recovery averaged 84% recovery. Greater than 95% of the surrogate recoveries were within the laboratory acceptance limits.

Surrogate recoveries were not determined for 50 of the organochlorine pesticide/PCB samples due to the dilutions required for quantitation performed for analysis. All results for these samples were flagged as estimated, "J" for detects and "UJ" for non-detects. The measured surrogate recoveries averaged 100.3%. Of these measurable surrogate recoveries, 95% were within laboratory control limits.

The organic surrogates recovered within control limits, demonstrating no adverse effects due to the sample matrix.

Matrix Spike Recoveries

Matrix spikes are prepared in order to document the precision and bias of a method in a given sample matrix For inorganic matrix spikes, three aliquots of a single sample were analyzed; one native sample, one native duplicate, and one sample spiked with target elements. Spike recovery is used to evaluate potential matrix interferences as well as accuracy. Precision is evaluated by the comparison between the native sample and native duplicate results for each target analyte Three aliquots of a single sample are also analyzed for organic methods, however, utilizing one native and two spiked aliquots. Unlike the surrogate spike compounds, organic matrix spike compounds are found on the method target compound list. Spike recovery is used to evaluate potential matrix interferences as well as accuracy. The duplicate results (MS/MSD or native/Dup.) are compared to evaluate precision

Organic results are not qualified upon the results of MS/MSD results alone. Evaluation is in conjunction with surrogate and internal standard (if applicable) results Several of the organochlorine pesticide/PCB spikes were diluted due to native concentrations of pesticides and recovery cannot be determined For the DDMT BRAC effort, the laboratory MS/MSD spiking solutions contained 5 compounds for volatiles, 11 targets for semivolatiles, and 6 compounds for pesticide/PCBs. No organic results required qualification due to the MS/MSD precision and accuracy measurements indicating that the matrix did not influence the method or the final analytical result

The GC/MS volatile and semivolatile MS/MSD recovery and precision data all fell within laboratory control limits. Two sets of the organochlorine pesticide/PCB spikes (A047MS/SD and A042MS/SD) were diluted due to native contents and recoveries could not be determined. However, the precision of the native compounds was acceptable. The other three sets of OC pesticide/PCB spikes had acceptable recovery and precision, except where native contents were significantly higher than the spike level.

Inorganic results may be qualified solely upon the results of the matrix spike/matrix spike duplicate precision and accuracy. Instances where the native sample concentration for a given element exceeds the spike added concentration by a factor of four or more are disregarded as the spike added would be masked by the native concentration According to EPA *Functional Guidelines*, metals recoveries of greater than 30% and outside the 75-125% recovery control limits are required to be flagged as estimated. Precision requirements for soils and waters are at 35 and 20 relative percent difference (RPD), respectively Lead recovery was below 75% in two spikes However, the native (A129) for one spike was almost four times the spike level The matrix spike recovery for sample A106 was 26 percent The lead detects in samples associated with this spike were qualified as estimated (J) and non-detects were rejected (R). All inorganic recoveries that exceeded the 75-125% recovery limits are summarized in Table C.1-4. For the other unacceptable recoveries, associated samples were flagged as estimated ("J" for detects and "UJ" for non-detects) due to matrix spike performance.

The precision and accuracy information obtained from the matrix spiking and native duplicate precision indicate that the specific sample matrix did not influence the overall analytical process or the final numerical sample result.

Laboratory and Field Duplicate Sample Results

For soil samples (laboratory and field duplicates), a control limit of ± 35% for the RPD was used for original and duplicate sample values greater than or equal to five times the RL A control limit of ± the two times the RL was used if either the sample or the duplicate value was less than five times the RL. In the cases where only one result is above the five times the RL level and the other is below, the ± two times the RL criteria were applied.

Laboratory duplicates (LD) are used in inorganic analysis to evaluate precision. Two aliquots of the same sample are separated in the laboratory and analyzed concurrently. According to the EPA *Functional Guidelines*, data are qualified based on laboratory duplicate precision. Table C.1-5a summarizes the laboratory duplicate results that did not meet precision criteria.

Field duplicate analyses measure both field and laboratory precision and can also be affected by the homogeneity of the samples. Therefore the results may have more variability than lab duplicates, which measure only lab performance. According to the EPA *Functional Guidelines*, there are no qualification criteria for field duplicate precision.

There were several sets of field duplicates collected during this field effort Both the native and duplicate samples were analyzed for the same parameters. Precision criteria were met for all parameters except those listed in Table C.1-5b, demonstrating minimal matrix heterogeneity

ICP Serial Dilution

The serial dilution of samples quantitated by ICP determines whether or not significant physical or chemical interferences exist due to sample matrix. If the analyte concentration is sufficiently high, the serial dilution analysis must agree within a 10% difference of the original determination after correction for dilution.

Two serial dilutions were reported with this sampling event. Results were qualified based on association of the serial dilution to the individual sample delivery groups (SDGs). Aluminum, barium, chromium, cobalt, copper, iron, lead, manganese, sodium, vanadium, and zinc did not meet serial dilution criteria for this sampling event. Associated samples were qualified as estimated (J/UJ).

Samples Requiring Dilution

There are often occasions during the analysis of samples when a dilution may be required for various reasons. Diluting a sample is usually performed to provide more accurate quantitation of the target compounds and to protect the analytical instrumentation If the concentrations of the target compounds are above the calibration range of the instrument, the sample extract must be diluted in order to obtain an accurate quantitation Laboratories typically dilute the sample extracts such that the responses of the target compounds are in the upper part of the calibration range This is done in order to give a clear, strong signal from the detector while providing the lowest possible reporting limits

488 144

Another reason samples need to be diluted is the presence of non-target compounds and chemical interferences, or matrix effects. Matrix effects can be produced from a variety of sources, including conductivity, pH, organic content, and biota (oils and lipids). Laboratories will often perform a clean-up procedure on the sample extract prior to analysis. Standard clean-up procedures are designed to recover the target compounds, while minimizing or removing interfering non-target compounds; however, interferences can still persist, even after clean-up procedures have been employed.

Some inorganic samples were diluted for selected parameters (calcium, barium, and iron) in order to prevent concentrations from exceeding the instrument linear ranges or when excessive interference was present.

Many organochlorine pesticide/PCB samples required dilutions due to levels of targets present in the samples Some of these were diluted to a level at which surrogate and spike recoveries could not be determined.

Several semivolatile samples required dilution due to levels of targets present in the samples. In these cases, the laboratory additionally provided data from less diluted analysis, thus providing better report limits for the other compounds.

PARCCs

Precision--is defined as the agreement between duplicate results, and was estimated by comparing duplicate matrix spike recoveries, sample duplicates, as wells as the field duplicate sample results. Other than the documented exceptions, the precision between native and field duplicate sample results were within acceptable criteria for 90% of the measurements indicating that sample matrix did not significantly interfere with the overall analytical process.

Accuracy--is a measure of the agreement between an experimental determination and the true value of the parameter being measured. For the organic analyses, each of the samples was spiked with a surrogate compound, for organic analyses a MS, MSD, and LCS were spiked with a known reference material before preparation, and for inorganic analyses a MS and LCS were spiked with target analytes before preparation. Each of these approaches provides a measure of the matrix effects on the analytical accuracy The LCS results demonstrate accuracy of the method and the laboratory's to meet the method criteria MS and MSD results establish precision and accuracy of the matrix. Accuracy can be estimated from the analytical data and was not measured directly Spike recoveries were within the method acceptance limits in greater than 92% of the measurements Surrogate recoveries were within acceptance limits in greater than 95% of the measurements. Therefore, other than the documented exceptions, there was no evidence of significant matrix interferences that would affect the usability of the data.

Representativeness--this criteria is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is a subjective parameter and is used to evaluate the efficacy of the sampling plan design Representativeness was demonstrated by providing full descriptions in the project scoping documents of the sampling techniques and the rationale used for selecting sampling locations

Completeness--is defined as the percentage of measurements that are judged to be valid compared to the to total number of measurements made Of a total of 15460 validated results (individual compounds or elements), 645 (4.2% of total results) were rejected. Of the rejected data, 644 (99% of rejected results) were attributed to reextracts, reanalysis, or secondary dilutions for the organic parameters (there can only be one valid result for a sample). Only 1 (< 0.01% of total results) result was completely rejected (where no valid result for parameter remains) Therefore, not considering the rejects based on multiple parameter results, more than 99 percent of the data was determined to be valid

Comparability--is another qualitative measure designed to express the confidence with which one data set may be compared to another Factors that affect comparability are sample collection and handling techniques, sample matrix type, and analytical method Comparability is limited by the other PARCC parameters because data sets can be compared with confidence only when precision and accuracy are known. Data from this investigation are comparable with other data collected at the site because only EPA methods were used to analyze the sample and standard EPA Level III QC data are available to support the quality of the data

Summary and Conclusions

Conclusions of the data quality evaluation process include:

- The laboratory analyzed the samples according to the EPA methods stated in the project plan as demonstrated by the deliverable summaries and analytical run sequences.
- Concentrations of acetone, methylene chloride, 2-butanone, diethyl phthalate, and di-n-butyl phthalate can all be attributed to field sampling and/or laboratory contamination rather than environmental contamination and all samples results for these parameters were flagged as non-detected for these parameters
- Several phthalates (benzyl butyl phthalate, bis(2-etylhexyl phthalate, di-n-octylphthalate, and dimethylphalate) were found in samples, but not in the associated blanks and were therefore not qualified as undetected. These are common laboratory contaminants and may possibly be due to low level contamination, rather than environmental conditions However, several of these phthalate compounds are present at levels significantly above the report limits In particular, sample AA0049DL was diluted solely in order to have bis(2-ethylhexyl)phthalate response within the calibration range These results may be anomalies, therefore care should be exercised when using these data.
- Sample results for metals above the MDL but less than the RL may be attributed to instrument noise and/or low level contamination and not site-related activities and as such may be false positives due to the inaccuracy at the MDL.
- Many of the validated organochlorine pesticide/PCB field samples were diluted for analysis in order to prevent target compounds from exceeding the calibration range Surrogates were diluted out of 50 of these samples and recoveries could not be determined
- Spike recoveries and duplicate sample results indicate that the specific sample matrix did not significantly interfere with the analytical process for target parameters.

The project objectives or PARCCs were met, and the data can be used in the project decision-making process as qualified by the data quality evaluation process.

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TABLE C.1-2a

Analytes Detected in Field and Laboratory Blanks

Memphis Depot Main Installation RI

Sample ID	Matrix	Sample Type	Method	Parameter	Result	Lab Qual	Units
ER1	WQ	EB	SW6010	ALUMINUM	113	TR	µG/L
FB1	WQ	FB	SW6010	ALUMINUM	82 5	TR	µG/L
FB2	WQ	FB	SW6010	ALUMINUM	156	TR	µG/L
AA0026	WQ	EB	SW6010	ANTIMONY	5 6	TR	µG/L
FB2	WQ	FB	SW6010	ANTIMONY	6 3	TR	µG/L
QCMC168PBS-P	SQ	LB	SW6010	ANTIMONY	0 467	TR	MG/KG
PBS-P	SQ	LB	SW6010	ARSENIC	-0 407	TR	MG/KG
PBS-P	SQ	LB	SW6010	ARSENIC	-0 407	TR	MG/KG
PBS-P	SQ	LB	SW6010	ARSENIC	-0 407	TR	MG/KG
ER1	WQ	EB	SW6010	BARIUM	1 1	TR	µG/L
AA0026	WQ	EB	SW6010	BARIUM	0 38	TR	µG/L
FB1	WQ	FB	SW6010	BARIUM	1 1	TR	µG/L
FB2	WQ	FB	SW6010	BARIUM	0 24	TR	µG/L
QCMC168PBS-P	SQ	LB	SW6010	BARIUM	0 036	TR	MG/KG
QCMC181PBS-P	SQ	LB	SW6010	BARIUM	0 076	TR	MG/KG
PBS-P	SQ	LB	SW6010	BARIUM	0 024	TR	MG/KG
PBS-P	SQ	LB	SW6010	BARIUM	0 024	TR	MG/KG
PBS-P	SQ	LB	SW6010	BARIUM	0 024	TR	MG/KG
QCMC168PBS-P	SQ	LB	SW6010	BERYLLIUM	-0 099	TR	MG/KG
QCMC181PBS-P	SQ	LB	SW6010	BERYLLIUM	-0 099	TR	MG/KG
PBS-P	SQ	LB	SW6010	BERYLLIUM	0 015	TR	MG/KG
PBS-P	SQ	LB	SW6010	BERYLLIUM	0 015	TR	MG/KG
PBS-P	SQ	LB	SW6010	BERYLLIUM	0 015	TR	MG/KG
QCMC181PBW-P	WQ	LB	SW6010	BERYLLIUM	-0 89	TR	µG/L
PBS-P	SQ	LB	SW6010	CADMIUM	0 018	TR	MG/KG
PBS-P	SQ	LB	SW6010	CADMIUM	0 018	TR	MG/KG
PBS-P	SQ	LB	SW6010	CADMIUM	0 018	TR	MG/KG
ER1	WQ	EB	SW6010	CALCIUM	864	TR	µG/L
FB1	WQ	FB	SW6010	CALCIUM	805	TR	µG/L
QCMC181PBS-P	SQ	LB	SW6010	CALCIUM	11 028	TR	MG/KG
PBS-P	SQ	LB	SW6010	CALCIUM	6 031	TR	MG/KG
PBS-P	SQ	LB	SW6010	CALCIUM	6 031	TR	MG/KG
PBS-P	SQ	LB	SW6010	CALCIUM	6 031	TR	MG/KG
QCMC181PBW-P	WQ	LB	SW6010	CALCIUM	117 41	TR	µG/L
AA0026	WQ	EB	SW6010	CHROMIUM, TOTAL	0 39	TR	µG/L
FB2	WQ	FB	SW6010	CHROMIUM, TOTAL	0 51	TR	µG/L
PBS-P	SQ	LB	SW6010	COBALT	-0 05	TR	MG/KG
PBS-P	SQ	LB	SW6010	COBALT	-0 05	TR	MG/KG
PBS-P	SQ	LB	SW6010	COBALT	-0 05	TR	MG/KG
ER1	WQ	EB	SW6010	COPPER	4 5	TR	µG/L
FB1	WQ	FB	SW6010	COPPER	3 9	TR	µG/L
PBS-P	SQ	LB	SW6010	COPPER	0 391	TR	MG/KG
PBS-P	SQ	LB	SW6010	COPPER	0 391	TR	MG/KG
PBS-P	SQ	LB	SW6010	COPPER	0 391	TR	MG/KG
QCMC181PBW-P	WQ	LB	SW6010	COPPER	3 24	TR	µG/L
ER1	WQ	EB	SW6010	IRON	60 4	TR	µG/L
FB1	WQ	FB	SW6010	IRON	47 8	TR	µG/L
QCMC181PBS-P	SQ	LB	SW6010	IRON	0 837	TR	MG/KG
PBS-P	SQ	LB	SW6010	IRON	-0 424	TR	MG/KG
PBS-P	SQ	LB	SW6010	IRON	-0 424	TR	MG/KG
PBS-P	SQ	LB	SW6010	IRON	-0 424	TR	MG/KG
QCMC181PBW-P	WQ	LB	SW6010	IRON	3 02	TR	µG/L
ER1	WQ	EB	SW6010	MAGNESIUM	30 6	TR	µG/L
FB1	WQ	FB	SW6010	MAGNESIUM	18 2	TR	µG/L
QCMC181PBS-P	SQ	LB	SW6010	MAGNESIUM	2 47	TR	MG/KG
PBS-P	SQ	LB	SW6010	MAGNESIUM	1 231	TR	MG/KG
PBS-P	SQ	LB	SW6010	MAGNESIUM	1 231	TR	MG/KG
PBS-P	SQ	LB	SW6010	MAGNESIUM	1 231	TR	MG/KG
ER1	WQ	EB	SW6010	MANGANESE	1 5	TR	µG/L
FB1	WQ	FB	SW6010	MANGANESE	0 82	TR	µG/L
QCMC168PBS-P	SQ	LB	SW6010	MANGANESE	-0 038	TR	MG/KG
QCMC181PBS-P	SQ	LB	SW6010	MANGANESE	0 089	TR	MG/KG
PBS-P	SQ	LB	SW6010	MANGANESE	-0 015	TR	MG/KG
PBS-P	SQ	LB	SW6010	MANGANESE	-0 015	TR	MG/KG
PBS-P	SQ	LB	SW6010	MANGANESE	-0 015	TR	MG/KG
QCMC181PBW-P	WQ	LB	SW6010	MANGANESE	0 59	TR	µG/L
PBS-P	SQ	LB	SW6010	NICKEL	-0 037	TR	MG/KG
PBS-P	SQ	LB	SW6010	NICKEL	-0 037	TR	MG/KG
PBS-P	SQ	LB	SW6010	NICKEL	-0 037	TR	MG/KG
FB2	WQ	FB	SW6010	POTASSIUM	291	TR	µG/L
PBS-P	SQ	LB	SW6010	SILVER	-0 117	TR	MG/KG

TABLE C.1-2a
Analytes Detected in Field and Laboratory Blanks
Memphis Depot Main Installation RI

PBS-P	SQ	LB	SW6010	SILVER	-0 117	TR	MG/KG
PBS-P	SQ	LB	SW6010	SILVER	-0 117	TR	MG/KG
ER1	WQ	EB	SW6010	SODIUM	1460	TR	µG/L
FB1	WQ	FB	SW6010	SODIUM	1360	TR	µG/L
FB2	WQ	FB	SW6010	SODIUM	135	TR	µG/L
QCMC181PBS-P	SQ	LB	SW6010	SODIUM	17 592	TR	MG/KG
PBS-P	SQ	LB	SW6010	SODIUM	64 424	TR	MG/KG
PBS-P	SQ	LB	SW6010	SODIUM	64 424	TR	MG/KG
PBS-P	SQ	LB	SW6010	SODIUM	64 424	TR	MG/KG
QCMC181PBW-P	WQ	LB	SW6010	SODIUM	332 2	TR	µG/L
ER1	WQ	EB	SW6010	THALLIUM	2 4	TR	µG/L
PBS-P	SQ	LB	SW6010	THALLIUM	-0 908	TR	MG/KG
PBS-P	SQ	LB	SW6010	THALLIUM	-0 908	TR	MG/KG
PBS-P	SQ	LB	SW6010	THALLIUM	-0 908	TR	MG/KG
ER1	WQ	EB	SW6010	ZINC	4	TR	µG/L
AA0026	WQ	EB	SW6010	ZINC	3 8	TR	µG/L
FB1	WQ	FB	SW6010	ZINC	3 2	TR	µG/L
FB2	WQ	FB	SW6010	ZINC	4 2	TR	µG/L
QCMC168PBS-P	SQ	LB	SW6010	ZINC	0 471	TR	MG/KG
QCMC181PBS-P	SQ	LB	SW6010	ZINC	0 295	TR	MG/KG
PBS-P	SQ	LB	SW6010	ZINC	0 19	TR	MG/KG
PBS-P	SQ	LB	SW6010	ZINC	0 19	TR	MG/KG
PBS-P	SQ	LB	SW6010	ZINC	0 19	TR	MG/KG
QCMC181PBW-P	WQ	LB	SW6010	ZINC	3 04	TR	µG/L
ER1	WQ	EB	SW7470	MERCURY	0 03	TR	µG/L
FB2	WQ	FB	SW7471	MERCURY	0 02	TR	µG/L
QCMC168PBS-CV	SQ	LB	SW7471	MERCURY	-0 021	TR	MG/KG
Y11056B2	SQ	LB	SW8260	2-HEXANONE	5	J	µG/KG
AA0026	WQ	EB	SW8260	ACETONE	14	=	µG/L
FB2	WQ	FB	SW8260	ACETONE	26	=	µG/L
Y10266B2	SQ	LB	SW8260	ACETONE	5	J	µG/KG
QCMC181VBLK8C	SQ	LB	SW8260	ACETONE	8	J	µG/KG
Y10286B1	SQ	LB	SW8260	ACETONE	8	J	µG/KG
Y10256B1	SQ	LB	SW8260	ACETONE	12	=	µG/KG
Y10266B2	SQ	LB	SW8260	ACETONE	5	J	µG/KG
Y10286B1	SQ	LB	SW8260	ACETONE	8	J	µG/KG
Y11046B2	SQ	LB	SW8260	ACETONE	6	J	µG/KG
Y11046B2	SQ	LB	SW8260	ACETONE	6	J	µG/KG
Y11056B2	SQ	LB	SW8260	ACETONE	10	=	µG/KG
VBLKTS	SQ	LB	SW8260	ACETONE	2	J	µG/KG
VBLKTU	SQ	LB	SW8260	ACETONE	4	J	µG/KG
TB1	WQ	TB	SW8260	ACETONE	10	=	µG/L
TB4	WQ	TB	SW8260	ACETONE	10	=	µG/L
TB6	WQ	TB	SW8260	ACETONE	9	J	µG/L
AA0026	WQ	EB	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	3	J	µG/L
FB2	WQ	FB	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	4	J	µG/L
Y10256B2	SQ	LB	SW8260	METHYLENE CHLORIDE	1	J	µG/KG
Y10266B2	SQ	LB	SW8260	METHYLENE CHLORIDE	2	J	µG/KG
Y10256B2	SQ	LB	SW8260	METHYLENE CHLORIDE	1	J	µG/KG
QCMC168VBLK84	SQ	LB	SW8260	METHYLENE CHLORIDE	1	J	µG/KG
Y10266B2	SQ	LB	SW8260	METHYLENE CHLORIDE	2	J	µG/KG
Y11016B2	SQ	LB	SW8260	METHYLENE CHLORIDE	1	J	µG/KG
Y11016B2	SQ	LB	SW8260	METHYLENE CHLORIDE	1	J	µG/KG
S11076B1	SQ	LB	SW8270	BENZYL BUTYL PHTHALATE	53	J	µG/KG
S10216B1	SQ	LB	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	120	J	µG/KG
QCMC168SBLKLV	SQ	LB	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	160	J	µG/KG
S11076B1	SQ	LB	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	160	J	µG/KG
S10216B1	SQ	LB	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	120	J	µG/KG
SBLKEJ	SQ	LB	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	53	J	µG/KG
AA0026	WQ	EB	SW8270	DIETHYL PHTHALATE	2	J	µG/L
FB2	WQ	FB	SW8270	DIETHYL PHTHALATE	5	J	µG/L
FB2	WQ	FB	SW8270	DI-n-BUTYL PHTHALATE	1	J	µG/L
QCMC181SBLKLW	SQ	LB	SW8270	DI-n-BUTYL PHTHALATE	160	J	µG/KG
S10216B2	SQ	LB	SW8270	DI-n-BUTYL PHTHALATE	150	J	µG/KG
S10226B1	SQ	LB	SW8270	DI-n-BUTYL PHTHALATE	91	J	µG/KG
S11076B1	SQ	LB	SW8270	DI-n-BUTYL PHTHALATE	610	=	µG/KG
S10286B1	SQ	LB	SW8270	DI-n-BUTYL PHTHALATE	120	J	µG/KG
S10286B2	SQ	LB	SW8270	DI-n-BUTYL PHTHALATE	89	J	µG/KG
SBLKEJ	SQ	LB	SW8270	DI-n-BUTYL PHTHALATE	95	J	µG/KG
SBLKFC	SQ	LB	SW8270	DI-n-BUTYL PHTHALATE	51	J	µG/KG
AA0026	WQ	EB	SW8270	PHENOL	2	J	µG/L

TABLE C.1-2b
Frequency of Detects in Samples
Memphis Depot Main Installation RI

Method	Matrix	Parameter	Number Analyzed	Number Detected	Minimum Detected	Maximum Detected	Units
E418 1	SB	PETROLEUM HYDROCARBONS	7	3	3 2	19 8	MG/KG
E418 1	SE	PETROLEUM HYDROCARBONS	3	3	1410	5980	MG/KG
E418 1	SS	PETROLEUM HYDROCARBONS	7	6	26 3	1570	MG/KG
SW6010	SB	ALUMINUM	53	53	1800	19500	MG/KG
SW6010	SE	ALUMINUM	3	3	3270	8210	MG/KG
SW6010	SS	ALUMINUM	34	34	1950	15900	MG/KG
SW6010	SE	ANTIMONY	3	3	28 4	1210	MG/KG
SW6010	SS	ANTIMONY	34	10	0 48	4 8	MG/KG
SW6010	SB	ARSENIC	53	53	1 9	12 7	MG/KG
SW6010	SE	ARSENIC	3	2	5 3	5 9	MG/KG
SW6010	SS	ARSENIC	34	32	2 2	50 5	MG/KG
SW6010	SB	BARIUM	53	53	6 7	176	MG/KG
SW6010	SE	BARIUM	3	3	1120	3650	MG/KG
SW6010	SS	BARIUM	34	34	9 3	239	MG/KG
SW6010	SB	BERYLLIUM	53	52	0 33	0 85	MG/KG
SW6010	SE	BERYLLIUM	3	1	0 33	0 33	MG/KG
SW6010	SS	BERYLLIUM	34	29	0 02	0 73	MG/KG
SW6010	SB	CADMIUM	53	13	0 26	0 34	MG/KG
SW6010	SE	CADMIUM	3	3	27 2	84 3	MG/KG
SW6010	SS	CADMIUM	34	23	0 2	6	MG/KG
SW6010	SB	CALCIUM	53	52	691	10900	MG/KG
SW6010	SE	CALCIUM	3	3	15900	79100	MG/KG
SW6010	SS	CALCIUM	34	33	479	104000	MG/KG
SW6010	SB	CHROMIUM, TOTAL	53	53	1 8	48 3	MG/KG
SW6010	SE	CHROMIUM, TOTAL	3	3	158	1700	MG/KG
SW6010	SS	CHROMIUM, TOTAL	34	34	5 5	60 9	MG/KG
SW6010	SB	COBALT	53	53	1 1	17	MG/KG
SW6010	SE	COBALT	3	3	44 4	90 9	MG/KG
SW6010	SS	COBALT	34	34	1 1	10 7	MG/KG
SW6010	SB	COPPER	53	53	3	20 8	MG/KG
SW6010	SE	COPPER	3	3	153	14200	MG/KG
SW6010	SS	COPPER	34	33	2 9	55 8	MG/KG
SW6010	SB	IRON	53	53	3450	24800	MG/KG
SW6010	SE	IRON	3	3	24700	133000	MG/KG
SW6010	SS	IRON	34	34	4870	23000	MG/KG
SW6010	SB	LEAD	53	53	4 6	21 8	MG/KG
SW6010	SE	LEAD	3	3	3110	3820	MG/KG
SW6010	SS	LEAD	34	33	2 8	372	MG/KG
SW6010	SB	MAGNESIUM	53	53	816	84200	MG/KG
SW6010	SE	MAGNESIUM	3	3	1590	17000	MG/KG
SW6010	SS	MAGNESIUM	34	34	122	5880	MG/KG
SW6010	SB	MANGANESE	53	53	165	2260	MG/KG
SW6010	SE	MANGANESE	3	3	224	739	MG/KG
SW6010	SS	MANGANESE	34	34	34 3	970	MG/KG
SW6010	SB	NICKEL	53	53	3 3	22 5	MG/KG
SW6010	SE	NICKEL	3	3	29 8	139	MG/KG
SW6010	SS	NICKEL	34	34	2 3	21 1	MG/KG
SW6010	SB	POTASSIUM	53	47	625	3710	MG/KG
SW6010	SE	POTASSIUM	3	3	173	1400	MG/KG
SW6010	SS	POTASSIUM	34	33	88 7	3360	MG/KG
SW6010	SB	SELENIUM	53	1	1 3	1 3	MG/KG
SW6010	SE	SELENIUM	3	2	49 9	182	MG/KG
SW6010	SS	SELENIUM	34	13	0 42	11 2	MG/KG
SW6010	SE	SILVER	3	1	49	49	MG/KG
SW6010	SS	SILVER	34	2	0 25	0 6	MG/KG
SW6010	SE	SODIUM	3	3	804	1750	MG/KG
SW6010	SB	THALLIUM	53	1	0 23	0 23	MG/KG
SW6010	SE	THALLIUM	3	1	21	21	MG/KG
SW6010	SB	VANADIUM	53	53	5 1	37 4	MG/KG
SW6010	SE	VANADIUM	3	3	0 1	15 4	MG/KG
SW6010	SS	VANADIUM	34	34	7 2	37 2	MG/KG
SW6010	SB	ZINC	53	53	9 9	94 5	MG/KG
SW6010	SE	ZINC	3	3	2550	5570	MG/KG
SW6010	SS	ZINC	34	33	9 5	263	MG/KG
SW7471	SB	MERCURY	53	2	0 37	0 37	MG/KG
SW7471	SE	MERCURY	3	2	0 1	0 67	MG/KG
SW7471	SS	MERCURY	34	24	0 02	2 1	MG/KG
SW8080	SS	ALPHA-CHLORDANE	76	10	11	1200	µG/KG
SW8080	SS	DDD	76	4	22	46	µG/KG
SW8080	SB	DDE	56	1	5 7	5 7	µG/KG

TABLE C 1-2b
Frequency of Detects in Samples
Memphis Depot Main Installation RI

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Method	Matrix	Parameter	Number Analyzed	Number Detected	Minimum Detected	Maximum Detected	Units
SW8080	SS	DDE	76	40	3 8	2300	µG/KG
SW8080	SS	DDT	76	45	9 2	3500	µG/KG
SW8080	SB	DIELDRIN	56	3	16	47	µG/KG
SW8080	SS	DIELDRIN	76	55	2 7	10000	µG/KG
SW8080	SS	GAMMA-CHLORDANE	76	10	17	1100	µG/KG
SW8080	SS	PCB-1260 (AROCHLOR 1260)	76	2	2300	2900	µG/KG
SW8260	SB	BROMOMETHANE	45	1	2	2	µG/KG
SW8260	SB	CHLOROMETHANE	45	2	1	2	µG/KG
SW8260	SS	CHLOROMETHANE	29	1	1	1	µG/KG
SW8260	SS	TOLUENE	29	3	1	2	µG/KG
SW8270	SE	2,4-DIMETHYLPHENOL	4	1	16000	16000	µG/KG
SW8270	SE	2-METHYLNAPHTHALENE	4	1	8200	8200	µG/KG
SW8270	SE	4-METHYLPHENOL (p-CRESOL)	4	1	5100	5100	µG/KG
SW8270	SE	ACENAPHTHENE	4	2	390	560	µG/KG
SW8270	SS	ACENAPHTHENE	39	2	130	3100	µG/KG
SW8270	SE	ANTHRACENE	4	2	510	1200	µG/KG
SW8270	SS	ANTHRACENE	39	4	57	4700	µG/KG
SW8270	SB	BENZO(a)ANTHRACENE	54	3	44	74	µG/KG
SW8270	SE	BENZO(a)ANTHRACENE	4	3	1200	6500	µG/KG
SW8270	SS	BENZO(a)ANTHRACENE	39	12	39	13000	µG/KG
SW8270	SB	BENZO(a)PYRENE	54	2	71	80	µG/KG
SW8270	SE	BENZO(a)PYRENE	4	3	840	5400	µG/KG
SW8270	SS	BENZO(a)PYRENE	39	13	39	12000	µG/KG
SW8270	SB	BENZO(b)FLUORANTHENE	54	2	82	88	µG/KG
SW8270	SE	BENZO(b)FLUORANTHENE	4	3	1400	8700	µG/KG
SW8270	SS	BENZO(b)FLUORANTHENE	39	14	42	12000	µG/KG
SW8270	SB	BENZO(g,h,i)PERYLENE	54	2	44	100	µG/KG
SW8270	SE	BENZO(g,h,i)PERYLENE	4	2	390	2300	µG/KG
SW8270	SS	BENZO(g,h,i)PERYLENE	39	9	37	9100	µG/KG
SW8270	SB	BENZO(k)FLUORANTHENE	54	2	39	81	µG/KG
SW8270	SE	BENZO(k)FLUORANTHENE	4	3	1100	8100	µG/KG
SW8270	SS	BENZO(k)FLUORANTHENE	39	13	42	11000	µG/KG
SW8270	SB	BENZYL BUTYL PHTHALATE	54	1	430	430	µG/KG
SW8270	SS	BENZYL BUTYL PHTHALATE	39	3	42	700	µG/KG
SW8270	SB	bis(2-ETHYLHEXYL) PHTHALATE	54	1	180000	180000	µG/KG
SW8270	SE	bis(2-ETHYLHEXYL) PHTHALATE	4	3	7500	13000	µG/KG
SW8270	SE	CARBAZOLE	4	2	400	830	µG/KG
SW8270	SS	CARBAZOLE	39	4	35	4000	µG/KG
SW8270	SB	CHRYSENE	54	5	40	93	µG/KG
SW8270	SE	CHRYSENE	4	3	1600	9800	µG/KG
SW8270	SS	CHRYSENE	39	15	43	15000	µG/KG
SW8270	SE	DIBENZ(a,h)ANTHRACENE	4	1	860	860	µG/KG
SW8270	SS	DIBENZ(a,h)ANTHRACENE	39	3	83	4000	µG/KG
SW8270	SS	DIBENZOFURAN	39	2	56	1200	µG/KG
SW8270	SB	DIMETHYL PHTHALATE	54	1	180	180	µG/KG
SW8270	SS	DI-n-OCTYLPHTHALATE	39	1	120	120	µG/KG
SW8270	SB	FLUORANTHENE	54	5	50	100	µG/KG
SW8270	SE	FLUORANTHENE	4	3	2400	9000	µG/KG
SW8270	SS	FLUORANTHENE	39	17	44	33000	µG/KG
SW8270	SE	FLUORENE	4	2	600	700	µG/KG
SW8270	SS	FLUORENE	39	2	140	2200	µG/KG
SW8270	SB	INDENO(1,2,3-c,d)PYRENE	54	1	90	90	µG/KG
SW8270	SE	INDENO(1,2,3-c,d)PYRENE	4	1	2200	2200	µG/KG
SW8270	SS	INDENO(1,2,3-c,d)PYRENE	39	7	48	9000	µG/KG
SW8270	SE	ISOPHORONE	4	1	400	400	µG/KG
SW8270	SE	NAPHTHALENE	4	1	5500	5500	µG/KG
SW8270	SS	NAPHTHALENE	39	1	1400	1400	µG/KG
SW8270	SB	N-NITROSODIPHENYLAMINE	54	1	140	140	µG/KG
SW8270	SS	PENTACHLOROPHENOL	39	1	94	94	µG/KG
SW8270	SB	PHENANTHRENE	54	3	49	69	µG/KG
SW8270	SE	PHENANTHRENE	4	3	1900	6700	µG/KG
SW8270	SS	PHENANTHRENE	39	14	43	23000	µG/KG
SW8270	SE	PHENOL	4	1	760	760	µG/KG
SW8270	SB	PYRENE	54	5	44	90	µG/KG
SW8270	SE	PYRENE	4	3	2200	9700	µG/KG
SW8270	SS	PYRENE	39	16	46	26000	µG/KG

TABLE C.1.3
Surrogate Recovery Control Limits
Memphis Depot Main Installation RI

Surrogate Compound	Laboratory Soil Control Limits (%)	Range Based on Actual Sample Recoveries
4-Bromofluorobenzene (VOC)	74 – 141	82 – 127%
Dibromofluoromethane (VOC)	80 – 120	
Toluene-d8 (VOC)	81 – 117	
Tetrachloro-m-xylene (Pest/PCB)	43 – 116	70 – 130%
Decachlorobiphenyl (Pest/PCB)	44 – 128	
2-Fluorophenol (SVOC)	25 – 121	Acid 13 – 140%
Phenol-d5 (SVOC)	24 – 113	
2,4,6-Tribromophenol (SVOC)	19 – 122	
2-Fluorobiphenyl (SVOC)	30 – 115	Base-Neutral 10 – 143%
Nitrobenzene-d5 (SVOC)	23 – 120	
Terphenyl-d14 (SVOC)	18 – 137	

TABLE C.1-4
Inorganic Matrix Spike Recoveries Outside Control Limits
Memphis Depot Main Installation RI

Method	Sample ID	Parameter	Matrix Spike Recovery (%)	Native Conc / Spike Added
SW6010	A106	Lead	26	1 14
SW6010	A106	Manganese	135	**3.59**
SW6010	A106	Thallium	69	0 00
SW6010	A106	Zinc	67	**3.60**
SW6010	A109	Antimony	61	0.03
SW6010	A109	Manganese	58	2 16
SW6010	A129	Antimony	59	0.05
SW6010	A129	Arsenic	67	0 04
SW6010	A129	Lead	-38	**3.66**
SW6010	A129	Selenium	61	0 00
SW6010	A129	Thallium	60	0 00
SW6010	A129	Zinc	186	**3.81**

Note
Bolded values indicate that the native contamination of the given element was greater than four times the concentration of the spike added The matrix spike recoveries for these elements are disregarded, because the spike added concentration was masked by the native concentration

TABLE C.1-5A
Laboratory Duplicate Precision Outside Control Limits
Memphis Depot Main Installation RI

Sample ID	Parameter	Lab Result		Lab Dup Result		UNITS	RPD	Diff of Sample & LD	Criteria to evaluate
A106	Aluminum	3690	=	2503.49	=	MG/KG	38.31%	1186 511	use RPD
A106	Barium	63.1	=	40.347	=	MG/KG	43 99%	22.753	use RPD
A106	Calcium	104000	=	64518.64	=	MG/KG	46.86%	39481.362	use RPD
A129	Calcium	5700	=	10330 45	=	MG/KG	57.77%	4630 446	use RPD
A106	Copper	15 5	=	24 960	=	MG/KG	46 76%	9 460	use RPD
A129	Iron	7730	=	13169 87	=	MG/KG	52 06%	5439 868	use RPD
A106	Lead	58.8	=	25.354	=	MG/KG	79.49%	33 446	use RPD
A129	Lead	201	=	124 940	=	MG/KG	46 67%	76 060	use RPD
A106	Magnesium	4700	=	2802.38	=	MG/KG	50 59%	1897 619	use RPD
A129	Magnesium	1420	=	4761 50	=	MG/KG	108 11%	3341 498	use RPD
A106	Manganese	186	=	124 995	=	MG/KG	39 23%	61 005	use RPD
A109	Manganese	113	=	69 907	=	MG/KG	47 12%	43 093	use RPD
A129	Nickel	4 2	TR	8 703	=	MG/KG	69 80%	4.5031	use RPD
A106	Sodium	0 91	TR	93.668	TR	MG/KG	196 15%	92 758	use +/-
A129	Zinc	212	=	380 582	=	MG/KG	56 90%	168 582	use RPD

TABLE C.1-5B
Field Duplicate Precision Outside Control Limits
Memphis Depot Main Installation RI

Method	Parameter	Sample ID	FD Sample ID	Sample Result		FD Result		Units	RPD	Diff of Sample & FD	Criteria to evaluate
SW6010	Arsenic	A106	DUP9	6.2	J	3.4	J	MG/KG	58 33%	2 8	use RPD
SW6010	Arsenic	A97	DUP8	4.1	J	5 9	J	MG/KG	36 00%	1 8	use RPD
SW6010	Barium	A106	DUP9	63 1	J	39 3	J	MG/KG	46.48%	23 8	use RPD
SW6010	Beryllium	A106	DUP9	0 16	J	0 11	J	MG/KG	37 04%	0 1	use RPD
SW6010	Beryllium	A97	DUP8	0 29	J	0 51	J	MG/KG	55 00%	0 2	use RPD
SW6010	Calcium	A129	DUP11	5700	J	8940	J	MG/KG	44 26%	3240 0	use RPD
SW6010	Calcium	A97	DUP8	19000	J	65000	J	MG/KG	109.52%	46000.0	use RPD
SW6010	Magnesium	A129	DUP11	1420	J	3910	J	MG/KG	93 43%	2490.0	use RPD
SW6010	Magnesium	A97	DUP8	2230	J	5880	J	MG/KG	90.01%	3650 0	use RPD
SW6010	Manganese	A109	DUP3	113	J	64.6	J	MG/KG	54 50%	48 4	use RPD
SW6010	Nickel	A106	DUP9	13 2	=	7 2	=	MG/KG	58.82%	6.0	use RPD
SW6010	Nickel	A109	DUP3	5	=	3 4	J	MG/KG	38 10%	1 6	use RPD
SW6010	Zinc	A97	DUP8	42	J	64.2	J	MG/KG	41.81%	22 2	use RPD
SW8080	DDT	A23	DUP4	81	J	250	=	UG/KG	102.11%	169.0	use +/-
SW8080	Dieldrin	A36	DUP1	5600	J	1800	J	UG/KG	102.70%	3800 0	use +/-

Appendix C-2

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Data Quality Evaluation (DQE) Report
DDMT Screening Sites Project

Introduction

Surface and groundwater, soil and sediment samples and the corresponding QC samples were collected and submitted to the analytical laboratory for analysis of the following parameters:

- Volatile organic compounds (VOCs) by SW-846 method 8260A
- Semivolatile organic compounds (SVOCs) by SW-846 method 8270B
- Pesticides and polychlorinated biphenyl (PCBs) by SW-846 method 8081
- Herbicides by SW-846 method 8151
- Polynuclear aromatic hydrocarbons (PAHs) by SW-846 method 8100
- Phenols by SW-846 method 8040
- Dioxins and Furans by SW-846 method 8280
- Metals by SW-846 methods 6010 and 7000 series
- pH by EPA method 150.1 (water) and SW-846 method 9045 (solids)
- Fluoride by EPA method 340.2

Field QC included duplicate field samples, trip blanks (analyzed for VOCs only), and equipment rinsate blanks, and field blanks.

The samples were submitted to the laboratory in 51 groups; therefore, there are 51 sample delivery groups (SDGs). All the samples were analyzed using SW-846 methods; however, the laboratory provided EPA Level 2 QC data packages for 23 of the SDGs and EPA Level 3 QC data packages for 28 of the SDGs. EPA Level 2 data packages included the sample results and corresponding laboratory method blank results; EPA Level 3 data packages also included a summary of the QC data (for example, calibration and spiked sample results).

The purpose of the data quality evaluation process (DQEP) is to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a straight-forward check of compliance with the method requirements; either the laboratory did, or did not, analyze the samples within the limits of the analytical method. Evaluation of matrix interferences is more subtle and involves the analysis of several areas of results including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

DQE for the Screening Sites data consisted of the following two principal activities:

- Hard copy "validation" of the EPA Level 3 data packages (as a note, it is not possible to "validate" the EPA Level 2 data because there is no QC summary data to evaluate)
- Database-wide evaluation of the trends in data quality (for example, trends in surrogate spike recovery)

It is important to note that *"data validation"* is the assessment of the hard-copy data base deliverables in terms of method compliance, and *"data quality evaluation"* is the qualitative evaluation of overall trends in the project-specific database. Areas evaluated in the DQE include the following:

- Potential "blank contamination" (i.e. the effect on the usability of data for target compounds and analytes detected in both the field or laboratory blank samples and the corresponding field samples)
- Laboratory performance (i.e. recovery for spiked blank samples and other laboratory checks such as calibration and laboratory control samples)
- Matrix interferences (i.e. recovery for spiked field samples)
- Usability of metals results at, or near, the instrument detection limits

This DQE technical memorandum (TM) includes the following:

- Results of the database-wide DQE queries (summary tables are included at the end of this report)
- Assessment of the overall usability of the data to support the project decision-making process

The focus of the hard-copy data validation was to review each of the QC summary sheets, note nonconformances on the DV worksheets, qualify the data as appropriate, and summarize the results of this review. These completed worksheets are included in the project file and are available upon request

Data Evaluation Criteria

Before the analytical results were released by the laboratory, both the sample and QC data were carefully reviewed to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the resulting data were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Any non-conforming data were discussed in the data package cover letter and case narrative.

The EPA Level 3 QC data packages were reviewed by the project chemists using the method acceptance criteria and the process outlined in the EPA *Functional Guidelines*. Samples that were not within the acceptance limits were annotated with a qualifying flag, which consists of a single or multi-letter abbreviation that indicates a QC nonconformance associated with that analytical result. Although the qualifying flags originate during the data review and validation process, they are included in the data summary tables so that the data will not be used indiscriminately. The following flags were used in the DQEP:

TABLE C.2-1
Data Qualification Flags
Memphis Depot Main Installation RI

Qualifier	Description
J	Estimated. The analyte was present, but the reported value may not be accurate or precise.
U	Undetected. Analyte was analyzed for but not detected above the method detection limit
R	Rejected. The data are unusable. (Analyte/compound may or may not be present)
UJ	Undetected, but the reporting limit is estimated

Once the data review and validation process for the EPA Level 3 QC data was completed, the entire data set was reviewed for target compound/analyte frequency of detection, dilution factors that might affect data usability, and patterns of target compound/analyte distribution. The data set was also evaluated to identify potential data limitations, uncertainties, or both in the analytical results.

Potential Field Sampling and Laboratory Contamination

Types of QC Blank Samples

Three types of field blank samples were used to monitor potential contamination introduced during field sampling and sample handling activities.

- **Trip Blank (TB)(VOCs only)**. A sample of ASTM Type II water was prepared by the laboratory and it accompanied the sample coolers from the field to the lab. This blank monitors potential contamination introduced during sample handling and shipping For this project, one trip blank was submitted with each cooler containing samples for VOC analysis. A total of 14 TBs were submitted to the laboratory for this field effort.

- **Equipment Rinsate Blank (ERB)**: Consists of a sample of the ASTM Type II water used as the final rinse during equipment decontamination. This blank sample is collected by rinsing a piece of equipment after decontamination is completed and is analyzed for the same analytical parameters as the corresponding samples. This blank monitors potential contamination caused by incomplete equipment decontamination

- **Field Blank (FB)**: Consists of a sample of the source water used to decontaminate the field sampling equipment and at least one FB was collected from each source of water. Typically there are 2 types of FBs: one a sample of the tap water used to steam-clean the equipment and a second sample of the ASTM Type II water used for the final equipment rinse. FBs are analyzed for the same parameters as the corresponding samples. Two FBs were submitted to the laboratory for this field effort.

Laboratory method blanks (LBs) were also analyzed with each analytical batch. For water samples, a laboratory method blank is ASTM Type II water that is treated as a sample in that it undergoes the same analytical process as the corresponding field samples For soil samples, the laboratory method blank may consist of a sample of EPA-approved soil (Ottawa desert sand). Method blanks are used to monitor laboratory performance and potential contamination introduced during the analytical process. One method blank was analyzed for every 20 samples, or one per analytical batch, whichever was more frequent.

Evaluation of QC Blank Results

Summarized in Table C 2-2 are the frequency of detection, and the minimum and maximum concentration for target compounds. Also included in Table C.2-2 are the frequency of detection, and minimum and maximum concentration for target compounds that were also detected in the field samples. For example, methylene chloride is included in Table C.2-2 because it was detected in the field and laboratory blank samples as well the field samples. However, phenanthrene was detected in selected field samples and not any of the field or laboratory blanks; therefore, phenanthrene is not included in this table.

According to the EPA Guidance Manual, *Functional Guidelines for Evaluating Data*, field sample results that were less than five (ten for common contaminants) times the concentration in the corresponding blank sample can be qualified as "U" for not detected. No qualifiers are applied to the blank sample results.

- Acetone was detected in one of the 14 trip blanks (11 ug/L) and 6 of the 86 laboratory blanks at concentrations ranging from 13 to 15 ug/kg Acetone is used as an extraction solvent in the laboratory and is a common contaminant. Acetone was detected in the field samples at frequencies and concentrations comparable to the field and laboratory blank samples. Therefore, acetone should be attributed to laboratory contamination and not environmental conditions.

- Bis(2-ethylhexyl)phthalate was detected in 4 of the 42 laboratory soil blanks at concentrations ranging from 360 to 660 ug/kg. Phthalates are commonly used as plasticizers and are field sampling and laboratory contaminants. Bis(2-ethylhexyl)phthalate was detected in the field samples at frequencies and concentrations comparable to the laboratory blank samples. Therefore, bis(2-ethylhexyl)phthalate should be attributed to laboratory contamination and not environmental conditions.

- The samples were analyzed for dioxins and furans using EPA method SW-846/8290 which is a sensitive method with low method detection and reporting limits. Concentrations of dioxins and furans were detected in the field and laboratory blank samples as well as the field samples. Dioxins and furans are not considered to be common field sampling or laboratory contaminants; therefore, the 5X rule is used to evaluate the environmental sample results Low concentrations of dioxins and furans can be attributed to background or instrument noise and are not indicative of environmental conditions. Concentrations of dioxins and furans greater than 5X the concentration in the corresponding field and laboratory blank samples are representative of environmental conditions

- Concentrations of metals near the instrument detection limit (IDL) and less than the project-specific reporting limits were detected in some of the QC blank samples. These results are typically indicative of instrument background and not field sampling or laboratory contamination. Negative numbers were reported by the laboratory for selected blank and field sample results Negative numbers associated with atomic spectroscopy methods of analysis results from one of, or a combination of two, possible situations:

- **Instrument noise:** Variation in signal intensity is the primary reason that negative numbers are reported. Any calibration curve associated with atomic spectroscopy utilizes a calibration blank. "Blank" is assigned a "zero concentration" when the calibration curve is computed. Because "blank" does not have an analyte signal, instrument noise, slight variations in detection devices, stray light, or background corrections can elicit a quantitative response different from the "blank". These responses can and often are, slightly negative absorbencies or emission intensities, which when compared to the curve, yield negative concentrations The absolute value of these negative concentrations are compared to the instrument (IDL) or method detection limit (MDL); both the IDL and MDL are calculated rather than demonstrated values and hence have an inherent inaccuracy. If the absolute value of the negative sample result is greater than these reporting limits, then the negative value is reported.

- **Calibration Blank Contamination:** Any contaminant present in the blank during calibration will artificially set "zero" at the contaminant concentration. Any samples analyzed after the calibration blank which contain less contamination than the calibration blank will result in a negative value as the sample result. This is not a common situation and occurs mostly with zinc and copper, two ubiquitous contaminants.

QC Measures

Surrogate Spike Recoveries

Surrogate spike compounds were added to every sample analyzed for the organic parameters including field and laboratory blanks as well as field environmental samples. Surrogate spike compounds are the structural homologs of target compounds and are therefore expected to behave in a similar manner during analysis. Surrogate spike recoveries were used to monitor both laboratory performance and matrix interferences. Surrogate spike recoveries from field and laboratory blanks were used to evaluate laboratory performance because the field blanks represent an "ideal" sample matrix. Surrogate spike recoveries for field samples were used to evaluate the potential for matrix interferences. There are no graphs for dioxins and furans because no surrogate compounds were added to the sample. Internal standards are used in place of surrogate spike compounds.

TABLE C 2-2

Comparison of Results for Target Compounds Detected in both Fields

Memphis Depot Main Installation RI

		Blank Sample Results					Field Sample Results					Comments
Method	Target Compound	Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of "
VOC	Acetone	EB	5/6	13	16	µg/L	SW	3/4	10	17	µg/L	Field sampling and laboratory contamination
		LB	1/10	14		µg/L	SS	13/24	13	220	µg/kg	Values > 160 reflect environmental conditions
		LB	8/23	13	16	µg/kg	SO	1/1	95		µg/kg	Field sampling and laboratory contamination
							SB	35/79	16	120	µg/kg	Field sampling and laboratory contamination
	2 Butanone	EB	2/6	17	22	µg/L	SS	2/24	22	34	µg/kg	Field sampling and laboratory contamination
							SB	1/79	14		µg/kg	
SVOC	Bis(2-ethylhexyl) phthalate	LB	1/12	360		µg/kg	SB	11/48	430	2800	µg/kg	Field sampling and laboratory contamination
Metals	Aluminum	EB	5/5	13	34	µg/L	SW	4/4	64	576	µg/L	Values > 170 µg/L or 17 mg/kg may reflect environmental conditions
		LB	1/8	14	14	µg/L	SW (D)	6/6	7	81	µg/L	
		LB	4/6	2 8	3 4	mg/kg	SS	5/5	6390	15600	mg/kg	
							SB	21/21	6070	20400	mg/kg	
	Antimony	EB	3/6	2 0	3 2	µg/L	SW	13/15	2	3 6	µg/L	Values > 15 µg/L or 1 5 mg/kg may reflect environmental contamination
		LB	5/8	1 87	2 27	µg/L	SW (D)	11/17	1 9	3 6	µg/L	
							SS	4/26	0 26	7	mg/kg	
							SB	35/81	0 25	22	mg/kg	
	Arsenic	LB	4/11	-0 4	-0 3	mg/kg	SW	11/15	2 6	77	µg/L	Values > 10 µg/L or 1 0 mg/kg may reflect environmental contamination
							SW (D)	13/17	1 8	41	µg/L	
							SS	26/26	1 7	49	mg/kg	
							SB	81/81	1 3	43	mg/kg	
	Barium	EB	5/5	0 35	1 9	µg/L	SW	4/4	5 8	15	µg/L	Values > 20 µg/L or 0 4 mg/kg may be environmental and/or native background levels
		FB	1/1	6 7		µg/L	SW (D)	6/6	3 8	15	µg/L	
		LB	8/8	0 27	1 36	µg/L	SS	5/5	80	168	mg/kg	
		LB	6/6	0 031	0 076	mg/kg	SB	21/21	64	204	mg/kg	

TABLE C 2-2

Comparison of Results for Target Compounds Detected in both Fields

Memphis Depot Main Installation RI

Method	Target Compound	Blank Sample Results					Field Sample Results					Comments
		Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of "
	Beryllium	LB	5/8	0 11	0 19	µg/L	SW	1/15	0 11		µg/L	Values > 1 0 µg/L or 0 1 mg/kg may reflect environmental contamination
							SW (D)	3/17	0 10	0 16	µg/L	
							SS	4/26	0 11	2 0	mg/kg	
							SB	13/81	0 03	0 27	mg/kg	
	Cadmium	LB	2/8	0 16	0 29	µg/L	SW	14/15	0 2	1 4	µg/L	Values > 1 5 µg/L or 0 5 mg/kg may reflect environmental contamination
		LB	3/11	0 22	0 22	mg/kg	SW (D)	12/17	0 17	0 53	µg/L	
							SS	11/26	0 31	2 5	mg/kg	
							SB	28/81	0 17	5 8	mg/kg	
	Calcium	EB	5/5	66 2	324	µg/L	SW	4/4	2490	9080	µg/L	Values > 500 µg/L or 50 0 mg/kg may be environmental and/or native background levels
		FB	1/1	64		µg/L	SW (D)	6/6	2290	9620	µg/L	
		LB	8/8	11	77	µg/L	SS	5/5	954	11100	mg/kg	
		LB	6/6	3 0	4 7	mg/kg	SB	21/21	805	2750	mg/kg	
	Chromium, total	EB	3/6	0 7	7 5	µg/L	SW	15/15	0 72	19	µg/L	Values > 15 µg/L or 1 5 mg/kg may reflect environmental contamination
		LB	5/8	0 71	0 73	µg/L	SW (D)	14/17	0 49	1 3	µg/L	
		LB	6/11	0 09	0 29	mg/kg	SS	26/26	6 8	336	mg/kg	
							SB	81/81	9 5	915	mg/kg	
	Cobalt	EB	3/5	0 48	0 67	µg/L	SW	4/4	0 66	1 4	µg/L	Values > 5 0 µg/L or 1 0 mg/kg may reflect environmental contamination
		LB	6/8	0 66	0 88	µg/L	SW (D)	6/6	0 68	1 0	µg/L	
							SS	5/5	5 0	8 3	mg/kg	
							SB	21/21	6 3	10	mg/kg	
	Copper	EB	4/6	1 2	4	µg/L	SW	15/15	2 4	22	µg/L	Values > 15 µg/L or 1 5 mg/kg may reflect environmental and/or native background levels
		FB	1/1	3	3	µg/L	SW (D)	17/17	0 99	17 1	µg/L	
		LB	7/8	1 04	2 06	µg/L	SS	26/26	4 1	103	mg/kg	
							SB	81/81	7	235	mg/kg	

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TABLE C 2-2

Comparison of Results for Target Compounds Detected in both Fields

Memphis Depot Main Installation RI

Method	Target Compound	Blank Sample Results					Field Sample Results					Comments
		Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of "
	Iron	EB	5/5	24	89	µg/L	SW	4/4	77	835	µg/L	Values > 150 µg/L or 7 5 mg/kg may reflect environmental and/or native background levels
		FB	1/1	30	30	µg/L	SW (D)	6/6	27	253	µg/L	
		LB	8/8	5 6	82	µg/L	SS	5/5	12800	44500	mg/kg	
		LB	6/6	1 4	1 5	mg/kg	SB	21/21	15000	28000	mg/kg	
	Magnesium	EB	3/5	4 9	11	µg/L	SW	4/4	286	1580	µg/L	Values > 500 µg/L or 50 mg/kg may reflect environmental and/or native background levels
		LB	6/8	2 0	13	µg/L	SW (D)	6/6	213	1620	µg/L	
		LB	1/6	0 58		mg/kg	SS	5/5	929	2630	mg/kg	
							SB	21/21	2090	3410	mg/kg	
	Manganese	EB	5/5	0 71	2 1	µg/L	SW	4/4	8 4	68	µg/L	Values > 10 µg/L or 1 0 mg/kg may reflect environmental and/or native background levels
		FB	1/1	0 94		µg/L	SW (D)	6/6	2 3	21	µg/L	
		LB	8/8	0 61		µg/L	SS	5/5	150	499	mg/kg	
		LB	6/6	0 06	0 1	mg/kg	SB	21/21	405	1350	mg/kg	
	Mercury	EB	1/1	0 04		µg/L	SW	9/15	0 04	0 18	µg/L	Values > 0 3 µg/L or 0 15 mg/kg may reflect environmental contamination
		LB	2/8	0 046	0 054	µg/L	SW (D)	9/17	0 04	0 08	µg/L	
		LB	2/12	0 01	0 01	mg/kg	SS	5/26	0 02	0 1	mg/kg	
							SB	4/81	0 04	0 06	mg/kg	
	Nickel	EB	2/6	1 5	2 3	µg/L	SW	13/15	1 3	18	µg/L	Values > 15 µg/L or 1 5 mg/kg may reflect environmental contamination
							SW (D)	9/17	1 4	4 6	µg/L	
							SS	26/26	3 2	29	mg/kg	
							SB	81/81	4 4	76	mg/kg	
	Potassium	LB	3/8	-844	845	µg/L	SW	2/4	1910	2730	µg/L	Values > 1000 µg/L or 100 mg/kg may reflect environmental and/or native background levels
							SW (D)	4/6	751	2580	µg/L	
							SS	5/5	1230	3090	mg/kg	
							SB	21/21	1550	3280	mg/kg	

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TABLE C 2-2

Comparison of Results for Target Compounds Detected in both Fields

Memphis Depot Main Installation RI

Method	Target Compound	Blank Sample Results					Field Sample Results					Comments
		Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of "
	Selenium	EB	3/5	1 5	2 7	µg/L	SW	10/15	1 4	3 8	µg/L	Values > 10 µg/L or 1 0 mg/kg may reflect environmental contamination
		LB	5/8	2 6	4 2	µg/L	SW (D)	10/17	1 7	3 6	µg/L	
							SS	1/26	0 31		mg/kg	
							SB	4/81	0 24	0 43	mg/kg	
	Sodium	EB	5/5	84	203	µg/L	SW	4/4	456	1080	µg/L	Values > 500 µg/L or 50 mg/kg may reflect environmental and/or native background levels
		FB	1/1	180	180	µg/L	SW (D)	6/6	419	907	µg/L	
		LB	6/6	84	87	mg/kg	SS	3/5	55	150	mg/kg	
							SB	18/21	24	101	mg/kg	
	Thallium	EB	2/5	1 3	1 3	µg/L	SW	4/15	1 9	2 5	µg/L	Values > 10 µg/L or 1 0 mg/kg may reflect environmental contamination
		LB	4/8	1 41	1 41	µg/L	SW (D)	7/17	1 4	2 9	µg/L	
							SB	1/81	0 96		mg/kg	
	Zinc	EB	6/6	3 9	40	µg/L	SW	15/15	24	467	µg/L	Values > 50 µg/L or 5 0 mg/kg may reflect environmental and/or native background levels
		FB	1/1	10 6		µg/L	SW (D)	17/17	13	406	µg/L	
		LB	8/8	2 0	11	µg/L	SS	26/26	21	4000	mg/kg	
		LB	6/11	0 20	1 7	mg/kg	SB	81/81	31	1460	mg/kg	

Notes

SW surface water
SW (D) dissolved metals in surface water
SB sub-surface soil from soil boring
SO soil sample
SS surface soil

TB Trip blank
EB Equipment rinsate blank
FB Field blank
LB laboratory method blank

TABLE C.2-3
Laboratory-specific QC Target Acceptance Limits
Memphis Depot Main Installation RI

Analytical Fraction	Spike Type	Parameter	Water	Soil
VOC	Surr	Dibromofluoromethane	86-118	80-120
		Toluene-d8	88-110	81-117
		Bromofluorobenzene	86-115	74-121
	MS/MSD	1,1-Dichloroethene	61-145	61-145
		Benzene	76-127	76-127
		Trichloroethene	71-120	71-120
		Toluene	76-125	76-125
		Chlorobenzene	75-130	75-130
SVOC	Surr	2-Fluorophenol	21-100	25-121
		Phenol-d5	10-94	24-113
		Nitrobenzene-d5	35-114	23-120
		2-Fluorobiphenyl	43-116	30-115
		2,4,6-Tribromophenol	10-123	19-122
		Terphenyl-d14	33-141	18-137
	MS/MSD	Phenol	12-110	26-90
		2-Chlorophenol	27-123	23-102
		1,4-Dichlorobeznene	36-97	28-104
		N-Nitrosodi-n-propylamine	41-116	41-126
		1,2,4-Trichlorobenzene	39-98	38-107
		4-Chloro-3-methylphenol	23-97	26-103
		Acenapthene	46-118	31-137
		4-Nitrophenol	10-80	11-114
		2,4-Dinitrotoluene	24-96	28-89
		Pentachlorophenol	9-103	17-109
		Pyrene	26-127	35-142

TABLE C.2-3
Laboratory-specific QC Target Acceptance Limits
Memphis Depot Main Installation RI

Analytical Fraction	Spike Type	Parameter	Water	Soil
Pest/PCB	Sur	Decachlorobiphenyl	42-108	44-128
		Tetrachloro-m-xylene	36-123	43-116
	MS/MSD	4 4'-DDT	30-135	42-149
		Aldrin	30-122	37-136
		Dieldrin	45-134	39-154
		Endrin	38-145	51-150
		gamma-BHC (lindane)	31-126	35-133
		Heptachlor	25-121	47-124
Herbicides	Surr	Dichlorophenylacetic acid	28-132	41-158
	MS/MSD	2,4,5-T	57-161	7-220
		2,4-D	64-135	13-190
		2,4-DB	53-167	40-186
		2,4-DP (Dichloroprop)	20-180	4-164
		3,5-Dichlorobenzoic acid	37-141	39-103
		4-Nitrophenol	12-191	0-142
		Dalapon	2-120	0-126
		Dicamba	48-158	26-166
		Dinoseb	0-192	0-247
		MCPA	32-124	0-180
		MCPP	37-156	0-180
		Pocloram	0-194	0-107
		Silvex (2,4,5-TP)	68-129	43-147

TABLE C.2-3
Laboratory-specific QC Target Acceptance Limits
Memphis Depot Main Installation RI

Analytical Fraction	Spike Type	Parameter	Water	Soil
PAHs	Surrogate	Terphenyl-d14	38-113	49-122
	MS/MSD	Naphthalene	37-98	62-125
		Acenaphthylene	41-99	60-124
		Acenaphthene	40-108	66-125
		Fluorene	54-106	66-125
		Phenanthrene	53-112	65-130
		Anthracene	53-107	60-120
		Fluoranthene	54-114	67-131
		Pyrene	50-114	64-138
		Benzo(a)anthracene	59-122	72-138
		Chrysene	53-126	70-147
		Benzo(b)fluoranthene	57-116	71-134
		Benzo(k)fluoranthene	37-144	58-144
		Benzo(a)pyrene	53-102	60-119
		Indeno(1,2,3-c,d)pyrene	43-117	64-143
		Dibenzo(a,h)anthracene	34-113	65-136
		Benzo(g,h,l)perylene	31-120	64-144
		2,3-Benzofuran	NR	NR

TABLE C.2-4
MS/MSD Results for Selected Analytical Fractions
Memphis Depot Main Installation RI

Matrix	Parameter	QC Limits	RHA-110-MS	RHA-110-MSD	RPD
SW	1,1-Dichloroethene	61-145	126	120	5
	Benzene	76-127	122	122	0
	Chlorobenzene	75-130	112	114	2
	Toluene	76-125	112	114	2
	Trichloroethene	71-120	110	112	2
SW	1,2,4-Trichlorobenzene	39-98	44	58	27
	1,4-Dichlorobenzene	36-97	40	56	33
	2,4-Dinitrotoluene	24-96	78	88	12
	2-Chlorophenol	27-123	60	74	21
	4-Chloro-3-methylphenol	23-97	65	74	13
	4-Nitrophenol	10-80	30	33	10
	Acenapthene	46-118	60	72	18
	N-Nitroso-di-n-propylamine	41-116	66	88	29
	Pentachlorophenol	9-103	60	62	3
	Phenol	12-110	30	41	31
	Pyrene	26-127	78	80	3
SW	4,4'-DDT	30-135	91	93	2
	Aldrin	30-122	87	81	7
	Dieldrin	45-134	102	101	1
	Endrin	38-145	106	104	2
	gamma-BHC (Lindane)	31-126	88	82	7
	Heptachlor	25-121	89	86	3
SS	2,4,5-T	7-220	177	200	12
	2,4-D	13-190	128	153	18
	2,4-DB	40-186	150	155	3
	2,4-DP (Dichloroprop)	4-164	70	78	11
	Dalapon	39-103	39	34	14
	Dicamba	0-142	159	206	26
	Dinoseb	0-126	53	54	2
	MCPA	0-180	57	68	18
	MCPP	0-180	52	64	21
	Silvex (2,4,5-TP)	68-129	124	126	2

TABLE C.2-5
Duplicate Field Sample Results Summary
Memphis Depot Main Installation RI

Sample Matrix	Method #	Sample ID	Parameter	Native Result	Duplicate Result	Units	RPD
SB	SW6010	RHA007	ARSENIC	8 4	8 1	mg/kg	4%
SB	SW6010	RHA007	CHROMIUM, TOTAL	24 7	11 4	mg/kg	74%
SB	SW6010	RHA007	COPPER	16 4	16 3	mg/kg	1%
SB	SW6010	RHA007	LEAD	9 1	8 4	mg/kg	8%
SB	SW6010	RHA007	NICKEL	18 1	17 4	mg/kg	4%
SB	SW6010	RHA007	ZINC	50 4	49 1	mg/kg	3%
SB	SW6010	RHA009	ARSENIC	7 8	7 7	mg/kg	1%
SB	SW6010	RHA009	CHROMIUM, TOTAL	24 6	26 8	mg/kg	9%
SB	SW6010	RHA009	COPPER	17	15 2	mg/kg	11%
SB	SW6010	RHA009	LEAD	8 7	8 3	mg/kg	5%
SB	SW6010	RHA009	NICKEL	17 7	17	mg/kg	4%
SB	SW6010	RHA009	ZINC	43 4	41 6	mg/kg	4%
SS	SW8100	RHA020	BENZO(g,h,i)PERYLENE	73	100	µg/kg	31%
SS	SW8100	RHA020	FLUORANTHENE	100	240	µg/kg	82%
SS	SW8100	RHA020	INDENO(1,2,3-c,d)PYRENE	88	120	µg/kg	31%
SS	SW8100	RHA020	PHENANTHRENE	89	160	µg/kg	57%
SS	SW8100	RHA020	PYRENE	76	170	µg/kg	76%
SS	SW8080	RHA020	DDT	77	30	µg/kg	88%
SS	SW8080	RHA020	DIELDRIN	62	50	µg/kg	21%
SS	SW6010	RHA020	ARSENIC	17 1	15 6	mg/kg	9%
SS	SW6010	RHA020	CADMIUM	2	1 3	mg/kg	42%
SS	SW6010	RHA020	CHROMIUM, TOTAL	336	164	mg/kg	69%
SS	SW6010	RHA020	COPPER	48 9	67 9	mg/kg	33%
SS	SW6010	RHA020	LEAD	1580	563	mg/kg	95%
SS	SW6010	RHA020	NICKEL	16 4	32	mg/kg	64%
SS	SW6010	RHA020	ZINC	693	369	mg/kg	61%
SB	SW8260	RHA030	ACETONE	16	32	µg/kg	67%
SB	SW6010	RHA030	ARSENIC	10 8	9	mg/kg	18%
SB	SW6010	RHA030	CHROMIUM, TOTAL	12 8	27 4	mg/kg	73%
SB	SW6010	RHA030	COPPER	18 8	16 5	mg/kg	13%
SB	SW6010	RHA030	LEAD	13 5	11 1	mg/kg	20%
SB	SW6010	RHA030	NICKEL	17 7	16 8	mg/kg	5%
SB	SW6010	RHA030	ZINC	60 8	55 3	mg/kg	9%
SS	SW8100	RHA039	ANTHRACENE	320	220	µg/kg	37%
SS	SW8100	RHA039	BENZO(a)ANTHRACENE	850	760	µg/kg	11%
SS	SW8100	RHA039	BENZO(a)PYRENE	730	710	µg/kg	3%
SS	SW8100	RHA039	BENZO(b)FLUORANTHENE	660	700	µg/kg	6%
SS	SW8100	RHA039	BENZO(g,h,i)PERYLENE	490	520	µg/kg	6%
SS	SW8100	RHA039	BENZO(k)FLUORANTHENE	680	720	µg/kg	6%
SS	SW8100	RHA039	CHRYSENE	760	710	µg/kg	7%
SS	SW8100	RHA039	FLUORANTHENE	1800	1500	µg/kg	18%
SS	SW8100	RHA039	FLUORENE	300	260	µg/kg	14%
SS	SW8100	RHA039	INDENO(1,2,3-c,d)PYRENE	730	740	µg/kg	1%
SS	SW8100	RHA039	PHENANTHRENE	1200	930	µg/kg	25%
SS	SW8100	RHA039	PYRENE	1300	1200	µg/kg	8%
SS	SW6010	RHA039	ARSENIC	10 9	11 3	mg/kg	4%
SS	SW6010	RHA039	CHROMIUM, TOTAL	51 3	77 2	mg/kg	40%
SS	SW6010	RHA039	COPPER	27 9	27	mg/kg	3%
SS	SW6010	RHA039	LEAD	340	505	mg/kg	39%
SS	SW6010	RHA039	NICKEL	16 3	16 3	mg/kg	0%
SS	SW6010	RHA039	ZINC	182	205	mg/kg	12%
SS	SW8080	RHA045	DDT	300	390	µg/kg	26%
SS	SW8080	RHA056	DDE	620	520	µg/kg	18%
SS	SW8080	RHA056	DDT	1800	1700	µg/kg	6%
SS	SW8100	RHA067	FLUORANTHENE	80	81	µg/kg	1%

TABLE C.2-5
Duplicate Field Sample Results Summary
Memphis Depot Main Installation RI

Sample Matrix	Method #	Sample ID	Parameter	Native Result	Duplicate Result	Units	RPD
SS	SW8100	RHA067	PHENANTHRENE	76	79	µg/kg	4%
SS	SW8100	RHA067	PYRENE	64	72	µg/kg	12%
SS	SW8080	RHA067	ALPHA-CHLORDANE	15	7 1	µg/kg	71%
SS	SW8080	RHA067	DDE	36	24	µg/kg	40%
SS	SW8080	RHA067	DDT	85	42	µg/kg	68%
SS	SW8080	RHA067	GAMMA-CHLORDANE	15	7 4	µg/kg	68%
SB	SW6010	RHA076	ARSENIC	8 6	8 9	mg/kg	3%
SB	SW6010	RHA076	CHROMIUM, TOTAL	11 7	11 8	mg/kg	1%
SB	SW6010	RHA076	COPPER	16 2	16 5	mg/kg	2%
SB	SW6010	RHA076	LEAD	9 3	9 6	mg/kg	3%
SB	SW6010	RHA076	NICKEL	17 3	17	mg/kg	2%
SB	SW6010	RHA076	ZINC	51	52 5	mg/kg	3%
SB	SW6010	RHA082	ARSENIC	9 8	11	mg/kg	12%
SB	SW6010	RHA082	CHROMIUM, TOTAL	10 2	11 9	mg/kg	15%
SB	SW6010	RHA082	COPPER	16 6	18 5	mg/kg	11%
SB	SW6010	RHA082	LEAD	11	13 1	mg/kg	17%
SB	SW6010	RHA082	NICKEL	18	19 8	mg/kg	10%
SB	SW6010	RHA082	ZINC	55 2	59 5	mg/kg	7%
SB	SW8260	RHA092	ACETONE	17	17	µg/kg	0%
SB	SW8080	RHA092	DDE	5 6	11	µg/kg	65%
SB	SW8080	RHA092	DDT	15	31	µg/kg	70%
SB	SW6010	RHA092	ANTIMONY	1	1 2	mg/kg	18%
SB	SW6010	RHA092	ARSENIC	6 9	8 5	mg/kg	21%
SB	SW6010	RHA092	CHROMIUM, TOTAL	13	14	mg/kg	7%
SB	SW6010	RHA092	COPPER	15 8	17 1	mg/kg	8%
SB	SW6010	RHA092	LEAD	8 5	9 4	mg/kg	10%
SB	SW6010	RHA092	NICKEL	18	18 6	mg/kg	3%
SB	SW6010	RHA092	ZINC	44 9	53 6	mg/kg	18%
WS	SW7470	RHA102	MERCURY	0 06	0 04	µg/L	40%
WS	SW6010	RHA102	ALUMINUM	147	81 2	µg/L	58%
WS	SW6010	RHA102	BARIUM	5 8	5	µg/L	15%
WS	SW6010	RHA102	CADMIUM	0 38	0 22	µg/L	53%
WS	SW6010	RHA102	CALCIUM	2490	2440	µg/L	2%
WS	SW6010	RHA102	CHROMIUM, TOTAL	1 2	1 4	µg/L	15%
WS	SW6010	RHA102	COBALT	1 1	0 84	µg/L	27%
WS	SW6010	RHA102	COPPER	4 4	3 4	µg/L	26%
WS	SW6010	RHA102	IRON	306	245	µg/L	22%
WS	SW6010	RHA102	LEAD	5 2	2 6	µg/L	67%
WS	SW6010	RHA102	MAGNESIUM	286	271	µg/L	5%
WS	SW6010	RHA102	MANGANESE	16 7	14 6	µg/L	13%
WS	SW6010	RHA102	SODIUM	456	483	µg/L	6%
WS	SW6010	RHA102	THALLIUM	2 2	1 3	µg/L	51%
WS	SW6010	RHA102	VANADIUM	1	0 76	µg/L	27%
WS	SW6010	RHA102	ZINC	34 6	31 2	µg/L	10%
WS	E415 2	RHA102	TOTAL ORGANIC CARBON	2 3	2 6	MG/L	12%
WS	SW6010	RHA110	ALUMINUM	64	49 8	µg/L	25%
WS	SW6010	RHA110	BARIUM	12 7	12 1	µg/L	5%
WS	SW6010	RHA110	CALCIUM	8370	8150	µg/L	3%
WS	SW6010	RHA110	CHROMIUM, TOTAL	1 4	1 2	µg/L	15%
WS	SW6010	RHA110	COBALT	0 66	0 86	µg/L	26%
WS	SW6010	RHA110	COPPER	9 1	6 6	µg/L	32%
WS	SW6010	RHA110	IRON	417	432	µg/L	4%
WS	SW6010	RHA110	MAGNESIUM	1580	1570	µg/L	1%
WS	SW6010	RHA110	MANGANESE	68 4	69 8	µg/L	2%
WS	SW6010	RHA110	NICKEL	3 3	3 6	µg/L	9%
WS	SW6010	RHA110	POTASSIUM	2730	2540	µg/L	7%
WS	SW6010	RHA110	SELENIUM	1 4	2 9	µg/L	70%

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TABLE C.2-5
Duplicate Field Sample Results Summary
Memphis Depot Main Installation RI

Sample Matrix	Method #	Sample ID	Parameter	Native Result	Duplicate Result	Units	RPD
WS	SW6010	RHA110	SODIUM	1080	993	µg/L	8%
WS	SW6010	RHA110	VANADIUM	0 81	0 69	µg/L	16%
WS	SW6010	RHA110	ZINC	61 3	70 2	µg/L	14%
WS	E415 2	RHA110	TOTAL ORGANIC CARBON	5 9	6	MG/L	2%
SB	SW8080	RHA154	ALPHA-CHLORDANE	12	16	µg/kg	29%
SB	SW8080	RHA154	GAMMA-CHLORDANE	11	16	µg/kg	37%
SB	SW6010	RHA154	ARSENIC	9 3	8 9	mg/kg	4%
SB	SW6010	RHA154	CHROMIUM, TOTAL	13 1	11 7	mg/kg	11%
SB	SW6010	RHA154	COPPER	16	15 9	mg/kg	1%
SB	SW6010	RHA154	LEAD	9 4	9 9	mg/kg	5%
SB	SW6010	RHA154	NICKEL	17 3	18	mg/kg	4%
SB	SW6010	RHA154	ZINC	55 8	51 7	mg/kg	8%
SB	SW8260	RHA164	ACETONE	37	30	µg/kg	21%
SB	SW6010	RHA164	ALUMINUM	12200	14300	mg/kg	16%
SB	SW6010	RHA164	ANTIMONY	0 25	0 35	mg/kg	33%
SB	SW6010	RHA164	ARSENIC	8 9	10 1	mg/kg	13%
SB	SW6010	RHA164	BARIUM	121	159	mg/kg	27%
SB	SW6010	RHA164	CADMIUM	0 25	0 29	mg/kg	15%
SB	SW6010	RHA164	CALCIUM	1500	1410	mg/kg	6%
SB	SW6010	RHA164	CHROMIUM, TOTAL	14 6	15 4	mg/kg	5%
SB	SW6010	RHA164	COBALT	8 1	7 8	mg/kg	4%
SB	SW6010	RHA164	COPPER	16 3	18 6	mg/kg	13%
SB	SW6010	RHA164	IRON	20200	20700	mg/kg	2%
SB	SW6010	RHA164	LEAD	10	11 2	mg/kg	11%
SB	SW6010	RHA164	MAGNESIUM	2370	2590	mg/kg	9%
SB	SW6010	RHA164	MANGANESE	445	504	mg/kg	12%
SB	SW6010	RHA164	NICKEL	18	17 5	mg/kg	3%
SB	SW6010	RHA164	POTASSIUM	2530	2650	mg/kg	5%
SB	SW6010	RHA164	VANADIUM	29 1	31 7	mg/kg	9%
SB	SW6010	RHA164	ZINC	52 8	57 4	mg/kg	8%
SB	SW8260	RHA173	ACETONE	18	16	µg/kg	12%
SB	SW6010	RHA173	ALUMINUM	12000	10500	mg/kg	13%
SB	SW6010	RHA173	ARSENIC	8	10	mg/kg	22%
SB	SW6010	RHA173	BARIUM	161	181	mg/kg	12%
SB	SW6010	RHA173	BERYLLIUM	0 03	0 09	mg/kg	100%
SB	SW6010	RHA173	CADMIUM	0 26	0 22	mg/kg	17%
SB	SW6010	RHA173	CALCIUM	1370	1170	mg/kg	16%
SB	SW6010	RHA173	CHROMIUM, TOTAL	13 9	12 9	mg/kg	7%
SB	SW6010	RHA173	COBALT	7 4	8 2	mg/kg	10%
SB	SW6010	RHA173	COPPER	16 7	16 7	mg/kg	0%
SB	SW6010	RHA173	IRON	18300	20300	mg/kg	10%
SB	SW6010	RHA173	LEAD	11	10 6	mg/kg	4%
SB	SW6010	RHA173	MAGNESIUM	2530	2480	mg/kg	2%
SB	SW6010	RHA173	MANGANESE	533	684	mg/kg	25%
SB	SW6010	RHA173	NICKEL	17 2	17 9	mg/kg	4%
SB	SW6010	RHA173	POTASSIUM	2460	2280	mg/kg	8%
SB	SW6010	RHA173	SILVER	0 12	0 15	mg/kg	22%
SB	SW6010	RHA173	SODIUM	54 7	63 7	mg/kg	15%
SB	SW6010	RHA173	VANADIUM	27 1	24 6	mg/kg	10%
SB	SW6010	RHA173	ZINC	56 1	54 6	mg/kg	3%

Appendix C-3

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Data Quality Evaluation (DQE) Report for the Defense Depot Memphis, Tennessee, Remedial Investigation Project

Introduction

Surface and groundwater, soil and sediment samples and the corresponding QC samples were collected and submitted to the analytical laboratory for analysis of the following parameters:

- Volatile organic compounds (VOCs) by SW-846 method 8260A
- Semivolatile organic compounds (SVOCs) by SW-846 method 8270B
- Pesticides and polychlorinated biphenyl (PCBs) by SW-846 method 8081
- Herbicides by SW-846 method 8151
- Polynuclear aromatic hydrocarbons (PAHs) by SW-846 method 8100
- Metals by SW-846 methods 6010 and 7000 series
- pH by EPA method 150.1 (water) and SW-846 method 9045 (solids)
- Total organic carbon (TOC) by EPA method 415.2
- Alkalinity by EPA method 310.1
- Cation exchange capacity (CEC) by SW-846 method 9080

Field QC included duplicate field samples, trip blanks (analyzed for VOCs only), equipment rinsate blanks, and field blanks.

The samples were submitted to the laboratory in 18 groups; therefore, there are 18 sample delivery groups (SDGs). All the samples were analyzed using SW-846 methods, however, the laboratory provided EPA Level 2 QC data packages for 10 of the SDGs and EPA Level 3 QC data packages for 8 of the SDGs. EPA Level 2 data packages included the sample results and corresponding laboratory method blank results; EPA Level 3 data packages also included a summary of the QC data (for example, calibration and spiked sample results).

The purpose of the data quality evaluation process (DQEP) is to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a straight-forward check of compliance with the method requirements; either the laboratory did, or did not, analyze the samples within the limits of the analytical method. Evaluation of matrix interferences is more subtle and involves the analysis of several areas of results including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

DQE for the Screening Sites data consisted of the following two principal activities·

- Hard copy "validation" of the EPA Level 3 data packages (as a note, it is not possible to "validate" the EPA Level 2 data because there is no QC summary data to evaluate)
- Database-wide evaluation of the trends in data quality (for example, trends in surrogate spike recovery)

It is important to note that *"data validation"* is the assessment of the hard-copy data base deliverables in terms of method compliance, and *"data quality evaluation"* is the qualitative evaluation of overall trends in the project-specific database. Areas evaluated in the DQE include the following:

- Potential "blank contamination" (i.e. the effect on the usability of data for target compounds and analytes detected in both the field or laboratory blank samples and the corresponding field samples)
- Laboratory performance (i.e. recovery for spiked blank samples and other laboratory checks such as calibration and laboratory control samples)
- Matrix interferences (i.e. recovery for spiked field samples)
- Usability of metals results at, or near, the instrument detection limits

This DQE technical memorandum (TM) includes the following:

- Results of the database-wide DQE queries (summary tables are included at the end of this report)
- Assessment of the overall usability of the data to support the project decision-making process

The focus of the hard-copy data validation was to review each of the QC summary sheets, note nonconformances on the DV worksheets, qualify the data as appropriate, and summarize the results of this review. These completed worksheets are included in the project file and are available upon request.

Data Evaluation Criteria

Before the analytical results were released by the laboratory, both the sample and QC data were carefully reviewed to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations Additionally, the QC data were reduced and the resulting data were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Any non-conforming data were discussed in the data package cover letter and case narrative.

The EPA Level 3 QC data packages were reviewed by the project chemists using the method acceptance criteria and the process outlined in the EPA *Functional Guidelines*. Samples that were not within the acceptance limits were annotated with a qualifying flag, which consists of a single or multi-letter abbreviation that indicates a QC nonconformance associated with that analytical result. Although the qualifying flags originate during the

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data review and validation process, they are included in the data summary tables so that the data will not be used indiscriminately. The following flags were used in the DQEP:

TABLE C.3-1
Data Qualification Flags
Memphis Depot Main Installation RI

Qualifier	Description
J	Estimated. The analyte was present, but the reported value may not be accurate or precise.
U	Undetected. Analyte was analyzed for but not detected above the method detection limit
R	Rejected. The data are unusable. (Analyte/compound may or may not be present.)
UJ	Undetected, but the reporting limit is estimated.

Once the data review and validation process for the EPA Level 3 QC data was completed, the entire data set was reviewed for target compound/analyte frequency of detection, dilution factors that might affect data usability, and patterns of target compound/analyte distribution The data set was also evaluated to identify potential data limitations, uncertainties, or both, in the analytical results.

Potential Field Sampling and Laboratory Contamination

Types of QC Blank Samples

Three types of field blank samples were used to monitor potential contamination introduced during field sampling and sample handling activities.

Trip Blank (TB)(VOCs only): A sample of ASTM Type II water was prepared by the laboratory and it accompanied the sample coolers from the field to the lab. This blank monitors potential contamination introduced during sample handling and shipping. For this project, one trip blank was submitted with each cooler containing samples for VOC analysis. A total of 7 TBs were submitted to the laboratory for this field effort

Equipment Rinsate Blank (ERB): Consists of a sample of the ASTM Type II water used as the final rinse during equipment decontamination. This blank sample is collected by rinsing a piece of equipment after decontamination is completed and is analyzed for the same analytical parameters as the corresponding samples. This blank monitors potential contamination caused by incomplete equipment decontamination. A total of 6 ERBs was submitted to the laboratory for this field effort.

Field Blank (FB): Consists of a sample of the source water used to decontaminate the field sampling equipment and at least one FB was collected from each source of water. Typically there are 2 types of FBs: one a sample of the tap water used to steam-clean the equipment and a second sample of the ASTM Type II water used for the final equipment rinse. FBs are analyzed for the same parameters as the corresponding samples. One FB of the ASTM Type II water was submitted to the laboratory for this field effort.

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Laboratory method blanks (LBs) were also analyzed with each analytical batch. For water samples, a laboratory method blank is ASTM Type II water that is treated as a sample in that it undergoes the same analytical process as the corresponding field samples. For soil samples, the laboratory method blank may consist of a sample of EPA-approved soil (Ottawa desert sand). Method blanks are used to monitor laboratory performance and potential contamination introduced during the analytical process. One method blank was analyzed for every 20 samples, or one per analytical batch, whichever was more frequent.

Evaluation of QC Blank Results

Summarized in Table C.3-2 are the frequency of detection, and the minimum and maximum concentration for target compounds. Also included in Table 2 are the frequency of detection, and minimum and maximum concentration for target compounds that were also detected in the field samples. For example, methylene chloride is included in Table 2 because it was detected in the field and laboratory blank samples as well the field samples. However, phenanthrene was detected in selected field samples and not any of the field or laboratory blanks; therefore, phenanthrene is not included in this table.

According to the EPA Guidance Manual, *Functional Guidelines for Evaluating Data*, field sample results that were less than five (ten for common contaminants) times the concentration in the corresponding blank sample can be qualified as "U" for not detected. No qualifiers are applied to the blank sample results.

- Acetone was detected in 5 of the 6 equipment rinsate blanks at concentrations ranging from 13 to 16 µg/L. Acetone was also detected in 1 of the 10 water laboratory method blanks (14 µg/L) and 8 of the 23 soil laboratory method blanks at concentrations ranging from 13 to 16 µg/kg. Acetone is used as an extraction solvent in the laboratory and is a common contaminant. Acetone was detected in both the surface water and solid field samples. With the exception of one sample result (RHA070 at 220 µg/kg), all the acetone results can be attributed to field sampling and laboratory contamination.

- 2-Butanone was detected in 2 of the 6 equipment rinsate blanks at 17 and 22 µg/L. 2-Butanone was also detected in 2 of the 24 surface soil samples (22 and 34 µg/kg) and 1 of the 79 subsurface soil samples at 14 µg/kg. 2-Butanone is an infrequent laboratory contaminant and source include contamination in the internal standard solutions and the moisture control module of the analytical instrument. According to the EPA *Functional Guidelines*, concentrations of contaminants detected in environmental samples at less than five times the concentrations detected in the corresponding field and laboratory blank samples may be attributed to field sampling or laboratory contamination. 2-Butanone was detected at a similar frequency and concentration as the equipment rinsate blank samples and can be attributed to laboratory contamination.

- Bis(2-ethylhexyl) phthalate (BEHP) was detected in one of the soil laboratory method blank samples at 360 µg/kg. BEHP was also detected in 11 of the 48 subsurface soil samples at concentrations ranging from 430 to 3,800 µg/kg. All the sample results are less than ten time the concentration in the laboratory method blank sample; therefore, BEHP can be attributed to laboratory contamination and not environmental conditions.

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- Concentrations of metals near the instrument detection limit (IDL) and less than the project-specific reporting limits were detected in some of the QC blank samples. These results are typically indicative of instrument background and not field sampling or laboratory contamination. Negative numbers were reported by the laboratory for selected blank and field sample results. Negative numbers associated with atomic spectroscopy methods of analysis results from one of, or a combination of, two possible situations:

  - **Instrument Noise:** Variation in signal intensity is the primary reason that negative numbers are reported. Any calibration curve associated with atomic spectroscopy utilizes a calibration blank. "Blank" is assigned a "zero concentration" when the calibration curve is computed. Because "blank" does not have an analyte signal, instrument noise, slight variations in detection devices, stray light, or background corrections can elicit a quantitative response different from the "blank". These responses can and often are, slightly negative absorbencies or emission intensities, which when compared to the curve, yield negative concentrations. The absolute value of these negative concentrations are compared to the instrument (IDL) or method detection limit (MDL); both the IDL and MDL are calculated rather than demonstrated values and hence have an inherent inaccuracy. If the absolute value of the negative sample result is greater than these reporting limits, then the negative value is reported.

  - **Calibration Blank Contamination:** Any contaminant present in the blank during calibration will artificially set "zero" at the contaminant concentration. Any samples analyzed after the calibration blank which contain less contamination than the calibration blank will result in a negative value as the sample result. This is not a common situation and occurs mostly with zinc and copper, two ubiquitous contaminants.

QC Measures

Surrogate Spike Recoveries

Surrogate spike compounds were added to every sample analyzed for the organic parameters including field and laboratory blanks as well as field environmental samples. Surrogate spike compounds are the structural homologs of target compounds and are therefore expected to behave in a similar manner during analysis. Surrogate spike recoveries were used to monitor both laboratory performance and matrix interferences. Surrogate spike recoveries from field and laboratory blanks were used to evaluate laboratory performance because the field blanks represent an "ideal" sample matrix. Surrogate spike recoveries for field samples were used to evaluate the potential for matrix interferences. There are no graphs for dioxins and furans because no surrogate compounds were added to the sample. Internal standards are used in place of surrogate spike compounds.

As each data package was reviewed, the surrogate spike recoveries were compared to the QC target limits summarized in Table C 3-3 Samples with surrogate spike recoveries

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outside the target acceptance limits were noted on the data validation worksheets and the sample results qualified with a "J" to indicate potential matrix interferences.

Surrogate spike recoveries were also evaluated in aggregate for each sample type or matrix. Because of the large number of samples, surrogate spike recoveries are summarized in a graph rather than a table. For each organic analysis, a graph was prepared of surrogate spike recovery as a function of "sample number". The samples were arranged chronologically and then numbered sequentially. The graphs are used to evaluate trends and not specific sample results.

Two separate pages were prepared for each analytical fraction The first page presents surrogate spike recoveries for water samples. The water field QC blanks, laboratory blank and field samples are presented on separate graphs so that trends in ideal versus matrix-specific can be evaluated. The second page presents soil laboratory blank and soil environmental samples; there are no field QC samples for soil. The spiked blank plots demonstrate that the laboratory method was in control. The spiked sample results are used to evaluate potential matrix interference. Spike recoveries of zero indicate that the sample was diluted and the surrogate was no longer "visible" to the instrument.

The following conclusions are applicable to all the figures:

- Surrogate spike recoveries for VOCs are clustered in a narrow band, while recoveries for semivolatile compounds (includes SVOCs, pesticides, PCBs, herbicides, etc.) are spread over a larger range. This is typical of the VOC versus semivolatile-type compounds and the laboratory-specific target acceptance limits reflect this difference.

- In general, the specific sample matrix did not interfere with the overall analytical process because the surrogate spike recoveries for both water and soil samples were within the method target acceptance limits; and the recovery "spread" for blank and field samples were similar.

Matrix Spike/Matrix Spike Duplicate Results (MS/MSD)

For this QC measure, three aliquots of a single sample are analyzed; a native sample, and two spiked with known concentrations of target compounds. For the metals analysis, two native and one spiked sample are analyzed (spike/duplicate). Unlike the surrogate spike compounds, matrix spike compounds are found on the method target compound list. Spike recovery is used to evaluate potential matrix interferences as well as accuracy. For organic analyses, precision is evaluated by comparing the duplicate spike results. For inorganic analyses, precision is evaluated by comparing the duplicate native sample results.

One water MS/MSD was analyzed for the surface water samples and the results of this QC measure are summarized in Table C.3-4. Also, there was only 1 MS/MDS sample for herbicides and this information is also presented in Table C.3-4. For the soil samples, the MS/MSD results are presented using a graph instead of a table because multiple MS/MSD samples were analyzed by the laboratory. All the solid MS/MSD results were combined in a single graph instead of presenting separate graphics for surface soil, subsurface soil, sediment, etc. The graphs are presented by MS/MSD target compound. For example, there are 5 MS/MSD compounds for VOCs; therefore, there are 5 plots for VOCs. Each plot presents MS and MSD recovery as a function of sample number. Sample numbers were assigned sequentially after the MS/MSD samples were arranged chronologically. The overall purpose of matrix spikes is to evaluate the effect of the specific sample matrix on accuracy and precision. Laboratory-specific target acceptance limits were used to evaluate accuracy and precision. Precision can also be evaluated visually by noting the similarity of the MS and MSD plots.

For all the analytical methods, the sample matrix did not interfere with the overall analytical process because the MS and MSD spike recoveries and precision were within the laboratory-specific target acceptance limits. Additionally, the MS and MSD graphical recovery trends were nearly identical.

Duplicate Field Sample Results

One duplicate field sample was collected for every ten field samples of the same matrix. The duplicate samples were submitted "blind" to the laboratory; i.e. the laboratory did not know which samples were duplicates nor which pair of samples were duplicate of each other.

Ideally, duplicate field samples would be chosen which contain target compounds or analytes above the reporting limit because non-detects provide limited information about precision (i.e the duplicate of not detected is not detected). It is difficult to summarize duplicate information in a graph because different target compounds/analytes were detected in each pair of duplicate sample. The duplicate field sample results are summarized in Table C.3-5. For each duplicate sample, all results above the reporting limit are presented for both the native and duplicate samples and the relative percent difference between them was calculated. The sample results were not qualified for duplicate sample recovery or precision; however, a general comparison of $\pm$20 RPD for water and $\pm$35 RPD for soil was used

In general, the duplicate sample results were within the guidance limits; indicating that the specific sample matrix did not interfere with the overall analytical process. Those duplicate soil results with a RPD greater than 50 percent should be attributed to the non-homogeneity of the soil matrix as well as potentially poor sampling and analysis precision.

Metals Results Near the Instrument Detection Limit

The samples were analyzed for 23 metals including aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Concentrations of metals near the instrument detection limit (IDL) were reported for many of the target metals. Plots of sample results as a function of sample index number for the soil field samples were reviewed yielding the following conclusions:

- Those sample results clustered about the IDL are due to instrument "background" (for example, silver)
- Results evenly distributed over a wide range of concentrations may be attributed to natural abundance (for example, aluminum)

- Results which appear to be greatly above the instrument background noise are reflective of environmental conditions

The IDL is the constituent concentration that produces a signal greater than five times the signal/noise ratio of the instrument and is a calculated value. Results at, or near, 10 times the IDL are more "viable" sample results and are not suspect in the same way as results reported at, or near, the IDL. Therefore, sample results at, or near, the IDL may be false positives caused by instrument noise or low level background shifts rather than a true analyte signal.

PARCCs

Precision–is defined as the agreement between duplicate results, and was estimated by comparing duplicate matrix spike recoveries and field duplicate sample results. As discussed above, the RPD for the MS/MSD results were within the target acceptance limits except for two SDGs from the pesticides analysis. However, the RPD for target analytes detected in the duplicate soil samples which were greater than 50% PD which may indicate either poor sample homogeneity or poor sampling and analysis precision.

Accuracy–is a measure of the agreement between an experimental determination and the true value of the parameter being measured. Spiked sample results were used to evaluate accuracy and as noted above, the spike recoveries were within the method target acceptance limits indicating the specific sample matrix did not interfere with the overall analytical process.

Representativeness–this criteria is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is a subjective parameter and is used to evaluate the efficacy of the sampling plan design. Representativeness was demonstrated by providing full descriptions in the project scoping documents of the sampling techniques and the rationale used for selecting sampling locations.

Completeness–is defined as the percentage of measurements that are judged to be valid compared to the total number of measurements made. None of the QC Level 1 data was rejected because it was not validated. None of the QC Level 2 data was rejected during validation for QC reasons. It is important to note that the "best value" for each sample is selected and other values rejected in the database. For example, a sample required a 10-fold dilution because one target compound was present above the linear calibration range The single undiluted result would be "rejected" in the database and the diluted results for the other target compounds rejected for the diluted analysis in order to choose the "best value" for each target compound or analyte. Therefore, 100 percent of the data was deemed usable which exceeds the goal of 95 percent usable data established in the work plan.

Comparability–is another qualitative measure designed to express the confidence with which one data set may be compared to another. Factors which affect comparability are: sample collection and handling techniques, sample matrix type, and analytical method. Comparability is limited by the other PARCC parameters because data sets can be compared with confidence only when precision and accuracy are known. EPA methods were used to analyze the sample; however, there is not QC data available to support the

Level 1 data. Therefore, the data can be compared with the understanding that the quality of the Level 1 data is not known.

Summary and Conclusions

Conclusions of the data quality evaluation process include the following:

- The laboratory analyzed the EPA Level 3 QC samples according to the EPA methods stated in the work plan as demonstrated by the data package deliverables
- Acetone, 2-butanone, and bis-2-ethylhexyl phthalate can be attributed to field sampling and laboratory contamination rather than environmental contamination.
- Surrogate spike and MS/MSD recoveries and duplicate field sample results indicate that the specific sample matrix did not interfere with the overall analytical process
- Poor duplicate precision for metals in the duplicate soil samples should be attributed to both poor sample homogeneity as well as potentially poor sampling and analysis precision.

These data can be used in the project decision making process without further qualification.

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TABLE C 3-2

Companson of Results for Target Compounds

Memphis Depot Main Installation RI

Method	Target Compound	Blank Sample Results					Field Sample Results					Comments
		Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of ..."
VOC	Acetone	EB	5/6	13	16	µg/L	SW	3/4	10	17	µg/L	Field sampling and laboratory contamination
		LB	1/10	14		µg/L	SS	13/24	13	220	µg/kg	Values > 160 reflect environmental conditions
		LB	8/23	13	16	µg/kg	SO	1/1	95		µg/kg	Field sampling and laboratory contamination
							SB	35/79	16	120	µg/kg	Field sampling and laboratory contamination
	2-Butanone	EB	2/6	17	22	µg/L	SS	2/24	22	34	µg/kg	Field sampling and laboratory contamination
							SB	1/79	14		µg/kg	
SVOC	Bis(2-ethylhexyl) phthalate	LB	1/12	360		µg/kg	SB	11/48	430	2800	µg/kg	Field sampling and laboratory contamination
Metals	Aluminum	EB	5/5	13	34	µg/L	SW	4/4	64	576	µg/L	Values > 170 µg/L or 17 mg/kg may reflect environmental conditions
		LB	1/8	14	14	µg/L	SW (D)	6/6	7	81	µg/L	
		LB	4/6	2 8	3 4	mg/kg	SS	5/5	6390	15600	mg/kg	
							SB	21/21	6070	20400	mg/kg	
	Antimony	EB	3/6	2 0	3 2	µg/L	SW	13/15	2	3 6	µg/L	Values > 15 µg/L or 1 5 mg/kg may reflect environmental contamination
		LB	5/8	1 87	2 27	µg/L	SW (D)	11/17	1 9	3 6	µg/L	
							SS	4/26	0 26	7	mg/kg	
							SB	35/81	0 25	22	mg/kg	
	Arsenic	LB	4/11	-0 4	-0 3	mg/kg	SW	11/15	2 6	77	µg/L	Values > 10 µg/L or 1 0 mg/kg may reflect environmental contamination
							SW (D)	13/17	1 8	41	µg/L	
							SS	26/26	1 7	49	mg/kg	
							SB	81/81	1 3	43	mg/kg	
	Barium	EB	5/5	0 35	1 9	µg/L	SW	4/4	5 8	15	µg/L	Values > 20 µg/L or 0 4 mg/kg may be environmental and/or native background levels
		FB	1/1	6 7		µg/L	SW (D)	6/6	3 8	15	µg/L	
		LB	8/8	0 27	1 36	µg/L	SS	5/5	80	168	mg/kg	
		LB	6/6	0 031	0 076	mg/kg	SB	21/21	64	204	mg/kg	

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TABLE C 3-2
Comparison of Results for Target Compounds
Memphis Depot Main Installation RI

Method	Target Compound	Blank Sample Results					Field Sample Results					Comments
		Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of...."
	Beryllium	LB	5/8	0 11	0 19	µg/L	SW	1/15	0 11		µg/L	Values > 1 0 µg/L or 0 1 mg/kg may reflect environmental contamination
							SW (D)	3/17	0 10	0 16	µg/L	
							SS	4/26	0 11	2 0	mg/kg	
							SB	13/81	0 03	0 27	mg/kg	
	Cadmium	LB	2/8	0 16	0 29	µg/L	SW	14/15	0 2	1 4	µg/L	Values > 1 5 µg/L or 0 5 mg/kg may reflect environmental contamination
		LB	3/11	0 22	0 22	mg/kg	SW (D)	12/17	0 17	0 53	µg/L	
							SS	11/26	0 31	2 5	mg/kg	
							SB	28/81	0 17	5 8	mg/kg	
	Calcium	EB	5/5	66 2	324	µg/L	SW	4/4	2490	9080	µg/L	Values > 500 µg/L or 50 0 mg/kg may be environmental and/or native background levels
		FB	1/1	64		µg/L	SW (D)	6/6	2290	9620	µg/L	
		LB	8/8	11	77	µg/L	SS	5/5	954	11100	mg/kg	
		LB	6/6	3 0	4 7	mg/kg	SB	21/21	805	2750	mg/kg	
	Chromium, total	EB	3/6	0 7	7 5	µg/L	SW	15/15	0 72	19	µg/L	Values > 15 µg/L or 1 5 mg/kg may reflect environmental contamination
		LB	5/8	0 71	0 73	µg/L	SW (D)	14/17	0 49	1 3	µg/L	
		LB	6/11	0 09	0 29	mg/kg	SS	26/26	6 8	336	mg/kg	
							SB	81/81	9 5	915	mg/kg	
	Cobalt	EB	3/5	0 48	0 67	µg/L	SW	4/4	0 66	1 4	µg/L	Values > 5 0 µg/L or 1 0 mg/kg may reflect environmental contamination
		LB	6/8	0 66	0 88	µg/L	SW (D)	6/6	0 68	1 0	µg/L	
							SS	5/5	5 0	8 3	mg/kg	
							SB	21/21	6 3	10	mg/kg	

TABLE C 3-2
Comparison of Results for Target Compounds
Memphis Depot Main Installation RI

Method	Target Compound	Blank Sample Results					Field Sample Results					Comments
		Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of...."
	Copper	EB	4/6	1 2	4	µg/L	SW	15/15	2 4	22	µg/L	Values > 15 µg/L or 1.5 mg/kg may reflect environmental and/or native background levels
		FB	1/1	3	3	µg/L	SW (D)	17/17	0 99	17 1	µg/L	
		LB	7/8	1 04	2 06	µg/L	SS	26/26	4 1	103	mg/kg	
							SB	81/81	7	235	mg/kg	
	Iron	EB	5/5	24	89	µg/L	SW	4/4	77	835	µg/L	Values > 150 µg/L or 7 5 mg/kg may reflect environmental and/or native background levels
		FB	1/1	30	30	µg/L	SW (D)	6/6	27	253	µg/L	
		LB	8/8	5 6	82	µg/L	SS	5/5	12800	44500	mg/kg	
		LB	6/6	1 4	1 5	mg/kg	SB	21/21	15000	28000	mg/kg	
	Magnesium	EB	3/5	4 9	11	µg/L	SW	4/4	286	1580	µg/L	Values > 500 µg/L or 50 mg/kg may reflect environmental and/or native background levels
		LB	6/8	2 0	13	µg/L	SW (D)	6/6	213	1620	µg/L	
		LB	1/6	0 58		mg/kg	SS	5/5	929	2630	mg/kg	
							SB	21/21	2090	3410	mg/kg	
	Manganese	EB	5/5	0 71	2 1	µg/L	SW	4/4	8 4	68	µg/L	Values > 10 µg/L or 1 0 mg/kg may reflect environmental and/or native background levels
		FB	1/1	0 94		µg/L	SW (D)	6/6	2 3	21	µg/L	
		LB	8/8	0 61		µg/L	SS	5/5	150	499	mg/kg	
		LB	6/6	0 06	0 1	mg/kg	SB	21/21	405	1350	mg/kg	
	Mercury	EB	1/1	0 04		µg/L	SW	9/15	0 04	0 18	µg/L	Values > 0 3 µg/L or 0 15 mg/kg may reflect environmental contamination
		LB	2/8	0 046	0 054	µg/L	SW (D)	9/17	0 04	0 08	µg/L	
		LB	2/12	0 01	0 01	mg/kg	SS	5/26	0 02	0 1	mg/kg	
							SB	4/81	0 04	0 06	mg/kg	

TABLE C.3-2

Comparison of Results for Target Compounds

Memphis Depot Main Installation RI

Method	Target Compound	Blank Sample Results					Field Sample Results					Comments
		Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of...."
	Nickel	EB	2/6	1 5	2 3	µg/L	SW	13/15	1 3	18	µg/L	Values > 15 µg/L or 1 5 mg/kg may reflect environmental contamination
							SW (D)	9/17	1 4	4 6	µg/L	
							SS	26/26	3 2	29	mg/kg	
							SB	81/81	4 4	76	mg/kg	
	Potassium	LB	3/8	-844	-845	µg/L	SW	2/4	1910	2730	µg/L	Values > 1000 µg/L or 100 mg/kg may reflect environmental and/or native background levels
							SW (D)	4/6	751	2580	µg/L	
							SS	5/5	1230	3090	mg/kg	
							SB	21/21	1550	3280	mg/kg	
	Selenium	EB	3/5	1 5	2 7	µg/L	SW	10/15	1 4	3 8	µg/L	Values > 10 µg/L or 1 0 mg/kg may reflect environmental contamination
		LB	5/8	2 6	4 2	µg/L	SW (D)	10/17	1 7	3 6	µg/L	
							SS	1/26	0 31		mg/kg	
							SB	4/81	0 24	0 43	mg/kg	
	Sodium	EB	5/5	84	203	µg/L	SW	4/4	456	1080	µg/L	Values > 500 µg/L or 50 mg/kg may reflect environmental and/or native background levels
		FB	1/1	180	180	µg/L	SW (D)	6/6	419	907	µg/L	
		LB	6/6	84	87	mg/kg	SS	3/5	55	150	mg/kg	
							SB	18/21	24	101	mg/kg	
	Thallium	EB	2/5	1 3	1 3	µg/L	SW	4/15	1 9	2 5	µg/L	Values > 10 µg/L or 1 0 mg/kg may reflect environmental contamination
		LB	4/8	1 41	1 41	µg/L	SW (D)	7/17	1 4	2 9	µg/L	
							SB	1/81	0 96		mg/kg	

TABLE C 3-2

Comparison of Results for Target Compounds

Memphis Depot Main Installation RI

Method	Target Compound	Blank Sample Results					Field Sample Results					Comments
		Blank Type	Frequency	Min Conc	Max Conc	Units	Sample Matrix	Frequency	Min Conc	Max Conc	Units	"Indicative of ..."
	Zinc	EB	6/6	3 9	40	µg/L	SW	15/15	24	467	µg/L	Values > 50 µg/L or 5 0 mg/kg may reflect environmental and/or native background levels
		FB	1/1	10 6		µg/L	SW (D)	17/17	13	406	µg/L	
		LB	8/8	2 0	11	µg/L	SS	26/26	21	4000	mg/kg	
		LB	6/11	0 20	1 7	mg/kg	SB	81/81	31	1460	mg/kg	

Notes

SW surface water
SW (D) dissolved metals in surface water
SB sub-surface soil from soil boring
SO soil sample
SS surface soil

TB Trip blank
EB Equipment rinsate blank
FB Field blank
LB laboratory method blank

TABLE C.3-3

Laboratory-specific QC Target Acceptance Limits

Memphis Depot Main Installation RI

Analytical Fraction	Spike Type	Parameter	Water	Soil
VOC	Surr	Dibromofluoromethane	86-118	80-120
		Toluene-d8	88-110	81-117
		Bromofluorobenzene	86-115	74-121
	MS/MSD	1,1-Dichloroethene	61-145	61-145
		Benzene	76-127	76-127
		Trichloroethene	71-120	71-120
		Toluene	76-125	76-125
		Chlorobenzene	75-130	75-130
SVOC	Surr	2-Fluorophenol	21-100	25-121
		Phenol-d5	10-94	24-113
		Nitrobenzene-d5	35-114	23-120
		2-Fluorobiphenyl	43-116	30-115
		2,4,6-Tribromophenol	10-123	19-122
		Terphenyl-d14	33-141	18-137
	MS/MSD	Phenol	12-110	26-90
		2-Chlorophenol	27-123	23-102
		1,4-Dichlorobeznene	36-97	28-104
		N-Nitrosodi-n-propylamine	41-116	41-126
		1,2,4-Trichlorobenzene	39-98	38-107
		4-Chloro-3-methylphenol	23-97	26-103
		Acenapthene	46-118	31-137
		4-Nitrophenol	10-80	11-114
		2,4-Dinitrotoluene	24-96	28-89
		Pentachlorophenol	9-103	17-109
		Pyrene	26-127	35-142

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TABLE C.3-3
Laboratory-specific QC Target Acceptance Limits
Memphis Depot Main Installation RI

Analytical Fraction	Spike Type	Parameter	Water	Soil
Pest/PCB	Sur	Decachlorobiphenyl	42-108	44-128
		Tetrachloro-m-xylene	36-123	43-116
	MS/MSD	4.4'-DDT	30-135	42-149
		Aldrin	30-122	37-136
		Dieldrin	45-134	39-154
		Endrin	38-145	51-150
		gamma-BHC (lindane)	31-126	35-133
		Heptachlor	25-121	47-124
Herbicides	Surr	Dichlorophenylacetic acid	28-132	41-158
	MS/MSD	2,4,5-T	57-161	7-220
		2,4-D	64-135	13-190
		2,4-DB	53-167	40-186
		2,4-DP (Dichloroprop)	20-180	4-164
		3,5-Dichlorobenzoic acid	37-141	39-103
		4-Nitrophenol	12-191	0-142
		Dalapon	2-120	0-126
		Dicamba	48-158	26-166
		Dinoseb	0-192	0-247
		MCPA	32-124	0-180
		MCPP	37-156	0-180
		Pocloram	0-194	0-107
		Silvex (2,4,5-TP)	68-129	43-147

TABLE C.3-3
Laboratory-specific QC Target Acceptance Limits
Memphis Depot Main Installation RI

Analytical Fraction	Spike Type	Parameter	Water	Soil
PAHs	Surrogate	Terphenyl-d14	38-113	49-122
	MS/MSD	Naphthalene	37-98	62-125
		Acenaphthylene	41-99	60-124
		Acenaphthene	40-108	66-125
		Fluorene	54-106	66-125
		Phenanthrene	53-112	65-130
		Anthracene	53-107	60-120
		Fluoranthene	54-114	67-131
		Pyrene	50-114	64-138
		Benzo(a)anthracene	59-122	72-138
		Chrysene	53-126	70-147
		Benzo(b)fluoranthene	57-116	71-134
		Benzo(k)fluoranthene	37-144	58-144
		Benzo(a)pyrene	53-102	60-119
		Indeno(1,2,3-c,d)pyrene	43-117	64-143
		Dibenzo(a,h)anthracene	34-113	65-136
		Benzo(g,h,l)perylene	31-120	64-144
		2,3-Benzofuran	NR	NR

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TABLE C.3-4
MS/MSD Results for Selected Analytical Fractions
Memphis Depot Main Installation RI

Fraction	Matrix	Parameter	QC Limits	RHA-110-MS	RHA-110-MSD	RPD
VOC	SW	1,1-Dichloroethene	61-145	126	120	5
		Benzene	76-127	122	122	0
		Chlorobenzene	75-130	112	114	2
		Toluene	76-125	112	114	2
		Trichloroethene	71-120	110	112	2
SVOC	SW	1,2,4-Trichlorobenzene	39-98	44	58	27
		1,4-Dichlorobenzene	36-97	40	56	33
		2,4-Dinitrotoluene	24-96	78	88	12
		2-Chlorophenol	27-123	60	74	21
		4-Chloro-3-methylphenol	23-97	65	74	13
		4-Nitrophenol	10-80	30	33	10
		Acenapthene	46-118	60	72	18
		N-Nitroso-di-n-propylamine	41-116	66	88	29
		Pentachlorophenol	9-103	60	62	3
		Phenol	12-110	30	41	31
		Pyrene	26-127	78	80	3
Pest	SW	4,4'-DDT	30-135	91	93	2
		Aldrin	30-122	87	81	7
		Dieldrin	45-134	102	101	1
		Endrin	38-145	106	104	2
		gamma-BHC (Lindane)	31-126	88	82	7
		Heptachlor	25-121	89	86	3
Herbicides	SS	2,4,5-T	7-220	177	200	12
		2,4-D	13-190	128	153	18
		2,4-DB	40-186	150	155	3
		2,4-DP (Dichloroprop)	4-164	70	78	11
		Dalapon	39-103	39	34	14
		Dicamba	0-142	159	206	26
		Dinoseb	0-126	53	54	2
		MCPA	0-180	57	68	18
		MCPP	0-180	52	64	21
		Silvex (2,4,5-TP)	68-129	124	126	2

TABLE C.3-5
Duplicate Field Sample Results Summary
Memphis Depot Main Installation RI

Sample Matrix	Method #	Sample ID	Parameter	Native Result	Duplicate Result	Units	RPD
SB	SW6010	RHA007	ARSENIC	8 4	8 1	mg/kg	4%
SB	SW6010	RHA007	CHROMIUM, TOTAL	24.7	11 4	mg/kg	74%
SB	SW6010	RHA007	COPPER	16 4	16 3	mg/kg	1%
SB	SW6010	RHA007	LEAD	9 1	8 4	mg/kg	8%
SB	SW6010	RHA007	NICKEL	18 1	17 4	mg/kg	4%
SB	SW6010	RHA007	ZINC	50 4	49 1	mg/kg	3%
SB	SW6010	RHA009	ARSENIC	7 8	7 7	mg/kg	1%
SB	SW6010	RHA009	CHROMIUM, TOTAL	24 6	26 8	mg/kg	9%
SB	SW6010	RHA009	COPPER	17	15 2	mg/kg	11%
SB	SW6010	RHA009	LEAD	8 7	8 3	mg/kg	5%
SB	SW6010	RHA009	NICKEL	17 7	17	mg/kg	4%
SB	SW6010	RHA009	ZINC	43 4	41 6	mg/kg	4%
SS	SW8100	RHA020	BENZO(g h,i)PERYLENE	73	100	µg/kg	31%
SS	SW8100	RHA020	FLUORANTHENE	100	240	µg/kg	82%
SS	SW8100	RHA020	INDENO(1 2 3-c,d)PYRENE	88	120	µg/kg	31%
SS	SW8100	RHA020	PHENANTHRENE	89	160	µg/kg	57%
SS	SW8100	RHA020	PYRENE	76	170	µg/kg	76%
SS	SW8080	RHA020	DDT	77	30	µg/kg	88%
SS	SW8080	RHA020	DIELDRIN	62	50	µg/kg	21%
SS	SW6010	RHA020	ARSENIC	17 1	15 6	mg/kg	9%
SS	SW6010	RHA020	CADMIUM	2	1 3	mg/kg	42%
SS	SW6010	RHA020	CHROMIUM, TOTAL	336	164	mg/kg	69%
SS	SW6010	RHA020	COPPER	48 9	67 9	mg/kg	33%
SS	SW6010	RHA020	LEAD	1580	563	mg/kg	95%
SS	SW6010	RHA020	NICKEL	16 4	32	mg/kg	64%
SS	SW6010	RHA020	ZINC	693	369	mg/kg	61%
SB	SW8260	RHA030	ACETONE	16	32	µg/kg	67%
SB	SW6010	RHA030	ARSENIC	10 8	9	mg/kg	18%
SB	SW6010	RHA030	CHROMIUM, TOTAL	12 8	27 4	mg/kg	73%
SB	SW6010	RHA030	COPPER	18 8	16 5	mg/kg	13%
SB	SW6010	RHA030	LEAD	13 5	11 1	mg/kg	20%
SB	SW6010	RHA030	NICKEL	17 7	16 8	mg/kg	5%
SB	SW6010	RHA030	ZINC	60 8	55 3	mg/kg	9%
SS	SW8100	RHA039	ANTHRACENE	320	220	µg/kg	37%
SS	SW8100	RHA039	BENZO(a)ANTHRACENE	850	760	µg/kg	11%
SS	SW8100	RHA039	BENZO(a)PYRENE	730	710	µg/kg	3%
SS	SW8100	RHA039	BENZO(b)FLUORANTHENE	660	700	µg/kg	6%
SS	SW8100	RHA039	BENZO(g,h,i)PERYLENE	490	520	µg/kg	6%
SS	SW8100	RHA039	BENZO(k)FLUORANTHENE	680	720	µg/kg	6%
SS	SW8100	RHA039	CHRYSENE	760	710	µg/kg	7%
SS	SW8100	RHA039	FLUORANTHENE	1800	1500	µg/kg	18%
SS	SW8100	RHA039	FLUORENE	300	260	µg/kg	14%
SS	SW8100	RHA039	INDENO(1,2,3-c,d)PYRENE	730	740	µg/kg	1%
SS	SW8100	RHA039	PHENANTHRENE	1200	930	µg/kg	25%
SS	SW8100	RHA039	PYRENE	1300	1200	µg/kg	8%
SS	SW6010	RHA039	ARSENIC	10 9	11 3	mg/kg	4%
SS	SW6010	RHA039	CHROMIUM, TOTAL	51 3	77 2	mg/kg	40%
SS	SW6010	RHA039	COPPER	27 9	27	mg/kg	3%
SS	SW6010	RHA039	LEAD	340	505	mg/kg	39%
SS	SW6010	RHA039	NICKEL	16 3	16 3	mg/kg	0%
SS	SW6010	RHA039	ZINC	182	205	mg/kg	12%
SS	SW8080	RHA045	DDT	300	390	µg/kg	26%
SS	SW8080	RHA056	DDE	620	520	µg/kg	18%
SS	SW8080	RHA056	DDT	1800	1700	µg/kg	6%
SS	SW8100	RHA067	FLUORANTHENE	80	81	µg/kg	1%

TABLE C.3-5
Duplicate Field Sample Results Summary
Memphis Depot Main Installation RI

Sample Matrix	Method #	Sample ID	Parameter	Native Result	Duplicate Result	Units	RPD
SS	SW8100	RHA067	PHENANTHRENE	76	79	µg/kg	4%
SS	SW8100	RHA067	PYRENE	64	72	µg/kg	12%
SS	SW8080	RHA067	ALPHA-CHLORDANE	15	7 1	µg/kg	71%
SS	SW8080	RHA067	DDE	36	24	µg/kg	40%
SS	SW8080	RHA067	DDT	85	42	µg/kg	68%
SS	SW8080	RHA067	GAMMA-CHLORDANE	15	7 4	µg/kg	68%
SB	SW6010	RHA076	ARSENIC	8 6	8 9	mg/kg	3%
SB	SW6010	RHA076	CHROMIUM, TOTAL	11 7	11 8	mg/kg	1%
SB	SW6010	RHA076	COPPER	16 2	16 5	mg/kg	2%
SB	SW6010	RHA076	LEAD	9 3	9 6	mg/kg	3%
SB	SW6010	RHA076	NICKEL	17.3	17	mg/kg	2%
SB	SW6010	RHA076	ZINC	51	52 5	mg/kg	3%
SB	SW6010	RHA082	ARSENIC	9 8	11	mg/kg	12%
SB	SW6010	RHA082	CHROMIUM, TOTAL	10 2	11 9	mg/kg	15%
SB	SW6010	RHA082	COPPER	16 6	18 5	mg/kg	11%
SB	SW6010	RHA082	LEAD	11	13 1	mg/kg	17%
SB	SW6010	RHA082	NICKEL	18	19 8	mg/kg	10%
SB	SW6010	RHA082	ZINC	55 2	59 5	mg/kg	7%
SB	SW8260	RHA092	ACETONE	17	17	µg/kg	0%
SB	SW8080	RHA092	DDE	5 6	11	µg/kg	65%
SB	SW8080	RHA092	DDT	15	31	µg/kg	70%
SB	SW6010	RHA092	ANTIMONY	1	1 2	mg/kg	18%
SB	SW6010	RHA092	ARSENIC	6 9	8 5	mg/kg	21%
SB	SW6010	RHA092	CHROMIUM, TOTAL	13	14	mg/kg	7%
SB	SW6010	RHA092	COPPER	15 8	17 1	mg/kg	8%
SB	SW6010	RHA092	LEAD	8 5	9 4	mg/kg	10%
SB	SW6010	RHA092	NICKEL	18	18 6	mg/kg	3%
SB	SW6010	RHA092	ZINC	44 9	53 6	mg/kg	18%
WS	SW7470	RHA102	MERCURY	0 06	0 04	µg/L	40%
WS	SW6010	RHA102	ALUMINUM	147	81 2	µg/L	58%
WS	SW6010	RHA102	BARIUM	5 8	5	µg/L	15%
WS	SW6010	RHA102	CADMIUM	0 38	0 22	µg/L	53%
WS	SW6010	RHA102	CALCIUM	2490	2440	µg/L	2%
WS	SW6010	RHA102	CHROMIUM, TOTAL	1 2	1 4	µg/L	15%
WS	SW6010	RHA102	COBALT	1 1	0 84	µg/L	27%
WS	SW6010	RHA102	COPPER	4 4	3 4	µg/L	26%
WS	SW6010	RHA102	IRON	306	245	µg/L	22%
WS	SW6010	RHA102	LEAD	5 2	2 6	µg/L	67%
WS	SW6010	RHA102	MAGNESIUM	286	271	µg/L	5%
WS	SW6010	RHA102	MANGANESE	16 7	14 6	µg/L	13%
WS	SW6010	RHA102	SODIUM	456	483	µg/L	6%
WS	SW6010	RHA102	THALLIUM	2 2	1 3	µg/L	51%
WS	SW6010	RHA102	VANADIUM	1	0 76	µg/L	27%
WS	SW6010	RHA102	ZINC	34 6	31 2	µg/L	10%
WS	E415 2	RHA102	TOTAL ORGANIC CARBON	2 3	2 6	mg/L	12%
WS	SW6010	RHA110	ALUMINUM	64	49 8	µg/L	25%
WS	SW6010	RHA110	BARIUM	12 7	12 1	µg/L	5%
WS	SW6010	RHA110	CALCIUM	8370	8150	µg/L	3%
WS	SW6010	RHA110	CHROMIUM, TOTAL	1 4	1 2	µg/L	15%
WS	SW6010	RHA110	COBALT	0 66	0 86	µg/L	26%
WS	SW6010	RHA110	COPPER	9 1	6 6	µg/L	32%
WS	SW6010	RHA110	IRON	417	432	µg/L	4%
WS	SW6010	RHA110	MAGNESIUM	1580	1570	µg/L	1%
WS	SW6010	RHA110	MANGANESE	68 4	69 8	µg/L	2%
WS	SW6010	RHA110	NICKEL	3 3	3 6	µg/L	9%
WS	SW6010	RHA110	POTASSIUM	2730	2540	µg/L	7%
WS	SW6010	RHA110	SELENIUM	1 4	2 9	µg/L	70%

TABLE C.3-5
Duplicate Field Sample Results Summary
Memphis Depot Main Installation RI

Sample Matrix	Method #	Sample ID	Parameter	Native Result	Duplicate Result	Units	RPD
WS	SW6010	RHA110	SODIUM	1080	993	µg/L	8%
WS	SW6010	RHA110	VANADIUM	0 81	0 69	µg/L	16%
WS	SW6010	RHA110	ZINC	61 3	70 2	µg/L	14%
WS	E415 2	RHA110	TOTAL ORGANIC CARBON	5 9	6	mg/L	2%
SB	SW8080	RHA154	ALPHA-CHLORDANE	12	16	µg/kg	29%
SB	SW8080	RHA154	GAMMA-CHLORDANE	11	16	µg/kg	37%
SB	SW6010	RHA154	ARSENIC	9 3	8 9	mg/kg	4%
SB	SW6010	RHA154	CHROMIUM, TOTAL	13 1	11 7	mg/kg	11%
SB	SW6010	RHA154	COPPER	16	15 9	mg/kg	1%
SB	SW6010	RHA154	LEAD	9 4	9 9	mg/kg	5%
SB	SW6010	RHA154	NICKEL	17 3	18	mg/kg	4%
SB	SW6010	RHA154	ZINC	55 8	51 7	mg/kg	8%
SB	SW8260	RHA164	ACETONE	37	30	µg/kg	21%
SB	SW6010	RHA164	ALUMINUM	12200	14300	mg/kg	16%
SB	SW6010	RHA164	ANTIMONY	0 25	0 35	mg/kg	33%
SB	SW6010	RHA164	ARSENIC	8 9	10 1	mg/kg	13%
SB	SW6010	RHA164	BARIUM	121	159	mg/kg	27%
SB	SW6010	RHA164	CADMIUM	0 25	0 29	mg/kg	15%
SB	SW6010	RHA164	CALCIUM	1500	1410	mg/kg	6%
SB	SW6010	RHA164	CHROMIUM, TOTAL	14 6	15 4	mg/kg	5%
SB	SW6010	RHA164	COBALT	8 1	7 8	mg/kg	4%
SB	SW6010	RHA164	COPPER	16 3	18 6	mg/kg	13%
SB	SW6010	RHA164	IRON	20200	20700	mg/kg	2%
SB	SW6010	RHA164	LEAD	10	11 2	mg/kg	11%
SB	SW6010	RHA164	MAGNESIUM	2370	2590	mg/kg	9%
SB	SW6010	RHA164	MANGANESE	445	504	mg/kg	12%
SB	SW6010	RHA164	NICKEL	18	17 5	mg/kg	3%
SB	SW6010	RHA164	POTASSIUM	2530	2650	mg/kg	5%
SB	SW6010	RHA164	VANADIUM	29 1	31 7	mg/kg	9%
SB	SW6010	RHA164	ZINC	52 8	57 4	mg/kg	8%
SB	SW8260	RHA173	ACETONE	18	16	µg/kg	12%
SB	SW6010	RHA173	ALUMINUM	12000	10500	mg/kg	13%
SB	SW6010	RHA173	ARSENIC	8	10	mg/kg	22%
SB	SW6010	RHA173	BARIUM	161	181	mg/kg	12%
SB	SW6010	RHA173	BERYLLIUM	0 03	0 09	mg/kg	100%
SB	SW6010	RHA173	CADMIUM	0 26	0 22	mg/kg	17%
SB	SW6010	RHA173	CALCIUM	1370	1170	mg/kg	16%
SB	SW6010	RHA173	CHROMIUM, TOTAL	13 9	12 9	mg/kg	7%
SB	SW6010	RHA173	COBALT	7 4	8 2	mg/kg	10%
SB	SW6010	RHA173	COPPER	16 7	16 7	mg/kg	0%
SB	SW6010	RHA173	IRON	18300	20300	mg/kg	10%
SB	SW6010	RHA173	LEAD	11	10 6	mg/kg	4%
SB	SW6010	RHA173	MAGNESIUM	2530	2480	mg/kg	2%
SB	SW6010	RHA173	MANGANESE	533	684	mg/kg	25%
SB	SW6010	RHA173	NICKEL	17 2	17 9	mg/kg	4%
SB	SW6010	RHA173	POTASSIUM	2460	2280	mg/kg	8%
SB	SW6010	RHA173	SILVER	0 12	0 15	mg/kg	22%
SB	SW6010	RHA173	SODIUM	54 7	63 7	mg/kg	15%
SB	SW6010	RHA173	VANADIUM	27 1	24 6	mg/kg	10%
SB	SW6010	RHA173	ZINC	56 1	54 6	mg/kg	3%

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Appendix C-4

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MEMORANDUM CH2MHILL

DDMT Main Installation RI/FS Data Quality Evaluation (DQE)

Introduction

Surface and groundwater, soil and sediment samples were collected during the fall of 1998 Field QC samples collected included field duplicates, field blanks, trip blanks (analyzed for VOCs only), and equipment rinsate blanks. The samples were analyzed for the following analytical fractions:

- Volatile organic compounds (VOCs) by SW-846 method 8260B
- Semivolatile organic compounds (SVOCs) by SW-846 method 8270C
- Total Metals by SW-846 methods 6010B and 7000 series
- Organochlorine Pesticides and PCB's by SW846 method 8081
- Polynuclear Aromatics (PAH's) by SW846 method 8100
- Hexavalent Chromium by SW846 method 7196
- Total Organic Carbon (TOC) by SW-846 9060

The purpose of the data quality evaluation process (DQEP) is to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a straight-forward check of compliance with the method requirements; either the laboratory did, or did not, analyze the samples within the limits of the analytical method Evaluation of matrix interferences is more subtle and involves the analysis of several areas of results including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

DQE for the Screening Sites data consisted of the following two principal activities:

- Hard copy "validation" of the EPA Level 3 data packages (as a note, it is not possible to "validate" the EPA Level 2 data because there is no QC summary data to evaluate)

- Database-wide evaluation of the trends in data quality (for example, trends in surrogate spike recovery)

It is important to note that *"data validation"* is the assessment of the hard-copy data base deliverables in terms of method compliance, and *"data quality evaluation"* is the qualitative evaluation of overall trends in the project-specific database. Areas evaluated in the DQE include the following:

- Potential "blank contamination" (i.e. the effect on the usability of data for target compounds and analytes detected in both the field or laboratory blank samples and the corresponding field samples)

- Laboratory performance (i.e. recovery for spiked blank samples and other laboratory checks such as calibration and laboratory control samples)

- Matrix interferences (i.e. recovery for spiked field samples)

- Usability of metals results at, or near, the instrument detection limits

This DQE technical memorandum (TM) includes the following:

- Results of the database-wide DQE queries (summary tables are included at the end of this report)

- Assessment of the overall usability of the data to support the project decision-making process

The focus of the hard-copy data validation was to review each of the QC summary sheets, note nonconformances on the DV worksheets, qualify the data as appropriate, and summarize the results of this review. These completed worksheets are included in the project file and are available upon request.

Data Evaluation Criteria

Before the analytical results were released by the laboratory, both the sample and QC data were carefully reviewed to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the resulting data were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision Any non-conforming data were discussed in the data package cover letter and case narrative

The EPA Level 3 QC data packages were reviewed by the project chemists using the process outlined in the Environmental Protection Agency (EPA) guidance document *Functional Guidelines for Evaluating Data* (February, 1994). Areas of review included (when applicable to the method) holding time compliance, calibration verification, blank results, matrix spike precision and accuracy, method accuracy as demonstrated by LCSs, field duplicate results, surrogate recoveries, internal standard performance, and interference checks. A data review worksheet was completed for each of these data packages and any non-conformance documented This data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decision-making processes.

Data that were not within the acceptance limits were appended with a qualifying flag, which consists of a single or double-letter abbreviation that reflects a problem with the data. Although the qualifying flags originate during the database query process, they are included in the final data summary tables deliverable so that the data will not be used indiscriminately. The following flags were used in this text:

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TABLE C.4-1
Data Qualification Flags
Memphis Depot Main Installation RI

Qualifier	Description
U	Undetected. Analyte was analyzed for but not detected above the method detection limit
UJ	Detection limit estimated. Analyte was analyzed for, and qualified as not detected. The result is estimated.
J	Estimated. The analyte was present, but the reported value may not be accurate or precise.
R	Rejected. The data are unusable. (NOTE· Analyte/compound may or may not be present.)

Numerical sample results that are greater than the method detection limit (MDL) but less than the laboratory reporting limit (RL) are qualified with a "J" for estimated as required by the EPA Functional Guidelines for Evaluating Data Quality.

The entire database was queried for frequency of detection in blanks and samples, detailed listing of blank detects, matrix spike/matrix spike duplicate (MS/MSD) results, field duplicate precision, surrogate recoveries, preparation and analysis dates pertaining to holding times. The queries were then manipulated to calculate necessary statistics for evaluation of the data.

Once the data review and validation process was completed, the entire data set were reviewed for chemical compound frequencies of detection, dilution factors that might affect data usability, and patterns of target compound distribution. The data set was also evaluated to identify potential data limitations, uncertainties, or both in the analytical results. Attachment A lists the changes in data qualifiers due to the validation processes.

Potential Field Sampling and Laboratory Contamination

Four types of blank samples were used to monitor potential contamination introduced during field sampling, sample handling, shipping activities, as well as sample preparation and analysis in the laboratory

- **Trip Blank (TB)**: A sample of ASTM Type II water that is prepared in the laboratory prior to the sampling event. The water is stored in VOC sample containers and is not opened in the field, and travels back to the laboratory with the other samples for VOC analysis. This blank is used to monitor the potential for sample contamination during the sample container trip. One trip blank should be included in each sample cooler that contained samples for VOC analysis. Ten trip blanks were submitted to the laboratory with these samples.

- **Equipment Rinsate Blank (ERB)**: A sample of the target-free water used for the final rinse during the equipment decontamination process. This blank sample is collected by rinsing the sampling equipment after decontamination and is analyzed for the same analytical parameters as the corresponding samples. This blank is used to monitor potential contamination caused by incomplete equipment decontamination. One equipment rinsate blank should be collected per day of sampling, per type of sampling equipment. Depending on the method, up to seventeen equipment rinsate blanks were submitted to the laboratory for this field effort

- **Field Blank or Ambient Blank (FB or AB)**: The field blank is an aliquot of the source water used for equipment decontamination. This blank monitors contamination that may be introduced from the water used for decontamination. One field blank should be collected from each source of decontamination water and analyzed for the same parameters as the associated samples Three field blanks were collected during this sampling event.

- **Laboratory Method Blank or Method Blank (MB)**: A laboratory method blank is ASTM Type II water that is treated as a sample in that it undergoes the same analytical process as the corresponding field samples. Method blanks are used to monitor laboratory performance and contamination introduced during the analytical procedure. One method blank was prepared and analyzed for every twenty samples or per analytical batch, whichever was more frequent.

Evaluation Criteria of QC Blank Results

According to the EPA Functional Guidelines, concentrations of common organic contaminants detected in samples at less than ten times the concentration of the associated blanks can be attributed to field sampling and laboratory contamination rather than environmental contamination from site activities Common organic contaminants include acetone, methylene chloride, 2-butanone, and the phthalates. For other inorganic and organic contaminants, five times the concentration detected in the associated blanks (rather than ten times) is used to qualify results as potential field and/or laboratory contamination rather than environmental contamination. The ten times rule was applied on an SDG by SDG basis and not globally. Global application, however, would account for anomalous data which should be attributed to laboratory or field blank contamination.

Detects in the samples at levels less than the action levels listed were qualified as not detected. Table C.4-2 compiles the blank detections into a "frequency of detection" by target parameter.

Table C.4-2 indicates that acetone, methylene chloride, 2-butanone, chloroform, and toluene were detected in at least one of the different volatiles blanks. Methylene chloride, acetone, and 2-butanone are common contaminants Methylene chloride and acetone are common laboratory extraction solvents. Butanone and the other ketones are common contaminants of methanol, the solvent used for equipment decontamination The majority of the sample detections for these compounds were qualified as not detected due to blank contamination. However, the data user should be cautioned that some of the remaining sample hits are anomalous and more than likely should be attributed to contamination. Chloroform was detected in two rinsate blanks and in one field sample at approximately the same concentration level. This compound is a THM (trihalomethane) and is suspected to be a contaminant in the laboratory water since no field blanks or samples contained detectable levels of chloroform Toluene was detected in a single rinsate blank at the MDL and was not used to qualify any field samples due to this low level.

Phthalates are used as plasticizers. The most common phthalates are bis(2-ethylhexyl) phthalate (BEHP) and Di-n-butylphthalate. Phthalates are often introduced into samples during handling. Gloves are often used when handling soil sampling and groundwater sampling equipment such as pumps, hoses, split spoons, dredges and bailers. Additionally, laboratory chemists use gloves when handling samples and extracts. Gloves are coated with plasticizers such as BEHP to facilitate release of the gloves from the skin. Table C.4-2 indicates that phthalates were detected in multiple blanks Attachment A reflects several field samples qualified as not detected due to blank contamination Again, if global application of the flags were applied, the majority of all phthalate detections would be qualified as not detected due to contamination. Thus, caution should be utilized when making decisions based upon phthalate data.

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As listed in Table C.4-2, several metals were reported in either the method, equipment rinsate, and/or field blanks. Sample results less than five times the concentration found in the associated blanks for that SDG were attributed to field sampling or laboratory contamination and are not considered to be indicative of environmental contamination. Samples reflecting this condition were qualified as not detected. These metals included aluminum, antimony, arsenic, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, selenium, silver, sodium, thallium, vanadium, and zinc.

Many of these metals are ubiquitous at low levels (aluminum, calcium, chromium, copper, nickel, iron, magnesium, manganese, sodium, and zinc). Iron, chromium, and nickel are associated with alloys of steel. Aluminum and copper are the primary metals used in conduits, tubing, and some electrical wiring. Lead is associated with many alloys or solder combinations. Calcium, magnesium, and sodium are the cations associated with common salts Additionally, many of these elements can be found as trace level contaminants in acids utilized for digestion in the laboratory. Other metals such as antimony, arsenic, beryllium, cadmium, cobalt, selenium, silver, thallium, and vanadium are not common contaminants and generally are quantitated just above the MDL and are usually false positives associated with instrument noise.

Samples were qualified for metallic blank contamination on an SDG applicable basis and not globally. Any sample concentration falling under the five times blank rule was qualified as not detected. Affected samples can be examined in Attachment A.

Matrix Effects

Surrogate Spike Recovery

Surrogate spike compounds were added to every sample analyzed for the organic parameters including field and laboratory blanks as well as field environmental samples Surrogate spikes consist of organic compounds which are similar to the method targets in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.

Surrogate spike recoveries were used to monitor both laboratory performance and matrix interferences. Surrogate spike recoveries from field and laboratory blanks were used to evaluate laboratory performance because the blanks should represent an "ideal" sample matrix. Surrogate spike recoveries for field samples were used to evaluate the potential for matrix interferences. According to *Functional Guidelines*, data are not qualified with respect to surrogate recoveries unless one or more volatile surrogates are out of specifications. Semivolatiles are not qualified unless two or more surrogates, within the same fraction (base/neutral or acid fraction), are out of specification.

As each data package was reviewed, the surrogate spike recoveries were compared to the QC target limits summarized in Table C.4-3.

Surrogate recoveries were well within method acceptance ranges. No VOC samples were qualified due to unacceptable surrogate recoveries. A greater variation (and hence broader range of recoveries) in surrogate spike recovery was observed for the SVOC analyses, but this is typical and is reflected by the broader method target acceptance limits. Again, recoveries for the SVOC's were mostly well within control limits. One pesticide/PCB sample, one 8270 SVOC re-extraction, and ten 8100 PAH samples were qualified as estimated for surrogate recoveries outside control limits. The recoveries indicate that the matrix did not influence the analytical method or the final analytical result.

Matrix Spike/Matrix Spike Duplicate Precision and Accuracy

A matrix spike is an aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix. The matrix spike duplicate is an intralaboratory-split sample spiked with identical concentrations of target analyte(s). The spiking occurs prior to sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. For the MS/MSD measurement, three aliquots of a single sample are analyzed; one native sample and two spiked with target analytes or compounds Matrix accuracy is evaluated from the spike recoveries, while precision is evaluated from comparison of the percent recoveries of the MS and MSD. All MS/MSD precision and accuracy results are listed in Table C 4-4.

Organic results are not qualified upon the results of MS/MSD results alone. Evaluation is in conjunction with surrogate and internal standard (if applicable) results. Additionally, many MS/MSD samples require dilution and thus the spike compounds added are diluted out and able to be evaluated. The majority of the accuracy and precision results were well within established criteria, indicating that the specific sample matrix did not influence the overall analytical process or the final numerical sample result. No organic methods required qualification due to the MS/MSD precision and accuracy measurements indicating that the matrix did not influence the method or the final analytical result.

Inorganic results may be qualified solely upon the results of the matrix spike/matrix spike duplicate precision and accuracy. Instances where the native sample concentration for a given element exceeds the spike added concentration by a factor of four or more are disregarded as the spike added would be masked by the native concentration This phenomenon often occurs in a soil matrix for common elements such as iron and aluminum. According to *Functional Guidelines*, metals recoveries of less than 30 percent for a given element require all associated non-detects to be rejected This was the case for 34 antimony results. Any recovery greater than 30% and outside the 75-125% recovery control limits are required to be flagged as estimated. Precision requirements for soils and waters are at 35 and 20 relative percent difference (RPD), respectively. As Table C.4-4 indicates, the majority of the accuracy and precision results were well within established criteria, indicating that the specific sample matrix did not influence the overall analytical process or the final numerical sample result.

Field Duplicate Sample Results

Field duplicate analyses measure both field and laboratory precision and can also be affected by the homogeneity of the samples. Therefore the results may have more variability than lab duplicates, which measure only lab performance. According to the EPA *Functional Guidelines*, there are no qualification criteria for field duplicate precision. Field duplicate results are summarized in Table C.4-5.

Dependent upon the method, there were up to 18 sets of field duplicates collected during this field effort Both the native and duplicate samples were analyzed for the same parameters.

An aqueous control limit of ± 20% for the RPD was used for original and duplicate sample values greater than or equal to five times the RL. Solid samples utilized a control limit of 35 RPD. A control limit of ± the RL was used if either the sample for the duplicate value was less than five times the RL for waters and 2 times the RL for soils. In the cases where only one result is above the five times the RL level and the other is below, the ± RL criteria were applied Table C.4-5 includes a summary of the field duplicate measurements and their associated precision statistic Statistics outside criteria are highlighted in gray.

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Six field duplicate sets contained at least one, but no more than three parameters outside precision criteria One field duplicate set (MIA313) contained six parameters outside precision criteria.

The 18 field duplicates produced a total of 434 results of which 17 did not meet acceptance criteria. Thus, the precision data (96% complete) indicate that matrix heterogeneity and sampling technique did not greatly influence the final numerical result.

Sample Results for Metals Near the Method Detection Limit (MDL)

The samples were primarily analyzed for the TAL list of metals or a sub-set thereof. The MDL is defined as the minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero. Sample results at, or near, the MDL may be false positives caused by instrument noise or low-level background shifts rather than a true analyte signal. Additionally, concentrations reported at up to 5 times the MDL should be recognized as lacking accuracy or precision.

PARCCs

Precision--is defined as the agreement between duplicate results, and was estimated by comparing duplicate matrix spike recoveries and field duplicate sample results. MS/MSD precision was documented as well within control limit criteria Other than the documented exceptions, the precision between native and field duplicate sample results were within acceptable criteria for 96% of the measurements indicating that sample matrix did not significantly interfere with the overall analytical process.

Accuracy--is a measure of the agreement between an experimental determination and the true value of the parameter being measured. For the organic analyses, each of the samples was spiked with a surrogate compound; and for organic and inorganic analyses a MS, MSD, and LCS were spiked with a known reference material before preparation. Each of these approaches provides a measure of the matrix effects on the analytical accuracy. The LCS results demonstrate accuracy of the method and the laboratory's to meet the method criteria. MS/MSD results establish precision and accuracy of the matrix. Spike recoveries were within the method acceptance limits for the majority of the measurements; therefore, other than the documented exceptions, there was no evidence of significant matrix interferences that would affect the usability of the data.

Representativeness--this criteria is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition. Representativeness is a subjective parameter and is used to evaluate the efficacy of the sampling plan design. Representativeness was demonstrated by providing full descriptions in the project scoping documents of the sampling techniques and the rationale used for selecting sampling locations.

Completeness--is defined as the percentage of measurements that are judged to be valid compared to the to total number of measurements made Other than the 34 antimony results rejected, only dilutions and re-extractions were rejected. Any dilution or re-extraction which were rejected was because a sample can only have a single numerical result for each target. A goal of 90 percent usable data was established in the project scoping document and 95.2% percent of the data was determined to be valid.

Comparability--is another qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix type, and analytical method. Comparability is limited by the other PARCC parameters because data sets can be compared with confidence only when precision and accuracy are known. Data from this investigation are comparable with other data collected at the site because only EPA methods were used to analyze the sample and EPA Level III QC data are available to support the quality of the data.

Summary and Conclusions

Conclusions of the data quality evaluation process include:

- The laboratory analyzed the samples according to the EPA methods stated in the work plan as demonstrated by the deliverable summaries and analytical run sequences
- Concentrations of acetone, chloroform, methylene chloride, Di-n-butyl phthalate, and BEHP, should all be attributed to field sampling and laboratory contamination rather than environmental contamination and all samples results were flagged as non-detected for these parameters. Several metals were qualified as not detected on an SDG by SDG basis as appropriate.
- Sample results for metals above the MDL but less than the RL may be attributed to instrument noise and/or low level contamination and not site-related activities and as such may be false positives.
- Sample results for target organic compounds above the MDL but less than the RL should be considered as uncertain but indicative of the presence of that compound at an estimated concentration
- Spike recoveries and duplicate sample results (other than the detailed exceptions in the text) indicate that the specific sample matrix did not interfere with the analytical process.

The project objectives or PARCCs were met, and the data can be used in the project decision-making process as qualified by the data quality evaluation process.

TABLE C.4-2
Frequency of Detection in Blanks
Memphis Depot Main Installation RI

Sample Type	Analytical Method	Parameter	Number Analyzed	Number Detected	Min Detected	Max Detected	Min Detection Limit	Max Detection Limit	Units
LB	SW6010	ALUMINUM	11	6	0 879	1 568	0 79	0 79	mg/kg
LB	SW6010	ALUMINUM	11	8	9 67	26 2	7 90	7 90	ug/L
FB	SW6010	ALUMINUM	3	2	10 3	27 8	7 90	7 90	ug/L
EB	SW6010	ALUMINUM	13	8	8 1	37 6	7 90	7 90	ug/L
LB	SW6010	ANTIMONY	18	6	-0 384	0 252	0 17	0 17	mg/kg
FB	SW6010	ANTIMONY	3	1	3 3	3 3	1 70	1 70	ug/L
LB	SW6010	ANTIMONY	15	8	-2 59	3 77	1 70	18 90	ug/L
EB	SW6010	ANTIMONY	17	2	3	4	1 70	1 70	ug/L
FB	SW6010	ARSENIC	3	1	1 6	1 6	1 40	1 40	ug/L
EB	SW6010	ARSENIC	17	1	2 3	2 3	1 40	1 40	ug/L
LB	SW6010	BERYLLIUM	18	16	-0 004	0 017	0 00	0 00	mg/kg
FB	SW6010	BERYLLIUM	3	3	0 05	0 09	0 03	0 03	ug/L
EB	SW6010	BERYLLIUM	17	15	0 02	0 13	0 02	0 03	ug/L
LB	SW6010	BERYLLIUM	15	15	-0 74	0 16	0 03	0 10	ug/L
LB	SW6010	CADMIUM	18	9	-0 031	0 012	0 01	0 01	mg/kg
LB	SW6010	CADMIUM	15	3	0 11	0 11	0 09	2 90	ug/L
LB	SW6010	CALCIUM	11	6	3 33	8 253	2 37	2 37	mg/kg
LB	SW6010	CALCIUM	11	1	31 09	31 09	23 70	23 72	ug/L
FB	SW6010	CALCIUM	3	3	34 6	41 2	23 70	23 70	ug/L
EB	SW6010	CALCIUM	13	10	26 1	73 7	23 70	23 70	ug/L
LB	SW6010	CHROMIUM, TOTAL	18	12	0 103	0 178	0 10	0 10	mg/kg
EB	SW6010	CHROMIUM, TOTAL	17	4	1 04	1 2	1 00	1 00	ug/L
FB	SW6010	CHROMIUM, TOTAL	3	2	1	1 5	1 00	1 00	ug/L
LB	SW6010	COBALT	11	1	0 054	0 054	0 05	0 05	mg/kg
LB	SW6010	COBALT	11	3	0 51	0 51	0 50	0 50	ug/L
FB	SW6010	COBALT	3	2	0 52	0 69	0 50	0 50	ug/L
EB	SW6010	COBALT	13	3	0 59	0 82	0 50	0 50	ug/L
LB	SW6010	COPPER	18	4	-0 219	0 275	0 10	0 10	mg/kg
LB	SW6010	COPPER	15	9	1 39	1 96	1 00	1 20	ug/L
EB	SW6010	COPPER	17	7	1	9 1	1 00	1 00	ug/L
LB	SW6010	IRON	11	11	-4 012	1 715	0 36	0 36	mg/kg
EB	SW6010	IRON	13	4	7 8	13 2	3 60	3 60	ug/L
LB	SW6010	IRON	11	3	14 35	14 35	3 60	3 60	ug/L
FB	SW6010	IRON	3	2	6 6	105	3 60	3 60	ug/L
LB	SW6010	LEAD	18	5	-0 23	0 211	0 13	0 13	mg/kg
EB	SW6010	LEAD	17	1	1 8	1 8	1 30	1 30	ug/L
LB	SW6010	MAGNESIUM	11	9	-2 445	2 51	0 62	0 62	mg/kg
FB	SW6010	MAGNESIUM	3	2	17 4	18 1	6 20	6 20	ug/L
EB	SW6010	MAGNESIUM	13	8	6 8	20	6 20	6 20	ug/L
LB	SW6010	MANGANESE	11	6	-0 06	0 129	0 05	0 05	mg/kg
EB	SW6010	MANGANESE	13	3	0 53	0 85	0 50	0 53	ug/L
FB	SW6010	MANGANESE	3	2	0 83	0 97	0 50	0 53	ug/L
LB	SW6010	NICKEL	18	7	0 031	0 038	0 03	0 03	mg/kg
EB	SW6010	NICKEL	17	1	0 32	0 32	0 30	0 32	ug/L
LB	SW6010	SELENIUM	18	8	-0 356	0 264	0 16	0 16	mg/kg
LB	SW6010	SELENIUM	15	9	-1 97	3 2	1 60	31 10	ug/L
LB	SW6010	SILVER	18	1	0 05	0 05	0 05	0 05	mg/kg
LB	SW6010	SODIUM	11	7	25 011	67 457	11 42	11 42	mg/kg
LB	SW6010	SODIUM	11	11	300 33	386 06	114 20	114 20	ug/L
FB	SW6010	SODIUM	3	3	309	415	114 20	114 20	ug/L
EB	SW6010	SODIUM	13	13	200	24700	114 20	114 20	ug/L
EB	SW6010	THALLIUM	17	1	1 6	1 6	1 60	1 60	ug/L
LB	SW6010	VANADIUM	11	5	-0 087	0 03	0 03	0 03	mg/kg
LB	SW6010	VANADIUM	11	4	0 34	0 41	0 30	0 31	ug/L
EB	SW6010	VANADIUM	13	2	0 44	0 81	0 30	0 31	ug/L
LB	SW6010	ZINC	18	7	-0 214	1 258	0 11	0 11	mg/kg
FB	SW6010	ZINC	3	2	1 9	3	1 10	1 10	ug/L
LB	SW6010	ZINC	15	7	1 26	3	1 10	4 70	ug/L
EB	SW6010	ZINC	17	14	1 2	23 6	1 10	1 10	ug/L
FB	SW7470	MERCURY	3	1	0 09	0 09	0 09	0 11	ug/L
EB	SW7470	MERCURY	17	1	0 1	0 1	0 08	0 11	ug/L
EB	SW8260	ACETONE	12	5	5	8	10 00	10 00	ug/L
FB	SW8260	ACETONE	3	1	8	8	10 00	10 00	ug/L
LB	SW8260	ACETONE	18	11	3	57	10 00	500 00	ug/kg
EB	SW8260	CHLOROFORM	12	2	1	1	10	10	ug/L
EB	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	12	2	3	4	10 00	10 00	ug/L
EB	SW8260	METHYLENE CHLORIDE	12	1	1	1	10	10	ug/L
LB	SW8260	METHYLENE CHLORIDE	13	2	1	1	10	10	ug/L
LB	SW8260	METHYLENE CHLORIDE	18	8	1	5	10 00	500 00	ug/kg
EB	SW8260	TOLUENE	12	1	1	1	10	10	ug/L
LB	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	6	2	2	2	10 00	10 00	ug/L
EB	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	6	4	1	4	10 00	10 00	ug/L
EB	SW8270	DI-n-BUTYL PHTHALATE	6	1	1	1	10	10	ug/L
EB	SW8270	DI-n-BUTYL PHTHALATE	6	1	1	1	10	10	ug/L
LB	SW8270	DI-n-BUTYL PHTHALATE	6	1	1	1	10	10	ug/L
LB	SW8270	DI-n-BUTYL PHTHALATE	6	4	1	1	10	10	ug/L
LB	SW8270	DI-n-BUTYL PHTHALATE	13	11	35	60	330 00	330 00	ug/kg

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TABLE C.4-3
Surrogate Recovery Criteria
Memphis Depot Main Installation RI

	SW8081 (SW3510): 2,4,5,6-TETRACHLORO-META-XYLENE	SW8081 (SW3510): DECACHLOROBIPHENYL	SW8081 (SW3550): 2,4,5,6-TETRACHLORO-META-XYLENE	SW8081 (SW3550): DECACHLOROBIPHENYL	SW8100 (SW3510): TERPHENYL-D14	SW8100 (SW3550): TERPHENYL-D14	SW8260 (METHOD): 1,2-DICHLOROETHANE-D4	SW8260 (METHOD). 1-BROMO-4-FLUOROBENZENE (4-BROMOFLUOROBENZENE)	SW8260 (METHOD). DIBROMOFLUOROMETHANE	SW8260 (METHOD): TOLUENE-D8	SW8270 (SW3510): 2,4,6-TRIBROMOPHENOL	SW8270 (SW3510): 2-FLUOROBIPHENYL	SW8270 (SW3510). 2-FLUOROPHENOL	SW8270 (SW3510): NITROBENZENE-D5	SW8270 (SW3510): PHENOL-D5	SW8270 (SW3510): TERPHENYL-D14	SW8270 (SW3520): 2,4,6-TRIBROMOPHENOL	SW8270 (SW3520): 2-FLUOROBIPHENYL
Lab Blanks Ranges	59-91	84-102	72-94	76-106	59-86	61-92	84-107	98-111	98-114	106-118	84-106	79-98	49-61	76-92	35-45	86-118	81-108	71-93
Field Sample Ranges	37-101	62-100	69-115	64-113	51-85	34-119	66-116	83-140	78-119	82-123	63-130	40-103	29-72	41-112	22-54	51-117	90-126	66-99

TABLE C.4-3
Surrogate Recovery Criteria
Memphis Depot Main Installation RI

	SW8270 (SW3520): 2-FLUOROPHENOL	SW8270 (SW3520): NITROBENZENE-D5	SW8270 (SW3520): PHENOL-D5	SW8270 (SW3520): TERPHENYL-D14	SW8270 (SW3550) 2,4,6-TRIBROMOPHENOL	SW8270 (SW3550): 2-FLUOROBIPHENYL	SW8270 (SW3550): 2-FLUOROPHENOL	SW8270 (SW3550): NITROBENZENE-D5	SW8270 (SW3550): PHENOL-D5	SW8270 (SW3550): TERPHENYL-D14	TC8080 (SW1311): 2,4,5,6-TETRACHLORO-META-XYLENE, TCLP	TC8080 (SW1311). DECACHLOROBIPHENYL, TCLP	TC8270 (SW1311): 2,4,6-TRIBROMOPHENOL, TCLP	TC8270 (SW1311): 2-FLUOROBIPHENYL, TCLP	TC8270 (SW1311): 2-FLUOROPHENOL, TCLP	TC8270 (SW1311). NITROBENZENE-D5, TCLP	TC8270 (SW1311). PHENOL-D5, TCLP	TC8270 (SW1311): TERPHENYL-D14, TCLP
Lab Blanks Ranges	34-98	87-104	52-108	84-102	40-88	61-95	62-83	67-97	68-89	64-99	79-89	102-108	62-113	55-76	54-97	63-97	54-113	84-95
Field Sample Ranges	84-110	87-112	92-108	80-106	54-128	59-106	58-106	57-108	62-117	50-112	68	97	59-136	48-83	46-94	54-101	47-114	69-106

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TABLE C 4-4
MS/MSD Accuracy and Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Sample ID	Parameter	Lab Result	Lab Qual	Units	MS Lab Result	MS Spike Added	MS Recovery	MSD Lab Result	MSD Spike Added	MSD Recovery	RPD
SS	E310.1	MIA112	ALKALINITY, TOTAL (AS CaCO3)	752000	=	mg/kg	1230000.00	517812.00	92.3%	1250000.00	517812.00	96.17%	1.6%
SS	E310.1	MIA159	ALKALINITY, TOTAL (AS CaCO3)	41400	=	mg/kg	333605.00	280930.00	104.0%	322368.00	280630.00	100.12%	3.4%
SS	SW6010	MIA138	IRON	20400	=	mg/kg	17892.67	168.20	-1490.7%	16343.50	168.20	-2411.72%	9.0%
SS	SW6010	MIA033	LEAD	318	=	mg/kg	106.68	58.50	-361.2%	93.03	58.50	-384.56%	13.7%
SS	SW6010	MIA327	CHROMIUM, TOTAL	133	=	mg/kg	123.37	21.11	-45.6%	145.23	21.11	57.91%	16.3%
SS	SW6010	MIA327	LEAD	332	=	mg/kg	313.98	53.42	-33.7%	382.65	53.42	94.81%	19.7%
SS	SW6010	MIA159	ZINC	340	=	mg/kg	330.94	56.00	-16.2%	892.13	56.00	985.92%	91.8%
SS	SW6010	MIA327	ZINC	282	=	mg/kg	281.97	53.36	-0.1%	294.13	53.36	22.74%	4.2%
SS	SW6010	MIA159	COPPER	208	=	mg/kg	208.26	28.09	0.9%	289.89	28.09	291.54%	32.8%
SS	SW6010	MIA327	MANGANESE	311	=	mg/kg	317.37	52.98	12.0%	334.79	52.98	44.91%	5.3%
SS	SW6010	MIA138	ANTIMONY	0.96	TR	mg/kg	9.73	59.10	14.8%	12.05	59.10	18.77%	21.4%
SS	SW6010	MIA128	ANTIMONY	1	TR	mg/kg	14.69	57.72	23.7%	17.16	57.72	28.00%	15.5%
SS	SW6010	MIA159	CHROMIUM, TOTAL	233	=	mg/kg	238.25	22.13	23.7%	463.14	22.13	1039.95%	64.1%
SS	SW6010	MIA327	ANTIMONY	0.18	U	mg/kg	13.87	52.97	26.2%	20.85	52.97	39.36%	40.2%
SS	SW6010	MIA159	ANTIMONY	3	TR	mg/kg	18.85	56.16	28.2%	19.28	56.16	28.98%	2.2%
SS	SW6010	MIA306	ANTIMONY	0.4	TR	mg/kg	20.26	57.67	34.4%	21.16	57.67	35.99%	4.4%
SS	SW6010	MIA230	ANTIMONY	0.68	TR	mg/kg	26.54	59.67	43.3%	24.50	59.67	39.92%	8.0%
SS	SW6010	MIA033	ANTIMONY	0.42	TR	mg/kg	26.08	58.28	44.0%	36.77	58.28	62.37%	34.0%
SS	SW6010	MIA277	ANTIMONY	0.41	TR	mg/kg	25.10	55.13	44.8%	29.43	55.13	52.63%	15.9%
SS	SW6010	MIA296	ANTIMONY	2.1	TR	mg/kg	27.48	53.57	47.4%	30.16	53.57	52.39%	9.3%
SS	SW6010	MIA033	SILVER	0.06	U	mg/kg	4.10	5.83	70.3%	4.29	5.83	73.57%	4.5%
SS	SW6010	MIA033	CHROMIUM, TOTAL	13.2	=	mg/kg	29.70	23.32	70.8%	28.18	23.32	64.22%	5.3%
SS	SW6010	MIA138	SILVER	0.06	U	mg/kg	4.22	5.91	71.5%	4.35	5.91	73.58%	2.9%
SS	SW6010	MIA277	COPPER	17.6	=	mg/kg	37.32	27.55	71.6%	39.56	27.55	79.70%	5.8%
SS	SW6010	MIA327	NICKEL	16.2	=	mg/kg	54.40	52.97	72.1%	57.25	52.97	77.50%	5.1%
SS	SW6010	MIA159	NICKEL	59.9	=	mg/kg	100.87	56.16	72.9%	114.31	56.16	96.89%	12.5%
SS	SW6010	MIA138	VANADIUM	27.4	=	mg/kg	70.87	59.10	73.6%	70.53	59.10	72.98%	0.5%
SS	SW6010	MIA327	CADMIUM	0.51	TR	mg/kg	4.41	5.30	73.6%	4.46	5.30	74.57%	1.2%
SS	SW6010	MIA327	SILVER	0.05	U	mg/kg	3.91	5.30	73.8%	3.93	5.30	74.21%	0.6%
SS	SW6010	MIA327	COBALT	4.7	TR	mg/kg	43.97	53.00	74.1%	44.53	53.00	75.15%	1.3%
SS	SW6010	MIA033	ZINC	44	=	mg/kg	87.46	58.30	74.6%	87.65	58.30	74.88%	0.2%
SS	SW6010	MIA138	CHROMIUM, TOTAL	13.8	=	mg/kg	31.48	23.67	74.7%	31.76	23.67	75.85%	0.9%
SS	SW6010	MIA277	SILVER	0.13	TR	mg/kg	4.26	5.51	74.9%	4.31	5.51	75.82%	1.2%
SS	SW6010	MIA159	THALLIUM	0.9	U	mg/kg	168.50	224.72	75.0%	178.80	224.72	79.57%	5.9%
SS	SW6010	MIA277	NICKEL	5.8	=	mg/kg	47.28	55.11	75.3%	48.07	55.11	76.70%	1.7%
SS	SW6010	MIA138	LEAD	65.4	=	mg/kg	110.09	59.09	75.6%	121.07	59.09	94.21%	9.5%
SS	SW6010	MIA230	SILVER	0.06	U	mg/kg	4.52	5.97	75.7%	4.46	5.97	74.68%	1.4%
SS	SW6010	MIA138	ZINC	61.4	=	mg/kg	106.41	59.10	76.2%	103.91	59.10	71.92%	2.4%
SS	SW6010	MIA138	NICKEL	16.3	=	mg/kg	61.34	59.14	76.2%	61.54	59.14	76.50%	0.3%
SS	SW6010	MIA033	NICKEL	11.8	=	mg/kg	56.96	58.24	77.5%	57.46	58.24	78.40%	0.9%
SS	SW6010	MIA159	SILVER	0.06	U	mg/kg	4.36	5.62	77.6%	4.06	5.62	72.19%	7.3%
SS	SW6010	MIA138	COBALT	7.6	=	mg/kg	53.62	59.11	77.8%	54.09	59.11	78.66%	0.9%
SS	SW6010	MIA138	SELENIUM	1.3	=	mg/kg	185.75	236.38	78.0%	185.85	236.38	78.07%	0.1%
SS	SW6010	MIA138	MANGANESE	657	=	mg/kg	703.43	59.29	78.3%	645.10	59.29	-20.07%	8.7%
SS	SW6010	MIA277	BERYLLIUM	0.26	TR	mg/kg	4.60	5.51	78.8%	4.72	5.51	81.03%	2.6%
SS	SW6010	MIA033	ARSENIC	39	=	mg/kg	222.81	233.09	78.9%	231.02	233.09	82.38%	3.6%
SS	SW6010	MIA138	CADMIUM	0.05	TR	mg/kg	4.72	5.91	79.0%	4.79	5.91	80.20%	1.5%
SS	SW6010	MIA327	THALLIUM	0.17	U	mg/kg	168.31	211.86	79.4%	169.98	211.86	80.23%	1.0%
SS	SW6010	MIA306	ZINC	45.2	=	mg/kg	91.07	57.67	79.5%	88.86	57.67	75.71%	2.5%
SS	SW6010	MIA306	NICKEL	15.1	=	mg/kg	61.06	57.65	79.7%	60.75	57.65	79.20%	0.5%
SS	SW6010	MIA306	LEAD	10.4	=	mg/kg	56.42	57.70	79.8%	56.28	57.70	79.52%	0.2%
SS	SW6010	MIA277	THALLIUM	0.18	U	mg/kg	176.76	220.51	80.2%	179.72	220.51	81.50%	1.7%
SS	SW6010	MIA277	SELENIUM	0.18	U	mg/kg	177.30	220.51	80.4%	180.00	220.51	81.63%	1.5%
SS	SW6010	MIA306	CHROMIUM, TOTAL	10.3	=	mg/kg	28.89	23.10	80.5%	29.36	23.10	82.49%	1.6%
SS	SW6010	MIA033	CADMIUM	0.03	TR	mg/kg	4.73	5.83	80.6%	4.88	5.83	83.08%	3.0%

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TABLE C 4-4
MS/MSD Accuracy and Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Sample ID	Parameter	Lab Result	Lab Qual	Units	MS Lab Result	MS Spike Added	MS Recovery	MSD Lab Result	MSD Spike Added	MSD Recovery	RPD
SS	SW6010	MIA306	SILVER	0.06	U	mg/kg	4.67	5.77	80.9%	4.69	5.77	81.32%	0.5%
SS	SW6010	MIA306	CADMIUM	0.26	TR	mg/kg	4.93	5.77	81.0%	4.95	5.77	81.26%	0.3%
SS	SW6010	MIA033	BERYLLIUM	0.67	=	mg/kg	5.40	5.83	81.1%	5.46	5.83	82.19%	1.2%
SS	SW6010	MIA138	THALLIUM	0.19	U	mg/kg	191.69	236.41	81.1%	195.09	236.41	82.52%	1.8%
SS	SW6010	MIA128	LEAD	36.3	=	mg/kg	83.28	57.69	81.4%	87.65	57.69	89.01%	5.1%
SS	SW6010	MIA327	BARIUM	76.2	=	mg/kg	249.02	211.83	81.6%	256.37	211.83	85.05%	2.9%
SS	SW6010	MIA277	ARSENIC	9.9	=	mg/kg	189.91	220.48	81.6%	193.84	220.48	83.43%	2.0%
SS	SW6010	MIA327	SELENIUM	0.17	U	mg/kg	173.63	211.86	82.0%	173.26	211.86	81.78%	0.2%
SS	SW6010	MIA277	CADMIUM	0.75	=	mg/kg	5.27	5.51	82.0%	5.00	5.51	77.09%	5.3%
SS	SW6010	MIA138	COPPER	18.3	=	mg/kg	42.57	29.52	82.2%	43.29	29.52	84.65%	1.7%
SS	SW6010	MIA327	BERYLLIUM	0.37	TR	mg/kg	4.74	5.30	82.3%	4.90	5.30	85.36%	3.4%
SS	SW6010	MIA033	THALLIUM	0.19	U	mg/kg	192.50	233.10	82.6%	199.34	233.10	85.52%	3.5%
SS	SW6010	MIA138	BERYLLIUM	0.52	TR	mg/kg	5.41	5.91	82.7%	5.45	5.91	83.34%	0.7%
SS	SW6010	MIA159	BERYLLIUM	0.3	TR	mg/kg	4.95	5.62	82.7%	4.95	5.62	82.78%	0.0%
SS	SW6010	MIA327	ARSENIC	5.5	=	mg/kg	180.86	211.84	82.8%	183.15	211.84	83.86%	1.3%
SS	SW6010	MIA296	LEAD	12.7	=	mg/kg	57.51	53.48	83.8%	56.63	53.48	82.13%	1.5%
SS	SW6010	MIA033	COPPER	10.5	=	mg/kg	34.99	29.18	83.9%	35.21	29.18	84.68%	0.6%
SS	SW6010	MIA138	ARSENIC	29.5	=	mg/kg	228.20	236.42	84.0%	228.94	236.42	84.36%	0.3%
SS	SW6010	MIA306	SELENIUM	0.18	U	mg/kg	194.02	230.68	84.1%	195.42	230.68	84.72%	0.7%
SS	SW6010	MIA033	SELENIUM	1	=	mg/kg	197.46	233.10	84.3%	204.97	233.10	87.50%	3.7%
SS	SW6010	MIA128	COBALT	7.9	=	mg/kg	56.73	57.64	84.7%	57.21	57.64	85.55%	0.8%
SS	SW6010	MIA296	CADMIUM	0.29	TR	mg/kg	4.84	5.35	85.0%	4.60	5.35	80.43%	5.2%
SS	SW6010	MIA306	THALLIUM	0.18	U	mg/kg	196.29	230.68	85.1%	199.96	230.68	86.68%	1.9%
SS	SW6010	MIA296	NICKEL	7	=	mg/kg	52.66	53.51	85.3%	49.80	53.51	79.99%	5.6%
SS	SW6010	MIA128	SILVER	0.06	U	mg/kg	4.93	5.77	85.4%	4.73	5.77	81.90%	4.2%
SS	SW6010	MIA230	NICKEL	15.8	=	mg/kg	66.75	59.67	85.4%	65.44	59.67	83.19%	2.0%
SS	SW6010	MIA230	CADMIUM	0.14	TR	mg/kg	5.25	5.97	85.5%	5.13	5.97	83.52%	2.2%
SS	SW6010	MIA138	BARIUM	119	=	mg/kg	320.73	236.04	85.5%	324.73	236.04	87.16%	1.2%
SS	SW6010	MIA230	ZINC	43.9	=	mg/kg	95.16	59.66	85.9%	94.55	59.66	84.90%	0.6%
SS	SW6010	MIA327	VANADIUM	12	=	mg/kg	57.60	53.02	86.0%	60.71	53.02	91.89%	5.3%
SS	SW6010	MIA128	CADMIUM	0.25	TR	mg/kg	5.23	5.77	86.3%	5.23	5.77	86.30%	0.0%
SS	SW6010	MIA230	LEAD	11.7	=	mg/kg	63.25	59.70	86.3%	62.74	59.70	85.50%	0.8%
SS	SW6010	MIA230	SELENIUM	1.3	=	mg/kg	209.86	238.66	87.4%	208.67	238.66	86.89%	0.6%
SS	SW6010	MIA230	COPPER	15.3	=	mg/kg	41.40	29.86	87.4%	41.32	29.86	87.14%	0.2%
SS	SW6010	MIA306	BERYLLIUM	0.39	TR	mg/kg	5.44	5.77	87.6%	5.40	5.77	86.80%	0.8%
SS	SW6010	MIA306	ARSENIC	9.9	=	mg/kg	212.52	230.69	87.8%	213.77	230.69	88.38%	0.6%
SS	SW6010	MIA277	CHROMIUM, TOTAL	10.6	=	mg/kg	29.99	22.04	88.0%	30.18	22.04	88.83%	0.6%
SS	SW6010	MIA128	ZINC	72.8	=	mg/kg	123.67	57.68	88.2%	132.02	57.68	102.66%	6.5%
SS	SW6010	MIA306	COPPER	16	=	mg/kg	41.49	28.85	88.4%	40.15	28.85	83.69%	3.3%
SS	SW6010	MIA230	BERYLLIUM	0.42	TR	mg/kg	5.70	5.97	88.5%	5.67	5.97	87.95%	0.6%
SS	SW6010	MIA128	THALLIUM	0.18	U	mg/kg	205.01	230.68	88.9%	206.45	230.68	89.50%	0.7%
SS	SW6010	MIA159	CADMIUM	0.66	TR	mg/kg	5.67	5.62	89.1%	5.96	5.62	94.17%	4.9%
SS	SW6010	MIA128	NICKEL	13.7	=	mg/kg	65.19	57.66	89.3%	64.29	57.66	87.74%	1.4%
SS	SW6010	MIA230	ARSENIC	7.9	=	mg/kg	221.45	238.66	89.5%	219.92	238.66	88.84%	0.7%
SS	SW6010	MIA230	THALLIUM	0.19	U	mg/kg	214.13	238.66	89.7%	215.08	238.66	90.12%	0.4%
SS	SW6010	MIA128	SELENIUM	0.18	U	mg/kg	207.39	230.68	89.9%	205.68	230.68	89.16%	0.8%
SS	SW6010	MIA296	SILVER	0.05	U	mg/kg	4.83	5.35	90.2%	4.63	5.35	86.51%	4.2%
SS	SW6010	MIA296	THALLIUM	0.17	U	mg/kg	194.30	214.13	90.7%	180.27	214.13	84.19%	7.5%
SS	SW6010	MIA296	ZINC	29.9	=	mg/kg	78.50	53.54	90.8%	71.29	53.54	77.31%	9.6%
WS	SW6010	MIA018	SILVER	0.5	U	ug/L	46.03	50.00	92.1%	46.79	50.00	93.58%	1.6%
SS	SW6010	MIA128	BERYLLIUM	0.41	TR	mg/kg	5.75	5.77	92.5%	5.73	5.77	92.13%	0.4%
WS	SW6010	MIA018	POTASSIUM	1510	TR	ug/L	20136.54	19997.47	93.1%	20672.41	19997.47	95.82%	2.6%
SS	SW6010	MIA159	ARSENIC	19	=	mg/kg	228.49	224.73	93.2%	231.67	224.73	94.64%	1.4%
SS	SW6010	MIA327	COPPER	38.9	=	mg/kg	63.65	26.49	93.4%	74.90	26.49	135.91%	16.3%
SS	SW6010	MIA128	ARSENIC	20	=	mg/kg	235.93	230.72	93.6%	235.46	230.72	93.39%	0.2%

TABLE C 4-4
MS/MSD Accuracy and Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Sample ID	Parameter	Lab Result	Lab Qual	Units	MS Lab Result	MS Spike Added	MS Recovery	MSD Lab Result	MSD Spike Added	MSD Recovery	RPD
SS	SW6010	MIA296	CHROMIUM, TOTAL	9.3	=	mg/kg	29.38	21.38	93.9%	29.62	21.38	95.03%	0.8%
SS	SW6010	MIA230	CHROMIUM, TOTAL	10.9	=	mg/kg	33.64	23.84	95.4%	32.37	23.84	90.06%	3.8%
SS	SW6010	MIA159	SELENIUM	1.6	TR	mg/kg	216.53	224.77	95.6%	214.21	224.77	94.59%	1.1%
WS	SW6010	MIA018	MAGNESIUM	714	TR	ug/L	19894.49	19999.85	95.9%	20280.27	19999.85	97.83%	1.9%
WS	SW6010	MIA018	SELENIUM	2.6	TR	ug/L	1929.42	2000.05	96.3%	1975.47	2000.05	98.64%	2.4%
WS	SW6010	MIA018	THALLIUM	1.6	U	ug/L	1938.58	2000.00	96.9%	2013.43	2000.00	100.67%	3.8%
SS	SW6010	MIA296	SELENIUM	0.33	TR	mg/kg	208.13	214.13	97.0%	202.08	214.13	94.22%	3.0%
WS	SW6010	MIA018	LEAD	1.9	TR	ug/L	488.65	499.96	97.4%	497.68	499.96	99.16%	1.8%
WS	SW6010	MIA018	ALUMINUM	38.7	TR	ug/L	1994.59	1999.98	97.8%	2036.85	1999.98	99.91%	2.1%
SS	SW6010	MIA296	BERYLLIUM	0.22	TR	mg/kg	5.46	5.35	98.0%	5.29	5.35	94.88%	3.1%
WS	SW6010	MIA018	ARSENIC	3.4	TR	ug/L	1964.52	2000.01	98.1%	2001.65	2000.01	99.91%	1.9%
SS	SW6010	MIA128	COPPER	15.4	=	mg/kg	43.73	28.87	98.1%	42.67	28.87	94.45%	2.5%
WS	SW6010	MIA018	COBALT	0.5	U	ug/L	492.65	500.00	98.5%	501.45	500.00	100.29%	1.8%
WS	SW6010	MIA018	CALCIUM	6660	=	ug/L	26385.20	20004.90	98.6%	26939.24	20004.90	101.37%	2.1%
WS	SW6010	MIA018	CADMIUM	0.1	U	ug/L	49.34	50.00	98.7%	50.23	50.00	100.46%	1.8%
WS	SW6010	MIA018	CHROMIUM, TOTAL	1	U	ug/L	198.00	200.00	99.0%	201.09	200.00	100.55%	1.5%
WS	SW6010	MIA018	MANGANESE	17.8	=	ug/L	516.25	500.04	99.7%	601.59	500.04	116.75%	15.3%
WS	SW6010	MIA018	NICKEL	0.49	TR	ug/L	500.12	500.00	99.9%	510.65	500.00	102.03%	2.1%
WS	SW6010	MIA018	BERYLLIUM	0.06	TR	ug/L	50.10	50.00	100.1%	50.92	50.00	101.72%	1.6%
SS	SW6010	MIA296	ARSENIC	4.4	=	mg/kg	219.47	214.13	100.4%	213.08	214.13	97.46%	3.0%
WS	SW6010	MIA018	IRON	149	=	ug/L	1158.41	999.82	101.0%	1190.77	999.82	104.20%	2.8%
WS	SW6010	MIA018	ZINC	9.5	TR	ug/L	516.16	499.97	101.3%	528.54	499.97	103.81%	2.4%
WS	SW6010	MIA018	SODIUM	790	TR	ug/L	21105.30	19999.86	101.6%	21242.66	19999.86	102.26%	0.6%
WS	SW6010	MIA018	COPPER	4.2	TR	ug/L	258.80	249.99	101.8%	265.10	249.99	104.36%	2.4%
SS	SW6010	MIA128	BARIUM	98	=	mg/kg	336.89	230.65	103.6%	329.33	230.65	100.30%	2.3%
WS	SW6010	MIA018	VANADIUM	0.7	TR	ug/L	519.99	500.00	103.9%	531.38	500.00	106.14%	2.2%
WS	SW6010	MIA018	BARIUM	12.7	TR	ug/L	2098.04	1999.97	104.3%	2136.73	1999.97	106.20%	1.8%
WS	SW6010	MIA018	ANTIMONY	5	TR	ug/L	527.21	500.00	104.4%	538.80	500.00	106.76%	2.2%
SS	SW6010	MIA128	VANADIUM	20.1	=	mg/kg	84.74	57.69	112.1%	76.81	57.69	98.30%	9.8%
SS	SW6010	MIA128	CHROMIUM, TOTAL	11.5	=	mg/kg	37.50	23.09	112.6%	34.18	23.09	98.23%	9.3%
SS	SW6010	MIA296	COPPER	13.3	=	mg/kg	43.74	26.79	113.6%	38.96	26.79	95.77%	11.6%
SS	SW6010	MIA128	MANGANESE	560	=	mg/kg	630.48	57.92	121.7%	598.18	57.92	65.92%	5.3%
SS	SW6010	MIA159	LEAD	828	=	mg/kg	899.48	56.39	126.8%	933.01	56.39	186.22%	3.7%
SS	SW6010	MIA277	ZINC	113	=	mg/kg	190.98	55.29	141.0%	153.84	55.29	73.87%	21.5%
SS	SW6010	MIA277	LEAD	269	=	mg/kg	394.37	55.57	225.6%	278.15	55.57	16.46%	34.6%
SS	SW6010	MIA327	IRON	19900	=	mg/kg	20761.97	73.41	1174.2%	23815.47	73.41	5333.83%	13.7%
SS	SW6010	MIA128	IRON	16700	=	mg/kg	20197.00	141.87	2464.9%	18166.09	141.87	1033.41%	10.6%
SS	SW7196	MIA327	CHROMIUM, HEXAVALENT	0.11	U	mg/kg	1.25	1.32	94.2%	1.25	1.32	94.18%	0.0%
WS	SW7470	MIA018	MERCURY	0.08	U	ug/L	2.04	2.00	102.1%	1.99	2.00	99.40%	2.6%
SS	SW7471	MIA277	MERCURY	0.04	=	mg/kg	0.35	0.37	83.6%	0.37	0.37	88.07%	4.7%
SS	SW7471	MIA128	MERCURY	0.07	=	mg/kg	0.41	0.38	87.9%	0.44	0.38	95.74%	7.1%
SS	SW7471	MIA159	MERCURY	0.03	TR	mg/kg	0.36	0.37	88.3%	0.35	0.37	86.01%	2.4%
SS	SW7471	MIA327	MERCURY	0.02	U	mg/kg	0.32	0.35	92.6%	0.33	0.35	95.31%	2.9%
SS	SW7471	MIA306	MERCURY	0.04	=	mg/kg	0.42	0.38	98.4%	0.42	0.38	99.11%	0.6%
SS	SW7471	MIA230	MERCURY	0.04	=	mg/kg	0.43	0.39	99.7%	0.44	0.39	101.97%	2.0%
SS	SW7471	MIA138	MERCURY	0.05	=	mg/kg	0.44	0.39	100.1%	0.45	0.39	102.05%	1.7%
SS	SW7471	MIA033	MERCURY	0.04	TR	mg/kg	0.46	0.39	108.9%	0.45	0.38	110.10%	1.4%
SS	SW8081	MIA138	DIELDRIN	480	=	ug/kg	413.54	43.88	-151.5%	381.66	43.88	-224.11%	8.0%
SS	SW8081	MIA128	DIELDRIN	140	=	ug/kg	125.25	17.24	-85.5%	160.99	17.24	121.74%	25.0%
SS	SW8081	MIA138	ALDRIN	200	U	ug/kg	200.00	19.61	0.0%	200.00	19.61	0.00%	
SS	SW8081	MIA138	ENDRIN	390	U	ug/kg	390.00	39.21	0.0%	390.00	39.21	0.00%	
SS	SW8081	MIA138	GAMMA BHC (LINDANE)	200	U	ug/kg	200.00	19.61	0.0%	200.00	19.61	0.00%	
SS	SW8081	MIA138	HEPTACHLOR	200	U	ug/kg	200.00	19.61	0.0%	200.00	19.61	0.00%	
SS	SW8081	MIA138	p,p DDT	390	U	ug/kg	390.00	39.21	0.0%	390.00	39.21	0.00%	
SS	SW8081	MIA128	p,p DDT	140	=	ug/kg	140.52	17.24	3.0%	155.31	17.24	88.80%	10.0%

TABLE C 4-4
MS/MSD Accuracy and Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Sample ID	Parameter	Lab Result	Lab Qual	Units	MS Lab Result	MS Spike Added	MS Recovery	MSD Lab Result	MSD Spike Added	MSD Recovery	RPD
WS	SW8081	MIA018	GAMMA BHC (LINDANE)	0.05	U	ug/L	0.32	0.45	71.1%	0.29	0.45	64.44%	9.8%
WS	SW8081	MIA018	ALDRIN	0.05	U	ug/L	0.33	0.45	73.3%	0.25	0.45	55.56%	27.6%
WS	SW8081	MIA018	DIELDRIN	0.1	U	ug/L	0.36	0.45	80.0%	0.31	0.45	68.89%	14.9%
SS	SW8081	MIA327	GAMMA BHC (LINDANE)	18	U	ug/kg	14.91	17.73	84.1%	13.71	17.73	77.33%	8.4%
WS	SW8081	MIA018	HEPTACHLOR	0.05	U	ug/L	0.39	0.45	86.7%	0.32	0.45	71.11%	19.7%
WS	SW8081	MIA018	p,p'-DDT	0.1	U	ug/L	0.41	0.45	91.1%	0.36	0.45	80.00%	13.0%
SS	SW8081	MIA128	GAMMA BHC (LINDANE)	20	U	ug/kg	15.71	17.24	91.1%	14.16	17.24	82.13%	10.4%
WS	SW8081	MIA018	ENDRIN	0.1	U	ug/L	0.42	0.45	93.3%	0.35	0.45	77.78%	18.2%
SS	SW8081	MIA128	HEPTACHLOR	20	U	ug/kg	16.27	17.24	94.4%	16.28	17.24	94.42%	0.1%
SS	SW8081	MIA128	ALDRIN	20	U	ug/kg	16.59	17.24	96.2%	16.72	17.24	96.98%	0.8%
SS	SW8081	MIA327	ALDRIN	18	U	ug/kg	17.52	17.73	98.8%	19.90	17.73	112.24%	12.7%
SS	SW8081	MIA327	DIELDRIN	12	J	ug/kg	48.09	35.60	101.4%	40.99	35.60	81.43%	15.9%
SS	SW8081	MIA327	ENDRIN	35	U	ug/kg	36.14	35.46	101.9%	33.69	35.46	95.01%	7.0%
SS	SW8081	MIA327	HEPTACHLOR	18	U	ug/kg	22.69	17.73	128.0%	19.90	17.73	112.24%	13.1%
SS	SW8081	MIA128	ENDRIN	38	U	ug/kg	35.33	17.24	204.9%	35.24	17.24	204.39%	0.3%
SS	SW8081	MIA327	p,p'-DDT	120	=	ug/kg	262.47	30.50	467.1%	132.58	30.50	41.25%	65.8%
SS	SW8100	MIA033	PHENANTHRENE	240	=	ug/kg	3300.00	3900.00	-6.2%	3400.00	3900.00	-6.15%	
SS	SW8100	MIA033	ACENAPHTHENE	120	U	ug/kg	3000.00	3900.00	0.0%	2900.00	3900.00	0.00%	
SS	SW8100	MIA277	ACENAPHTHENE	5500	U	ug/kg	5500.00	3700.00	0.0%	5500.00	3700.00	0.00%	
SS	SW8100	MIA033	ACENAPHTHYLENE	120	U	ug/kg	2900.00	3900.00	0.0%	2800.00	3900.00	0.00%	
SS	SW8100	MIA277	ACENAPHTHYLENE	5500	U	ug/kg	5500.00	3700.00	0.0%	5500.00	3700.00	0.00%	
SS	SW8100	MIA033	ANTHRACENE	120	U	ug/kg	2900.00	3900.00	0.0%	2800.00	3900.00	0.00%	
SS	SW8100	MIA277	ANTHRACENE	5500	U	ug/kg	5500.00	3700.00	0.0%	5500.00	3700.00	0.00%	
SS	SW8100	MIA112	BENZO(a)ANTHRACENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	BENZO(a)ANTHRACENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	BENZO(a)ANTHRACENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	BENZO(a)ANTHRACENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	BENZO(a)ANTHRACENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	BENZO(a)ANTHRACENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	BENZO(a)ANTHRACENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA112	BENZO(a)PYRENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	BENZO(a)PYRENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	BENZO(a)PYRENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	BENZO(a)PYRENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	BENZO(a)PYRENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	BENZO(a)PYRENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	BENZO(a)PYRENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA112	BENZO(b)FLUORANTHENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	BENZO(b)FLUORANTHENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	BENZO(b)FLUORANTHENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	BENZO(b)FLUORANTHENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	BENZO(b)FLUORANTHENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	BENZO(b)FLUORANTHENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	BENZO(b)FLUORANTHENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA112	BENZO(g,h,i)PERYLENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	BENZO(g,h,i)PERYLENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	BENZO(g,h,i)PERYLENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	BENZO(g,h,i)PERYLENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	BENZO(g,h,i)PERYLENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	BENZO(g,h,i)PERYLENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	BENZO(g,h,i)PERYLENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA112	BENZO(k)FLUORANTHENE	1000	U	ug/kg	1000.00	170.00	0.0%	1000.00	170.00	0.00%	
SS	SW8100	MIA200	BENZO(k)FLUORANTHENE	1100	U	ug/kg	1100.00	180.00	0.0%	1100.00	180.00	0.00%	
SS	SW8100	MIA230	BENZO(k)FLUORANTHENE	1200	U	ug/kg	1200.00	200.00	0.0%	1200.00	200.00	0.00%	
SS	SW8100	MIA277	BENZO(k)FLUORANTHENE	5500	U	ug/kg	5500.00	180.00	0.0%	5500.00	180.00	0.00%	

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TABLE C.4-4
MS/MSD Accuracy and Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Sample ID	Parameter	Lab Result	Lab Qual	Units	MS Lab Result	MS Spike Added	MS Recovery	MSD Lab Result	MSD Spike Added	MSD Recovery	RPD
SS	SW8100	MIA296	BENZO(k)FLUORANTHENE	1100	U	ug/kg	1100.00	180.00	0.0%	1100.00	180.00	0.00%	
SS	SW8100	MIA306	BENZO(k)FLUORANTHENE	1100	U	ug/kg	1100.00	190.00	0.0%	1100.00	190.00	0.00%	
SS	SW8100	MIA327	BENZO(k)FLUORANTHENE	1100	U	ug/kg	1100.00	180.00	0.0%	1100.00	180.00	0.00%	
SS	SW8100	MIA112	CHRYSENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	CHRYSENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	CHRYSENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	CHRYSENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	CHRYSENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	CHRYSENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	CHRYSENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA112	DIBENZ(a,h)ANTHRACENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	DIBENZ(a,h)ANTHRACENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	DIBENZ(a,h)ANTHRACENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	DIBENZ(a,h)ANTHRACENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	DIBENZ(a,h)ANTHRACENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	DIBENZ(a,h)ANTHRACENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	DIBENZ(a,h)ANTHRACENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA112	FLUORANTHENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	FLUORANTHENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	FLUORANTHENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	FLUORANTHENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	FLUORANTHENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	FLUORANTHENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	FLUORANTHENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA033	FLUORENE	120	U	ug/kg	3000.00	3900.00	0.0%	2900.00	3900.00	0.00%	
SS	SW8100	MIA277	FLUORENE	5500	U	ug/kg	5500.00	3700.00	0.0%	5500.00	3700.00	0.00%	
SS	SW8100	MIA112	INDENO(1,2,3-c,d)PYRENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	INDENO(1,2,3-c,d)PYRENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	INDENO(1,2,3-c,d)PYRENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	INDENO(1,2,3-c,d)PYRENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	INDENO(1,2,3-c,d)PYRENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	INDENO(1,2,3-c,d)PYRENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	INDENO(1,2,3-c,d)PYRENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA033	NAPHTHALENE	120	U	ug/kg	2800.00	3900.00	0.0%	2700.00	3900.00	69.23%	200.0%
SS	SW8100	MIA277	NAPHTHALENE	5500	U	ug/kg	5500.00	3700.00	0.0%	5500.00	3700.00	0.00%	
SS	SW8100	MIA277	PHENANTHRENE	5500	U	ug/kg	5500.00	3700.00	0.0%	5500.00	3700.00	0.00%	
SS	SW8100	MIA112	PYRENE	1000	U	ug/kg	1000.00	340.00	0.0%	1000.00	340.00	0.00%	
SS	SW8100	MIA200	PYRENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA230	PYRENE	1200	U	ug/kg	1200.00	400.00	0.0%	1200.00	400.00	0.00%	
SS	SW8100	MIA277	PYRENE	5500	U	ug/kg	5500.00	370.00	0.0%	5500.00	370.00	0.00%	
SS	SW8100	MIA296	PYRENE	1100	U	ug/kg	1100.00	360.00	0.0%	1100.00	360.00	0.00%	
SS	SW8100	MIA306	PYRENE	1100	U	ug/kg	1100.00	380.00	0.0%	1100.00	380.00	0.00%	
SS	SW8100	MIA327	PYRENE	1100	U	ug/kg	1100.00	350.00	0.0%	1100.00	350.00	0.00%	
SS	SW8100	MIA296	ACENAPHTHENE	1100	U	ug/kg	1600.00	3600.00	44.4%	1500.00	3600.00	41.67%	6.5%
SS	SW8100	MIA296	ACENAPHTHYLENE	1100	U	ug/kg	1600.00	3600.00	44.4%	1800.00	3600.00	50.00%	11.8%
SS	SW8100	MIA296	ANTHRACENE	1100	U	ug/kg	1600.00	3600.00	44.4%	1600.00	3600.00	44.44%	0.0%
SS	SW8100	MIA296	NAPHTHALENE	1100	U	ug/kg	1600.00	3600.00	44.4%	1600.00	3600.00	44.44%	0.0%
SS	SW8100	MIA306	NAPHTHALENE	1100	U	ug/kg	1800.00	3800.00	47.4%	1600.00	3800.00	42.11%	11.8%
SS	SW8100	MIA306	ACENAPHTHENE	1100	U	ug/kg	1900.00	3800.00	50.0%	1800.00	3800.00	47.37%	5.4%
SS	SW8100	MIA230	ANTHRACENE	1200	U	ug/kg	2000.00	4000.00	50.0%	1800.00	4000.00	45.00%	10.5%
SS	SW8100	MIA306	ANTHRACENE	1100	U	ug/kg	1900.00	3800.00	50.0%	1800.00	3800.00	47.37%	5.4%
SS	SW8100	MIA296	FLUORENE	1100	U	ug/kg	1800.00	3600.00	50.0%	1700.00	3600.00	47.22%	5.7%
SS	SW8100	MIA306	FLUORENE	1100	U	ug/kg	1900.00	3800.00	50.0%	1800.00	3800.00	47.37%	5.4%
SS	SW8100	MIA306	ACENAPHTHYLENE	1100	U	ug/kg	2000.00	3800.00	52.6%	1800.00	3800.00	47.37%	10.5%
SS	SW8100	MIA306	PHENANTHRENE	1100	U	ug/kg	2000.00	3800.00	52.6%	1900.00	3800.00	50.00%	5.1%

TABLE C 4-4
MS/MSD Accuracy and Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Sample ID	Parameter	Lab Result	Lab Qual	Units	MS Lab Result	MS Spike Added	MS Recovery	MSD Lab Result	MSD Spike Added	MSD Recovery	RPD
SS	SW8100	MIA296	PHENANTHRENE	1100	U	ug/kg	1900.00	3600.00	52.8%	1700.00	3600.00	47.22%	11.1%
SS	SW8100	MIA230	ACENAPHTHYLENE	1200	U	ug/kg	2400.00	4000.00	60.0%	2400.00	4000.00	60.00%	0.0%
SS	SW8100	MIA230	NAPHTHALENE	1200	U	ug/kg	2400.00	4000.00	60.0%	2200.00	4000.00	55.00%	8.7%
SS	SW8100	MIA230	ACENAPHTHENE	1200	U	ug/kg	2600.00	4000.00	65.0%	2400.00	4000.00	60.00%	8.0%
SS	SW8100	MIA230	FLUORENE	1200	U	ug/kg	2600.00	4000.00	65.0%	2400.00	4000.00	60.00%	8.0%
SS	SW8100	MIA033	INDENO(1,2,3-c,d)PYRENE	120	=	ug/kg	400.00	390.00	71.8%	450.00	390.00	84.62%	11.8%
SS	SW8100	MIA112	ANTHRACENE	1000	U	ug/kg	2500.00	3400.00	73.5%	2400.00	3400.00	70.59%	4.1%
SS	SW8100	MIA033	BENZO(a)PYRENE	170	=	ug/kg	460.00	390.00	74.4%	530.00	390.00	92.31%	14.1%
SS	SW8100	MIA033	DIBENZ(a,h)ANTHRACENE	120	U	ug/kg	290.00	390.00	74.4%	290.00	390.00	74.36%	0.0%
SS	SW8100	MIA033	BENZO(k)FLUORANTHENE	170	=	ug/kg	320.00	190.00	78.9%	420.00	190.00	131.58%	27.0%
SS	SW8100	MIA112	ACENAPHTHENE	1000	U	ug/kg	2700.00	3400.00	79.4%	2600.00	3400.00	76.47%	3.8%
SS	SW8100	MIA112	ACENAPHTHYLENE	1000	U	ug/kg	2700.00	3400.00	79.4%	2700.00	3400.00	79.41%	0.0%
SS	SW8100	MIA112	NAPHTHALENE	1000	U	ug/kg	2700.00	3400.00	79.4%	2600.00	3400.00	76.47%	3.8%
SS	SW8100	MIA033	BENZO(b)FLUORANTHENE	260	=	ug/kg	570.00	390.00	79.5%	660.00	390.00	102.56%	14.6%
SS	SW8100	MIA033	FLUORANTHENE	300	=	ug/kg	610.00	390.00	79.5%	920.00	390.00	158.97%	40.5%
SS	SW8100	MIA112	FLUORENE	1000	U	ug/kg	2800.00	3400.00	82.4%	2700.00	3400.00	79.41%	3.6%
SS	SW8100	MIA112	PHENANTHRENE	1000	U	ug/kg	2800.00	3400.00	82.4%	2800.00	3400.00	82.35%	0.0%
SS	SW8100	MIA033	BENZO(a)ANTHRACENE	170	=	ug/kg	500.00	390.00	84.6%	600.00	390.00	110.26%	18.2%
SS	SW8100	MIA033	CHRYSENE	180	=	ug/kg	520.00	390.00	87.2%	630.00	390.00	115.38%	19.1%
SS	SW8100	MIA033	PYRENE	320	=	ug/kg	660.00	390.00	87.2%	860.00	390.00	138.46%	26.3%
SS	SW8100	MIA230	PHENANTHRENE	1200	U	ug/kg	3700.00	4000.00	92.5%	3100.00	4000.00	77.50%	17.6%
SS	SW8100/	MIA033	BENZO(g,h,i)PERYLENE	120	U	ug/kg	370.00	390.00	94.9%	420.00	390.00	107.69%	12.7%
SS	SW8100	MIA327	ANTHRACENE	1100	U	ug/kg	3500.00	3500.00	100.0%	4200.00	3500.00	120.00%	18.2%
SS	SW8100	MIA200	ANTHRACENE	1100	U	ug/kg	3600.00	3500.00	102.9%	1700.00	3500.00	48.57%	71.7%
SS	SW8100	MIA327	NAPHTHALENE	1100	U	ug/kg	3800.00	3500.00	108.6%	4600.00	3500.00	131.43%	19.0%
SS	SW8100	MIA327	ACENAPHTHYLENE	1100	U	ug/kg	4000.00	3500.00	114.3%	5200.00	3500.00	148.57%	26.1%
SS	SW8100	MIA327	ACENAPHTHENE	1100	U	ug/kg	4100.00	3500.00	117.1%	5400.00	3500.00	154.29%	27.4%
SS	SW8100	MIA327	PHENANTHRENE	1100	U	ug/kg	4100.00	3500.00	117.1%	5600.00	3500.00	160.00%	30.9%
SS	SW8100	MIA200	NAPHTHALENE	1100	U	ug/kg	4300.00	3500.00	122.9%	2100.00	3500.00	60.00%	68.8%
SS	SW8100	MIA327	FLUORENE	1100	U	ug/kg	4400.00	3500.00	125.7%	5300.00	3500.00	151.43%	18.6%
SS	SW8100	MIA200	PHENANTHRENE	1100	U	ug/kg	4500.00	3500.00	128.6%	2200.00	3500.00	62.86%	68.7%
SS	SW8100	MIA200	ACENAPHTHENE	1100	U	ug/kg	4600.00	3500.00	131.4%	2200.00	3500.00	62.86%	70.6%
SS	SW8100	MIA200	ACENAPHTHYLENE	1100	U	ug/kg	4600.00	3500.00	131.4%	2200.00	3500.00	62.86%	70.6%
SS	SW8100	MIA200	FLUORENE	1100	U	ug/kg	4600.00	3500.00	131.4%	2200.00	3500.00	62.86%	70.6%
WS	SW8260	MIA018	1,1-DICHLOROETHENE	10	U	ug/L	40.00	50.00	80.0%	40.00	50.00	80.00%	0.0%
WS	SW8260	MIA018	BENZENE	10	U	ug/L	44.00	50.00	88.0%	45.00	50.00	90.00%	2.2%
WS	SW8260	MIA018	TOLUENE	10	U	ug/L	44.00	50.00	88.0%	46.00	50.00	92.00%	4.4%
WS	SW8260	MIA018	TRICHLOROETHYLENE (TCE)	10	U	ug/L	44.00	50.00	88.0%	44.00	50.00	88.00%	0.0%
SS	SW8260	MIA128	TOLUENE	11	U	ug/kg	46.00	51.00	90.2%	54.00	57.00	94.74%	16.0%
SS	SW8260	MIA128	TRICHLOROETHYLENE (TCE)	11	U	ug/kg	46.00	51.00	90.2%	50.00	57.00	87.72%	8.3%
WS	SW8260	MIA018	CHLOROBENZENE	10	U	ug/L	48.00	50.00	96.0%	50.00	50.00	100.00%	4.1%
SS	SW8260	MIA128	CHLOROBENZENE	11	U	ug/kg	49.00	51.00	96.1%	54.00	57.00	94.74%	9.7%
SS	SW8260	MIA327	CHLOROBENZENE	9	U	ug/kg	44.00	45.00	97.8%	44.00	45.00	97.78%	0.0%
SS	SW8260	MIA327	TRICHLOROETHYLENE (TCE)	9	U	ug/kg	44.00	45.00	97.8%	44.00	45.00	97.78%	0.0%
SS	SW8260	MIA128	1,1-DICHLOROETHENE	11	U	ug/kg	50.00	51.00	98.0%	55.00	57.00	96.49%	9.5%
SS	SW8260	MIA128	BENZENE	11	U	ug/kg	50.00	51.00	98.0%	55.00	57.00	96.49%	9.5%
SS	SW8260	MIA138	TRICHLOROETHYLENE (TCE)	11	U	ug/kg	55.00	56.00	98.2%	57.00	59.00	96.61%	3.6%
SB	SW8260	MIA088	1,1-DICHLOROETHENE	10	U	ug/kg	50.00	50.00	100.0%	57.00	53.00	107.55%	13.1%
SS	SW8260	MIA138	BENZENE	6	J	ug/kg	62.00	56.00	100.0%	64.00	59.00	98.31%	3.2%
SB	SW8260	MIA088	TOLUENE	10	U	ug/kg	50.00	50.00	100.0%	55.00	53.00	103.77%	9.5%
SB	SW8260	MIA088	TRICHLOROETHYLENE (TCE)	10	U	ug/kg	50.00	50.00	100.0%	55.00	53.00	103.77%	9.5%
SS	SW8260	MIA138	TOLUENE	11	U	ug/kg	57.00	56.00	101.8%	57.00	59.00	96.61%	0.0%
SS	SW8260	MIA138	1,1-DICHLOROETHENE	11	U	ug/kg	58.00	56.00	103.6%	59.00	59.00	100.00%	1.7%
SB	SW8260	MIA088	BENZENE	10	U	ug/kg	52.00	50.00	104.0%	56.00	53.00	105.66%	7.4%
SS	SW8260	MIA327	TOLUENE	1	J	ug/kg	48.00	45.00	104.4%	44.00	45.00	95.56%	8.7%

TABLE C.4-4
MS/MSD Accuracy and Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Sample ID	Parameter	Lab Result	Lab Qual	Units	MS Lab Result	MS Spike Added	MS Recovery	MSD Lab Result	MSD Spike Added	MSD Recovery	RPD
SS	SW8260	MIA138	CHLOROBENZENE	11	U	ug/kg	59.00	56.00	105.4%	57.00	59.00	96.61%	3.4%
SB	SW8260	MIA088	CHLOROBENZENE	10	U	ug/kg	53.00	50.00	106.0%	56.00	53.00	105.66%	5.5%
SS	SW8260	MIA327	BENZENE	2	J	ug/kg	50.00	45.00	106.7%	48.00	45.00	102.22%	4.1%
SS	SW8260	MIA327	1,1-DICHLOROETHENE	9	U	ug/kg	49.00	45.00	108.9%	47.00	45.00	104.44%	4.2%
SS	SW8270	MIA138	ACENAPHTHENE	3000	J	ug/kg	4300.00	-997.00	-130.4%	3200.00	-997.00	-20.06%	29.3%
SS	SW8270	MIA327	2-CHLOROPHENOL	350	U	ug/kg	2800.00	3500.00	0.0%	2700.00	3500.00	77.14%	200.0%
SS	SW8270	MIA128	4-CHLORO-3-METHYLPHENOL	380	U	ug/kg	3200.00	3800.00	0.0%	3600.00	3800.00	0.00%	
SS	SW8270	MIA327	4-CHLORO-3-METHYLPHENOL	350	U	ug/kg	3000.00	3500.00	0.0%	2900.00	3500.00	0.00%	
WS	SW8270	MIA018	4-CHLORO-3-METHYLPHENOL	10	U	ug/L	84.00	100.00	0.0%	98.00	100.00	0.00%	
SS	SW8270	MIA327	4-NITROPHENOL	1800	U	ug/kg	3200.00	3500.00	0.0%	3100.00	3500.00	0.00%	
SS	SW8270	MIA128	PENTACHLOROPHENOL	190	U	ug/kg	3100.00	3800.00	0.0%	3700.00	3800.00	0.00%	
SS	SW8270	MIA128	PHENOL	380	U	ug/kg	3100.00	3800.00	0.0%	3600.00	3800.00	0.00%	
SS	SW8270	MIA138	PYRENE	26000	=	ug/kg	24000.00	-23974.00	8.3%	17000.00	-23974.00	37.54%	34.1%
WS	SW8270	MIA018	4-NITROPHENOL	50	U	ug/L	31.00	100.00	31.0%	33.00	100.00	33.00%	6.3%
WS	SW8270	MIA018	PHENOL	10	U	ug/L	37.00	100.00	37.0%	47.00	100.00	47.00%	23.8%
WS	SW8270	MIA018	1,4-DICHLOROBENZENE	10	U	ug/L	25.00	50.00	50.0%	27.00	50.00	54.00%	7.7%
SS	SW8270	MIA138	4-NITROPHENOL	20000	U	ug/kg	2000.00	3900.00	51.3%	2000.00	3900.00	51.28%	0.0%
WS	SW8270	MIA018	1,2,4-TRICHLOROBENZENE	10	U	ug/L	31.00	50.00	62.0%	32.00	50.00	64.00%	3.2%
SS	SW8270	MIA138	PENTACHLOROPHENOL	2000	U	ug/kg	2500.00	3900.00	64.1%	2600.00	3900.00	66.67%	3.9%
WS	SW8270	MIA018	2-CHLOROPHENOL	10	U	ug/L	65.00	100.00	65.0%	86.00	100.00	0.00%	200.0%
SS	SW8270	MIA128	1,4-DICHLOROBENZENE	380	U	ug/kg	1300.00	1900.00	68.4%	1500.00	1900.00	78.95%	14.3%
SS	SW8270	MIA138	2,4-DINITROTOLUENE	3900	U	ug/kg	1400.00	2000.00	70.0%	1300.00	2000.00	65.00%	7.4%
WS	SW8270	MIA018	ACENAPHTHENE	10	U	ug/L	35.00	50.00	70.0%	39.00	50.00	78.00%	10.8%
WS	SW8270	MIA018	N-NITROSODI-n-PROPYLAMINE	10	U	ug/L	35.00	50.00	70.0%	43.00	50.00	86.00%	20.5%
SS	SW8270	MIA138	4-CHLORO-3-METHYLPHENOL	3900	U	ug/kg	2800.00	3900.00	71.8%	3000.00	3900.00	76.92%	6.9%
SS	SW8270	MIA128	2-CHLOROPHENOL	380	U	ug/kg	2800.00	3800.00	73.7%	3200.00	3800.00	0.00%	200.0%
SS	SW8270	MIA128	4-NITROPHENOL	1900	U	ug/kg	2800.00	3800.00	73.7%	3300.00	3800.00	0.00%	200.0%
SS	SW8270	MIA128	ACENAPHTHENE	380	U	ug/kg	1400.00	1900.00	73.7%	1500.00	1900.00	78.95%	6.9%
SS	SW8270	MIA128	N-NITROSODI-n-PROPYLAMINE	380	U	ug/kg	1400.00	1900.00	73.7%	1600.00	1900.00	84.21%	13.3%
WS	SW8270	MIA018	2,4-DINITROTOLUENE	10	U	ug/L	38.00	50.00	76.0%	45.00	50.00	90.00%	16.9%
WS	SW8270	MIA018	PENTACHLOROPHENOL	5	U	ug/L	77.00	100.00	77.0%	91.00	100.00	0.00%	200.0%
SS	SW8270	MIA327	PENTACHLOROPHENOL	180	U	ug/kg	2700.00	3500.00	77.1%	2200.00	3500.00	62.86%	20.4%
SS	SW8270	MIA327	PHENOL	350	U	ug/kg	2700.00	3500.00	77.1%	2600.00	3500.00	74.29%	3.8%
SS	SW8270	MIA327	1,4-DICHLOROBENZENE	350	U	ug/kg	1400.00	1800.00	77.8%	1400.00	1800.00	77.78%	0.0%
SS	SW8270	MIA128	1,2,4 TRICHLOROBENZENE	380	U	ug/kg	1500.00	1900.00	78.9%	1700.00	1900.00	89.47%	12.5%
SS	SW8270	MIA128	2,4-DINITROTOLUENE	380	U	ug/kg	1500.00	1900.00	78.9%	1600.00	1900.00	84.21%	6.5%
SS	SW8270	MIA128	PYRENE	380	U	ug/kg	1600.00	1900.00	84.2%	1900.00	1900.00	100.00%	17.1%
SS	SW8270	MIA138	1,4-DICHLOROBENZENE	3900	U	ug/kg	1700.00	2000.00	85.0%	1600.00	2000.00	80.00%	6.1%
SS	SW8270	MIA138	N-NITROSODI-n-PROPYLAMINE	3900	U	ug/kg	1700.00	2000.00	85.0%	1800.00	2000.00	90.00%	5.7%
WS	SW8270	MIA018	PYRENE	10	U	ug/L	44.00	50.00	88.0%	54.00	50.00	108.00%	20.4%
SS	SW8270	MIA327	1,2,4-TRICHLOROBENZENE	350	U	ug/kg	1600.00	1800.00	88.9%	1500.00	1800.00	83.33%	6.5%
SS	SW8270	MIA327	ACENAPHTHENE	350	U	ug/kg	1600.00	1800.00	88.9%	1600.00	1800.00	88.89%	0.0%
SS	SW8270	MIA138	1,2,4-TRICHLOROBENZENE	3900	U	ug/kg	1800.00	2000.00	90.0%	1800.00	2000.00	90.00%	0.0%
SS	SW8270	MIA138	2-CHLOROPHENOL	3900	U	ug/kg	3600.00	3900.00	92.3%	3500.00	3900.00	89.74%	2.8%
SS	SW8270	MIA138	PHENOL	3900	U	ug/kg	3600.00	3900.00	92.3%	3500.00	3900.00	89.74%	2.8%
SS	SW8270	MIA327	2,4-DINITROTOLUENE	350	U	ug/kg	1700.00	1800.00	94.4%	1700.00	1800.00	94.44%	0.0%
SS	SW8270	MIA327	N-NITROSODI-n-PROPYLAMINE	350	U	ug/kg	1700.00	1800.00	94.4%	1600.00	1800.00	88.89%	6.1%
SS	SW8270	MIA327	PYRENE	130	J	ug/kg	1900.00	1800.00	98.3%	2000.00	1800.00	103.89%	5.1%
SS	SW9060	MIA112	TOTAL ORGANIC CARBON	12300	=	mg/kg	49600.00	39985.40	93.3%	52000.00	39985.40	99.29%	4.7%
SS	SW9060	MIA159	TOTAL ORGANIC CARBON	6240	=	mg/kg	27600.00	19996.80	106.8%	27020.00	19996.80	103.92%	2.1%
SS	TC6010	MIA159	Cadmium, TCLP	11.6	U	ug/L	32.96	50.00	65.9%	47.96	50.00	95.92%	37.1%
SS	TC6010	MIA159	Selenium, TCLP	124	U	ug/L	1717.52	2000.00	85.9%	1749.28	2000.00	87.46%	1.8%
SS	TC6010	MIA159	Lead, TCLP	1180	=	ug/L	1608.84	498.36	86.1%	1648.72	498.36	94.05%	2.4%
SS	TC6010	MIA159	Silver, TCLP	7.6	U	ug/L	45.40	50.00	90.8%	45.28	50.00	90.56%	0.3%
SS	TC6010	MIA159	Thallium, TCLP	82	U	ug/L	1838.12	2000.00	91.9%	1683.20	2000.00	84.16%	8.8%

TABLE C 4-4
MS/MSD Accuracy and Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Sample ID	Parameter	Lab Result	Lab Qual	Units	MS Lab Result	MS Spike Added	MS Recovery	MSD Lab Result	MSD Spike Added	MSD Recovery	RPD
SS	TC6010	MIA159	Antimony, TCLP	75.6	U	ug/L	471.80	500.00	94.4%	471.68	500.00	94.34%	0.0%
SS	TC6010	MIA159	Beryllium, TCLP	0.4	U	ug/L	47.72	50.00	95.4%	46.88	50.00	93.76%	1.8%
SS	TC6010	MIA159	Nickel, TCLP	83.5	TR	ug/L	560.76	500.02	95.4%	542.56	500.02	91.81%	3.3%
SS	TC6010	MIA159	Chromium, TCLP	77.1	=	ug/L	268.88	199.98	95.9%	266.72	199.98	94.82%	0.8%
SS	TC6010	MIA159	Arsenic, TCLP	46.4	U	ug/L	1922.08	2000.00	96.1%	1954.80	2000.00	97.74%	1.7%
SS	TC6010	MIA159	Copper, TCLP	21.4	TR	ug/L	262.20	249.96	96.3%	256.60	249.96	94.10%	2.2%
SS	TC6010	MIA159	Zinc, TCLP	1660	=	ug/L	2145.24	499.76	97.1%	2121.00	499.76	92.24%	1.1%
SS	TC7470	MIA159	Mercury, TCLP	0.19	TR	ug/L	2.23	2.00	101.8%	2.25	2.00	102.90%	1.0%
SS	TC8270	MIA112	CRESOLS, m & p, TCLP	50	U	ug/L	540.00	500.00	0.0%	540.00	500.00	0.00%	
SS	TC8270	MIA112	1,4-DICHLOROBENZENE, TCLP	50	U	ug/L	120.00	250.00	48.0%	140.00	250.00	56.00%	15.4%
SS	TC8270	MIA112	HEXACHLOROETHANE, TCLP	50	U	ug/L	120.00	250.00	48.0%	140.00	250.00	56.00%	15.4%
SS	TC8270	MIA112	HEXACHLOROBUTADIENE, TCLP	50	U	ug/L	140.00	250.00	56.0%	160.00	250.00	64.00%	13.3%
SS	TC8270	MIA112	PENTACHLOROPHENOL, TCLP	250	U	ug/L	160.00	250.00	64.0%	110.00	250.00	44.00%	37.0%
SS	TC8270	MIA112	2,4,5-TRICHLOROPHENOL, TCLP	250	U	ug/L	180.00	250.00	72.0%	180.00	250.00	72.00%	0.0%
SS	TC8270	MIA112	HEXACHLOROBENZENE, TCLP	50	U	ug/L	180.00	250.00	72.0%	190.00	250.00	76.00%	5.4%
SS	TC8270	MIA112	2,4-DINITROTOLUENE, TCLP	50	U	ug/L	210.00	250.00	84.0%	230.00	250.00	92.00%	9.1%
SS	TC8270	MIA112	PYRIDINE, TCLP	250	U	ug/L	210.00	250.00	84.0%	210.00	250.00	84.00%	0.0%
SS	TC8270	MIA112	2,4,6-TRICHLOROPHENOL, TCLP	50	U	ug/L	220.00	250.00	88.0%	220.00	250.00	88.00%	0.0%
SS	TC8270	MIA112	NITROBENZENE, TCLP	50	U	ug/L	230.00	250.00	92.0%	240.00	250.00	96.00%	4.3%
SS	TC8270	MIA112	2-METHYLPHENOL (o-CRESOL), TCLP	50	U	ug/L	260.00	250.00	104.0%	270.00	250.00	108.00%	3.8%

TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	TC6010	Arsenic, TCLP	MIA159	MIA160FD	46 4	U	46 4	74 2	TR	ug/L	46 4	200 0%
WS	SW7470	MERCURY	MIA018	MIA019FD	0 08	U	0 08	0 09	TR	ug/L	0 09	200 0%
WS	SW6010	NICKEL	MIA018	MIA019FD	0 49	TR	0 32	0 67	TR	ug/L	0 32	200 0%
SE	SW8081	ALPHA-CHLORDANE	MIA025	MIA026FD	24	U	24	8 7	J	ug/kg	25	200 0%
SE	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	MIA025	MIA026FD	470	U	470	110	J	ug/kg	480	200 0%
SE	SW8081	GAMMA-CHLORDANE	MIA025	MIA026FD	24	U	24	11	J	ug/kg	25	200 0%
SE	SW8270	INDENO(1,2,3-c,d)PYRENE	MIA025	MIA026FD	470	U	470	51	J	ug/kg	480	200 0%
SS	SW8270	2-METHYLNAPHTHALENE	MIA188	MIA189FD	1800	U	1800	64	J	ug/kg	350	200 0%
SS	SW8270	2-METHYLNAPHTHALENE	MIA188DL	MIA189FD	10000	U	10000	64	J	ug/kg	350	200 0%
SS	SW8270	ACENAPHTHENE	MIA188	MIA189FDDL	2000	=	1800	1500	J	ug/kg	7100	200 0%
SS	SW8270	ACENAPHTHENE	MIA188DL	MIA189FD	2400	J	10000	1500	=	ug/kg	350	200 0%
SS	SW8270	ACENAPHTHYLENE	MIA188	MIA189FDDL	240	J	1800	7100	U	ug/kg	7100	200 0%
SS	SW8270	ACENAPHTHYLENE	MIA188DL	MIA189FD	10000	U	10000	100	J	ug/kg	350	200 0%
SS	SW8100	ANTHRACENE	MIA222	MIA223FD	2500	J	3000	3000	U	ug/kg	3000	200 0%
SS	SW8270	ANTHRACENE	MIA188DL	MIA189FDDL	5000	J	10000	3000	J	ug/kg	7100	200 0%
SS	SW8270	ANTHRACENE	MIA188	MIA189FD	4100	=	1800	2900	E	ug/kg	350	200 0%
SS	SW8260	BENZENE	MIA138	MIA139FDDL	6	J	11	600	U	ug/kg	600	200 0%
SS	SW8270	BENZO(a)ANTHRACENE	MIA188DL	MIA189FD	29000	=	10000	19000	E	ug/kg	350	200 0%
SS	SW8270	BENZO(a)PYRENE	MIA188DL	MIA189FD	31000	=	10000	23000	E	ug/kg	350	200 0%
SS	SW8270	BENZO(b)FLUORANTHENE	MIA188DL	MIA189FD	32000	=	10000	38000	E	ug/kg	350	200 0%
SS	SW8100	BENZO(g,h,i)PERYLENE	MIA222	MIA223FD	3700	=	3000	3000	U	ug/kg	3000	200 0%
SS	SW8100	BENZO(g,h,i)PERYLENE	MIA198	MIA199FD	5300	U	5300	6900	=	ug/kg	5300	200 0%
SS	SW8270	BENZO(g,h,i)PERYLENE	MIA188DL	MIA189FD	27000	=	10000	9300	E	ug/kg	350	200 0%
SS	SW8270	BENZO(k)FLUORANTHENE	MIA188DL	MIA189FD	30000	=	10000	20000	E	ug/kg	350	200 0%
SS	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	MIA188	MIA189FDDL	310	J	1800	7100	U	ug/kg	7100	200 0%
SS	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	MIA188	MIA189FD	310	J	1800	350	U	ug/kg	350	200 0%
SS	SW8270	CARBAZOLE	MIA188DL	MIA189FDDL	6000	J	10000	4200	J	ug/kg	7100	200 0%
SS	SW8270	CARBAZOLE	MIA188	MIA189FD	4900	=	1800	3900	E	ug/kg	350	200 0%
SS	SW8260	CARBON DISULFIDE	MIA138	MIA139FDDL	2	J	11	600	U	ug/kg	600	200 0%
SS	SW8270	CHRYSENE	MIA188DL	MIA189FD	32000	=	10000	27000	E	ug/kg	350	200 0%
SS	SW8270	DIBENZOFURAN	MIA188	MIA189FDDL	540	J	1800	7100	U	ug/kg	7100	200 0%
SS	SW8270	DIBENZOFURAN	MIA188DL	MIA189FD	10000	U	10000	440	=	ug/kg	350	200 0%
SS	SW8100	FLUORANTHENE	MIA230	MIA231FD	1200	U	1200	800	J	ug/kg	1200	200 0%
SS	SW8270	FLUORENE	MIA188DL	MIA189FD	1500	J	10000	970	=	ug/kg	350	200 0%
SS	SW8100	FLUORENE	MIA222	MIA223FD	1600	J	3000	3000	U	ug/kg	3000	200 0%
SS	SW8270	FLUORENE	MIA188	MIA189FDDL	1300	J	1800	980	J	ug/kg	7100	200 0%
SS	SW8100	INDENO(1,2,3-c,d)PYRENE	MIA222	MIA223FD	4000	=	3000	3000	U	ug/kg	3000	200 0%
SS	SW8100	INDENO(1,2,3-c,d)PYRENE	MIA198	MIA199FD	5300	U	5300	7300	=	ug/kg	5300	200 0%
SS	SW8270	INDENO(1,2,3-c,d)PYRENE	MIA188DL	MIA189FD	24000	=	10000	11000	E	ug/kg	350	200 0%
SS	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	MIA138	MIA139FDDL	31	=	11	120	J	ug/kg	600	200 0%
SS	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	MIA188	MIA189FD	6	J	10	11	U	ug/kg	11	200 0%
SS	SW8270	NAPHTHALENE	MIA188	MIA189FD	1800	U	1800	150	J	ug/kg	350	200 0%
SS	SW8270	NAPHTHALENE	MIA188DL	MIA189FD	10000	U	10000	150	J	ug/kg	350	200 0%
SS	SW8270	PHENANTHRENE	MIA188DL	MIA189FD	29000	=	10000	32000	E	ug/kg	350	200 0%
SS	SW8100	PYRENE	MIA230	MIA231FD	1200	U	1200	840	J	ug/kg	1200	200 0%
SS	SW8270	PYRENE	MIA128	MIA129FD	380	U	380	45	J	ug/kg	390	200 0%
SS	SW6010	ANTIMONY	MIA281	MIA282FD	0 37	TR	0 2	0 19	U	mg/kg	0 19	200 0%

TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW6010	ANTIMONY	MIA170	MIA171FD	0.19	U	0.19	0.46	TR	mg/kg	0.19	200.0%
SS	SW6010	ANTIMONY	MIA033	MIA034FD	0.42	TR	0.2	0.2	U	mg/kg	0.2	200.0%
SS	SW7471	MERCURY	MIA296	MIA297FD	0.02	U	0.02	0.02	TR	mg/kg	0.018	200.0%
SS	SW7471	MERCURY	MIA327	MIA328FD	0.02	U	0.02	0.04	=	mg/kg	0.018	200.0%
SS	SW6010	SELENIUM	MIA128	MIA129FD	0.18	U	0.18	0.44	TR	mg/kg	0.19	200.0%
SS	SW6010	SILVER	MIA159	MIA160FD	0.06	U	0.06	0.91	TR	mg/kg	0.11	200.0%
SS	SW6010	SILVER	MIA281	MIA282FD	0.06	U	0.06	0.13	TR	mg/kg	0.056	200.0%
SS	SW6010	SILVER	MIA277	MIA278FD	0.13	TR	0.054	0.06	U	mg/kg	0.06	200.0%
SS	SW6010	BERYLLIUM	MIA159	MIA160FD	0.3	TR	0.0028	0.26	TR	mg/kg	0.0028	200.0%
SS	SW6010	CADMIUM	MIA049	MIA050FD	0.08	TR	0.0092	0.05	TR	mg/kg	0.0091	200.0%
SS	SW6010	SODIUM	MIA327	MIA328FD	62.1	TR	12.1	50.4	TR	mg/kg	12.5	200.0%
SS	SW8270	DIBENZ(a,h)ANTHRACENE	MIA188	MIA189FDDL	9500	=	1800	7100	U	ug/kg	7100	200.0%
SS	SW8270	BENZO(a)ANTHRACENE	MIA188	MIA189FDDL	25000	E	1800	17000	=	ug/kg	7100	200.0%
SS	SW8270	BENZO(a)PYRENE	MIA188	MIA189FDDL	30000	E	1800	16000	=	ug/kg	7100	200.0%
SS	SW8270	BENZO(b)FLUORANTHENE	MIA188	MIA189FDDL	36000	E	1800	18000	=	ug/kg	7100	200.0%
SS	SW8270	BENZO(g,h,i)PERYLENE	MIA188	MIA189FDDL	23000	E	1800	11000	=	ug/kg	7100	200.0%
SS	SW8270	BENZO(k)FLUORANTHENE	MIA188	MIA189FDDL	24000	E	1800	17000	=	ug/kg	7100	200.0%
SS	SW8270	CHRYSENE	MIA188	MIA189FDDL	30000	E	1800	19000	=	ug/kg	7100	200.0%
SS	SW8270	FLUORANTHENE	MIA188	MIA189FDDL	81000	E	1800	40000	=	ug/kg	7100	200.0%
SS	SW8270	INDENO(1,2,3-c,d)PYRENE	MIA188	MIA189FDDL	23000	E	1800	12000	=	ug/kg	7100	200.0%
SS	SW8270	PHENANTHRENE	MIA188	MIA189FDDL	25000	E	1800	18000	=	ug/kg	7100	200.0%
SS	SW8270	PYRENE	MIA188	MIA189FDDL	72000	E	1800	31000	=	ug/kg	7100	200.0%
SS	SW8270	DIBENZ(a,h)ANTHRACENE	MIA188	MIA189FD	9500	=	1800	5600	E	ug/kg	350	200.0%
SS	SW8270	FLUORANTHENE	MIA188DL	MIA189FD	65000	=	10000	95000	E	ug/kg	350	200.0%
SS	SW8270	PYRENE	MIA188DL	MIA189FD	52000	=	10000	74000	E	ug/kg	350	200.0%
SS	SW6010	COPPER	MIA313	MIA314FD	30.3	=	1.1	1260	=	mg/kg	1	**190.6%**
SS	SW6010	ZINC	MIA313	MIA314FD	184	=	0.12	1770	=	mg/kg	0.12	**162.3%**
SS	SW6010	LEAD	MIA033	MIA034FD	318	=	0.15	34.6	=	mg/kg	0.15	**160.7%**
SS	SW8100	PHENANTHRENE	MIA222	MIA223FD	18000	=	3000	2400	J	ug/kg	3000	152.9%
SS	SW6010	NICKEL	MIA313	MIA314FD	6.7	=	0.034	46.3	=	mg/kg	0.034	**149.4%**
SS	SW8100	PYRENE	MIA222	MIA223FD	14000	=	3000	2600	J	ug/kg	3000	137.3%
SE	SW6010	ZINC	MIA025	MIA026FD	573	=	0.16	128	=	mg/kg	0.16	**127.0%**
SS	SW8100	FLUORANTHENE	MIA222	MIA223FD	20000	=	3000	4500	=	ug/kg	3000	126.5%
SS	SW8100	CHRYSENE	MIA222	MIA223FD	8700	=	3000	2100	J	ug/kg	3000	122.2%
SS	SW8260	TOLUENE	MIA327	MIA328FD	1	J	9	4	J	ug/kg	10	120.0%
SS	SW8100	BENZO(k)FLUORANTHENE	MIA222	MIA223FD	7000	=	3000	1900	J	ug/kg	3000	114.6%
SS	SW8100	BENZO(a)ANTHRACENE	MIA222	MIA223FD	7200	=	3000	2000	J	ug/kg	3000	113.0%
SS	SW8100	BENZO(a)PYRENE	MIA222	MIA223FD	6100	=	3000	1700	J	ug/kg	3000	112.8%
SS	SW8100	BENZO(b)FLUORANTHENE	MIA222	MIA223FD	6000	=	3000	1700	J	ug/kg	3000	111.7%
SS	SW8260	BENZENE	MIA327	MIA328FD	2	J	9	7	J	ug/kg	10	111.1%
SS	SW8100	BENZO(b)FLUORANTHENE	MIA198	MIA199FD	4000	J	5300	12000	=	ug/kg	5300	100.0%
SS	SW8260	Total Xylenes	MIA327	MIA328FD	1	J	9	3	J	ug/kg	10	100.0%
SS	SW8100	PYRENE	MIA198	MIA199FD	5100	J	5300	15000	=	ug/kg	5300	98.5%
SS	SW6010	CADMIUM	MIA327	MIA328FD	0.51	TR	0.009	1.5	=	mg/kg	0.0093	98.5%
SS	SW8100	CHRYSENE	MIA198	MIA199FD	4200	J	5300	12000	=	ug/kg	5300	96.3%
SS	SW8100	BENZO(k)FLUORANTHENE	MIA198	MIA199FD	4300	J	5300	12000	=	ug/kg	5300	94.5%
SS	SW8100	BENZO(a)PYRENE	MIA198	MIA199FD	3700	J	5300	10000	=	ug/kg	5300	92.0%

TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	MIA138	MIA139FD	31	=	11	81	=	ug/kg	14	89.3%
SS	SW8100	FLUORANTHENE	MIA198	MIA199FD	7800	=	5300	20000	=	ug/kg	5300	87.8%
SS	SW8100	BENZO(a)ANTHRACENE	MIA198	MIA199FD	3700	J	5300	9300	=	ug/kg	5300	86.2%
SS	SW8270	BENZO(g,h,i)PERYLENE	MIA188DL	MIA189FDDL	27000	=	10000	11000	=	ug/kg	7100	84.2%
SS	SW6010	CADMIUM	MIA230	MIA231FD	0.14	TR	0.01	0.34	TR	mg/kg	0.01	83.3%
SS	SW8270	ACENAPHTHYLENE	MIA188	MIA189FD	240	J	1800	100	J	ug/kg	350	82.4%
SS	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	MIA128	MIA129FD	16	=	11	38	=	ug/kg	13	81.5%
SS	SW8100	PHENANTHRENE	MIA198	MIA199FD	3000	J	5300	7100	=	ug/kg	5300	81.2%
SS	SW7471	MERCURY	MIA277	MIA278FD	0.04	=	0.018	0.09	=	mg/kg	0.02	76.9%
SS	SW6010	ANTIMONY	MIA277	MIA278FD	0.41	TR	0.19	0.87	TR	mg/kg	0.2	71.9%
SS	SW6010	LEAD	MIA313	MIA314FD	344	=	1.4	727	=	mg/kg	1.3	**71.5%**
SS	SW8260	BENZENE	MIA138	MIA139FD	6	J	11	3	J	ug/kg	14	66.7%
SS	SW8260	CARBON DISULFIDE	MIA188	MIA189FD	1	J	10	2	J	ug/kg	11	66.7%
SS	SW8270	INDENO(1,2,3-c,d)PYRENE	MIA188DL	MIA189FDDL	24000	=	10000	12000	=	ug/kg	7100	66.7%
SS	SW6010	CADMIUM	MIA159	MIA160FD	0.66	TR	0.048	1.3	=	mg/kg	0.019	65.3%
SS	SW8270	BENZO(a)PYRENE	MIA188DL	MIA189FDDL	31000	=	10000	16000	=	ug/kg	7100	63.8%
SS	SW6010	ZINC	MIA188	MIA189FD	142	=	0.12	74.8	=	mg/kg	0.12	**62.0%**
SB	SW8260	ETHYLBENZENE	MIA120	MIA121FD	360	J	610	190	J	ug/kg	610	61.8%
SS	SW6010	SELENIUM	MIA313	MIA314FD	2.8	TR	1.7	5.3	=	mg/kg	1.7	61.7%
SS	SW6010	ARSENIC	MIA033	MIA034FD	39	=	0.16	21.3	=	mg/kg	0.16	**58.7%**
SB	SW8260	Total Xylenes	MIA120	MIA121FD	570	J	610	320	J	ug/kg	610	56.2%
SS	SW8270	BENZO(b)FLUORANTHENE	MIA188DL	MIA189FDDL	32000	=	10000	18000	=	ug/kg	7100	56.0%
SS	SW8270	BENZO(k)FLUORANTHENE	MIA188DL	MIA189FDDL	30000	=	10000	17000	=	ug/kg	7100	55.3%
SS	SW6010	ANTIMONY	MIA313	MIA314FD	7.4	TR	1.8	12.8	TR	mg/kg	1.8	53.5%
SS	SW8270	BENZO(a)ANTHRACENE	MIA188DL	MIA189FDDL	29000	=	10000	17000	=	ug/kg	7100	52.2%
SS	SW6010	SELENIUM	MIA033	MIA034FD	1	=	0.19	1.7	=	mg/kg	0.19	**51.9%**
SS	SW8270	CHRYSENE	MIA188DL	MIA189FDDL	32000	=	10000	19000	=	ug/kg	7100	51.0%
SS	SW8270	PYRENE	MIA188DL	MIA189FDDL	52000	=	10000	31000	=	ug/kg	7100	50.6%
SS	SW7471	MERCURY	MIA138	MIA139FD	0.05	=	0.02	0.03	TR	mg/kg	0.019	50.0%
SS	SW8081	p,p'-DDT	MIA128	MIA129FD	140	=	38	86	=	ug/kg	58	47.8%
SS	SW8270	FLUORANTHENE	MIA188DL	MIA189FDDL	65000	=	10000	40000	=	ug/kg	7100	**47.6%**
SS	SW8270	PHENANTHRENE	MIA188DL	MIA189FDDL	29000	=	10000	18000	=	ug/kg	7100	46.8%
SE	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	MIA025	MIA026FD	5	J	13	8	J	ug/kg	16	46.2%
SS	SW6010	ARSENIC	MIA138	MIA139FD	29.5	=	0.17	46.1	=	mg/kg	0.17	**43.9%**
SS	SW6010	BERYLLIUM	MIA033	MIA034FD	0.67	=	0.0029	0.43	TR	mg/kg	0.0029	**43.6%**
SS	SW6010	NICKEL	MIA159	MIA160FD	59.9	=	0.036	38.6	=	mg/kg	0.036	**43.2%**
SS	SW6010	COPPER	MIA327	MIA328FD	38.9	=	0.11	60	=	mg/kg	0.11	**42.7%**
SB	SW8260	BENZENE	MIA120	MIA121FD	2000	=	610	1300	=	ug/kg	610	42.4%
SS	SW6010	ANTIMONY	MIA159	MIA160FD	3	TR	0.96	4.5	TR	mg/kg	0.38	40.0%
SS	SW6010	CADMIUM	MIA033	MIA034FD	0.03	TR	0.0099	0.02	TR	mg/kg	0.0098	40.0%
SS	SW7471	MERCURY	MIA281	MIA282FD	0.06	=	0.019	0.04	=	mg/kg	0.019	40.0%
SS	SW6010	CADMIUM	MIA313	MIA314FD	1.8	=	0.0089	1.2	=	mg/kg	0.0089	**40.0%**
SS	SW6010	BERYLLIUM	MIA296	MIA297FD	0.22	TR	0.0027	0.33	TR	mg/kg	0.0027	40.0%
SS	SW6010	POTASSIUM	MIA188	MIA189FD	960	TR	434.4	1420	TR	mg/kg	436.7	38.7%
SS	SW6010	IRON	MIA188	MIA189FD	4410	=	0.38	6500	=	mg/kg	0.38	**38.3%**
SS	SW6010	SELENIUM	MIA159	MIA160FD	1.6	TR	0.9	1.1	TR	mg/kg	0.36	37.0%
SS	SW6010	SELENIUM	MIA049	MIA050FD	1.2	=	0.17	0.83	=	mg/kg	0.17	36.5%

TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW6010	CADMIUM	MIA170	MIA171FD	0.49	TR	0.0095	0.7	=	mg/kg	0.0094	35.3%
SS	SW6010	LEAD	MIA230	MIA231FD	11.7	=	0.15	16.5	=	mg/kg	0.15	34.0%
SS	SW6010	CADMIUM	MIA138	MIA139FD	0.05	TR	0.01	0.07	TR	mg/kg	0.01	33.3%
SS	SW6010	ZINC	MIA170	MIA171FD	235	=	0.12	329	=	mg/kg	0.12	33.3%
SS	SW6010	ARSENIC	MIA313	MIA314FD	13.8	=	0.15	9.9	=	mg/kg	0.15	32.9%
SS	SW8270	BENZO(k)FLUORANTHENE	MIA327	MIA328FD	66	J	350	92	J	ug/kg	370	32.9%
SS	SW6010	CHROMIUM, TOTAL	MIA033	MIA034FD	13.2	=	0.12	9.5	=	mg/kg	0.12	32.6%
SS	SW8270	ANTHRACENE	MIA188	MIA189FDDL	4100	=	1800	3000	J	ug/kg	7100	31.0%
SE	SW6010	CADMIUM	MIA025	MIA026FD	0.15	TR	0.012	0.11	TR	mg/kg	0.012	30.8%
SS	SW6010	NICKEL	MIA277	MIA278FD	5.8	=	0.036	7.9	=	mg/kg	0.038	30.7%
SS	SW6010	COPPER	MIA159	MIA160FD	208	=	0.56	153	=	mg/kg	0.22	30.5%
SS	SW6010	ZINC	MIA159	MIA160FD	340	=	0.12	251	=	mg/kg	0.12	30.1%
SS	SW6010	NICKEL	MIA281	MIA282FD	6.9	=	0.037	9.3	=	mg/kg	0.037	29.6%
SS	SW8270	FLUORENE	MIA188	MIA189FD	1300	J	1800	970	=	ug/kg	350	29.1%
SS	SW6010	CHROMIUM, TOTAL	MIA277	MIA278FD	10.6	=	0.11	14.2	=	mg/kg	0.12	29.0%
SS	SW6010	CHROMIUM, TOTAL	MIA188	MIA189FD	9.8	=	0.11	13.1	=	mg/kg	0.11	28.8%
SS	SW7471	MERCURY	MIA033	MIA034FD	0.04	TR	0.019	0.03	TR	mg/kg	0.019	28.6%
SS	SW7471	MERCURY	MIA230	MIA231FD	0.04	=	0.02	0.03	TR	mg/kg	0.02	28.6%
SS	SW8270	ACENAPHTHENE	MIA188	MIA189FD	2000	=	1800	1500	=	ug/kg	350	28.6%
SE	SW6010	CALCIUM	MIA025	MIA026FD	4030	=	3.4	3040	=	mg/kg	3.4	28.0%
SS	SW6010	VANADIUM	MIA327	MIA328FD	12	=	0.032	15.9	=	mg/kg	0.033	28.0%
SS	SW6010	LEAD	MIA170	MIA171FD	34.1	=	0.14	44.9	=	mg/kg	0.14	27.3%
SS	SW6010	ALUMINUM	MIA128	MIA129FD	8910	=	0.91	11700	=	mg/kg	0.92	27.1%
SS	SW6010	ARSENIC	MIA327	MIA328FD	5.5	=	0.15	7.2	=	mg/kg	0.15	26.8%
SS	SW8100	FLUORANTHENE	MIA033	MIA034FD	300	=	120	230	=	ug/kg	110	26.4%
SS	SW6010	POTASSIUM	MIA128	MIA129FD	1790	=	95.1	2330	=	mg/kg	95.6	26.2%
SS	SW6010	CADMIUM	MIA281	MIA282FD	0.41	TR	0.0097	0.53	TR	mg/kg	0.0097	25.5%
SS	SW6010	ARSENIC	MIA159	MIA160FD	19	=	0.79	14.7	=	mg/kg	0.31	25.5%
SS	SW6010	ARSENIC	MIA128	MIA129FD	20	=	0.16	25.8	=	mg/kg	0.16	25.3%
SS	SW6010	COPPER	MIA281	MIA282FD	12.9	=	0.11	16.5	=	mg/kg	0.11	24.5%
SE	SW8081	p,p -DDE	MIA025	MIA026FD	55	=	46	70	=	ug/kg	48	24.0%
SS	TC6010	Nickel, TCLP	MIA159	MIA160FD	83.5	TR	25.6	66.3	TR	ug/L	25.6	23.0%
SS	SW6010	BERYLLIUM	MIA188	MIA189FD	0.31	TR	0.0026	0.39	TR	mg/kg	0.0026	22.9%
SS	SW6010	VANADIUM	MIA128	MIA129FD	20.1	=	0.035	25.2	=	mg/kg	0.036	22.5%
SS	SW8270	FLUORANTHENE	MIA128	MIA129FD	40	J	380	50	J	ug/kg	390	22.2%
SS	SW8081	GAMMA-CHLORDANE	MIA138	MIA139FD	150	J	200	120	J	ug/kg	200	22.2%
SS	SW6010	BERYLLIUM	MIA281	MIA282FD	0.56	TR	0.0029	0.7	=	mg/kg	0.0029	22.2%
SS	SW6010	IRON	MIA327	MIA328FD	19900	=	0.38	24800	=	mg/kg	0.39	21.9%
SS	SW6010	CHROMIUM, TOTAL	MIA159	MIA160FD	233	=	0.12	187	=	mg/kg	0.12	21.9%
SS	SW8100	ANTHRACENE	MIA188	MIA189FD	4500	J	5300	5600	=	ug/kg	5300	21.8%
SS	TC6010	Chromium, TCLP	MIA159	MIA160FD	77.1	=	6.8	62.1	=	ug/L	6.8	21.6%
SS	SW8100	PHENANTHRENE	MIA313	MIA314FD	42000	J	53000	52000	J	ug/kg	53000	21.3%
SS	SW6010	CHROMIUM, TOTAL	MIA296	MIA297FD	9.3	=	0.11	11.5	=	mg/kg	0.11	21.2%
SS	SW8081	ALPHA-CHLORDANE	MIA138	MIA139FD	210	=	200	170	J	ug/kg	200	21.1%
SS	SW8100	BENZO(a)ANTHRACENE	MIA313	MIA314FD	51000	J	53000	63000	=	ug/kg	53000	21.1%
SS	SW6010	CALCIUM	MIA327	MIA328FD	46100	=	2.5	37400	=	mg/kg	2.6	20.8%
SS	SW6010	POTASSIUM	MIA327	MIA328FD	1050	=	87.3	1290	=	mg/kg	90.1	20.5%

TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW8270	DIBENZOFURAN	MIA188	MIA189FD	540	J	1800	440	=	ug/kg	350	20.4%
SS	SW6010	ARSENIC	MIA296	MIA297FD	4.4	=	0.15	5.4	=	mg/kg	0.15	20.4%
SS	SW6010	LEAD	MIA188	MIA189FD	43.7	=	0.68	53.6	=	mg/kg	0.68	20.3%
SS	SW6010	COPPER	MIA296	MIA297FD	13.3	=	0.11	16.3	=	mg/kg	0.11	20.3%
SS	SW8100	PYRENE	MIA313	MIA314FD	67000	=	53000	82000	=	ug/kg	53000	20.1%
SE	SW8270	FLUORANTHENE	MIA025	MIA026FD	140	J	470	170	J	ug/kg	480	19.4%
SS	SW8081	DIELDRIN	MIA128	MIA129FD	140	=	38	170	=	ug/kg	58	19.4%
SS	SW8100	BENZO(k)FLUORANTHENE	MIA313	MIA314FD	57000	=	53000	69000	=	ug/kg	53000	19.0%
SS	SW6010	ALUMINUM	MIA049	MIA050FD	4430	=	0.85	5360	=	mg/kg	0.85	19.0%
SS	SW6010	COPPER	MIA170	MIA171FD	12.9	=	0.11	15.6	=	mg/kg	0.11	18.9%
SS	SW8081	p,p'-DDE	MIA327	MIA328FD	48	=	35	58	=	ug/kg	36	18.9%
SS	SW6010	VANADIUM	MIA138	MIA139FD	27.4	=	0.036	22.7	=	mg/kg	0.036	18.8%
SS	SW8100	CHRYSENE	MIA313	MIA314FD	63000	=	53000	76000	=	ug/kg	53000	18.7%
SS	SW6010	ALUMINUM	MIA327	MIA328FD	4740	=	0.84	5700	=	mg/kg	0.86	18.4%
SS	SW8100	PHENANTHRENE	MIA188	MIA189FD	30000	=	5300	36000	=	ug/kg	5300	18.2%
SS	SW7471	MERCURY	MIA222	MIA223FD	0.12	=	0.02	0.1	=	mg/kg	0.02	18.2%
SS	SW6010	MANGANESE	MIA188	MIA189FD	93.9	=	0.055	112	=	mg/kg	0.056	17.6%
SS	SW6010	CHROMIUM, TOTAL	MIA230	MIA231FD	10.9	=	0.12	13	=	mg/kg	0.12	17.6%
SS	SW8100	BENZO(a)PYRENE	MIA313	MIA314FD	52000	J	53000	62000	=	ug/kg	53000	17.5%
SS	SW6010	CALCIUM	MIA188	MIA189FD	144000	=	12.5	121000	=	mg/kg	12.6	17.4%
SS	SW6010	ALUMINUM	MIA138	MIA139FD	12600	=	0.93	10600	=	mg/kg	0.94	17.2%
SS	SW6010	NICKEL	MIA296	MIA297FD	7	=	0.035	8.3	=	mg/kg	0.034	17.0%
SS	SW8100	FLUORANTHENE	MIA313	MIA314FD	110000	=	53000	130000	=	ug/kg	53000	16.7%
SS	SW8100	BENZO(b)FLUORANTHENE	MIA313	MIA314FD	50000	J	53000	59000	=	ug/kg	53000	16.5%
SS	SW6010	SELENIUM	MIA296	MIA297FD	0.33	TR	0.17	0.28	TR	mg/kg	0.17	16.4%
SS	SW6010	ZINC	MIA033	MIA034FD	44	=	0.13	37.4	=	mg/kg	0.13	16.2%
SS	SW6010	MANGANESE	MIA128	MIA129FD	560	=	0.061	658	=	mg/kg	0.061	16.1%
SS	SW6010	MAGNESIUM	MIA049	MIA050FD	263	TR	0.67	309	TR	mg/kg	0.66	16.1%
SE	SW6010	ALUMINUM	MIA025	MIA026FD	10300	=	1.1	12100	=	mg/kg	1.1	16.1%
SS	SW6010	LEAD	MIA138	MIA139FD	65.4	=	0.15	76.8	=	mg/kg	0.15	16.0%
SS	SW6010	COBALT	MIA188	MIA189FD	2.3	TR	0.053	2.7	TR	mg/kg	0.053	16.0%
SS	SW6010	NICKEL	MIA327	MIA328FD	16.2	=	0.034	19	=	mg/kg	0.035	15.9%
SS	SW6010	BARIUM	MIA188	MIA189FD	43.5	TR	0.25	51	TR	mg/kg	0.25	15.9%
SS	SW8081	DIELDRIN	MIA138	MIA139FD	480	=	390	410	=	ug/kg	390	15.7%
SS	SW6010	MAGNESIUM	MIA128	MIA129FD	1730	=	0.71	2020	=	mg/kg	0.72	15.5%
SS	SW7471	MERCURY	MIA128	MIA129FD	0.07	=	0.019	0.06	=	mg/kg	0.019	15.4%
SE	SW8270	PYRENE	MIA025	MIA026FD	120	J	470	140	J	ug/kg	480	15.4%
SS	SW8100	BENZO(g,h,i)PERYLENE	MIA313	MIA314FD	30000	J	53000	35000	J	ug/kg	53000	15.4%
SS	SW8100	BENZO(k)FLUORANTHENE	MIA188	MIA189FD	36000	=	5300	42000	=	ug/kg	5300	15.4%
SS	SW8270	CARBAZOLE	MIA188	MIA189FDDL	4900	=	1800	4200	J	ug/kg	7100	15.4%
SS	SW8081	DIELDRIN	MIA327	MIA328FD	12	J	35	14	J	ug/kg	36	15.4%
SS	SW8260	ETHYLBENZENE	MIA188	MIA189FD	6	J	10	7	J	ug/kg	11	15.4%
SS	SW8081	p,p'-DDT	MIA327	MIA328FD	120	=	35	140	=	ug/kg	36	15.4%
SS	SW8260	TOLUENE	MIA188	MIA189FD	12	=	10	14	=	ug/kg	11	15.4%
SE	SW6010	ARSENIC	MIA025	MIA026FD	7.2	=	0.2	8.4	=	mg/kg	0.2	15.4%
SE	SW6010	BARIUM	MIA025	MIA026FD	75.6	=	0.068	88.1	=	mg/kg	0.07	15.3%
SS	SW6010	NICKEL	MIA188	MIA189FD	5.5	=	0.034	6.4	=	mg/kg	0.034	15.1%

TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW6010	BARIUM	MIA327	MIA328FD	76.2	=	0.051	88.6	=	mg/kg	0.053	15.0%
SS	SW6010	ZINC	MIA296	MIA297FD	29.9	=	0.12	34.7	=	mg/kg	0.12	14.9%
SS	SW8100	INDENO(1,2,3-c,d)PYRENE	MIA313	MIA314FD	38000	J	53000	44000	J	ug/kg	53000	14.6%
SS	SW6010	NICKEL	MIA033	MIA034FD	11.8	=	0.038	10.2	=	mg/kg	0.037	14.5%
SS	SW8100	BENZO(b)FLUORANTHENE	MIA188	MIA189FD	32000	=	5300	37000	=	ug/kg	5300	14.5%
SS	SW6010	POTASSIUM	MIA138	MIA139FD	2590	=	97.5	2240	=	mg/kg	97.7	14.5%
SE	SW6010	BERYLLIUM	MIA025	MIA026FD	0.45	TR	0.0035	0.52	TR	mg/kg	0.0036	14.4%
SS	SW6010	ARSENIC	MIA188	MIA189FD	5.2	=	0.15	6	=	mg/kg	0.15	14.3%
SE	SW8270	BENZO(b)FLUORANTHENE	MIA025	MIA026FD	91	J	470	79	J	ug/kg	480	14.1%
SE	SW6010	COPPER	MIA025	MIA026FD	15.3	=	0.14	17.6	=	mg/kg	0.15	14.0%
SS	SW8100	BENZO(g,h,i)PERYLENE	MIA188	MIA189FD	20000	=	5300	23000	=	ug/kg	5300	14.0%
SE	SW6010	NICKEL	MIA025	MIA026FD	12.8	=	0.046	14.7	=	mg/kg	0.047	13.8%
SS	SW6010	CHROMIUM, TOTAL	MIA128	MIA129FD	11.5	=	0.12	13.2	=	mg/kg	0.12	13.8%
SE	SW6010	VANADIUM	MIA025	MIA026FD	25.1	=	0.043	28.8	=	mg/kg	0.045	13.7%
SS	SW6010	NICKEL	MIA128	MIA129FD	13.7	=	0.037	15.7	=	mg/kg	0.037	13.6%
SS	SW6010	COPPER	MIA188	MIA189FD	9.7	TR	0.53	11.1	TR	mg/kg	0.53	13.5%
SS	SW6010	ZINC	MIA230	MIA231FD	43.9	=	0.13	50.2	=	mg/kg	0.13	13.4%
SS	SW8100	CHRYSENE	MIA188	MIA189FD	42000	=	5300	48000	=	ug/kg	5300	13.3%
SS	SW8270	BENZO(a)ANTHRACENE	MIA327	MIA328FD	71	J	350	81	J	ug/kg	370	13.2%
SS	SW6010	ARSENIC	MIA230	MIA231FD	7.9	=	0.17	9	=	mg/kg	0.17	13.0%
SE	SW6010	IRON	MIA025	MIA026FD	15100	=	0.51	17200	=	mg/kg	0.52	13.0%
SS	SW8270	BENZO(b)FLUORANTHENE	MIA327	MIA328FD	91	J	350	80	J	ug/kg	370	12.9%
SS	SW6010	ANTIMONY	MIA188	MIA189FD	2.2	TR	0.9	2.5	TR	mg/kg	0.9	12.8%
SS	SW8081	p,p'-DDE	MIA128	MIA129FD	84	=	38	74	=	ug/kg	58	12.7%
SS	TC6010	Lead, TCLP	MIA159	MIA160FD	1180	=	60.4	1040	=	ug/L	60.4	12.6%
SS	SW8100	BENZO(a)PYRENE	MIA188	MIA189FD	30000	=	5300	34000	=	ug/kg	5300	12.5%
SS	SW6010	MAGNESIUM	MIA138	MIA139FD	2390	=	0.73	2110	=	mg/kg	0.73	12.4%
SS	SW6010	BARIUM	MIA128	MIA129FD	98	=	0.055	111	=	mg/kg	0.056	12.4%
SS	SW6010	LEAD	MIA222	MIA223FD	49.9	=	0.16	56.5	=	mg/kg	0.15	12.4%
SS	SW6010	VANADIUM	MIA188	MIA189FD	8.4	=	0.032	9.5	=	mg/kg	0.032	12.3%
SE	SW6010	POTASSIUM	MIA025	MIA026FD	2050	=	116.8	2310	=	mg/kg	119.8	11.9%
SS	SW6010	COPPER	MIA049	MIA050FD	12.5	=	0.11	11.1	=	mg/kg	0.11	11.9%
SS	SW6010	IRON	MIA128	MIA129FD	16700	=	0.42	18800	=	mg/kg	0.42	11.8%
SS	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	MIA327	MIA328FD	8	J	9	9	J	ug/kg	10	11.8%
SS	SW6010	LEAD	MIA327	MIA328FD	332	=	0.14	373	=	mg/kg	0.14	11.6%
SS	SW6010	BERYLLIUM	MIA128	MIA129FD	0.41	TR	0.0029	0.46	TR	mg/kg	0.0029	11.5%
SS	SW8100	BENZO(a)ANTHRACENE	MIA188	MIA189FD	33000	=	5300	37000	=	ug/kg	5300	11.4%
SS	SW6010	BERYLLIUM	MIA170	MIA171FD	0.37	TR	0.0028	0.33	TR	mg/kg	0.0028	11.4%
SS	SW6010	CADMIUM	MIA128	MIA129FD	0.25	TR	0.0098	0.28	TR	mg/kg	0.0099	11.3%
SB	SW6010	LEAD	MIA146	MIA147FD	8.4	=	0.16	7.5	=	mg/kg	0.16	11.3%
SS	SW8270	FLUORANTHENE	MIA138	MIA139FD	28000	=	3900	25000	=	ug/kg	4000	11.3%
SS	SW6010	COBALT	MIA049	MIA050FD	1.9	TR	0.054	1.7	TR	mg/kg	0.054	11.1%
SS	SW6010	MAGNESIUM	MIA188	MIA189FD	9700	=	3.2	8680	=	mg/kg	3.3	11.1%
SS	SW8270	PYRENE	MIA138	MIA139FD	26000	=	3900	29000	=	ug/kg	4000	10.9%
SS	SW6010	BERYLLIUM	MIA277	MIA278FD	0.26	TR	0.0028	0.29	TR	mg/kg	0.0029	10.9%
SS	SW8100	FLUORANTHENE	MIA188	MIA189FD	70000	=	5300	78000	=	ug/kg	5300	10.8%
SS	SW6010	ALUMINUM	MIA188	MIA189FD	3740	=	0.83	4160	=	mg/kg	0.84	10.6%

TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW6010	CALCIUM	MIA049	MIA050FD	1270	=	2.6	1410	=	mg/kg	2.6	10.4%
SS	SW6010	ARSENIC	MIA170	MIA171FD	6.4	=	0.16	7.1	=	mg/kg	0.15	10.4%
SS	SW6010	NICKEL	MIA230	MIA231FD	15.8	=	0.038	17.5	=	mg/kg	0.038	10.2%
SE	SW6010	CHROMIUM, TOTAL	MIA025	MIA026FD	13.5	=	0.15	14.9	=	mg/kg	0.15	9.9%
SS	SW6010	ARSENIC	MIA222	MIA223FD	34.8	=	0.17	38.4	=	mg/kg	0.17	9.8%
SS	SW8081	p,p -DDE	MIA327	MIA328FD	32	J	35	29	J	ug/kg	36	9.8%
SS	SW6010	IRON	MIA138	MIA139FD	20400	=	0.43	18500	=	mg/kg	0.43	9.8%
SS	SW8270	INDENO(1,2,3-c,d)PYRENE	MIA327	MIA328FD	59	J	350	65	J	ug/kg	370	9.7%
SS	TC6010	Zinc, TCLP	MIA170	MIA171FD	2870	=	18.8	3160	=	ug/L	18.8	9.6%
SB	SW6010	CHROMIUM, TOTAL	MIA146	MIA147FD	15.3	=	0.13	13.9	=	mg/kg	0.13	9.6%
SS	SW8270	DIBENZOFURAN	MIA138	MIA139FD	2000	J	3900	2200	J	ug/kg	4000	9.5%
SS	SW6010	NICKEL	MIA170	MIA171FD	14.5	=	0.036	13.2	=	mg/kg	0.036	9.4%
SE	SW8270	BENZO(g,h,i)PERYLENE	MIA025	MIA026FD	56	J	470	51	J	ug/kg	480	9.3%
SS	SW6010	BERYLLIUM	MIA230	MIA231FD	0.42	TR	0.003	0.46	TR	mg/kg	0.003	9.1%
SS	SW6010	CALCIUM	MIA128	MIA129FD	1790	=	2.7	1960	=	mg/kg	2.8	9.1%
SS	SW8270	BENZO(a)PYRENE	MIA138	MIA139FD	12000	=	3900	11000	=	ug/kg	4000	8.7%
SS	SW8081	p,p -DDE	MIA138	MIA139FD	120	J	390	110	J	ug/kg	390	8.7%
SS	SW8100	PHENANTHRENE	MIA033	MIA034FD	240	=	120	220	=	ug/kg	110	8.7%
SS	SW8100	PYRENE	MIA188	MIA189FD	55000	=	5300	60000	=	ug/kg	5300	8.7%
SE	SW6010	MANGANESE	MIA025	MIA026FD	271	=	0.075	295	=	mg/kg	0.077	8.5%
SS	SW6010	CADMIUM	MIA277	MIA278FD	0.75	=	0.0094	0.69	=	mg/kg	0.01	8.3%
SS	SW8270	PHENANTHRENE	MIA327	MIA328FD	63	J	350	58	J	ug/kg	370	8.3%
SS	SW6010	ARSENIC	MIA049	MIA050FD	3.8	=	0.15	3.5	=	mg/kg	0.15	8.2%
SS	SW8270	INDENO(1,2,3-c,d)PYRENE	MIA138	MIA139FD	7700	=	3900	7100	=	ug/kg	4000	8.1%
SB	SW6010	SELENIUM	MIA146	MIA147FD	1.3	=	0.19	1.2	=	mg/kg	0.2	8.0%
SE	SW6010	SELENIUM	MIA025	MIA026FD	1.2	=	0.23	1.3	=	mg/kg	0.23	8.0%
SS	SW6010	BERYLLIUM	MIA138	MIA139FD	0.52	TR	0.003	0.48	TR	mg/kg	0.003	8.0%
SS	SW6010	CADMIUM	MIA306	MIA307FD	0.26	TR	0.0098	0.24	TR	mg/kg	0.0099	8.0%
SS	SW6010	SILVER	MIA313	MIA314FD	1.2	=	0.052	1.3	=	mg/kg	0.051	8.0%
SS	SW8100	BENZO(b)FLUORANTHENE	MIA033	MIA034FD	260	=	120	240	=	ug/kg	110	8.0%
SS	SW8100	INDENO(1,2,3-c,d)PYRENE	MIA033	MIA034FD	120	=	120	130	=	ug/kg	110	8.0%
SS	SW8270	NAPHTHALENE	MIA138	MIA139FD	1300	J	3900	1200	J	ug/kg	4000	8.0%
SS	SW8081	p,p'-DDT	MIA188	MIA189FD	1300	=	690	1200	=	ug/kg	700	8.0%
SS	SW6010	MANGANESE	MIA049	MIA050FD	65.2	=	0.057	60.2	=	mg/kg	0.057	8.0%
SE	SW6010	LEAD	MIA025	MIA026FD	15	=	0.18	16.2	=	mg/kg	0.19	7.7%
SS	SW6010	LEAD	MIA296	MIA297FD	12.7	=	0.14	13.7	=	mg/kg	0.14	7.6%
WS	SW6010	POTASSIUM	MIA018	MIA019FD	1510	TR	824.5	1400	TR	ug/L	824.5	7.6%
SS	SW6010	COPPER	MIA222	MIA223FD	18.1	=	0.12	19.5	=	mg/kg	0.12	7.4%
SS	SW8270	CHRYSENE	MIA138	MIA139FD	13000	=	3900	14000	=	ug/kg	4000	7.4%
SE	SW8270	BENZO(a)PYRENE	MIA025	MIA026FD	71	J	470	66	J	ug/kg	480	7.3%
SS	SW8270	BENZO(g,h,i)PERYLENE	MIA327	MIA328FD	66	J	350	71	J	ug/kg	370	7.3%
SS	SW6010	CHROMIUM III	MIA327	MIA328FD	133	=	1.1	143	=	mg/kg	1.1	7.2%
SS	SW6010	CHROMIUM, TOTAL	MIA327	MIA328FD	133	=	0.11	143	=	mg/kg	0.11	7.2%
SS	SW6010	CADMIUM	MIA222	MIA223FD	0.4	TR	0.01	0.43	TR	mg/kg	0.01	7.2%
SE	SW6010	COBALT	MIA025	MIA026FD	5.4	TR	0.071	5.8	TR	mg/kg	0.073	7.1%
SS	SW6010	BERYLLIUM	MIA049	MIA050FD	0.27	TR	0.0027	0.29	TR	mg/kg	0.0027	7.1%
SS	SW8081	p,p'-DDT	MIA222	MIA223FD	1500	=	400	1400	=	ug/kg	400	6.9%

TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW6010	COPPER	MIA128	MIA129FD	15.4	=	0.12	16.5	=	mg/kg	0.12	6.9%
SS	SW6010	POTASSIUM	MIA049	MIA050FD	847	=	89	905	=	mg/kg	88.7	6.6%
SS	SW8270	ACENAPHTHENE	MIA138	MIA139FD	3000	J	3900	3200	J	ug/kg	4000	6.5%
SS	SW8100	PYRENE	MIA033	MIA034FD	320	=	120	300	=	ug/kg	110	6.5%
SS	SW6010	ZINC	MIA306	MIA307FD	45.2	=	0.13	42.4	=	mg/kg	0.13	6.4%
SS	SW6010	COPPER	MIA230	MIA231FD	15.3	=	0.12	16.3	=	mg/kg	0.12	6.3%
SE	SW8081	p,p -DDD	MIA025	MIA026FD	31	J	46	33	J	ug/kg	48	6.3%
SE	SW8270	CHRYSENE	MIA025	MIA026FD	78	J	470	83	J	ug/kg	480	6.2%
SE	SW8270	PHENANTHRENE	MIA025	MIA026FD	78	J	470	83	J	ug/kg	480	6.2%
SS	SW8270	BENZO(k)FLUORANTHENE	MIA138	MIA139FD	10000	=	3900	9400	=	ug/kg	4000	6.2%
SS	SW6010	COBALT	MIA327	MIA328FD	4.7	TR	0.053	5	TR	mg/kg	0.055	6.2%
SS	SW6010	NICKEL	MIA306	MIA307FD	15.1	=	0.037	14.2	=	mg/kg	0.038	6.1%
SS	SW8100	BENZO(a)PYRENE	MIA033	MIA034FD	170	=	120	160	=	ug/kg	110	6.1%
SS	SW6010	COPPER	MIA277	MIA278FD	17.6	=	0.11	18.7	=	mg/kg	0.12	6.1%
SS	SW6010	CHROMIUM, TOTAL	MIA138	MIA139FD	13.8	=	0.12	13	=	mg/kg	0.12	6.0%
SE	SW6010	MAGNESIUM	MIA025	MIA026FD	2800	=	0.87	2640	=	mg/kg	0.9	5.9%
SS	SW6010	ARSENIC	MIA277	MIA278FD	9.9	=	0.15	10.5	=	mg/kg	0.17	5.9%
SS	SW6010	COPPER	MIA033	MIA034FD	10.5	=	0.12	9.9	=	mg/kg	0.12	5.9%
SS	SW6010	ZINC	MIA327	MIA328FD	282	=	0.12	299	=	mg/kg	0.12	5.9%
SS	SW6010	CALCIUM	MIA138	MIA139FD	1550	=	2.8	1640	=	mg/kg	2.8	5.6%
SS	SW6010	NICKEL	MIA222	MIA223FD	15.5	=	0.039	16.4	=	mg/kg	0.039	5.6%
SE	SW8270	BENZO(k)FLUORANTHENE	MIA025	MIA026FD	74	J	470	70	J	ug/kg	480	5.6%
SS	SW6010	MAGNESIUM	MIA327	MIA328FD	3050	=	0.65	2890	=	mg/kg	0.67	5.4%
SS	SW6010	VANADIUM	MIA049	MIA050FD	15.5	=	0.033	14.7	=	mg/kg	0.033	5.3%
SS	SW6010	COPPER	MIA306	MIA307FD	16	=	0.12	15.2	=	mg/kg	0.12	5.1%
SB	SW6010	ARSENIC	MIA146	MIA147FD	4	=	0.17	4.2	=	mg/kg	0.17	4.9%
SS	SW6010	ANTIMONY	MIA296	MIA297FD	2.1	TR	0.18	2	TR	mg/kg	0.18	4.9%
SS	SW6010	BARIUM	MIA049	MIA050FD	30.1	=	0.052	28.7	=	mg/kg	0.052	4.8%
SS	SW8270	BENZO(a)PYRENE	MIA327	MIA328FD	82	J	350	86	J	ug/kg	370	4.8%
SS	SW8081	PCB-1260 (AROCHLOR 1260)	MIA222	MIA223FD	6300	=	4000	6600	=	ug/kg	4000	4.7%
WS	SW6010	IRON	MIA018	MIA019FD	149	=	3.6	156	=	ug/L	3.6	4.6%
SS	SW6010	NICKEL	MIA049	MIA050FD	4.5	=	0.035	4.7	=	mg/kg	0.035	4.3%
SS	SW8270	BENZO(g,h,i)PERYLENE	MIA138	MIA139FD	7400	=	3900	7100	=	ug/kg	4000	4.1%
SS	SW6010	ARSENIC	MIA306	MIA307FD	9.9	=	0.16	10.3	=	mg/kg	0.16	4.0%
SS	SW6010	LEAD	MIA281	MIA282FD	83.9	=	0.15	80.8	=	mg/kg	0.15	3.8%
SS	SW6010	NICKEL	MIA138	MIA139FD	16.3	=	0.038	15.7	=	mg/kg	0.038	3.8%
SS	SW6010	COBALT	MIA128	MIA129FD	7.9	=	0.058	8.2	=	mg/kg	0.058	3.7%
SS	SW6010	LEAD	MIA159	MIA160FD	828	=	0.72	798	=	mg/kg	0.29	3.7%
SB	SW6010	ZINC	MIA146	MIA147FD	27.7	=	0.13	26.7	=	mg/kg	0.13	3.7%
SS	SW8100	INDENO(1,2,3-c,d)PYRENE	MIA188	MIA189FD	27000	=	5300	28000	=	ug/kg	5300	3.6%
SS	SW6010	CADMIUM	MIA296	MIA297FD	0.29	TR	0.0091	0.28	TR	mg/kg	0.0091	3.5%
SB	SW6010	BERYLLIUM	MIA146	MIA147FD	0.59	TR	0.003	0.57	TR	mg/kg	0.003	3.4%
SS	SW8270	CHRYSENE	MIA327	MIA328FD	87	J	350	90	J	ug/kg	370	3.4%
SS	SW6010	ZINC	MIA128	MIA129FD	72.8	=	0.13	75.2	=	mg/kg	0.13	3.2%
SS	SW6010	ZINC	MIA049	MIA050FD	30.5	=	0.12	31.5	=	mg/kg	0.12	3.2%
SB	SW6010	NICKEL	MIA146	MIA147FD	10.9	=	0.039	11.2	=	mg/kg	0.039	2.7%
SS	SW6010	BERYLLIUM	MIA327	MIA328FD	0.37	TR	0.0026	0.38	TR	mg/kg	0.0027	2.7%

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TABLE C.4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW6010	COBALT	MIA138	MIA139FD	7.6	=	0.059	7.4	=	mg/kg	0.06	2.7%
SS	SW6010	BERYLLIUM	MIA306	MIA307FD	0.39	TR	0.0029	0.38	TR	mg/kg	0.0029	2.6%
SS	SW6010	LEAD	MIA128	MIA129FD	36.3	=	0.15	35.4	=	mg/kg	0.15	2.5%
SS	SW6010	ARSENIC	MIA281	MIA282FD	8.2	=	0.16	8.4	=	mg/kg	0.16	2.4%
SS	SW6010	CADMIUM	MIA188	MIA189FD	0.95	=	0.009	0.93	=	mg/kg	0.009	2.1%
SS	SW6010	ZINC	MIA222	MIA223FD	80.6	=	0.13	82.3	=	mg/kg	0.13	2.1%
SS	SW6010	BERYLLIUM	MIA222	MIA223FD	0.48	TR	0.003	0.49	TR	mg/kg	0.003	2.1%
SS	SW8270	CARBAZOLE	MIA138	MIA139FD	5200	=	3900	5100	=	ug/kg	4000	1.9%
SS	SW6010	IRON	MIA049	MIA050FD	10600	=	0.39	10400	=	mg/kg	0.39	1.9%
SS	SW8270	ANTHRACENE	MIA138	MIA139FD	5300	=	3900	5400	=	ug/kg	4000	1.9%
SS	SW6010	CHROMIUM, TOTAL	MIA170	MIA171FD	17.9	=	0.12	17.6	=	mg/kg	0.11	1.7%
SS	SW6010	BARIUM	MIA138	MIA139FD	119	=	0.057	121	=	mg/kg	0.057	1.7%
SS	SW6010	CHROMIUM, TOTAL	MIA281	MIA282FD	18.7	=	0.12	19	=	mg/kg	0.12	1.6%
SS	SW6010	CHROMIUM, TOTAL	MIA222	MIA223FD	15.3	=	0.13	15.1	=	mg/kg	0.13	1.3%
SS	SW6010	MANGANESE	MIA327	MIA328FD	311	=	0.056	315	=	mg/kg	0.058	1.3%
SB	SW6010	COPPER	MIA146	MIA147FD	7.8	=	0.12	7.9	=	mg/kg	0.12	1.3%
SS	SW6010	MANGANESE	MIA138	MIA139FD	657	=	0.062	650	=	mg/kg	0.062	1.1%
SS	SW6010	CHROMIUM, TOTAL	MIA313	MIA314FD	38	=	0.11	38.4	=	mg/kg	0.11	1.0%
SS	SW6010	CHROMIUM, TOTAL	MIA306	MIA307FD	10.3	=	0.12	10.4	=	mg/kg	0.12	1.0%
SS	SW6010	LEAD	MIA306	MIA307FD	10.4	=	0.15	10.5	=	mg/kg	0.15	1.0%
SS	SW6010	CHROMIUM, TOTAL	MIA049	MIA050FD	10.9	=	0.11	10.8	=	mg/kg	0.11	0.9%
WS	SW6010	MAGNESIUM	MIA018	MIA019FD	714	TR	6.2	719	TR	ug/L	6.2	0.7%
SS	TC6010	Zinc TCLP	MIA159	MIA160FD	1660	=	18.8	1670	=	ug/L	18.8	0.6%
WS	SW6010	MANGANESE	MIA018	MIA019FD	17.8	=	0.53	17.9	=	ug/L	0.53	0.6%
SS	SW6010	COPPER	MIA138	MIA139FD	18.3	=	0.12	18.4	=	mg/kg	0.12	0.5%
SS	SW6010	LEAD	MIA049	MIA050FD	19.3	=	0.14	19.4	=	mg/kg	0.14	0.5%
WS	SW6010	CALCIUM	MIA018	MIA019FD	6660	=	23.7	6690	=	ug/L	23.7	0.4%
SS	SW6010	LEAD	MIA277	MIA278FD	269	=	0.14	270	=	mg/kg	0.15	0.4%
SS	SW6010	ZINC	MIA138	MIA139FD	61.4	=	0.13	61.5	=	mg/kg	0.13	0.2%
SS	SW6010	ZINC	MIA281	MIA282FD	61.6	=	0.13	61.7	=	mg/kg	0.13	0.2%
WS	SW6010	BARIUM	MIA018	MIA019FD	12.7	TR	0.48	12.7	TR	ug/L	0.48	0.0%
SB	SW8260	CARBON DISULFIDE	MIA088	MIA089FD	1	J	10	1	J	ug/kg	10	0.0%
SB	SW8260	METHYL ETHYL KETONE (2-BUTANONE)	MIA088	MIA089FD	22	=	10	22	=	ug/kg	10	0.0%
SE	SW8270	BENZO(a)ANTHRACENE	MIA025	MIA026FD	52	J	470	52	J	ug/kg	480	0.0%
SS	SW8260	2 HEXANONE	MIA327	MIA328FD	1	J	9	1	J	ug/kg	10	0.0%
SS	SW8270	2-METHYLNAPHTHALENE	MIA138	MIA139FD	600	J	3900	600	J	ug/kg	4000	0.0%
SS	SW8260	BENZENE	MIA188	MIA189FD	4	J	10	4	J	ug/kg	11	0.0%
SS	SW8270	BENZO(a)ANTHRACENE	MIA138	MIA139FD	12000	=	3900	12000	=	ug/kg	4000	0.0%
SS	SW8100	BENZO(a)ANTHRACENE	MIA033	MIA034FD	170	=	120	170	=	ug/kg	110	0.0%
SS	SW8270	BENZO(b)FLUORANTHENE	MIA138	MIA139FD	12000	=	3900	12000	=	ug/kg	4000	0.0%
SS	SW8100	BENZO(k)FLUORANTHENE	MIA033	MIA034FD	170	=	120	170	=	ug/kg	110	0.0%
SS	SW8260	CARBON DISULFIDE	MIA327	MIA328FD	2	J	9	2	J	ug/kg	10	0.0%
SS	SW8260	CARBON DISULFIDE	MIA138	MIA139FD	2	J	11	2	J	ug/kg	14	0.0%
SS	SW8100	CHRYSENE	MIA033	MIA034FD	180	=	120	180	=	ug/kg	110	0.0%
SS	SW8081	DIELDRIN	MIA222	MIA223FD	450	=	400	450	=	ug/kg	400	0.0%
SS	SW8270	FLUORANTHENE	MIA327	MIA328FD	130	J	350	130	J	ug/kg	370	0.0%
SS	SW8270	FLUORENE	MIA138	MIA139FD	3100	J	3900	3100	J	ug/kg	4000	0.0%

TABLE C 4-5
Field Duplicate Precision
Memphis Depot Main Installation RI

Matrix	Analytical Method	Parameter	Sample ID	Field Dup Sample ID	Final Result	Lab Qual	Detection Limit	Field Dup Final Result	Field Dup Lab Qual	Units	Field Dup Detection Limit	RPD
SS	SW8081	p,p'-DDE	MIA188	MIA189FD	1100	=	690	1100	=	ug/kg	700	0 0%
SS	SW8081	p,p'-DDE	MIA222	MIA223FD	1200	=	400	1200	=	ug/kg	400	0 0%
SS	SW8270	PHENANTHRENE	MIA138	MIA139FD	25000	=	3900	25000	=	ug/kg	4000	0 0%
SS	SW8270	PYRENE	MIA327	MIA328FD	130	J	350	130	J	ug/kg	370	0 0%
SS	SW8260	Total Xylenes	MIA188	MIA189FD	9	J	10	9	J	ug/kg	11	0 0%
SS	SW6010	BERYLLIUM	MIA313	MIA314FD	2 5	=	0 0026	2 5	=	mg/kg	0 0026	0 0%
SS	SW7471	MERCURY	MIA049	MIA050FD	0 04	=	0 018	0 04	=	mg/kg	0 018	0 0%
SS	SW7471	MERCURY	MIA188	MIA189FD	0 03	TR	0 018	0 03	TR	mg/kg	0 018	0 0%
SS	SW7471	MERCURY	MIA313	MIA314FD	3 5	=	0 088	3 5	=	mg/kg	0 087	0 0%
SS	SW7471	MERCURY	MIA306	MIA307FD	0 04	=	0 019	0 04	TR	mg/kg	0 019	0 0%
SS	SW6010	ZINC	MIA277	MIA278FD	113	=	0 12	113	=	mg/kg	0 13	0 0%

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ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
WS	MIA018	MG682001	SW6010	ALUMINUM	38 7	TR	U	7 9	ug/L	BL
WS	MIA019FD	MG682002	SW6010	ALUMINUM	39 1	TR	U	7 9	ug/L	BL
WS	MIA022	MG682004	SW6010	ALUMINUM	49 5	TR	U	7 9	ug/L	BL
SE	MIA015	MG682018	SW6010	ANTIMONY	0 89	TR	U	0 34	mg/kg	BL
SE	MIA026FD	MG682008	SW6010	ANTIMONY	0 26	TR	U	0 25	mg/kg	BL
SS	MIA001	MG672001	SW6010	ANTIMONY	1 3	TR	U	0 19	mg/kg	BL
SS	MIA005	MG672005	SW6010	ANTIMONY	0 56	TR	U	0 21	mg/kg	BL
SS	MIA006	MG672006	SW6010	ANTIMONY	0 32	TR	U	0 19	mg/kg	BL
WS	MIA011	MG682014	SW6010	ANTIMONY	4 1	TR	U	1 7	ug/L	BL
WS	MIA012	MG682015	SW6010	ANTIMONY	5	TR	U	1 7	ug/L	BL
WS	MIA016	MG682019	SW6010	ANTIMONY	3	TR	U	1 7	ug/L	BL
WS	MIA017	MG682020	SW6010	ANTIMONY	3 9	TR	U	1 7	ug/L	BL
WS	MIA018	MG682001	SW6010	ANTIMONY	5	TR	U	1 7	ug/L	BL
WS	MIA019FD	MG682002	SW6010	ANTIMONY	3	TR	U	1 7	ug/L	BL
WS	MIA021	MG682003	SW6010	ANTIMONY	4 7	TR	U	1 7	ug/L	BL
WS	MIA022	MG682004	SW6010	ANTIMONY	6 1	TR	U	1 7	ug/L	BL
WS	MIA007	MG682011	SW6010	ARSENIC	15 8	=	U	1 4	ug/L	BL
WS	MIA012	MG682015	SW6010	ARSENIC	16 9	=	U	1 4	ug/L	BL
WS	MIA016	MG682019	SW6010	ARSENIC	3 4	TR	U	1 4	ug/L	BL
WS	MIA017	MG682020	SW6010	ARSENIC	3 4	TR	U	1 4	ug/L	BL
WS	MIA018	MG682001	SW6010	ARSENIC	3 4	TR	U	1 4	ug/L	BL
WS	MIA019FD	MG682002	SW6010	ARSENIC	2 5	TR	U	1 4	ug/L	BL
WS	MIA021	MG682003	SW6010	ARSENIC	2 6	TR	U	1 4	ug/L	BL
WS	MIA022	MG682004	SW6010	ARSENIC	2 9	TR	U	1 4	ug/L	BL
SB	MIA151	MG730032	SW6010	BERYLLIUM	0 09	TR	U	0 0027	mg/kg	BL
SB	MIA152	MG730033	SW6010	BERYLLIUM	0 01	TR	U	0 0027	mg/kg	BL
WS	MIA007	MG682011	SW6010	BERYLLIUM	0 03	TR	U	0 025	ug/L	BL
WS	MIA011	MG682014	SW6010	BERYLLIUM	0 04	TR	U	0 025	ug/L	BL
WS	MIA012	MG682015	SW6010	BERYLLIUM	0 04	TR	U	0 025	ug/L	BL
WS	MIA016	MG682019	SW6010	BERYLLIUM	0 07	TR	U	0 025	ug/L	BL
WS	MIA017	MG682020	SW6010	BERYLLIUM	0 06	TR	U	0 025	ug/L	BL
WS	MIA018	MG682001	SW6010	BERYLLIUM	0 06	TR	U	0 025	ug/L	BL
WS	MIA019FD	MG682002	SW6010	BERYLLIUM	0 04	TR	U	0 025	ug/L	BL
WS	MIA021	MG682003	SW6010	BERYLLIUM	0 04	TR	U	0 025	ug/L	BL
WS	MIA022	MG682004	SW6010	BERYLLIUM	0 02	TR	U	0 02	ug/L	BL
SS	MIA050FD	MG711009	SW6010	CADMIUM	0 05	TR	U	0 0091	mg/kg	BL
SS	MIA051	MG711010	SW6010	CADMIUM	0 03	TR	U	0 0092	mg/kg	BL
SS	MIA353	MG723024	SW6010	CADMIUM	0 01	TR	U	0 0093	mg/kg	BL
SS	MIA354	MG723025	SW6010	CADMIUM	0 09	TR	U	0 0092	mg/kg	BL
WS	MIA007	MG682011	SW6010	COBALT	0 59	TR	U	0 5	ug/L	BL
WS	MIA016	MG682019	SW6010	COBALT	0 51	TR	U	0 5	ug/L	BL
SB	MIA152	MG730033	SW6010	COPPER	1 4	TR	U	0 11	mg/kg	BL
WS	MIA007	MG682011	SW6010	COPPER	2 4	TR	U	1	ug/L	BL
WS	MIA011	MG682014	SW6010	COPPER	2 8	TR	U	1	ug/L	BL
WS	MIA012	MG682015	SW6010	COPPER	2 4	TR	U	1	ug/L	BL
WS	MIA016	MG682019	SW6010	COPPER	1 7	TR	U	1	ug/L	BL
WS	MIA017	MG682020	SW6010	COPPER	4 9	TR	U	1	ug/L	BL
WS	MIA018	MG682001	SW6010	COPPER	4 2	TR	U	1	ug/L	BL
WS	MIA019FD	MG682002	SW6010	COPPER	1 9	TR	U	1	ug/L	BL
WS	MIA021	MG682003	SW6010	COPPER	2 1	TR	U	1	ug/L	BL
WS	MIA022	MG682004	SW6010	COPPER	2 4	TR	U	1	ug/L	BL
WS	MIA007	MG682011	SW6010	LEAD	2	TR	U	1 3	ug/L	BL
WS	MIA011	MG682014	SW6010	LEAD	1 7	TR	U	1 3	ug/L	BL
WS	MIA012	MG682015	SW6010	LEAD	1 8	TR	U	1 3	ug/L	BL
WS	MIA018	MG682001	SW6010	LEAD	1 9	TR	U	1 3	ug/L	BL
WS	MIA019FD	MG682002	SW6010	LEAD	1 4	TR	U	1 3	ug/L	BL
WS	MIA022	MG682004	SW6010	LEAD	2 8	TR	U	1 3	ug/L	BL
WS	MIA007	MG682011	SW6010	NICKEL	1 1	TR	U	0 32	ug/L	BL
WS	MIA011	MG682014	SW6010	NICKEL	2 1	TR	U	0 32	ug/L	BL
WS	MIA012	MG682015	SW6010	NICKEL	1	TR	U	0 32	ug/L	BL
WS	MIA016	MG682019	SW6010	NICKEL	0 33	TR	U	0 32	ug/L	BL
WS	MIA017	MG682020	SW6010	NICKEL	0 58	TR	U	0 32	ug/L	BL
WS	MIA019FD	MG682002	SW6010	NICKEL	0 67	TR	U	0 32	ug/L	BL
WS	MIA021	MG682003	SW6010	NICKEL	1 6	TR	U	0 32	ug/L	BL
WS	MIA022	MG682004	SW6010	NICKEL	0 64	TR	U	0 32	ug/L	BL
SB	MIA074	MG743012	SW6010	SELENIUM	1 2	=	U	0 19	mg/kg	BL
SB	MIA076	MG743014	SW6010	SELENIUM	1	=	U	0 2	mg/kg	BL
SB	MIA125	MG743020	SW6010	SELENIUM	1 2	=	U	0 2	mg/kg	BL
SB	MIA127	MG743022	SW6010	SELENIUM	0 96	=	U	0 2	mg/kg	BL
SS	MIA134	MG743023	SW6010	SELENIUM	1 1	=	U	0 19	mg/kg	BL
SS	MIA137	MG743002	SW6010	SELENIUM	0 87	=	U	0 19	mg/kg	BL

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA138	MG743003	SW6010	SELENIUM	1 3	=	U	0 19	mg/kg	BL
SS	MIA139FD	MG743004	SW6010	SELENIUM	1 2	=	U	0 19	mg/kg	BL
SS	MIA141	MG743005	SW6010	SELENIUM	0 76	=	U	0 18	mg/kg	BL
SS	MIA142	MG743006	SW6010	SELENIUM	0 84	=	U	0 19	mg/kg	BL
SS	MIA143	MG743007	SW6010	SELENIUM	0 75	=	U	0 19	mg/kg	BL
SS	MIA144	MG743008	SW6010	SELENIUM	0 85	=	U	0 18	mg/kg	BL
SS	MIA145	MG743009	SW6010	SELENIUM	0 9	=	U	0 18	mg/kg	BL
SS	MIA222	MG776005	SW6010	SELENIUM	0 97	=	U	0 19	mg/kg	BL
SS	MIA223FD	MG776006	SW6010	SELENIUM	0 89	=	U	0 19	mg/kg	BL
SS	MIA228	MG776010	SW6010	SELENIUM	1 2	=	U	0 19	mg/kg	BL
SS	MIA229	MG776011	SW6010	SELENIUM	1 3	=	U	0 19	mg/kg	BL
SS	MIA230	MG776012	SW6010	SELENIUM	1 3	=	U	0 19	mg/kg	BL
SS	MIA231FD	MG776013	SW6010	SELENIUM	1 2	=	U	0 19	mg/kg	BL
SS	MIA237	MG776017	SW6010	SELENIUM	0 72	=	U	0 17	mg/kg	BL
SS	MIA240	MG776020	SW6010	SELENIUM	1	=	U	0 17	mg/kg	BL
SS	MIA253	MG776022	SW6010	SELENIUM	1 1	=	U	0 18	mg/kg	BL
SS	MIA254	MG776023	SW6010	SELENIUM	0 78	=	U	0 19	mg/kg	BL
SS	MIA256	MG776025	SW6010	SELENIUM	0 87	=	U	0 17	mg/kg	BL
SS	MIA259	MG776028	SW6010	SELENIUM	1 3	=	U	0 17	mg/kg	BL
SS	MIA260	MG776029	SW6010	SELENIUM	0 67	=	U	0 19	mg/kg	BL
SS	MIA242	MG777003	SW6010	SELENIUM	1 9	=	U	0 35	mg/kg	BL
SS	MIA248	MG777008	SW6010	SELENIUM	1	=	U	0 18	mg/kg	BL
SS	MIA249	MG777009	SW6010	SELENIUM	1 3	=	U	0 42	mg/kg	BL
SS	MIA251	MG777011	SW6010	SELENIUM	0 63	=	U	0 19	mg/kg	BL
SS	MIA280	MG777017	SW6010	SELENIUM	0 96	=	U	0 2	mg/kg	BL
SB	MIA126	MG743021	SW6010	SELENIUM	0 29	TR	U	0 2	mg/kg	BL
SE	MIA023	MG682005	SW6010	SELENIUM	0 54	TR	U	0 21	mg/kg	BL
SS	MIA252	MG776021	SW6010	SELENIUM	1 3	TR	U	0 83	mg/kg	BL
SS	MIA255	MG776024	SW6010	SELENIUM	1 2	TR	U	0 83	mg/kg	BL
SS	MIA244	MG777004	SW6010	SELENIUM	0 26	TR	U	0 18	mg/kg	BL
SS	MIA247	MG777007	SW6010	SELENIUM	0 28	TR	U	0 18	mg/kg	BL
SS	MIA250	MG777010	SW6010	SELENIUM	0 36	TR	U	0 18	mg/kg	BL
SS	MIA263	MG777014	SW6010	SELENIUM	0 54	TR	U	0 35	mg/kg	BL
SS	MIA278FD	MG777016	SW6010	SELENIUM	0 44	TR	U	0 19	mg/kg	BL
SS	MIA284	MG777021	SW6010	SELENIUM	0 51	TR	U	0 18	mg/kg	BL
SS	MIA285	MG777022	SW6010	SELENIUM	0 28	TR	U	0 19	mg/kg	BL
SS	MIA286	MG777023	SW6010	SELENIUM	0 31	TR	U	0 2	mg/kg	BL
SS	MIA288	MG777025	SW6010	SELENIUM	0 32	TR	U	0 2	mg/kg	BL
SS	MIA227	MG776009	SW6010	SELENIUM	0 41	TR	U	0 18	mg/kg	BL
WS	MIA011	MG682014	SW6010	SELENIUM	1 7	TR	U	1 6	ug/L	BL
WS	MIA018	MG682001	SW6010	SELENIUM	2 6	TR	U	1 6	ug/L	BL
WS	MIA019FD	MG682002	SW6010	SELENIUM	4 6	TR	U	1 6	ug/L	BL
WS	MIA021	MG682003	SW6010	SELENIUM	2 8	TR	U	1 6	ug/L	BL
SB	MIA074	MG743012	SW6010	SODIUM	116	TR	U	13 8	mg/kg	BL
SB	MIA075	MG743013	SW6010	SODIUM	242	TR	U	14	mg/kg	BL
SB	MIA076	MG743014	SW6010	SODIUM	125	TR	U	14 1	mg/kg	BL
SB	MIA099	MG767002	SW6010	SODIUM	93 2	TR	U	14 4	mg/kg	BL
SB	MIA177	MG767006	SW6010	SODIUM	146	TR	U	14 5	mg/kg	BL
SB	MIA178	MG767007	SW6010	SODIUM	56 7	TR	U	14 1	mg/kg	BL
SB	MIA180	MG767009	SW6010	SODIUM	223	TR	U	13 9	mg/kg	BL
SB	MIA182	MG767011	SW6010	SODIUM	178	TR	U	14 4	mg/kg	BL
SB	MIA184	MG767013	SW6010	SODIUM	112	TR	U	14 1	mg/kg	BL
SE	MIA014	MG682017	SW6010	SODIUM	112	TR	U	16 9	mg/kg	BL
SE	MIA015	MG682018	SW6010	SODIUM	136	TR	U	22 9	mg/kg	BL
SE	MIA023	MG682005	SW6010	SODIUM	99	TR	U	15	mg/kg	BL
SE	MIA024	MG682006	SW6010	SODIUM	132	TR	U	15	mg/kg	BL
SE	MIA026FD	MG682008	SW6010	SODIUM	138	TR	U	16 6	mg/kg	BL
SE	MIA027	MG682009	SW6010	SODIUM	51 4	TR	U	14 7	mg/kg	BL
SS	MIA005	MG672005	SW6010	SODIUM	68 5	TR	U	13 8	mg/kg	BL
SS	MIA006	MG672006	SW6010	SODIUM	105	TR	U	12 8	mg/kg	BL
SS	MIA032	MG695004	SW6010	SODIUM	158	TR	U	12 7	mg/kg	BL
SS	MIA037	MG695008	SW6010	SODIUM	95 5	TR	U	13	mg/kg	BL
SS	MIA045	MG711004	SW6010	SODIUM	117	TR	U	12 4	mg/kg	BL
SS	MIA048	MG711007	SW6010	SODIUM	150	TR	U	12 6	mg/kg	BL
SS	MIA049	MG711008	SW6010	SODIUM	95 2	TR	U	12 3	mg/kg	BL
SS	MIA050FD	MG711009	SW6010	SODIUM	87 8	TR	U	12 3	mg/kg	BL
SS	MIA051	MG711010	SW6010	SODIUM	150	TR	U	12 4	mg/kg	BL
SS	MIA134	MG743023	SW6010	SODIUM	100	TR	U	13 7	mg/kg	BL
SS	MIA137	MG743002	SW6010	SODIUM	109	TR	U	13 3	mg/kg	BL
SS	MIA138	MG743003	SW6010	SODIUM	131	TR	U	13 5	mg/kg	BL
SS	MIA139FD	MG743004	SW6010	SODIUM	90 7	TR	U	13 5	mg/kg	BL

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA141	MG743005	SW6010	SODIUM	87 5	TR	U	13 1	mg/kg	BL
SS	MIA142	MG743006	SW6010	SODIUM	98 9	TR	U	13 3	mg/kg	BL
SS	MIA143	MG743007	SW6010	SODIUM	56 9	TR	U	13 5	mg/kg	BL
SS	MIA144	MG743008	SW6010	SODIUM	80 7	TR	U	12 8	mg/kg	BL
SS	MIA328FD	MG757001	SW6010	SODIUM	50 4	TR	U	12 5	mg/kg	BL
SS	MIA098	MG767001	SW6010	SODIUM	182	TR	U	13 4	mg/kg	BL
SS	MIA174	MG767003	SW6010	SODIUM	85 4	TR	U	12 7	mg/kg	BL
SS	MIA179	MG767008	SW6010	SODIUM	105	TR	U	12 7	mg/kg	BL
SS	MIA183	MG767012	SW6010	SODIUM	87 5	TR	U	12	mg/kg	BL
SS	MIA188	MG770001	SW6010	SODIUM	182	TR	U	12	mg/kg	BL
SS	MIA189FD	MG770002	SW6010	SODIUM	266	TR	U	12 1	mg/kg	BL
SS	MIA193	MG770006	SW6010	SODIUM	113	TR	U	13 4	mg/kg	BL
SS	MIA275	MG778001	SW6010	SODIUM	155	TR	U	12 3	mg/kg	BL
SS	MIA128	MG785001	SW6010	SODIUM	27 4	TR	U	13 2	mg/kg	BL
SS	MIA129FD	MG785002	SW6010	SODIUM	51	TR	U	13 2	mg/kg	BL
SS	MIA132	MG785003	SW6010	SODIUM	63 6	TR	U	13	mg/kg	BL
SS	MIA302	MG785013	SW6010	SODIUM	90 4	TR	U	13 7	mg/kg	BL
SS	MIA303	MG785014	SW6010	SODIUM	53	TR	U	13 7	mg/kg	BL
SS	MIA304	MG785015	SW6010	SODIUM	122	TR	U	13 9	mg/kg	BL
SE	MIA028	MG682010	SW6010	SODIUM	101	TR	U	22	mg/kg	BL
WS	MIA007	MG682011	SW6010	SODIUM	1140	TR	U	114 2	ug/L	BL
WS	MIA011	MG682014	SW6010	SODIUM	1290	TR	U	114 2	ug/L	BL
WS	MIA012	MG682015	SW6010	SODIUM	992	TR	U	114 2	ug/L	BL
WS	MIA016	MG682019	SW6010	SODIUM	846	TR	U	114 2	ug/L	BL
WS	MIA017	MG682020	SW6010	SODIUM	958	TR	U	114 2	ug/L	BL
WS	MIA018	MG682001	SW6010	SODIUM	790	TR	U	114 2	ug/L	BL
WS	MIA019FD	MG682002	SW6010	SODIUM	735	TR	U	114 2	ug/L	BL
WS	MIA021	MG682003	SW6010	SODIUM	755	TR	U	114 2	ug/L	BL
WS	MIA022	MG682004	SW6010	SODIUM	737	TR	U	114 2	ug/L	BL
SB	MIA074	MG743012	SW6010	THALLIUM	0 42	TR	U	0 19	mg/kg	BL
SB	MIA184	MG767013	SW6010	THALLIUM	0 69	TR	U	0 2	mg/kg	BL
SS	MIA347	MG723021	SW6010	THALLIUM	0 3	TR	U	0 23	mg/kg	BL
SS	MIA332	MG757004	SW6010	THALLIUM	0 24	TR	U	0 19	mg/kg	BL
SS	MIA336	MG757008	SW6010	THALLIUM	0 2	TR	U	0 19	mg/kg	BL
WS	MIA019FD	MG682002	SW6010	THALLIUM	4 3	TR	U	1 6	ug/L	BL
WS	MIA012	MG682015	SW6010	VANADIUM	3 9	TR	U	0 31	ug/L	BL
WS	MIA016	MG682019	SW6010	VANADIUM	0 55	TR	U	0 31	ug/L	BL
WS	MIA017	MG682020	SW6010	VANADIUM	0 31	TR	U	0 31	ug/L	BL
WS	MIA018	MG682001	SW6010	VANADIUM	0 7	TR	U	0 31	ug/L	BL
WS	MIA019FD	MG682002	SW6010	VANADIUM	0 35	TR	U	0 31	ug/L	BL
WS	MIA022	MG682004	SW6010	VANADIUM	0 47	TR	U	0 31	ug/L	BL
WS	MIA007	MG682011	SW6010	ZINC	4	TR	U	1 1	ug/L	BL
WS	MIA011	MG682014	SW6010	ZINC	4 1	TR	U	1 1	ug/L	BL
WS	MIA018	MG682001	SW6010	ZINC	9 5	TR	U	1 1	ug/L	BL
WS	MIA019FD	MG682002	SW6010	ZINC	9 1	TR	U	1 1	ug/L	BL
SE	MIA023	MG682005	SW7471	MERCURY	0 05	=	U	0 022	mg/kg	BL
SE	MIA025	MG682007	SW7471	MERCURY	0 05	=	U	0 024	mg/kg	BL
SS	MIA006	MG672006	SW7471	MERCURY	0 05	=	U	0 019	mg/kg	BL
SE	MIA026FD	MG682008	SW7471	MERCURY	0 03	TR	U	0 024	mg/kg	BL
SE	MIA027	MG682009	SW7471	MERCURY	0 03	TR	U	0 021	mg/kg	BL
SS	MIA159	MG756007	SW7471	MERCURY	0 03	TR	U	0 019	mg/kg	BL
SB	MIA177	MG767006	SW8260	2-BUTANONE	16	=	U	11	ug/kg	BL
SB	MIA180	MG767009	SW8260	2-BUTANONE	17	=	U	11	ug/kg	BL
SS	MIA174	MG767003	SW8260	2-BUTANONE	52	=	U	9	ug/kg	BL
SS	MIA179	MG767008	SW8260	2-BUTANONE	58	=	U	9	ug/kg	BL
SS	MIA183	MG767012	SW8260	2-BUTANONE	17	=	U	9	ug/kg	BL
SB	MIA099	MG767002	SW8260	2-BUTANONE	11	J	U	11	ug/kg	BL
SB	MIA178	MG767007	SW8260	2-BUTANONE	11	J	U	11	ug/kg	BL
SB	MIA181	MG767010	SW8260	2-BUTANONE	11	J	U	11	ug/kg	BL
SB	MIA182	MG767011	SW8260	2-BUTANONE	12	J	U	12	ug/kg	BL
SB	MIA184	MG767013	SW8260	2-BUTANONE	11	J	U	11	ug/kg	BL
SS	MIA098	MG767001	SW8260	2-BUTANONE	10	J	U	10	ug/kg	BL
SB	MIA099	MG767002	SW8260	ACETONE	14	=	U	11	ug/kg	BL
SB	MIA177	MG767006	SW8260	ACETONE	78	=	U	11	ug/kg	BL
SB	MIA178	MG767007	SW8260	ACETONE	33	=	U	11	ug/kg	BL
SB	MIA180	MG767009	SW8260	ACETONE	90	=	U	11	ug/kg	BL
SB	MIA181	MG767010	SW8260	ACETONE	41	=	U	11	ug/kg	BL
SB	MIA182	MG767011	SW8260	ACETONE	38	=	U	12	ug/kg	BL
SB	MIA184	MG767013	SW8260	ACETONE	20	=	U	11	ug/kg	BL
SE	MIA023	MG682005	SW8260	ACETONE	13	=	U	12	ug/kg	BL
SE	MIA024	MG682006	SW8260	ACETONE	17	=	U	13	ug/kg	BL

ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SE	MIA025	MG682007	SW8260	ACETONE	33	=	U	13	ug/kg	BL
SE	MIA026FD	MG682008	SW8260	ACETONE	45	=	U	16	ug/kg	BL
SS	MIA327	MG756027	SW8260	ACETONE	35	=	U	9	ug/kg	BL
SS	MIA328FD	MG757001	SW8260	ACETONE	46	=	U	10	ug/kg	BL
SS	MIA098	MG767001	SW8260	ACETONE	52	=	U	10	ug/kg	BL
SS	MIA174	MG767003	SW8260	ACETONE	300	=	U	9	ug/kg	BL
SS	MIA179	MG767008	SW8260	ACETONE	320	=	U	9	ug/kg	BL
SS	MIA183	MG767012	SW8260	ACETONE	82	=	U	9	ug/kg	BL
SS	MIA132	MG785003	SW8260	ACETONE	150	=	U	12	ug/kg	BL
SS	MIA302	MG785013	SW8260	ACETONE	300	=	U	10	ug/kg	BL
SS	MIA303	MG785014	SW8260	ACETONE	370	=	U	11	ug/kg	BL
SS	MIA304	MG785015	SW8260	ACETONE	220	=	U	11	ug/kg	BL
SS	MIA188	MG770001	SW8260	ACETONE	22	=	UJ	10	ug/kg	BL
SS	MIA143	MG743007	SW8260	ACETONE	520	E	U	10	ug/kg	BL
SE	MIA013	MG682016	SW8260	ACETONE	880	=	UJ	110	ug/kg	BL
SE	MIA014	MG682017	SW8260	ACETONE	30	=	U	14	ug/kg	BL
SE	MIA015	MG682018	SW8260	ACETONE	150	=	U	27	ug/kg	BL
SE	MIA027	MG682009	SW8260	ACETONE	18	=	U	12	ug/kg	BL
SS	MIA032	MG695004	SW8260	ACETONE	160	=	U	10	ug/kg	BL
SS	MIA037	MG695008	SW8260	ACETONE	170	=	U	11	ug/kg	BL
SE	MIA028	MG682010	SW8260	ACETONE	200	=	UJ	21	ug/kg	BL
SB	MIA066	MG723001	SW8260	ACETONE	56	=	U	11	ug/kg	BL
SB	MIA070	MG723005	SW8260	ACETONE	56	=	U	11	ug/kg	BL
SB	MIA071	MG723006	SW8260	ACETONE	33	=	U	12	ug/kg	BL
SB	MIA072	MG723007	SW8260	ACETONE	21	=	U	11	ug/kg	BL
SB	MIA089FD	MG730002	SW8260	ACETONE	96	=	U	10	ug/kg	BL
SB	MIA094	MG730005	SW8260	ACETONE	140	=	U	11	ug/kg	BL
SB	MIA095	MG730006	SW8260	ACETONE	33	=	U	10	ug/kg	BL
SB	MIA097	MG730008	SW8260	ACETONE	11	=	U	9	ug/kg	BL
SB	MIA074	MG743012	SW8260	ACETONE	200	=	U	11	ug/kg	BL
SB	MIA075	MG743013	SW8260	ACETONE	270	=	U	12	ug/kg	BL
SB	MIA076	MG743014	SW8260	ACETONE	140	=	U	11	ug/kg	BL
SS	MIA134	MG743023	SW8260	ACETONE	150	=	U	11	ug/kg	BL
SS	MIA137	MG743002	SW8260	ACETONE	260	=	U	10	ug/kg	BL
SS	MIA138	MG743003	SW8260	ACETONE	280	=	U	11	ug/kg	BL
SS	MIA141	MG743005	SW8260	ACETONE	320	=	U	11	ug/kg	BL
SS	MIA142	MG743006	SW8260	ACETONE	260	=	U	11	ug/kg	BL
SS	MIA144	MG743008	SW8260	ACETONE	200	=	U	9	ug/kg	BL
SS	MIA145	MG743009	SW8260	ACETONE	120	=	U	10	ug/kg	BL
SS	MIA128	MG785001	SW8260	ACETONE	170	=	U	11	ug/kg	BL
SS	MIA129FD	MG785002	SW8260	ACETONE	310	=	U	13	ug/kg	BL
SB	MIA088	MG730001	SW8260	ACETONE	100	=	UJ	10	ug/kg	BL
SS	MIA189FD	MG770002	SW8260	ACETONE	24	=	UJ	11	ug/kg	BL
SS	MIA193	MG770006	SW8260	ACETONE	220	=	UJ	10	ug/kg	BL
SS	MIA275	MG778001	SW8260	ACETONE	54	=	UJ	11	ug/kg	BL
SB	MIA096	MG730007	SW8260	ACETONE	12	J	U	12	ug/kg	BL
SS	MIA139FDDL	MG743004DL	SW8260	ACETONE	600	J	U	600	ug/kg	BL
WS	MIA007	MG682011	SW8260	ACETONE	10	J	U	10	ug/L	BL
WS	MIA011	MG682014	SW8260	ACETONE	10	J	U	10	ug/L	BL
WS	MIA012	MG682015	SW8260	ACETONE	10	J	U	10	ug/L	BL
WS	MIA018	MG682001	SW8260	ACETONE	10	J	U	10	ug/L	BL
WS	MIA021	MG682003	SW8260	ACETONE	10	J	UJ	10	ug/L	BL
SB	MIA089FD	MG730002	SW8260	METHYLENE CHLORIDE	10	J	U	10	ug/kg	BL
SB	MIA094	MG730005	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SB	MIA095	MG730006	SW8260	METHYLENE CHLORIDE	10	J	U	10	ug/kg	BL
SB	MIA096	MG730007	SW8260	METHYLENE CHLORIDE	12	J	U	12	ug/kg	BL
SB	MIA097	MG730008	SW8260	METHYLENE CHLORIDE	9	J	U	9	ug/kg	BL
SE	MIA014	MG682017	SW8260	METHYLENE CHLORIDE	14	J	U	14	ug/kg	BL
SE	MIA015	MG682018	SW8260	METHYLENE CHLORIDE	27	J	U	27	ug/kg	BL
SE	MIA025	MG682007	SW8260	METHYLENE CHLORIDE	13	J	U	13	ug/kg	BL
SE	MIA027	MG682009	SW8260	METHYLENE CHLORIDE	12	J	U	12	ug/kg	BL
SS	MIA032	MG695004	SW8260	METHYLENE CHLORIDE	10	J	U	10	ug/kg	BL
SS	MIA037	MG695008	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SS	MIA132	MG785003	SW8260	METHYLENE CHLORIDE	12	J	U	12	ug/kg	BL
SS	MIA302	MG785013	SW8260	METHYLENE CHLORIDE	10	J	U	10	ug/kg	BL
SS	MIA303	MG785014	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SS	MIA304	MG785015	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SE	MIA013	MG682016	SW8260	METHYLENE CHLORIDE	110	J	UJ	110	ug/kg	BL
SE	MIA028	MG682010	SW8260	METHYLENE CHLORIDE	21	J	UJ	21	ug/kg	BL
SE	MIA023	MG682005	SW8260	METHYLENE CHLORIDE	12	J	U	12	ug/kg	BL
SE	MIA024	MG682006	SW8260	METHYLENE CHLORIDE	13	J	U	13	ug/kg	BL

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ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SE	MIA026FD	MG682008	SW8260	METHYLENE CHLORIDE	16	J	U	16	ug/kg	BL
SS	MIA005	MG672005	SW8260	METHYLENE CHLORIDE	12	J	U	12	ug/kg	BL
SS	MIA006	MG672006	SW8260	METHYLENE CHLORIDE	12	J	U	12	ug/kg	BL
SS	MIA275	MG778001	SW8260	METHYLENE CHLORIDE	14	=	U	11	ug/kg	BL
SB	MIA088	MG730001	SW8260	METHYLENE CHLORIDE	10	J	U	10	ug/kg	BL
SB	MIA074	MG743012	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SB	MIA075	MG743013	SW8260	METHYLENE CHLORIDE	12	J	U	12	ug/kg	BL
SB	MIA076	MG743014	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SS	MIA137	MG743002	SW8260	METHYLENE CHLORIDE	10	J	U	10	ug/kg	BL
SS	MIA138	MG743003	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SS	MIA139FD	MG743004	SW8260	METHYLENE CHLORIDE	14	J	U	14	ug/kg	BL
SS	MIA141	MG743005	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SS	MIA142	MG743006	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SS	MIA143	MG743007	SW8260	METHYLENE CHLORIDE	10	J	U	10	ug/kg	BL
SS	MIA144	MG743008	SW8260	METHYLENE CHLORIDE	9	J	U	9	ug/kg	BL
SS	MIA145	MG743009	SW8260	METHYLENE CHLORIDE	10	J	U	10	ug/kg	BL
SS	MIA128	MG785001	SW8260	METHYLENE CHLORIDE	11	J	U	11	ug/kg	BL
SS	MIA129FD	MG785002	SW8260	METHYLENE CHLORIDE	13	J	U	13	ug/kg	BL
SS	MIA327	MG756027	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	350	J	U	350	ug/kg	BL
SS	MIA328FD	MG757001	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	370	J	U	370	ug/kg	BL
SS	MIA275	MG778001	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	360	J	U	360	ug/kg	BL
SE	MIA024	MG682006	SW8270	DI-n-BUTYL PHTHALATE	440	J	U	440	ug/kg	BL
SE	MIA015	MG682018	SW8270	DI-n-BUTYL PHTHALATE	670	J	U	670	ug/kg	BL
SE	MIA023	MG682005	SW8270	DI-n-BUTYL PHTHALATE	440	J	U	440	ug/kg	BL
SS	MIA327	MG756027	SW8270	DI-n-BUTYL PHTHALATE	350	J	U	350	ug/kg	BL
WS	MIA022	MG682004	SW8270	DI-n-BUTYL PHTHALATE	10	J	U	10	ug/L	BL
SS	MIA159	MG756007	TC6010	Copper TCLP	21 4	TR	U	4 8	ug/L	BL
SS	MIA160FD	MG756008	TC6010	Copper, TCLP	13 5	TR	U	4 8	ug/L	BL
SS	MIA165	MG756012	TC6010	Copper, TCLP	10 1	TR	U	4 8	ug/L	BL
SS	MIA167	MG756014	TC6010	Copper TCLP	11 2	TR	U	4 8	ug/L	BL
SS	MIA338	MG757010	TC6010	Copper TCLP	13 5	TR	U	4 8	ug/L	BL
SS	MIA253	TCMG776022	TC6010	Copper TCLP	6 7	TR	U	4 8	ug/L	BL
SS	MIA261	TCMG777012	TC6010	Copper, TCLP	7 8	TR	U	4 8	ug/L	BL
SS	MIA165	MG756012	TC6010	Thallium, TCLP	90 4	TR	U	82	ug/L	BL
SS	MIA253	TCMG776022	TC6010	Zinc, TCLP	41 9	TR	U	18 8	ug/L	BL
SS	MIA160FD	MG756008	TC7470	Mercury, TCLP	0 22	=	U	0 1	ug/L	BL
SS	MIA159	MG756007	TC7470	Mercury, TCLP	0 19	TR	U	0 1	ug/L	BL
SS	MIA167	MG756014	TC7470	Mercury, TCLP	0 12	TR	U	0 1	ug/L	BL
SS	MIA032	MG695004	SW8081	ALDRIN	9 4	U	UJ	9 4	ug/kg	CC
SS	MIA037	MG695008	SW8081	ALDRIN	19	U	UJ	19	ug/kg	CC
SB	MIA075	MG743013DL	SW8081	ALPHA BHC	10	U	UJ	10	ug/kg	CC
SB	MIA099	MG767002	SW8081	ALPHA BHC	2 1	U	UJ	2 1	ug/kg	CC
SB	MIA177	MG767006	SW8081	ALPHA BHC	2 2	U	UJ	2 2	ug/kg	CC
SB	MIA178	MG767007	SW8081	ALPHA BHC	2 1	U	UJ	2 1	ug/kg	CC
SB	MIA180	MG767009	SW8081	ALPHA BHC	2 1	U	UJ	2 1	ug/kg	CC
SB	MIA181	MG767010	SW8081	ALPHA BHC	2 1	U	UJ	2 1	ug/kg	CC
SB	MIA182	MG767011	SW8081	ALPHA BHC	2 2	U	UJ	2 2	ug/kg	CC
SB	MIA184	MG767013	SW8081	ALPHA BHC	2 1	U	UJ	2 1	ug/kg	CC
SS	MIA141	MG743005DL	SW8081	ALPHA BHC	1 9	U	UJ	1 9	ug/kg	CC
SS	MIA144	MG743008DL	SW8081	ALPHA BHC	1 9	U	UJ	1 9	ug/kg	CC
SS	MIA320	MG756021	SW8081	ALPHA BHC	780	U	UJ	780	ug/kg	CC
SS	MIA324	MG756024	SW8081	ALPHA BHC	9 4	U	UJ	9 4	ug/kg	CC
SS	MIA325	MG756025	SW8081	ALPHA BHC	19	U	UJ	19	ug/kg	CC
SS	MIA326	MG756026	SW8081	ALPHA BHC	4 8	U	UJ	4 8	ug/kg	CC
SS	MIA327	MG756027	SW8081	ALPHA BHC	18	U	UJ	18	ug/kg	CC
SS	MIA328FD	MG757001	SW8081	ALPHA BHC	19	U	UJ	19	ug/kg	CC
SS	MIA330	MG757002	SW8081	ALPHA BHC	20	U	UJ	20	ug/kg	CC
SS	MIA331	MG757003	SW8081	ALPHA BHC	2	U	UJ	2	ug/kg	CC
SS	MIA332	MG757004	SW8081	ALPHA BHC	10	U	UJ	10	ug/kg	CC
SS	MIA333	MG757005	SW8081	ALPHA BHC	1 9	U	UJ	1 9	ug/kg	CC
SS	MIA334	MG757006	SW8081	ALPHA BHC	96	U	UJ	96	ug/kg	CC
SS	MIA335	MG757007	SW8081	ALPHA BHC	2 1	U	UJ	2 1	ug/kg	CC
SS	MIA336	MG757008	SW8081	ALPHA BHC	2	U	UJ	2	ug/kg	CC
SS	MIA098	MG767001	SW8081	ALPHA BHC	100	U	UJ	100	ug/kg	CC
SS	MIA174	MG767003	SW8081	ALPHA BHC	19	U	UJ	19	ug/kg	CC
SS	MIA179	MG767008	SW8081	ALPHA BHC	19	U	UJ	19	ug/kg	CC
SE	MIA013	MG682016DL	SW8081	HEPTACHLOR	53	U	UJ	53	ug/kg	CC
SE	MIA014	MG682017	SW8081	HEPTACHLOR	12	U	UJ	12	ug/kg	CC
SE	MIA015	MG682018	SW8081	HEPTACHLOR	34	U	UJ	34	ug/kg	CC
SE	MIA023	MG682005	SW8081	HEPTACHLOR	22	U	UJ	22	ug/kg	CC
SE	MIA024	MG682006	SW8081	HEPTACHLOR	11	U	UJ	11	ug/kg	CC

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SE	MIA025	MG682007	SW8081	HEPTACHLOR	24	U	UJ	24	ug/kg	CC
SE	MIA026FD	MG682008	SW8081	HEPTACHLOR	25	U	UJ	25	ug/kg	CC
SE	MIA027	MG682009	SW8081	HEPTACHLOR	2 2	U	UJ	2 2	ug/kg	CC
SE	MIA028	MG682010DL	SW8081	HEPTACHLOR	330	U	UJ	330	ug/kg	CC
WS	MIA007	MG682011	SW8081	HEPTACHLOR	0 05	U	UJ	0 05	ug/L	CC
WS	MIA011	MG682014	SW8081	HEPTACHLOR	0 05	U	UJ	0 05	ug/L	CC
WS	MIA012	MG682015	SW8081	HEPTACHLOR	0 05	U	UJ	0 05	ug/L	CC
WS	MIA016	MG682019	SW8081	HEPTACHLOR	0 05	U	UJ	0 05	ug/L	CC
WS	MIA017	MG682020	SW8081	HEPTACHLOR	0 05	U	UJ	0 05	ug/L	CC
WS	MIA018	MG682001	SW8081	HEPTACHLOR	0 05	U	UJ	0 05	ug/L	CC
WS	MIA021	MG682003	SW8081	HEPTACHLOR	0 05	U	UJ	0 05	ug/L	CC
WS	MIA022	MG682004	SW8081	HEPTACHLOR	0 05	U	UJ	0 05	ug/L	CC
SB	MIA075	MG743013DL	SW8081	METHOXYCHLOR	100	U	UJ	100	ug/kg	CC
SB	MIA099	MG767002	SW8081	METHOXYCHLOR	21	U	UJ	21	ug/kg	CC
SB	MIA177	MG767006	SW8081	METHOXYCHLOR	22	U	UJ	22	ug/kg	CC
SB	MIA178	MG767007	SW8081	METHOXYCHLOR	21	U	UJ	21	ug/kg	CC
SB	MIA180	MG767009	SW8081	METHOXYCHLOR	21	U	UJ	21	ug/kg	CC
SB	MIA181	MG767010	SW8081	METHOXYCHLOR	21	U	UJ	21	ug/kg	CC
SB	MIA182	MG767011	SW8081	METHOXYCHLOR	22	U	UJ	22	ug/kg	CC
SB	MIA184	MG767013	SW8081	METHOXYCHLOR	21	U	UJ	21	ug/kg	CC
SE	MIA014	MG682017	SW8081	METHOXYCHLOR	120	U	UJ	120	ug/kg	CC
SE	MIA015	MG682018	SW8081	METHOXYCHLOR	340	U	UJ	340	ug/kg	CC
SE	MIA023	MG682005	SW8081	METHOXYCHLOR	220	U	UJ	220	ug/kg	CC
SE	MIA024	MG682006	SW8081	METHOXYCHLOR	110	U	UJ	110	ug/kg	CC
SE	MIA025	MG682007	SW8081	METHOXYCHLOR	240	U	UJ	240	ug/kg	CC
SE	MIA026FD	MG682008	SW8081	METHOXYCHLOR	250	U	UJ	250	ug/kg	CC
SE	MIA027	MG682009	SW8081	METHOXYCHLOR	22	U	UJ	22	ug/kg	CC
SS	MIA005	MG672005	SW8081	METHOXYCHLOR	4100	U	UJ	4100	ug/kg	CC
SS	MIA006	MG672006	SW8081	METHOXYCHLOR	190	U	UJ	190	ug/kg	CC
SS	MIA032	MG695004	SW8081	METHOXYCHLOR	94	U	UJ	94	ug/kg	CC
SS	MIA037	MG695008	SW8081	METHOXYCHLOR	190	U	UJ	190	ug/kg	CC
SS	MIA141	MG743005DL	SW8081	METHOXYCHLOR	19	U	UJ	19	ug/kg	CC
SS	MIA144	MG743008DL	SW8081	METHOXYCHLOR	19	U	UJ	19	ug/kg	CC
SS	MIA320	MG756021	SW8081	METHOXYCHLOR	7800	U	UJ	7800	ug/kg	CC
SS	MIA324	MG756024	SW8081	METHOXYCHLOR	94	U	UJ	94	ug/kg	CC
SS	MIA325	MG756025	SW8081	METHOXYCHLOR	190	U	UJ	190	ug/kg	CC
SS	MIA326	MG756026	SW8081	METHOXYCHLOR	48	U	UJ	48	ug/kg	CC
SS	MIA327	MG756027	SW8081	METHOXYCHLOR	180	U	UJ	180	ug/kg	CC
SS	MIA328FD	MG757001	SW8081	METHOXYCHLOR	190	U	UJ	190	ug/kg	CC
SS	MIA330	MG757002	SW8081	METHOXYCHLOR	200	U	UJ	200	ug/kg	CC
SS	MIA331	MG757003	SW8081	METHOXYCHLOR	20	U	UJ	20	ug/kg	CC
SS	MIA332	MG757004	SW8081	METHOXYCHLOR	100	U	UJ	100	ug/kg	CC
SS	MIA333	MG757005	SW8081	METHOXYCHLOR	19	U	UJ	19	ug/kg	CC
SS	MIA334	MG757006	SW8081	METHOXYCHLOR	960	U	UJ	960	ug/kg	CC
SS	MIA335	MG757007	SW8081	METHOXYCHLOR	21	U	UJ	21	ug/kg	CC
SS	MIA336	MG757008	SW8081	METHOXYCHLOR	20	U	UJ	20	ug/kg	CC
SS	MIA098	MG767001	SW8081	METHOXYCHLOR	1000	U	UJ	1000	ug/kg	CC
SS	MIA174	MG767003	SW8081	METHOXYCHLOR	190	U	UJ	190	ug/kg	CC
SS	MIA179	MG767008	SW8081	METHOXYCHLOR	190	U	UJ	190	ug/kg	CC
WS	MIA007	MG682011	SW8081	METHOXYCHLOR	0 5	U	UJ	0 5	ug/L	CC
WS	MIA011	MG682014	SW8081	METHOXYCHLOR	0 5	U	UJ	0 5	ug/L	CC
WS	MIA012	MG682015	SW8081	METHOXYCHLOR	0 5	U	UJ	0 5	ug/L	CC
WS	MIA016	MG682019	SW8081	METHOXYCHLOR	0 5	U	UJ	0 5	ug/L	CC
WS	MIA017	MG682020	SW8081	METHOXYCHLOR	0 5	U	UJ	0 5	ug/L	CC
WS	MIA018	MG682001	SW8081	METHOXYCHLOR	0 5	U	UJ	0 5	ug/L	CC
WS	MIA021	MG682003	SW8081	METHOXYCHLOR	0 5	U	UJ	0 5	ug/L	CC
WS	MIA022	MG682004	SW8081	METHOXYCHLOR	0 5	U	UJ	0 5	ug/L	CC
SB	MIA074	MG743012	SW8081	p p -DDE	4	U	UJ	4	ug/kg	CC
SB	MIA076	MG743014	SW8081	p p'-DDE	4 1	U	UJ	4 1	ug/kg	CC
SS	MIA100	MG730009	SW8081	p,p'-DDE	9 3	U	UJ	9 3	ug/kg	CC
SS	MIA102	MG730011	SW8081	p,p'-DDE	18	U	UJ	18	ug/kg	CC
SS	MIA103	MG730012	SW8081	p p'-DDE	18	U	UJ	18	ug/kg	CC
SS	MIA104	MG730013	SW8081	p p -DDE	18	U	UJ	18	ug/kg	CC
SS	MIA105	MG730014	SW8081	p p -DDE	3 8	U	UJ	3 8	ug/kg	CC
SS	MIA106	MG730015	SW8081	p p -DDE	18	U	UJ	18	ug/kg	CC
SS	MIA107	MG730016	SW8081	p,p'-DDE	18	U	UJ	18	ug/kg	CC
SS	MIA108	MG730017	SW8081	p p'-DDE	7 5	U	UJ	7 5	ug/kg	CC
SS	MIA109	MG730018	SW8081	p,p -DDE	3 8	U	UJ	3 8	ug/kg	CC
SS	MIA134	MG743023	SW8081	p p -DDE	20	U	UJ	20	ug/kg	CC
SS	MIA137	MG743002	SW8081	p p -DDE	38	U	UJ	38	ug/kg	CC
SS	MIA138	MG743003	SW8081	p p -DDE	390	U	UJ	390	ug/kg	CC

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA139FD	MG743004	SW8081	p p'-DDE	390	U	UJ	390	ug/kg	CC
SS	MIA142	MG743006	SW8081	p p'-DDE	19	U	UJ	19	ug/kg	CC
SS	MIA143	MG743007	SW8081	p p'-DDE	200	U	UJ	200	ug/kg	CC
SS	MIA292	MG785004	SW8081	PCB-1260 (AROCHLOR 1260)	280	=	J	180	ug/kg	CC
SS	MIA300	MG785011	SW8081	PCB-1260 (AROCHLOR 1260)	6100	=	J	3800	ug/kg	CC
SS	MIA301	MG785012	SW8081	PCB-1260 (AROCHLOR 1260)	18000	=	J	7300	ug/kg	CC
SS	MIA303	MG785014	SW8081	PCB-1260 (AROCHLOR 1260)	17000	=	J	8000	ug/kg	CC
SS	MIA128	MG785001	SW8081	PCB-1260 (AROCHLOR 1260)	380	U	UJ	380	ug/kg	CC
SS	MIA129FD	MG785002	SW8081	PCB-1260 (AROCHLOR 1260)	580	U	UJ	580	ug/kg	CC
SS	MIA132	MG785003	SW8081	PCB-1260 (AROCHLOR 1260)	380	U	UJ	380	ug/kg	CC
SS	MIA302	MG785013	SW8081	PCB-1260 (AROCHLOR 1260)	390	U	UJ	390	ug/kg	CC
SS	MIA304	MG785015	SW8081	PCB-1260 (AROCHLOR 1260)	8000	U	UJ	8000	ug/kg	CC
WS	MIA017	MG682020	SW8260	ACETONE	10	U	UJ	10	ug/L	CC
WS	MIA019FD	MG682002	SW8260	ACETONE	10	U	UJ	10	ug/L	CC
SB	MIA120	MG743015	SW8260	BROMOMETHANE	610	U	UJ	610	ug/kg	CC
SB	MIA121FD	MG743016	SW8260	BROMOMETHANE	610	U	UJ	610	ug/kg	CC
SB	MIA124	MG743019	SW8260	BROMOMETHANE	620	U	UJ	620	ug/kg	CC
SS	MIA327	MG756027	SW8260	BROMOMETHANE	9	U	UJ	9	ug/kg	CC
SS	MIA328FD	MG757001	SW8260	BROMOMETHANE	10	U	UJ	10	ug/kg	CC
SS	MIA098	MG767001	SW8260	BROMOMETHANE	10	U	UJ	10	ug/kg	CC
SS	MIA188	MG770001	SW8260	BROMOMETHANE	10	U	UJ	10	ug/kg	CC
SS	MIA189FD	MG770002	SW8260	BROMOMETHANE	11	U	UJ	11	ug/kg	CC
SB	MIA120	MG743015	SW8260	CHLOROMETHANE	610	U	UJ	610	ug/kg	CC
SB	MIA121FD	MG743016	SW8260	CHLOROMETHANE	610	U	UJ	610	ug/kg	CC
SB	MIA124	MG743019	SW8260	CHLOROMETHANE	620	U	UJ	620	ug/kg	CC
WS	MIA007	MG682011	SW8260	CHLOROMETHANE	10	U	UJ	10	ug/L	CC
WS	MIA018	MG682001	SW8260	CHLOROMETHANE	10	U	UJ	10	ug/L	CC
WS	MIA022	MG682004	SW8260	CHLOROMETHANE	10	U	UJ	10	ug/L	CC
SB	MIA088	MG730001	SW8260	METHYL ISOBUTYL KETONE	10	U	UJ	10	ug/kg	CC
SS	MIA188	MG770001	SW8260	METHYL ISOBUTYL KETONE	10	U	UJ	10	ug/kg	CC
SS	MIA189FD	MG770002	SW8260	METHYL ISOBUTYL KETONE	11	U	UJ	11	ug/kg	CC
SS	MIA193	MG770006	SW8260	METHYL ISOBUTYL KETONE	10	U	UJ	10	ug/kg	CC
SS	MIA275	MG778001	SW8260	METHYL ISOBUTYL KETONE	11	U	UJ	11	ug/kg	CC
SS	MIA302	MG785013	SW8270	2,4-DINITROPHENOL	7900	U	UJ	7900	ug/kg	CC
SS	MIA303	MG785014	SW8270	2 4-DINITROPHENOL	2000	U	UJ	2000	ug/kg	CC
SS	MIA304	MG785015	SW8270	2,4-DINITROPHENOL	2000	U	UJ	2000	ug/kg	CC
WS	MIA007	MG682011	SW8270	4-NITROPHENOL	50	U	UJ	50	ug/L	CC
WS	MIA011	MG682014	SW8270	4-NITROPHENOL	50	U	UJ	50	ug/L	CC
WS	MIA012	MG682015	SW8270	4-NITROPHENOL	50	U	UJ	50	ug/L	CC
WS	MIA016	MG682019	SW8270	4-NITROPHENOL	50	U	UJ	50	ug/L	CC
WS	MIA017	MG682020	SW8270	4-NITROPHENOL	50	U	UJ	50	ug/L	CC
WS	MIA018	MG682001	SW8270	4-NITROPHENOL	50	U	UJ	50	ug/L	CC
WS	MIA019FD	MG682002	SW8270	4-NITROPHENOL	50	U	UJ	50	ug/L	CC
WS	MIA021	MG682003	SW8270	4-NITROPHENOL	50	U	UJ	50	ug/L	CC
SS	MIA139FDDL	MG743004DL	SW8260	1 1 1-TRICHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	1 1 1-TRICHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	1 1 2 2-TETRACHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	1,1,2,2-TETRACHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	1,1 2-TRICHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	1,1,2-TRICHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	1,1-DICHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	1 1-DICHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	1 1-DICHLOROETHENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	1,1-DICHLOROETHENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	1 2-DICHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	1,2-DICHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	1,2-DICHLOROPROPANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	1,2-DICHLOROPROPANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	2-BUTANONE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	2-BUTANONE	120	J	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	2-HEXANONE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	2-HEXANONE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	ACETONE	600	U	R	600	ug/kg	DL
SS	MIA139FD	MG743004	SW8260	ACETONE	700	E	R	14	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	BENZENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	BENZENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	BROMODICHLOROMETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	BROMODICHLOROMETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	BROMOFORM	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	BROMOFORM	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	BROMOMETHANE	600	U	R	600	ug/kg	DL

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA143DL	MG743007DL	SW8260	BROMOMETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	CARBON DISULFIDE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	CARBON DISULFIDE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	CARBON TETRACHLORIDE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	CARBON TETRACHLORIDE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	CHLOROBENZENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	CHLOROBENZENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	CHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	CHLOROETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	CHLOROFORM	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	CHLOROFORM	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	CHLOROMETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	CHLOROMETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	cis-1,3-DICHLOROPROPENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	cis-1 3-DICHLOROPROPENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	DIBROMOCHLOROMETHANE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	DIBROMOCHLOROMETHANE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	ETHYLBENZENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	ETHYLBENZENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	METHYL ISOBUTYL KETONE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	METHYL ISOBUTYL KETONE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	METHYLENE CHLORIDE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	METHYLENE CHLORIDE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	STYRENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	STYRENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	TETRACHLOROETHYLENE(PCE)	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	TETRACHLOROETHYLENE(PCE)	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	TOLUENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	TOLUENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	TOTAL 1,2-DICHLOROETHENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	TOTAL 1,2-DICHLOROETHENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	Total Xylenes	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	Total Xylenes	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	trans-1 3-DICHLOROPROPENE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	trans-1 3-DICHLOROPROPENE	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	TRICHLOROETHYLENE (TCE)	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	TRICHLOROETHYLENE (TCE)	600	U	R	600	ug/kg	DL
SS	MIA139FDDL	MG743004DL	SW8260	VINYL CHLORIDE	600	U	R	600	ug/kg	DL
SS	MIA143DL	MG743007DL	SW8260	VINYL CHLORIDE	600	U	R	600	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	1,2,4-TRICHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	1,2 4-TRICHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	1,2,4-TRICHLOROBENZENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	1 2 4-TRICHLOROBENZENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	1 2 4-TRICHLOROBENZENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	1,2 4-TRICHLOROBENZENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	1,2 4-TRICHLOROBENZENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	1 2 4-TRICHLOROBENZENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	1 2-DICHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	1 2-DICHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	1 2-DICHLOROBENZENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	1 2-DICHLOROBENZENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	1 2-DICHLOROBENZENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	1 2-DICHLOROBENZENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	1 2-DICHLOROBENZENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	1 2-DICHLOROBENZENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	1 3-DICHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	1 3-DICHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	1 3-DICHLOROBENZENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	1,3-DICHLOROBENZENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	1 3-DICHLOROBENZENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	1 3-DICHLOROBENZENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	1 3-DICHLOROBENZENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	1,3-DICHLOROBENZENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	1 4-DICHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	1 4-DICHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	1,4-DICHLOROBENZENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	1 4-DICHLOROBENZENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	1,4-DICHLOROBENZENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	1 4-DICHLOROBENZENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	1 4-DICHLOROBENZENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	1 4-DICHLOROBENZENE	1200	U	R	1200	ug/kg	DL

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SE	MIA015DL	MG682018DL	SW8270	2 2'-OXYBIS(1-CHLORO)PROPANE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2 2'-OXYBIS(1-CHLORO)PROPANE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2 2'-OXYBIS(1-CHLORO)PROPANE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2 2'-OXYBIS(1-CHLORO)PROPANE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2 2'-OXYBIS(1-CHLORO)PROPANE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2,2'-OXYBIS(1-CHLORO)PROPANE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2 2'-OXYBIS(1-CHLORO)PROPANE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2,2'-OXYBIS(1-CHLORO)PROPANE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2 4 5-TRICHLOROPHENOL	6700	U	R	6700	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2 4 5-TRICHLOROPHENOL	6400	U	R	6400	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2 4 5-TRICHLOROPHENOL	9800	U	R	9800	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2 4 5-TRICHLOROPHENOL	53000	U	R	53000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2 4 5-TRICHLOROPHENOL	35000	U	R	35000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2 4 5-TRICHLOROPHENOL	12000	U	R	12000	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2 4 5-TRICHLOROPHENOL	4000	U	R	4000	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2 4 5-TRICHLOROPHENOL	6100	U	R	6100	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2,4 6-TRICHLOROPHENOL	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2,4 6-TRICHLOROPHENOL	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2,4 6-TRICHLOROPHENOL	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2 4 6-TRICHLOROPHENOL	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2 4 6-TRICHLOROPHENOL	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2 4 6-TRICHLOROPHENOL	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2 4 6-TRICHLOROPHENOL	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2,4,6-TRICHLOROPHENOL	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2,4-DICHLOROPHENOL	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2 4-DICHLOROPHENOL	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2 4-DICHLOROPHENOL	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2 4-DICHLOROPHENOL	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2 4-DICHLOROPHENOL	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2,4-DICHLOROPHENOL	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2,4-DICHLOROPHENOL	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2 4-DICHLOROPHENOL	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2 4-DIMETHYLPHENOL	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2 4-DIMETHYLPHENOL	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2 4-DIMETHYLPHENOL	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2 4-DIMETHYLPHENOL	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2 4-DIMETHYLPHENOL	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2 4-DIMETHYLPHENOL	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2 4-DIMETHYLPHENOL	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2 4-DIMETHYLPHENOL	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2 4-DINITROPHENOL	6700	U	R	6700	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2 4-DINITROPHENOL	6400	U	R	6400	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2 4-DINITROPHENOL	9800	U	R	9800	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2 4-DINITROPHENOL	53000	U	R	53000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2 4-DINITROPHENOL	35000	U	R	35000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2 4-DINITROPHENOL	12000	U	R	12000	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2 4-DINITROPHENOL	4000	U	R	4000	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2 4-DINITROPHENOL	6100	U	R	6100	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2 4-DINITROTOLUENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2 4-DINITROTOLUENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2 4-DINITROTOLUENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2 4-DINITROTOLUENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2 4-DINITROTOLUENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2 4-DINITROTOLUENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2 4-DINITROTOLUENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2 4-DINITROTOLUENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2,6-DINITROTOLUENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2,6-DINITROTOLUENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2,6-DINITROTOLUENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2,6-DINITROTOLUENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2 6-DINITROTOLUENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2 6-DINITROTOLUENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2 6-DINITROTOLUENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2 6-DINITROTOLUENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2-CHLORONAPHTHALENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2-CHLORONAPHTHALENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2-CHLORONAPHTHALENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2-CHLORONAPHTHALENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2-CHLORONAPHTHALENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2-CHLORONAPHTHALENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2-CHLORONAPHTHALENE	800	U	R	800	ug/kg	DL

ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA304DL	MG785015DL	SW8270	2-CHLORONAPHTHALENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2-CHLOROPHENOL	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2-CHLOROPHENOL	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2-CHLOROPHENOL	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2-CHLOROPHENOL	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2-CHLOROPHENOL	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2-CHLOROPHENOL	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2-CHLOROPHENOL	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2-CHLOROPHENOL	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2-METHYLNAPHTHALENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2-METHYLNAPHTHALENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2-METHYLNAPHTHALENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2-METHYLNAPHTHALENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2-METHYLNAPHTHALENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2-METHYLNAPHTHALENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2-METHYLNAPHTHALENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2-METHYLNAPHTHALENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2-METHYLPHENOL (o-CRESOL)	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2-METHYLPHENOL (o-CRESOL)	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2-METHYLPHENOL (o-CRESOL)	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2-METHYLPHENOL (o-CRESOL)	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2-METHYLPHENOL (o-CRESOL)	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2-METHYLPHENOL (o-CRESOL)	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2-METHYLPHENOL (o-CRESOL)	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2-METHYLPHENOL (o-CRESOL)	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2-NITROANILINE	6700	U	R	6700	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2-NITROANILINE	6400	U	R	6400	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2-NITROANILINE	9800	U	R	9800	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2-NITROANILINE	53000	U	R	53000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2-NITROANILINE	35000	U	R	35000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2-NITROANILINE	12000	U	R	12000	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2-NITROANILINE	4000	U	R	4000	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2-NITROANILINE	6100	U	R	6100	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	2-NITROPHENOL	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	2-NITROPHENOL	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	2-NITROPHENOL	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	2-NITROPHENOL	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	2-NITROPHENOL	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	2-NITROPHENOL	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	2-NITROPHENOL	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	2-NITROPHENOL	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	3 3 -DICHLOROBENZIDINE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	3,3'-DICHLOROBENZIDINE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	3 3'-DICHLOROBENZIDINE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	3 3'-DICHLOROBENZIDINE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	3 3 -DICHLOROBENZIDINE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	3 3 -DICHLOROBENZIDINE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	3 3'-DICHLOROBENZIDINE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	3 3 -DICHLOROBENZIDINE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	3-NITROANILINE	6700	U	R	6700	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	3-NITROANILINE	6400	U	R	6400	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	3-NITROANILINE	9800	U	R	9800	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	3-NITROANILINE	53000	U	R	53000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	3-NITROANILINE	35000	U	R	35000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	3-NITROANILINE	12000	U	R	12000	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	3-NITROANILINE	4000	U	R	4000	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	3-NITROANILINE	6100	U	R	6100	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	4 6-DINITRO-2-METHYLPHENOL	6700	U	R	6700	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	4 6-DINITRO-2-METHYLPHENOL	6400	U	R	6400	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	4,6-DINITRO-2-METHYLPHENOL	9800	U	R	9800	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	4,6-DINITRO-2-METHYLPHENOL	53000	U	R	53000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	4,6-DINITRO-2-METHYLPHENOL	35000	U	R	35000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	4 6-DINITRO-2-METHYLPHENOL	12000	U	R	12000	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	4 6-DINITRO-2-METHYLPHENOL	4000	U	R	4000	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	4 6-DINITRO-2-METHYLPHENOL	6100	U	R	6100	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	4-BROMOPHENYL PHENYL ETHER	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	4-BROMOPHENYL PHENYL ETHER	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	4-BROMOPHENYL PHENYL ETHER	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	4-BROMOPHENYL PHENYL ETHER	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	4-BROMOPHENYL PHENYL ETHER	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	4-BROMOPHENYL PHENYL ETHER	2400	U	R	2400	ug/kg	DL

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA303DL	MG785014DL	SW8270	4-BROMOPHENYL PHENYL ETHER	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	4-BROMOPHENYL PHENYL ETHER	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	4-CHLORO-3-METHYLPHENOL	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	4-CHLORO-3-METHYLPHENOL	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	4-CHLORO-3-METHYLPHENOL	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	4-CHLORO-3-METHYLPHENOL	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	4-CHLORO-3-METHYLPHENOL	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	4-CHLORO-3-METHYLPHENOL	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	4-CHLORO-3-METHYLPHENOL	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	4-CHLORO-3-METHYLPHENOL	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	4-CHLOROANILINE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	4-CHLOROANILINE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	4-CHLOROANILINE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	4-CHLOROANILINE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	4-CHLOROANILINE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	4-CHLOROANILINE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	4-CHLOROANILINE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	4-CHLOROANILINE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	4-CHLOROPHENYL PHENYL ETHER	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	4-CHLOROPHENYL PHENYL ETHER	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	4-CHLOROPHENYL PHENYL ETHER	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	4-CHLOROPHENYL PHENYL ETHER	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	4-CHLOROPHENYL PHENYL ETHER	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	4-CHLOROPHENYL PHENYL ETHER	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	4-CHLOROPHENYL PHENYL ETHER	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	4-CHLOROPHENYL PHENYL ETHER	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	4-METHYLPHENOL (p-CRESOL)	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	4-METHYLPHENOL (p-CRESOL)	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	4-METHYLPHENOL (p-CRESOL)	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	4-METHYLPHENOL (p-CRESOL)	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	4-METHYLPHENOL (p-CRESOL)	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	4-METHYLPHENOL (p-CRESOL)	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	4-METHYLPHENOL (p-CRESOL)	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	4-METHYLPHENOL (p-CRESOL)	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	4-NITROANILINE	6700	U	R	6700	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	4-NITROANILINE	6400	U	R	6400	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	4-NITROANILINE	9800	U	R	9800	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	4-NITROANILINE	53000	U	R	53000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	4-NITROANILINE	35000	U	R	35000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	4-NITROANILINE	12000	U	R	12000	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	4-NITROANILINE	4000	U	R	4000	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	4-NITROANILINE	6100	U	R	6100	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	4-NITROPHENOL	6700	U	R	6700	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	4-NITROPHENOL	6400	U	R	6400	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	4-NITROPHENOL	9800	U	R	9800	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	4-NITROPHENOL	53000	U	R	53000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	4-NITROPHENOL	35000	U	R	35000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	4-NITROPHENOL	12000	U	R	12000	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	4-NITROPHENOL	4000	U	R	4000	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	4-NITROPHENOL	6100	U	R	6100	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	ACENAPHTHENE	240	J	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	ACENAPHTHENE	250	J	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	ACENAPHTHENE	620	J	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	ACENAPHTHENE	2400	J	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	ACENAPHTHENE	1500	J	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	ACENAPHTHENE	1600	J	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	ACENAPHTHENE	380	J	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	ACENAPHTHENE	690	J	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	ACENAPHTHYLENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	ACENAPHTHYLENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	ACENAPHTHYLENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	ACENAPHTHYLENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	ACENAPHTHYLENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	ACENAPHTHYLENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	ACENAPHTHYLENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	ACENAPHTHYLENE	1200	U	R	1200	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	ANTHRACENE	2900	E	R	350	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	ANTHRACENE	440	J	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	ANTHRACENE	420	J	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	ANTHRACENE	960	J	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	ANTHRACENE	5000	J	R	10000	ug/kg	DL

ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA302DL	MG785013DL	SW8270	ANTHRACENE	2100	J	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	ANTHRACENE	500	J	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	ANTHRACENE	1100	J	R	1200	ug/kg	DL
SS	MIA098	MG767001	SW8270	BENZO(a)ANTHRACENE	3400	E	R	390	ug/kg	DL
SS	MIA188	MG770001	SW8270	BENZO(a)ANTHRACENE	25000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	BENZO(a)ANTHRACENE	19000	E	R	350	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	BENZO(a)ANTHRACENE	1800	=	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	BENZO(a)ANTHRACENE	1600	=	R	1300	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	BENZO(a)ANTHRACENE	5200	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	BENZO(a)ANTHRACENE	1700	=	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	BENZO(a)ANTHRACENE	3200	=	R	1200	ug/kg	DL
SS	MIA098	MG767001	SW8270	BENZO(a)PYRENE	3100	E	R	390	ug/kg	DL
SS	MIA188	MG770001	SW8270	BENZO(a)PYRENE	30000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	BENZO(a)PYRENE	23000	E	R	350	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	BENZO(a)PYRENE	2000	=	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	BENZO(a)PYRENE	2000	=	R	1300	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	BENZO(a)PYRENE	4400	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	BENZO(a)PYRENE	1700	=	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	BENZO(a)PYRENE	2800	=	R	1200	ug/kg	DL
SS	MIA188	MG770001	SW8270	BENZO(b)FLUORANTHENE	36000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	BENZO(b)FLUORANTHENE	38000	E	R	350	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	BENZO(b)FLUORANTHENE	2300	=	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	BENZO(b)FLUORANTHENE	2300	=	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	BENZO(b)FLUORANTHENE	2700	=	R	2000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	BENZO(b)FLUORANTHENE	4700	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	BENZO(b)FLUORANTHENE	2000	=	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	BENZO(b)FLUORANTHENE	2700	=	R	1200	ug/kg	DL
SS	MIA188	MG770001	SW8270	BENZO(g,h,i)PERYLENE	23000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	BENZO(g h i)PERYLENE	9300	E	R	350	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	BENZO(g h i)PERYLENE	1800	=	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	BENZO(g h i)PERYLENE	1700	=	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	BENZO(g h i)PERYLENE	2300	=	R	2000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	BENZO(g,h,i)PERYLENE	2900	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	BENZO(g,h,i)PERYLENE	1300	=	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	BENZO(g,h,i)PERYLENE	1800	=	R	1200	ug/kg	DL
SS	MIA098	MG767001	SW8270	BENZO(k)FLUORANTHENE	3200	E	R	390	ug/kg	DL
SS	MIA188	MG770001	SW8270	BENZO(k)FLUORANTHENE	24000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	BENZO(k)FLUORANTHENE	20000	E	R	350	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	BENZO(k)FLUORANTHENE	2100	=	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	BENZO(k)FLUORANTHENE	1900	=	R	1300	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	BENZO(k)FLUORANTHENE	4000	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	BENZO(k)FLUORANTHENE	1500	=	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	BENZO(k)FLUORANTHENE	2800	=	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	BENZYL BUTYL PHTHALATE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	BENZYL BUTYL PHTHALATE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	BENZYL BUTYL PHTHALATE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	BENZYL BUTYL PHTHALATE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	BENZYL BUTYL PHTHALATE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	BENZYL BUTYL PHTHALATE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	BENZYL BUTYL PHTHALATE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	BENZYL BUTYL PHTHALATE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	bis(2-CHLOROETHOXY) METHANE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	bis(2-CHLOROETHOXY) METHANE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	bis(2-CHLOROETHOXY) METHANE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	bis(2-CHLOROETHOXY) METHANE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	bis(2-CHLOROETHOXY) METHANE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	bis(2-CHLOROETHOXY) METHANE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	bis(2-CHLOROETHOXY) METHANE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	bis(2-CHLOROETHOXY) METHANE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	bis(2-CHLOROETHYL) ETHER	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	bis(2-CHLOROETHYL) ETHER	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	bis(2-CHLOROETHYL) ETHER	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	bis(2-CHLOROETHYL) ETHER	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	bis(2-CHLOROETHYL) ETHER	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	bis(2-CHLOROETHYL) ETHER	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	bis(2-CHLOROETHYL) ETHER	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	bis(2-CHLOROETHYL) ETHER	1200	U	R	1200	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	2400	U	R	2400	ug/kg	DL

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ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA303DL	MG785014DL	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	800	U	R	800	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	260	J	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	1400	=	R	1300	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	190	J	R	1200	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	CARBAZOLE	3900	E	R	350	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	CARBAZOLE	490	J	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	CARBAZOLE	460	J	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	CARBAZOLE	770	J	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	CARBAZOLE	6000	J	R	10000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	CARBAZOLE	2200	J	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	CARBAZOLE	640	J	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	CARBAZOLE	1100	J	R	1200	ug/kg	DL
SS	MIA098	MG767001	SW8270	CHRYSENE	3900	E	R	390	ug/kg	DL
SS	MIA188	MG770001	SW8270	CHRYSENE	30000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	CHRYSENE	27000	E	R	350	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	CHRYSENE	2600	=	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	CHRYSENE	2600	=	R	1300	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	CHRYSENE	5400	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	CHRYSENE	1900	=	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	CHRYSENE	3400	=	R	1200	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	DIBENZ(a h)ANTHRACENE	5600	E	R	350	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	DIBENZ(a h)ANTHRACENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	DIBENZ(a h)ANTHRACENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	DIBENZ(a,h)ANTHRACENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	DIBENZ(a h)ANTHRACENE	10000	U	R	10000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	DIBENZ(a h)ANTHRACENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	DIBENZ(a h)ANTHRACENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	DIBENZ(a h)ANTHRACENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	DIBENZOFURAN	1300	U	R	1300	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	DIBENZOFURAN	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	DIBENZOFURAN	7100	U	R	7100	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	DIBENZOFURAN	140	J	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	DIBENZOFURAN	240	J	R	2000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	DIBENZOFURAN	650	J	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	DIBENZOFURAN	200	J	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	DIBENZOFURAN	390	J	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	DIETHYL PHTHALATE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	DIETHYL PHTHALATE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	DIETHYL PHTHALATE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	DIETHYL PHTHALATE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	DIETHYL PHTHALATE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	DIETHYL PHTHALATE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	DIETHYL PHTHALATE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	DIETHYL PHTHALATE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	DIMETHYL PHTHALATE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	DIMETHYL PHTHALATE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	DIMETHYL PHTHALATE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	DIMETHYL PHTHALATE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	DIMETHYL PHTHALATE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	DIMETHYL PHTHALATE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	DIMETHYL PHTHALATE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	DIMETHYL PHTHALATE	1200	U	R	1200	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	DI-n-BUTYL PHTHALATE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	DI-n-BUTYL PHTHALATE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	DI-n-BUTYL PHTHALATE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	DI-n-BUTYL PHTHALATE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	DI-n-BUTYL PHTHALATE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	DI-n-BUTYL PHTHALATE	1200	U	R	1200	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	DI-n-BUTYL PHTHALATE	160	J	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	DI-n-BUTYL PHTHALATE	160	J	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	DI-n-OCTYLPHTHALATE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	DI-n-OCTYLPHTHALATE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	DI-n-OCTYLPHTHALATE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	DI-n-OCTYLPHTHALATE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	DI-n-OCTYLPHTHALATE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	DI-n-OCTYLPHTHALATE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	DI-n-OCTYLPHTHALATE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	DI-n-OCTYLPHTHALATE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	FLUORANTHENE	5200	=	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	FLUORANTHENE	5700	=	R	1300	ug/kg	DL
SE	MIA015	MG682018	SW8270	FLUORANTHENE	5400	E	R	670	ug/kg	DL

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SE	MIA028	MG682010	SW8270	FLUORANTHENE	5400	E	R	640	ug/kg	DL
SS	MIA098	MG767001	SW8270	FLUORANTHENE	10000	E	R	390	ug/kg	DL
SS	MIA188	MG770001	SW8270	FLUORANTHENE	81000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	FLUORANTHENE	95000	E	R	350	ug/kg	DL
SS	MIA302	MG785013	SW8270	FLUORANTHENE	14000	E	R	1600	ug/kg	DL
SS	MIA303	MG785014	SW8270	FLUORANTHENE	4000	E	R	400	ug/kg	DL
SS	MIA304	MG785015	SW8270	FLUORANTHENE	5900	E	R	410	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	FLUORENE	280	J	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	FLUORENE	330	J	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	FLUORENE	470	J	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	FLUORENE	1500	J	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	FLUORENE	980	J	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	FLUORENE	1100	J	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	FLUORENE	290	J	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	FLUORENE	610	J	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	HEXACHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	HEXACHLOROBENZENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	HEXACHLOROBENZENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	HEXACHLOROBENZENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	HEXACHLOROBENZENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	HEXACHLOROBENZENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	HEXACHLOROBENZENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	HEXACHLOROBENZENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	HEXACHLOROBUTADIENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	HEXACHLOROBUTADIENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	HEXACHLOROBUTADIENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	HEXACHLOROBUTADIENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	HEXACHLOROBUTADIENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	HEXACHLOROBUTADIENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	HEXACHLOROBUTADIENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	HEXACHLOROBUTADIENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	HEXACHLOROCYCLOPENTADIENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	HEXACHLOROCYCLOPENTADIENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	HEXACHLOROCYCLOPENTADIENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	HEXACHLOROCYCLOPENTADIENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	HEXACHLOROCYCLOPENTADIENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	HEXACHLOROCYCLOPENTADIENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	HEXACHLOROCYCLOPENTADIENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	HEXACHLOROCYCLOPENTADIENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	HEXACHLOROETHANE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	HEXACHLOROETHANE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	HEXACHLOROETHANE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	HEXACHLOROETHANE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	HEXACHLOROETHANE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	HEXACHLOROETHANE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	HEXACHLOROETHANE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	HEXACHLOROETHANE	1200	U	R	1200	ug/kg	DL
SS	MIA188	MG770001	SW8270	INDENO(1 2,3-c d)PYRENE	23000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	INDENO(1,2,3-c d)PYRENE	11000	E	R	350	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	INDENO(1 2 3-c d)PYRENE	1700	=	R	1300	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	INDENO(1 2 3-c d)PYRENE	1500	=	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	INDENO(1,2,3-c,d)PYRENE	2100	=	R	2000	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	INDENO(1 2,3-c,d)PYRENE	3000	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	INDENO(1 2,3-c d)PYRENE	1200	=	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	INDENO(1,2 3-c,d)PYRENE	1900	=	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	ISOPHORONE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	ISOPHORONE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	ISOPHORONE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	ISOPHORONE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	ISOPHORONE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	ISOPHORONE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	ISOPHORONE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	ISOPHORONE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	NAPHTHALENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	NAPHTHALENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	NAPHTHALENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	NAPHTHALENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	NAPHTHALENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	NAPHTHALENE	320	J	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	NAPHTHALENE	150	J	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	NAPHTHALENE	190	J	R	1200	ug/kg	DL

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SE	MIA015DL	MG682018DL	SW8270	NITROBENZENE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	NITROBENZENE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	NITROBENZENE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	NITROBENZENE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	NITROBENZENE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	NITROBENZENE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	NITROBENZENE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	NITROBENZENE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	N-NITROSODI-n-PROPYLAMINE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	N-NITROSODI-n-PROPYLAMINE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	N-NITROSODI-n-PROPYLAMINE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	N-NITROSODI-n-PROPYLAMINE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	N-NITROSODI-n-PROPYLAMINE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	N-NITROSODI-n-PROPYLAMINE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	N-NITROSODI-n-PROPYLAMINE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	N-NITROSODI-n-PROPYLAMINE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	N-NITROSODIPHENYLAMINE	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	N-NITROSODIPHENYLAMINE	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	N-NITROSODIPHENYLAMINE	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	N-NITROSODIPHENYLAMINE	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	N-NITROSODIPHENYLAMINE	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	N-NITROSODIPHENYLAMINE	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	N-NITROSODIPHENYLAMINE	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	N-NITROSODIPHENYLAMINE	1200	U	R	1200	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	PENTACHLOROPHENOL	670	U	R	670	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	PENTACHLOROPHENOL	640	U	R	640	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	PENTACHLOROPHENOL	980	U	R	980	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	PENTACHLOROPHENOL	5300	U	R	5300	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	PENTACHLOROPHENOL	3500	U	R	3500	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	PENTACHLOROPHENOL	1200	U	R	1200	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	PENTACHLOROPHENOL	400	U	R	400	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	PENTACHLOROPHENOL	610	U	R	610	ug/kg	DL
SS	MIA098	MG767001	SW8270	PHENANTHRENE	6700	E	R	390	ug/kg	DL
SS	MIA188	MG770001	SW8270	PHENANTHRENE	25000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	PHENANTHRENE	32000	E	R	350	ug/kg	DL
SS	MIA304	MG785015	SW8270	PHENANTHRENE	4700	E	R	410	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	PHENANTHRENE	3200	=	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	PHENANTHRENE	2400	=	R	1300	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	PHENANTHRENE	10000	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	PHENANTHRENE	3300	=	R	800	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	PHENOL	1300	U	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	PHENOL	1300	U	R	1300	ug/kg	DL
SS	MIA098DL	MG767001DL	SW8270	PHENOL	2000	U	R	2000	ug/kg	DL
SS	MIA188DL	MG770001DL	SW8270	PHENOL	10000	U	R	10000	ug/kg	DL
SS	MIA189FDDL	MG770002DL	SW8270	PHENOL	7100	U	R	7100	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	PHENOL	2400	U	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	PHENOL	800	U	R	800	ug/kg	DL
SS	MIA304DL	MG785015DL	SW8270	PHENOL	1200	U	R	1200	ug/kg	DL
SS	MIA098	MG767001	SW8270	PYRENE	8600	E	R	390	ug/kg	DL
SS	MIA188	MG770001	SW8270	PYRENE	72000	E	R	1800	ug/kg	DL
SS	MIA189FD	MG770002	SW8270	PYRENE	74000	E	R	350	ug/kg	DL
SS	MIA304	MG785015	SW8270	PYRENE	4900	E	R	410	ug/kg	DL
SE	MIA015DL	MG682018DL	SW8270	PYRENE	4700	=	R	1300	ug/kg	DL
SE	MIA028DL	MG682010DL	SW8270	PYRENE	4900	=	R	1300	ug/kg	DL
SS	MIA302DL	MG785013DL	SW8270	PYRENE	9400	=	R	2400	ug/kg	DL
SS	MIA303DL	MG785014DL	SW8270	PYRENE	3200	=	R	800	ug/kg	DL
SS	MIA252	MG776021	SW6010	SILVER	0 09	TR	J	0 051	mg/kg	IB MS
SS	MIA255	MG776024	SW6010	SILVER	0 31	TR	J	0 051	mg/kg	IB MS
SS	MIA256	MG776025	SW6010	SILVER	0 18	TR	J	0 052	mg/kg	IB MS
SS	MIA257	MG776026	SW6010	SILVER	0 11	TR	J	0 053	mg/kg	IB MS
SS	MIA259	MG776028	SW6010	SILVER	0 1	TR	J	0 053	mg/kg	IB MS
SS	MIA242	MG777003	SW6010	SILVER	0 2	TR	J	0 11	mg/kg	IB,MS
SS	MIA244	MG777004	SW6010	SILVER	0 34	TR	J	0 054	mg/kg	IB,MS
SS	MIA245	MG777005	SW6010	SILVER	0 44	TR	J	0 053	mg/kg	IB,MS
SS	MIA246	MG777006	SW6010	SILVER	0 61	TR	J	0 21	mg/kg	IB MS
SS	MIA249	MG777009	SW6010	SILVER	0 58	TR	J	0 13	mg/kg	IB MS
SS	MIA250	MG777010	SW6010	SILVER	0 09	TR	J	0 054	mg/kg	IB MS
SS	MIA251	MG777011	SW6010	SILVER	0 13	TR	J	0 058	mg/kg	IB,MS
SS	MIA277	MG777015	SW6010	SILVER	0 13	TR	J	0 054	mg/kg	IB MS
SS	MIA280	MG777017	SW6010	SILVER	0 21	TR	J	0 061	mg/kg	IB,MS
SS	MIA282FD	MG777019	SW6010	SILVER	0 13	TR	J	0 056	mg/kg	IB,MS

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Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA283	MG777020	SW6010	SILVER	0 09	TR	J	0 054	mg/kg	IB MS
SS	MIA032	MG695004	SW6010	COBALT	4 2	TR	J	0 056	mg/kg	IB SD
SE	MIA013R	MG682016R	SW8260	1,1,1-TRICHLOROETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	1,1,1-TRICHLOROETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	1,1,1-TRICHLOROETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	1,1,1-TRICHLOROETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	1,1,2 2-TETRACHLOROETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	1,1,2,2-TETRACHLOROETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	1,1,2,2-TETRACHLOROETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	1 1,2,2-TETRACHLOROETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	1 1,2-TRICHLOROETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	1,1 2-TRICHLOROETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	1,1 2-TRICHLOROETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	1 1 2-TRICHLOROETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	1 1-DICHLOROETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	1 1-DICHLOROETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	1 1-DICHLOROETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	1,1-DICHLOROETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	1 1-DICHLOROETHENE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	1,1-DICHLOROETHENE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	1,1-DICHLOROETHENE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	1,1-DICHLOROETHENE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	1 2-DICHLOROETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	1 2-DICHLOROETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	1,2-DICHLOROETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	1,2-DICHLOROETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	1 2-DICHLOROPROPANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	1,2-DICHLOROPROPANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	1 2-DICHLOROPROPANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	1 2-DICHLOROPROPANE	21	U	UJ	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	2-BUTANONE	120	=	J	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	2-BUTANONE	40	=	J	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	2-BUTANONE	120	=	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	2-BUTANONE	22	=	R	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	2-HEXANONE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	2-HEXANONE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	2-HEXANONE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	2-HEXANONE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	ACETONE	1600	=	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	ACETONE	120	=	R	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	BENZENE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	BENZENE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	BENZENE	110	U	UJ	110	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	BROMODICHLOROMETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	BROMODICHLOROMETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	BROMODICHLOROMETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	BROMODICHLOROMETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	BROMOFORM	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	BROMOFORM	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	BROMOFORM	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	BROMOFORM	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	BROMOMETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	BROMOMETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	BROMOMETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	BROMOMETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	CARBON DISULFIDE	22	J	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	CARBON DISULFIDE	3	J	R	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	CARBON TETRACHLORIDE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	CARBON TETRACHLORIDE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	CARBON TETRACHLORIDE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	CARBON TETRACHLORIDE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	CHLOROBENZENE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	CHLOROBENZENE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	CHLOROBENZENE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	CHLOROBENZENE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	CHLOROETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	CHLOROETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	CHLOROETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	CHLOROETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	CHLOROFORM	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	CHLOROFORM	21	U	R	21	ug/kg	IS

ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SE	MIA013	MG682016	SW8260	CHLOROFORM	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	CHLOROFORM	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	CHLOROMETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	CHLOROMETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	CHLOROMETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	CHLOROMETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	cis-1 3-DICHLOROPROPENE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	cis-1 3-DICHLOROPROPENE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	cis-1 3-DICHLOROPROPENE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	cis-1 3-DICHLOROPROPENE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	DIBROMOCHLOROMETHANE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	DIBROMOCHLOROMETHANE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	DIBROMOCHLOROMETHANE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	DIBROMOCHLOROMETHANE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	ETHYLBENZENE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	ETHYLBENZENE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	ETHYLBENZENE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	ETHYLBENZENE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	METHYL ISOBUTYL KETONE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	METHYL ISOBUTYL KETONE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	METHYL ISOBUTYL KETONE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	METHYL ISOBUTYL KETONE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	METHYLENE CHLORIDE	21	J	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	METHYLENE CHLORIDE	4	J	R	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	STYRENE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	STYRENE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	STYRENE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	STYRENE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	TETRACHLOROETHYLENE(PCE)	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	TETRACHLOROETHYLENE(PCE)	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	TETRACHLOROETHYLENE(PCE)	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	TETRACHLOROETHYLENE(PCE)	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	TOLUENE	13	J	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	TOLUENE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	TOLUENE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	TOLUENE	21	U	UJ	21	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	TOTAL 1 2-DICHLOROETHENE	2	J	R	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	TOTAL 1 2-DICHLOROETHENE	110	U	R	110	ug/kg	IS
SE	MIA013	MG682016	SW8260	TOTAL 1 2-DICHLOROETHENE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	TOTAL 1 2-DICHLOROETHENE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	Total Xylenes	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	Total Xylenes	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	Total Xylenes	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	Total Xylenes	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	trans-1 3-DICHLOROPROPENE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	trans-1 3-DICHLOROPROPENE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	trans-1 3-DICHLOROPROPENE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	trans-1,3-DICHLOROPROPENE	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	TRICHLOROETHYLENE (TCE)	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	TRICHLOROETHYLENE (TCE)	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	TRICHLOROETHYLENE (TCE)	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	TRICHLOROETHYLENE (TCE)	21	U	UJ	21	ug/kg	IS
SE	MIA013R	MG682016R	SW8260	VINYL CHLORIDE	110	U	R	110	ug/kg	IS
SE	MIA028R	MG682010R	SW8260	VINYL CHLORIDE	21	U	R	21	ug/kg	IS
SE	MIA013	MG682016	SW8260	VINYL CHLORIDE	110	U	UJ	110	ug/kg	IS
SE	MIA028	MG682010	SW8260	VINYL CHLORIDE	21	U	UJ	21	ug/kg	IS
SS	MIA330	MG757002	SW6010	ANTIMONY	0 6	TR	J	0 19	mg/kg	MS
SS	MIA331	MG757003	SW6010	ANTIMONY	0 34	TR	J	0 2	mg/kg	MS
SS	MIA332	MG757004	SW6010	ANTIMONY	0 41	TR	J	0 2	mg/kg	MS
SS	MIA333	MG757005	SW6010	ANTIMONY	0 24	TR	J	0 19	mg/kg	MS
SS	MIA336	MG757008	SW6010	ANTIMONY	0 24	TR	J	0 2	mg/kg	MS
SS	MIA337	MG757009	SW6010	ANTIMONY	0 25	TR	J	0 18	mg/kg	MS
SS	MIA338	MG757010	SW6010	ANTIMONY	0 21	TR	J	0 18	mg/kg	MS
SS	MIA349	MG757012	SW6010	ANTIMONY	0 48	TR	J	0 21	mg/kg	MS
SS	MIA350	MG757013	SW6010	ANTIMONY	0 42	TR	J	0 2	mg/kg	MS
SS	MIA351	MG757014	SW6010	ANTIMONY	0 43	TR	J	0 19	mg/kg	MS
SS	MIA188	MG770001	SW6010	ANTIMONY	2 2	TR	J	0 9	mg/kg	MS
SS	MIA189FD	MG770002	SW6010	ANTIMONY	2 5	TR	J	0 9	mg/kg	MS
SS	MIA193	MG770006	SW6010	ANTIMONY	0 73	TR	J	0 2	mg/kg	MS
SS	MIA328FD	MG757001	SW6010	ANTIMONY	0 19	U	R	0 19	mg/kg	MS
SS	MIA334	MG757006	SW6010	ANTIMONY	0 19	U	R	0 19	mg/kg	MS

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA335	MG757007	SW6010	ANTIMONY	0 21	U	R	0 21	mg/kg	MS
SS	MIA339	MG757011	SW6010	ANTIMONY	0 19	U	R	0 19	mg/kg	MS
SS	MIA032	MG695004	SW6010	ANTIMONY	0 19	U	UJ	0 19	mg/kg	MS
SS	MIA033	MG695005	SW6010	ANTIMONY	0 42	TR	J	0 2	mg/kg	MS
SS	MIA037	MG695008	SW6010	ANTIMONY	0 19	U	UJ	0 19	mg/kg	MS
SS	MIA040	MG695011	SW6010	ANTIMONY	0 18	U	UJ	0 18	mg/kg	MS
SS	MIA041	MG695012	SW6010	ANTIMONY	0 18	U	UJ	0 18	mg/kg	MS
SS	MIA034FD	MG695006	SW6010	ANTIMONY	0 2	U	UJ	0 2	mg/kg	MS
SS	MIA132	MG785003	SW6010	ANTIMONY	0 79	TR	R	0 19	mg/kg	MS
SS	MIA261	MG777012	SW6010	ANTIMONY	49 1	TR	J	3 7	mg/kg	MS
SS	MIA285	MG777022	SW6010	ANTIMONY	0 79	TR	J	0 2	mg/kg	MS
SS	MIA269	MG778027	SW6010	ANTIMONY	16 8	=	J	0 19	mg/kg	MS
SS	MIA153	MG756001	SW6010	ANTIMONY	0 42	TR	J	0 19	mg/kg	MS
SS	MIA155	MG756003	SW6010	ANTIMONY	0 34	TR	J	0 2	mg/kg	MS
SS	MIA157	MG756005	SW6010	ANTIMONY	0 26	TR	J	0 19	mg/kg	MS
SS	MIA158	MG756006	SW6010	ANTIMONY	0 37	TR	J	0 19	mg/kg	MS
SS	MIA159	MG756007	SW6010	ANTIMONY	3	TR	J	0 96	mg/kg	MS
SS	MIA160FD	MG756008	SW6010	ANTIMONY	4 5	TR	J	0 38	mg/kg	MS
SS	MIA162	MG756009	SW6010	ANTIMONY	0 58	TR	J	0 19	mg/kg	MS
SS	MIA163	MG756010	SW6010	ANTIMONY	0 49	TR	J	0 2	mg/kg	MS
SS	MIA165	MG756012	SW6010	ANTIMONY	0 23	TR	J	0 2	mg/kg	MS
SS	MIA166	MG756013	SW6010	ANTIMONY	0 44	TR	J	0 19	mg/kg	MS
SS	MIA167	MG756014	SW6010	ANTIMONY	0 49	TR	J	0 21	mg/kg	MS
SS	MIA171FD	MG756018	SW6010	ANTIMONY	0 46	TR	J	0 19	mg/kg	MS
SS	MIA172	MG756019	SW6010	ANTIMONY	0 32	TR	J	0 19	mg/kg	MS
SS	MIA325	MG756025	SW6010	ANTIMONY	10 1	TR	J	0 77	mg/kg	MS
SS	MIA226	MG776008	SW6010	ANTIMONY	2 6	TR	J	0 76	mg/kg	MS
SS	MIA233	MG776014	SW6010	ANTIMONY	0 71	TR	J	0 2	mg/kg	MS
SS	MIA234	MG776015	SW6010	ANTIMONY	5	TR	J	0 73	mg/kg	MS
SS	MIA238	MG776018	SW6010	ANTIMONY	6 3	TR	J	1 8	mg/kg	MS
SS	MIA252	MG776021	SW6010	ANTIMONY	3 9	TR	J	0 88	mg/kg	MS
SS	MIA255	MG776024	SW6010	ANTIMONY	14 7	TR	J	0 89	mg/kg	MS
SS	MIA256	MG776025	SW6010	ANTIMONY	3 2	TR	J	0 18	mg/kg	MS
SS	MIA258	MG776027	SW6010	ANTIMONY	2 7	TR	J	0 9	mg/kg	MS
SS	MIA241	MG777002	SW6010	ANTIMONY	0 91	TR	J	0 2	mg/kg	MS
SS	MIA242	MG777003	SW6010	ANTIMONY	1 5	TR	J	0 37	mg/kg	MS
SS	MIA244	MG777004	SW6010	ANTIMONY	2 7	TR	J	0 19	mg/kg	MS
SS	MIA245	MG777005	SW6010	ANTIMONY	2 9	TR	J	0 18	mg/kg	MS
SS	MIA246	MG777006	SW6010	ANTIMONY	7 4	TR	J	0 72	mg/kg	MS
SS	MIA249	MG777009	SW6010	ANTIMONY	4 8	TR	J	0 45	mg/kg	MS
SS	MIA250	MG777010	SW6010	ANTIMONY	1 1	TR	J	0 19	mg/kg	MS
SS	MIA251	MG777011	SW6010	ANTIMONY	0 86	TR	J	0 2	mg/kg	MS
SS	MIA262	MG777013	SW6010	ANTIMONY	5 9	TR	J	1 9	mg/kg	MS
SS	MIA263	MG777014	SW6010	ANTIMONY	0 96	TR	J	0 37	mg/kg	MS
SS	MIA277	MG777015	SW6010	ANTIMONY	0 41	TR	J	0 19	mg/kg	MS
SS	MIA278FD	MG777016	SW6010	ANTIMONY	0 87	TR	J	0 2	mg/kg	MS
SS	MIA280	MG777017	SW6010	ANTIMONY	1 5	TR	J	0 21	mg/kg	MS
SS	MIA281	MG777018	SW6010	ANTIMONY	0 37	TR	J	0 2	mg/kg	MS
SS	MIA283	MG777020	SW6010	ANTIMONY	0 64	TR	J	0 19	mg/kg	MS
SS	MIA284	MG777021	SW6010	ANTIMONY	0 74	TR	J	0 19	mg/kg	MS
SS	MIA286	MG777023	SW6010	ANTIMONY	0 3	TR	J	0 22	mg/kg	MS
SS	MIA287	MG777024	SW6010	ANTIMONY	0 53	TR	J	0 21	mg/kg	MS
SS	MIA288	MG777025	SW6010	ANTIMONY	0 39	TR	J	0 21	mg/kg	MS
SS	MIA243	MG778021	SW6010	ANTIMONY	2 8	TR	J	0 18	mg/kg	MS
SS	MIA265	MG778023	SW6010	ANTIMONY	3 2	TR	J	1 8	mg/kg	MS
SS	MIA275	MG778001	SW6010	ANTIMONY	4 3	TR	J	0 92	mg/kg	MS
SS	MIA313	MG778010	SW6010	ANTIMONY	7 4	TR	J	1 8	mg/kg	MS
SS	MIA314FD	MG778011	SW6010	ANTIMONY	12 8	TR	J	1 8	mg/kg	MS
SS	MIA315	MG778012	SW6010	ANTIMONY	7 9	TR	J	1 9	mg/kg	MS
SS	MIA316	MG778013	SW6010	ANTIMONY	9	TR	J	1 8	mg/kg	MS
SS	MIA295	MG785007	SW6010	ANTIMONY	2 9	TR	J	0 18	mg/kg	MS
SS	MIA296	MG785008	SW6010	ANTIMONY	2 1	TR	J	0 18	mg/kg	MS
SS	MIA297FD	MG785009	SW6010	ANTIMONY	2	TR	J	0 18	mg/kg	MS
SB	MIA074	MG743012	SW6010	ANTIMONY	0 33	TR	R	0 2	mg/kg	MS
SB	MIA076	MG743014	SW6010	ANTIMONY	0 85	TR	R	0 21	mg/kg	MS
SB	MIA125	MG743020	SW6010	ANTIMONY	0 42	TR	R	0 21	mg/kg	MS
SS	MIA134	MG743023	SW6010	ANTIMONY	0 54	TR	R	0 2	mg/kg	MS
SS	MIA137	MG743002	SW6010	ANTIMONY	0 4	TR	R	0 2	mg/kg	MS
SS	MIA138	MG743003	SW6010	ANTIMONY	0 96	TR	R	0 2	mg/kg	MS
SS	MIA139FD	MG743004	SW6010	ANTIMONY	0 95	TR	R	0 2	mg/kg	MS
SS	MIA141	MG743005	SW6010	ANTIMONY	0 48	TR	R	0 19	mg/kg	MS

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ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA142	MG743006	SW6010	ANTIMONY	0 7	TR	R	0 2	mg/kg	MS
SS	MIA143	MG743007	SW6010	ANTIMONY	0 5	TR	R	0 2	mg/kg	MS
SS	MIA144	MG743008	SW6010	ANTIMONY	0 35	TR	R	0 19	mg/kg	MS
SS	MIA145	MG743009	SW6010	ANTIMONY	0 27	TR	R	0 19	mg/kg	MS
SS	MIA128	MG785001	SW6010	ANTIMONY	1	TR	R	0 2	mg/kg	MS
SS	MIA129FD	MG785002	SW6010	ANTIMONY	1 6	TR	R	0 2	mg/kg	MS
SS	MIA299	MG785010	SW6010	ANTIMONY	1 6	TR	R	0 18	mg/kg	MS
SS	MIA302	MG785013	SW6010	ANTIMONY	0 58	TR	R	0 2	mg/kg	MS
SS	MIA303	MG785014	SW6010	ANTIMONY	0 71	TR	R	0 2	mg/kg	MS
SS	MIA304	MG785015	SW6010	ANTIMONY	0 76	TR	R	0 21	mg/kg	MS
SS	MIA218	MG776001	SW6010	ANTIMONY	0 98	TR	UJ	0 21	mg/kg	MS
SS	MIA220	MG776003	SW6010	ANTIMONY	1 3	TR	UJ	0 21	mg/kg	MS
SS	MIA221	MG776004	SW6010	ANTIMONY	1 1	TR	UJ	0 21	mg/kg	MS
SS	MIA222	MG776005	SW6010	ANTIMONY	1	TR	UJ	0 21	mg/kg	MS
SS	MIA223FD	MG776006	SW6010	ANTIMONY	1 2	TR	UJ	0 2	mg/kg	MS
SS	MIA225	MG776007	SW6010	ANTIMONY	0 76	TR	UJ	0 21	mg/kg	MS
SS	MIA227	MG776009	SW6010	ANTIMONY	0 96	TR	UJ	0 19	mg/kg	MS
SS	MIA228	MG776010	SW6010	ANTIMONY	0 73	TR	UJ	0 2	mg/kg	MS
SS	MIA229	MG776011	SW6010	ANTIMONY	1 1	TR	UJ	0 21	mg/kg	MS
SS	MIA230	MG776012	SW6010	ANTIMONY	0 68	TR	UJ	0 2	mg/kg	MS
SS	MIA231FD	MG776013	SW6010	ANTIMONY	0 66	TR	UJ	0 2	mg/kg	MS
SS	MIA236	MG776016	SW6010	ANTIMONY	1 1	TR	UJ	0 19	mg/kg	MS
SS	MIA239	MG776019	SW6010	ANTIMONY	0 47	TR	UJ	0 19	mg/kg	MS
SS	MIA240	MG776020	SW6010	ANTIMONY	0 22	TR	UJ	0 18	mg/kg	MS
SS	MIA253	MG776022	SW6010	ANTIMONY	1 1	TR	UJ	0 2	mg/kg	MS
SS	MIA254	MG776023	SW6010	ANTIMONY	0 75	TR	UJ	0 2	mg/kg	MS
SS	MIA257	MG776026	SW6010	ANTIMONY	0 86	TR	UJ	0 18	mg/kg	MS
SS	MIA259	MG776028	SW6010	ANTIMONY	1 2	TR	UJ	0 18	mg/kg	MS
SS	MIA260	MG776029	SW6010	ANTIMONY	0 85	TR	UJ	0 2	mg/kg	MS
SS	MIA264	MG778022	SW6010	ANTIMONY	1 2	TR	UJ	0 19	mg/kg	MS
SS	MIA270	MG778028	SW6010	ANTIMONY	1 1	TR	UJ	0 19	mg/kg	MS
SS	MIA305	MG778003	SW6010	ANTIMONY	0 48	TR	UJ	0 21	mg/kg	MS
SS	MIA306	MG778004	SW6010	ANTIMONY	0 4	TR	UJ	0 2	mg/kg	MS
SS	MIA309	MG778006	SW6010	ANTIMONY	0 22	TR	UJ	0 19	mg/kg	MS
SB	MIA075	MG743013	SW6010	ANTIMONY	0 21	U	R	0 21	mg/kg	MS
SB	MIA126	MG743021	SW6010	ANTIMONY	0 21	U	R	0 21	mg/kg	MS
SB	MIA127	MG743022	SW6010	ANTIMONY	0 21	U	R	0 21	mg/kg	MS
SS	MIA156	MG756004	SW6010	ANTIMONY	0 19	U	R	0 19	mg/kg	MS
SS	MIA164	MG756011	SW6010	ANTIMONY	0 2	U	R	0 2	mg/kg	MS
SS	MIA168	MG756015	SW6010	ANTIMONY	0 2	U	R	0 2	mg/kg	MS
SS	MIA169	MG756016	SW6010	ANTIMONY	0 19	U	R	0 19	mg/kg	MS
SS	MIA170	MG756017	SW6010	ANTIMONY	0 19	U	R	0 19	mg/kg	MS
SS	MIA173	MG756020	SW6010	ANTIMONY	0 2	U	R	0 2	mg/kg	MS
SS	MIA326	MG756026	SW6010	ANTIMONY	0 19	U	R	0 19	mg/kg	MS
SS	MIA327	MG756027	SW6010	ANTIMONY	0 18	U	R	0 18	mg/kg	MS
SS	MIA237	MG776017	SW6010	ANTIMONY	0 18	U	UJ	0 18	mg/kg	MS
SS	MIA247	MG777007	SW6010	ANTIMONY	0 19	U	UJ	0 19	mg/kg	MS
SS	MIA248	MG777008	SW6010	ANTIMONY	0 19	U	UJ	0 19	mg/kg	MS
SS	MIA282FD	MG777019	SW6010	ANTIMONY	0 19	U	UJ	0 19	mg/kg	MS
SS	MIA289	MG777026	SW6010	ANTIMONY	0 19	U	UJ	0 19	mg/kg	MS
SS	MIA290	MG777027	SW6010	ANTIMONY	0 2	U	UJ	0 2	mg/kg	MS
SS	MIA291	MG777028	SW6010	ANTIMONY	0 18	U	UJ	0 18	mg/kg	MS
SS	MIA307FD	MG778005	SW6010	ANTIMONY	0 2	U	UJ	0 2	mg/kg	MS
SS	MIA328FD	MG757001	SW6010	CADMIUM	1 5	=	J	0 0093	mg/kg	MS
SS	MIA334	MG757006	SW6010	CADMIUM	1	=	J	0 0096	mg/kg	MS
SS	MIA338	MG757010	SW6010	CADMIUM	3 1	=	J	0 009	mg/kg	MS
SS	MIA330	MG757002	SW6010	CADMIUM	0 24	TR	J	0 0097	mg/kg	MS
SS	MIA331	MG757003	SW6010	CADMIUM	0 14	TR	J	0 0099	mg/kg	MS
SS	MIA332	MG757004	SW6010	CADMIUM	0 15	TR	J	0 01	mg/kg	MS
SS	MIA333	MG757005	SW6010	CADMIUM	0 19	TR	J	0 0097	mg/kg	MS
SS	MIA335	MG757007	SW6010	CADMIUM	0 24	TR	J	0 01	mg/kg	MS
SS	MIA336	MG757008	SW6010	CADMIUM	0 16	TR	J	0 0099	mg/kg	MS
SS	MIA337	MG757009	SW6010	CADMIUM	0 27	TR	J	0 0091	mg/kg	MS
SS	MIA339	MG757011	SW6010	CADMIUM	0 16	TR	J	0 0094	mg/kg	MS
SS	MIA349	MG757012	SW6010	CADMIUM	0 14	TR	J	0 011	mg/kg	MS
SS	MIA350	MG757013	SW6010	CADMIUM	0 11	TR	J	0 01	mg/kg	MS
SS	MIA351	MG757014	SW6010	CADMIUM	0 08	TR	J	0 0096	mg/kg	MS
SS	MIA160FD	MG756008	SW6010	CADMIUM	1 3	=	J	0 019	mg/kg	MS
SS	MIA164	MG756011	SW6010	CADMIUM	1 1	=	J	0 0098	mg/kg	MS
SS	MIA171FD	MG756018	SW6010	CADMIUM	0 7	=	J	0 0094	mg/kg	MS
SS	MIA325	MG756025	SW6010	CADMIUM	2 7	=	J	0 039	mg/kg	MS

ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA153	MG756001	SW6010	CADMIUM	0 55	TR	J	0 0093	mg/kg	MS
SS	MIA155	MG756003	SW6010	CADMIUM	0 29	TR	J	0 01	mg/kg	MS
SS	MIA156	MG756004	SW6010	CADMIUM	0 5	TR	J	0 0096	mg/kg	MS
SS	MIA157	MG756005	SW6010	CADMIUM	0 46	TR	J	0 0095	mg/kg	MS
SS	MIA158	MG756006	SW6010	CADMIUM	0 25	TR	J	0 0095	mg/kg	MS
SS	MIA159	MG756007	SW6010	CADMIUM	0 66	TR	J	0 048	mg/kg	MS
SS	MIA162	MG756009	SW6010	CADMIUM	0 12	TR	J	0 0096	mg/kg	MS
SS	MIA163	MG756010	SW6010	CADMIUM	0 16	TR	J	0 0098	mg/kg	MS
SS	MIA165	MG756012	SW6010	CADMIUM	0 11	TR	J	0 01	mg/kg	MS
SS	MIA166	MG756013	SW6010	CADMIUM	0 13	TR	J	0 0097	mg/kg	MS
SS	MIA167	MG756014	SW6010	CADMIUM	0 57	TR	J	0 011	mg/kg	MS
SS	MIA168	MG756015	SW6010	CADMIUM	0 17	TR	J	0 0098	mg/kg	MS
SS	MIA169	MG756016	SW6010	CADMIUM	0 17	TR	J	0 0094	mg/kg	MS
SS	MIA170	MG756017	SW6010	CADMIUM	0 49	TR	J	0 0095	mg/kg	MS
SS	MIA172	MG756019	SW6010	CADMIUM	0 12	TR	J	0 0093	mg/kg	MS
SS	MIA173	MG756020	SW6010	CADMIUM	0 13	TR	J	0 0098	mg/kg	MS
SS	MIA326	MG756026	SW6010	CADMIUM	0 29	TR	J	0 0096	mg/kg	MS
SS	MIA327	MG756027	SW6010	CADMIUM	0 51	TR	J	0 009	mg/kg	MS
SS	MIA032	MG695004	SW6010	CHROMIUM TOTAL	12 2	=	J	0 12	mg/kg	MS
SS	MIA033	MG695005	SW6010	CHROMIUM TOTAL	13 2	=	J	0 12	mg/kg	MS
SS	MIA034FD	MG695006	SW6010	CHROMIUM TOTAL	9 5	=	J	0 12	mg/kg	MS
SS	MIA037	MG695008	SW6010	CHROMIUM, TOTAL	14 9	=	J	0 12	mg/kg	MS
SS	MIA040	MG695011	SW6010	CHROMIUM TOTAL	16 5	=	J	0 11	mg/kg	MS
SS	MIA041	MG695012	SW6010	CHROMIUM TOTAL	16 7	=	J	0 11	mg/kg	MS
SB	MIA074	MG743012	SW6010	CHROMIUM TOTAL	14	=	J	0 13	mg/kg	MS
SB	MIA075	MG743013	SW6010	CHROMIUM TOTAL	10 4	=	J	0 13	mg/kg	MS
SB	MIA076	MG743014	SW6010	CHROMIUM TOTAL	12 5	=	J	0 13	mg/kg	MS
SB	MIA125	MG743020	SW6010	CHROMIUM TOTAL	13 5	=	J	0 13	mg/kg	MS
SB	MIA126	MG743021	SW6010	CHROMIUM TOTAL	12	=	J	0 13	mg/kg	MS
SB	MIA127	MG743022	SW6010	CHROMIUM, TOTAL	13	=	J	0 13	mg/kg	MS
SS	MIA134	MG743023	SW6010	CHROMIUM, TOTAL	14	=	J	0 12	mg/kg	MS
SS	MIA137	MG743002	SW6010	CHROMIUM TOTAL	13 1	=	J	0 12	mg/kg	MS
SS	MIA138	MG743003	SW6010	CHROMIUM TOTAL	13 8	=	J	0 12	mg/kg	MS
SS	MIA139FD	MG743004	SW6010	CHROMIUM, TOTAL	13	=	J	0 12	mg/kg	MS
SS	MIA141	MG743005	SW6010	CHROMIUM, TOTAL	11 6	=	J	0 12	mg/kg	MS
SS	MIA142	MG743006	SW6010	CHROMIUM TOTAL	13 9	=	J	0 12	mg/kg	MS
SS	MIA143	MG743007	SW6010	CHROMIUM TOTAL	10 4	=	J	0 12	mg/kg	MS
SS	MIA144	MG743008	SW6010	CHROMIUM TOTAL	8 2	=	J	0 12	mg/kg	MS
SS	MIA145	MG743009	SW6010	CHROMIUM TOTAL	10 4	=	J	0 12	mg/kg	MS
SS	MIA328FD	MG757001	SW6010	COBALT	5	TR	J	0 055	mg/kg	MS
SS	MIA153	MG756001	SW6010	COPPER	17 5	=	J	0 11	mg/kg	MS
SS	MIA155	MG756003	SW6010	COPPER	15 4	=	J	0 12	mg/kg	MS
SS	MIA156	MG756004	SW6010	COPPER	21 3	=	J	0 11	mg/kg	MS
SS	MIA157	MG756005	SW6010	COPPER	26 9	=	J	0 11	mg/kg	MS
SS	MIA158	MG756006	SW6010	COPPER	55 1	=	J	0 11	mg/kg	MS
SS	MIA159	MG756007	SW6010	COPPER	208	=	J	0 56	mg/kg	MS
SS	MIA160FD	MG756008	SW6010	COPPER	153	=	J	0 22	mg/kg	MS
SS	MIA162	MG756009	SW6010	COPPER	15 5	=	J	0 11	mg/kg	MS
SS	MIA163	MG756010	SW6010	COPPER	12 1	=	J	0 12	mg/kg	MS
SS	MIA164	MG756011	SW6010	COPPER	16 8	=	J	0 12	mg/kg	MS
SS	MIA165	MG756012	SW6010	COPPER	11 3	=	J	0 12	mg/kg	MS
SS	MIA166	MG756013	SW6010	COPPER	11	=	J	0 11	mg/kg	MS
SS	MIA167	MG756014	SW6010	COPPER	18 4	=	J	0 12	mg/kg	MS
SS	MIA168	MG756015	SW6010	COPPER	13 8	=	J	0 12	mg/kg	MS
SS	MIA169	MG756016	SW6010	COPPER	12 8	=	J	0 11	mg/kg	MS
SS	MIA170	MG756017	SW6010	COPPER	12 9	=	J	0 11	mg/kg	MS
SS	MIA171FD	MG756018	SW6010	COPPER	15 6	=	J	0 11	mg/kg	MS
SS	MIA172	MG756019	SW6010	COPPER	14	=	J	0 11	mg/kg	MS
SS	MIA325	MG756025	SW6010	COPPER	163	=	J	0 45	mg/kg	MS
SS	MIA326	MG756026	SW6010	COPPER	23 6	=	J	0 11	mg/kg	MS
SS	MIA327	MG756027	SW6010	COPPER	38 9	=	J	0 11	mg/kg	MS
SS	MIA173	MG756020	SW6010	COPPER	14 3	=	J	0 12	mg/kg	MS
SS	MIA328FD	MG757001	SW6010	NICKEL	19	=	J	0 035	mg/kg	MS
SS	MIA330	MG757002	SW6010	NICKEL	10 5	=	J	0 037	mg/kg	MS
SS	MIA331	MG757003	SW6010	NICKEL	14	=	J	0 037	mg/kg	MS
SS	MIA332	MG757004	SW6010	NICKEL	16 3	=	J	0 039	mg/kg	MS
SS	MIA333	MG757005	SW6010	NICKEL	14 6	=	J	0 037	mg/kg	MS
SS	MIA334	MG757006	SW6010	NICKEL	11	=	J	0 036	mg/kg	MS
SS	MIA335	MG757007	SW6010	NICKEL	14 1	=	J	0 039	mg/kg	MS
SS	MIA336	MG757008	SW6010	NICKEL	11 7	=	J	0 038	mg/kg	MS
SS	MIA337	MG757009	SW6010	NICKEL	6 3	=	J	0 035	mg/kg	MS

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ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA338	MG757010	SW6010	NICKEL	6 6	=	J	0 034	mg/kg	MS
SS	MIA339	MG757011	SW6010	NICKEL	10 2	=	J	0 035	mg/kg	MS
SS	MIA349	MG757012	SW6010	NICKEL	12 6	=	J	0 04	mg/kg	MS
SS	MIA351	MG757014	SW6010	NICKEL	12 5	=	J	0 037	mg/kg	MS
SS	MIA328FD	MG757001	SW6010	SILVER	0 05	U	UJ	0 05	mg/kg	MS
SS	MIA330	MG757002	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA331	MG757003	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA332	MG757004	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA333	MG757005	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA334	MG757006	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA335	MG757007	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA336	MG757008	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA337	MG757009	SW6010	SILVER	0 05	U	UJ	0 05	mg/kg	MS
SS	MIA338	MG757010	SW6010	SILVER	0 05	U	UJ	0 05	mg/kg	MS
SS	MIA339	MG757011	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA349	MG757012	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA350	MG757013	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA351	MG757014	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA032	MG695004	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA033	MG695005	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA034FD	MG695006	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA037	MG695008	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA040	MG695011	SW6010	SILVER	0 05	U	UJ	0 05	mg/kg	MS
SS	MIA041	MG695012	SW6010	SILVER	0 05	U	UJ	0 05	mg/kg	MS
SS	MIA160FD	MG756008	SW6010	SILVER	0 91	TR	J	0 11	mg/kg	MS
SS	MIA325	MG756025	SW6010	SILVER	1 6	TR	J	0 22	mg/kg	MS
SB	MIA074	MG743012	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SB	MIA075	MG743013	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SB	MIA076	MG743014	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SB	MIA125	MG743020	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SB	MIA126	MG743021	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SB	MIA127	MG743022	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA134	MG743023	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA137	MG743002	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA138	MG743003	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA139FD	MG743004	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA141	MG743005	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA142	MG743006	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA143	MG743007	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA145	MG743009	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA153	MG756001	SW6010	SILVER	0 05	U	UJ	0 05	mg/kg	MS
SS	MIA155	MG756003	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA156	MG756004	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA157	MG756005	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA158	MG756006	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA159	MG756007	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA162	MG756009	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA163	MG756010	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA164	MG756011	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA165	MG756012	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA166	MG756013	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA167	MG756014	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA168	MG756015	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA169	MG756016	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA170	MG756017	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA171FD	MG756018	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA172	MG756019	SW6010	SILVER	0 05	U	UJ	0 05	mg/kg	MS
SS	MIA173	MG756020	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA326	MG756026	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA327	MG756027	SW6010	SILVER	0 05	U	UJ	0 05	mg/kg	MS
SS	MIA144	MG743008	SW6010	SILVER	0 06	U	UJ	0 06	mg/kg	MS
SS	MIA032	MG695004	SW6010	VANADIUM	20 6	=	J	0 034	mg/kg	MS
SS	MIA037	MG695008	SW6010	VANADIUM	24 4	=	J	0 035	mg/kg	MS
SB	MIA074	MG743012	SW6010	VANADIUM	27 1	=	J	0 037	mg/kg	MS
SB	MIA075	MG743013	SW6010	VANADIUM	13 8	=	J	0 038	mg/kg	MS
SB	MIA076	MG743014	SW6010	VANADIUM	23 6	=	J	0 038	mg/kg	MS
SS	MIA134	MG743023	SW6010	VANADIUM	28 7	=	J	0 037	mg/kg	MS
SS	MIA137	MG743002	SW6010	VANADIUM	22 1	=	J	0 036	mg/kg	MS
SS	MIA138	MG743003	SW6010	VANADIUM	27 4	=	J	0 036	mg/kg	MS
SS	MIA139FD	MG743004	SW6010	VANADIUM	22 7	=	J	0 036	mg/kg	MS
SS	MIA141	MG743005	SW6010	VANADIUM	21 3	=	J	0 035	mg/kg	MS

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA142	MG743006	SW6010	VANADIUM	28 1	=	J	0 036	mg/kg	MS
SS	MIA143	MG743007	SW6010	VANADIUM	21 3	=	J	0 036	mg/kg	MS
SS	MIA144	MG743008	SW6010	VANADIUM	16 9	=	J	0 034	mg/kg	MS
SS	MIA145	MG743009	SW6010	VANADIUM	23	=	J	0 034	mg/kg	MS
SS	MIA032	MG695004	SW6010	ZINC	36 7	=	J	0 12	mg/kg	MS
SS	MIA033	MG695005	SW6010	ZINC	44	=	J	0 13	mg/kg	MS
SS	MIA034FD	MG695006	SW6010	ZINC	37 4	=	J	0 13	mg/kg	MS
SS	MIA037	MG695008	SW6010	ZINC	57 8	=	J	0 13	mg/kg	MS
SS	MIA040	MG695011	SW6010	ZINC	57 5	=	J	0 12	mg/kg	MS
SS	MIA041	MG695012	SW6010	ZINC	75 1	=	J	0 12	mg/kg	MS
SS	MIA142	MG743006	SW7471	MERCURY	0 03	TR	J	0 019	mg/kg	MS
SS	MIA338	MG757010	TC6010	Cadmium, TCLP	11 6	U	UJ	11 6	ug/L	MS
SS	MIA349	MG757012	TC6010	Cadmium, TCLP	11 6	U	UJ	11 6	ug/L	MS
SS	MIA159	MG756007	TC6010	Cadmium TCLP	11 6	U	UJ	11 6	ug/L	MS
SS	MIA160FD	MG756008	TC6010	Cadmium TCLP	11 6	U	UJ	11 6	ug/L	MS
SS	MIA165	MG756012	TC6010	Cadmium, TCLP	11 6	U	UJ	11 6	ug/L	MS
SS	MIA167	MG756014	TC6010	Cadmium TCLP	11 6	U	UJ	11 6	ug/L	MS
SS	MIA170	MG756017	TC6010	Cadmium, TCLP	11 6	U	UJ	11 6	ug/L	MS
SS	MIA171FD	MG756018	TC6010	Cadmium TCLP	11 6	U	UJ	11 6	ug/L	MS
SS	MIA144	MG743008	SW6010	BERYLLIUM	0 36	TR	J	0 0028	mg/kg	MS, SD
SS	MIA327	MG756027	SW6010	COBALT	4 7	TR	J	0 053	mg/kg	MS, SD
SS	MIA241	MG777002	SW6010	COPPER	12 7	=	J	0 12	mg/kg	MS, SD
SS	MIA242	MG777003	SW6010	COPPER	7 8	=	J	0 22	mg/kg	MS SD
SS	MIA244	MG777004	SW6010	COPPER	24	=	J	0 11	mg/kg	MS, SD
SS	MIA245	MG777005	SW6010	COPPER	19 1	=	J	0 11	mg/kg	MS, SD
SS	MIA246	MG777006	SW6010	COPPER	28 3	=	J	0 43	mg/kg	MS SD
SS	MIA247	MG777007	SW6010	COPPER	8 9	=	J	0 11	mg/kg	MS, SD
SS	MIA248	MG777008	SW6010	COPPER	5 8	=	J	0 11	mg/kg	MS, SD
SS	MIA249	MG777009	SW6010	COPPER	35 6	=	J	0 26	mg/kg	MS, SD
SS	MIA250	MG777010	SW6010	COPPER	4 7	=	J	0 11	mg/kg	MS, SD
SS	MIA251	MG777011	SW6010	COPPER	14 3	=	J	0 12	mg/kg	MS, SD
SS	MIA262	MG777013	SW6010	COPPER	38 2	=	J	1 1	mg/kg	MS SD
SS	MIA263	MG777014	SW6010	COPPER	11 7	=	J	0 22	mg/kg	MS SD
SS	MIA277	MG777015	SW6010	COPPER	17 6	=	J	0 11	mg/kg	MS SD
SS	MIA278FD	MG777016	SW6010	COPPER	18 7	=	J	0 12	mg/kg	MS, SD
SS	MIA280	MG777017	SW6010	COPPER	32 1	=	J	0 12	mg/kg	MS, SD
SS	MIA281	MG777018	SW6010	COPPER	12 9	=	J	0 11	mg/kg	MS, SD
SS	MIA282FD	MG777019	SW6010	COPPER	16 5	=	J	0 11	mg/kg	MS, SD
SS	MIA283	MG777020	SW6010	COPPER	29 1	=	J	0 11	mg/kg	MS, SD
SS	MIA284	MG777021	SW6010	COPPER	6 5	=	J	0 11	mg/kg	MS, SD
SS	MIA285	MG777022	SW6010	COPPER	10 9	=	J	0 12	mg/kg	MS, SD
SS	MIA286	MG777023	SW6010	COPPER	31 2	=	J	0 13	mg/kg	MS, SD
SS	MIA287	MG777024	SW6010	COPPER	24 2	=	J	0 12	mg/kg	MS, SD
SS	MIA288	MG777025	SW6010	COPPER	25 1	=	J	0 13	mg/kg	MS, SD
SS	MIA289	MG777026	SW6010	COPPER	13 7	=	J	0 11	mg/kg	MS, SD
SS	MIA290	MG777027	SW6010	COPPER	14 4	=	J	0 11	mg/kg	MS, SD
SS	MIA291	MG777028	SW6010	COPPER	7 5	=	J	0 11	mg/kg	MS, SD
SS	MIA261	MG777012	SW6010	COPPER	19 3	TR	J	2 2	mg/kg	MS, SD
SS	MIA153	MG756001	SW6010	NICKEL	10 5	=	J	0 035	mg/kg	MS SD
SS	MIA155	MG756003	SW6010	NICKEL	13 3	=	J	0 038	mg/kg	MS SD
SS	MIA156	MG756004	SW6010	NICKEL	12 8	=	J	0 036	mg/kg	MS, SD
SS	MIA157	MG756005	SW6010	NICKEL	15 4	=	J	0 036	mg/kg	MS, SD
SS	MIA158	MG756006	SW6010	NICKEL	20	=	J	0 036	mg/kg	MS, SD
SS	MIA159	MG756007	SW6010	NICKEL	59 9	=	J	0 036	mg/kg	MS, SD
SS	MIA160FD	MG756008	SW6010	NICKEL	38 6	=	J	0 036	mg/kg	MS, SD
SS	MIA162	MG756009	SW6010	NICKEL	15 4	=	J	0 037	mg/kg	MS, SD
SS	MIA163	MG756010	SW6010	NICKEL	14 2	=	J	0 037	mg/kg	MS, SD
SS	MIA164	MG756011	SW6010	NICKEL	9 4	=	J	0 037	mg/kg	MS SD
SS	MIA165	MG756012	SW6010	NICKEL	10 8	=	J	0 038	mg/kg	MS SD
SS	MIA166	MG756013	SW6010	NICKEL	12 9	=	J	0 037	mg/kg	MS SD
SS	MIA167	MG756014	SW6010	NICKEL	14 5	=	J	0 04	mg/kg	MS, SD
SS	MIA168	MG756015	SW6010	NICKEL	15	=	J	0 037	mg/kg	MS SD
SS	MIA169	MG756016	SW6010	NICKEL	14 6	=	J	0 036	mg/kg	MS SD
SS	MIA170	MG756017	SW6010	NICKEL	14 5	=	J	0 036	mg/kg	MS SD
SS	MIA171FD	MG756018	SW6010	NICKEL	13 2	=	J	0 036	mg/kg	MS SD
SS	MIA172	MG756019	SW6010	NICKEL	10 9	=	J	0 035	mg/kg	MS SD
SS	MIA173	MG756020	SW6010	NICKEL	14 5	=	J	0 037	mg/kg	MS, SD
SS	MIA325	MG756025	SW6010	NICKEL	56	=	J	0 036	mg/kg	MS, SD
SS	MIA326	MG756026	SW6010	NICKEL	11 3	=	J	0 036	mg/kg	MS, SD
SS	MIA327	MG756027	SW6010	NICKEL	16 2	=	J	0 034	mg/kg	MS SD
SS	MIA157	MG756005	SW6010	ZINC	111	=	J	0 12	mg/kg	MS, SD

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ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SB	MIA074	MG743012	SW6010	ZINC	51 5	=	J	0 13	mg/kg	MS, SD
SB	MIA075	MG743013	SW6010	ZINC	50 3	=	J	0 14	mg/kg	MS, SD
SB	MIA076	MG743014	SW6010	ZINC	48 8	=	J	0 14	mg/kg	MS SD
SB	MIA125	MG743020	SW6010	ZINC	55 2	=	J	0 13	mg/kg	MS SD
SB	MIA126	MG743021	SW6010	ZINC	42 9	=	J	0 14	mg/kg	MS, SD
SB	MIA127	MG743022	SW6010	ZINC	28 2	=	J	0 14	mg/kg	MS, SD
SS	MIA134	MG743023	SW6010	ZINC	68 6	=	J	0 13	mg/kg	MS, SD
SS	MIA137	MG743002	SW6010	ZINC	48 8	=	J	0 13	mg/kg	MS, SD
SS	MIA138	MG743003	SW6010	ZINC	61 4	=	J	0 13	mg/kg	MS, SD
SS	MIA139FD	MG743004	SW6010	ZINC	61 5	=	J	0 13	mg/kg	MS, SD
SS	MIA141	MG743005	SW6010	ZINC	42	=	J	0 13	mg/kg	MS SD
SS	MIA142	MG743006	SW6010	ZINC	59 1	=	J	0 13	mg/kg	MS SD
SS	MIA143	MG743007	SW6010	ZINC	52 1	=	J	0 13	mg/kg	MS SD
SS	MIA144	MG743008	SW6010	ZINC	36 6	=	J	0 12	mg/kg	MS, SD
SS	MIA241	MG777002	SW6010	ZINC	50 8	=	J	0 13	mg/kg	MS, SD
SS	MIA242	MG777003	SW6010	ZINC	154	=	J	0 24	mg/kg	MS, SD
SS	MIA244	MG777004	SW6010	ZINC	482	=	J	0 12	mg/kg	MS, SD
SS	MIA245	MG777005	SW6010	ZINC	505	=	J	0 12	mg/kg	MS SD
SS	MIA246	MG777006	SW6010	ZINC	1060	=	J	0 47	mg/kg	MS SD
SS	MIA247	MG777007	SW6010	ZINC	85 4	=	J	0 12	mg/kg	MS, SD
SS	MIA248	MG777008	SW6010	ZINC	41 2	=	J	0 12	mg/kg	MS, SD
SS	MIA249	MG777009	SW6010	ZINC	1100	=	J	0 29	mg/kg	MS, SD
SS	MIA250	MG777010	SW6010	ZINC	16 8	=	J	0 12	mg/kg	MS SD
SS	MIA251	MG777011	SW6010	ZINC	48 3	=	J	0 13	mg/kg	MS SD
SS	MIA261	MG777012	SW6010	ZINC	11500	=	J	2 4	mg/kg	MS, SD
SS	MIA262	MG777013	SW6010	ZINC	8330	=	J	1 2	mg/kg	MS, SD
SS	MIA263	MG777014	SW6010	ZINC	692	=	J	0 24	mg/kg	MS SD
SS	MIA277	MG777015	SW6010	ZINC	113	=	J	0 12	mg/kg	MS SD
SS	MIA278FD	MG777016	SW6010	ZINC	113	=	J	0 13	mg/kg	MS, SD
SS	MIA280	MG777017	SW6010	ZINC	177	=	J	0 14	mg/kg	MS, SD
SS	MIA281	MG777018	SW6010	ZINC	61 6	=	J	0 13	mg/kg	MS SD
SS	MIA282FD	MG777019	SW6010	ZINC	61 7	=	J	0 13	mg/kg	MS, SD
SS	MIA283	MG777020	SW6010	ZINC	280	=	J	0 12	mg/kg	MS, SD
SS	MIA284	MG777021	SW6010	ZINC	41	=	J	0 12	mg/kg	MS SD
SS	MIA285	MG777022	SW6010	ZINC	45 6	=	J	0 13	mg/kg	MS SD
SS	MIA286	MG777023	SW6010	ZINC	128	=	J	0 14	mg/kg	MS, SD
SS	MIA287	MG777024	SW6010	ZINC	223	=	J	0 13	mg/kg	MS, SD
SS	MIA288	MG777025	SW6010	ZINC	100	=	J	0 14	mg/kg	MS SD
SS	MIA289	MG777026	SW6010	ZINC	72 6	=	J	0 13	mg/kg	MS, SD
SS	MIA290	MG777027	SW6010	ZINC	50 5	=	J	0 13	mg/kg	MS, SD
SS	MIA291	MG777028	SW6010	ZINC	22 5	=	J	0 12	mg/kg	MS, SD
SS	MIA241	MG777002	SW6010	ARSENIC	6 6	=	J	0 17	mg/kg	SD
SS	MIA242	MG777003	SW6010	ARSENIC	3 2	=	J	0 3	mg/kg	SD
SS	MIA244	MG777004	SW6010	ARSENIC	8	=	J	0 15	mg/kg	SD
SS	MIA245	MG777005	SW6010	ARSENIC	6 6	=	J	0 15	mg/kg	SD
SS	MIA246	MG777006	SW6010	ARSENIC	7 2	=	J	0 6	mg/kg	SD
SS	MIA247	MG777007	SW6010	ARSENIC	3 8	=	J	0 15	mg/kg	SD
SS	MIA248	MG777008	SW6010	ARSENIC	3 7	=	J	0 15	mg/kg	SD
SS	MIA249	MG777009	SW6010	ARSENIC	11 1	=	J	0 37	mg/kg	SD
SS	MIA250	MG777010	SW6010	ARSENIC	3 9	=	J	0 15	mg/kg	SD
SS	MIA251	MG777011	SW6010	ARSENIC	9 1	=	J	0 16	mg/kg	SD
SS	MIA263	MG777014	SW6010	ARSENIC	4 4	=	J	0 31	mg/kg	SD
SS	MIA277	MG777015	SW6010	ARSENIC	9 9	=	J	0 15	mg/kg	SD
SS	MIA278FD	MG777016	SW6010	ARSENIC	10 5	=	J	0 17	mg/kg	SD
SS	MIA280	MG777017	SW6010	ARSENIC	13 4	=	J	0 17	mg/kg	SD
SS	MIA281	MG777018	SW6010	ARSENIC	8 2	=	J	0 16	mg/kg	SD
SS	MIA282FD	MG777019	SW6010	ARSENIC	8 4	=	J	0 16	mg/kg	SD
SS	MIA283	MG777020	SW6010	ARSENIC	14 8	=	J	0 15	mg/kg	SD
SS	MIA284	MG777021	SW6010	ARSENIC	6 3	=	J	0 16	mg/kg	SD
SS	MIA285	MG777022	SW6010	ARSENIC	8	=	J	0 17	mg/kg	SD
SS	MIA286	MG777023	SW6010	ARSENIC	15 7	=	J	0 18	mg/kg	SD
SS	MIA287	MG777024	SW6010	ARSENIC	9 2	=	J	0 17	mg/kg	SD
SS	MIA288	MG777025	SW6010	ARSENIC	12 1	=	J	0 18	mg/kg	SD
SS	MIA289	MG777026	SW6010	ARSENIC	9 4	=	J	0 16	mg/kg	SD
SS	MIA290	MG777027	SW6010	ARSENIC	6 6	=	J	0 16	mg/kg	SD
SS	MIA291	MG777028	SW6010	ARSENIC	5 2	=	J	0 15	mg/kg	SD
SS	MIA243	MG778021	SW6010	ARSENIC	12 4	=	J	0 15	mg/kg	SD
SS	MIA264	MG778022	SW6010	ARSENIC	7 1	=	J	0 15	mg/kg	SD
SS	MIA265	MG778023	SW6010	ARSENIC	5	=	J	0 15	mg/kg	SD
SS	MIA269	MG778027	SW6010	ARSENIC	11	=	J	0 16	mg/kg	SD
SS	MIA270	MG778028	SW6010	ARSENIC	6 6	=	J	0 16	mg/kg	SD

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA305	MG778003	SW6010	ARSENIC	24 2	=	J	0 17	mg/kg	SD
SS	MIA306	MG778004	SW6010	ARSENIC	9 9	=	J	0 16	mg/kg	SD
SS	MIA307FD	MG778005	SW6010	ARSENIC	10 3	=	J	0 16	mg/kg	SD
SS	MIA309	MG778006	SW6010	ARSENIC	9 2	=	J	0 16	mg/kg	SD
SS	MIA313	MG778010	SW6010	ARSENIC	13 8	=	J	0 15	mg/kg	SD
SS	MIA314FD	MG778011	SW6010	ARSENIC	9 9	=	J	0 15	mg/kg	SD
SS	MIA315	MG778012	SW6010	ARSENIC	6 4	=	J	0 15	mg/kg	SD
SS	MIA316	MG778013	SW6010	ARSENIC	5 6	=	J	0 15	mg/kg	SD
SS	MIA262	MG777013	SW6010	ARSENIC	7 2	TR	J	1 6	mg/kg	SD
SS	MIA275	MG778001	SW6010	ARSENIC	4 9	TR	J	0 76	mg/kg	SD
SS	MIA261	MG777012	SW6010	ARSENIC	3	U	UJ	3	mg/kg	SD
SS	MIA328FD	MG757001	SW6010	BERYLLIUM	0 38	TR	J	0 0027	mg/kg	SD
SS	MIA330	MG757002	SW6010	BERYLLIUM	0 37	TR	J	0 0029	mg/kg	SD
SS	MIA331	MG757003	SW6010	BERYLLIUM	0 35	TR	J	0 0029	mg/kg	SD
SS	MIA332	MG757004	SW6010	BERYLLIUM	0 5	TR	J	0 003	mg/kg	SD
SS	MIA333	MG757005	SW6010	BERYLLIUM	0 44	TR	J	0 0028	mg/kg	SD
SS	MIA334	MG757006	SW6010	BERYLLIUM	0 42	TR	J	0 0028	mg/kg	SD
SS	MIA335	MG757007	SW6010	BERYLLIUM	0 42	TR	J	0 003	mg/kg	SD
SS	MIA336	MG757008	SW6010	BERYLLIUM	0 43	TR	J	0 0029	mg/kg	SD
SS	MIA337	MG757009	SW6010	BERYLLIUM	0 25	TR	J	0 0027	mg/kg	SD
SS	MIA338	MG757010	SW6010	BERYLLIUM	0 31	TR	J	0 0027	mg/kg	SD
SS	MIA339	MG757011	SW6010	BERYLLIUM	0 38	TR	J	0 0028	mg/kg	SD
SS	MIA349	MG757012	SW6010	BERYLLIUM	0 42	TR	J	0 0031	mg/kg	SD
SS	MIA350	MG757013	SW6010	BERYLLIUM	0 47	TR	J	0 003	mg/kg	SD
SS	MIA351	MG757014	SW6010	BERYLLIUM	0 43	TR	J	0 0028	mg/kg	SD
SS	MIA188	MG770001	SW6010	BERYLLIUM	0 31	TR	J	0 0026	mg/kg	SD
SS	MIA189FD	MG770002	SW6010	BERYLLIUM	0 39	TR	J	0 0026	mg/kg	SD
SS	MIA193	MG770006	SW6010	BERYLLIUM	0 47	TR	J	0 0029	mg/kg	SD
SS	MIA032	MG695004	SW6010	BERYLLIUM	0 41	TR	J	0 0028	mg/kg	SD
SS	MIA033	MG695005	SW6010	BERYLLIUM	0 67	=	J	0 0029	mg/kg	SD
SS	MIA034FD	MG695006	SW6010	BERYLLIUM	0 43	TR	J	0 0029	mg/kg	SD
SS	MIA037	MG695008	SW6010	BERYLLIUM	0 48	TR	J	0 0029	mg/kg	SD
SS	MIA040	MG695011	SW6010	BERYLLIUM	0 47	TR	J	0 0027	mg/kg	SD
SS	MIA041	MG695012	SW6010	BERYLLIUM	0 28	TR	J	0 0027	mg/kg	SD
SS	MIA315	MG778012	SW6010	BERYLLIUM	1 8	=	J	0 0027	mg/kg	SD
SB	MIA125	MG743020	SW6010	BERYLLIUM	0 64	=	J	0 0031	mg/kg	SD
SS	MIA158	MG756006	SW6010	BERYLLIUM	0 87	=	J	0 0028	mg/kg	SD
SS	MIA255	MG776024	SW6010	BERYLLIUM	0 58	=	J	0 0026	mg/kg	SD
SS	MIA244	MG777004	SW6010	BERYLLIUM	0 67	=	J	0 0027	mg/kg	SD
SS	MIA245	MG777005	SW6010	BERYLLIUM	0 87	=	J	0 0027	mg/kg	SD
SS	MIA282FD	MG777019	SW6010	BERYLLIUM	0 7	=	J	0 0029	mg/kg	SD
SS	MIA289	MG777026	SW6010	BERYLLIUM	0 62	=	J	0 0029	mg/kg	SD
SS	MIA313	MG778010	SW6010	BERYLLIUM	2 5	=	J	0 0026	mg/kg	SD
SS	MIA314FD	MG778011	SW6010	BERYLLIUM	2 5	=	J	0 0026	mg/kg	SD
SS	MIA316	MG778013	SW6010	BERYLLIUM	1 3	=	J	0 0027	mg/kg	SD
SB	MIA074	MG743012	SW6010	BERYLLIUM	0 56	TR	J	0 003	mg/kg	SD
SB	MIA075	MG743013	SW6010	BERYLLIUM	0 38	TR	J	0 0031	mg/kg	SD
SB	MIA076	MG743014	SW6010	BERYLLIUM	0 43	TR	J	0 0031	mg/kg	SD
SB	MIA126	MG743021	SW6010	BERYLLIUM	0 47	TR	J	0 0031	mg/kg	SD
SB	MIA127	MG743022	SW6010	BERYLLIUM	0 52	TR	J	0 0031	mg/kg	SD
SS	MIA134	MG743023	SW6010	BERYLLIUM	0 53	TR	J	0 003	mg/kg	SD
SS	MIA137	MG743002	SW6010	BERYLLIUM	0 5	TR	J	0 0029	mg/kg	SD
SS	MIA138	MG743003	SW6010	BERYLLIUM	0 52	TR	J	0 003	mg/kg	SD
SS	MIA139FD	MG743004	SW6010	BERYLLIUM	0 48	TR	J	0 003	mg/kg	SD
SS	MIA141	MG743005	SW6010	BERYLLIUM	0 43	TR	J	0 0029	mg/kg	SD
SS	MIA142	MG743006	SW6010	BERYLLIUM	0 56	TR	J	0 0029	mg/kg	SD
SS	MIA143	MG743007	SW6010	BERYLLIUM	0 49	TR	J	0 003	mg/kg	SD
SS	MIA145	MG743009	SW6010	BERYLLIUM	0 49	TR	J	0 0028	mg/kg	SD
SS	MIA160FD	MG756008	SW6010	BERYLLIUM	0 26	TR	J	0 0028	mg/kg	SD
SS	MIA162	MG756009	SW6010	BERYLLIUM	0 4	TR	J	0 0028	mg/kg	SD
SS	MIA163	MG756010	SW6010	BERYLLIUM	0 44	TR	J	0 0029	mg/kg	SD
SS	MIA164	MG756011	SW6010	BERYLLIUM	0 3	TR	J	0 0029	mg/kg	SD
SS	MIA165	MG756012	SW6010	BERYLLIUM	0 34	TR	J	0 0029	mg/kg	SD
SS	MIA166	MG756013	SW6010	BERYLLIUM	0 45	TR	J	0 0029	mg/kg	SD
SS	MIA167	MG756014	SW6010	BERYLLIUM	0 41	TR	J	0 0031	mg/kg	SD
SS	MIA168	MG756015	SW6010	BERYLLIUM	0 42	TR	J	0 0029	mg/kg	SD
SS	MIA169	MG756016	SW6010	BERYLLIUM	0 41	TR	J	0 0028	mg/kg	SD
SS	MIA170	MG756017	SW6010	BERYLLIUM	0 37	TR	J	0 0028	mg/kg	SD
SS	MIA171FD	MG756018	SW6010	BERYLLIUM	0 33	TR	J	0 0028	mg/kg	SD
SS	MIA172	MG756019	SW6010	BERYLLIUM	0 37	TR	J	0 0027	mg/kg	SD
SS	MIA173	MG756020	SW6010	BERYLLIUM	0 53	TR	J	0 0029	mg/kg	SD

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA325	MG756025	SW6010	BERYLLIUM	0.34	TR	J	0.0028	mg/kg	SD
SS	MIA326	MG756026	SW6010	BERYLLIUM	0.37	TR	J	0.0028	mg/kg	SD
SS	MIA327	MG756027	SW6010	BERYLLIUM	0.37	TR	J	0.0026	mg/kg	SD
SS	MIA218	MG776001	SW6010	BERYLLIUM	0.47	TR	J	0.003	mg/kg	SD
SS	MIA220	MG776003	SW6010	BERYLLIUM	0.49	TR	J	0.0031	mg/kg	SD
SS	MIA221	MG776004	SW6010	BERYLLIUM	0.51	TR	J	0.003	mg/kg	SD
SS	MIA222	MG776005	SW6010	BERYLLIUM	0.48	TR	J	0.003	mg/kg	SD
SS	MIA223FD	MG776006	SW6010	BERYLLIUM	0.49	TR	J	0.003	mg/kg	SD
SS	MIA225	MG776007	SW6010	BERYLLIUM	0.39	TR	J	0.003	mg/kg	SD
SS	MIA226	MG776008	SW6010	BERYLLIUM	0.08	TR	J	0.0028	mg/kg	SD
SS	MIA227	MG776009	SW6010	BERYLLIUM	0.28	TR	J	0.0028	mg/kg	SD
SS	MIA228	MG776010	SW6010	BERYLLIUM	0.48	TR	J	0.0029	mg/kg	SD
SS	MIA229	MG776011	SW6010	BERYLLIUM	0.3	TR	J	0.003	mg/kg	SD
SS	MIA231FD	MG776013	SW6010	BERYLLIUM	0.46	TR	J	0.003	mg/kg	SD
SS	MIA233	MG776014	SW6010	BERYLLIUM	0.4	TR	J	0.003	mg/kg	SD
SS	MIA234	MG776015	SW6010	BERYLLIUM	0.31	TR	J	0.0027	mg/kg	SD
SS	MIA236	MG776016	SW6010	BERYLLIUM	0.38	TR	J	0.0027	mg/kg	SD
SS	MIA237	MG776017	SW6010	BERYLLIUM	0.37	TR	J	0.0027	mg/kg	SD
SS	MIA238	MG776018	SW6010	BERYLLIUM	0.23	TR	J	0.0027	mg/kg	SD
SS	MIA239	MG776019	SW6010	BERYLLIUM	0.36	TR	J	0.0027	mg/kg	SD
SS	MIA240	MG776020	SW6010	BERYLLIUM	0.18	TR	J	0.0027	mg/kg	SD
SS	MIA252	MG776021	SW6010	BERYLLIUM	0.27	TR	J	0.0026	mg/kg	SD
SS	MIA253	MG776022	SW6010	BERYLLIUM	0.48	TR	J	0.0029	mg/kg	SD
SS	MIA254	MG776023	SW6010	BERYLLIUM	0.42	TR	J	0.0029	mg/kg	SD
SS	MIA256	MG776025	SW6010	BERYLLIUM	0.3	TR	J	0.0027	mg/kg	SD
SS	MIA257	MG776026	SW6010	BERYLLIUM	0.21	TR	J	0.0027	mg/kg	SD
SS	MIA259	MG776028	SW6010	BERYLLIUM	0.19	TR	J	0.0027	mg/kg	SD
SS	MIA260	MG776029	SW6010	BERYLLIUM	0.39	TR	J	0.0029	mg/kg	SD
SS	MIA241	MG777002	SW6010	BERYLLIUM	0.38	TR	J	0.0029	mg/kg	SD
SS	MIA242	MG777003	SW6010	BERYLLIUM	0.32	TR	J	0.0054	mg/kg	SD
SS	MIA246	MG777006	SW6010	BERYLLIUM	0.36	TR	J	0.011	mg/kg	SD
SS	MIA247	MG777007	SW6010	BERYLLIUM	0.16	TR	J	0.0027	mg/kg	SD
SS	MIA248	MG777008	SW6010	BERYLLIUM	0.13	TR	J	0.0027	mg/kg	SD
SS	MIA249	MG777009	SW6010	BERYLLIUM	0.22	TR	J	0.0066	mg/kg	SD
SS	MIA250	MG777010	SW6010	BERYLLIUM	0.2	TR	J	0.0027	mg/kg	SD
SS	MIA251	MG777011	SW6010	BERYLLIUM	0.41	TR	J	0.0029	mg/kg	SD
SS	MIA261	MG777012	SW6010	BERYLLIUM	0.33	TR	J	0.054	mg/kg	SD
SS	MIA262	MG777013	SW6010	BERYLLIUM	0.68	TR	J	0.028	mg/kg	SD
SS	MIA263	MG777014	SW6010	BERYLLIUM	0.17	TR	J	0.0055	mg/kg	SD
SS	MIA277	MG777015	SW6010	BERYLLIUM	0.26	TR	J	0.0028	mg/kg	SD
SS	MIA278FD	MG777016	SW6010	BERYLLIUM	0.29	TR	J	0.0029	mg/kg	SD
SS	MIA280	MG777017	SW6010	BERYLLIUM	0.56	TR	J	0.0031	mg/kg	SD
SS	MIA281	MG777018	SW6010	BERYLLIUM	0.56	TR	J	0.0029	mg/kg	SD
SS	MIA283	MG777020	SW6010	BERYLLIUM	0.36	TR	J	0.0028	mg/kg	SD
SS	MIA284	MG777021	SW6010	BERYLLIUM	0.17	TR	J	0.0028	mg/kg	SD
SS	MIA285	MG777022	SW6010	BERYLLIUM	0.37	TR	J	0.003	mg/kg	SD
SS	MIA286	MG777023	SW6010	BERYLLIUM	0.51	TR	J	0.0032	mg/kg	SD
SS	MIA287	MG777024	SW6010	BERYLLIUM	0.48	TR	J	0.003	mg/kg	SD
SS	MIA288	MG777025	SW6010	BERYLLIUM	0.61	TR	J	0.0031	mg/kg	SD
SS	MIA290	MG777027	SW6010	BERYLLIUM	0.53	TR	J	0.0029	mg/kg	SD
SS	MIA291	MG777028	SW6010	BERYLLIUM	0.33	TR	J	0.0027	mg/kg	SD
SS	MIA243	MG778021	SW6010	BERYLLIUM	0.37	TR	J	0.0027	mg/kg	SD
SS	MIA264	MG778022	SW6010	BERYLLIUM	0.31	TR	J	0.0028	mg/kg	SD
SS	MIA265	MG778023	SW6010	BERYLLIUM	0.21	TR	J	0.0027	mg/kg	SD
SS	MIA269	MG778027	SW6010	BERYLLIUM	0.29	TR	J	0.0028	mg/kg	SD
SS	MIA270	MG778028	SW6010	BERYLLIUM	0.26	TR	J	0.0028	mg/kg	SD
SS	MIA275	MG778001	SW6010	BERYLLIUM	0.09	TR	J	0.014	mg/kg	SD
SS	MIA305	MG778003	SW6010	BERYLLIUM	0.36	TR	J	0.003	mg/kg	SD
SS	MIA306	MG778004	SW6010	BERYLLIUM	0.39	TR	J	0.0029	mg/kg	SD
SS	MIA307FD	MG778005	SW6010	BERYLLIUM	0.38	TR	J	0.0029	mg/kg	SD
SS	MIA309	MG778006	SW6010	BERYLLIUM	0.39	TR	J	0.0028	mg/kg	SD
SS	MIA128	MG785001	SW6010	BERYLLIUM	0.41	TR	J	0.0029	mg/kg	SD
SS	MIA129FD	MG785002	SW6010	BERYLLIUM	0.46	TR	J	0.0029	mg/kg	SD
SS	MIA132	MG785003	SW6010	BERYLLIUM	0.34	TR	J	0.0028	mg/kg	SD
SS	MIA295	MG785007	SW6010	BERYLLIUM	0.04	TR	J	0.0026	mg/kg	SD
SS	MIA296	MG785008	SW6010	BERYLLIUM	0.22	TR	J	0.0027	mg/kg	SD
SS	MIA297FD	MG785009	SW6010	BERYLLIUM	0.33	TR	J	0.0027	mg/kg	SD
SS	MIA299	MG785010	SW6010	BERYLLIUM	0.26	TR	J	0.0027	mg/kg	SD
SS	MIA302	MG785013	SW6010	BERYLLIUM	0.47	TR	J	0.003	mg/kg	SD
SS	MIA303	MG785014	SW6010	BERYLLIUM	0.53	TR	J	0.003	mg/kg	SD
SS	MIA304	MG785015	SW6010	BERYLLIUM	0.47	TR	J	0.003	mg/kg	SD

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA153	MG756001	SW6010	BERYLLIUM	0 33	TR	UJ	0 0027	mg/kg	SD
SS	MIA155	MG756003	SW6010	BERYLLIUM	0 43	TR	UJ	0 0029	mg/kg	SD
SS	MIA156	MG756004	SW6010	BERYLLIUM	0 42	TR	UJ	0 0028	mg/kg	SD
SS	MIA157	MG756005	SW6010	BERYLLIUM	0 45	TR	UJ	0 0028	mg/kg	SD
SS	MIA159	MG756007	SW6010	BERYLLIUM	0 3	TR	UJ	0 0028	mg/kg	SD
SS	MIA258	MG776027	SW6010	BERYLLIUM	0 05	TR	UJ	0 0026	mg/kg	SD
SS	MIA230	MG776012	SW6010	BERYLLIUM	0 42	TR	J	0 003	mg/kg	SD
SS	MIA244	MG777004	SW6010	CADMIUM	0 86	=	J	0 0093	mg/kg	SD
SS	MIA245	MG777005	SW6010	CADMIUM	0 69	=	J	0 0092	mg/kg	SD
SS	MIA277	MG777015	SW6010	CADMIUM	0 75	=	J	0 0094	mg/kg	SD
SS	MIA278FD	MG777016	SW6010	CADMIUM	0 69	=	J	0 01	mg/kg	SD
SS	MIA280	MG777017	SW6010	CADMIUM	1	=	J	0 011	mg/kg	SD
SS	MIA283	MG777020	SW6010	CADMIUM	1 6	=	J	0 0094	mg/kg	SD
SS	MIA286	MG777023	SW6010	CADMIUM	0 76	=	J	0 011	mg/kg	SD
SS	MIA287	MG777024	SW6010	CADMIUM	0 79	=	J	0 01	mg/kg	SD
SS	MIA241	MG777002	SW6010	CADMIUM	0 41	TR	J	0 01	mg/kg	SD
SS	MIA242	MG777003	SW6010	CADMIUM	0 56	TR	J	0 018	mg/kg	SD
SS	MIA246	MG777006	SW6010	CADMIUM	1 2	TR	J	0 036	mg/kg	SD
SS	MIA247	MG777007	SW6010	CADMIUM	0 18	TR	J	0 0093	mg/kg	SD
SS	MIA248	MG777008	SW6010	CADMIUM	0 14	TR	J	0 0093	mg/kg	SD
SS	MIA249	MG777009	SW6010	CADMIUM	1	TR	J	0 023	mg/kg	SD
SS	MIA250	MG777010	SW6010	CADMIUM	0 14	TR	J	0 0093	mg/kg	SD
SS	MIA251	MG777011	SW6010	CADMIUM	0 3	TR	J	0 01	mg/kg	SD
SS	MIA261	MG777012	SW6010	CADMIUM	3 7	TR	J	0 18	mg/kg	SD
SS	MIA262	MG777013	SW6010	CADMIUM	4 8	TR	J	0 095	mg/kg	SD
SS	MIA263	MG777014	SW6010	CADMIUM	0 75	TR	J	0 019	mg/kg	SD
SS	MIA281	MG777018	SW6010	CADMIUM	0 41	TR	J	0 0097	mg/kg	SD
SS	MIA282FD	MG777019	SW6010	CADMIUM	0 53	TR	J	0 0097	mg/kg	SD
SS	MIA284	MG777021	SW6010	CADMIUM	0 36	TR	J	0 0095	mg/kg	SD
SS	MIA285	MG777022	SW6010	CADMIUM	0 3	TR	J	0 01	mg/kg	SD
SS	MIA288	MG777025	SW6010	CADMIUM	0 47	TR	J	0 011	mg/kg	SD
SS	MIA289	MG777026	SW6010	CADMIUM	0 45	TR	J	0 0097	mg/kg	SD
SS	MIA290	MG777027	SW6010	CADMIUM	0 4	TR	J	0 0098	mg/kg	SD
SS	MIA291	MG777028	SW6010	CADMIUM	0 14	TR	J	0 0092	mg/kg	SD
SS	MIA243	MG778021	SW6010	CHROMIUM, TOTAL	81	=	J	0 11	mg/kg	SD
SS	MIA264	MG778022	SW6010	CHROMIUM, TOTAL	9 7	=	J	0 12	mg/kg	SD
SS	MIA265	MG778023	SW6010	CHROMIUM, TOTAL	7 5	=	J	0 11	mg/kg	SD
SS	MIA269	MG778027	SW6010	CHROMIUM, TOTAL	27 8	=	J	0 12	mg/kg	SD
SS	MIA270	MG778028	SW6010	CHROMIUM TOTAL	13 8	=	J	0 12	mg/kg	SD
SS	MIA275	MG778001	SW6010	CHROMIUM TOTAL	9 2	=	J	0 56	mg/kg	SD
SS	MIA305	MG778003	SW6010	CHROMIUM TOTAL	14	=	J	0 13	mg/kg	SD
SS	MIA306	MG778004	SW6010	CHROMIUM TOTAL	10 3	=	J	0 12	mg/kg	SD
SS	MIA307FD	MG778005	SW6010	CHROMIUM TOTAL	10 4	=	J	0 12	mg/kg	SD
SS	MIA309	MG778006	SW6010	CHROMIUM TOTAL	10 1	=	J	0 12	mg/kg	SD
SS	MIA313	MG778010	SW6010	CHROMIUM TOTAL	38	=	J	0 11	mg/kg	SD
SS	MIA314FD	MG778011	SW6010	CHROMIUM, TOTAL	38 4	=	J	0 11	mg/kg	SD
SS	MIA315	MG778012	SW6010	CHROMIUM TOTAL	31 3	=	J	0 11	mg/kg	SD
SS	MIA316	MG778013	SW6010	CHROMIUM, TOTAL	13 2	=	J	0 11	mg/kg	SD
SB	MIA074	MG743012	SW6010	COBALT	6 8	=	J	0 061	mg/kg	SD
SB	MIA076	MG743014	SW6010	COBALT	6 9	=	J	0 062	mg/kg	SD
SS	MIA134	MG743023	SW6010	COBALT	6 6	=	J	0 06	mg/kg	SD
SS	MIA138	MG743003	SW6010	COBALT	7 6	=	J	0 059	mg/kg	SD
SS	MIA139FD	MG743004	SW6010	COBALT	7 4	=	J	0 06	mg/kg	SD
SS	MIA141	MG743005	SW6010	COBALT	6 2	=	J	0 057	mg/kg	SD
SS	MIA142	MG743006	SW6010	COBALT	8	=	J	0 059	mg/kg	SD
SS	MIA143	MG743007	SW6010	COBALT	7	=	J	0 06	mg/kg	SD
SS	MIA144	MG743008	SW6010	COBALT	5 7	=	J	0 056	mg/kg	SD
SS	MIA145	MG743009	SW6010	COBALT	7 2	=	J	0 056	mg/kg	SD
SB	MIA075	MG743013	SW6010	COBALT	2 7	TR	J	0 062	mg/kg	SD
SS	MIA137	MG743002	SW6010	COBALT	5 6	TR	J	0 058	mg/kg	SD
SS	MIA193	MG770006	SW6010	COPPER	17 7	=	J	0 12	mg/kg	SD
SS	MIA188	MG770001	SW6010	COPPER	9 7	TR	J	0 53	mg/kg	SD
SS	MIA189FD	MG770002	SW6010	COPPER	11 1	TR	J	0 53	mg/kg	SD
SS	MIA144	MG743008	SW6010	COPPER	11 9	=	J	0 11	mg/kg	SD
SB	MIA074	MG743012	SW6010	COPPER	18 2	=	J	0 12	mg/kg	SD
SB	MIA075	MG743013	SW6010	COPPER	9 5	=	J	0 12	mg/kg	SD
SB	MIA076	MG743014	SW6010	COPPER	17 6	=	J	0 12	mg/kg	SD
SB	MIA125	MG743020	SW6010	COPPER	19 1	=	J	0 12	mg/kg	SD
SB	MIA126	MG743021	SW6010	COPPER	15 1	=	J	0 12	mg/kg	SD
SB	MIA127	MG743022	SW6010	COPPER	10 7	=	J	0 13	mg/kg	SD
SS	MIA134	MG743023	SW6010	COPPER	18 5	=	J	0 12	mg/kg	SD

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ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA137	MG743002	SW6010	COPPER	19 3	=	J	0 12	mg/kg	SD
SS	MIA138	MG743003	SW6010	COPPER	18 3	=	J	0 12	mg/kg	SD
SS	MIA139FD	MG743004	SW6010	COPPER	18 4	=	J	0 12	mg/kg	SD
SS	MIA141	MG743005	SW6010	COPPER	15 1	=	J	0 11	mg/kg	SD
SS	MIA142	MG743006	SW6010	COPPER	19	=	J	0 12	mg/kg	SD
SS	MIA143	MG743007	SW6010	COPPER	16 5	=	J	0 12	mg/kg	SD
SS	MIA145	MG743009	SW6010	COPPER	16 2	=	J	0 11	mg/kg	SD
SS	MIA218	MG776001	SW6010	COPPER	25 5	=	J	0 12	mg/kg	SD
SS	MIA220	MG776003	SW6010	COPPER	27 2	=	J	0 12	mg/kg	SD
SS	MIA221	MG776004	SW6010	COPPER	25 2	=	J	0 12	mg/kg	SD
SS	MIA222	MG776005	SW6010	COPPER	18 1	=	J	0 12	mg/kg	SD
SS	MIA223FD	MG776006	SW6010	COPPER	19 5	=	J	0 12	mg/kg	SD
SS	MIA225	MG776007	SW6010	COPPER	18	=	J	0 12	mg/kg	SD
SS	MIA227	MG776009	SW6010	COPPER	11 5	=	J	0 11	mg/kg	SD
SS	MIA228	MG776010	SW6010	COPPER	15 9	=	J	0 12	mg/kg	SD
SS	MIA229	MG776011	SW6010	COPPER	21 2	=	J	0 12	mg/kg	SD
SS	MIA230	MG776012	SW6010	COPPER	15 3	=	J	0 12	mg/kg	SD
SS	MIA231FD	MG776013	SW6010	COPPER	16 3	=	J	0 12	mg/kg	SD
SS	MIA233	MG776014	SW6010	COPPER	15 6	=	J	0 12	mg/kg	SD
SS	MIA236	MG776016	SW6010	COPPER	14 6	=	J	0 11	mg/kg	SD
SS	MIA237	MG776017	SW6010	COPPER	13 4	=	J	0 11	mg/kg	SD
SS	MIA239	MG776019	SW6010	COPPER	10 6	=	J	0 11	mg/kg	SD
SS	MIA240	MG776020	SW6010	COPPER	4 3	=	J	0 11	mg/kg	SD
SS	MIA253	MG776022	SW6010	COPPER	16 9	=	J	0 11	mg/kg	SD
SS	MIA254	MG776023	SW6010	COPPER	14	=	J	0 12	mg/kg	SD
SS	MIA255	MG776024	SW6010	COPPER	39 1	=	J	0 52	mg/kg	SD
SS	MIA256	MG776025	SW6010	COPPER	20 2	=	J	0 11	mg/kg	SD
SS	MIA257	MG776026	SW6010	COPPER	4	=	J	0 11	mg/kg	SD
SS	MIA259	MG776028	SW6010	COPPER	7 1	=	J	0 11	mg/kg	SD
SS	MIA260	MG776029	SW6010	COPPER	12 7	=	J	0 12	mg/kg	SD
SS	MIA128	MG785001	SW6010	COPPER	15 4	=	J	0 12	mg/kg	SD
SS	MIA129FD	MG785002	SW6010	COPPER	16 5	=	J	0 12	mg/kg	SD
SS	MIA132	MG785003	SW6010	COPPER	15 9	=	J	0 11	mg/kg	SD
SS	MIA295	MG785007	SW6010	COPPER	9 1	=	J	0 11	mg/kg	SD
SS	MIA296	MG785008	SW6010	COPPER	13 3	=	J	0 11	mg/kg	SD
SS	MIA297FD	MG785009	SW6010	COPPER	16 3	=	J	0 11	mg/kg	SD
SS	MIA299	MG785010	SW6010	COPPER	9 1	=	J	0 11	mg/kg	SD
SS	MIA302	MG785013	SW6010	COPPER	16 8	=	J	0 12	mg/kg	SD
SS	MIA303	MG785014	SW6010	COPPER	18 9	=	J	0 12	mg/kg	SD
SS	MIA304	MG785015	SW6010	COPPER	21 9	=	J	0 12	mg/kg	SD
SS	MIA226	MG776008	SW6010	COPPER	7 6	TR	J	0 45	mg/kg	SD
SS	MIA234	MG776015	SW6010	COPPER	8 7	TR	J	0 43	mg/kg	SD
SS	MIA238	MG776018	SW6010	COPPER	8 2	TR	J	1 1	mg/kg	SD
SS	MIA252	MG776021	SW6010	COPPER	10 9	TR	J	0 52	mg/kg	SD
SS	MIA258	MG776027	SW6010	COPPER	3 8	TR	J	0 53	mg/kg	SD
SS	MIA188	MG770001	SW6010	LEAD	43 7	=	J	0 68	mg/kg	SD
SS	MIA189FD	MG770002	SW6010	LEAD	53 6	=	J	0 68	mg/kg	SD
SS	MIA193	MG770006	SW6010	LEAD	15 4	=	J	0 15	mg/kg	SD
SS	MIA218	MG776001	SW6010	LEAD	38 4	=	J	0 16	mg/kg	SD
SS	MIA220	MG776003	SW6010	LEAD	41 6	=	J	0 16	mg/kg	SD
SS	MIA221	MG776004	SW6010	LEAD	34 3	=	J	0 16	mg/kg	SD
SS	MIA222	MG776005	SW6010	LEAD	49 9	=	J	0 16	mg/kg	SD
SS	MIA223FD	MG776006	SW6010	LEAD	56 5	=	J	0 15	mg/kg	SD
SS	MIA225	MG776007	SW6010	LEAD	21	=	J	0 16	mg/kg	SD
SS	MIA226	MG776008	SW6010	LEAD	14 1	=	J	0 57	mg/kg	SD
SS	MIA227	MG776009	SW6010	LEAD	13 5	=	J	0 14	mg/kg	SD
SS	MIA228	MG776010	SW6010	LEAD	18 8	=	J	0 15	mg/kg	SD
SS	MIA229	MG776011	SW6010	LEAD	85 4	=	J	0 16	mg/kg	SD
SS	MIA230	MG776012	SW6010	LEAD	11 7	=	J	0 15	mg/kg	SD
SS	MIA231FD	MG776013	SW6010	LEAD	16 5	=	J	0 15	mg/kg	SD
SS	MIA233	MG776014	SW6010	LEAD	9 3	=	J	0 15	mg/kg	SD
SS	MIA234	MG776015	SW6010	LEAD	93 2	=	J	0 56	mg/kg	SD
SS	MIA236	MG776016	SW6010	LEAD	210	=	J	0 14	mg/kg	SD
SS	MIA237	MG776017	SW6010	LEAD	120	=	J	0 14	mg/kg	SD
SS	MIA238	MG776018	SW6010	LEAD	24 9	=	J	1 4	mg/kg	SD
SS	MIA239	MG776019	SW6010	LEAD	12 5	=	J	0 14	mg/kg	SD
SS	MIA240	MG776020	SW6010	LEAD	22	=	J	0 14	mg/kg	SD
SS	MIA252	MG776021	SW6010	LEAD	162	=	J	0 66	mg/kg	SD
SS	MIA253	MG776022	SW6010	LEAD	12 1	=	J	0 15	mg/kg	SD
SS	MIA254	MG776023	SW6010	LEAD	8 6	=	J	0 15	mg/kg	SD
SS	MIA255	MG776024	SW6010	LEAD	1400	=	J	0 67	mg/kg	SD

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA256	MG776025	SW6010	LEAD	1590	=	J	0 14	mg/kg	SD
SS	MIA257	MG776026	SW6010	LEAD	95 2	=	J	0 14	mg/kg	SD
SS	MIA258	MG776027	SW6010	LEAD	76 2	=	J	0 68	mg/kg	SD
SS	MIA259	MG776028	SW6010	LEAD	745	=	J	0 14	mg/kg	SD
SS	MIA260	MG776029	SW6010	LEAD	15 5	=	J	0 15	mg/kg	SD
SS	MIA243	MG778021	SW6010	LEAD	188	=	J	0 14	mg/kg	SD
SS	MIA264	MG778022	SW6010	LEAD	20 2	=	J	0 14	mg/kg	SD
SS	MIA265	MG778023	SW6010	LEAD	11 8	=	J	1 4	mg/kg	SD
SS	MIA269	MG778027	SW6010	LEAD	187	=	J	0 15	mg/kg	SD
SS	MIA270	MG778028	SW6010	LEAD	82 1	=	J	0 14	mg/kg	SD
SS	MIA275	MG778001	SW6010	LEAD	14 8	=	J	0 69	mg/kg	SD
SS	MIA305	MG778003	SW6010	LEAD	32 8	=	J	0 16	mg/kg	SD
SS	MIA306	MG778004	SW6010	LEAD	10 4	=	J	0 15	mg/kg	SD
SS	MIA307FD	MG778005	SW6010	LEAD	10 5	=	J	0 15	mg/kg	SD
SS	MIA309	MG778006	SW6010	LEAD	9 6	=	J	0 14	mg/kg	SD
SS	MIA313	MG778010	SW6010	LEAD	344	=	J	1 4	mg/kg	SD
SS	MIA314FD	MG778011	SW6010	LEAD	727	=	J	1 3	mg/kg	SD
SS	MIA315	MG778012	SW6010	LEAD	250	=	J	1 4	mg/kg	SD
SS	MIA316	MG778013	SW6010	LEAD	157	=	J	1 4	mg/kg	SD
SS	MIA128	MG785001	SW6010	LEAD	36 3	=	J	0 15	mg/kg	SD
SS	MIA129FD	MG785002	SW6010	LEAD	35 4	=	J	0 15	mg/kg	SD
SS	MIA132	MG785003	SW6010	LEAD	11 4	=	J	0 15	mg/kg	SD
SS	MIA295	MG785007	SW6010	LEAD	22 6	=	J	0 14	mg/kg	SD
SS	MIA296	MG785008	SW6010	LEAD	12 7	=	J	0 14	mg/kg	SD
SS	MIA297FD	MG785009	SW6010	LEAD	13 7	=	J	0 14	mg/kg	SD
SS	MIA299	MG785010	SW6010	LEAD	14 3	=	J	0 14	mg/kg	SD
SS	MIA302	MG785013	SW6010	LEAD	29 2	=	J	0 15	mg/kg	SD
SS	MIA303	MG785014	SW6010	LEAD	32	=	J	0 15	mg/kg	SD
SS	MIA304	MG785015	SW6010	LEAD	74 9	=	J	0 16	mg/kg	SD
SS	MIA243	MG778021	SW6010	NICKEL	7 8	=	J	0 035	mg/kg	SD
SS	MIA264	MG778022	SW6010	NICKEL	11	=	J	0 036	mg/kg	SD
SS	MIA265	MG778023	SW6010	NICKEL	8 3	=	J	0 035	mg/kg	SD
SS	MIA269	MG778027	SW6010	NICKEL	26 4	=	J	0 036	mg/kg	SD
SS	MIA270	MG778028	SW6010	NICKEL	11 5	=	J	0 036	mg/kg	SD
SS	MIA305	MG778003	SW6010	NICKEL	14 1	=	J	0 039	mg/kg	SD
SS	MIA306	MG778004	SW6010	NICKEL	15 1	=	J	0 037	mg/kg	SD
SS	MIA307FD	MG778005	SW6010	NICKEL	14 2	=	J	0 038	mg/kg	SD
SS	MIA309	MG778006	SW6010	NICKEL	14 6	=	J	0 036	mg/kg	SD
SS	MIA313	MG778010	SW6010	NICKEL	6 7	=	J	0 034	mg/kg	SD
SS	MIA314FD	MG778011	SW6010	NICKEL	46 3	=	J	0 034	mg/kg	SD
SS	MIA315	MG778012	SW6010	NICKEL	6 3	=	J	0 035	mg/kg	SD
SS	MIA316	MG778013	SW6010	NICKEL	6 9	=	J	0 035	mg/kg	SD
SS	MIA128	MG785001	SW6010	NICKEL	13 7	=	J	0 037	mg/kg	SD
SS	MIA129FD	MG785002	SW6010	NICKEL	15 7	=	J	0 037	mg/kg	SD
SS	MIA132	MG785003	SW6010	NICKEL	16 8	=	J	0 037	mg/kg	SD
SS	MIA295	MG785007	SW6010	NICKEL	6 1	=	J	0 034	mg/kg	SD
SS	MIA296	MG785008	SW6010	NICKEL	7	=	J	0 035	mg/kg	SD
SS	MIA297FD	MG785009	SW6010	NICKEL	8 3	=	J	0 034	mg/kg	SD
SS	MIA299	MG785010	SW6010	NICKEL	8 5	=	J	0 034	mg/kg	SD
SS	MIA302	MG785013	SW6010	NICKEL	17 1	=	J	0 039	mg/kg	SD
SS	MIA303	MG785014	SW6010	NICKEL	18 1	=	J	0 039	mg/kg	SD
SS	MIA304	MG785015	SW6010	NICKEL	16 7	=	J	0 039	mg/kg	SD
SS	MIA275	MG778001	SW6010	NICKEL	10 5	TR	J	0 17	mg/kg	SD
SS	MIA328FD	MG757001	SW6010	ZINC	299	=	J	0 12	mg/kg	SD
SS	MIA330	MG757002	SW6010	ZINC	60 6	=	J	0 13	mg/kg	SD
SS	MIA331	MG757003	SW6010	ZINC	36 9	=	J	0 13	mg/kg	SD
SS	MIA332	MG757004	SW6010	ZINC	57 3	=	J	0 13	mg/kg	SD
SS	MIA333	MG757005	SW6010	ZINC	57 8	=	J	0 13	mg/kg	SD
SS	MIA334	MG757006	SW6010	ZINC	653	=	J	0 12	mg/kg	SD
SS	MIA335	MG757007	SW6010	ZINC	37 4	=	J	0 13	mg/kg	SD
SS	MIA336	MG757008	SW6010	ZINC	30 7	=	J	0 13	mg/kg	SD
SS	MIA337	MG757009	SW6010	ZINC	61 4	=	J	0 12	mg/kg	SD
SS	MIA338	MG757010	SW6010	ZINC	300	=	J	0 12	mg/kg	SD
SS	MIA339	MG757011	SW6010	ZINC	30 2	=	J	0 12	mg/kg	SD
SS	MIA349	MG757012	SW6010	ZINC	57 4	=	J	0 14	mg/kg	SD
SS	MIA350	MG757013	SW6010	ZINC	44 3	=	J	0 13	mg/kg	SD
SS	MIA351	MG757014	SW6010	ZINC	38 9	=	J	0 12	mg/kg	SD
SS	MIA188	MG770001	SW6010	ZINC	142	=	J	0 12	mg/kg	SD
SS	MIA189FD	MG770002	SW6010	ZINC	74 8	=	J	0 12	mg/kg	SD
SS	MIA193	MG770006	SW6010	ZINC	53 7	=	J	0 13	mg/kg	SD
SS	MIA218	MG776001	SW6010	ZINC	59 4	=	J	0 13	mg/kg	SD

ATTACHMENT A

Changes in Qualifiers Due to the Data Validation Process

Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA221	MG776004	SW6010	ZINC	65 2	=	J	0 13	mg/kg	SD
SS	MIA153	MG756001	SW6010	ZINC	386	=	J	0 12	mg/kg	SD
SS	MIA155	MG756003	SW6010	ZINC	141	=	J	0 13	mg/kg	SD
SS	MIA156	MG756004	SW6010	ZINC	170	=	J	0 12	mg/kg	SD
SS	MIA158	MG756006	SW6010	ZINC	53 9	=	J	0 12	mg/kg	SD
SS	MIA159	MG756007	SW6010	ZINC	340	=	J	0 12	mg/kg	SD
SS	MIA160FD	MG756008	SW6010	ZINC	251	=	J	0 12	mg/kg	SD
SS	MIA162	MG756009	SW6010	ZINC	49 8	=	J	0 12	mg/kg	SD
SS	MIA163	MG756010	SW6010	ZINC	36 8	=	J	0 13	mg/kg	SD
SS	MIA164	MG756011	SW6010	ZINC	1010	=	J	0 13	mg/kg	SD
SS	MIA165	MG756012	SW6010	ZINC	59 4	=	J	0 13	mg/kg	SD
SS	MIA166	MG756013	SW6010	ZINC	33 4	=	J	0 13	mg/kg	SD
SS	MIA167	MG756014	SW6010	ZINC	204	=	J	0 14	mg/kg	SD
SS	MIA168	MG756015	SW6010	ZINC	48 9	=	J	0 13	mg/kg	SD
SS	MIA169	MG756016	SW6010	ZINC	39 4	=	J	0 12	mg/kg	SD
SS	MIA170	MG756017	SW6010	ZINC	235	=	J	0 12	mg/kg	SD
SS	MIA171FD	MG756018	SW6010	ZINC	329	=	J	0 12	mg/kg	SD
SS	MIA172	MG756019	SW6010	ZINC	52	=	J	0 12	mg/kg	SD
SS	MIA173	MG756020	SW6010	ZINC	43	=	J	0 13	mg/kg	SD
SS	MIA325	MG756025	SW6010	ZINC	856	=	J	0 12	mg/kg	SD
SS	MIA326	MG756026	SW6010	ZINC	78	=	J	0 12	mg/kg	SD
SS	MIA327	MG756027	SW6010	ZINC	282	=	J	0 12	mg/kg	SD
SS	MIA220	MG776003	SW6010	ZINC	76 6	=	J	0 14	mg/kg	SD
SS	MIA222	MG776005	SW6010	ZINC	80 6	=	J	0 13	mg/kg	SD
SS	MIA223FD	MG776006	SW6010	ZINC	82 3	=	J	0 13	mg/kg	SD
SS	MIA225	MG776007	SW6010	ZINC	59 7	=	J	0 13	mg/kg	SD
SS	MIA226	MG776008	SW6010	ZINC	26 2	=	J	0 12	mg/kg	SD
SS	MIA227	MG776009	SW6010	ZINC	31 4	=	J	0 12	mg/kg	SD
SS	MIA228	MG776010	SW6010	ZINC	67 8	=	J	0 13	mg/kg	SD
SS	MIA229	MG776011	SW6010	ZINC	105	=	J	0 13	mg/kg	SD
SS	MIA230	MG776012	SW6010	ZINC	43 9	=	J	0 13	mg/kg	SD
SS	MIA231FD	MG776013	SW6010	ZINC	50 2	=	J	0 13	mg/kg	SD
SS	MIA233	MG776014	SW6010	ZINC	41	=	J	0 13	mg/kg	SD
SS	MIA234	MG776015	SW6010	ZINC	123	=	J	0 12	mg/kg	SD
SS	MIA236	MG776016	SW6010	ZINC	229	=	J	0 12	mg/kg	SD
SS	MIA237	MG776017	SW6010	ZINC	433	=	J	0 12	mg/kg	SD
SS	MIA238	MG776018	SW6010	ZINC	41 6	=	J	0 12	mg/kg	SD
SS	MIA239	MG776019	SW6010	ZINC	37 3	=	J	0 12	mg/kg	SD
SS	MIA240	MG776020	SW6010	ZINC	28 2	=	J	0 12	mg/kg	SD
SS	MIA252	MG776021	SW6010	ZINC	312	=	J	0 11	mg/kg	SD
SS	MIA253	MG776022	SW6010	ZINC	56 6	=	J	0 13	mg/kg	SD
SS	MIA254	MG776023	SW6010	ZINC	40 2	=	J	0 13	mg/kg	SD
SS	MIA255	MG776024	SW6010	ZINC	1160	=	J	0 11	mg/kg	SD
SS	MIA256	MG776025	SW6010	ZINC	690	=	J	0 12	mg/kg	SD
SS	MIA257	MG776026	SW6010	ZINC	65 3	=	J	0 12	mg/kg	SD
SS	MIA258	MG776027	SW6010	ZINC	364	=	J	0 12	mg/kg	SD
SS	MIA259	MG776028	SW6010	ZINC	571	=	J	0 12	mg/kg	SD
SS	MIA260	MG776029	SW6010	ZINC	49 5	=	J	0 13	mg/kg	SD
SS	MIA243	MG778021	SW6010	ZINC	140	=	J	0 12	mg/kg	SD
SS	MIA264	MG778022	SW6010	ZINC	43 8	=	J	0 12	mg/kg	SD
SS	MIA265	MG778023	SW6010	ZINC	44 4	=	J	0 12	mg/kg	SD
SS	MIA269	MG778027	SW6010	ZINC	228	=	J	0 12	mg/kg	SD
SS	MIA270	MG778028	SW6010	ZINC	87 7	=	J	0 12	mg/kg	SD
SS	MIA275	MG778001	SW6010	ZINC	45 4	=	J	0 59	mg/kg	SD
SS	MIA305	MG778003	SW6010	ZINC	55 3	=	J	0 13	mg/kg	SD
SS	MIA306	MG778004	SW6010	ZINC	45 2	=	J	0 13	mg/kg	SD
SS	MIA307FD	MG778005	SW6010	ZINC	42 4	=	J	0 13	mg/kg	SD
SS	MIA309	MG778006	SW6010	ZINC	43 4	=	J	0 12	mg/kg	SD
SS	MIA313	MG778010	SW6010	ZINC	184	=	J	0 12	mg/kg	SD
SS	MIA314FD	MG778011	SW6010	ZINC	1770	=	J	0 12	mg/kg	SD
SS	MIA315	MG778012	SW6010	ZINC	121	=	J	0 12	mg/kg	SD
SS	MIA316	MG778013	SW6010	ZINC	117	=	J	0 12	mg/kg	SD
SS	MIA128	MG785001	SW6010	ZINC	72 8	=	J	0 13	mg/kg	SD
SS	MIA129FD	MG785002	SW6010	ZINC	75 2	=	J	0 13	mg/kg	SD
SS	MIA132	MG785003	SW6010	ZINC	46 9	=	J	0 13	mg/kg	SD
SS	MIA295	MG785007	SW6010	ZINC	28	=	J	0 12	mg/kg	SD
SS	MIA296	MG785008	SW6010	ZINC	29 9	=	J	0 12	mg/kg	SD
SS	MIA297FD	MG785009	SW6010	ZINC	34 7	=	J	0 12	mg/kg	SD
SS	MIA299	MG785010	SW6010	ZINC	45	=	J	0 12	mg/kg	SD
SS	MIA302	MG785013	SW6010	ZINC	59 2	=	J	0 13	mg/kg	SD
SS	MIA303	MG785014	SW6010	ZINC	69 4	=	J	0 13	mg/kg	SD

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA304	MG785015	SW6010	ZINC	107	=	J	0.13	mg/kg	SD
SS	MIA145	MG743009	SW6010	ZINC	49	=	J	0.12	mg/kg	SD
WS	MIA019FD	MG682002	SW8081	ALDRIN	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	ALPHA BHC	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	ALPHA ENDOSULFAN	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	ALPHA-CHLORDANE	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	BETA BHC	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	BETA ENDOSULFAN	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	DELTA BHC (DELTA	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	DIELDRIN	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	ENDOSULFAN SULFATE	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	ENDRIN	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	ENDRIN ALDEHYDE	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	ENDRIN KETONE	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	GAMMA BHC (LINDANE)	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	GAMMA-CHLORDANE	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	HEPTACHLOR	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	HEPTACHLOR EPOXIDE	0.05	U	UJ	0.05	ug/L	SS
WS	MIA019FD	MG682002	SW8081	METHOXYCHLOR	0.5	U	UJ	0.5	ug/L	SS
WS	MIA019FD	MG682002	SW8081	p,p'-DDD	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	p,p'-DDE	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	p,p'-DDT	0.1	U	UJ	0.1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	PCB-1016 (AROCHLOR 1016)	1	U	UJ	1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	PCB-1221 (AROCHLOR 1221)	2	U	UJ	2	ug/L	SS
WS	MIA019FD	MG682002	SW8081	PCB-1232 (AROCHLOR 1232)	1	U	UJ	1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	PCB-1242 (AROCHLOR 1242)	1	U	UJ	1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	PCB-1248 (AROCHLOR 1248)	1	U	UJ	1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	PCB-1254 (AROCHLOR 1254)	1	U	UJ	1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	PCB-1260 (AROCHLOR 1260)	1	U	UJ	1	ug/L	SS
WS	MIA019FD	MG682002	SW8081	TOXAPHENE	5	U	UJ	5	ug/L	SS
SS	MIA056	MG720004	SW8100	1-METHYLNAPHTHALENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	2-METHYLNAPHTHALENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	ACENAPHTHENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	ACENAPHTHYLENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	ANTHRACENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	BENZO(a)ANTHRACENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	BENZO(a)PYRENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	BENZO(b)FLUORANTHENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	BENZO(g,h,i)PERYLENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	BENZO(k)FLUORANTHENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	CHRYSENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	DIBENZ(a,h)ANTHRACENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	FLUORANTHENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	FLUORENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	INDENO(1,2,3-c,d)PYRENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	NAPHTHALENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	PHENANTHRENE	58	U	UJ	58	ug/kg	SS
SS	MIA056	MG720004	SW8100	PYRENE	58	U	UJ	58	ug/kg	SS
SS	MIA060	MG720008	SW8100	1-METHYLNAPHTHALENE	1000	U	UJ	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	2-METHYLNAPHTHALENE	1000	U	UJ	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	ACENAPHTHENE	1000	U	UJ	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	ACENAPHTHYLENE	1000	U	UJ	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	ANTHRACENE	1000	U	UJ	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	BENZO(a)ANTHRACENE	2000	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	BENZO(a)PYRENE	2200	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	BENZO(b)FLUORANTHENE	2200	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	BENZO(g,h,i)PERYLENE	1300	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	BENZO(k)FLUORANTHENE	1900	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	CHRYSENE	2400	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	DIBENZ(a,h)ANTHRACENE	1000	U	UJ	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	FLUORANTHENE	4900	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	FLUORENE	1000	U	UJ	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	INDENO(1,2,3-c,d)PYRENE	1400	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	NAPHTHALENE	1000	U	UJ	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	PHENANTHRENE	3400	=	J	1000	ug/kg	SS
SS	MIA060	MG720008	SW8100	PYRENE	3500	=	J	1000	ug/kg	SS
SS	MIA082	MG723014	SW8100	BENZO(a)ANTHRACENE	6100	=	J	1300	ug/kg	SS
SS	MIA082	MG723014	SW8100	BENZO(a)PYRENE	5100	=	J	1300	ug/kg	SS
SS	MIA082	MG723014	SW8100	BENZO(b)FLUORANTHENE	5400	=	J	1300	ug/kg	SS
SS	MIA082	MG723014	SW8100	BENZO(g,h,i)PERYLENE	2600	=	J	1300	ug/kg	SS
SS	MIA082	MG723014	SW8100	BENZO(k)FLUORANTHENE	7000	=	J	1300	ug/kg	SS

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA082	MG723014	SW8100	CHRYSENE	7100	=	J	1300	ug/kg	SS
SS	MIA082	MG723014	SW8100	FLUORANTHENE	14000	=	J	1300	ug/kg	SS
SS	MIA082	MG723014	SW8100	INDENO(1,2,3-c,d)PYRENE	3400	=	J	1300	ug/kg	SS
SS	MIA082	MG723014	SW8100	PHENANTHRENE	8800	=	J	1300	ug/kg	SS
SS	MIA082	MG723014	SW8100	PYRENE	10000	=	J	1300	ug/kg	SS
SS	MIA085	MG723017	SW8100	BENZO(a)ANTHRACENE	2200	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	BENZO(a)PYRENE	2300	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	BENZO(b)FLUORANTHENE	2300	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	BENZO(g,h,i)PERYLENE	1300	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	BENZO(k)FLUORANTHENE	2900	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	CHRYSENE	2600	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	FLUORANTHENE	4900	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	INDENO(1,2,3-c,d)PYRENE	1400	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	PHENANTHRENE	2800	=	J	1000	ug/kg	SS
SS	MIA085	MG723017	SW8100	PYRENE	3600	=	J	1000	ug/kg	SS
SS	MIA118	MG730026	SW8100	ACENAPHTHENE	2000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	ANTHRACENE	2200	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	BENZO(a)ANTHRACENE	13000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	BENZO(a)PYRENE	11000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	BENZO(b)FLUORANTHENE	10000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	BENZO(g,h,i)PERYLENE	8200	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	BENZO(k)FLUORANTHENE	12000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	CHRYSENE	14000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	DIBENZ(a,h)ANTHRACENE	2200	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	FLUORANTHENE	26000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	FLUORENE	1300	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	INDENO(1,2,3-c,d)PYRENE	11000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	PHENANTHRENE	14000	=	J	1100	ug/kg	SS
SS	MIA118	MG730026	SW8100	PYRENE	20000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	ACENAPHTHENE	2600	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	ANTHRACENE	2600	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	BENZO(a)ANTHRACENE	12000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	BENZO(a)PYRENE	10000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	BENZO(b)FLUORANTHENE	10000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	BENZO(g,h,i)PERYLENE	7300	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	BENZO(k)FLUORANTHENE	11000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	CHRYSENE	12000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	DIBENZ(a,h)ANTHRACENE	2000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	FLUORANTHENE	25000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	FLUORENE	1600	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	INDENO(1,2,3-c,d)PYRENE	10000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	PHENANTHRENE	16000	=	J	1100	ug/kg	SS
SS	MIA119	MG730027	SW8100	PYRENE	19000	=	J	1100	ug/kg	SS
SB	MIA205	MG743025	SW8100	1-METHYLNAPHTHALENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	2-METHYLNAPHTHALENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	ACENAPHTHENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	ACENAPHTHYLENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	ANTHRACENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	BENZO(a)ANTHRACENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	BENZO(a)PYRENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	BENZO(b)FLUORANTHENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	BENZO(g,h,i)PERYLENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	BENZO(k)FLUORANTHENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	CHRYSENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	DIBENZ(a,h)ANTHRACENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	FLUORANTHENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	FLUORENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	INDENO(1,2,3-c,d)PYRENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	NAPHTHALENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	PHENANTHRENE	120	U	UJ	120	ug/kg	SS
SB	MIA205	MG743025	SW8100	PYRENE	120	U	UJ	120	ug/kg	SS
SS	MIA320	MG756021	SW8100	BENZO(a)ANTHRACENE	4200	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	BENZO(a)PYRENE	4300	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	BENZO(b)FLUORANTHENE	3700	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	BENZO(g,h,i)PERYLENE	3300	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	BENZO(k)FLUORANTHENE	4800	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	CHRYSENE	4600	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	FLUORANTHENE	14000	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	INDENO(1,2,3-c,d)PYRENE	3800	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	PHENANTHRENE	7800	=	J	1100	ug/kg	SS
SS	MIA320	MG756021	SW8100	PYRENE	11000	=	J	1100	ug/kg	SS

ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
SS	MIA206	MG770013	SW8100	1-METHYLNAPHTHALENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	2-METHYLNAPHTHALENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	ACENAPHTHENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	ACENAPHTHYLENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	ANTHRACENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	BENZO(a)ANTHRACENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	BENZO(a)PYRENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	BENZO(b)FLUORANTHENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	BENZO(g,h i)PERYLENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	BENZO(k)FLUORANTHENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	CHRYSENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	DIBENZ(a,h)ANTHRACENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	FLUORANTHENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	FLUORENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	INDENO(1 2 3-c d)PYRENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	NAPHTHALENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	PHENANTHRENE	530	U	UJ	530	ug/kg	SS
SS	MIA206	MG770013	SW8100	PYRENE	530	U	UJ	530	ug/kg	SS
SB	MIA207	MG770014	SW8100	1-METHYLNAPHTHALENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	2-METHYLNAPHTHALENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	ACENAPHTHENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	ACENAPHTHYLENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	ANTHRACENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	BENZO(a)ANTHRACENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	BENZO(a)PYRENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	BENZO(b)FLUORANTHENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	BENZO(g h i)PERYLENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	BENZO(k)FLUORANTHENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	CHRYSENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	DIBENZ(a h)ANTHRACENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	FLUORANTHENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	FLUORENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	INDENO(1 2 3-c d)PYRENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	NAPHTHALENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	PHENANTHRENE	280	U	UJ	280	ug/kg	SS
SB	MIA207	MG770014	SW8100	PYRENE	280	U	UJ	280	ug/kg	SS
WQ	MIA068EBRE	MG723003RE	SW8270	1 2 4-TRICHLOROBENZENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	1,2-DICHLOROBENZENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	1 3-DICHLOROBENZENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	1 4-DICHLOROBENZENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2 2 -OXYBIS(1-CHLORO)PROPANE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2,4,5-TRICHLOROPHENOL	50	U	R	50	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2 4 6-TRICHLOROPHENOL	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2 4-DICHLOROPHENOL	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2 4-DIMETHYLPHENOL	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2 4-DINITROPHENOL	50	U	R	50	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2,4-DINITROTOLUENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2,6-DINITROTOLUENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2-CHLORONAPHTHALENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2-CHLOROPHENOL	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2-METHYLNAPHTHALENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2-METHYLPHENOL (o-CRESOL)	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2-NITROANILINE	50	U	R	50	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	2-NITROPHENOL	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	3 3 -DICHLOROBENZIDINE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	3-NITROANILINE	50	U	R	50	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	4 6-DINITRO-2-METHYLPHENOL	50	U	R	50	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	4-BROMOPHENYL PHENYL ETHER	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	4-CHLORO-3-METHYLPHENOL	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	4-CHLOROANILINE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	4-CHLOROPHENYL PHENYL ETHER	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	4-METHYLPHENOL (p-CRESOL)	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	4-NITROANILINE	50	U	R	50	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	4-NITROPHENOL	50	U	R	50	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	ACENAPHTHENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	ACENAPHTHYLENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	ANTHRACENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	BENZO(a)ANTHRACENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	BENZO(a)PYRENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	BENZO(b)FLUORANTHENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	BENZO(g h i)PERYLENE	10	U	R	10	ug/L	SS

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ATTACHMENT A
Changes in Qualifiers Due to the Data Validation Process
Memphis Depot Main Installation RI

Matrix	Sample ID	Lab Sample ID	Analytical Method	Parameter	Final Result	Lab Qual	Final Qual	Det Limit	Units	Qual Reason
WQ	MIA068EBRE	MG723003RE	SW8270	BENZO(k)FLUORANTHENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	BENZYL BUTYL PHTHALATE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	bis(2-CHLOROETHOXY) METHANE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	bis(2-CHLOROETHYL) ETHER	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	bis(2-ETHYLHEXYL) PHTHALATE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	CARBAZOLE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	CHRYSENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	DIBENZ(a h)ANTHRACENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	DIBENZOFURAN	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	DIETHYL PHTHALATE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	DIMETHYL PHTHALATE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	DI-n-BUTYL PHTHALATE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	DI-n-OCTYLPHTHALATE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	FLUORANTHENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	FLUORENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	HEXACHLOROBENZENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	HEXACHLOROBUTADIENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	HEXACHLOROCYCLOPENTADIENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	HEXACHLOROETHANE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	INDENO(1,2 3-c,d)PYRENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	ISOPHORONE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	NAPHTHALENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	NITROBENZENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	N-NITROSODI-n-PROPYLAMINE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	N-NITROSODIPHENYLAMINE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	PENTACHLOROPHENOL	5	U	R	5	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	PHENANTHRENE	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	PHENOL	10	U	R	10	ug/L	SS
WQ	MIA068EBRE	MG723003RE	SW8270	PYRENE	10	U	R	10	ug/L	SS

TAB

Appendix D

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TAB

Appendix D

COPC Selection for All FUs/Surrogate Sites

APPENDIX D

COPC Selection for All FUs and Surrogate Sites

This appendix contains the following:

- **Table D-1**–Constituents of Potential Concern in FU1: Surface Soil
- **Table D-2**–Constituents of Potential Concern in FU1: Subsurface Soil
- **Table D-3**–Constituents of Potential Concern in Screening Site 65: Surface Soil
- **Table D-4**–Constituents of Potential Concern in Screening Site 65: Subsurface Soil
- **Table D-5**–Constituents of Potential Concern in FU2: Surface Soil
- **Table D-6**–Constituents of Potential Concern in FU2: Sediment
- **Table D-7**–Constituents of Potential Concern in FU2: Surface Water
- **Table D-8**–Constituents of Potential Concern in RI Site 59: Surface Soil
- **Table D-9**–Constituents of Potential Concern in RI Site 59: Subsurface Soil
- **Table D-10**–Constituents of Potential Concern in FU3: Surface Soil
- **Table D-11**–Constituents of Potential Concern in FU3: Subsurface Soil
- **Table D-12**–Constituents of Potential Concern in FU3: Sediment
- **Table D-13**–Constituents of Potential Concern in RI Site 34: Surface Soil
- **Table D-14**–Constituents of Potential Concern in RI Site 34: Subsurface Soil
- **Table D-15**–Constituents of Potential Concern in FU4: Surface Soil
- **Table D-16**–Constituents of Potential Concern in FU4: Subsurface Soil
- **Table D-17**–Constituents of Potential Concern in FU4: Sediment
- **Table D-18**–Constituents of Potential Concern in Residential Point Estimate at Station SS14A: Surface Soil
- **Table D-19**–Constituents of Potential Concern in Screening Site 36: Surface Soil
- **Table D-20**–Constituents of Potential Concern in Screening Site 36: Subsurface Soil
- **Table D-21**–Constituents of Potential Concern in FU5: Surface Soil
- **Table D-22**–Constituents of Potential Concern in FU5: Subsurface Soil
- **Table D-23**–Constituents of Potential Concern in Residential Point Estimate at Station SS77C: Surface Soil
- **Table D-24**–Constituents of Potential Concern in Screening Site 77: Surface Soil
- **Table D-25**–Constituents of Potential Concern in Screening Site 77: Subsurface Soil
- **Table D-26**–Constituents of Potential Concern in FU6: Surface Soil
- **Table D-27**–Constituents of Potential Concern in FU6: Subsurface Soil
- **Table D-28**–Constituents of Potential Concern in FU6: Sediment
- **Table D-29**–Constituents of Potential Concern in Residential Point Estimate at Station SS66A: Surface Soil
- **Table D-30**–Constituents of Potential Concern in Screening Site 66: Surface Soil
- **Table D-31**–Constituents of Potential Concern in Screening Site 66: Subsurface Soil
- **Table D-32**–Constituents of Potential Concern in FU7: Groundwater
- **Table D-33**–Human Health Criteria per Chemical

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TABLE D-1

Constituents of Potential Concern in FU1—Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
1	SS	MG/KG	ANTIMONY	18	7	0 2	3 5	0 73	8	4 2	7	3 1	5	Yes	A
1	SS	MG/KG	ARSENIC	23	23	0 15000001	3 6	2 5	55	21	20	0 43	29	Yes	A
1	SS	MG/KG	BENZO(a)ANTHRACENE	38	27	0 058	53	0 085	55	13	0 71	0 87	2	Yes	A
1	SS	MG/KG	BENZO(a)PYRENE	38	27	0 058	53	0 081	67	14	0 96	0 087	8	Yes	A
1	SS	MG/KG	BENZO(b)FLUORANTHENE	38	27	0 058	53	0 098	65	14	0 9	0 87	5	Yes	A
1	SS	MG/KG	BENZO(k)FLUORANTHENE	38	27	0 058	53	0 073	71	14	0 78	8 7	49	Yes	A
1	SS	MG/KG	CARBAZOLE	22	15	0 38	24	0 045	13	3 4	0 067	32	0 6	Yes	A
1	SS	MG/KG	CHRYSENE	38	27	0 058	53	0 11	68	16	0 94	87	160	Yes	G
1	SS	MG/KG	DDE	44	42	0 0038	3 5	0 0025	7 3	0 67	0 16	1 9	54	Yes	A
1	SS	MG/KG	DDT	44	39	0 0038	3 5	0 004	10	0 84	0 074	1 9	11	Yes	A
1	SS	MG/KG	DIBENZ(a,h)ANTHRACENE	38	2	0 058	53	0 078	2 1	1 1	0 26	0 087	2	Yes	A
1	SS	MG/KG	DIELDRIN	44	33	0 0038	3 5	0 0049	4	0 78	0 086	0 04	0 004	Yes	A
1	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	38	26	0 058	53	0 056	44	10	0 7	0 87	14	Yes	A
1	SS	MG/KG	MERCURY	23	14	0	0 12	0 03	2 1	0 2	0 4		2	Yes	A
1	SS	MG/KG	PCB-1260 (AROCLOR 1260)	39	4	0 038	35	2 3	6 6	4 5	0 11	0 32	17	Yes	A
1	SS	MG/KG	PETROLEUM HYDROCARBONS	3	3	2 1	2 20000005	16	64	38		34	340	Yes	A
1	SS	MG/KG	2-HEXANONE	16	2	0 01	0 014	0 002	0 003	0 0025		310	1 4	No	B
1	SS	MG/KG	2-METHYLNAPHTHALENE	38	3	0 058	53	0 19	0 6	0 46		160	6 1	No	B
1	SS	MG/KG	ACENAPHTHENE	38	10	0 058	53	0 093	5 7	1 8		470	570	No	B
1	SS	MG/KG	ACENAPHTHYLENE	38	1	0 058	53	9 5	9 5	9 5	0 19	470	27	No	B
1	SS	MG/KG	ACETONE	15	3	0 01	0 6	0 007	0 017	0 01		780	16	No	B
1	SS	MG/KG	ALPHA-CHLORDANE	44	3	0 0019	1 8	0 019	0 21	0 13	0 029	1 8		No	B
1	SS	MG/KG	ALUMINUM	11	11	0 82999998	2	3740	13300	8939	23810	7800		No	C
1	SS	MG/KG	ANTHRACENE	38	21	0 058	53	0 045	12	2 6	0 096	2300	12000	No	B
1	SS	MG/KG	BARIUM	11	11	0 025	0 25	44	164	102	234	550	1600	No	C
1	SS	MG/KG	BENZENE	16	6	0 01	0 014	0 001	0 006	0 0033		22	0 03	No	B
1	SS	MG/KG	BENZO(g,h,i)PERYLENE	38	26	0 058	53	0 062	48	9	0 82	230	32000	No	B
1	SS	MG/KG	BERYLLIUM	23	16	0 0026	0 48	0 27	2 2	0 55	1 1	16	63	No	B
1	SS	MG/KG	bis(2 ETHYLHEXYL) PHTHALATE	23	5	0 35	24	0 064	0 31	0 18		46	3600	No	F
1	SS	MG/KG	BROMOMETHANE	16	3	0 01	0 014	0 002	0 002	0 002		11	0 2	No	B
1	SS	MG/KG	CADMIUM	23	21	0 0089	0 6	0 04	4 1	0 58	1 4	7 8	8	No	B
1	SS	MG/KG	CALCIUM	11	11	0 69999999	13	1550	144000	37749	5840			No	E
1	SS	MG/KG	CARBON DISULFIDE	16	4	0 01	0 014	0 001	0 002	0 0018	0 002	780	32	No	C
1	SS	MG/KG	CHROMIUM, TOTAL	23	23	0 06	1 2	9 8	35	15	25	10800	38	No	B
1	SS	MG/KG	COBALT	11	11	0 038	0 27000001	2 3	7 6	5 6	18	470		No	C
1	SS	MG/KG	COPPER	23	23	0 1	1 2	7 8	27	18	34	310		No	C
1	SS	MG/KG	DDD	44	1	0 0038	3 5	0 0028	0 0028	0 0028	0 0067	2 7	16	No	C
1	SS	MG/KG	DIBENZOFURAN	23	8	0 35	24	0 065	2 2	1	0 65	31	15	No	B
1	SS	MG/KG	DI-n-BUTYL PHTHALATE	23	1	0 35	24	0 056	0 056	0 056		780	2300	No	B
1	SS	MG/KG	ETHYLBENZENE	16	2	0 01	0 014	0 006	0 007	0 0065		780	13	No	B
1	SS	MG/KG	FLUORANTHENE	38	29	0 058	53	0 26	130	25	1 6	310	4300	No	B
1	SS	MG/KG	FLUORENE	38	11	0 058	53	0 066	5 2	1 6		310	560	No	B
1	SS	MG/KG	GAMMA BHC (LINDANE)	44	1	0 0019	1 8	0 0029	0 0029	0 0029		0 49	0 009	No	B
1	SS	MG/KG	GAMMA-CHLORDANE	44	3	0 0019	1 8	0 02	0 15	0 097	0 026	1 8		No	B
1	SS	MG/KG	IRON	11	11	0 22	0 87	4410	20400	14190	37040	2300		No	E
1	SS	MG/KG	LEAD	23	23	0 13	4 3	12	297	48	30	400		No	B
1	SS	MG/KG	MAGNESIUM	11	11	0 41999999	3 29999995	1670	9700	4019	4600			No	E
1	SS	MG/KG	MANGANESE	11	11	0 013	0 063	94	657	400	1304	1100		No	C
1	SS	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	16	7	0 01	0 014	0 006	0 081	0 038	0 002	4700	17	No	B
1	SS	MG/KG	NAPHTHALENE	38	4	0 058	53	0 36	1 3	0 88		160	84	No	B
1	SS	MG/KG	NICKEL	23	23	0 034	2 4	4 4	21	14	30	160	130	No	C

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TABLE D-1

Constituents of Potential Concern in FU1—Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
1	SS	MG/KG	PHENANTHRENE	38	27	0 058	53	0 18	61	13	0 61	230	250	No	B
1	SS	MG/KG	POTASSIUM	11	11	80	437	808	2630	1948	1820			No	E
1	SS	MG/KG	PYRENE	38	29	0 058	53	0 2	120	21	1 5	230	880	No	B
1	SS	MG/KG	SELENIUM	23	5	0 18	3 1	1 2	3 4	1 9	0 8	39	5	No	B
1	SS	MG/KG	SILVER	23	1	0 05	2 3	0 67	0 67	0 67	2	39	34	No	C
1	SS	MG/KG	SODIUM	11	1	0 97000003	14	294	294	294				No	E
1	SS	MG/KG	TOLUENE	16	4	0 01	0 014	0 001	0 014	0 0073	0 002	1600	12	No	B
1	SS	MG/KG	Total Xylenes	16	2	0 01	0 014	0 009	0 009	0 009	0 009	16000	0 2	No	C
1	SS	MG/KG	TRICHLOROETHYLENE (TCE)	16	1	0 01	0 014	0 002	0 002	0 002		58	0 06	No	B
1	SS	MG/KG	VANADIUM	11	11	0 032	0 19	8 4	29	20	48	55	6000	No	C
1	SS	MG/KG	ZINC	30	30	0 078	6	42	646	104	126	2300	12000	No	B

Note Data evaluated include field duplicates and normal samples (0-2 feet)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

TABLE D-2

Constituents of Potential Concern in FU1—Subsurface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
1	SB	MG/KG	ANTIMONY	21	5	0 22	3 9	1	1 3	1 2		5	Yes	H
1	SB	MG/KG	ARSENIC	21	21	0 2	1 3	4 7	13	8 4	17	29	Yes	H
1	SB	MG/KG	DDE	21	8	0 004	0 013	0 0016	0 032	0 0098	0 0015	54	Yes	H
1	SB	MG/KG	DDT	21	10	0 004	0 013	0 0016	0 081	0 021	0 0072	11	Yes	H
1	SB	MG/KG	ACETONE	21	12	0 012	0 013	0 006	0 018	0 012		16	No	B
1	SB	MG/KG	ALUMINUM	9	9	0 79	0 88	9180	18700	11683	21829		No	C
1	SB	MG/KG	BARIUM	9	9	0 029	0 033	76	181	128	300	1600	No	C
1	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	27	12	0 4	0 44	0 047	1 2	0 23		3600	No	F
1	SB	MG/KG	BROMOMETHANE	21	1	0 012	0 013	0 002	0 002	0 002		0 2	No	B
1	SB	MG/KG	CALCIUM	9	9	0 46	0 51	978	2750	1782	2432		No	E
1	SB	MG/KG	CHROMIUM, TOTAL	21	21	0 058	1 3	10	19	13	26	38	No	C
1	SB	MG/KG	CHRYSENE	27	2	0 063	0 44	0 047	0 05	0 049		160	No	B
1	SB	MG/KG	COBALT	9	9	0 04	0 044	6 3	9 9	7 8	20		No	C
1	SB	MG/KG	COPPER	21	21	0 1	1 3	11	22	16	33		No	C
1	SB	MG/KG	DI-n-BUTYL PHTHALATE	27	2	0 4	0 44	0 052	0 058	0 055		2300	No	B
1	SB	MG/KG	FLUORANTHENE	27	2	0 063	0 44	0 066	0 072	0 069	0 045	4300	No	B
1	SB	MG/KG	GAMMA BHC (LINDANE)	21	3	0 002	0 0065	0 0014	0 0027	0 0021		0 009	No	B
1	SB	MG/KG	IRON	9	9	0 2	0 22	15900	23400	19233	38480		No	E
1	SB	MG/KG	LEAD	21	21	0 24	0 39	7 3	14	10	24		No	C
1	SB	MG/KG	MAGNESIUM	9	9	0 23	0 26	2210	2920	2490	4900		No	E
1	SB	MG/KG	MANGANESE	9	9	0 024	0 026	405	1110	598	1540		No	C
1	SB	MG/KG	NICKEL	21	21	0 15	2 6	14	20	18	37	130	No	C
1	SB	MG/KG	PHENANTHRENE	27	1	0 063	0 44	0 089	0 089	0 089		250	No	B
1	SB	MG/KG	POTASSIUM	9	9	90	99	1880	2780	2389	1800		No	E
1	SB	MG/KG	PYRENE	27	2	0 063	0 44	0 058	0 06	0 059	0 042	880	No	B
1	SB	MG/KG	SILVER	21	6	0 084	2 6	0 1	0 17	0 135	1	34	No	C
1	SB	MG/KG	TETRACHLOROETHYLENE(PCE)	21	3	0 012	0 013	0 002	0 007	0 004		0 06	No	B
1	SB	MG/KG	VANADIUM	9	9	0 052	0 058	25	36	28	51	6000	No	C
1	SB	MG/KG	ZINC	27	27	0 075	5 2	36	155	65	114	12000	No	B

Note Data evaluated include field duplicates and normal samples (2 feet and below) The risk calculations include soil samples from surface and subsurface (0-10 feet)

A Exceeds Criteria

B Does not exceed Criteria

C Does not exceed Background

D No Criteria available & exceeds Background, or no Criteria or Background available

E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC

F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC

G Chemical is a member of a chemical class which contains other COPCs

H Chemical is a surface soil COPC

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TABLE D-3

Constituents of Potential Concern in Screening Site 65—Surface Soil

Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
1	65	SS	MG/KG	BENZO(a)ANTHRACENE	17	13	0.4	22	0.085	55	18	0.71	0.87	2	Yes	A
1	65	SS	MG/KG	BENZO(a)PYRENE	17	13	0.4	22	0.081	67	20	0.96	0.087	8	Yes	A
1	65	SS	MG/KG	BENZO(b)FLUORANTHENE	17	13	0.4	22	0.098	65	21	0.9	0.87	5	Yes	A
1	65	SS	MG/KG	BENZO(k)FLUORANTHENE	17	13	0.4	22	0.073	71	21	0.78	8.7	49	Yes	A
1	65	SS	MG/KG	CARBAZOLE	10	7	0.39	15	0.048	12	3.5	0.067	32	0.6	Yes	A
1	65	SS	MG/KG	DDE	8	8	0.0077	3.5	0.004	7.3	1.8	0.16	1.9	54	Yes	A
1	65	SS	MG/KG	DDT	8	8	0.0077	3.5	0.0057	10	2.5	0.074	1.9	11	Yes	A
1	65	SS	MG/KG	DIELDRIN	8	3	0.0077	3.5	0.01	0.83	0.35	0.086	0.04	0.004	Yes	A
1	65	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	17	13	0.4	22	0.056	44	15	0.7	0.87	14	Yes	A
1	65	SS	MG/KG	CHRYSENE	17	13	0.4	22	0.11	68	23	0.94	87	160	Yes	G
1	65	SS	MG/KG	ACENAPHTHENE	17	3	0.4	15	1.1	5.7	2.6		470	570	No	B
1	65	SS	MG/KG	ACENAPHTHYLENE	17	1	0.4	15	9.5	9.5	9.5	0.19	470	27	No	B
1	65	SS	MG/KG	ANTHRACENE	17	9	0.4	15	0.048	12	3.8	0.096	2300	12000	No	B
1	65	SS	MG/KG	BENZENE	4	3	0.01	0.011	0.001	0.004	0.003		22	0.03	No	B
1	65	SS	MG/KG	BENZO(g,h,i)PERYLENE	17	13	0.4	22	0.062	48	14	0.82	230	32000	No	B
1	65	SS	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	11	3	0.35	15	0.1	0.31	0.24		46	3600	No	B
1	65	SS	MG/KG	BROMOMETHANE	4	1	0.01	0.011	0.002	0.002	0.002		11	0.2	No	B
1	65	SS	MG/KG	CADMIUM	4	4	0.009	0.36	0.12	4.1	1.5	1.4	7.8	8	No	B
1	65	SS	MG/KG	CHROMIUM, TOTAL	4	4	0.109999999	0.24	9.8	30	16	25	10800	38	No	B
1	65	SS	MG/KG	DI n-BUTYL PHTHALATE	11	1	0.35	15	0.056	0.056	0.056		780	2300	No	B
1	65	SS	MG/KG	DIBENZOFURAN	11	3	0.35	15	0.44	1.9	0.96	0.65	31	15	No	B
1	65	SS	MG/KG	ETHYLBENZENE	4	2	0.01	0.011	0.006	0.007	0.0065		780	13	No	B
1	65	SS	MG/KG	FLUORANTHENE	17	14	0.4	22	0.26	130	35	1.6	310	4300	No	B
1	65	SS	MG/KG	FLUORENE	17	3	0.4	15	0.82	5.2	2.4		310	560	No	B
1	65	SS	MG/KG	LEAD	4	4	0.15	4.3	15	98	53	30	400		No	B
1	65	SS	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	4	2	0.01	0.011	0.006	0.024	0.015	0.002	4700	17	No	B
1	65	SS	MG/KG	NAPHTHALENE	17	1	0.4	15	0.66	0.66	0.66		160	84	No	B
1	65	SS	MG/KG	PHENANTHRENE	17	13	0.4	22	0.18	61	16	0.61	230	250	No	B
1	65	SS	MG/KG	PYRENE	17	14	0.4	22	0.2	120	30	1.5	230	880	No	B
1	65	SS	MG/KG	SELENIUM	4	1	0.189999998	3.1	1.2	1.2	1.2	0.8	39	5	No	B
1	65	SS	MG/KG	TOLUENE	4	2	0.01	0.011	0.012	0.014	0.013	0.002	1600	12	No	B
1	65	SS	MG/KG	ZINC	11	11	0.109999999	6	54	646	159	126	2300	12000	No	B
1	65	SS	MG/KG	ALUMINUM	4	4	0.83	2	3740	13300	6288	23810	7800		No	C
1	65	SS	MG/KG	ANTIMONY	4	3	0.200000003	1.6	0.73	2.5	1.8	7	3.1	5	No	C
1	65	SS	MG/KG	ARSENIC	4	4	0.15	3.6	4	14	7.3	20	0.43	29	No	C
1	65	SS	MG/KG	BARIUM	4	4	0.037999999	0.25	44	121	74	234	550	1600	No	C
1	65	SS	MG/KG	BERYLLIUM	4	4	0.0026	0.014	0.27	0.47	0.36	1.1	16	63	No	C
1	65	SS	MG/KG	CARBON DISULFIDE	4	2	0.01	0.011	0.001	0.002	0.0015	0.002	780	32	No	C
1	65	SS	MG/KG	COBALT	4	4	0.052999999	0.27	2.3	6.9	4.1	18	470		No	C
1	65	SS	MG/KG	COPPER	4	4	0.119999997	0.53	9.7	21	15	34	310		No	C
1	65	SS	MG/KG	IRON	4	4	0.219999999	0.42	4410	19900	9773	37040	2300		No	C
1	65	SS	MG/KG	MANGANESE	4	4	0.037	0.061999999	94	541	227	1304	1100		No	C
1	65	SS	MG/KG	MERCURY	4	3	0.0068	0.018999999	0.03	0.05	0.037	0.4	2.3	2	No	C
1	65	SS	MG/KG	NICKEL	4	4	0.034000002	0.6	5.5	16	10	30	160	130	No	C
1	65	SS	MG/KG	Total Xylenes	4	2	0.01	0.011	0.009	0.009	0.009	0.009	16000	0.2	No	C
1	65	SS	MG/KG	VANADIUM	4	4	0.032000002	0.189999998	8.4	26	14	48	55	6000	No	C
1	65	SS	MG/KG	CALCIUM	4	4	2.8	13	1620	144000	100155	5840			No	E
1	65	SS	MG/KG	MAGNESIUM	4	4	0.72	3.3	2180	9700	7538	4600			No	E
1	65	SS	MG/KG	POTASSIUM	4	4	82	437	808	2290	1370	1820			No	E
1	65	SS	MG/KG	SODIUM	4	1	0.97	13	294	294	294				No	E

Note Data evaluated include field duplicates and normal samples (0-2 feet)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgment was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-4

Constituents of Potential Concern in Screening Site 65—Subsurface Soil

Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
1	65	SB	MG/KG	CHRYSENE	6	1	0 42	0 43	0 05	0 05	0 05		160	Yes	H
1	65	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	6	1	0 42	0 43	0 11	0 11	0 11		3600	No	B
1	65	SB	MG/KG	DI-n-BUTYL PHTHALATE	6	1	0 42	0 43	0 052	0 052	0 052		2300	No	B
1	65	SB	MG/KG	FLUORANTHENE	6	1	0 42	0 43	0 066	0 066	0 066	0 045	4300	No	B
1	65	SB	MG/KG	PHENANTHRENE	6	1	0 42	0 43	0 089	0 089	0 089		250	No	B
1	65	SB	MG/KG	PYRENE	6	1	0 42	0 43	0 06	0 06	0 06	0 042	880	No	B
1	65	SB	MG/KG	ZINC	6	6	5	5 2	78	155	115	114	12000	No	B

Note Data evaluated include field duplicates and normal samples (2 feet and below)

- A Exceeds Cntena
- B Does not exceed Cntena
- C Does not exceed Background
- D No Cnteria available & exceeds Background, or no Cntena or Background available
- E Chemical is an essential nutrient and professional judgment was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgment was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

TABLE D-5

Constituents of Potential Concern in FU2—Surface Soil

Memphis Depot Main Installation RI

Pesticides	PAHs	Inorganics
DDE	Benzo(a)pyrene	Arsenic
DDT	Benzo(a)anthracene	Chromium, total
Dieldrin	Benzo(b)fluoranthene	Copper
Chlordane-alpha		Lead
Chlordane-gamma		Manganese
		Nickel

Note: COPCs have been adapted from the previous risk assessment of Parcel 3. *(Final Streamlined Risk Assessment for Parcel 3 Technical Memorandum*, CH2M HILL, January 1999)

TABLE D-6

Constituents of Potential Concern in FU2—Sediment

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Sediments	Regulatory Criteria for Leachability	COPC	BASIS
2	SE	MG/KG	ALUMINUM	19	19	1	4.9	662	17100	6636	10085	7800		Yes	A
2	SE	MG/KG	ARSENIC	24	24	0.18	1.1	1.4	14	6.2	12	0.43	29	Yes	A
2	SE	MG/KG	BENZO(a)ANTHRACENE	24	17	0.061	2.1	0.046	3.8	0.73	2.9	0.87	2	Yes	A
2	SE	MG/KG	BENZO(a)PYRENE	24	19	0.061	2.1	0.041	4.1	0.71	2.5	0.087	8	Yes	A
2	SE	MG/KG	BENZO(b)FLUORANTHENE	24	19	0.061	2.1	0.053	4.9	0.93	2.2	0.87	5	Yes	A
2	SE	MG/KG	CARBON TETRACHLORIDE	22	4	0.01	0.11	0.005	0.11	0.042		4.9	0.07	Yes	A
2	SE	MG/KG	DIELDRIN	24	12	0.0034	0.63	0.0028	0.16	0.032	0.011	0.04	0.00	Yes	A
2	SE	MG/KG	INDENO(1,2,3-c,d)PYRENE	24	16	0.061	2.1	0.028	3.2	0.64	1.7	0.87	14	Yes	A
2	SE	MG/KG	PCB-1260 (AROCLOR 1260)	19	1	0.034	6.3	0.33	0.33	0.33		0.32	17	Yes	A
2	SE	MG/KG	PENTACHLOROPHENOL	22	2	0.2	4.1	0.12	0.14	0.13		5.3	0.03	Yes	A
2	SE	MG/KG	TCDD Equivalent	6	6	0	0	0.00001	0.00015	0.000067	0.000009	0.0000043	0.005	Yes	A
2	SE	MG/KG	CHRYSENE	24	19	0.061	2.1	0.059	4.6	0.84	3.2	87	160	Yes	G
2	SE	MG/KG	2-METHYLNAPHTHALENE	24	2	0.061	2.1	0.018	0.086	0.052		160	6.1	No	B
2	SE	MG/KG	ACENAPHTHYLENE	24	4	0.061	2.1	0.029	0.066	0.054		470	27	No	B
2	SE	MG/KG	ACETONE	22	3	0.01	0.11	0.007	0.023	0.014		780	16	No	B
2	SE	MG/KG	ALDRIN	24	3	0.0018	0.33	0.0092	0.014	0.011		0.038	0.5	No	B
2	SE	MG/KG	ALPHA ENDOSULFAN	24	4	0.0018	0.33	0.0045	0.0081	0.0064		47	18	No	B
2	SE	MG/KG	ALPHA-CHLORDANE	24	11	0.0018	0.33	0.0043	0.034	0.015	0.0052	1.8		No	B
2	SE	MG/KG	BARIUM	19	19	0.062	0.3	16	145	80	118	550	1600	No	B
2	SE	MG/KG	BENZENE	22	1	0.01	0.11	0.004	0.004	0.004		22	0.03	No	B
2	SE	MG/KG	BENZO(g,h,i)PERYLENE	24	17	0.061	2.1	0.034	3	0.6	1.8	230	32000	No	B
2	SE	MG/KG	BENZO(k)FLUORANTHENE	24	13	0.061	2.1	0.041	4.6	0.95	2.3	8.7	49	No	B
2	SE	MG/KG	BENZYL BUTYL PHTHALATE	22	1	0.34	2.1	0.084	0.084	0.084		1600	930	No	B
2	SE	MG/KG	CARBON DISULFIDE	22	5	0.01	0.11	0.002	0.032	0.0094		780	32	No	B
2	SE	MG/KG	CHROMIUM, TOTAL	24	24	0.13	0.65	3.1	37	12	20	10800	38	No	B
2	SE	MG/KG	COBALT	19	19	0.064	0.31	0.76	219	15	14	470		No	B
2	SE	MG/KG	CYANIDE	10	2	0.15	0.21	0.23	0.34	0.29		160	40	No	B
2	SE	MG/KG	DDD	24	19	0.0034	0.63	0.0044	0.4	0.069	0.0061	2.7	16	No	B
2	SE	MG/KG	DDE	24	20	0.0034	0.63	0.0021	0.79	0.088	0.0072	1.9	54	No	B
2	SE	MG/KG	DDT	22	9	0.0034	0.63	0.0037	0.093	0.031		1.9	11	No	B
2	SE	MG/KG	DIETHYL PHTHALATE	22	5	0.34	2.1	0.026	0.52	0.21		6300	470	No	B
2	SE	MG/KG	DIMETHYL PHTHALATE	22	1	0.34	2.1	0.11	0.11	0.11		78000	380	No	B
2	SE	MG/KG	DI-n-BUTYL PHTHALATE	22	9	0.34	2.1	0.019	0.045	0.028		780	2300	No	B
2	SE	MG/KG	DI-n-OCTYLPHTHALATE	22	2	0.34	2.1	0.021	0.09	0.056	0.047	160	10000	No	B
2	SE	MG/KG	ENDRIN	24	7	0.0034	0.63	0.01	0.026	0.015		2.3	1	No	B
2	SE	MG/KG	ENDRIN ALDEHYDE	24	5	0.0034	0.63	0.004	0.019	0.0091		2.3	1	No	B
2	SE	MG/KG	FLUORANTHENE	22	16	0.061	2.1	0.037	9.9	1.3	7.1	310	4300	No	B
2	SE	MG/KG	LEAD	24	24	0.17	0.8	7.7	169	32	35	400		No	B
2	SE	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	22	9	0	0.11	0.003	0.12	0.024	0.01	4700	17	No	B
2	SE	MG/KG	METHYLENE CHLORIDE	22	5	0.01	0.11	0.001	0.015	0.0068		85	0.02	No	B
2	SE	MG/KG	PYRENE	24	19	0.06	2.1	0.039	9.3	1.6	2.9	230	880	No	B
2	SE	MG/KG	SELENIUM	24	12	0.17	0.99	0.71	3.8	1.5	1.7	39	5	No	B
2	SE	MG/KG	SILVER	24	2	0.06	0.57	0.28	9.1	4.7	1.8	39	34	No	B
2	SE	MG/KG	VANADIUM	19	19	0.039	0.29	4.6	39	17	30	55	6000	No	B
2	SE	MG/KG	ZINC	24	24	0.12	0.68	33	1170	149	797	2300	12000	No	B
2	SE	MG/KG	ACENAPHTHENE	24	9	0.061	2.1	0.027	0.26	0.13	0.77	470	570	No	C
2	SE	MG/KG	ANTHRACENE	24	12	0.061	2.1	0.019	0.62	0.2	1.6	2300	12000	No	C
2	SE	MG/KG	ANTIMONY	24	3	0.22	1.9	0.44	6.4	3	7.6	3.1	5	No	C
2	SE	MG/KG	BERYLLIUM	24	21	0.0032	0.29	0.1	1.2	0.45	1.3	16	63	No	C
2	SE	MG/KG	CADMIUM	24	14	0.01	0.42	0.11	2.4	0.76	29	7.8	8	No	C
2	SE	MG/KG	CARBAZOLE	22	11	0.34	2.1	0.023	0.66	0.24	1.1	32	0.6	No	C

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TABLE D-6

Constituents of Potential Concern in FU2—Sediment

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Sediments	Regulatory Criteria for Leachability	COPC/BASIS	
2	SE	MG/KG	COPPER	24	24	0.13	0.62	4.3	49	16	58	310		No	C
2	SE	MG/KG	DIBENZ(a,h)ANTHRACENE	24	7	0.061	2.1	0.028	0.48	0.19	0.7	0.087	2	No	C
2	SE	MG/KG	DIBENZOFURAN	22	5	0.34	2.1	0.022	0.14	0.08	0.38	31	15	No	C
2	SE	MG/KG	FLUORENE	24	10	0.061	2.1	0.029	0.33	0.13	0.87	310	560	No	C
2	SE	MG/KG	GAMMA-CHLORDANE	24	11	0.0018	0.33	0.0048	0.054	0.018	2	1.8		No	C
2	SE	MG/KG	HEPTACHLOR	24	2	0.0018	0.33	0.0018	0.002	0.0019	0.23	0.14	23	No	C
2	SE	MG/KG	HEPTACHLOR EPOXIDE	24	1	0.0018	0.33	0.0037	0.0037	0.0037	0.23			No	C
2	SE	MG/KG	MANGANESE	19	19	0.068	0.33	24	697	215	871	1100		No	C
2	SE	MG/KG	MERCURY	24	4	0.0072	0.14	0.1	0.53	0.23	4	2.3	2	No	C
2	SE	MG/KG	NAPHTHALENE	24	3	0.061	2.1	0.052	0.081	0.068	0.13	160	84	No	C
2	SE	MG/KG	NICKEL	24	24	0.041	0.7	2.1	26	11	31	160	130	No	C
2	SE	MG/KG	PHENANTHRENE	24	18	0.061	2.1	0.029	4.7	0.97	6.9	230	250	No	C
2	SE	MG/KG	CALCIUM	19	19	1	15	958	158000	25586	14860			No	E
2	SE	MG/KG	IRON	19	19	0.46	3.7	2470	19200	10447	23080	2300		No	E
2	SE	MG/KG	MAGNESIUM	19	19	0.79	3.8	714	19100	3458	2440			No	E
2	SE	MG/KG	POTASSIUM	19	19	8.4	512	106	3240	1210	1560			No	E
2	SE	MG/KG	SODIUM	19	11	2.1	71	41	282	108	240			No	E
2	SE	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	22	15	0.34	2.1	0.051	1.5	0.32	0.48	46	3600	No	F

Notes

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

TABLE D-7

Constituents of Potential Concern in FU2—Surface Water

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surfacewater	COPC/BASIS	
2	WS	MG/L	ARSENIC	31	15	0.0014	0.0016	0.0026	0.077	0.02	0.018	0.000018	Yes	A
2	WS	MG/L	DDE	31	5	0.0001	0.0002	0.000026	0.000058	0.000035		0.00000059	Yes	A
2	WS	MG/L	DDT	31	3	0.0001	0.0002	0.000047	0.00015	0.000084		0.00000059	Yes	A
2	WS	MG/L	DIELDRIN	31	12	0.0001	0.0002	0.000035	0.00043	0.00014		0.00000014	Yes	A
2	WS	MG/L	LEAD	31	18	0.0013	0.002	0.0022	0.059	0.013	0.019		Yes	D
2	WS	MG/L	MERCURY	31	1	0.000013	0.00009	0.00009	0.00009	0.00009		0.00005	Yes	A
2	WS	MG/L	SELENIUM	31	1	0.0014	0.0016	0.0058	0.0058	0.0058		0.17	No	B
2	WS	MG/L	ALUMINUM	15	10	0.0066	0.0079	0.05	0.58	0.19	5.1		No	C
2	WS	MG/L	BARIUM	15	9	0.00024	0.00048	0.013	0.018	0.014	0.13	1	No	C
2	WS	MG/L	CHROMIUM, TOTAL	31	5	0.00048	0.0022	0.0011	0.019	0.011	0.036		No	C
2	WS	MG/L	COPPER	31	3	0.00084	0.0012	0.0046	0.022	0.016	0.075	1.3	No	C
2	WS	MG/L	MANGANESE	15	15	0.0002	0.00053	0.0084	0.07	0.035	0.66	0.05	No	C
2	WS	MG/L	NICKEL	31	6	0.00032	0.0055	0.00049	0.018	0.0098	0.23	0.61	No	C
2	WS	MG/L	VANADIUM	15	2	0.0003	0.00044	0.0041	0.0043	0.0042	0.039		No	C
2	WS	MG/L	CALCIUM	15	15	0.0039	0.024	2.4	9.3	6.8	32		No	E
2	WS	MG/L	IRON	15	14	0.0017	0.0036	0.15	0.84	0.38	6.1	0.3	No	E
2	WS	MG/L	MAGNESIUM	15	15	0.0019	0.0062	0.27	2.4	1.1	7.7		No	E
2	WS	MG/L	POTASSIUM	15	12	0.75	0.82	1	4	2.1	7.3		No	E
2	WS	MG/L	SODIUM	15	4	0.057	0.11	0.96	1.1	1	21		No	E
2	WS	MG/L	bis(2-ETHYLHEXYL) PHTHALATE	18	1	0.01	0.01	0.001	0.001	0.001		0.0018	No	F
2	WS	MG/L	ZINC	31	20	0.00062	0.0011	0.0098	0.47	0.087	0.29	9.1	No	B

Notes

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

TABLE D-8

Constituents of Potential Concern in RI Site 59—Surface Soil

Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
2	59	SS	MG/KG	DIELDRIN	11	4	0 0039	0 17	0 01	0 58	0 18	0 086	0 04	0 004	Yes	A
2	59	SS	MG/KG	TETRACHLOROETHYLENE(PCE)	2	2	0 012	0 012	0 004	0 073	0 039		12	0 06	Yes	A
2	59	SS	MG/KG	ACENAPHTHENE	11	1	0 059	0 4	0 059	0 059	0 059		470	570	No	B
2	59	SS	MG/KG	ACETONE	2	1	0 012	0 012	0 095	0 095	0 095		780	16	No	B
2	59	SS	MG/KG	ALPHA-CHLORDANE	11	4	0 002	0 087	0 0071	0 08	0 031	0 029	1 8		No	B
2	59	SS	MG/KG	ALUMINUM	1	1	2 2	2 2	15600	15600	15600	23810	7800		No	C
2	59	SS	MG/KG	ARSENIC	1	1	1 8	1 8	11 6	12	12	20	0 43	29	No	C
2	59	SS	MG/KG	BARIUM	1	1	0 042	0 042	103	103	103	234	550	1600	No	C
2	59	SS	MG/KG	BENZO(a)ANTHRACENE	11	2	0 059	0 4	0 14	0 21	0 18	0 71	0 87	2	No	C
2	59	SS	MG/KG	BENZO(a)PYRENE	11	2	0 059	0 4	0 14	0 2	0 17	0 96	0 087	8	No	C
2	59	SS	MG/KG	BENZO(b)FLUORANTHENE	11	2	0 059	0 4	0 13	0 2	0 17	0 9	0 87	5	No	C
2	59	SS	MG/KG	BENZO(g,h,i)PERYLENE	11	1	0 059	0 4	0 1	0 1	0 1	0 82	230	32000	No	C
2	59	SS	MG/KG	BENZO(k)FLUORANTHENE	11	2	0 059	0 4	0 14	0 16	0 15	0 78	8 7	49	No	C
2	59	SS	MG/KG	CALCIUM	1	1	0 69	0 69	986	986	986	5840			No	E
2	59	SS	MG/KG	CARBON DISULFIDE	2	1	0 012	0 012	0 002	0 002	0 002	0 002	780	32	No	C
2	59	SS	MG/KG	CHROMIUM, TOTAL	1	1	0 27	0 27	16	16	16	25	10800	38	No	C
2	59	SS	MG/KG	CHRYSENE	11	2	0 059	0 4	0 14	0 2	0 17	0 94	87	160	No	C
2	59	SS	MG/KG	COBALT	1	1	0 3	0 3	6 4	6 4	6 4	18	470		No	C
2	59	SS	MG/KG	COPPER	1	1	0 15	0 15	19	19	19	34	310		No	C
2	59	SS	MG/KG	DDD	11	7	0 0039	0 17	0 0028	0 017	0 0086	0 0067	2 7	16	No	B
2	59	SS	MG/KG	DDE	11	10	0 0039	0 17	0 002	0 69	0 12341	0 16	1 9	54	No	B
2	59	SS	MG/KG	DDT	11	9	0 0039	0 17	0 0017	0 77	0 15	0 074	1 9	11	No	B
2	59	SS	MG/KG	FLUORANTHENE	11	4	0 059	0 4	0 08	0 37	0.2	1 6	310	4300	No	C
2	59	SS	MG/KG	GAMMA-CHLORDANE	11	4	0 002	0 087	0 0074	0 061	0 025	0 026	1 8		No	B
2	59	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	11	1	0 059	0 4	0 12	0 12	0 12	0 7	0 87	14	No	C
2	59	SS	MG/KG	IRON	1	1	0 24	0 24	21300	21300	21300	37040	2300		No	E
2	59	SS	MG/KG	LEAD	1	1	1 9	1 9	15	15	15	30	400		No	C
2	59	SS	MG/KG	MAGNESIUM	1	1	2 2	2 2	2590	2590	2590	4600			No	E
2	59	SS	MG/KG	MANGANESE	1	1	0 041	0 041	499	499	499	1304	1100		No	C
2	59	SS	MG/KG	METHYL ETHYL KETONE (2-	2	1	0 012	0 012	0 009	0 009	0 009	0 002	4700	17	No	B
2	59	SS	MG/KG	METHYLENE CHLORIDE	2	1	0 012	0 012	0 002	0 002	0 002		85	0 02	No	B
2	59	SS	MG/KG	NICKEL	1	1	0 67	0 67	17	17	17	30	160	130	No	C
2	59	SS	MG/KG	PHENANTHRENE	11	4	0 059	0 4	0 076	0 24	0 15	0 61	230	250	No	C
2	59	SS	MG/KG	POTASSIUM	1	1	90	90	2060	2060	2060	1820			No	E
2	59	SS	MG/KG	PYRENE	11	4	0 059	0 4	0 064	0 27	0 15	1 5	230	880	No	C
2	59	SS	MG/KG	TOTAL 1,2-DICHLOROETHENE	2	1	0 012	0 012	0 004	0 004	0 004		70		No	B
2	59	SS	MG/KG	TRICHLOROETHYLENE (TCE)	2	1	0 012	0 012	0 003	0 003	0 003		58	0 06	No	B
2	59	SS	MG/KG	VANADIUM	1	1	0 21	0 21	31	31	31	48	55	6000	No	C
2	59	SS	MG/KG	ZINC	1	1	0 12	0 12	63	63	63	126	2300	12000	No	C

Notes Data evaluated include field duplicates and normal samples (0-2 feet)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

TABLE D-9

Constituents of Potential Concern in RI Site 59—Subsurface Soil

Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
2	59	SB	MG/KG	ALUMINUM	1	1	1	1	9650	9650	9650	21829		No	C
2	59	SB	MG/KG	ANTIMONY	1	1	0.21	0.21	0.58	0.58	0.58		5	No	B
2	59	SB	MG/KG	ARSENIC	1	1	0.18	0.18	7.8	7.8	7.8	17	29	No	C
2	59	SB	MG/KG	BARIUM	1	1	0.061000001	0.061000001	97	97	97	300	1600	No	C
2	59	SB	MG/KG	BERYLLIUM	1	1	0.0032	0.0032	0.41	0.41	0.41	1.2	63	No	C
2	59	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	1	1	0.42	0.42	0.13	0.13	0.13		3600	No	F
2	59	SB	MG/KG	CADMIUM	1	1	0.011	0.011	0.15	0.15	0.15	1.4	8	No	C
2	59	SB	MG/KG	CALCIUM	1	1	3	3	1980	1980	1980	2432		No	E
2	59	SB	MG/KG	CHROMIUM, TOTAL	1	1	0.129999995	0.129999995	13	13	13	26	38	No	C
2	59	SB	MG/KG	COBALT	1	1	0.063000001	0.063000001	4.7	4.7	4.7	20		No	C
2	59	SB	MG/KG	COPPER	1	1	0.129999995	0.129999995	14	14	14	33		No	C
2	59	SB	MG/KG	IRON	1	1	0.45	0.45	16500	16500	16500	38480		No	E
2	59	SB	MG/KG	LEAD	1	1	0.159999996	0.159999996	8	8	8	24		No	C
2	59	SB	MG/KG	MAGNESIUM	1	1	0.78	0.78	2380	2380	2380	4900		No	E
2	59	SB	MG/KG	MANGANESE	1	1	0.066	0.066	334	334	334	1540		No	C
2	59	SB	MG/KG	NICKEL	1	1	0.041000001	0.041000001	14	14	14	37	130	No	C
2	59	SB	MG/KG	POTASSIUM	1	1	104	104	2900	2900	2900	1800		No	E
2	59	SB	MG/KG	SELENIUM	1	1	0.200000003	0.200000003	1.3	1.3	1.3	0.6	5	No	B
2	59	SB	MG/KG	Total Xylenes	1	1	0.012	0.012	0.001	0.001	0.001	0.002	0.2	No	C
2	59	SB	MG/KG	VANADIUM	1	1	0.039000001	0.039000001	26	26	26	51	6000	No	C
2	59	SB	MG/KG	ZINC	1	1	0.140000001	0.140000001	39	39	39	114	12000	No	C

Notes Data evaluated include field duplicates and normal samples (2 feet and below)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

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TABLE D-10

Constituents of Potential Concern in FU3 - Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
3	SS	MG/KG	ANTIMONY	119	31	0 18	7.5	0.23	22	2.3	7	3 1	5	Yes	A
3	SS	MG/KG	ARSENIC	125	122	0.15	3.8	0 43	49	10	20	0.43	29	Yes	A
3	SS	MG/KG	BENZO(a)ANTHRACENE	107	43	0.052000001	15	0 039	40	2.5	0 71	0.87	2	Yes	A
3	SS	MG/KG	BENZO(a)PYRENE	107	42	0.053	15	0 039	37	2 3	0 96	0 087	8	Yes	A
3	SS	MG/KG	BENZO(b)FLUORANTHENE	107	43	0.053	15	0.038	39	2 4	0 9	0.87	5	Yes	A
3	SS	MG/KG	BENZO(k)FLUORANTHENE	107	41	0 053	15	0.043	34	2 6	0.78	8 7	49	Yes	A
3	SS	MG/KG	CADMIUM	125	61	0 0089	1.3	0.08	8 1	1 1	1 4	7.8	8	Yes	A
3	SS	MG/KG	CARBAZOLE	37	7	0 34	15	0.08	10	2.2	0 067	32	0.6	Yes	A
3	SS	MG/KG	CHROMIUM, TOTAL	125	125	0.055	2 5	5 5	915	70	25	10800	38	Yes	A
3	SS	MG/KG	CHRYSENE	107	45	0.052000001	15	0.043	46	2 7	0 94	87	160	Yes	G
3	SS	MG/KG	DIBENZ(a,h)ANTHRACENE	107	2	0.053	15	0 21	1 2	0 71	0.26	0.087	2	Yes	A
3	SS	MG/KG	DIELDRIN	80	24	0.0036	0.38	0.0012	0.18	0 043	0.086	0 04	0 00	Yes	A
3	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	107	36	0 053	15	0 048	22	1 8	0 7	0.87	14	Yes	A
3	SS	MG/KG	LEAD	125	125	0 109999999	4.5	2 8	4150	244	30	400		Yes	A
3	SS	MG/KG	MERCURY	125	32	0	0 12	0 015	2.1	0.12	0 4	2.3	2	Yes	A
3	SS	MG/KG	PENTACHLOROPHENOL	37	1	0.17	7.7	0 68	0 68	0 68		5 3	0.03	Yes	A
3	SS	MG/KG	PETROLEUM HYDROCARBONS	4	4	1 8	9.1	26	274	98		34	340	Yes	A
3	SS	MG/KG	SELENIUM	125	36	0 140000001	3 5	0 29	9 5	1 4	0 8	39	5	Yes	A
3	SS	MG/KG	TCDD Equivalent	6	6	0 001	0 001	0 0000028	0.000013	0 0000072	0.00001	0.0000043	0 005	Yes	A
3	SS	MG/KG	VANADIUM	30	30	0 032000002	0.2	6 8	77	20	48	55	6000	Yes	A
3	SS	MG/KG	ZINC	125	125	0 072	5	21	4000	257	126	2300	12000	Yes	A
3	SS	MG/KG	2-HEXANONE	80	3	0 009	0 013	0.001	0 008	0.0033		310	1 4	No	B
3	SS	MG/KG	2-METHYLNAPHTHALENE	107	2	0 052000001	15	0 084	0 51	0 3		160	6 1	No	B
3	SS	MG/KG	ACENAPHTHENE	107	12	0 052000001	15	0.063	5	1		470	570	No	B
3	SS	MG/KG	ACENAPHTHYLENE	107	2	0.052000001	15	0 088	0 14	0.11	0.19	470	27	No	C
3	SS	MG/KG	ACETONE	80	34	0.009	0.013	0 002	0.14	0.02		780	16	No	B
3	SS	MG/KG	ALPHA-CHLORDANE	80	15	0 0018	0 2	0.0014	0 61	0 12	0.029	1 8		No	B
3	SS	MG/KG	ALUMINUM	30	30	0.76	8 3	2820	13600	6283	23810	7800		No	C
3	SS	MG/KG	ANTHRACENE	107	14	0 052000001	15	0 07	11	1 6	0.096	2300	12000	No	B
3	SS	MG/KG	BARIUM	30	30	0 023	0.21	29	432	90	234	550	1600	No	B
3	SS	MG/KG	BENZENE	81	3	0 005	0 013	0.001	0.007	0 0033		22	0.03	No	B
3	SS	MG/KG	BENZO(g,h,i)PERYLENE	107	35	0 053	15	0.037	22	1.6	0 82	230	32000	No	B
3	SS	MG/KG	BENZYL BUTYL PHTHALATE	37	1	0 34	15	0 083	0 083	0.083	0 65	1600	930	No	C
3	SS	MG/KG	BERYLLIUM	125	57	0	1.3	0.05	2	0 43	1.1	16	63	No	B
3	SS	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	37	11	0 34	15	0 04	5 6	0 82		46	3600	No	F
3	SS	MG/KG	BROMOMETHANE	80	4	0 009	0 013	0.002	0 002	0 002		11	0 2	No	B
3	SS	MG/KG	CALCIUM	30	30	0 45	13	951	227000	38368	5840			No	E
3	SS	MG/KG	CARBON DISULFIDE	80	2	0 009	0.013	0 002	0 002	0 002	0 002	780	32	No	C
3	SS	MG/KG	CHROMIUM III	5	5	1.1	1 2	13	403	142		12000		No	B
3	SS	MG/KG	CHROMIUM, HEXAVALENT	5	1	0.109999999	0 119999997	0.12	0.12	0 12		23	38	No	B
3	SS	MG/KG	COBALT	30	30	0 032000002	0 3	0 88	8.8	4 1	18	470		No	C
3	SS	MG/KG	COPPER	125	123	0.097	2 5	4 1	235	31	34	310		No	B
3	SS	MG/KG	DDD	80	4	0 0036	0.38	0.029	0 046	0 037	0 0067	2 7	16	No	B
3	SS	MG/KG	DDE	80	33	0 0036	0.38	0 0014	0 17	0 033	0 16	1 9	54	No	B
3	SS	MG/KG	DDT	80	39	0 0036	0.38	0.002	0 41	0 08	0 074	1 9	11	No	B
3	SS	MG/KG	DIBENZOFURAN	37	3	0.34	15	0 49	2 4	1 3	0 65	31	15	No	B
3	SS	MG/KG	DIETHYL PHTHALATE	37	1	0 34	15	0 9	0 9	0 9		6300	470	No	B
3	SS	MG/KG	DI-n-BUTYL PHTHALATE	37	1	0 34	15	0 18	0 18	0 18		780	2300	No	B
3	SS	MG/KG	FLUORANTHENE	107	50	0 052000001	15	0.04	71	4 2	1.6	310	4300	No	B
3	SS	MG/KG	FLUORENE	107	14	0 052000001	15	0 056	4.8	1		310	560	No	B
3	SS	MG/KG	GAMMA-CHLORDANE	80	15	0 0018	0 2	0 0017	0 58	0 13	0 026	1 8		No	B

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TABLE D-10

Constituents of Potential Concern in FU3 - Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
3	SS	MG/KG	HEPTACHLOR	80	1	0 0018	0.2	0 035	0 035	0 035		0.14	23	No	B
3	SS	MG/KG	IRON	30	30	0 2	3.2	3960	51300	15498	37040	2300		No	E
3	SS	MG/KG	MAGNESIUM	30	30	0 22	7 5	263	10900	2406	4600			No	E
3	SS	MG/KG	MANGANESE	30	30	0 011	0.230000004	60	634	251	1304	1100		No	C
3	SS	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	80	5	0 009	0 013	0.002	0 044	0 016	0 002	4700	17	No	B
3	SS	MG/KG	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	80	1	0 009	0.013	0 002	0 002	0.002		630	2 6	No	B
3	SS	MG/KG	METHYLENE CHLORIDE	80	28	0 009	0 013	0 001	0 007	0 003		85	0 02	No	B
3	SS	MG/KG	NAPHTHALENE	107	4	0 052000001	15	0 085	0 63	0 24		160	84	No	B
3	SS	MG/KG	NICKEL	125	125	0.034000002	5	3 2	76	18	30	160	130	No	B
3	SS	MG/KG	PHENANTHRENE	107	44	0 052000001	15	0 043	52	3.3	0.61	230	250	No	B
3	SS	MG/KG	POTASSIUM	30	29	75	723	190	4650	1159	1820			No	E
3	SS	MG/KG	PYRENE	107	49	0.052000001	15	0 043	71	3.6	1 5	230	880	No	B
3	SS	MG/KG	SILVER	125	3	0.05	2 5	0 31	2 5	1.5	2	39	34	No	B
3	SS	MG/KG	SODIUM	30	9	0 879999995	94	62	863	334				No	E
3	SS	MG/KG	TOLUENE	81	5	0 005	0 013	0 001	0 004	0 0018	0 002	1600	12	No	B
3	SS	MG/KG	Total Xylenes	81	3	0.005	0.013	0.001	0 003	0 002	0 009	16000	0 2	No	C
3	SS	MG/KG	TRICHLOROETHYLENE (TCE)	80	1	0 009	0 013	0 001	0.001	0 001		58	0 06	No	B

Note Data evaluated includes field duplicates and normal samples (0-2 feet)

A full list of all chemicals and their COPC status can be found in Appendix I

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

TABLE D-11

Constituents of Potential Concern in FU3 - Subsurface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
3	SB	MG/KG	ANTIMONY	103	3	0.18	7.8	0.74	7.8	5.4		5	Yes	A
3	SB	MG/KG	ARSENIC	106	101	0.15	24	2.1	27	10	17	29	Yes	H
3	SB	MG/KG	BENZO(a)ANTHRACENE	89	4	0.052000001	2.1	0.044	1.2	0.37		2	Yes	H
3	SB	MG/KG	BENZO(a)PYRENE	89	3	0.052000001	2.1	0.08	1	0.4		8	Yes	H
3	SB	MG/KG	BENZO(b)FLUORANTHENE	89	3	0.052000001	2.1	0.088	1	0.4		5	Yes	H
3	SB	MG/KG	BENZO(k)FLUORANTHENE	89	3	0.052000001	2.1	0.081	0.72	0.3		49	Yes	H
3	SB	MG/KG	CADMIUM	106	13	0.0091	1.3	0.07	1.5	0.35	1.4	8	Yes	H
3	SB	MG/KG	CARBAZOLE	45	1	0.38	2.1	0.48	0.48	0.48		0.6	Yes	H
3	SB	MG/KG	CHROMIUM, TOTAL	106	106	0.058	3.1	2.1	102	26	26	38	Yes	A
3	SB	MG/KG	CHRYSENE	89	5	0.052000001	2.1	0.043	1.2	0.31		160	Yes	H
3	SB	MG/KG	COPPER	106	103	0.1	2.6	2.5	49	20	33		Yes	D
3	SB	MG/KG	DIELDRIN	59	1	0.0038	0.02	0.0049	0.0049	0.0049	0.37	0.0040	Yes	H
3	SB	MG/KG	INDENO(1,2,3-c,d)PYRENE	89	2	0.052000001	2.1	0.09	0.67	0.38		14	Yes	H
3	SB	MG/KG	LEAD	106	106	0.140000001	0.78	1.1	282	17	24		Yes	D
3	SB	MG/KG	MERCURY	106	3	0.0074	0.17	0.03	0.05	0.04	0.2	2	Yes	H
3	SB	MG/KG	PETROLEUM HYDROCARBONS	2	1	1.9	2.6	3.2	3.2	3.2		340	Yes	H
3	SB	MG/KG	SELENIUM	106	10	0.159999996	12	0.36	2.3	1.2	0.6	5	Yes	H
3	SB	MG/KG	TCDD Equivalent	13	13	0.001	0.001	0.00000005	0.0000079	0.0000019	0.000006	0.005	Yes	H
3	SB	MG/KG	VANADIUM	21	21	0.037	0.058	14	38	26	51	6000	Yes	H
3	SB	MG/KG	ZINC	106	106	0.076	5.2	1.7	145	59	114	12000	Yes	H
3	SB	MG/KG	2-HEXANONE	106	2	0.009	0.015	0.001	0.003	0.002		1.4	No	B
3	SB	MG/KG	2-METHYLNAPHTHALENE	89	1	0.052000001	2.1	0.057	0.057	0.057		6.1	No	B
3	SB	MG/KG	ACENAPHTHENE	89	1	0.052000001	2.1	0.48	0.48	0.48		570	No	B
3	SB	MG/KG	ACETONE	106	46	0.009	0.015	0.003	0.1	0.013		16	No	B
3	SB	MG/KG	ALUMINUM	21	21	0.8	8.3	5990	19500	11042	21829		No	C
3	SB	MG/KG	ANTHRACENE	89	1	0.052000001	2.1	0.67	0.67	0.67		12000	No	B
3	SB	MG/KG	BARIUM	21	21	0.03	0.059	59	240	103	300	1600	No	C
3	SB	MG/KG	BENZENE	106	2	0.009	0.015	0.001	0.001	0.001		0.03	No	B
3	SB	MG/KG	BENZO(g,h,i)PERYLENE	89	3	0.052000001	2.1	0.1	0.71	0.31		32000	No	B
3	SB	MG/KG	BENZYL BUTYL PHTHALATE	45	1	0.38	2.1	0.51	0.51	0.51		930	No	B
3	SB	MG/KG	BERYLLIUM	106	44	0.0027	1.3	0.1	1.7	0.76	1.2	63	No	B
3	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	45	17	0.38	2.1	0.045	7.8	0.68		3600	No	F
3	SB	MG/KG	BROMOMETHANE	106	4	0.009	0.015	0.002	0.007	0.0038		0.2	No	B
3	SB	MG/KG	CALCIUM	21	21	0.47	8.2	912	50300	4315	2432		No	E
3	SB	MG/KG	CARBON DISULFIDE	106	4	0.009	0.015	0.001	0.023	0.0065	0.002	32	No	B
3	SB	MG/KG	CHLOROMETHANE	106	1	0.009	0.015	0.002	0.002	0.002		0.01	No	B
3	SB	MG/KG	COBALT	21	21	0.032000002	0.062	2.7	10	7.1	20		No	C
3	SB	MG/KG	DDE	59	1	0.0038	0.02	0.04	0.04	0.04	0.0015	54	No	B
3	SB	MG/KG	DDT	59	1	0.0038	0.02	0.0079	0.0079	0.0079	0.0072	11	No	B
3	SB	MG/KG	DIBENZOFURAN	45	1	0.38	2.1	0.19	0.19	0.19	0.72	15	No	C
3	SB	MG/KG	DI-n-BUTYL PHTHALATE	45	4	0.38	2.1	0.075	1.2	0.38		2300	No	B
3	SB	MG/KG	FLUORANTHENE	89	4	0.052000001	2.1	0.069	2.4	0.73	0.045	4300	No	B
3	SB	MG/KG	FLUORENE	89	2	0.052000001	2.1	0.15	0.38	0.27		560	No	B
3	SB	MG/KG	IRON	21	21	0.2	3.2	11100	24200	17614	38480		No	E
3	SB	MG/KG	MAGNESIUM	21	21	0.23	7.5	816	7760	2455	4900		No	E
3	SB	MG/KG	MANGANESE	21	21	0.013	0.065	206	1170	545	1540		No	C
3	SB	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	106	15	0.009	0.015	0.002	0.038	0.014		17	No	B
3	SB	MG/KG	METHYLENE CHLORIDE	106	28	0.009	0.015	0.001	0.004	0.0019		0.02	No	B
3	SB	MG/KG	NAPHTHALENE	89	1	0.052000001	2.1	0.24	0.24	0.24		84	No	B
3	SB	MG/KG	NICKEL	106	105	0.034000002	5.2	0.57	48	21	37	130	No	B
3	SB	MG/KG	PHENANTHRENE	89	3	0.052000001	2.1	0.056	2.2	0.88		250	No	B
3	SB	MG/KG	POTASSIUM	21	18	75	102	625	3190	1405	1800		No	E

TABLE D-11

Constituents of Potential Concern in FU3 - Subsurface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
3	SB	MG/KG	PYRENE	89	4	0.052000001	2 1	0 064	2 4	0 70	0 042	880	No	B
3	SB	MG/KG	SILVER	106	1	0 050	2 6	0.38	0.38	0 38	1	34	No	C
3	SB	MG/KG	TOLUENE	106	1	0 0090	0 015	0.0040	0 0040	0 0040		12	No	B
3	SB	MG/KG	Total Xylenes	106	1	0 0090	0 015	0.0020	0.0020	0.0020	0 0020	0 20	No	C
3	SB	MG/KG	TRICHLOROETHYLENE (TCE)	106	5	0 0090	0 015	0.0020	0 010	0.0052		0 060	No	B

Note: Data evaluated includes field duplicates and normal samples (2 feet and below)

A full list of all chemicals and their COPC status can be found in Appendix I

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

TABLE D-12

Constituents of Potential Concern in FU3 Sediment

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Sediments	Regulatory Criteria for Leachability	COPC/BASIS	
3	SE	MG/KG	2 4-DIMETHYLPHENOL	1	1	2 7	2 7	16	16	16		160	9	Yes	A
3	SE	MG/KG	2 METHYLNAPHTHALENE	1	1	2 7	2 7	8 2	8 2	8 2		160	6 1	Yes	A
3	SE	MG/KG	ANTIMONY	1	1	0 35	0 35	28	28	28	7 6	3 1	5	Yes	A
3	SE	MG/KG	BARIUM	1	1	0 037999999	0 037999999	1120	1120	1120	118	550	1600	Yes	A
3	SE	MG/KG	CADMIUM	1	1	0 037999999	0 037999999	84	84	84	29	7 8	8	Yes	A
3	SE	MG/KG	CHROMIUM TOTAL	1	1	3 3	3 3	1700	1700	1700	20	10800	38	Yes	A
3	SE	MG/KG	LEAD	1	1	0 18	0 18	3820	3820	3820	35	400		Yes	A
3	SE	MG/KG	PETROLEUM HYDROCARBONS	1	1	134	134	5980	5980	5980		34	340	Yes	A
3	SE	MG/KG	ZINC	1	1	0 379999995	0 379999995	2550	2550	2550	797	2300	12000	Yes	A
3	SE	MG/KG	ACENAPHTHENE	1	1	2 7	2 7	0 39	0 39	0 39	0 77	470	570	No	C
3	SE	MG/KG	ALUMINUM	1	1	8 3	8 3	3550	3550	3550	10085	7800		No	C
3	SE	MG/KG	ANTHRACENE	1	1	2 7	2 7	0 51	0 51	0 51	1 6	2300	12000	No	C
3	SE	MG/KG	ARSENIC	1	1	1 1	1 1	5 9	5 9	5 9	12	0 43	29	No	C
3	SE	MG/KG	BENZO(a)ANTHRACENE	1	1	2 7	2 7	1 2	1 2	1 2	2 9	0 87	2	No	C
3	SE	MG/KG	BENZO(a)PYRENE	1	1	2 7	2 7	0 84	0 84	0 84	2 5	0 087	8	No	C
3	SE	MG/KG	BENZO(b)FLUORANTHENE	1	1	2 7	2 7	1 4	1 4	1 4	2 2	0 87	5	No	C
3	SE	MG/KG	BENZO(k)FLUORANTHENE	1	1	2 7	2 7	1 1	1 1	1 1	2 3	8 7	49	No	C
3	SE	MG/KG	bis(2 ETHYLHEXYL) PHTHALATE	1	1	2 7	2 7	12	12	12	0 48	46	3600	No	F
3	SE	MG/KG	CALCIUM	1	1	8 2	8 2	15900	15900	15900	14860			No	E
3	SE	MG/KG	CARBAZOLE	1	1	2 7	2 7	0 4	0 4	0 4	1 1	32	0 6	No	C
3	SE	MG/KG	CHRYSENE	1	1	2 7	2 7	1 6	1 6	1 6	3 2	87	160	No	C
3	SE	MG/KG	COBALT	1	1	0 032000002	0 032000002	44	44	44	14	470		No	B
3	SE	MG/KG	COPPER	1	1	0 129999995	0 129999995	153	153	153	58	310		No	B
3	SE	MG/KG	FLUORANTHENE	1	1	2 7	2 7	2 4	2 4	2 4	7 1	310	4300	No	C
3	SE	MG/KG	FLUORENE	1	1	2 7	2 7	0 7	0 7	0 7	0 87	310	560	No	C
3	SE	MG/KG	IRON	1	1	3 2	3 2	24700	24700	24700	23080	2300		No	E
3	SE	MG/KG	ISOPHORONE	1	1	2 7	2 7	0 4	0 4	0 4		670	0 5	No	B
3	SE	MG/KG	MAGNESIUM	1	1	7 5	7 5	1590	1590	1590	2440			No	E
3	SE	MG/KG	MANGANESE	1	1	0 013	0 013	224	224	224	871	1100		No	C
3	SE	MG/KG	MERCURY	1	1	0 0075	0 0075	0 1	0 1	0 1	4	2 3	2	No	C
3	SE	MG/KG	NAPHTHALENE	1	1	2 7	2 7	5 5	5 5	5 5	0 13	160	84	No	B
3	SE	MG/KG	NICKEL	1	1	0 119999997	0 119999997	30	30	30	31	160	130	No	C
3	SE	MG/KG	PHENANTHRENE	1	1	2 7	2 7	3 1	3 1	3 1	6 9	230	250	No	C
3	SE	MG/KG	POTASSIUM	1	1	75	75	173	173	173	1560			No	E
3	SE	MG/KG	PYRENE	1	1	2 7	2 7	2 2	2 2	2 2	2 9	230	880	No	C
3	SE	MG/KG	SODIUM	1	1	0 91	0 91	1330	1330	1330	240			No	E
3	SE	MG/KG	VANADIUM	1	1	0 057999998	0 057999998	0 1	0 1	0 1	30	55	6000	No	C

Note Data evaluated includes field duplicates and normal samples

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-13

Constituents of Potential Concern in RI Site 34 - Surface Soil

Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
3	34	SS	MG/KG	ARSENIC	5	5	1 6	2 3	1 7	49	15	20	0 43	29	Yes	A
3	34	SS	MG/KG	BENZO(a)ANTHRACENE	9	7	0 11	5 3	0 49	10	3 7	0 71	0 87	2	Yes	A
3	34	SS	MG/KG	BENZO(a)PYRENE	9	7	0 11	5 3	0 48	9 5	3 2	0 96	0 087	8	Yes	A
3	34	SS	MG/KG	BENZO(b)FLUORANTHENE	9	7	0 11	5 3	0 46	9 5	3 1	0 9	0 87	5	Yes	A
3	34	SS	MG/KG	BENZO(k)FLUORANTHENE	9	7	0 11	5 3	0 46	12	3 7	0 78	8 7	49	Yes	A
3	34	SS	MG/KG	CHROMIUM TOTAL	5	5	0 23	2 3	18 8	124	65	25	10800	38	Yes	A
3	34	SS	MG/KG	DIBENZ(a h)ANTHRACENE	9	2	0 11	5 3	0 21	1 2	0 71	0 26	0 087	2	Yes	A
3	34	SS	MG/KG	INDENO(1 2 3-c d)PYRENE	9	7	0 11	5 3	0 48	6 2	2 5	0 7	0 87	14	Yes	A
3	34	SS	MG/KG	LEAD	5	5	0 64	1 7	94	960	399	30	400		Yes	A
3	34	SS	MG/KG	CHRYSENE	9	7	0 11	5 3	0 52	12	4 1	0 94	87	160	Yes	G
3	34	SS	MG/KG	ACENAPHTHENE	9	2	0 11	5 3	0 11	1 6	0 86		470	570	No	B
3	34	SS	MG/KG	ACETONE	5	4	0 01	0 011	0 002	0 035	0 014		780	16	No	B
3	34	SS	MG/KG	ANTHRACENE	9	3	0 11	5 3	0 13	2 4	1 3	0 096	2300	12000	No	B
3	34	SS	MG/KG	BENZO(g,h i)PERYLENE	9	7	0 11	5 3	0 41	5 6	1 9	0 82	230	32000	No	B
3	34	SS	MG/KG	BERYLLIUM	5	1	0 014	0 9	2	2	2	1 1	16	63	No	B
3	34	SS	MG/KG	CADMIUM	5	1	0 35	1 1	0 59	0 59	0 59	1 4	7 8	8	No	C
3	34	SS	MG/KG	COPPER	5	5	0 13	2 3	7 1	52	20	34	310		No	B
3	34	SS	MG/KG	FLUORANTHENE	9	7	0 11	5 3	0 99	24	8 5	1 6	310	4300	No	B
3	34	SS	MG/KG	FLUORENE	9	3	0 11	5 3	0 14	1 6	1 1		310	560	No	B
3	34	SS	MG/KG	METHYLENE CHLORIDE	5	3	0 01	0 011	0 002	0 002	0 002		85	0 02	No	B
3	34	SS	MG/KG	NICKEL	5	5	0 58	4 5	4 6	16	8 9	30	160	130	No	C
3	34	SS	MG/KG	PHENANTHRENE	9	7	0 11	5 3	0 41	16	5 8	0 61	230	250	No	B
3	34	SS	MG/KG	PYRENE	9	7	0 11	5 3	0 94	17	6 2	1 5	230	880	No	B
3	34	SS	MG/KG	TOLUENE	5	1	0 01	0 011	0 002	0 002	0 002	0 002	1600	12	No	C
3	34	SS	MG/KG	Total Xylenes	5	1	0 01	0 011	0 002	0 002	0 002	0 009	16000	0 2	No	C
3	34	SS	MG/KG	ZINC	5	5	0 11	4 5	42	577	193	126	2300	12000	No	B

Note Data evaluated includes field duplicates and normal samples (0-2 feet)

A full list of all chemicals and their COPC status can be found in Appendix I

A Exceeds Criteria

B Does not exceed Criteria

C Does not exceed Background

D No Criteria available & exceeds Background, or no Criteria or Background available

E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC

F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC

G Chemical is a member of a chemical class which contains other COPCs

TABLE D-14

Constituents of Potential Concern in RI Site 34 - Subsurface Soil

Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC?	Basis?
3	34	SB	MG/KG	CHROMIUM, TOTAL	13	13	0 06	2 6	13	41	25	26	38	Yes	A
3	34	SB	MG/KG	ARSENIC	13	13	0 2	1 3	4 3	13	7 7	17	29	Yes	H
3	34	SB	MG/KG	BENZO(a)ANTHRACENE	13	1	0 062	0 42	0 18	0 18	0 18		2	Yes	H
3	34	SB	MG/KG	BENZO(a)PYRENE	13	1	0 062	0 42	0 13	0 13	0 13		8	Yes	H
3	34	SB	MG/KG	BENZO(b)FLUORANTHENE	13	1	0 062	0 42	0 12	0 12	0 12		5	Yes	H
3	34	SB	MG/KG	BENZO(k)FLUORANTHENE	13	1	0 062	0 42	0 1	0 1	0 1		49	Yes	H
3	34	SB	MG/KG	CHRYSENE	13	1	0 062	0 42	0 15	0 15	0 15		160	Yes	H
3	34	SB	MG/KG	LEAD	13	13	0 24	0 39	6 8	14	10	24		Yes	H
3	34	SB	MG/KG	ACETONE	13	11	0 012	0 013	0 004	0 032	0 011		16	No	B
3	34	SB	MG/KG	ALUMINUM	1	1	0 82	0 82	16800	16800	16800	21829		No	C
3	34	SB	MG/KG	BARIUM	1	1	0 03	0 03	147	147	147	300	1600	No	C
3	34	SB	MG/KG	BENZO(g,h,i)PERYLENE	13	1	0 062	0 42	0 13	0 13	0 13		32000	No	B
3	34	SB	MG/KG	BERYLLIUM	13	1	0 01	0 52	0 1	0 1	0 1	1 2	63	No	C
3	34	SB	MG/KG	CADMIUM	13	2	0 02	0 65	0 27	0 28	0 28	1 4	8	No	C
3	34	SB	MG/KG	CALCIUM	1	1	0 48	0 48	912	912	912	2432		No	E
3	34	SB	MG/KG	COBALT	1	1	0 041	0 041	10	10	10	20		No	C
3	34	SB	MG/KG	COPPER	13	13	0 1	1 3	9 4	22	15	33		No	C
3	34	SB	MG/KG	FLUORANTHENE	13	1	0 062	0 42	0 34	0 34	0 34	0 045	4300	No	B
3	34	SB	MG/KG	FLUORENE	13	1	0 062	0 42	0 15	0 15	0 15		560	No	B
3	34	SB	MG/KG	IRON	1	1	0 21	0 21	24200	24200	24200	38480		No	E
3	34	SB	MG/KG	MAGNESIUM	1	1	0 24	0 24	3030	3030	3030	4900		No	E
3	34	SB	MG/KG	MANGANESE	1	1	0 024	0 024	1090	1090	1090	1540		No	C
3	34	SB	MG/KG	METHYLENE CHLORIDE	13	4	0 012	0 013	0 001	0 0030	0 0020		0 02	No	B
3	34	SB	MG/KG	NICKEL	13	13	0 15	2 6	12	21	16	37	130	No	C
3	34	SB	MG/KG	PHENANTHRENE	13	1	0 062	0 42	0 37	0 37	0 37		250	No	B
3	34	SB	MG/KG	PYRENE	13	1	0 062	0 42	0 26	0 26	0 26	0 042	880	No	B
3	34	SB	MG/KG	TRICHLOROETHYLENE (TCE)	13	3	0 012	0 013	0 0020	0 007	0 0043		0 06	No	B
3	34	SB	MG/KG	VANADIUM	1	1	0 054	0 054	38	38	38	51	6000	No	C
3	34	SB	MG/KG	ZINC	13	13	0 078	2 6	31	75	49	114	12000	No	C
3	34	SB	MG/KG	POTASSIUM	1	1	93	93	3190	3190	3190	1800		No	E

Note Data evaluated includes field duplicates and normal samples (2 feet and below)

A Exceeds Criteria

B Does not exceed Criteria

C Does not exceed Background

D No Criteria available & exceeds Background, or no Criteria or Background available

E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC

F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC

G Chemical is a member of a chemical class which contains other COPCs

H Chemical is a surface soil COPC

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TABLE D-15
Constituents of Potential Concern in FU4 - Surface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
4	SS	MG/KG	1,1,2,2 TETRACHLOROETHANE	105	3	0.01	0.025	0.004	0.007	0.0053		3.2	0.003	Yes	A
4	SS	MG/KG	ALPHA-CHLORDANE	108	22	0.0018	0.78	0.00075	3.4	0.18	0.029	1.8		Yes	A
4	SS	MG/KG	ALUMINUM	43	43	0.85000002	28	674	27600	8896	23810	7800		Yes	A
4	SS	MG/KG	ANTIMONY	147	46	0.18000001	10	0.37	27.5	4	7	3.1	5	Yes	A
4	SS	MG/KG	ARSENIC	150	147	0.14	3.29999995	1.1	66.3	13	20	0.43	29	Yes	A
4	SS	MG/KG	BENZO(a)ANTHRACENE	129	47	0.057	6.2	0.037	6.6	0.64	0.71	0.87	2	Yes	A
4	SS	MG/KG	BENZO(a)PYRENE	129	49	0.057	6.2	0.04	6.3	0.60	0.96	0.087	8	Yes	A
4	SS	MG/KG	BENZO(b)FLUORANTHENE	129	50	0.057	6.2	0.048	6.4	0.59	0.9	0.87	5	Yes	A
4	SS	MG/KG	CARBAZOLE	99	12	0.34	2.2	0.035	1.8	0.44	0.067	32	0.6	Yes	A
4	SS	MG/KG	CHROMIUM, TOTAL	150	150	0.036	3.29999995	5	4385	93	25	10800	38	Yes	A
4	SS	MG/KG	CHRYSENE	129	50	0.057	6.2	0.045	7.1	0.69	0.94	87	160	Yes	G
4	SS	MG/KG	COPPER	150	150	0.1	3.29999995	1.4	1400	35	34	310		Yes	A
4	SS	MG/KG	DDE	108	34	0.0034	1.5	0.0013	3	0.23	0.16	1.9	54	Yes	A
4	SS	MG/KG	DDT	108	48	0.0034	1.5	0.0024	13	0.48	0.074	1.9	11	Yes	A
4	SS	MG/KG	DIBENZ(a h)ANTHRACENE	129	7	0.057	6.2	0.046	0.87	0.24	0.26	0.087	2	Yes	A
4	SS	MG/KG	DIELDRIN	108	44	0.0034	1.5	0.0012	5.6	0.57	0.086	0.04	0.004	Yes	A
4	SS	MG/KG	GAMMA-CHLORDANE	108	22	0.0018	0.78	0.00097	3.3	0.18	0.026	1.8		Yes	A
4	SS	MG/KG	INDENO(1 2 3-c d)PYRENE	129	37	0.057	6.2	0.042	4.1	0.53	0.7	0.87	14	Yes	A
4	SS	MG/KG	LEAD	150	150	0.11	6.5	5	2800	153	30	400		Yes	A
4	SS	MG/KG	MANGANESE	43	43	0.011	2.79999995	34	2260	391	1304	1100		Yes	A
4	SS	MG/KG	PCB-1260 (AROCHLOR 1260)	54	5	0.034	15	0.28	18	8.4	0.11	0.32	17	Yes	A
4	SS	MG/KG	PENTACHLOROPHENOL	99	8	0.17	1.20000005	0.048	0.3	0.11		5.3	0.03	Yes	A
4	SS	MG/KG	PETROLEUM HYDROCARBONS	3	2	1.70000005	111	1300	1570	1435		34	340	Yes	A
4	SS	MG/KG	SELENIUM	150	36	0.15000001	1.79999995	0.28	15	3	0.8	39	5	Yes	A
4	SS	MG/KG	TCDD Equivalent	27	27	0.001	0.001	0.0000010	0.00047	0	0.00001	0.0000043	0.005	Yes	A
4	SS	MG/KG	THALLIUM	150	2	0.14	3.29999995	2.8	6.5	4.7		0.55	0.7	Yes	A
4	SS	MG/KG	ZINC	150	149	0.076	7	9.5	9915	238	126	2300	12000	Yes	A
4	SS	MG/KG	2-HEXANONE	105	2	0.01	0.025	0.001	0.001	0.001		310	1.4	No	B
4	SS	MG/KG	2-METHYLNAPHTHALENE	129	4	0.057	12	0.051	0.13	0.089		160	6.1	No	B
4	SS	MG/KG	ACENAPHTHENE	129	7	0.057	12	0.041	1.2	0.48		470	570	No	B
4	SS	MG/KG	ACENAPHTHYLENE	129	2	0.057	12	0.074	0.2	0.14	0.19	470	27	No	B
4	SS	MG/KG	ACETONE	105	33	0.01	0.025	0.002	0.31	0.035		780	16	No	B
4	SS	MG/KG	ANTHRACENE	129	15	0.057	25	0.048	1.9	0.49	0.096	2300	12000	No	B
4	SS	MG/KG	BARIUM	43	43	0.019	7	6.7	366	81	234	550	1600	No	B
4	SS	MG/KG	BENZENE	105	1	0.01	0.025	0.002	0.002	0.002		22	0.03	No	B
4	SS	MG/KG	BENZO(g h i)PERYLENE	129	41	0.057	6.2	0.041	4.2	0.45	0.82	230	32000	No	B
4	SS	MG/KG	BENZO(k)FLUORANTHENE	129	48	0.057	6.2	0.04	5.7	0.63	0.78	8.7	49	No	B
4	SS	MG/KG	BENZYL BUTYL PHTHALATE	99	3	0.34	2	0.11	0.7	0.34	0.65	1600	930	No	B
4	SS	MG/KG	BERYLLIUM	150	80	0	1.39999998	0.02	1.6	0.38	1.1	16	63	No	B
4	SS	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	99	43	0.2	2	0.038	3	0.35		46	3600	No	F
4	SS	MG/KG	BROMOMETHANE	105	2	0.01	0.025	0.001	0.003	0.002		11	0.2	No	B
4	SS	MG/KG	CADMIUM	150	66	0.0088	1.70000005	0.12	4.8	0.92	1.4	7.8	8	No	B
4	SS	MG/KG	CALCIUM	43	41	0.61000001	138	479	306000	32982	5840			No	E
4	SS	MG/KG	CARBON DISULFIDE	105	2	0.01	0.025	0.001	0.001	0.001	0.002	780	32	No	C
4	SS	MG/KG	CHLOROMETHANE	105	1	0.01	0.025	0.001	0.001	0.001		49	0.01	No	B
4	SS	MG/KG	COBALT	43	43	0.032	2.79999995	0.25	19	6	18	470		No	B
4	SS	MG/KG	DDD	108	1	0.0034	1.5	0.033	0.033	0.033	0.0067	2.7	16	No	B
4	SS	MG/KG	DIBENZOFURAN	99	4	0.34	2	0.05	0.44	0.27	0.65	31	15	No	C
4	SS	MG/KG	DIETHYL PHTHALATE	99	1	0.34	2	0.18	0.18	0.18		6300	470	No	B
4	SS	MG/KG	DI-n-BUTYL PHTHALATE	99	12	0.34	2	0.041	0.15	0.091		780	2300	No	B
4	SS	MG/KG	DI n-OCTYLPHTHALATE	99	1	0.34	2	0.12	0.12	0.12		160	10000	No	B
4	SS	MG/KG	ETHYLBENZENE	105	1	0.01	0.025	0.008	0.008	0.008		780	13	No	B
4	SS	MG/KG	FLUORANTHENE	129	51	0.057	6.2	0.049	14	1	1.6	310	4300	No	B
4	SS	MG/KG	FLUORENE	129	8	0.057	31	0.04	0.77	0.36		310	560	No	B
4	SS	MG/KG	IRON	43	43	0.22	28	1360	66100	15737	37040	2300		No	E
4	SS	MG/KG	MAGNESIUM	43	43	0.37	138	122	7060	2260	4600			No	E
4	SS	MG/KG	MERCURY	150	44	0	0.16	0.01	0.11	0.044	0.4	2.3	2	No	C
4	SS	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	105	8	0.01	0.025	0.006	0.044	0.022	0.002	4700	17	No	B
4	SS	MG/KG	METHYLENE CHLORIDE	105	21	0.01	0.025	0.001	0.01	0.0029		85	0.02	No	B
4	SS	MG/KG	NAPHTHALENE	129	4	0.057	6.2	0.045	0.38	0.19		160	84	No	B

TABLE D-15

Constituents of Potential Concern in FU4 - Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
4	SS	MG/KG	NICKEL	150	150	0 033	7	2 3	44	19	30	160	130	No	B
4	SS	MG/KG	PHENANTHRENE	129	47	0 057	25	0 038	9 7	0 95	0 61	230	250	No	B
4	SS	MG/KG	POTASSIUM	43	42	71	710	89	3140	1135	1820			No	E
4	SS	MG/KG	PYRENE	129	53	0 057	6 2	0 05	12	1	1 5	230	880	No	B
4	SS	MG/KG	SILVER	150	18	0 05	3 29999995	0 045	0 63	0 26	2	39	34	No	C
4	SS	MG/KG	SODIUM	43	10	0 91000003	276	104	1080	466				No	E
4	SS	MG/KG	TETRACHLOROETHYLENE(PCE)	105	1	0 01	0 025	0 008	0 008	0 008		12	0 06	No	B
4	SS	MG/KG	TOLUENE	105	4	0 01	0 025	0 002	0 017	0 0093	0 002	1600	12	No	B
4	SS	MG/KG	Total Xylenes	105	4	0 01	0 025	0 001	0 002	0 0018	0 009	16000	0 2	No	C
4	SS	MG/KG	TRICHLOROETHYLENE (TCE)	105	1	0 01	0 025	0 005	0 005	0 005		58	0 06	No	B
4	SS	MG/KG	VANADIUM	43	43	0 032	5 5	3 4	51	21	48	55	6000	No	B

Note Data evaluated include field duplicates and normal samples (0-2 feet)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-16
Constituents of Potential Concern in FU4 - Subsurface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC	BASIS
4	SB	MG/KG	1,1,2,2-TETRACHLOROETHANE	157	5	0.01	0.024	0.005	0.02	0.012		0.003	Yes	A
4	SB	MG/KG	ALPHA-CHLORDANE	144	1	0.0018	0.0083	0.022	0.022	0.022	0.0026		Yes	D
4	SB	MG/KG	ALUMINUM	57	57	0.8	25	1800	26800	11481	21829		Yes	D
4	SB	MG/KG	ANTIMONY	154	9	0.22	10	0.51	8.7	2.5		5	Yes	A
4	SB	MG/KG	ARSENIC	157	157	0.15000001	3.29999995	1.3	34	13	17	29	Yes	A
4	SB	MG/KG	CHROMIUM, TOTAL	157	157	0.058	3.29999995	1.8	140	22	26	38	Yes	A
4	SB	MG/KG	COBALT	57	57	0.032	2.5	1.1	28	8.6	20		Yes	D
4	SB	MG/KG	COPPER	157	157	0.1	3.29999995	3	57	24	33		Yes	D
4	SB	MG/KG	GAMMA-CHLORDANE	144	1	0.0018	0.0083	0.024	0.024	0.024	0.0022		Yes	D
4	SB	MG/KG	LEAD	157	156	0.076	1	1.8	38	17	24		Yes	D
4	SB	MG/KG	MANGANESE	57	57	0.013	2.5	39	2960	661	1540		Yes	D
4	SB	MG/KG	PENTACHLOROPHENOL	154	1	0.12	50	470	470	470		0.03	Yes	A
4	SB	MG/KG	TCDD Equivalent	35	32	0.001	0.001	0.000000045	0.013	0.00042	0.000006	0.005	Yes	A
4	SB	MG/KG	THALLIUM	157	2	0.15	3.29999995	3.5	4.7	4.1		0.7	Yes	A
4	SB	MG/KG	TOTAL 1,2-DICHLOROETHENE	157	4	0.01	0.025	0.006	0.11	0.063			Yes	D
4	SB	MG/KG	TRICHLOROETHYLENE (TCE)	157	10	0.01	0.025	0.001	0.32	0.056		0.06	Yes	A
4	SB	MG/KG	BENZO(a)ANTHRACENE	157	3	0.055	2	0.042	0.18	0.099		2	Yes	H
4	SB	MG/KG	BENZO(a)PYRENE	157	3	0.055	2	0.049	0.16	0.093		8	Yes	H
4	SB	MG/KG	BENZO(b)FLUORANTHENE	157	3	0.055	2	0.057	0.21	0.12		5	Yes	H
4	SB	MG/KG	CARBAZOLE	151	1	0.34999999	2	0.07	0.07	0.07		0.6	Yes	H
4	SB	MG/KG	CHRYSENE	157	3	0.055	2	0.066	0.27	0.14		160	Yes	H
4	SB	MG/KG	DDE	144	5	0.0034	0.016	0.002	0.024	0.0089	0.0015	54	Yes	H
4	SB	MG/KG	DDT	144	8	0.0034	0.016	0.0033	0.019	0.0089	0.0072	11	Yes	H
4	SB	MG/KG	DIELDRIN	144	7	0.0034	0.016	0.0014	0.039	0.011	0.37	0.004	Yes	H
4	SB	MG/KG	INDENO(1,2,3-c,d)PYRENE	157	1	0.055	2	0.14	0.14	0.14		14	Yes	H
4	SB	MG/KG	PETROLEUM HYDROCARBONS	5	2	1.70000005	2	19	20	19		340	Yes	H
4	SB	MG/KG	SELENIUM	157	8	0.13	1.70000005	0.57	2	1.5	0.6	5	Yes	H
4	SB	MG/KG	ZINC	157	156	0.076	6.7	9.9	223	83	114	12000	Yes	H
4	SB	MG/KG	1,1-DICHLOROETHENE	157	1	0.01	0.025	0.009	0.009	0.009		0.06	No	B
4	SB	MG/KG	ACETONE	157	55	0.01	0.025	0.003	0.16	0.023		16	No	B
4	SB	MG/KG	ALDRIN	144	1	0.0018	0.0083	0.0031	0.0031	0.0031		0.5	No	B
4	SB	MG/KG	ANTHRACENE	157	2	0.055	2	0.054	0.2	0.127		12000	No	B
4	SB	MG/KG	BARIUM	57	57	0.03	6.3	6.7	422	126	300	1600	No	B
4	SB	MG/KG	BENZENE	157	1	0.01	0.025	0.001	0.001	0.001		0.03	No	B
4	SB	MG/KG	BENZO(g,h,i)PERYLENE	157	2	0.055	2	0.044	0.14	0.092		32000	No	B
4	SB	MG/KG	BENZO(k)FLUORANTHENE	157	2	0.055	2	0.039	0.18	0.1095		49	No	B
4	SB	MG/KG	BENZYL BUTYL PHTHALATE	151	3	0.34999999	2	0.086	0.43	0.204		930	No	B
4	SB	MG/KG	BERYLLIUM	157	71	0.0031	1.29999995	0.33	1.8	0.63	1.2	63	No	B
4	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	150	43	0.34999999	39	0.042	180	5.0		3600	No	F
4	SB	MG/KG	BROMOMETHANE	157	2	0.01	0.025	0.001	0.002	0.0015		0.2	No	B
4	SB	MG/KG	CADMIUM	157	18	0.01	1.70000005	0.03	1.8	0.41	1.4	8	No	B
4	SB	MG/KG	CALCIUM	57	56	0.47	126	377	5670	1344	2432		No	E
4	SB	MG/KG	CHLOROMETHANE	157	2	0.01	0.025	0.001	0.002	0.0015		0.01	No	B
4	SB	MG/KG	DIMETHYL PHTHALATE	151	1	0.34999999	2	0.18	0.18	0.18		380	No	B
4	SB	MG/KG	DI-n-BUTYL PHTHALATE	151	23	0.34999999	2	0.041	0.74	0.13		2300	No	B
4	SB	MG/KG	FLUORANTHENE	157	5	0.055	2	0.05	0.54	0.18	0.045	4300	No	B
4	SB	MG/KG	IRON	57	57	0.2	25	3450	40800	19278	38480		No	E
4	SB	MG/KG	MAGNESIUM	57	57	0.23	126	295	84200	3861	4900		No	E
4	SB	MG/KG	MERCURY	157	3	0.0073	0.16	0.04	0.37	0.26	0.2	2	No	B
4	SB	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	157	11	0.01	0.025	0.001	0.024	0.012		17	No	B
4	SB	MG/KG	METHYLENE CHLORIDE	157	25	0.01	0.025	0.001	0.008	0.0025		0.02	No	B

TABLE D-16
Constituents of Potential Concern in FU4 - Subsurface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC	BASIS
4	SB	MG/KG	NICKEL	157	157	0 039	6 7	3 3	64 8	27	36 6	130	No	B
4	SB	MG/KG	N-NITROSODIPHENYLAMINE	151	1	0 34999999	2	0 14	0 14	0 14		1	No	B
4	SB	MG/KG	PHENANTHRENE	157	4	0 055	2	0 049	0 35	0 13		250	No	B
4	SB	MG/KG	POTASSIUM	57	55	75	505	236	3710	1517	1800		No	E
4	SB	MG/KG	PYRENE	157	5	0 055	2	0 044	0 37	0 13	0 042	880	No	B
4	SB	MG/KG	SILVER	157	9	0 06	3 29999995	0 09	0 25	0 14	1	34	No	C
4	SB	MG/KG	SODIUM	57	3	0 91000003	252	110	451	337			No	E
4	SB	MG/KG	TETRACHLOROETHYLENE(PCE)	157	2	0 01	0 024	0 004	0 006	0 005		0 06	No	B
4	SB	MG/KG	TOLUENE	157	1	0 01	0 025	0 002	0 002	0 002		12	No	B
4	SB	MG/KG	Total Xylenes	157	1	0 01	0 025	0 002	0 002	0 002	0 002	0 2	No	C
4	SB	MG/KG	VANADIUM	57	57	0 053	5	5 1	65 1	26	51 3	6000	No	B

Note Data evaluated include field duplicates and normal samples (2 feet and below)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

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TABLE D-17
Constituents of Potential Concern in FU4 - Sediment
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Sediments	Regulatory Criteria for Leachability	COPC/BASIS	
4	SE	MG/KG	2 METHYLNAPHTHALENE	11	3	0.36	9.5	0.026	10	5.7		160	6.1	Yes	A
4	SE	MG/KG	4-METHYLPHENOL (p-CRESOL)	11	1	0.36	13	0.17	0.17	0.17		39	0.02	Yes	A
4	SE	MG/KG	BENZO(a)ANTHRACENE	11	10	0.36	9.5	0.06	20	3.6	2.9	0.87	2	Yes	A
4	SE	MG/KG	BENZO(a)PYRENE	11	10	0.36	9.5	0.085	19	3.4	2.5	0.087	8	Yes	A
4	SE	MG/KG	BENZO(b)FLUORANTHENE	11	10	0.36	13	0.18	26	4.7	2.2	0.87	5	Yes	A
4	SE	MG/KG	BENZO(k)FLUORANTHENE	11	10	0.36	9.5	0.12	25	4.1	2.3	8.7	49	Yes	A
4	SE	MG/KG	CARBAZOLE	11	5	0.36	13	0.1	2.4	1	1.1	32	0.6	Yes	A
4	SE	MG/KG	CARBON TETRACHLORIDE	11	1	0.011	0.014	0.078	0.078	0.078		4.9	0.07	Yes	A
4	SE	MG/KG	CHROMIUM TOTAL	11	11	0.230000004	0.32	3.7	69	23	20	1.08E+04	38	Yes	A
4	SE	MG/KG	DIELDRIN	11	8	0.0039	0.36	0.038	0.31	0.15	0.011	0.04	0.004	Yes	A
4	SE	MG/KG	INDENO(1,2,3-c,d)PYRENE	11	8	0.36	13	0.1	9.1	1.3	1.7	0.87	14	Yes	A
4	SE	MG/KG	LEAD	11	11	0.21	2.4	1.8	484	92	35.2	400		Yes	A
4	SE	MG/KG	METHYLENE CHLORIDE	11	2	0.011	0.014	0.032	0.045	0.039		85	0.02	Yes	A
4	SE	MG/KG	PENTACHLOROPHENOL	11	2	0.18	31	0.08	0.26	0.17		5.3	0.03	Yes	A
4	SE	MG/KG	TCDD Equivalent	11	11	0	0.001	0.0000003	0.00049	0.000095	0.000009	0.0000043	0.005	Yes	A
4	SE	MG/KG	CHRYSENE	11	10	0.36	9.5	0.16	30	4.9	3.2	87	160	Yes	G
4	SE	MG/KG	ACENAPHTHYLENE	11	1	0.36	13	0.038	0.038	0.038		470	27	No	B
4	SE	MG/KG	ACETONE	11	1	0.011	0.014	0.025	0.025	0.025		780	16	No	B
4	SE	MG/KG	ALPHA ENDOSULFAN	11	1	0.002	0.18	0.032	0.032	0.032		47	18	No	B
4	SE	MG/KG	ALPHA CHLORDANE	11	5	0.002	0.18	0.0032	0.53	0.13	0.0052	1.8		No	B
4	SE	MG/KG	ANTHRACENE	11	5	0.36	13	0.094	6.9	2.3	1.6	2300	12000	No	B
4	SE	MG/KG	BENZO(g h i)PERYLENE	11	8	0.36	13	0.095	9.5	1.4	1.8	230	32000	No	B
4	SE	MG/KG	CYANIDE	3	2	0.18	0.200000003	0.6	0.7	0.65		160	40	No	B
4	SE	MG/KG	DDD	11	7	0.0039	0.36	0.03	0.99	0.20	0.0061	2.7	16	No	B
4	SE	MG/KG	DDE	11	7	0.0039	0.36	0.015	0.25	0.087	0.0072	1.9	54	No	B
4	SE	MG/KG	DDT	11	10	0.0039	0.36	0.022	0.27	0.13		1.9	11	No	B
4	SE	MG/KG	DIETHYL PHTHALATE	11	1	0.36	13	7.7	7.7	7.7		6300	470	No	B
4	SE	MG/KG	DI-n BUTYL PHTHALATE	11	1	0.36	13	0.034	0.034	0.034		780	2300	No	B
4	SE	MG/KG	ENDRIN	11	2	0.0039	0.36	0.045	0.048	0.047		2.3	1	No	B
4	SE	MG/KG	ENDRIN ALDEHYDE	11	2	0.0039	0.36	0.029	0.043	0.036		2.3	1	No	B
4	SE	MG/KG	FLUORANTHENE	11	10	0.36	13	0.16	32	7.0	7.1	310	4300	No	B
4	SE	MG/KG	FLUORENE	11	3	0.36	9.5	0.066	7.2	4.2	0.87	310	560	No	B
4	SE	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	11	1	0.011	0.014	0.014	0.014	0.014	0.01	4700	17	No	B
4	SE	MG/KG	PHENANTHRENE	11	10	0.36	13	0.02	33	6.8	6.9	230	250	No	B
4	SE	MG/KG	PYRENE	11	10	0.36	13	0.13	55	9.0	2.9	230	880	No	B
4	SE	MG/KG	Total Xylenes	11	2	0.011	0.014	0.018	0.036	0.027		16000	0.2	No	B
4	SE	MG/KG	ACENAPHTHENE	11	1	0.36	9.5	0.061	0.061	0.061	0.77	470	570	No	C
4	SE	MG/KG	ALUMINUM	8	8	1.9	2.6	203	3450	2063	10085	7800		No	C
4	SE	MG/KG	ANTIMONY	11	2	0.469999999	2.2	1.3	1.4	1.4	7.6	3.1	5	No	C
4	SE	MG/KG	ARSENIC	11	10	0.18	2	0.26	10	5.2	12	0.43	29	No	C
4	SE	MG/KG	BARIUM	8	8	0.037	0.26	5.8	79	41	118	550	1600	No	C
4	SE	MG/KG	BERYLLIUM	11	7	0.014	0.26	0.04	0.35	0.14	1.3	16	63	No	C
4	SE	MG/KG	CADMIUM	11	4	0.230000004	0.469999999	1.3	3	2.4	29	7.8	8	No	C
4	SE	MG/KG	COBALT	8	8	0.230000004	0.36	1.5	11	4.2	14	470		No	C
4	SE	MG/KG	COPPER	11	11	0.129999995	0.26	2.9	57	22	58	310		No	C
4	SE	MG/KG	DIBENZ(a h)ANTHRACENE	11	1	0.36	13	0.09	0.09	0.09	0.7	0.087	2	No	C
4	SE	MG/KG	GAMMA-CHLORDANE	11	5	0.002	0.18	0.0038	0.65	0.16	2	1.8		No	C
4	SE	MG/KG	MANGANESE	8	8	0.035999998	0.26	37	341	152	871	1100		No	C
4	SE	MG/KG	MERCURY	11	2	0.0066	0.129999995	0.1	0.12	0.11	4	2.3	2	No	C
4	SE	MG/KG	NICKEL	11	10	0.230000004	0.79	3	19	8.4	31	160	130	No	C
4	SE	MG/KG	SELENIUM	11	2	0.15	1.7	0.87	1.1	0.99	1.7	39	5	No	C
4	SE	MG/KG	VANADIUM	8	8	0.18	0.26	2.1	18	10	30	55	6000	No	C
4	SE	MG/KG	ZINC	11	11	0.109999999	0.26	16	288	96	797	2300	12000	No	C
4	SE	MG/KG	CALCIUM	8	8	0.61	16	24800	243000	97288	14860			No	E
4	SE	MG/KG	IRON	8	8	0.21	3.4	2960	12200	7386	23080	2300		No	E
4	SE	MG/KG	MAGNESIUM	8	8	1.9	2.6	1620	7780	3220	2440			No	E

TABLE D-17
Constituents of Potential Concern in FU4 - Sediment
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Sediments	Regulatory Criteria for Leachability	COPC/BASIS	
4	SE	MG/KG	POTASSIUM	8	8	9 6	107	76	419	261	1560			No	E
4	SE	MG/KG	SODIUM	8	6	0 939999998	2 6	63	158	113	240			No	E
4	SE	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	11	2	0 36	9 5	0 074	1 5	0 787	0 48	46	3600	No	F

Note
- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-18

Constituents of Potential Concern in Residential Point Estimate at Station SS14A - Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
4	SS	MG/KG	BENZO(a)ANTHRACENE	6	0 71	0 87	2	Yes	A
4	SS	MG/KG	BENZO(a)PYRENE	6 1	0 96	0 087	8	Yes	A
4	SS	MG/KG	CARBAZOLE	1 4	0 067	32	0 6	Yes	A
4	SS	MG/KG	PENTACHLOROPHENOL	0 11		5 3	0 03	Yes	A
4	SS	MG/KG	CHRYSENE	0 11	0.94	87	160	Yes	G
4	SS	MG/KG	ACENAPHTHENE	1 4		470	570	No	B
4	SS	MG/KG	ANTHRACENE	2 4	0 096	2300	12000	No	B
4	SS	MG/KG	BENZO(g,h,i)PERYLENE	4 9	0 82	230	32000	No	B
4	SS	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	0 71		46	3600	No	B
4	SS	MG/KG	COPPER	34	34	310		No	B
4	SS	MG/KG	FLUORANTHENE	12	1 6	310	4300	No	B
4	SS	MG/KG	FLUORENE	0 91		310	560	No	B
4	SS	MG/KG	LEAD	36	30	400		No	B
4	SS	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	0 03	0 002	4700	17	No	B
4	SS	MG/KG	PHENANTHRENE	7.1	0 61	230	250	No	B
4	SS	MG/KG	PYRENE	9 6	1 5	230	880	No	B
4	SS	MG/KG	ALUMINUM	10100	23810	7800		No	C
4	SS	MG/KG	ARSENIC	12	20	0 43	29	No	C
4	SS	MG/KG	BARIUM	111	234	550	1600	No	C
4	SS	MG/KG	BENZO(a)ANTHRACENE	0 093	0 71	0 87	2	No	C
4	SS	MG/KG	BENZO(b)FLUORANTHENE	0 13	0 9	0.87	5	No	C
4	SS	MG/KG	BENZO(k)FLUORANTHENE	0 088	0.78	8 7	49	No	C
4	SS	MG/KG	BERYLLIUM	0 32	1 1	16	63	No	C
4	SS	MG/KG	CADMIUM	0.56	1 4	7 8	8	No	C
4	SS	MG/KG	CALCIUM	1875	5840			No	E
4	SS	MG/KG	CHROMIUM, TOTAL	19	24 8	10800	38	No	C
4	SS	MG/KG	COBALT	8 8	18	470		No	C
4	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	0 079	0.7	0 87	14	No	C
4	SS	MG/KG	IRON	18300	37040	2300		No	C
4	SS	MG/KG	MAGNESIUM	2290	4600			No	E
4	SS	MG/KG	MANGANESE	492	1304	1100		No	C
4	SS	MG/KG	MERCURY	0 081	0 4	2.3	2	No	C
4	SS	MG/KG	NICKEL	22	30	160	130	No	C
4	SS	MG/KG	VANADIUM	25	48	55	6000	No	C
4	SS	MG/KG	ZINC	121	126	2300	12000	No	C

TABLE D-18

Constituents of Potential Concern in Residential Point Estimate at Station SS14A - Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
4	SS	MG/KG	2-METHYLNAPHTHALENE	0 11		160	6 1	No	B
4	SS	MG/KG	BENZYL BUTYL PHTHALATE	0.11	0 65	1600	930	No	C
4	SS	MG/KG	BROMOMETHANE	0.001		11	0 2	No	B
4	SS	MG/KG	DIBENZOFURAN	0 37	0 65	21	15	No	C
4	SS	MG/KG	NAPHTHALENE	0 19		160	84	No	B
4	SS	MG/KG	POTASSIUM	2040	1820			No	E

Note. Data evaluated include field duplicates and normal samples (0-2 feet)

A Exceeds Criteria

B Does not exceed Criteria

C Does not exceed Background

D No Criteria available & exceeds Background, or no Criteria or Background available

E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC.

F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC

G Chemical is a member of a chemical class which contains other COPCs

TABLE D-19
Constituents of Potential Concern in Screening Site 36 Surface Soil
Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
4	36	SS	MG/KG	1,1,2,2 TETRACHLOROETHANE	23	3	0.011	0.013	0.004	0.007	0.0053		3.2	0.003	Yes	A
4	36	SS	MG/KG	ANTIMONY	24	3	0.189999998	7.6	2	18	9.4	7	3.1	5	Yes	A
4	36	SS	MG/KG	ARSENIC	24	24	0.159999996	2.5	11	28	20	20	0.43	29	Yes	A
4	36	SS	MG/KG	DIELDRIN	23	6	0.0037	0.8	0.0012	2.6	0.45	0.086	0.04	0.004	Yes	A
4	36	SS	MG/KG	PENTACHLOROPHENOL	23	1	0.189999998	0.79	0.11	0.11	0.11		5.3	0.03	Yes	A
4	36	SS	MG/KG	SELENIUM	24	8	0.170000002	1.3	0.79	15	4.1	0.8	39	5	Yes	A
4	36	SS	MG/KG	2-HEXANONE	23	1	0.011	0.013	0.001	0.001	0.001		310	1.4	No	B
4	36	SS	MG/KG	ACETONE	23	7	0.011	0.013	0.007	0.27	0.074		780	16	No	B
4	36	SS	MG/KG	ALPHA CHLORDANE	23	3	0.0019	0.41	0.0016	0.011	0.0073	0.029	1.8		No	C
4	36	SS	MG/KG	ALUMINUM	2	2	0.89	0.96	11100	11200	11150	23810	7800		No	C
4	36	SS	MG/KG	ANTHRACENE	24	1	0.11	1.6	0.058	0.058	0.058	0.096	2300	12000	No	C
4	36	SS	MG/KG	BARIUM	2	2	0.054000001	0.057999998	107	114	111	234	550	1600	No	C
4	36	SS	MG/KG	BENZENE	23	1	0.011	0.013	0.002	0.002	0.002		22	0.03	No	B
4	36	SS	MG/KG	BENZO(a)ANTHRACENE	24	4	0.11	1.6	0.042	0.14	0.093	0.71	0.87	2	No	C
4	36	SS	MG/KG	BENZO(a)PYRENE	24	4	0.11	1.6	0.048	0.13	0.091	0.96	0.087	8	No	C
4	36	SS	MG/KG	BENZO(b)FLUORANTHENE	24	4	0.11	1.6	0.056	0.21	0.13	0.9	0.87	5	No	C
4	36	SS	MG/KG	BENZO(g,h,i)PERYLENE	24	3	0.11	1.6	0.044	0.11	0.077	0.82	230	32000	No	C
4	36	SS	MG/KG	BENZO(k)FLUORANTHENE	24	4	0.11	1.6	0.061	0.1	0.088	0.78	8.7	49	No	C
4	36	SS	MG/KG	BERYLLIUM	24	8	0.0028	1	0.31	1	0.57	1.1	16	63	No	C
4	36	SS	MG/KG	bis(2-ETHYLHEXYL)	23	12	0.200000003	0.42	0.051	3	0.71		46	3600	No	F
4	36	SS	MG/KG	CADMIUM	24	5	0.0095	1.3	0.84	4.2	1.9	1.4	7.8	8	No	B
4	36	SS	MG/KG	CALCIUM	2	2	2.7	2.9	1760	1990	1875	5840			No	E
4	36	SS	MG/KG	CARBAZOLE	23	1	0.37	1.6	0.048	0.048	0.048	0.067	32	0.6	No	C
4	36	SS	MG/KG	CARBON DISULFIDE	23	1	0.011	0.013	0.001	0.001	0.001	0.002	780	32	No	C
4	36	SS	MG/KG	CHROMIUM, TOTAL	24	24	0.119999997	2.5	12.3	34	26	25	10800	38	No	B
4	36	SS	MG/KG	CHRYSENE	24	4	0.11	1.6	0.063	0.16	0.11	0.94	87	160	No	C
4	36	SS	MG/KG	COBALT	2	2	0.056000002	0.061000001	6.5	6.7	6.6	18	470		No	C
4	36	SS	MG/KG	COPPER	24	24	0.109999999	2.5	17	86	34	34	310		No	B
4	36	SS	MG/KG	DDE	23	4	0.0037	0.8	0.0013	0.36	0.12	0.16	1.9	54	No	B
4	36	SS	MG/KG	DDT	23	6	0.0037	0.8	0.0039	0.23	0.069	0.074	1.9	11	No	B
4	36	SS	MG/KG	DI-n-BUTYL PHTHALATE	23	5	0.37	1.6	0.069	0.15	0.11		780	2300	No	B
4	36	SS	MG/KG	FLUORANTHENE	24	4	0.11	1.6	0.11	0.34	0.2	1.6	310	4300	No	C
4	36	SS	MG/KG	GAMMA-CHLORDANE	23	3	0.0019	0.41	0.0024	0.02	0.0094	0.026	1.8		No	C
4	36	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	24	4	0.11	1.6	0.045	0.1	0.079	0.7	0.87	14	No	C
4	36	SS	MG/KG	IRON	2	2	0.40	0.439999998	15600	16500	16050	37040	2300		No	E
4	36	SS	MG/KG	LEAD	24	24	0.140000001	0.76	13.1	142	36	30	400		No	B
4	36	SS	MG/KG	MAGNESIUM	2	2	0.689999998	0.75	1740	1900	1820	4600			No	E
4	36	SS	MG/KG	MANGANESE	2	2	0.059	0.064000003	418	566	492	1304	1100		No	C
4	36	SS	MG/KG	MERCURY	24	2	0.0074	0.119999997	0.06	0.07	0.065	0.4	2.3	2	No	C
4	36	SS	MG/KG	METHYL ETHYL KETONE (2-	23	2	0.011	0.013	0.025	0.035	0.03	0.002	4700	17	No	B
4	36	SS	MG/KG	METHYLENE CHLORIDE	23	4	0.011	0.013	0.001	0.01	0.0055		85	0.02	No	B
4	36	SS	MG/KG	NICKEL	24	24	0.035999998	5	8.6	43	32	30	160	130	No	B
4	36	SS	MG/KG	PHENANTHRENE	24	4	0.11	1.6	0.053	0.27	0.15	0.61	230	250	No	C
4	36	SS	MG/KG	POTASSIUM	2	2	93	100	2020	2060	2040	1820			No	E
4	36	SS	MG/KG	PYRENE	24	4	0.11	1.6	0.086	0.31	0.20	1.5	230	880	No	C
4	36	SS	MG/KG	SILVER	24	1	0.059999999	2.5	0.63	0.63	0.63	2	39	34	No	C
4	36	SS	MG/KG	TRICHLOROETHYLENE (TCE)	23	1	0.011	0.013	0.005	0.005	0.005		58	0.06	No	B
4	36	SS	MG/KG	VANADIUM	2	2	0.034000002	0.037	26	26	26	48	55	6000	No	C
4	36	SS	MG/KG	ZINC	24	24	0.119999997	5	57.2	266	121	126	2300	12000	No	B

Note Data evaluated include field duplicates and normal samples (0-2 feet)

A Exceeds Criteria
B Does not exceed Criteria
C Does not exceed Background
D No Criteria available & exceeds Background, or no Criteria or Background available
E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-20

Constituents of Potential Concern in Screening Site 36 - Subsurface Soil

Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
4	36	SB	MG/KG	1,1,2,2-TETRACHLOROETHANE	42	5	0.01	0.024	0.005	0.02	0.012		0.003	Yes	A
4	36	SB	MG/KG	ANTIMONY	42	1	1.8	9.4	8.7	8.7	8.7		5	Yes	A
4	36	SB	MG/KG	ARSENIC	42	42	0.200000003	3.1	3.2	30	16	17	29	Yes	A
4	36	SB	MG/KG	CHROMIUM, TOTAL	42	42	0.26	3.1	10	45	28	26	38	Yes	A
4	36	SB	MG/KG	COPPER	42	42	0.140000001	3.1	16	44	29	33		Yes	D
4	36	SB	MG/KG	LEAD	42	42	0.230000004	0.939999998	7.6	32	19	24		Yes	D
4	36	SB	MG/KG	SELENIUM	42	3	0.170000002	1.6	1.3	1.7	1.6	0.6	5	Yes	H
4	36	SB	MG/KG	TOTAL 1,2-DICHLOROETHENE	42	3	0.01	0.025	0.042	0.11	0.082			Yes	D
4	36	SB	MG/KG	TRICHLOROETHYLENE (TCE)	42	8	0.01	0.025	0.001	0.32	0.069		0.06	Yes	A
4	36	SB	MG/KG	1,1-DICHLOROETHENE	42	1	0.01	0.025	0.009	0.009	0.009		0.06	No	B
4	36	SB	MG/KG	ACETONE	42	11	0.01	0.025	0.006	0.1	0.029		16	No	B
4	36	SB	MG/KG	ALUMINUM	2	2	2.3	2.3	12300	15400	13850	21829		No	C
4	36	SB	MG/KG	BARIUM	2	2	0.043000001	0.044	89	121	105	300	1600	No	C
4	36	SB	MG/KG	BENZENE	42	1	0.01	0.025	0.001	0.001	0.001		0.03	No	B
4	36	SB	MG/KG	BERYLLIUM	42	13	0.016000001	1.3	0.36	1.4	0.86	1.2	63	No	B
4	36	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	42	16	0.35	2	0.042	16	1.4		3600	No	F
4	36	SB	MG/KG	CADMIUM	42	2	0.4	1.6	0.44	1.8	1.1	1.4	8	No	B
4	36	SB	MG/KG	CALCIUM	2	2	0.71	0.71	510	590	550	2432		No	E
4	36	SB	MG/KG	COBALT	2	2	0.310000002	0.310000002	8.6	9.3	9	20		No	C
4	36	SB	MG/KG	DI-n-BUTYL PHTHALATE	42	7	0.35	2	0.041	0.075	0.058		2300	No	B
4	36	SB	MG/KG	IRON	2	2	0.25	0.25	21800	26400	24100	38480		No	E
4	36	SB	MG/KG	MAGNESIUM	2	2	2.2	2.3	2220	2570	2395	4900		No	E
4	36	SB	MG/KG	MANGANESE	2	2	0.041999999	0.041999999	882	1050	966	1540		No	C
4	36	SB	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	42	4	0.01	0.025	0.004	0.017	0.0098		17	No	B
4	36	SB	MG/KG	METHYLENE CHLORIDE	42	13	0.01	0.025	0.002	0.008	0.003		0.02	No	B
4	36	SB	MG/KG	NICKEL	42	42	0.66	6.3	18	47	33	37	130	No	B
4	36	SB	MG/KG	POTASSIUM	2	2	92	93	755	1010	883	1800		No	E
4	36	SB	MG/KG	SODIUM	2	1	1.1	1.1	110	110	110			No	E
4	36	SB	MG/KG	TETRACHLOROETHYLENE(PCE)	42	2	0.01	0.024	0.004	0.006	0.005		0.06	No	B
4	36	SB	MG/KG	VANADIUM	2	2	0.21	0.21	25	31	28	51	6000	No	C
4	36	SB	MG/KG	ZINC	42	42	0.119999997	6.3	51	157	100	114	12000	No	B

Note Data evaluated include field duplicates and normal samples (2 feet and below)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

TABLE D-21
Constituents of Potential Concern in FU5 - Surface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
5	SS	MG/KG	4-METHYLPHENOL (p CRESOL)	21	1	0 37	38	0 056	0 056	0 056		39	0 02	Yes	A
5	SS	MG/KG	ANTIMONY	17	3	0 19	7 3	0 87	7 4	3 2	7	3 1	5	Yes	A
5	SS	MG/KG	ARSENIC	21	21	0 16	2 6	5 05	29	13	20	0 43	29	Yes	A
5	SS	MG/KG	BENZO(a)ANTHRACENE	31	17	0 11	38	0 07	26	3 9	0 71	0 87	2	Yes	A
5	SS	MG/KG	BENZO(a)PYRENE	31	16	0 11	38	0 064	26	4 0	0 96	0 087	8	Yes	A
5	SS	MG/KG	BENZO(b)FLUORANTHENE	31	16	0 11	38	0 08	26	4 0	0 9	0 87	5	Yes	A
5	SS	MG/KG	BENZO(k)FLUORANTHENE	31	16	0 11	38	0 077	20	3 6	0 78	8 7	49	Yes	A
5	SS	MG/KG	CARBAZOLE	21	6	0 37	38	0 12	4	1 6	0 067	32	0 6	Yes	A
5	SS	MG/KG	CHRYSENE	31	17	0 11	38	0 081	30	4 4	0 94	87	160	Yes	G
5	SS	MG/KG	DIBENZ(a h)ANTHRACENE	31	2	0 11	38	1 1	4	2 6	0 26	0 087	2	Yes	A
5	SS	MG/KG	DIELDRIN	24	15	0 0037	1 9	0 0041	1 1	0 21	0 086	0 04	0 004	Yes	A
5	SS	MG/KG	INDENO(1,2,3-c d)PYRENE	31	14	0 11	38	0 059	17	3 2	0 7	0 87	14	Yes	A
5	SS	MG/KG	PENTACHLOROPHENOL	21	2	0 19	19	0 04	0 32	0 18		5 3	0 03	Yes	A
5	SS	MG/KG	2-HEXANONE	21	3	0 009	0 013	0 002	0 003	0 0027		310	1 4	No	B
5	SS	MG/KG	2-METHYLNAPHTHALENE	31	1	0 11	38	0 12	0 12	0 12		160	6 1	No	B
5	SS	MG/KG	ACENAPHTHENE	31	7	0 11	38	0 086	4 1	1 3		470	570	No	B
5	SS	MG/KG	ACETONE	21	4	0 009	0 013	0 004	0 005	0 0043		780	16	No	B
5	SS	MG/KG	ALPHA-CHLORDANE	24	6	0 0019	0 94	0 00068	0 14	0 034	0 029	1 8		No	B
5	SS	MG/KG	ALUMINUM	9	9	0 88999999	8 3	1950	12200	8908	23810	7800		No	C
5	SS	MG/KG	ANTHRACENE	31	8	0 11	38	0 14	6 7	1 9	0 096	2300	12000	No	B
5	SS	MG/KG	BARIUM	9	9	0 038	0 057	22	122	102	234	550	1600	No	C
5	SS	MG/KG	BENZENE	21	1	0 009	0 013	0 002	0 002	0 002		22	0 03	No	B
5	SS	MG/KG	BENZO(g,h,i)PERYLENE	31	14	0 22	38	0 062	18	3 2	0 82	230	32000	No	B
5	SS	MG/KG	BERYLLIUM	21	13	0 0028	1 20000005	0 18	0 56	0 38	1 1	16	63	No	C
5	SS	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	21	4	0 37	38	0 1	250	63		46	3600	No	F
5	SS	MG/KG	BROMOMETHANE	21	1	0 009	0 013	0 002	0 002	0 002		11	0 2	No	B
5	SS	MG/KG	CADMIUM	21	11	0 0095	1 20000005	0 02	6	1 1	1 4	7 8	8	No	B
5	SS	MG/KG	CALCIUM	9	9	0 67000002	8 2	1580	39800	7320	5840			No	E
5	SS	MG/KG	CARBON DISULFIDE	21	1	0 009	0 013	0 037	0 037	0 037	0 002	780	32	No	B
5	SS	MG/KG	CHROMIUM TOTAL	21	21	0 12	2 4	6 15	37	18	25		38	No	B
5	SS	MG/KG	COBALT	9	9	0 032	0 31	3 3	12	7	18	470		No	C
5	SS	MG/KG	COPPER	21	21	0 11	2 4	9 6	52	22	34	310		No	B
5	SS	MG/KG	DDD	24	2	0 0037	1 8	0 013	0 022	0 0175	0 0067	2 7	16	No	B
5	SS	MG/KG	DDE	24	14	0 0037	1 8	0 0038	0 077	0 031	0 16	1 9	54	No	C
5	SS	MG/KG	DDT	24	15	0 0037	1 8	0 0022	0 26	0 073	0 074	1 9	11	No	B
5	SS	MG/KG	DIBENZOFURAN	21	3	0 37	38	0 11	1 2	0 54	0 65	31	15	No	B
5	SS	MG/KG	ETHYLBENZENE	21	1	0 009	0 013	0 002	0 002	0 002		780	13	No	B
5	SS	MG/KG	FLUORANTHENE	31	21	0 22	38	0 047	67	7 9	1 6	310	4300	No	B
5	SS	MG/KG	FLUORENE	31	7	0 11	38	0 061	2 6	0 9		310	560	No	B
5	SS	MG/KG	GAMMA-CHLORDANE	24	6	0 0019	0 94	0 00069	0 15	0 038	0 026	1 8		No	B
5	SS	MG/KG	IRON	9	9	0 23	3 2	6430	19800	15526	37040	2300		No	E
5	SS	MG/KG	LEAD	21	21	0 14	0 77999997	8 7	109	28	30	400		No	B
5	SS	MG/KG	MAGNESIUM	9	9	0 69	7 5	1160	2390	1972	4600			No	E
5	SS	MG/KG	MANGANESE	9	9	0 013	0 062	44	713	489	1304	1100		No	C
5	SS	MG/KG	MERCURY	21	7	0 0075	0 13	0 01	0 14	0 071	0 4	2 3	2	No	C
5	SS	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	21	5	0 009	0 013	0 016	0 076	0 036	0 002	4700	17	No	B
5	SS	MG/KG	METHYLENE CHLORIDE	21	5	0 009	0 013	0 002	0 006	0 0034		85	0 02	No	B
5	SS	MG/KG	NAPHTHALENE	31	2	0 11	38	0 19	1 4	0 8		160	84	No	B
5	SS	MG/KG	NICKEL	21	21	0 036	4 9	4 1	51	20	30	160	130	No	B
5	SS	MG/KG	PHENANTHRENE	31	19	0 11	38	0 055	36	5 0	0 61	230	250	No	B
5	SS	MG/KG	POTASSIUM	9	8	75	98	743	2500	1834	1820			No	E
5	SS	MG/KG	PYRENE	31	22	0 11	38	0 04	56	6 2	1 5	230	880	No	B
5	SS	MG/KG	SELENIUM	21	3	0 17	1 29999995	0 76	1 4	1 2	0 8	39	5	No	B
5	SS	MG/KG	SILVER	21	1	0 06	2 4	0 6	0 6	0 6	2	39	34	No	C
5	SS	MG/KG	SODIUM	9	2	0 91000003	14	133	192	163				No	E
5	SS	MG/KG	TOLUENE	21	2	0 009	0 013	0 001	0 007	0 004	0 002	1600	12	No	B

TABLE D-21

Constituents of Potential Concern in FU5 - Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
5	SS	MG/KG	Total Xylenes	21	1	0 009	0 013	0 009	0 009	0 009	0 009	16000	0 2	No	C
5	SS	MG/KG	VANADIUM	9	9	0 034	0 20999999	7 2	28	21	48	55	6000	No	C
5	SS	MG/KG	ZINC	21	21	0 12	4 9	29	136	69	126	2300	12000	No	B

Note Data evaluated include field duplicates and normal samples (0-2 feet)

A Exceeds Criteria
B Does not exceed Criteria
C Does not exceed Background
D No Criteria available & exceeds Background, or no Criteria or Background available
E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-22
Constituents of Potential Concern in FU5- Subsurface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
5	SB	MG/KG	CADMIUM	27	2	0.011	1.299999952	0.11	77	39	1.4	8	Yes	A
5	SB	MG/KG	CHROMIUM, TOTAL	27	27	0.129999995	2.6	9.6	48	28	26	38	Yes	A
5	SB	MG/KG	COPPER	27	27	0.129999995	2.6	3.3	38	22	33		Yes	D
5	SB	MG/KG	LEAD	27	27	0.159999996	0.769999981	4.8	54	17	24		Yes	D
5	SB	MG/KG	MANGANESE	7	7	0.013	0.066	17	2260	545	1540		Yes	D
5	SB	MG/KG	TOTAL 1,2-DICHLOROETHENE	32	1	0.011	0.810000002	0.002	0.002	0.002			Yes	D
5	SB	MG/KG	TRICHLOROETHYLENE (TCE)	32	3	0.011	0.810000002	0.085	11	3.8		0.06	Yes	A
5	SB	MG/KG	ANTIMONY	27	1	0.209999993	7.7	0.89	0.89	0.89		5	Yes	H
5	SB	MG/KG	ARSENIC	27	27	0.180000007	2.6	2.8	23	12	17	29	Yes	H
5	SB	MG/KG	BENZO(a)ANTHRACENE	32	5	0.370000005	0.430000007	0.054	0.43	0.18		2	Yes	H
5	SB	MG/KG	BENZO(a)PYRENE	32	5	0.370000005	0.430000007	0.057	0.31	0.15		8	Yes	H
5	SB	MG/KG	BENZO(b)FLUORANTHENE	32	5	0.370000005	0.430000007	0.05	0.41	0.18		5	Yes	H
5	SB	MG/KG	BENZO(k)FLUORANTHENE	32	5	0.370000005	0.430000007	0.047	0.38	0.17		49	Yes	H
5	SB	MG/KG	CARBAZOLE	32	1	0.370000005	0.430000007	0.048	0.048	0.048		0.6	Yes	H
5	SB	MG/KG	CHRYSENE	32	6	0.370000005	0.430000007	0.04	0.67	0.23		160	Yes	H
5	SB	MG/KG	DIELDRIN	13	1	0.0037	0.0043	0.0057	0.0057	0.0057	0.37	0.004	Yes	H
5	SB	MG/KG	INDENO(1,2,3-c,d)PYRENE	32	4	0.370000005	0.430000007	0.082	0.24	0.14		14	Yes	H
5	SB	MG/KG	ACETONE	32	16	0.011	1.600000024	0.004	0.079	0.011		16	No	B
5	SB	MG/KG	ALUMINUM	7	7	0.99000001	8.3	4840	11700	9814	21829		No	C
5	SB	MG/KG	ANTHRACENE	32	3	0.370000005	0.430000007	0.068	0.13	0.094		12000	No	B
5	SB	MG/KG	BARIUM	7	7	0.037999999	0.059999999	8.5	88	63	300	1600	No	C
5	SB	MG/KG	BENZO(g,h,i)PERYLENE	32	3	0.370000005	0.430000007	0.086	0.26	0.16		32000	No	B
5	SB	MG/KG	BENZYL BUTYL PHTHALATE	32	1	0.370000005	0.430000007	0.077	0.077	0.077		930	No	B
5	SB	MG/KG	BERYLLIUM	27	9	0.0031	1.299999952	0.33	1.4	0.7	1.2	63	No	B
5	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	32	6	0.370000005	0.430000007	0.046	0.082	0.06		3600	No	F
5	SB	MG/KG	CALCIUM	7	7	0.639999986	8.2	520	5150	1883	2432		No	E
5	SB	MG/KG	CHLOROBENZENE	32	1	0.011	0.810000002	0.002	0.002	0.002		1	No	B
5	SB	MG/KG	COBALT	7	7	0.032000002	0.330000013	1.1	17	6.1	20		No	C
5	SB	MG/KG	DDE	13	1	0.0037	0.0043	0.002	0.002	0.002	0.0015	54	No	B
5	SB	MG/KG	DDT	13	1	0.0037	0.0043	0.0046	0.0046	0.0046	0.0072	11	No	C
5	SB	MG/KG	DI-n-BUTYL PHTHALATE	32	9	0.370000005	0.430000007	0.07	0.21	0.12		2300	No	B
5	SB	MG/KG	FLUORANTHENE	32	6	0.370000005	0.430000007	0.1	0.85	0.39	0.045	4300	No	B
5	SB	MG/KG	IRON	7	7	0.230000004	3.2	11600	24800	16500	38480		No	E
5	SB	MG/KG	MAGNESIUM	7	7	0.779999971	7.5	279	2510	1432	4900		No	E
5	SB	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	32	3	0.011	1.600000024	0.002	0.01	0.0053		17	No	B
5	SB	MG/KG	METHYLENE CHLORIDE	32	7	0.011	0.810000002	0.001	0.004	0.0023		0.02	No	B
5	SB	MG/KG	NICKEL	27	27	0.041000001	5.2	1.7	46	26	36.6	130	No	B
5	SB	MG/KG	PHENANTHRENE	32	6	0.370000005	0.430000007	0.069	0.37	0.18		250	No	B
5	SB	MG/KG	POTASSIUM	7	4	75	104	523	1580	892	1800		No	E
5	SB	MG/KG	PYRENE	32	6	0.370000005	0.430000007	0.081	0.74	0.33	0.042	880	No	B
5	SB	MG/KG	SELENIUM	27	3	0.159999996	1.299999952	1.3	1.9	1.6	0.6	5	No	B
5	SB	MG/KG	SODIUM	7	1	0.910000026	14	157	157	157			No	E
5	SB	MG/KG	TETRACHLOROETHYLENE(PCE)	32	3	0.011	0.810000002	0.001	0.003	0.002		0.06	No	B
5	SB	MG/KG	THALLIUM	27	1	0.140000001	2.6	0.23	0.23	0.23		0.7	No	B
5	SB	MG/KG	VANADIUM	7	7	0.039000001	0.219999999	24	37	28	51	6000	No	C
5	SB	MG/KG	ZINC	27	27	0.109999999	5.2	4.5	132	71	114	12000	No	B

Note Data evaluated include field duplicates and normal samples (2 feet and below)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

TABLE D-23

Constituents of Potential Concern in Residential Point Estimate at Station SS77C - Surface Soil

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Analytical Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
5	SS	MG/KG	BENZO(a)ANTHRACENE	6	0 71	0.87	2	Yes	A
5	SS	MG/KG	BENZO(a)PYRENE	6 1	0.96	0.087	8	Yes	A
5	SS	MG/KG	BENZO(b)FLUORANTHENE	6.1	0 9	0.87	5	Yes	A
5	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	4 6	0.7	0 87	14	Yes	A
5	SS	MG/KG	BENZO(k)FLUORANTHENE	4 8	0 78	8 7	49	No	B
5	SS	MG/KG	ACENAPHTHENE	1 4		470	570	No	B
5	SS	MG/KG	ANTHRACENE	2.4	0 096	2300	12000	No	B
5	SS	MG/KG	BENZO(g,h,i)PERYLENE	4 9	0.82	230	32000	No	B
5	SS	MG/KG	FLUORANTHENE	12	1 6	310	4300	No	B
5	SS	MG/KG	FLUORENE	0 91		310	560	No	B
5	SS	MG/KG	METHYLENE CHLORIDE	0 0028		85	0 02	No	B
5	SS	MG/KG	PHENANTHRENE	7 1	0 61	230	250	No	B
5	SS	MG/KG	PYRENE	9 6	1 5	230	880	No	B
5	SS	MG/KG	ARSENIC	12	20	0 43	29	No	C
5	SS	MG/KG	COPPER	26	34	310		No	C
5	SS	MG/KG	LEAD	30	30	400		No	C
5	SS	MG/KG	MERCURY	0 081	0 4	2 3	2	No	C
5	SS	MG/KG	NICKEL	22	30	160	130	No	C
5	SS	MG/KG	ZINC	77	126	2300	12000	No	C

Note. Data evaluated include field duplicates and normal samples (0-2 feet)

A Exceeds Criteria

B Does not exceed Criteria

C Does not exceed Background

D No Criteria available & exceeds Background; or no Criteria or Background available

E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC

F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC.

G Chemical is a member of a chemical class which contains other COPCs.

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TABLE D-24
Constituents of Potential Concern in Screening Site 77 - Surface Soil
Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
5	77	SS	MG/KG	ANTIMONY	10	2	0 189999998	7 3	1 3	7 4	4 4	7	3 1	5	Yes	A
5	77	SS	MG/KG	ARSENIC	10	10	0 159999996	2 6	5 1	23	12	20	0 43	29	Yes	A
5	77	SS	MG/KG	BENZO(a)ANTHRACENE	10	5	0 39	38	0 086	26	6 0	0 71	0 87	2	Yes	A
5	77	SS	MG/KG	BENZO(a)PYRENE	10	5	0 39	38	0 11	26	6 1	0 96	0 087	8	Yes	A
5	77	SS	MG/KG	BENZO(b)FLUORANTHENE	10	5	0 39	38	0 13	26	6 1	0 9	0 87	5	Yes	A
5	77	SS	MG/KG	BENZO(k)FLUORANTHENE	10	5	0 39	38	0 11	20	4 8	0 78	8 7	49	Yes	A
5	77	SS	MG/KG	CARBAZOLE	7	3	0 39	38	0 12	4	1 4	0 067	32	0 6	Yes	A
5	77	SS	MG/KG	CHRYSENE	10	5	0 39	38	0 12	30	7 0	0 94	87	160	Yes	G
5	77	SS	MG/KG	DIELDRIN	7	2	0 004	0 379999995	0 032	0 26	0 15	0 086	0 04	0 004	Yes	A
5	77	SS	MG/KG	INDENO(1 2 3-c,d)PYRENE	10	4	0 39	38	0 093	17	4 6	0 7	0 87	14	Yes	A
5	77	SS	MG/KG	PENTACHLOROPHENOL	7	1	0 200000003	19	0 32	0 32	0 32		5 3	0 03	Yes	A
5	77	SS	MG/KG	ACENAPHTHENE	10	3	0 39	38	0 086	4 1	1 4		470	570	No	B
5	77	SS	MG/KG	ACETONE	7	1	0 011	0 012	0 004	0 004	0 004		780	16	No	B
5	77	SS	MG/KG	ALPHA CHLORDANE	7	2	0 002	0 200000003	0 0027	0 024	0 013	0 029	1 8		No	C
5	77	SS	MG/KG	ALUMINUM	1	1	2 1	2 1	10100	10100	10100	23810	7800		No	C
5	77	SS	MG/KG	ANTHRACENE	10	3	0 39	38	0 14	6 7	2 4	0 096	2300	12000	No	B
5	77	SS	MG/KG	BARIUM	1	1	0 041000001	0 041000001	114	114	114	234	550	1600	No	C
5	77	SS	MG/KG	BENZO(g,h,i)PERYLENE	10	4	0 39	38	0 1	18	4 9	0 82	230	32000	No	B
5	77	SS	MG/KG	BERYLLIUM	10	5	0 0028	1 2	0 18	0 39	0 32	1 1	16	63	No	C
5	77	SS	MG/KG	bis(2 ETHYLHEXYL) PHTHALATE	7	1	0 39	38	250	250	250		46	3600	No	F
5	77	SS	MG/KG	CADMIUM	10	4	0 0095	1 2	0 27	1 2	0 56	1 4	7 8	8	No	C
5	77	SS	MG/KG	CALCIUM	1	1	0 67	0 67	2020	2020	2020	5840			No	E
5	77	SS	MG/KG	CHROMIUM, TOTAL	10	10	0 119999997	2 4	6 2	37	19	25		38	No	B
5	77	SS	MG/KG	COBALT	1	1	0 29	0 29	8 8	8 8	8 8	18	470		No	C
5	77	SS	MG/KG	COPPER	10	10	0 109999999	2 4	9 6	52	26	34	310		No	B
5	77	SS	MG/KG	DDE	7	3	0 004	0 379999995	0 013	0 077	0 05	0 16	1 9	54	No	C
5	77	SS	MG/KG	DDT	7	5	0 004	0 379999995	0 0022	0 26	0 1	0 074	1 9	11	No	B
5	77	SS	MG/KG	FLUORANTHENE	10	7	0 4	38	0 21	67	12	1 6	310	4300	No	B
5	77	SS	MG/KG	FLUORENE	10	3	0 39	38	0 061	2 6	0 91		310	560	No	B
5	77	SS	MG/KG	GAMMA-CHLORDANE	7	2	0 002	0 200000003	0 0036	0 04	0 022	0 026	1 8		No	B
5	77	SS	MG/KG	IRON	1	1	0 230000004	0 230000004	18300	18300	18300	37040	2300		No	E
5	77	SS	MG/KG	LEAD	10	10	0 140000001	0 78	12	71	30	30	400		No	B
5	77	SS	MG/KG	MAGNESIUM	1	1	2 1	2 1	2290	2290	2290	4600			No	E
5	77	SS	MG/KG	MANGANESE	1	1	0 039999999	0 039999999	552	552	552	1304	1100		No	C
5	77	SS	MG/KG	MERCURY	10	4	0 0076	0 119999997	0 01	0 14	0 081	0 4	2 3	2	No	C
5	77	SS	MG/KG	METHYLENE CHLORIDE	7	4	0 011	0 012	0 002	0 003	0 0028		85	0 02	No	B
5	77	SS	MG/KG	NICKEL	10	10	0 035999998	4 9	5 4	51	22	30	160	130	No	B
5	77	SS	MG/KG	PHENANTHRENE	10	6	0 39	38	0 1	36	7 1	0 61	230	250	No	B
5	77	SS	MG/KG	POTASSIUM	1	1	87	87	939	939	939	1820			No	E
5	77	SS	MG/KG	PYRENE	10	7	0 39	38	0 2	56	10	1 5	230	880	No	B
5	77	SS	MG/KG	SELENIUM	10	1	0 170000002	1 3	1 4	1 4	1 4	0 8	39	5	No	B
5	77	SS	MG/KG	SODIUM	1	1	1	1	192	192	192				No	E
5	77	SS	MG/KG	VANADIUM	1	1	0 200000003	0 200000003	25	25	25	48	55	6000	No	C
5	77	SS	MG/KG	ZINC	10	10	0 119999997	4 9	29	136	77	126	2300	12000	No	B

Note Data evaluated include field duplicates and normal samples (0-2 feet)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs

TABLE D-25
Constituents of Potential Concern in Screening Site 77 - Subsurface Soil
Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC	BASIS
5	77	SB	MG/KG	ARSENIC	4	4	2 5	2 6	9	18	13	17	29	Yes	H
5	77	SB	MG/KG	COPPER	4	4	2 5	2 6	19	33	29	33		Yes	D
5	77	SB	MG/KG	ACETONE	4	2	0 012	0 013	0 005	0 006	0 0055		16	No	B
5	77	SB	MG/KG	BENZYL BUTYL PHTHALATE	4	1	0 42	0 43	0 077	0 077	0 077		930	No	B
5	77	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	4	1	0 42	0 43	0 082	0 082	0 082		3600	No	F
5	77	SB	MG/KG	CHROMIUM, TOTAL	4	4	2 5	2 6	28	34	30	26	38	No	B
5	77	SB	MG/KG	LEAD	4	4	0 75	0 77	15	21	17	24		No	C
5	77	SB	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	4	1	0 012	0 013	0 004	0 004	0 004		17	No	B
5	77	SB	MG/KG	METHYLENE CHLORIDE	4	1	0 012	0 013	0 002	0 002	0 002		0 02	No	B
5	77	SB	MG/KG	NICKEL	4	4	5	5 2	29	46	38	37	130	No	B
5	77	SB	MG/KG	ZINC	4	4	5	5 2	63 5	121	88 35	114	12000	No	B

Note Data evaluated include field duplicates and normal samples (2 feet and below)

- A Exceeds Criteria
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- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

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TABLE D-26
Constituents of Potential Concern in FU6 Surface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
6	SS	MG/KG	ARSENIC	13	13	0.15000001	2.5	3.6	29	14	20	0.43	29	Yes	A
6	SS	MG/KG	BENZO(a)ANTHRACENE	14	6	0.062	12	0.045	5.4	1.1	0.71	0.87	2	Yes	A
6	SS	MG/KG	BENZO(a)PYRENE	14	6	0.062	12	0.052	6.3	1.2	0.96	0.087	8	Yes	A
6	SS	MG/KG	BENZO(b)FLUORANTHENE	14	5	0.062	12	0.06	8.1	1.7	0.9	0.87	5	Yes	A
6	SS	MG/KG	CARBAZOLE	13	2	0.37	12	0.063	1.5	0.78	0.067	32	0.6	Yes	A
6	SS	MG/KG	CHRYSENE	14	6	0.062	12	0.068	9.2	1.7	0.94	87	160	Yes	G
6	SS	MG/KG	DDE	32	18	0.0038	2.3	0.0086	2.3	0.27	0.16	1.9	54	Yes	A
6	SS	MG/KG	DDT	32	19	0.0038	2.3	0.0068	3.5	0.65	0.074	1.9	11	Yes	A
6	SS	MG/KG	DIELDRIN	32	17	0.0038	2.3	0.013	5.5	0.53	0.086	0.04	0.004	Yes	A
6	SS	MG/KG	INDENO(1 2 3-c d)PYRENE	14	5	0.062	12	0.042	6.2	1.3	0.7	0.87	14	Yes	A
6	SS	MG/KG	PCB-1260 (AROCLOR 1260)	23	5	0.039	23	0.026	1.4	0.43	0.11	0.32	17	Yes	A
6	SS	MG/KG	2-HEXANONE	22	3	0.009	0.014	0.002	0.004	0.003		310	1.4	No	B
6	SS	MG/KG	ACETONE	22	5	0.009	0.014	0.005	0.033	0.013		780	16	No	B
6	SS	MG/KG	ALPHA-CHLORDANE	32	9	0.002	1.2	0.0032	1.2	0.15	0.029	1.8		No	B
6	SS	MG/KG	ALUMINUM	8	8	0.78	3	5120	13700	11003	23810	7800		No	C
6	SS	MG/KG	ANTHRACENE	14	2	0.062	12	0.038	0.047	0.043	0.096	2300	12000	No	C
6	SS	MG/KG	ANTIMONY	12	4	0.18000001	7	0.7	2.9	1.4	7	3.1	5	No	C
6	SS	MG/KG	BARIUM	8	8	0.029	0.058	87	168	117	234	550	1600	No	C
6	SS	MG/KG	BENZENE	22	2	0.009	0.014	0.001	0.001	0.001		22	0.03	No	B
6	SS	MG/KG	BENZO(g h i)PERYLENE	14	6	0.062	12	0.044	6.8	1.3	0.82	230	32000	No	B
6	SS	MG/KG	BENZO(k)FLUORANTHENE	14	5	0.062	12	0.066	7.4	1.6	0.78	8.7	49	No	B
6	SS	MG/KG	BERYLLIUM	13	7	0.0026	1.20000005	0.23	0.53	0.41	1.1	16	63	No	C
6	SS	MG/KG	bis(2 ETHYLHEXYL) PHTHALATE	13	1	0.37	12	0.14	0.14	0.14		46	3600	No	F
6	SS	MG/KG	BROMOMETHANE	22	2	0.009	0.014	0.002	0.004	0.003		11	0.2	No	B
6	SS	MG/KG	CADMIUM	13	6	0.0089	1.20000005	0.04	0.62	0.31	1.4	7.8	8	No	C
6	SS	MG/KG	CALCIUM	8	8	0.46	2.79999995	954	33800	5912	5840			No	E
6	SS	MG/KG	CARBON DISULFIDE	22	1	0.009	0.014	0.008	0.008	0.008	0.002	780	32	No	B
6	SS	MG/KG	CHLOROFORM	22	2	0.009	0.014	0.004	0.005	0.0045		100	0.6	No	B
6	SS	MG/KG	CHLOROMETHANE	22	1	0.009	0.014	0.002	0.002	0.002		49	0.01	No	B
6	SS	MG/KG	CHROMIUM TOTAL	13	13	0.057	2.5	11	28	19	25	10800	38	No	B
6	SS	MG/KG	COBALT	8	8	0.04	0.36000001	4.6	17	7.9	18	470		No	C
6	SS	MG/KG	COPPER	13	13	0.1	2.5	12	51	28	34	310		No	B
6	SS	MG/KG	DDD	32	7	0.0038	2.3	0.0056	0.13	0.073	0.0067	2.7	16	No	B
6	SS	MG/KG	DI-n-BUTYL PHTHALATE	13	1	0.37	12	0.044	0.044	0.044		780	2300	No	B
6	SS	MG/KG	ETHYLBENZENE	22	1	0.009	0.014	0.001	0.001	0.001		780	13	No	B
6	SS	MG/KG	FLUORANTHENE	14	7	0.062	12	0.078	14	2	1.6	310	4300	No	B
6	SS	MG/KG	GAMMA CHLORDANE	32	9	0.002	1.2	0.0037	1.1	0.14	0.026	1.8		No	B
6	SS	MG/KG	IRON	8	8	0.2	0.43000001	14700	24700	18550	37040	2300		No	E
6	SS	MG/KG	LEAD	13	13	0.14	1.9	9.5	136	38	30	400		No	B
6	SS	MG/KG	MAGNESIUM	8	8	0.23	3	1480	3630	2366	4600			No	E
6	SS	MG/KG	MANGANESE	8	8	0.023	0.063	242	601	468	1304	1100		No	C
6	SS	MG/KG	MERCURY	13	3	0.0073	0.12	0.02	0.03	0.027	0.4	2.3	2	No	C
6	SS	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	22	3	0.009	0.014	0.016	0.034	0.022	0.002	4700	17	No	B
6	SS	MG/KG	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	22	1	0.009	0.014	0.006	0.006	0.006		630	2.6	No	B
6	SS	MG/KG	METHYLENE CHLORIDE	22	3	0.009	0.014	0.003	0.005	0.004		85	0.02	No	B
6	SS	MG/KG	NICKEL	13	13	0.034	5	12	41	23	30	160	130	No	B
6	SS	MG/KG	PHENANTHRENE	14	5	0.062	12	0.048	6	1	0.61	230	250	No	B
6	SS	MG/KG	POTASSIUM	8	8	87	106	401	3090	1933	1820			No	E
6	SS	MG/KG	PYRENE	14	7	0.062	12	0.044	12	2	1.5	230	880	No	B
6	SS	MG/KG	SELENIUM	13	3	0.17	3.6	0.66	0.89	0.80	0.8	39	5	No	B
6	SS	MG/KG	SODIUM	8	1	1.1	14	152	152	152				No	E
6	SS	MG/KG	TETRACHLOROETHYLENE(PCE)	22	2	0.009	0.014	0.004	0.013	0.0085		12	0.06	No	B
6	SS	MG/KG	TOLUENE	22	1	0.009	0.014	0.004	0.004	0.004	0.002	1600	12	No	B
6	SS	MG/KG	Total Xylenes	22	1	0.009	0.014	0.003	0.003	0.003	0.009	16000	0.2	No	C
6	SS	MG/KG	TRICHLOROETHYLENE (TCE)	22	1	0.009	0.014	0.002	0.002	0.002		58	0.06	No	B

TABLE D-26
Constituents of Potential Concern in FU6 Surface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
6	SS	MG/KG	VANADIUM	8	8	0 032	0 23999999	20	32	25	48	55	6000	No	C
6	SS	MG/KG	ZINC	13	13	0 074	5	40	541	129	126	2300	12000	No	B

Note Data evaluated include field duplicates and normal samples (0-2 feet)
Data screened includes pre-remediation data
A Exceeds Criteria
B Does not exceed Criteria
C Does not exceed Background
D No Criteria available & exceeds Background, or no Criteria or Background available
E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
G Chemical is a member of a chemical class which contains other COPCs

TABLE D-27
Constituents of Potential Concern in FU6 - Subsurface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
6	SB	MG/KG	ARSENIC	14	14	0.17	2.6	1.2	17	7.6	17	29	Yes	H
6	SB	MG/KG	BENZENE	28	6	0.01	0.62	0.082	2	0.74		0.03	Yes	A
6	SB	MG/KG	COPPER	14	14	0.12	2.6	5.3	34	17	33		Yes	D
6	SB	MG/KG	METHYLENE CHLORIDE	28	7	0.01	0.62	0.001	0.069	0.012		0.02	Yes	A
6	SB	MG/KG	Total Xylenes	28	9	0.01	0.62	0.001	0.57	0.22	0.002	0.2	Yes	A
6	SB	MG/KG	ACETONE	28	6	0.01	0.62	0.004	0.35	0.069		16	No	B
6	SB	MG/KG	ALUMINUM	7	7	0.95999998	2.29999995	8860	14200	11250	21829		No	C
6	SB	MG/KG	ANTIMONY	14	5	0.20999999	7.7	0.42	0.79	0.55		5	No	B
6	SB	MG/KG	BARIUM	7	7	0.042	0.061	78	154	104	300	1600	No	C
6	SB	MG/KG	BERYLLIUM	14	9	0.003	1	0.26	1.2	0.54	1.2	63	No	C
6	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	19	6	0.34999999	1.20000005	0.046	5.3	0.99		3600	No	F
6	SB	MG/KG	BROMOMETHANE	28	2	0.01	0.62	0.001	0.004	0.0025		0.2	No	B
6	SB	MG/KG	CADMIUM	14	5	0.01	1.29999995	0.16	0.29	0.22	1.4	8	No	C
6	SB	MG/KG	CALCIUM	7	7	0.68000001	3	1340	1920	1634	2432		No	E
6	SB	MG/KG	CARBON TETRACHLORIDE	28	2	0.01	0.62	0.011	0.019	0.015		0.07	No	B
6	SB	MG/KG	CHLOROFORM	28	3	0.01	0.62	0.002	0.043	0.025		0.6	No	B
6	SB	MG/KG	CHROMIUM, TOTAL	14	14	0.13	2.6	11	28	17	26	38	No	B
6	SB	MG/KG	COBALT	7	7	0.061	0.31	5	8.8	6	20		No	C
6	SB	MG/KG	DI-n-BUTYL PHTHALATE	19	1	0.34999999	1.20000005	0.077	0.077	0.077		2300	No	B
6	SB	MG/KG	ETHYLBENZENE	28	4	0.01	0.62	0.07	0.36	0.18		13	No	B
6	SB	MG/KG	FLUORANTHENE	24	1	0.06	3.1	0.061	0.061	0.061	0.045	4300	No	B
6	SB	MG/KG	IRON	7	7	0.23999999	0.46000001	9190	17500	13970	38480		No	E
6	SB	MG/KG	LEAD	14	14	0.16	0.76999998	4	19	11	24		No	C
6	SB	MG/KG	MAGNESIUM	7	7	0.75	2.29999995	1750	2400	2044	4900		No	E
6	SB	MG/KG	MANGANESE	7	7	0.041	0.067	49	681	431	1540		No	C
6	SB	MG/KG	MERCURY	14	1	0.0074	0.13	0.04	0.04	0.04	0.2	2	No	C
6	SB	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	28	3	0.01	0.62	0.016	0.38	0.138		17	No	B
6	SB	MG/KG	NICKEL	14	13	0.039	5.2	5	42	21	37	130	No	B
6	SB	MG/KG	PHENANTHRENE	24	1	0.06	3.1	0.052	0.052	0.052		250	No	B
6	SB	MG/KG	POTASSIUM	7	7	89	105	663	2740	1878	1800		No	E
6	SB	MG/KG	PYRENE	24	1	0.06	3.1	0.066	0.066	0.066	0.042	880	No	B
6	SB	MG/KG	SELENIUM	14	5	0.17	1.29999995	1	1.7	1.3	0.6	5	No	B
6	SB	MG/KG	SODIUM	7	1	1.10000002	15	274	274	274			No	E
6	SB	MG/KG	TOLUENE	28	1	0.01	0.62	0.68	0.68	0.68		12	No	B
6	SB	MG/KG	TRICHLOROETHYLENE (TCE)	28	1	0.01	0.62	0.002	0.002	0.002		0.06	No	B
6	SB	MG/KG	VANADIUM	7	7	0.037	0.20999999	17	32	25	51	6000	No	C
6	SB	MG/KG	ZINC	14	14	0.12	5.2	14	112	51	114	12000	No	C

Note Data evaluated include field duplicates and normal samples (2 feet and below)
Data screened includes pre-remediation data

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

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TABLE D-28
Constituents of Potential Concern in FU6 - Sediment
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Sediments	Regulatory Criteria for Leachability	COPC/BASIS	
6	SE	MG/KG	4-METHYLPHENOL (p-CRESOL)	2	1	3	3.5	5.1	5.1	5.1		39	0.02	Yes	A
6	SE	MG/KG	ANTIMONY	2	2	0.35	0.35	154	1210	682	7.6	3.1	5	Yes	A
6	SE	MG/KG	BARIUM	2	2	0.037999999	0.037999999	3630	3650	3640	118	550	1600	Yes	A
6	SE	MG/KG	BENZO(a)ANTHRACENE	2	2	3	3.5	3	6.5	4.8	2.9	0.87	2	Yes	A
6	SE	MG/KG	BENZO(a)PYRENE	2	2	3	3.5	3	5.4	4.2	2.5	0.087	8	Yes	A
6	SE	MG/KG	BENZO(b)FLUORANTHENE	2	2	3	3.5	4.7	8.7	6.7	2.2	0.87	5	Yes	A
6	SE	MG/KG	CADMIUM	2	2	0.037999999	0.037999999	27	33	30	29	7.8	8	Yes	A
6	SE	MG/KG	CHROMIUM, TOTAL	2	2	2.1	4.5	158	257	208	20	10800	38	Yes	A
6	SE	MG/KG	COPPER	2	2	0.129999995	0.129999995	2500	14200	8350	58	310		Yes	A
6	SE	MG/KG	DIBENZ(a,h)ANTHRACENE	2	1	3	3.5	0.86	0.86	0.86	0.7	0.087	2	Yes	A
6	SE	MG/KG	INDENO(1,2,3-c,d)PYRENE	2	1	3	3.5	2.2	2.2	2.2	1.7	0.87	14	Yes	A
6	SE	MG/KG	LEAD	2	2	0.18	0.18	3110	3570	3340	35	400		Yes	A
6	SE	MG/KG	NICKEL	2	2	0.119999997	0.119999997	83	139	111	31	160	130	Yes	A
6	SE	MG/KG	PETROLEUM HYDROCARBONS	2	2	87	185	1410	1460	1435		34	340	Yes	A
6	SE	MG/KG	SELENIUM	2	2	0.39	0.39	50	182	116	1.7	39	5	Yes	A
6	SE	MG/KG	SILVER	2	1	0.085000001	0.085000001	49	49	49	1.8	39	34	Yes	A
6	SE	MG/KG	THALLIUM	2	1	0.189999998	0.189999998	21	21	21	1.1	0.55	0.7	Yes	A
6	SE	MG/KG	ZINC	2	2	0.379999995	0.379999995	4980	5570	5275	797	2300	12000	Yes	A
6	SE	MG/KG	CHRYSENE	2	2	3	3.5	5	9.8	7.4	3.2	87	160	Yes	G
6	SE	MG/KG	BENZO(g,h,i)PERYLENE	2	2	3	3.5	0.39	2.3	1.3	1.8	230	32000	No	B
6	SE	MG/KG	BENZO(k)FLUORANTHENE	2	1	3	3.5	3.3	3.3	3.3	2.3	8.7	49	No	B
6	SE	MG/KG	COBALT	2	2	0.032000002	0.032000002	65	91	78	14	470		No	B
6	SE	MG/KG	FLUORANTHENE	2	2	3	3.5	3.1	9	6.1	7.1	310	4300	No	B
6	SE	MG/KG	PHENOL	2	1	3	3.5	0.76	0.76	0.76	0.2	4700	100	No	B
6	SE	MG/KG	PYRENE	2	2	3	3.5	5.6	9.7	7.7	2.9	230	880	No	B
6	SE	MG/KG	ACENAPHTHENE	2	1	3	3.5	0.56	0.56	0.56	0.77	470	570	No	C
6	SE	MG/KG	ALUMINUM	2	2	8.3	8.3	3270	8210	5740	10085	7800		No	C
6	SE	MG/KG	ANTHRACENE	2	1	3	3.5	1.2	1.2	1.2	1.6	2300	12000	No	C
6	SE	MG/KG	ARSENIC	2	1	1.1	1.1	5.3	5.3	5.3	12	0.43	29	No	C
6	SE	MG/KG	BERYLLIUM	2	1	0.011	0.011	0.33	0.33	0.33	1.3	16	63	No	C
6	SE	MG/KG	CARBAZOLE	2	1	3	3.5	0.83	0.83	0.83	1.1	32	0.6	No	C
6	SE	MG/KG	FLUORENE	2	1	3	3.5	0.6	0.6	0.6	0.87	310	560	No	C
6	SE	MG/KG	MANGANESE	2	2	0.013	0.013	505	739	622	871	1100		No	C
6	SE	MG/KG	MERCURY	2	1	0.0075	0.0075	0.67	0.67	0.67	4	2.3	2	No	C
6	SE	MG/KG	PHENANTHRENE	2	2	3	3.5	1.9	6.7	4.3	6.9	230	250	No	C
6	SE	MG/KG	VANADIUM	2	2	0.057999998	0.057999998	12	15	13	30	55	6000	No	C
6	SE	MG/KG	CALCIUM	2	2	8.2	8.2	30800	79100	54950	14860			No	E
6	SE	MG/KG	IRON	2	2	3.2	3.2	95900	133000	114450	23080	2300		No	E
6	SE	MG/KG	MAGNESIUM	2	2	7.5	7.5	11600	17000	14300	2440			No	E
6	SE	MG/KG	POTASSIUM	2	2	75	75	1050	1400	1225	1560			No	E
6	SE	MG/KG	SODIUM	2	2	0.91	0.91	804	1750	1277	240			No	E
6	SE	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	2	2	3	3.5	7.5	13	10.25	0.48	46	3600	No	F

Note

A Exceeds Criteria
B Does not exceed Criteria
C Does not exceed Background
D No Criteria available & exceeds Background, or no Criteria or Background available
E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-29
Constituents of Potential Concern in Residential Point Estimate at Station SS66A - Surface Soil
Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Analytical Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
6	SS	MG/KG	BENZO(a)ANTHRACENE	5 4	0 71	0 87	2	Yes	A
6	SS	MG/KG	BENZO(a)PYRENE	6 3	0 96	0 087	8	Yes	A
6	SS	MG/KG	BENZO(b)FLUORANTHENE	8 1	0 9	0 87	5	Yes	A
6	SS	MG/KG	CARBAZOLE	1 5	0 067	32	0 6	Yes	A
6	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	6 2	0 7	0 87	14	Yes	A
6	SS	MG/KG	CHRYSENE	9 2	0 94	87	160	Yes	G
6	SS	MG/KG	BENZO(g,h,i)PERYLENE	6 8	0 82	230	32000	No	B
6	SS	MG/KG	BENZO(k)FLUORANTHENE	7 4	0 78	8 7	49	No	B
6	SS	MG/KG	COPPER	39	34	310		No	B
6	SS	MG/KG	DDD	0 12	0 0067	2 7	16	No	B
6	SS	MG/KG	DDE	0 22	0 16	1 9	54	No	B
6	SS	MG/KG	DDT	0 57	0 074	1 9	11	No	B
6	SS	MG/KG	FLUORANTHENE	14	1 6	310	4300	No	B
6	SS	MG/KG	LEAD	67	30	400		No	B
6	SS	MG/KG	METHYL ETHYL KETONE (2-BUTANONE)	0 016	0 002	4700	17	No	B
6	SS	MG/KG	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	0 006		630	2 6	No	B
6	SS	MG/KG	PHENANTHRENE	6	0 61	230	250	No	B
6	SS	MG/KG	PYRENE	12	1 5	230	880	No	B
6	SS	MG/KG	TETRACHLOROETHYLENE(PCE)	0 004		12	0 06	No	B
6	SS	MG/KG	ZINC	541	126	2300	12000	No	B
6	SS	MG/KG	ALUMINUM	5120	23810	7800		No	C
6	SS	MG/KG	ANTIMONY	2 9	7	3 1	5	No	C
6	SS	MG/KG	ARSENIC	3 6	20	0 43	29	No	C
6	SS	MG/KG	BARIUM	99	234	550	1600	No	C
6	SS	MG/KG	BERYLLIUM	0 23	1 1	16	63	No	C
6	SS	MG/KG	CHROMIUM, TOTAL	23	25	10800	38	No	C
6	SS	MG/KG	COBALT	17	18	470		No	C
6	SS	MG/KG	IRON	24700	37040	2300		No	C
6	SS	MG/KG	MANGANESE	242	1304	1100		No	C
6	SS	MG/KG	NICKEL	16	30	160	130	No	C
6	SS	MG/KG	VANADIUM	27	48	55	6000	No	C
6	SS	MG/KG	CALCIUM	33800	5840			No	E
6	SS	MG/KG	MAGNESIUM	3630	4600			No	E
6	SS	MG/KG	POTASSIUM	401	1820			No	E
6	SS	MG/KG	SODIUM	152				No	E

Note Data evaluated include field duplicates and normal samples (0-2 feet)
A Exceeds Criteria
B Does not exceed Criteria
C Does not exceed Background
D No Criteria available & exceeds Background, or no Criteria or Background available
E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
G Chemical is a member of a chemical class which contains other COPCs

TABLE D-30
Constituents of Potential Concern in Screening Site 66 - Surface Soil
Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Surface Soil	Regulatory Criteria for Leachability	COPC/BASIS	
6	66	SS	MG/KG	BENZO(a)ANTHRACENE	6	1	0.39	12	5.4	5.4	5.4	0.71	0.87	2	Yes	A
6	66	SS	MG/KG	BENZO(a)PYRENE	6	1	0.39	12	6.3	6.3	6.3	0.96	0.087	8	Yes	A
6	66	SS	MG/KG	BENZO(b)FLUORANTHENE	6	1	0.39	12	8.1	8.1	8.1	0.9	0.87	5	Yes	A
6	66	SS	MG/KG	CARBAZOLE	6	1	0.39	12	1.5	1.5	1.5	0.067	32	0.6	Yes	A
6	66	SS	MG/KG	INDENO(1,2,3-c,d)PYRENE	6	1	0.39	12	6.2	6.2	6.2	0.7	0.87	14	Yes	A
6	66	SS	MG/KG	CHRYSENE	6	1	0.39	12	9.2	9.2	9.2	0.94	87	160	Yes	G
6	66	SS	MG/KG	ALUMINUM	1	1	2.6	2.6	5120	5120	5120	23810	7800		No	C
6	66	SS	MG/KG	ANTIMONY	1	1	2.1	2.1	2.9	2.9	2.9	7	3.1	5	No	C
6	66	SS	MG/KG	ARSENIC	1	1	0.230000004	0.230000004	3.6	3.6	3.6	20	0.43	29	No	C
6	66	SS	MG/KG	BARIUM	1	1	0.050000001	0.050000001	99	99	99	234	550	1600	No	C
6	66	SS	MG/KG	BENZO(g,h,i)PERYLENE	6	1	0.39	12	6.8	6.8	6.8	0.82	230	32000	No	B
6	66	SS	MG/KG	BENZO(k)FLUORANTHENE	6	1	0.39	12	7.4	7.4	7.4	0.78	8.7	49	No	B
6	66	SS	MG/KG	BERYLLIUM	1	1	0.018999999	0.018999999	0.23	0.23	0.23	1.1	16	63	No	C
6	66	SS	MG/KG	CALCIUM	1	1	0.810000002	0.810000002	33800	33800	33800	5840			No	E
6	66	SS	MG/KG	CHLOROFORM	5	2	0.012	0.014	0.004	0.005	0.0045		100	0.6	No	B
6	66	SS	MG/KG	CHROMIUM, TOTAL	1	1	0.310000002	0.310000002	23	23	23	25	10800	38	No	C
6	66	SS	MG/KG	COBALT	1	1	0.36	0.36	17	17	17	18	470		No	C
6	66	SS	MG/KG	COPPER	1	1	0.170000002	0.170000002	39	39	39	34	310		No	B
6	66	SS	MG/KG	DDD	1	1	0.15	0.15	0.12	0.12	0.12	0.0067	2.7	16	No	B
6	66	SS	MG/KG	DDE	1	1	0.15	0.15	0.22	0.22	0.22	0.16	1.9	54	No	B
6	66	SS	MG/KG	DDT	1	1	0.15	0.15	0.57	0.57	0.57	0.074	1.9	11	No	B
6	66	SS	MG/KG	DI-n-BUTYL PHTHALATE	6	1	0.39	12	0.044	0.044	0.044		780	2300	No	B
6	66	SS	MG/KG	FLUORANTHENE	6	2	0.39	12	0.078	14	7	1.6	310	4300	No	B
6	66	SS	MG/KG	IRON	1	1	0.29	0.29	24700	24700	24700	37040	2300		No	E
6	66	SS	MG/KG	LEAD	1	1	0.28	0.28	67	67	67	30	400		No	B
6	66	SS	MG/KG	MAGNESIUM	1	1	2.6	2.6	3630	3630	3630	4600			No	E
6	66	SS	MG/KG	MANGANESE	1	1	0.048999999	0.048999999	242	242	242	1304	1100		No	C
6	66	SS	MG/KG	METHYL ETHYL KETONE (2	5	1	0.012	0.014	0.016	0.016	0.016	0.002	4700	17	No	B
6	66	SS	MG/KG	METHYL ISOBUTYL KETONE (4	5	1	0.012	0.014	0.006	0.006	0.006		630	2.6	No	B
6	66	SS	MG/KG	METHYLENE CHLORIDE	5	1	0.012	0.014	0.004	0.004	0.004		85	0.02	No	B
6	66	SS	MG/KG	NICKEL	1	1	0.79	0.79	16	16	16	30	160	130	No	C
6	66	SS	MG/KG	PHENANTHRENE	6	2	0.39	12	0.078	6	3	0.81	230	250	No	B
6	66	SS	MG/KG	POTASSIUM	1	1	106	106	401	401	401	1820			No	E
6	66	SS	MG/KG	PYRENE	6	2	0.39	12	0.044	12	6.022	1.5	230	880	No	B
6	66	SS	MG/KG	SODIUM	1	1	1.3	1.3	152	152	152				No	E
6	66	SS	MG/KG	TETRACHLOROETHYLENE(PCE)	5	1	0.012	0.014	0.004	0.004	0.004		12	0.06	No	B
6	66	SS	MG/KG	VANADIUM	1	1	0.24	0.24	27	27	27	48	55	6000	No	C
6	66	SS	MG/KG	ZINC	1	1	0.140000001	0.140000001	541	541	541	126	2300	12000	No	B

Note Data evaluated include field duplicates and normal samples (0-2 feet)

A Exceeds Criteria
B Does not exceed Criteria
C Does not exceed Background
D No Criteria available & exceeds Background, or no Criteria or Background available
E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-31
Constituents of Potential Concern in Screening Site 66 - Subsurface Soil
Memphis Depot Main Installation RI

Unit	SiteID	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Subsurface Soil (Leachability)	COPC/BASIS	
6	66	SB	MG/KG	ACETONE	12	2	0 01	0 013	0 004	0 006	0 005		16	No	B
6	66	SB	MG/KG	ALUMINUM	1	1	2 2	2 2	11000	11000	11000	21829		No	C
6	66	SB	MG/KG	ARSENIC	1	1	0 200000003	0 200000003	1 2	1 2	1 2	17	29	No	C
6	66	SB	MG/KG	BARIUM	1	1	0 041999999	0 041999999	154	154	154	300	1600	No	C
6	66	SB	MG/KG	BERYLLIUM	1	1	0 016000001	0 016000001	0 26	0 26	0 26	1 2	63	No	C
6	66	SB	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	13	5	0 35	1 2	0 046	5 3	1 2		3600	No	F
6	66	SB	MG/KG	CALCIUM	1	1	0 68	0 68	1830	1830	1830	2432		No	E
6	66	SB	MG/KG	CARBON TETRACHLORIDE	12	2	0 01	0 013	0 011	0 019	0 015		0 07	No	B
6	66	SB	MG/KG	CHLOROFORM	12	3	0 01	0 013	0 002	0 043	0 025		0 6	No	B
6	66	SB	MG/KG	CHROMIUM, TOTAL	1	1	0 26	0 26	14	14	14	26	38	No	C
6	66	SB	MG/KG	COBALT	1	1	0 3	0 3	5	5	5	20		No	C
6	66	SB	MG/KG	COPPER	1	1	0 140000001	0 140000001	19	19	19	33		No	C
6	66	SB	MG/KG	DI-n-BUTYL PHTHALATE	13	1	0 35	1 2	0 077	0 077	0 077		2300	No	B
6	66	SB	MG/KG	FLUORANTHENE	13	1	0 35	1 2	0 061	0 061	0 061	0 045	4300	No	B
6	66	SB	MG/KG	IRON	1	1	0 24	0 24	9190	9190	9190	38480		No	E
6	66	SB	MG/KG	LEAD	1	1	0 230000004	0 230000004	11	11	11	24		No	C
6	66	SB	MG/KG	MAGNESIUM	1	1	2 2	2 2	2050	2050	2050	4900		No	E
6	66	SB	MG/KG	MANGANESE	1	1	0 041000001	0 041000001	49	49	49	1540		No	C
6	66	SB	MG/KG	METHYLENE CHLORIDE	12	4	0 01	0 013	0 001	0 002	0 0013		0 02	No	B
6	66	SB	MG/KG	NICKEL	1	1	0 66	0 66	20	20	20	37	130	No	C
6	66	SB	MG/KG	PHENANTHRENE	13	1	0 35	1 2	0 052	0 052	0 052		250	No	B
6	66	SB	MG/KG	POTASSIUM	1	1	89	89	835	835	835	1800		No	E
6	66	SB	MG/KG	PYRENE	13	1	0 35	1 2	0 066	0 066	0 066	0 042	880	No	B
6	66	SB	MG/KG	VANADIUM	1	1	0 200000003	0 200000003	17	17	17	51	6000	No	C
6	66	SB	MG/KG	ZINC	1	1	0 119999997	0 119999997	62 6	62 6	62 6	114	12000	No	C

Note Data evaluated include field duplicates and normal samples (2 feet and below)

- A Exceeds Criteria
- B Does not exceed Criteria
- C Does not exceed Background
- D No Criteria available & exceeds Background, or no Criteria or Background available
- E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC
- F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC
- G Chemical is a member of a chemical class which contains other COPCs
- H Chemical is a surface soil COPC

TABLE D-32

Constituents of Potential Concern in FU7 - Groundwater

Memphis Depot Main Installation RI

Unit	Matrix	Units	Parameter Name	Number Analyzed	Number Detected	Minimum Detection Limit	Maximum Detection Limit	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Detected Concentration	Background Concentration	Regulatory Criteria for Groundwater	COPC/BASIS	
7	WG	MG/L	1 1 2 2-TETRACHLOROETHANE	83	2	0 005	0 01	0 002	0 004	0 003		0 000053	Yes	A
7	WG	MG/L	ARSENIC	76	13	0 00068	0 0024	0 0016	0 091	0 013		0 05	Yes	A
7	WG	MG/L	BERYLLIUM	76	10	0 00002	0 00015	0 00018	0 0059	0 0014	0 0006	0 004	Yes	A
7	WG	MG/L	CADMIUM	76	37	0 000085	0 0018	0 0003	0 085	0 009		0 005	Yes	A
7	WG	MG/L	CHLOROBENZENE	83	2	0 005	0 01	0 001	0 004	0 0025		0 0035	Yes	A
7	WG	MG/L	CHLOROMETHANE	83	2	0 01	0 01	0 001	0 002	0 0015		0 0015	Yes	A
7	WG	MG/L	CHROMIUM TOTAL	76	49	0 00039	0 0022	0 0012	0 28	0 028	0 054	0 11	Yes	A
7	WG	MG/L	DIBROMOCHLOROMETHANE	83	2	0 005	0 01	0 001	0 002	0 0015		0 00013	Yes	A
7	WG	MG/L	LEAD	76	41	0 00099	0 0093	0 0011	0 11	0 014	0 0094	0 015	Yes	A
7	WG	MG/L	MANGANESE	69	61	0 000063	0 00053	0 00092	2 7	0 23	0 56	0 073	Yes	A
7	WG	MG/L	NICKEL	76	40	0 00027	0 0077	0 00085	0 21	0 021	0 031	0 1	Yes	A
7	WG	MG/L	TETRACHLOROETHYLENE(PCE)	83	33	0 005	0 01	0 001	0 12	0 021	0 001	0 005	Yes	A
7	WG	MG/L	TRICHLOROETHYLENE (TCE)	83	31	0 005	0 01	0 001	0 058	0 009		0 005	Yes	A
7	WG	MG/L	VANADIUM	69	48	0 0003	0 0016	0 00031	0 26	0 014	0 006	0 026	Yes	A
7	WG	MG/L	1 1 1-TRICHLOROETHANE	83	5	0 005	0 01	0 001	0 014	0 0038	0 001	0 2	No	B
7	WG	MG/L	1 2 DICHLOROETHANE	83	1	0 005	0 01	0 001	0 001	0 001		0 005	No	B
7	WG	MG/L	2 HEXANONE	83	1	0 01	0 01	0 005	0 005	0 005		0 15	No	B
7	WG	MG/L	ACETONE	83	3	0 01	0 012	0 014	0 19	0 076		0 37	No	B
7	WG	MG/L	ANTIMONY	76	5	0 0017	0 011	0 0017	0 0025	0 002	0 034	0 006	No	C
7	WG	MG/L	BARIUM	69	69	0 00011	0 00055	0 031	0 39	0 11	0 22	2	No	B
7	WG	MG/L	BENZENE	84	1	0 001	0 01	0 003	0 003	0 003		0 005	No	B
7	WG	MG/L	bis(2 ETHYLHEXYL) PHTHALATE	57	5	0 01	0 01	0 001	0 019	0 007		0 0048	No	F
7	WG	MG/L	BROMODICHLOROMETHANE	83	2	0 005	0 01	0 001	0 002	0 0015		0 08	No	B
7	WG	MG/L	BROMOFORM	83	1	0 005	0 01	0 001	0 001	0 001		0 08	No	B
7	WG	MG/L	CALCIUM	69	69	0 0059	0 024	7 4	116	23	53		No	E
7	WG	MG/L	CARBON DISULFIDE	83	2	0 005	0 01	0 001	0 001	0 001		0 1	No	B
7	WG	MG/L	CARBON TETRACHLORIDE	83	10	0 005	0 01	0 001	0 004	0 0027		0 005	No	B
7	WG	MG/L	CHLOROFORM	83	10	0 005	0 01	0 001	0 005	0 0018		0 1	No	B
7	WG	MG/L	CHRYSENE	57	1	0 01	0 01	0 001	0 001	0 001		0 0092	No	B
7	WG	MG/L	COBALT	69	37	0 00033	0 0015	0 00088	0 086	0 011	0 025	0 22	No	B
7	WG	MG/L	COPPER	76	36	0 00059	0 002	0 0011	0 21	0 029	0 16	1 3	No	B
7	WG	MG/L	DIETHYL PHTHALATE	57	1	0 01	0 01	0 001	0 001	0 001		2 9	No	B
7	WG	MG/L	DI-n-BUTYL PHTHALATE	57	1	0 01	0 01	0 002	0 002	0 002		0 37	No	B
7	WG	MG/L	DI-n-OCTYLPHTHALATE	57	1	0 01	0 01	0 004	0 004	0 004		0 073	No	B
7	WG	MG/L	IRON	70	64	0 0017	0 0039	0 048	136	8 2	6 7	1 1	No	E
7	WG	MG/L	MAGNESIUM	69	69	0 0024	0 022	2 8	19	9 2	26		No	E
7	WG	MG/L	MERCURY	76	4	0 000060	0 00011	0 00013	0 00029	0 0002		0 0011	No	B
7	WG	MG/L	METHYL ETHYL KETONE (2-BUTANONE)	83	4	0 01	0 01	0 004	0 009	0 0063		0 19	No	B
7	WG	MG/L	POTASSIUM	69	53	0 72	1 29	0 849	13 9	2 8	3 5		No	E
7	WG	MG/L	SELENIUM	76	4	0 0016	0 0037	0 0041	0 0083	0 0059	0 0058	0 05	No	B
7	WG	MG/L	SILVER	76	2	0 00039	0 0022	0 0028	0 0109	0 0069		0 018	No	B
7	WG	MG/L	SODIUM	69	60	0 013	0 11	7 0	43	19	107		No	E
7	WG	MG/L	TOLUENE	84	1	0 001	0 01	0 002	0 002	0 002		1	No	B
7	WG	MG/L	TOTAL 1 2 DICHLOROETHENE	83	7	0 005	0 01	0 001	0 009	0 003		0 1	No	B
7	WG	MG/L	ZINC	76	40	0 00053	0 0011	0 0027	0 351	0 073		1 1	No	B
7	WG	MG/L	ALUMINUM	69	55	0 0061	0 023	0 011	126	4 3	1 8		Yes	D
7	WG	MG/L	CHLOROETHANE	83	1	0 01	0 01	0 001	0 001	0 001			Yes	D

Note Data evaluated includes field duplicates and normal samples

A full list of all chemicals and their COPC status can be found in Appendix I

A Exceeds Criteria

B Does not exceed Criteria

C Does not exceed Background

D No Criteria available & exceeds Background, or no Criteria or Background available

E Chemical is an essential nutrient and professional judgement was used in eliminating it as a COPC

F Chemical is a common lab contaminant and professional judgement was used in eliminating it as a COPC

G Chemical is a member of a chemical class which contains other COPCs

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TABLE D-33

Human Health Cntena per Chemical

Memphis Depot Main Installation RI

Parameter Name	Surface soils & sediments (direct) (mg/kg)	Source	Surface, subsurface & sediments (leachability) (mg/kg)	Source	Groundwater (mg/L)[1]	Source[1]	Surfacewater (mg/L)	Source
1,1,1,2-TETRACHLOROETHANE							0 006	g
1,1,1-TRICHLOROETHANE	160	a	2	c	0 2	d		
1,1,2,2-TETRACHLOROETHANE	3.2	a	0 003	c	0 000053	e	0 0017	g
1,1,2-TRICHLOROETHANE					0 005	d		
1,1-DICHLOROETHANE	780	a	23	c	0 08	e		
1,1-DICHLOROETHENE	1 1	a	0 06	c	0 007	d	0 00057	g
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	0 000000043	a	0 00005	c	3E-10	d	1E-11	g
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0 000000043	a	0 00005	c	3E-10	d	1E-11	g
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	0 000000043	a	0 00005	c	3E-10	d	1E-11	g
1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	0 00000043	a	0 0005	c	0 000000003	d	1E-10	g
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	0 00000043	a	0 0005	c	0 000000003	d	1E-10	g
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	0 00000043	a	0 0005	c	0 000000003	d	1E-10	g
1 2,3 6,7,8-HEXACHLORODIBENZOFURAN	0 00000043	a	0 0005	c	0 000000003	d	1E-10	g
1 2,3,7 8,9-HEXACHLORODIBENZO-P-DIOXIN	0 00000043	a	0 0005	c	0 000000003	d	1E-10	g
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	0 00000043	a	0 0005	c	0 000000003	d	1E-10	g
1 2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	0 00000215	a	0 0025	c	0 000000015	d	5E-10	g
1,2,3,7,8-PENTACHLORODIBENZOFURAN	0 00000215	a	0 0025	c	0 000000015	d	5E-10	g
1,2-DICHLOROETHANE	7	a	0 02	c	0 005	d	0 0038	g
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	0 00000043	a	0 0005	c	0 000000003	d	1E-10	g
2,3,4,7,8-PENTACHLORODIBENZOFURAN	0 000000215	a	0 00025	c	1 5E-09	d	5E-11	g
2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	0 0000043	a	0 005	c	0 00000003	d	0 000000001	g
2,3 7,8-TETRACHLORODIBENZOFURAN	0 00000043	a	0 0005	c	0 000000003	d	1E-10	g
2,4-DIMETHYLPHENOL	160	a	9	c	0 073	e	0 54	g
2-HEXANONE	310	a	1 4	b	0 15	e		
2-METHYLNAPHTHALENE	160	a	6 1	b	0 012	e		
4-METHYLPHENOL (p-CRESOL)	39	a	0 02	b	0 018	e		
ACENAPHTHENE	470	a	570	c	0 22	e	1 2	g
ACENAPHTHYLENE	470	a	27	b				
ACETONE	780	a	16	c	0 37	e		
ALDRIN	0 038	a	0 5	c	0 0000039	e	0 0000013	g
ALPHA ENDOSULFAN	47	a	18	c	0 022	e	0 074	g
ALPHA-CHLORDANE	1 8	a			0 002	d	0 0000057	g
ALUMINUM	7800	a						
ANTHRACENE	2300	a	12000	c	1 1	e	9 6	g
ANTIMONY	3 1	a	5	c	0 006	d	0 014	g
ARSENIC	0 43	a	29	c	0 05	d	0 000018	g
BARIUM	550	a	1600	c	2	d	1	f
BENZENE	22	a	0 03	c	0 005	d	0 012	g
BENZO(a)ANTHRACENE	0 87	a	2	c	0 000092	e	0 000044	g
BENZO(a)PYRENE	0 087	a	8	c	0 002	d	0 000044	g
BENZO(b)FLUORANTHENE	0 87	a	5	c	0 000092	e	0 0000044	f
BENZO(g,h,i)PERYLENE	230	a	32000	b				
BENZO(k)FLUORANTHENE	8 7	a	49	c	0 00092	e	0 000044	g
BENZYL BUTYL PHTHALATE	1600	a	930	c	0 73	e	3	g
BERYLLIUM	16	a	63	c	0 004	d		
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	0 35	a	0 003	c	0 000037	e	0 00014	g
bis(2-ETHYLHEXYL) PHTHALATE	46	a	3600	c	0 0048	e	0 0018	g
BROMODICHLOROMETHANE	10	a	0 6	c	0 08	d	0 0027	g
BROMOFORM	81	a	0 8	c	0 08	d	0 043	g
BROMOMETHANE	11	a	0 2	c	0 00085	e		
CADMIUM	7 8	a	8	c	0 005	d		
CARBAZOLE	32	a	0 6	c	0 0033	e		
CARBON DISULFIDE	780	a	32	c	0 1	e		
CARBON TETRACHLORIDE	4 9	a	0 07	c	0 005	d	0 0025	g
CHLOROBENZENE	160	a	1	c	0 0035	e	0 68	g
CHLOROFORM	100	a	0 6	c	0 1	d	0 057	g
CHLOROMETHANE	49	a	0 01	b	0 0015	e		
CHROMIUM III	12000	a			5 5	e		
CHROMIUM, HEXAVALENT	23	a	38	c	0 011	e		
CHROMIUM, TOTAL	10800	a*	38	c	0 011	e		
CHRYSENE	87	a	160	c	0 0092	e	0 000044	g
COBALT	470	a			0 22	e		
COPPER	310	a			1 3	d	1 3	f
CYANIDE	160	a	40	c	0 2	d	0 7	g
DDD	2 7	a	16	c	0 00028	e	0 0000083	g
DDE	1 9	a	54	c	0 0002	e	0 00000059	g
DDT	1 9	a	11	b	0 0002	e	0 00000059	g
DI-n-BUTYL PHTHALATE	780	a	2300	c	0 37	e	2 7	f

TABLE D-33

Human Health Cnteria per Chemical

Memphis Depot Main Installation RI

Parameter Name	Surface soils & sediments (direct) (mg/kg)	Source	Surface, subsurface & sediments (leachability) (mg/kg)	Source	Groundwater (mg/L)[1]	Source[1]	Surfacewater (mg/L)	Source
DI-n-OCTYLPHTHALATE	160	a	10000	c	0 073	e		
DIBENZ(a,h)ANTHRACENE	0 087	a	2	c	0 0000092	e	0 000044	g
DIBENZOFURAN	31	a	15	b	0 0024	e		
DIBROMOCHLOROMETHANE	7 6	a	0 003	c	0 00013	e	0 0041	g
DIELDRIN	0 04	a	0 004	b	0 0000042	e	0 00000014	g
DIETHYL PHTHALATE	6300	a	470	c	2 9	e	23	g
DIMETHYL PHTHALATE	78000	a	380	b	37	e	313	g
ENDRIN	2 3	a	1	c	0 002	d	0 00076	g
ENDRIN ALDEHYDE	2 3	a	1	c	0 002	d	0 00076	g
ETHYLBENZENE	780	a	13	c	0 7	d	3 1	g
FLUORANTHENE	310	a	4300	c	0 15	e	0 3	g
FLUORENE	310	a	560	c	0 15	e	1 3	g
GAMMA BHC (LINDANE)	0 49	a	0 009	c	0 0002	d	0 00019	g
GAMMA-CHLORDANE	1 8	a			0 002	d	0 0000021	f
HEPTACHLOR	0 14	a	23	c	0 0004	d	0 0000021	g
INDENO(1,2,3-c,d)PYRENE	0 87	a	14	c	0 000092	e	0 000044	g
IRON	2300	a			1 1	e	0 3	f
ISOPHORONE	670	a	0 5	c	0 07	e	0 36	g
LEAD	400	a			0 015	d		
MANGANESE	1100	a			0 073	e	0 05	f
MERCURY	2 3	a	2	c	0 002	d	0 00005	f
METHYL ETHYL KETONE (2-BUTANONE)	4700	a	17	b	0 19	e		
METHYL ISOBUTYL KETONE (4-METHYL-2-	630	a	2 6	b	0 29	e		
METHYLENE CHLORIDE	85	a	0 02	c	0 0041	e	0 047	g
N-NITROSODIPHENYLAMINE	130	a	1	c	0 014	e	0 05	g
NAPHTHALENE	160	a	84	c	0 073	e		
NICKEL	160	a	130	c	0 1	d	0 61	g
OCTACHLORODIBENZO-p DIOXIN	4 3E-09	a	0 000005	c	3E-11	d	1E-12	g
OCTACHLORODIBENZOFURAN	4 3E-09	a	0 000005	c	3E-11	d	1E-12	g
PCB-1260 (AROCHLOR 1260)	0 32	a	17	b	0 0005	d	0 00000044	g
PENTACHLOROPHENOL	5 3	a	0 03	c	0 001	d	0 0028	g
PETROLEUM HYDROCARBONS	34	a	340	c	5	d		
PHENANTHRENE	230	a	250	b				
PHENOL	4700	a	100	c	2 2	e	21	g
PYRENE	230	a	880	b	0 11	e	0 96	g
SELENIUM	39	a	5	c	0 05	d	0 17	f
SILVER	39	a	34	c	0 018	e		
TCDD Equivalent	0 0000043	a	0 005	c	0 00000003	d	0 000000001	g
TETRACHLOROETHYLENE(PCE)	12	a	0 06	c	0 005	d	0 008	g
THALLIUM	0 55	a	0 7	c	0 002	d	0 0017	g
TOLUENE	1600	a	12	c	1	d	6 8	g
TOTAL 1,2-DICHLOROETHENE	70	a			0 1	d	0 7	f
Total Xylenes	16000	a	0 2	b	10	d		
TRICHLOROETHYLENE (TCE)	58	a	0 06	c	0 005	d	0 027	g
VANADIUM	55	a	6000	c	0 026	e		
ZINC	2300	a	12000	c	1 1	e	9 1	f

Notes

a = EPA Region III Residential Soil RBCs, 1999 (Note *EPA III Residential Soil Value was calculated for total chromium from its isomers)

b = Brownfield's Groundwater Cleanup Target Level for Soil, 1998

c = EPA Soil Screening Level, 1996

d = EPA Maximum Contaminant Levels for Groundwater, 1996

e = EPA Region III Tap Water RBCs, 1999

f = EPA Ambient Water Quality Criteria, 1999

g = Environmental Law Reporter - Tenn Environmental - H2O & Organism Values for Surface Water, 1996

The criteria used in this table were revisited to compare with the current (April 1999) EPA Ambient Water Quality criteria The comparative criteria represent Human Health for Consumption of Water and Organism The review indicated that the mercury criterion has been changed to 0 00005 mg/L This criterion is slightly above the site-reported concentration in a single sample Of 31 surface water samples analyzed for mercury, a single detection of 0 00009 mg/L mercury occurred This detected value marginally exceeded the new criterion of 0 00005 mg/L In addition, the detected value did not exceed the RBC value of 0 00011 mg/L Therefore, the new EPA criteria only affect mercury, which considering the above-described issues, would not be a constituent of significant concern None of the other chemicals had a change in their status of "Yes/No" as COPCs

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TAB

Appendix E

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Appendix E

Preliminary Risk Evaluation for all Surface Soils

APPENDIX E

Preliminary Risk Evaluation for All Surface Soils

A PRE was conducted previously for the data from the Main Installation (CH2M HILL, April 1998), and these calculations are provided as an update of the additional data collected since the last PRE.

These tables include carcinogenic and noncarcinogenic PRE calculations for the surface soils in all applicable FUs for the Main Installation. Maximum PRE ratios are used to identify a worst-case representative surrogate site per functional unit. Exceptions to choosing the highest PRE include sites where the next highest PRE site is near the maximum PRE site, and also has a larger list of COPCs (such as dieldrin). Then the second highest site is selected as the surrogate site, and is identified with a footnote.

Maximum PRE values across FUs also were identified, and these highest PRE locations (single data points) are used for residential risk estimations.

The following are included in this appendix:

- **Table E-1**–Summary of Surrogate Sites Within the Functional Units
- **Table E-2**–Summary of Carcinogenic Preliminary Risk Evaluation for Surface Soils
- **Table E-3**–Carcinogenic Preliminary Risk Evaluation for Surface Soils
- **Table E-4**–Summary of Noncarcinogenic Preliminary Risk Evaluation for Surface Soils
- **Table E-5**–Summary of Noncarcinogenic Preliminary Risk Evaluation for Surface Soils

NOTE: Only the first 6 pages of this appendix are included hard-copy, because of its large size. The complete appendix is included on the enclosed CD-ROM. The full hard-copy appendix is found starting in Volume 5, which is found in the Administrative Record.

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TABLE E-1

Summary of Surrogate Sites within the Functional Units (Surface Soils Maximum Detected Concentrations)

Memphis Depot Main Installation RI

Functional Unit	Surrogate Site		Maximum Preliminary Risk Evaluation Carcinogenic Risk Ratio	Station	Noncarcinogenic Risk Ratio	Station
1	57		9 17E-03	SS42	2 3	SS42
1	**65**	a	**9 41E-04**	**SS65A**	0 2	SS65E
1	BRAC		2 57E-04	SS8A	0 3	E(10 2)
1	66		2 03E-04	SS66E	0 0	SS66E
2	**BRAC**	b	**2.50E-04**	B(3 5)	0 02	N(3 5)
2	51		1 71E-04	SS14	0 05	SS51B
2	**59**	c	**1.33E-04**	SS37	0 06	SS50
2	52		1 24E-04	SS52B	0 2	SS52A
2	92		3 59E-06	TEC92A	0 0000008	TEC92B
2	69		0 00E+00	d	0	d
3	**BRAC**	b	**5 46E-04**	B(26 2)	0 1	B(35 2)
3	**34**	e	**1.40E-04**	SS34G	0 6	SS39
3	27		1 23E-04	SS27F	2 4	SS27T
3	32		1 09E-04	SB32A	2 4	SS16
3	89		6 18E-05	SS89H	0 1	SS89J
3	82		5 66E-05	SS82C	0 05	SB82A
3	33		5 57E-05	SS33K	0 5	SS33K
3	31		4 80E-05	SB31A	0 2	SS31A
3	84		8 46E-07	SB84B	0 02	SB84A
3	87		0 00E+00	d	0	d
3	93		0 00E+00	d	0 003	TEC93A
4	**BRAC**	b	**1.92E-04**	**SS14A**	0 3	E(31 1)
4	46		1 70E-04	SS46E	0	d
4	**36**	c	**1 32E-04**	SS52B	3 5	SS5
4	79		1 07E-04	SS79A	0 08	SS79A
4	54		9 69E-05	SB54B	0 07	SB54B
4	70		8 29E-05	SS23	0 4	SS23
4	43		8 13E-05	SS43B	0 01	SS43F
4	35		7 67E-05	SS4	1 1	SS35C
4	80		7 33E-05	SS24	0 07	SB80B
4	72		6 77E-05	SS72A	0 08	SS41
4	28		5 01E-05	SB28A	0 1	SS28A
4	56		4 77E-05	SS56B	3 1	SS56B
4	42		3 96E-05	SS42A	0 005	SS42F
4	84		3 89E-05	SS84C	0 05	SS84C
4	83		1 92E-05	SS20	3 4	SS20
4	55		9 07E-06	SB55A	0	d
4	34		2 67E-06	SS34E	0 009	SS34E
4	74		8 13E-08	SB74C	0 008	SB74C
4	57		0 00E+00	d	0 0000002	SB57B
4	81		0 00E+00	d	0	d
5	**77**		**3 81E-04**	**SS77C**	0 2	SS77B
5	BRAC		2 25E-04	A(20 6)	0 1	A(20 6)
5	75		6 74E-05	SS75D	0 005	SS75F
5	91		4 34E-05	TEC91A	0 01	TEC91A
5	76		7 25E-06	SB76A	0 04	SB76B
6	BRAC	f	1 38E-04	A(2 7)	0 0000004	SS1A
6	**66**	e	**9 62E-05**	**SS66A**	0 05	SS66A
6	67		5 85E-05	SS67A	0 04	SS67A
6	48		4 38E-06	SS48E	0 0000007	SS48D
6	58		3 10E-06	SB58A	0 002	SB58A
6	68		0 00E+00	d	0 002	SB68C
6	69		0 00E+00	d	0	d

Note

a = Site 65 and station SS65A selected over sites with maximum risk, because maxiumum risk was due to historic Law data

b = Residential carcinogenic risk estimates are on these maximum PRE ratio samples from BRAC samples

c = Industrial surrogate site selected over site with maximum risk due to greater number of COPCs & higher risk due to Dieldrin

d = Concentration is below Background, therefore no risk calculations are necessary

e = Industrial surrogate site selected over BRAC site

f = Residential carcinogenic risk estimates not from BRAC sample because it has been excavated

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TABLE E-2

Summary of Carcinogenic Preliminary Risk Evaluation for Surface Soils

Memphis Depot Main Installation RI

Functional Unit	Site		Residential PRE Carcinogenic Risk Ratio	Industrial PRE Carcinogenic Risk Ratio	Residential PRE Carcinogenic Risk Ratio - All Results	Industrial PRE Carcinogenic Risk Ratio - All Results
1	**57**	**Max**	**9.17E-03**	**1.02E-03**	**9.20E-03**	**1.03E-03**
1	65	Max	9 41E-04	1 05E-04	9 41E-04	1 05E-04
1	BRAC	Max	2 57E-04	2 88E-05	2 57E-04	2 88E-05
1	66	Max	2 03E-04	2 28E-05	2 03E-04	2 28E-05
2	**BRAC**	**Max**	**2.50E-04**	**2.78E-05**	**2.50E-04**	**2.78E-05**
2	**51**	**Max**	**1.71E-04**	**1.92E-05**	**1.82E-04**	**2.05E-05**
2	59	Max	1 33E-04	1 50E-05	1 48E-04	1 66E-05
2	52	Max	1 24E-04	1 41E-05	1 28E-04	1 45E-05
2	92	Max	3 59E-06	4 25E-07	5 01E-05	5 69E-06
2	69	Max	0 00E+00	0 00E+00	3 25E-05	3 68E-06
3	**BRAC**	**Max**	**5 46E-04**	**6.10E-05**	**5 47E-04**	**6.11E-05**
3	**34**	**Max**	**1.40E-04**	**1.56E-05**	**1.40E-04**	**1.56E-05**
3	27	Max	1 23E-04	1 38E-05	1 57E-04	1 76E-05
3	32	Max	1 09E-04	2 16E-05	1 13E-04	2 16E-05
3	89	Max	6 18E-05	8 76E-06	6 18E-05	8 76E-06
3	82	Max	5 66E-05	6 45E-06	5 80E-05	6 59E-06
3	33	Max	5 57E-05	7 62E-06	5 66E-05	7 72E-06
3	31	Max	4 80E-05	5 47E-06	4 80E-05	5 47E-06
3	84	Max	8 46E-07	1 47E-07	4 70E-05	5 32E-06
3	87	Max	0 00E+00	0 00E+00	0 00E+00	0 00E+00
3	93	Max	0 00E+00	0 00E+00	2 68E-05	3 04E-06
4	**BRAC**	**Max**	**1.92E-04**	**2.17E-05**	**1.92E-04**	**2.17E-05**
4	**46**	**Max**	**1 70E-04**	**1.93E-05**	**1.70E-04**	**1 93E-05**
4	36	Max	1 32E-04	1 65E-05	1 79E-04	2 17E-05
4	79	Max	1 07E-04	1 29E-05	1 11E-04	1 33E-05
4	54	Max	9 69E-05	1 11E-05	1 01E-04	1 16E-05
4	70	Max	8 29E-05	9 41E-06	8 41E-05	9 55E-06
4	43	Max	8 13E-05	9 20E-06	8 13E-05	9 20E-06
4	35	Max	7 67E-05	8 68E-06	7 84E-05	8 89E-06
4	80	Max	7 33E-05	8 35E-06	7 43E-05	8 47E-06
4	72	Max	6 77E-05	7 73E-06	6 98E-05	7 96E-06
4	28	Max	5 01E-05	5 70E-06	5 01E-05	5 70E-06
4	56	Max	4 77E-05	5 62E-06	4 80E-05	5 65E-06
4	42	Max	3 96E-05	4 49E-06	3 96E-05	4 49E-06
4	84	Max	3 89E-05	4 37E-06	7 56E-05	8 53E-06
4	83	Max	1 92E-05	7 68E-06	5 45E-05	1 17E-05
4	55	Max	9 07E-06	1 03E-06	3 04E-05	3 45E-06
4	34	Max	2 67E-06	5 43E-07	3 73E-05	4 44E-06
4	74	Max	8 13E-08	3 25E-08	3 40E-05	3 87E-06
4	57	Max	0 00E+00	0 00E+00	2 36E-05	2 68E-06
4	81	Max	0.00E+00	0 00E+00	2 46E-05	2 79E-06
5	**77**	**Max**	**3.81E-04**	**4 26E-05**	**4.08E-04**	**4.56E-05**
5	BRAC	Max	2 25E-04	2 52E-05	2 56E-04	2 86E-05
5	75	Max	6 74E-05	7 63E-06	6 92E-05	7 85E-06
5	91	Max	4 34E-05	4 84E-06	5 82E-05	6 51E-06
5	76	Max	7 25E-06	8 06E-07	3 52E-05	3 98E-06
6	**BRAC**	**Max**	**1.38E-04**	**1.53E-05**	**1.38E-04**	**1.53E-05**
6	**66**	**Max**	**9.62E-05**	**1.08E-05**	**1 05E-04**	**1.17E-05**
6	67	Max	5 85E-05	6 64E-06	5 99E-05	6 79E-06
6	48	Max	4 38E-06	4 83E-07	4 74E-05	5 42E-06
6	58	Max	3 10E-06	3 75E-07	4 32E-05	4 91E-06
6	68	Max	0 00E+00	0 00E+00	2 39E-05	2 70E-06
6	69	Max	0 00E+00	0 00E+00	0 00E+00	0 00E+00

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TABLE E-3

Carcinogenic Preliminary Risk Evaluation for Surface Soils (mg/kg)

Memphis Depot Main Installation RI

Functional Unit	Site	Station	Parameter	Upper Depth	Lower Depth	Concentration	Background	Residential Land-use Criteria	Industrial Land-use Criteria	Residential PRE Carcinogenic Risk Ratio	Industrial PRE Carcinogenic Risk Ratio
1	57	FS57A	ARSENIC	0	1	17 05	20	43	3 8		
1	57	FS57A	BENZO(a)ANTHRACENE	0	1	1 05	71	87	7 8	1 21E-06	1 35E-07
1	57	FS57A	BENZO(a)PYRENE	0	1	1 05	96	087	78	1 21E-05	1 35E-06
1	57	FS57A	BENZO(b)FLUORANTHENE	0	1	0 9	9	87	7 8		
1	57	FS57A	BENZO(k)FLUORANTHENE	0	1	1 15	78	8 7	78	1 32E-07	1 47E-08
1	57	FS57A	CHRYSENE	0	1	1 1	94	87	780	1 26E-08	1 41E-09
1	57	FS57A	DIBENZ(a,h)ANTHRACENE	0	1	0	26	087	78		
1	57	FS57A	INDENO(1,2,3-c,d)PYRENE	0	1	0 65	7	87	7 8		
1	57	FS57A	LEAD	0	1	21 6	30	400	1000		
1	57	FS57A Total								1 34E-05	1 50E-06
1	57	FS57B	BENZO(a)ANTHRACENE	0	1	2 2	71	87	7 8	2 53E-06	2 82E-07
1	57	FS57B	BENZO(a)PYRENE	0	1	2 1	96	087	78	2 41E-05	2.69E-06
1	57	FS57B	BENZO(b)FLUORANTHENE	0	1	1 9	9	87	7 8	2 18E-06	2 44E-07
1	57	FS57B	BENZO(k)FLUORANTHENE	0	1	2 3	78	8 7	78	2 64E-07	2 95E-08
1	57	FS57B	CHRYSENE	0	1	2 25	94	87	780	2 59E-08	2 88E-09
1	57	FS57B	DIBENZ(a,h)ANTHRACENE	0	1	0	26	087	78		
1	57	FS57B	INDENO(1,2,3-c,d)PYRENE	0	1	1 1	7	87	7 8	1 26E-06	1 41E-07
1	57	FS57B Total								3 04E-05	3 39E-06
1	57	FS57C	ARSENIC	0	1	10 1	20	43	3 8		
1	57	FS57C	BENZO(a)ANTHRACENE	0	1	25 5	71	87	7 8	2 93E-05	3 27E-06
1	57	FS57C	BENZO(a)PYRENE	0	1	26	96	087	78	2 99E-04	3 33E-05
1	57	FS57C	BENZO(b)FLUORANTHENE	0	1	25	9	87	7 8	2 87E-05	3 21E-06
1	57	FS57C	BENZO(k)FLUORANTHENE	0	1	28 5	78	8 7	78	3 28E-06	3 65E-07
1	57	FS57C	CHRYSENE	0	1	31 5	94	87	780	3 62E-07	4 04E-08
1	57	FS57C	DIBENZ(a,h)ANTHRACENE	0	1	0	26	087	78		
1	57	FS57C	INDENO(1,2,3-c,d)PYRENE	0	1	19	7	87	7 8	2 18E-05	2 44E-06
1	57	FS57C	LEAD	0	1	297	30	400	1000	7 43E-07	2 97E-07
1	57	FS57C Total								3 83E-04	4 29E-05
1	57	FS57D	BENZO(a)ANTHRACENE	0	1	30	71	87	7 8	3 45E-05	3 85E-06
1	57	FS57D	BENZO(a)PYRENE	0	1	29 5	96	087	78	3 39E-04	3 78E-05
1	57	FS57D	BENZO(b)FLUORANTHENE	0	1	27 5	9	87	7 8	3 16E-05	3 53E-06
1	57	FS57D	BENZO(k)FLUORANTHENE	0	1	32	78	8 7	78	3 68E-06	4 10E-07
1	57	FS57D	CHRYSENE	0	1	35 5	94	87	780	4 08E-07	4.55E-08
1	57	FS57D	DIBENZ(a,h)ANTHRACENE	0	1	0	26	087	78		
1	57	FS57D	INDENO(1,2,3-c,d)PYRENE	0	1	20 9	7	87	7 8	2 40E-05	2 68E-06
1	57	FS57D Total								4 33E-04	4 83E-05
1	57	SB57C	1,1,2,2-TETRACHLOROETHANE	0	2	0	NA	3 2	29		
1	57	SB57C	1,1,2-TRICHLOROETHANE	0	2	0	NA	11	100		
1	57	SB57C	1,1-DICHLOROETHENE	0	2	0	NA	1 1	9 5		

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TABLE E-3

Carcinogenic Preliminary Risk Evaluation for Surface Soils (mg/kg)

Memphis Depot Main Installation RI

Functional Unit	Site	Station	Parameter	Upper Depth	Lower Depth	Concentration	Background	Residential Land-use Criteria	Industrial Land-use Criteria	Residential PRE Carcinogenic Risk Ratio	Industrial PRE Carcinogenic Risk Ratio
1	57	SB57C	1,2-DICHLOROETHANE	0	2	0	NA	7	6 31		
1	57	SB57C	1,2-DICHLOROPROPANE	0	2	0	NA	NA	NA		
1	57	SB57C	1,4-DICHLOROBENZENE	0	2	0	NA	NA	NA		
1	57	SB57C	2,4,6-TRICHLOROPHENOL	0	2	0	NA	NA	NA		
1	57	SB57C	2,4-DINITROTOLUENE	0	2	0	NA	NA	NA		
1	57	SB57C	2,6-DINITROTOLUENE	0	2	0	NA	NA	NA		
1	57	SB57C	2-METHYLPHENOL (o-CRESOL)	0	2	0	NA	NA	NA		
1	57	SB57C	3,3'-DICHLOROBENZIDINE	0	2	0	NA	NA-	NA		
1	57	SB57C	ALDRIN	0	2	0	NA	038	34		
1	57	SB57C	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	0	2	0	NA	NA	NA		
1	57	SB57C	ALPHA-CHLORDANE	0	2	0	029	1 8	16		
1	57	SB57C	ARSENIC	0	2	11 6	20	43	3 8		
1	57	SB57C	BENZENE	0	2	0	NA	22	200		
1	57	SB57C	BENZO(a)ANTHRACENE	0	2	0	71	87	7 8		
1	57	SB57C	BENZO(a)PYRENE	0	2	0	96	087	78		
1	57	SB57C	BENZO(b)FLUORANTHENE	0	2	0	9	87	7 8		
1	57	SB57C	BENZO(k)FLUORANTHENE	0	2	0	78	8 7	78		
1	57	SB57C	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	0	2	0	NA	35	3 2		
1	57	SB57C	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHI	0	2	0	NA	NA	NA		
1	57	SB57C	bis(2-ETHYLHEXYL) PHTHALATE	0	2	0 064	NA	46	410		
1	57	SB57C	BROMODICHLOROMETHANE	0	2	0	NA	10	92		
1	57	SB57C	BROMOFORM	0	2	0	NA	81	720		
1	57	SB57C	CARBAZOLE	0	2	0	067	32	290		
1	57	SB57C	CARBON TETRACHLORIDE	0	2	0	NA	4 9	44		
1	57	SB57C	CHLOROFORM	0	2	0	NA	100	940		
1	57	SB57C	CHLOROMETHANE	0	2	0	NA	49	440		
1	57	SB57C	CHRYSENE	0	2	0	94	87	780		
1	57	SB57C	cis-1,3-DICHLOROPROPENE	0	2	0	NA	NA	NA		
1	57	SB57C	DDD	0	2	0	0067	NA	NA		
1	57	SB57C	DDE	0	2	0 0025	16	NA	NA		
1	57	SB57C	DDT	0	2	0	074	NA	NA		
1	57	SB57C	DIBENZ(a,h)ANTHRACENE	0	2	0	26	087	78		
1	57	SB57C	DIBROMOCHLOROMETHANE	0	2	0	NA	7 6	68		
1	57	SB57C	DIELDRIN	0	2	0	086	04	36		
1	57	SB57C	GAMMA BHC (LINDANE)	0	2	0	NA	49	4 4		
1	57	SB57C	GAMMA-CHLORDANE	0	2	0	026	1 8	16		
1	57	SB57C	HEPTACHLOR	0	2	0	NA	14	1 3		
1	57	SB57C	HEPTACHLOR EPOXIDE	0	2	0	0045	NA	NA		
1	57	SB57C	HEXACHLOROBENZENE	0	2	0	NA	NA	NA		

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TABLE E-3

Carcinogenic Preliminary Risk Evaluation for Surface Soils (mg/kg)

Memphis Depot Main Installation RI

Functional Unit	Site	Station	Parameter	Upper Depth	Lower Depth	Concentration	Background	Residential Land-use Criteria	Industrial Land-use Criteria	Residential PRE Carcinogenic Risk Ratio	Industrial PRE Carcinogenic Risk Ratio
1	57	SB57C	HEXACHLOROBUTADIENE	0	2	0	NA	NA	NA		
1	57	SB57C	HEXACHLOROETHANE	0	2	0	NA	NA	NA		
1	57	SB57C	INDENO(1,2,3-c,d)PYRENE	0	2	0	7	87	7 8		
1	57	SB57C	ISOPHORONE	0	2	0	NA	670	6000		
1	57	SB57C	LEAD	0	2	13 7	30	400	1000		
1	57	SB57C	METHYLENE CHLORIDE	0	2	0	NA	85	760		
1	57	SB57C	N-NITROSODI-n-PROPYLAMINE	0	2	0	NA	NA	NA		
1	57	SB57C	N-NITROSODIPHENYLAMINE	0	2	0	NA	130	1200		
1	57	SB57C	NITROBENZENE	0	2	0	NA	NA	NA		
1	57	SB57C	PENTACHLOROPHENOL	0	2	0	NA	5 3	48		
1	57	SB57C	STYRENE	0	2	0	NA	NA	NA		
1	57	SB57C	TETRACHLOROETHYLENE(PCE)	0	2	0	NA	12	110		
1	57	SB57C	TOXAPHENE	0	2	0	NA	NA	NA		
1	57	SB57C	trans-1,3-DICHLOROPROPENE	0	2	0	NA	NA	NA		
1	57	SB57C	TRICHLOROETHYLENE (TCE)	0	2	0	NA	58	520		
1	57	SB57C	VINYL CHLORIDE	0	2	0	NA	NA	NA		
1	57	SB57C Total								0 00E+00	0 00E+00
1	57	SB57D	1,1,2,2-TETRACHLOROETHANE	0	2	0	NA	3 2	29		
1	57	SB57D	1,1,2-TRICHLOROETHANE	0	2	0	NA	11	100		
1	57	SB57D	1,1-DICHLOROETHENE	0	2	0	NA	1 1	9 5		
1	57	SB57D	1,2-DICHLOROETHANE	0	2	0	NA	7	6 31		
1	57	SB57D	1,2-DICHLOROPROPANE	0	2	0	NA	NA	NA		
1	57	SB57D	1,4-DICHLOROBENZENE	0	2	0	NA	NA	NA		
1	57	SB57D	2,4,6-TRICHLOROPHENOL	0	2	0	NA	NA	NA		
1	57	SB57D	2,4-DINITROTOLUENE	0	2	0	NA	NA	NA		
1	57	SB57D	2,6-DINITROTOLUENE	0	2	0	NA	NA	NA		
1	57	SB57D	2-METHYLPHENOL (o-CRESOL)	0	2	0	NA	NA	NA		
1	57	SB57D	3,3'-DICHLOROBENZIDINE	0	2	0	NA	NA	NA		
1	57	SB57D	ALDRIN	0	2	0	NA	038	34		
1	57	SB57D	ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	0	2	0	NA	NA	NA		
1	57	SB57D	ALPHA-CHLORDANE	0	2	0	029	1 8	16		
1	57	SB57D	ARSENIC	0	2	13 7	20	43	3 8		
1	57	SB57D	BENZENE	0	2	0	NA	22	200		
1	57	SB57D	BENZO(a)ANTHRACENE	0	2	0	71	87	7 8		
1	57	SB57D	BENZO(a)PYRENE	0	2	0	96	087	78		
1	57	SB57D	BENZO(b)FLUORANTHENE	0	2	0	9	87	7 8		
1	57	SB57D	BENZO(k)FLUORANTHENE	0	2	0	78	8 7	78		
1	57	SB57D	BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	0	2	0	NA	35	3 2		
1	57	SB57D	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHI	0	2	0	NA	NA	NA		

TABLE E-3

Carcinogenic Preliminary Risk Evaluation for Surface Soils (mg/kg)

Memphis Depot Main Installation RI

Functional Unit	Site	Station	Parameter	Upper Depth	Lower Depth	Concentration	Background	Residential Land-use Criteria	Industrial Land-use Criteria	Residential PRE Carcinogenic Risk Ratio	Industrial PRE Carcinogenic Risk Ratio
1	57	SB57D	bis(2-ETHYLHEXYL) PHTHALATE	0	2	0	NA	46	410		
1	57	SB57D	BROMODICHLOROMETHANE	0	2	0	NA	10	92		
1	57	SB57D	BROMOFORM	0	2	0	NA	81	720		
1	57	SB57D	CARBAZOLE	0	2	0	067	32	290		
1	57	SB57D	CARBON TETRACHLORIDE	0	2	0	NA	4 9	44		
1	57	SB57D	CHLOROFORM	0	2	0	NA	100	940		
1	57	SB57D	CHLOROMETHANE	0	2	0	NA	49	440		
1	57	SB57D	CHRYSENE	0	2	0	94	87	780		
1	57	SB57D	cis-1,3-DICHLOROPROPENE	0	2	0	NA	NA	NA		
1	57	SB57D	DDD	0	2	0 0028	0067	NA	NA		
1	57	SB57D	DDE	0	2	0 0063	16	NA	NA		
1	57	SB57D	DDT	0	2	0 021	074	NA	NA		
1	57	SB57D	DIBENZ(a,h)ANTHRACENE	0	2	0	26	087	78		
1	57	SB57D	DIBROMOCHLOROMETHANE	0	2	0	NA	7 6	68		
1	57	SB57D	DIELDRIN	0	2	0	086	04	36		
1	57	SB57D	GAMMA BHC (LINDANE)	0	2	0 0029	NA	49	4 4		
1	57	SB57D	GAMMA-CHLORDANE	0	2	0	026	1 8	16		
1	57	SB57D	HEPTACHLOR	0	2	0	NA	14	1 3		
1	57	SB57D	HEPTACHLOR EPOXIDE	0	2	0	0045	NA	NA		
1	57	SB57D	HEXACHLOROBENZENE	0	2	0	NA	NA	NA		
1	57	SB57D	HEXACHLOROBUTADIENE	0	2	0	NA	NA	NA		
1	57	SB57D	HEXACHLOROETHANE	0	2	0	NA	NA	NA		
1	57	SB57D	INDENO(1,2,3-c,d)PYRENE	0	2	0	7	87	7 8		
1	57	SB57D	ISOPHORONE	0	2	0	NA	670	6000		
1	57	SB57D	LEAD	0	2	16	30	400	1000		
1	57	SB57D	METHYLENE CHLORIDE	0	2	0	NA	85	760		
1	57	SB57D	N-NITROSODI-n-PROPYLAMINE	0	2	0	NA	NA	NA		
1	57	SB57D	N-NITROSODIPHENYLAMINE	0	2	0	NA	130	1200		
1	57	SB57D	NITROBENZENE	0	2	0	NA	NA	NA		
1	57	SB57D	PENTACHLOROPHENOL	0	2	0	NA	5 3	48		
1	57	SB57D	STYRENE	0	2	0	NA	NA	NA		
1	57	SB57D	TETRACHLOROETHYLENE(PCE)	0	2	0	NA	12	110		
1	57	SB57D	TOXAPHENE	0	2	0	NA	NA	NA		
1	57	SB57D	trans-1,3-DICHLOROPROPENE	0	2	0	NA	NA	NA		
1	57	SB57D	TRICHLOROETHYLENE (TCE)	0	2	0	NA	58	520		
1	57	SB57D	VINYL CHLORIDE	0	2	0	NA	NA	NA		
1	57	SB57D Total								0 00E+00	0 00E+00
1	57	SB57E	1,1,2,2-TETRACHLOROETHANE	0	2	0	NA	3 2	29		
1	57	SB57E	1,1,2-TRICHLOROETHANE	0	2	0	NA	11	100		

TAB

Appendix F

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TAB

Appendix F

Relative Exposure Comparisons for Potential Worker Scenarios

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APPENDIX F

Relative Exposure Comparisons for Potential Worker Scenarios

This appendix includes a comparison of the ingestion exposures for all workers and exhibits the level of protection that maintenance workers/utility workers/industrial workers offer. These comparisons are included to document the relative exposures that justify not quantifying some of the lower exposure pathways. The higher exposure populations are assumed to cover for the lower exposure populations.

The following is included in this appendix:

Table F-1–Relative Exposure Comparisons for Potential Workers

In accordance with Section 4.7.1.4 of the Statement of Work, the following persons performed and checked calculations contained in this appendix:

Full Name	Title	Date
Elizabeth L. Garland	Envir. Scientist 2	01/10/00
Ugaya Mfavanapi	Project Scientist 5	1/10/2000

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TABLE F-1
Relative Exposure Comparisons for Potential Workers
Memphis Depot Main Installation RI

Exposure Scenario Specific Parameters for Potential Workers
Intake Estimation formulas:

$$\text{Intake} = \frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$$

Exposure Scenarios	Carcinogenic	Noncarcinogenic
Landscape Worker		
Cs = concentration in soil (mg/kg)	1	1
IR = Soil ingestion rate (mg/day)	200	200
FI = Fraction ingested from contaminated area (unitless)	1	1
ET = Exposure Time (hours/8 hr workday)	8	8
EF = Exposure frequency (days/yr)	250	250
ED = Exposure duration (years)	1	1
CF= Conversion factor (kg/mg)	0 000001	0 000001
BW = Body weight (kg)	70	70
AT = Averaging time(days/yr. x years)	25550	365
Intake =	**2.80E-08**	**0.000002**
RATIO for comparison to Industrial Worker	**0.16**	**4**
RATIO for comparison to Maintenance Worker	**1.6**	**40**
	12 MONTHS/YEAR	
Factory/Lumberyard/Office Worker/etc.		
Cs = concentration in soil (mg/kg)	1	1
IR = Soil ingestion rate (mg/day)	50	50
FI = Fraction ingested from contaminated area (unitless)	0 5	0 5
ET = Exposure Time (hours/8 hr workday)	1	1
EF = Exposure frequency (days/yr.)	50	50
ED = Exposure duration (years)	25	25
CF= Conversion factor (kg/mg)	0 000001	0.000001
BW = Body weight (kg)	70	70
AT = Averaging time(days/yr. x years)	25550	9125
Intake =	**2.18E-09**	**0.000000006**
RATIO for comparison to Industrial Worker	**0.01**	**0.01**
RATIO for comparison to Maintenance Worker	**0.1**	**0.1**
	partial days 12 MONTHS/YEAR	
Maintenance Worker		
Cs = concentration in soil (mg/kg)	1	1
IR = Soil ingestion rate (mg/day)	50	50
FI = Fraction ingested from contaminated area (unitless)	0 5	0 5
ET = Exposure Time (hours/8 hr workday)	8	8
EF = Exposure frequency (days/yr.)	50	50
ED = Exposure duration (years)	25	25
CF= Conversion factor (kg/mg)	0 000001	0.000001
BW = Body weight (kg)	70	70
AT = Averaging time(days/yr x years)	25550	9125
Intake =	**1.75E-08**	**0.00000005**
RATIO for comparison to Industrial Worker	**0.1**	**0.1**
	once a week/50weeks of year	
Utility Worker (new pipeline installer)		
Cs = concentration in soil (mg/kg)	1	1
IR = Soil ingestion rate (mg/day)	100	100
FI = Fraction ingested from contaminated area (unitless)	0 5	0 5

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TABLE F-1
Relative Exposure Comparisons for Potential Workers
Memphis Depot Main Installation RI

Exposure Scenario Specific Parameters for Potential Workers
Intake Estimation formulas

$$\text{Intake} = \frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$$

Exposure Scenarios	**Carcinogenic**	**Noncarcinogenic**
ET = Exposure Time (hours/8 hr workday)	8	8
EF = Exposure frequency (days/yr)	60	60
ED = Exposure duration (years)	1	1
CF= Conversion factor (kg/mg)	0 000001	0 000001
BW = Body weight (kg)	70	70
AT = Averaging time(days/yr x years)	25550	365
Intake =	**1.68E-09**	**0.0000001**
RATIO for comparison to Industrial Worker	**0.01**	**0.2**
RATIO for comparison to Utility Worker (routine)	**0.1**	**2.5**
	3 MONTHS/YEAR	
Utility Worker (routine maintainer)		
Cs = concentration in soil (mg/kg)	1	1
IR = Soil ingestion rate (mg/day)	100	100
FI = Fraction ingested from contaminated area (unitless)	0 50	0 50
ET = Exposure Time (hours/8 hr workday)	8	8
EF = Exposure frequency (days/yr)	24	24
ED = Exposure duration (years)	25	25
CF= Conversion factor (kg/mg)	0 000001	0 000001
BW = Body weight (kg)	70	70
AT = Averaging time(days/yr x years)	25550	9125
Intake =	**1.68E-08**	**0.00000005**
RATIO for comparison to Industrial Worker	**0.1**	**0.1**
	once a month/12 months a year	
Industrial Worker (from PRE report)		
Cs = concentration in soil (mg/kg)	1	1
IR = Soil ingestion rate (mg/day)	50	50
FI = Fraction ingested from contaminated area (unitless)	1	1
ET = Exposure Time (hours/8 hr workday)	8	8
EF = Exposure frequency (days/yr)	250	250
ED = Exposure duration (years)	25	25
CF= Conversion factor (kg/mg)	0 000001	0.000001
BW = Body weight (kg)	70	70
AT = Averaging time(days/yr. x years)	25550	9125
Intake =	**1.75E-07**	**0.0000005**
	Every working day per year	

TAB

Appendix G

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TAB

Appendix G

Supporting Information for Exposure Factors Development

APPENDIX G

Supporting Information for Exposure Factors Development

The following are included in this appendix:

- **Table G-1**–Exposure Factors for Soil
- **Table G-2**–Exposure Factors for Sediment and Surface Water
- **Table G-3**–Exposure Factors for Groundwater
- **Table G-4**–Surface Areas per Receptor
- **Table G-5**–Chemical-specific Dermal Permeability Factors
- **Table G-6**–Soil Loading Information
- **Table G-7**–Soil Loading Information: Calculation of UCL 90 for Soil Loading of Body Parts
- **Table G-8**–Soil Loading Information: Calculation of Adherence Factors for Child Receptors
- **Table G-9**–Soil Loading Information: Calculation of Adherence Factors for Adult Receptors

In accordance with Section 4.7.1.4 of the Statement of Work, the following persons performed and checked calculations contained in this appendix:

Full Name	Title	Date
Elizabeth R. Harland	Envir. Scientist 2	01/10/00
Evgenya Mylavarapu	Project Scientist 5	1/10/2000

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TABLE G-1

Exposure Factors for Soil

Memphis Depot Main Installation RI

Symbols	Parameter	FUTURE									
		Maintenance Worker		Utility Worker		Industrial Worker		Onsite Resident (Adult)		Onsite Resident (Child)	
BW	Body Weight (kg)	70	a	70	a	70	a	70	a	15	a
IR_Inh	Inhalation Rate (m^3/day)	20	a	20	a	20	a	20	a	15	a
IR_Inh_adj	Inhalation Rate_ age-adjusted	N/A		N/A		N/A		12 86	a,m	N/A	
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	70x365	a	70x365	a	N/A	a
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	25x365	a	25x365	a	30x365	a	6x365	a
	Soils										
IR_Ing	Incidental Ingestion Rate (mg/day)	50	p	100	p	50	p	100	p	200	p
IR_adj_Ing	Age-adjusted Incidental Ingestion Rate (mg/day)	N/A		N/A		N/A		114 29	p,n	N/A	
FI	Fraction Ingested	0 5	b	0 5	b	1	b	1	b	1	b
SA	Skin Surface Area (cm^2)	2,679	c	2,679	c	2,679	c	5,049	d	2,351	e
SA_adj	Age adjusted Skin Surface Area (cm^2)	N/A		N/A		N/A		2,671	d,o	N/A	
AF	Adherence Factor for dry soil (mg/cm^2)	0 03	f	0 1	g	0 03	f	0 03	f	0 15	h
PEF	Particulate Emission Factor (m^3/kg)	1 32E+09	i	1 32E+09	i	1 32E+09	i	1 32E+09	i	1 32E+09	i
ET	Exposure Time (hours/day)	8	a	8	a	8	a	4	j	4	j
EF	Exposure Frequency (days/year)	50	k	24	l	250	a	350	a	350	a
ED	Exposure Duration (years)	25	a	25	a	25	a	30	a	6	a

Notes All current scenario exposure factors are subject to re evaluation based on site-specific information

a Default exposure factors adapted from EPA Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25 1991

b Fraction ingested assumed by the nature of the activity

c Worker soil exposure is adapted from EPA Exposure Factor Handbook August 1997 & is protective of 1/2 head (face) hands & forearms (see Appendix G)

d Residential adult soil exposure is adapted from EPA Exposure Factor Handbook August 1997 & is protective of 1/2 head (face), hands forearms & lower legs (see Appendix G)

e Residential child soil exposure is adapted from EPA Exposure Factor Handbook August 1997 & is protective of 1/2 head (face) hands, forearms lower legs & feet (see Appendix G)

f 0 03 = Groundskeeper No 2 (exposure scenarios similar to urban horticulture center campus grounds arboretum) AFs chosen from Soil Loading calculations (see Appendix G)

g 0 1 = Construction Worker (heavy digging exposure to mixed bare earth concrete surfaces dust & debris) AFs chosen from Soil Loading calculations (see Appendix G)

h 0 15 = Daycare Kids No 1b (indoor exposure to linoleum outdoor exposure to grass bare earth no shoes) AFs chosen from Soil Loading calculations (see Appendix G)

i PEF adapted from EPA 1996 Soil Screening Guidance Technical Background Document

j 4 hours soil exposure are assumed for residential dermal contact and inhalation exposure time

k Worker soil exposure is assumed to be once a week per year, minus vaction time

l Worker soil exposure is assumed to be twice a month

m Age adjusted inhalation rate for residential adult $\text{IR-Inh adj} = \frac{\text{IR Inhc x EDc}}{\text{BWc}} + \frac{\text{IR Inha x (EDa - EDc)}}{\text{BWa}} = \frac{15 \times 6}{15} + \frac{20 \times (30-6)}{70} =$ *12 86 (m^3-year)/(kg-day)*

n Age adjusted ingestion rate for residential adult $\text{IRadj} = \frac{\text{IRc x EDc}}{\text{BWc}} + \frac{\text{IRa x (EDa - EDc)}}{\text{BWa}} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70} =$ *114 29 (mg-year)/(kg-day)*

o Age-adjusted dermal contact for residential adult $\text{SAadj} = \frac{\text{SAc x EDc}}{\text{BWc}} + \frac{\text{SAa x (EDa - EDc)}}{\text{BWa}} = \frac{2351 \times 6}{15} + \frac{5049 \times (30-6)}{70} =$ *2671 (cm^2-year)/(kg)*

p Ingestion rates adapted from EPA Supplemental Guidance to RAGS Region 4 Bulletins Human Health Risk Assessment Interim November 1995

cm^2 centimeters squared

days/year days per year

hours/day hours per day

kg kilograms

m^3/day cubic meters per day

m^3/kg cubic meters per kilogram

mg/cm^2 milligrams per centimeters squared

mg/day milligrams per day

N/A Not applicable for this receptor

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TABLE G-2

Exposure Factors for Sediment and Surface Water

Memphis Depot Main Installation RI

		FUTURE											
Symbols	**Parameter**	**Maintenance Worker**		**Industrial Worker - ponds**		**Industrial Worker - sumps/ditches**		**Residential/ Recreational (Adult)**		**Residential/ Recreational (Youth)**		**Residential/ Recreational (Child)**	
BW	Body Weight (kg)	70	a	70	a	70	a	70	a	45	a	15	a
IR_Inh	Inhalation Rate (m^3/day)	20	a	20	a	20	a	20	a	20	a	15	a
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	70x365	a	70x365	a	70x365	a	N/A	
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	25x365	a	25x365	a	30x365	a	10x365	a	6x365	a
	Surface Water												
IR_Ing_w	Incidental Ingestion - Wading (L/hour)	0 01	b	0 01	b	0 01	b	N/A		N/A		N/A	
IR_Ing_s	Incidental Ingestion Swimming (L/hour)	N/A		N/A		N/A		0 05	c	0 05	c	0 05	c
SA_w	Skin Surface Area - Wading (cm^2)	2,679	d	2 679	d	2,679	d	N/A		N/A		N/A	
SA_s	Skin Surface Area -Swimming (cm^2)	N/A		N/A		N/A		20 000	e	13,118	f	6,557	p
ET	Exposure Time (hours/day)	4	g	4	g	1 or 2	r	6	h	6	h	6	h
EF	Exposure Frequency (days/year)	12	i	50	s	50	s	45	j	45	j	45	j
ED	Exposure Duration (years)	25	a	25	a	25	a	30	a	10	j	6	a
	Sediments												
IR_Ing	Incidental Ingestion - Wading (mg/day)	50	k	50	k	50	k	100	k	100	k	200	k
FI	Fraction Ingested	1	l	1	l	1	l	1	l	1	l	1	l
SA	Skin Surface Area - Wading (cm^2)	2,679	d	2,679	d	2 679	d	5,671	m	4,785	n	1,851	q
AF	Adherence Factor for wet soil (mg/cm^2)	0 1	o	0 1	o	0 1	o	0 1	o	0 1	o	0 1	o
ET	Exposure Time (hours/day)	4	g	4	g	1 or 2	r	6	h	6	h	6	h
EF	Exposure Frequency (days/year)	12	i	50	s	50	s	45	j	45	j	45	j
ED	Exposure Duration (years)	25	a	25	a	25	a	30	a	10	j	6	a

Notes. All current scenario exposure factors are subject to re-evaluation based on site-specific information

a Default exposure factors adapted from EPA, Human Health Evaluation Manual Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b Surface water ingestion while wading adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

c Surface water ingestion while swimming adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

d Worker surface water/sediment exposure is adapted from EPA Exposure Factor Handbook August 1997 & is protective of 1/2 head (face) hands & forearms (see Appendix G)

e Recreational adult total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix G)

f Recreational youth total body surface area is adapted from EPA Exposure Factor Handbook August 1997 & is protective of all body parts (see Appendix G)

g 4 hours surface water/sediment exposure are assumed for workers based on the nature of the activities

h 6 hours surface water/sediment exposure are assumed for recreational adults/youths based on the nature of the activities

i Maintenance Worker surface water/sediment exposure is assumed to be once a month

j Recreational factors adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

k Sediment ingestion rates adapted from Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

l Fraction ingested assumed by the nature of the activity

m Recreational adult sediment exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of hands, forearms, lower legs & feet (see Appendix G)

n Recreational youth sediment exposure is adapted from EPA Exposure Factor Handbook, August 1997 &is protective of hands, forearms, lower legs & feet (see Appendix G)

o 0 1 = Construction Worker (heavy digging exposure to mixed bare earth, concrete surfaces dust & debris) AFs chosen from Soil Loading calculations (see Appendix G)

p Recreational child total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix G)

q Recreational child sediment exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of hands, forearms, lower legs & feet (see Appendix G)

r 1-2 hours exposure to sump (1) or ditch (2) sediment is assumed for workers based on the nature of the activities

s Industrial Worker surface water & sediment exposure (sump, ditch or impoundment) is assumed to be once a week

cm^2 centimeters squared

days/year days per year

hours/day hours per day

kg kilograms

L/hour liters per hour

m^3/day cubic meters per day

m^3/kg cubic meters per kilogram

mg/cm^2 milligrams per centimeters squared

mg/day milligrams per day

N/A Not applicable for this receptor

TABLE G-3
Exposure Factors for Groundwater
Memphis Depot Main Installation RI

		FUTURE					
Symbols	Parameter	Industrial Worker		Onsite Resident (Adult)		Onsite Resident (Child)	
BW	Body Weight (kg)	70	a	70	a	15	a
IR_Inh	Inhalation Rate (m^3/day)	*		*		*	
AT_C	Averaging Time - Carcinogenic	70x365	a	70x365	a	N/A	
AT_NC	Averaging Time - Noncarcinogenic	25x365	a	30x365	a	6x365	a
	Groundwater						
IR_Ing	Ingestion Rate of Water (L/day)	1	a	2	a	1	a
IR_adj_Ing	Age-adjusted Incidental Ingestion Rate (L/day)	N/A		1 1	a,f	N/A	
SA	Skin Surface Area (cm^2)	2679	b	20,000	c	6,557	d
SA_adj	Age-adjusted Skin Surface Area (cm^2)	N/A		9480	c,g	N/A	
ET	Exposure Time (hours/day)	0 007	e	0 007	e	0 007	e
EF	Exposure Frequency (days/year)	250	a	350	a	350	a
ED	Exposure Duration (years)	25	a	30	a	6	a

Notes:

* Inhalation exposures to volatiles in the groundwater are equal to the ingestion exposures as per EPA Region IV policy

a Default exposure factors adapted from EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b Worker groundwater exposure is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of 1/2 head (face), hands & forearms (see Appendix G)

c Residential adult total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix G)

d Residential child total body surface area is adapted from EPA Exposure Factor Handbook, August 1997 & is protective of all body parts (see Appendix G)

e Calculation for Shower dermal exposure time 10 minute event x 1 hour/60 minutes x 1 day/ 24 hours = 0 007 event/day

f Age-adjusted ingestion rate for residential adult $IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70} = 1\,09$ *(L-year)/(kg-day)*

g Age-adjusted dermal contact for residential adult $SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70} = 9480$ *(cm^2-year)/(kg)*

cm^2 centimeters squared
days/year days per year
hours/day hours per day
kg kilograms
L/day liters per day
m^3/day cubic meters per day
N/A Not applicable for this receptor

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TABLE G-4
Surface Areas per Receptor
Memphis Depot Main Installation RI

Surface Area Calculations for Adult Receptors
Surface Area for Residential Adults for soil exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet		
602 5	903 5	1805	1172 5	2370	5930	N/A	5049	1/2 head, hands, forearms, & lower legs

Surface Area for Adults Workers for soil & water exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet		
602 5	903 5	1805	1172 5	N/A	N/A	N/A	2679	1/2 head, hands & forearms

Surface Area for Recreational Adults for sediment (wading) exposure

1/2 Head	Hands	Arms	Forearms	Lower legs	Legs	Feet		
N/A	903 5	1805	1172 5	2370	5930	1225	5671	hands, forearms, lower legs & feet

Forearms = 45% whole Arms if not available
Lower legs = 40% entire Leg if not available
All values are averages of 50th percentile Male-Female Adults from EPA, Exposure Factors Handbook, 1997 (Tables 6 2 & 6 3)

Mean Total Body Surface Area (TBSA) for male/female adults = 20,000
TBSA is central tendency value for Male-Female Adults from EPA, Exposure Factors Handbook, 1997 (Table 6 14)

Surface Area Calculations for Child Receptors
Total Body Surface Area for Male-Female Children

50th percentile	Male	Female		
0>1	6030	5790		
1>2	6030	5790		
2>3	6030	5790		
3>4	6640	6490		
4>5	7310	7060		
5>6	7930	7790	**Mean TBSA for Child**	6557

All values are averages of 50th percentile Male-Female Children from EPA, Exposure Factors Handbook, 1997 (Tables 6 6 & 6 7)

Percent of Total Body Surface Area for Male-Female Children by Body Part

Age	1/2 Head	Hands	Feet	Forearms	Lower legs		
0>1	18 2	5 3	6 54	13 7	20 6		
1>2	16 5	5 68	6 27	13	23 1		
2>3	14 2	5 3	7 07	11 8	23 2		
3>4	13 6	6 07	7 21	14 4	26 8		
4>5	13 8	5 7	7 29	14	27 8		
5>6							
Mean %	15	6	7	6	10	43	%
	500	368	451	395	637	2351	**Percentage of TBSA for Child**

Calculated Surface Area for Child for sediment (wading) exposure 28 %

368	451	395	637	1851	**Percentage of TBSA for Child (sed exposure)**

For comparison

	Arms (entire)	Legs (entire)
Mean %	13	24
	877	1593

All values are mean values of Percentage of TBSA by body part for Male-Female Children from EPA, Exposure Factors Handbook, 1997 (Table 6 8)
Forearms = 45% whole Arms if not available
Lower legs = 40% entire Leg if not available

(Surface areas for Youth receptors on next page)

TABLE G-4
Surface Areas per Receptor
Memphis Depot Main Installation RI

Surface Area Calculations for Youth Receptors

Total Body Surface Area for Male-Female Youths

50th percentile	Male	Female
6>7	8660	8430
7>8	9360	9170
8>9	10000	10000
9>10	10700	10600
10>11	11800	11700
11>12	12300	13000
12>13	13400	14000
13>14	14700	14800
14>15	16100	15500
15>16	17000	15700
16>17	17600	16000
17>18	18000	16300

Mean TBSA for Youth 13118

All values are averages of 50th percentile Male Female Children from EPA, Exposure Factors Handbook, 1997 (Tables 6 6 & 6 7)

Percent of Total Body Surface Area for Male-Female Youths by Body Part

Age	Head	Arms	Hands	Legs	Feet
6>7	13 1	13 1	4 71	27 1	6 9
9>10	12	12 3	5 3	28 7	7 58
12>13	8 74	34 7	5 39	30 5	7 03
13>14	9 97	32 7	5 11	32	8 02
16>17	7 96	32 7	5 68	33 6	6 93
17>18	7 58	31 7	5 13	30 8	7 28
Mean %	10	26	5	30	7
% TBSA	1298	3437	685	3994	956

All values are mean values of Percentage of TBSA by body part for Male-Female Children from EPA Exposure Factors Handbook, 1997 (Table 6 8)

Calculated Surface Area for Youth for soil exposure

1/2 Head	Forearms	Hands	Lower legs	Feet		
					72	%
649	1547	685	1598	N/A	4478	**Percentage of TBSA for Youth (soil)**

1/2 head, hands, forearms & lower legs

Calculated Surface Area for Youth for sediment (wading) exposure

1/2 Head	Forearms	Hands	Lower legs	Feet		
					69	%
N/A	1547	685	1598	956	4785	**Percentage of TBSA for Youth (sed)**

hands forearms lower legs & feet

Forearms = 45% whole Arms if not available
Lower legs = 40% entire Leg if not available

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TABLE G-5
Chemical-specific Dermal Permeability Factors
Memphis Depot Main Installation RI

Chemical Name	Dermal Absorption ABS		Permeability Constant PC	
1,1,2 2-Tetrachloroethane	1%	EPA Reg 4 1995	9 0E-03	EPA 1992
2,4-Dimethylphenol	1%	EPA Reg 4 1995	1 5E-02	EPA 1992
2,3,7,8-TCDD	3%	EPA Reg 3 1995	1 4E+00	EPA 1992
2-Methylnaphthalene	1%	EPA Reg 4 1995	1 6E-04	EPA 1992
4-Methylphenol	1%	EPA Reg 4 1995	1 0E-02	EPA 1992
Acenaphthene	1%	EPA Reg 4 1995	1 6E-04	EPA 1992
alpha-Chlordane	4%	Wester 1992	5 2E-02	EPA 1992
Aluminum	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Antimony	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Aroclor-1260	6%	EPA 1992	1 6E-04	EPA 1992
Arsenic	3%	Wester 1993	1 6E-04	EPA 1992
Barium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Benzene	1%	EPA Reg 4 1995	2 1E-02	EPA 1992
Benzo(a)anthracene	10%	EPA Reg 3 1995	8 1E-01	EPA 1992
Benzo(a)pyrene	13%	EPA Reg 3 1995	1 2E+00	EPA 1992
Benzo(b)fluoranthene	10%	EPA Reg 3 1995	1 2E+00	EPA 1992
Benzo(k)fluoranthene	10%	EPA Reg 3 1995	1 6E-04	EPA 1992
Beryllium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
beta-BHC	10%	EPA Reg 3 1995	1 6E-04	EPA 1992
Cadmium	1%	EPA Reg 4 1995	1 0E-03	EPA 1992
Carbazole	10%	EPA Reg 3 1995	1 6E-04	EPA 1992
Carbon tetrachloride	1%	EPA Reg 4 1995	2 2E-02	EPA 1992
Chlorobenzene	1%	EPA Reg 4 1995	4 1E-02	EPA 1992
Chloroethane	1%	EPA Reg 4 1995	8 0E-03	EPA 1992
Chloromethane	1%	EPA Reg 4 1995	4 2E-03	EPA 1992
Chromium total	0 1%	EPA Reg 4 1995	1 0E-03	EPA 1992
Chrysene	10%	EPA Reg 3 1995	8 1E-01	EPA 1992
Cobalt	0 1%	EPA Reg 4 1995	4 0E-04	EPA 1992
Copper	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
DDD	10%	EPA Reg 3 1995	2 8E-01	EPA 1992
DDE	10%	EPA Reg 3 1995	2 4E-01	EPA 1992
DDT	10%	EPA Reg 3 1995	4 3E-01	EPA 1992
Dibromochloromethane	1%	EPA Reg 4 1995	3 9E-03	EPA 1992
Dibenz(a h)anthracene	10%	EPA Reg 3 1995	2 7E+00	EPA 1992
Dieldrin	10%	Ryan 1987	1 6E-02	EPA 1992
Fluoranthene	1%	EPA Reg 4 1995	3 6E-01	EPA 1992
Fluorene	1%	EPA Reg 4 1995	1 6E-04	EPA 1992
gamma-Chlordane	4%	Wester 1992	5 2E-02	EPA 1992
Indeno(1,2,3-cd)pyrene	10%	EPA Reg 3 1995	1 9E+00	EPA 1992
Lead	0 1%	EPA Reg 4 1995	4 0E-06	EPA 1992
Manganese	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Mercury	0 1%	EPA Reg 4 1995	1 0E-03	EPA 1992
Methylene chloride	1%	EPA Reg 4 1995	4 5E-03	EPA 1992
Naphthalene	1%	EPA Reg 4 1995	6 9E-02	EPA 1992
Nickel	0 1%	EPA Reg 4 1995	1 0E-04	EPA 1992
Pentachlorophenol	24%	Wester 1993	6 5E-01	EPA 1992
Petroleum Hydrocarbons	1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Phenanthrene	1%	EPA Reg 4 1995	2 3E-01	EPA 1992
Pyrene	1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Selenium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Silver	0 1%	EPA Reg 4 1995	6 0E-04	EPA 1992
Tetrachloroethene	1%	EPA Reg 4 1995	4 8E-02	EPA 1992
Thallium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Total 1 2-Dichloroethene	1%	EPA Reg 4 1995	1 0E-02	EPA 1992
Trichloroethene	1%	EPA Reg 4 1995	1 6E-02	EPA 1992
Vanadium	0 1%	EPA Reg 4 1995	1 6E-04	EPA 1992
Xylenes (total)	1%	EPA Reg 4 1995	8 0E-02	EPA 1992 *
Zinc	0 1%	EPA Reg 4 1995	6 0E-04	EPA 1992

References

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* = Value for *m*-Xylene used for (total) Xylenes

TABLE G-6
Soil Loading Information
Memphis Depot Main Installation RI

APost-Activity Dermal Soil Loadings (mg/cm^2)											
Activity	**N**	**Hands**		**Arms**		**Legs**		**Faces**		**Feet**	
		Geo. Mean	std dev	Geo. Mean	std dev	Geo Mean	std dev	Geo Mean	std dev	Geo Mean	std dev
Indoor:											
Tae Kwon Do	7	0.0063	1 9	0 0019	4 1	0 002	2			0 0022	2 1
Greenhouse Workers	2	0 043	-	0 0064	-	0 0015	-	0 005	.		
Indoor Kids No 1	4	0.0073	1 9	0 0042	1 9	0 0041	2.3			0 012	1 4
Indoor Kids No 2	6	0.014	1.5	0 0041	2	0 0031	1 5			0 0091	1.7
Daycare Kids No 1a	6	0 11	1 9	0 026	1 9	0.03	1.7			0 079	2 4
Daycare Kids No.1b	6	0 15	2.1	0 031	1.8	0 023	1 2			0 13	1 4
Daycare Kids No 2	5	0 073	1 6	0 023	1.4	0.011	1.4			0 044	1.3
Daycare Kids No.3	4	0 036	1 3	0 012	1.2	0 014	3			0.0053	5 1
Outdoor:											
Soccer No 1	8	0 11	1 8	0 011	2	0 031	3 8	0 012	1 5		
Soccer No 2	8	0 035	3 9	0 0043	2 2	0.014	5.3	0 016	1 5		
Soccer No 3	7	0 019	1 5	0 0029	2 2	0 0081	1 6	0 012	1.6		
Groundskeepers No 1	2	0.15	-	0.005	-			0 0021	-	0 018	-
Groundskeepers No 2	5	0 098	2 1	0 0021	2 6	0 001	1 5	0 01	2		
Groundskeepers No 3	7	0 03	2 3	0 0022	1 9	0 0009	1 8	0 0044	2 6	0 004	2.6
Groundskeepers No 4	7	0 045	1 9	0 014	1 8	0 0008	1 9	0 0026	1 6	0 018	1.5
Groundskeepers No 5	8	0 032	1 7	0 022	2 8	0 001	1 4	0 0039	2 1		
Landscape/Rockery	4	0 072	2 1	0 03	2.1			0 0057	1.9		
Irrigation Installers	6	0 19	1 6	0 018	3 2	0 0054	1 8	0.0063	1 3		
Gardeners No 1	8	0.2	1 9	0 05	2.1	0.072	1.4	0 058	1 6	0 17	1 6
Gardeners No 2	7	0 18	3 4	0.054	2.9	0 022	2	0 047	1 6	0 26	1.6
Rugby No 1	8	0 4	1 7	0 27	1 6	0 36	1 7	0 059	2 7		
Rugby No 2	8	0 14	1 4	0 11	1.6	0.15	1 6	0 046	1 4		
Rugby No 3	7	0 049	1 7	0 031	1.3	0 057	1 2	0 02	1 5		
Archeologists	7	0 14	1 3	0 041	1 9	0 028	4.1	0 05	1 8	0 24	1.4
Construction Workers	8	0 24	1 5	0 098	1.5	0 066	1 4	0 029	1 6		
Utility Workers No 1	5	0 32	1 7	0.2	2.7			0 1	1.5		
Utility Workers No 2	6	0 27	2 1	0 3	1 8			0 1	1 5		
Equipment Operators No 1	4	0 26	2 5	0 089	1 6			0 1	1 4		
Equipment Operators No.2	4	0 32	1 6	0 27	1 4			0 223	1 7		
Farmers No 1	4	0 41	1 6	0 059	3 2	0 0058	2 7	0.018	1 4		
Farmers No 2	6	0 47	1 4	0.13	2 2	0 037	3.9	0 041	3		
Reed Gatherers	4	0 66	1 8	0 036	2 1	0 16	9 2			0 63	7 1
Kids-in-mud No 1	6	35	2 3	11	6 1	36	2			24	3.6
Kids-in-mud No.2	6	58	2 3	11	3 8	9 5	2 3			6.7	12.4

= substituted information
N = Number of subjects
Sources
Kissel et al , 1996b, Holmes et al , 1996 (submitted for publication) adapted from EPA, Exposure Factors Handbook, 1997 (Table 6 12)

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TABLE G-7
Soil Loading Information
Memphis Depot Main Installation RI

B. Calculation of UCL90 for Soil Loading of Body Parts																					
Activity	N	Hands	Hands		Hands SL	Arms	Arms		Arms SL	Legs	Legs		Legs SL	Faces	Faces		Faces SL	Feet	Feet		Feet SL
		$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90	$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90	$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90	$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90	$H_{0.90}$	ln(Geom mean)	ln(sd)	UCL90
Indoor:																					
Tae Kwon Do	7	1.9020	-5.0672	0.64	0.0127	3.1435	-6.2659	1.41	0.0314	1.9700	-6.2146	0.69	0.0044					2.0445	-6.1193	0.74	0.0054
Greenhouse Workers	2		-3.1466				-5.0515				-6.5023				-5.2983						
Indoor Kids No.1	4	3.0115	-4.9199	0.64	0.0274	3.0115	-5.4727	0.64	0.0158	3.6225	-5.4968	0.83	0.0331					2.01475	-4.4228	0.34	0.0188
Indoor Kids No.2	6	1.6810	-4.2687	0.41	0.0206	2.1270	-5.4968	0.69	0.0101	1.68	-5.7764	0.41	0.0046					1.8095	-4.6995	0.53	0.0161
Daycare Kids No.1a	6	2.0430	-2.2073	0.64	0.2430	2.0430	-3.6497	0.64	0.0574	1.8095	-3.5066	0.53	0.0531					2.5080	-2.5383	0.88	0.3094
Daycare Kids No.1b	6	2.2190	-1.8971	0.74	0.4125	1.9590	-3.4738	0.59	0.0617	1.4820	-3.7723	0.18	0.0264					1.63	-2.0402	0.34	0.1757
Daycare Kids No.2	5	1.9070	-2.6173	0.47	0.1276	1.6910	-3.7723	0.34	0.0323	1.691	-4.5099	0.34	0.0155					1.5745	-3.1236	0.26	0.0560
Daycare Kids No.3	4	1.7975	-3.3242	0.26	0.0489	1.7035	-4.4228	0.18	0.0146	5.0045	-4.2687	1.10	0.6120					7.1683	-5.2400	1.63	17
Outdoor:																					
Soccer No.1	8	2.096	-2.2073	0.59	0.2083	2.2514	-4.5099	0.69	0.0252	3.5926	-3.4738	1.34	0.4631	1.8366	-4.4228	0.41	0.0173				
Soccer No.2	8	3.5926	-3.3524	1.36	0.5609	2.4217	-5.4491	0.79	0.0121	4.1486	-4.2687	1.67	0.7687	1.8366	-4.1352	0.41	0.0230				
Soccer No.3	7	1.6070	-3.9633	0.41	0.0269	2.1190	-5.8430	0.79	0.0078	1.71	-4.8159	0.47	0.0126	1.71	-4.4228	0.47	0.0186				
Groundskeepers No.1	2		-1.8971				-5.2983														
Groundskeepers No.2	5	2.3935	-2.3228	0.74	0.3136	2.9800	-6.1658	0.96	0.0138	1.7550	-6.9078	0.41	0.0015	2.2840	-4.6052	0.69	0.0281				
Groundskeepers No.3	7	2.1190	-3.5066	0.83	0.0872	1.9020	-6.1193	0.64	0.0044	1.834	-7.0131	0.59	0.0017	2.45	-5.4262	0.96	0.0181	2.4500	-5.5215	0.96	0.0164
Groundskeepers No.4	7	1.9020	-3.1011	0.64	0.0910	1.8340	-4.2687	0.59	0.0258	1.902	-7.1309	0.64	0.0016	1.71	-5.9522	0.47	0.0040	1.6070	-4.0174	0.41	0.0255
Groundskeepers No.5	8	1.9566	-3.4420	0.53	0.0545	2.8	-3.8167	1.03	0.1111	1.7852	-6.9078	0.34	0.0013	2.3366	-5.5468	0.74	0.0099				
Landscape/Rockery	4	3.4163	-2.6311	0.74	0.4096	3.4163	-3.5066	0.74	0.1707					3.0115	-5.1673	0.64	0.0214				
Irrigation Installers	6	1.8095	-1.6607	0.47	0.3104	2.9878	-4.0174	1.16	0.1675	1.9590	-5.2214	0.59	0.0107	1.5270	-5.0672	0.26	0.0078				
Gardeners No.1	8	2.1737	-1.6094	0.64	0.4164	2.3366	-2.9957	0.74	0.1268	1.7852	-2.6311	0.34	0.0956	1.9566	-2.8473	0.47	0.0917	1.9566	-1.7720	0.47	0.2688
Gardeners No.2	7	2.9040	-1.7148	1.22	1.6240	2.4500	-2.9188	1.06	0.2761	1.9700	-3.8167	0.69	0.0488	1.71	-3.0576	0.47	0.0729	1.712	-1.3471	0.47	0.4033
Rugby No.1	8	1.9566	-0.9163	0.53	0.6817	1.9566	-1.3093	0.47	0.4269	1.9566	-1.0217	0.53	0.6136	2.8	-2.8302	0.99	0.2764				
Rugby No 2	8	1.7852	-1.9661	0.34	0.1859	1.9566	-2.2073	0.47	0.1739	1.9566	-1.8971	0.47	0.2371	1.7852	-3.0791	0.34	0.0611				
Rugby No 3	7	1.7120	-3.0159	0.53	0.0817	1.4795	-3.4738	0.26	0.0376	1.4420	-2.8647	0.18	0.0645	1.61	-3.9120	0.41	0.0283				
Archeologists	7	1.4795	-1.9661	0.26	0.1698	1.9020	-3.1942	0.64	0.0829	3.1435	-3.5756	1.41	0.4633	1.834	-2.9957	0.59	0.0923	1.5620	-1.4271	0.34	0.3148
Construction Workers	8	1.8366	-1.4271	0.41	0.3453	1.8366	-2.3228	0.41	0.1410	1.7852	-2.7181	0.34	0.0876	1.9566	-3.5405	0.47	0.0458				
Utility Workers No 1	5	1.9070	-1.1394	0.53	0.6110	2.9800	-1.6094	0.99	1.4388					1.755	-2.3026	0.41	0.1550				
Utility Workers No.2	6	2.2190	-1.3093	0.74	0.7424	1.9590	-1.2040	0.59	0.5967					1.68	-2.3026	0.41	0.1473				
Equipment Operators No.1	4	4.0425	-1.3471	0.92	3.3578	2.4485	-2.4191	0.47	0.1932					2.01475	-2.3026	0.34	0.1565				
Equipment Operators No.2	4	2.4485	-1.1394	0.47	0.6945	2.0148	-1.3093	0.34	0.4226					2.4485	-1.5006	0.53	0.5435				
Farmers No.1	4	2.4485	-0.8916	0.47	0.8898	5.0045	-2.8302	1.16	3.3434	4.4675	-5.1499	0.99	0.1231	2.01475	-4.0174	0.34	0.0282				
Farmers No.2	6	1.6265	-0.7550	0.34	0.6353	2.3110	-2.0402	0.79	0.4007	3.5450	-3.2968	1.36	0.8081	2.98775	-3.1942	1.10	0.3254				
Reed Gatherers	4	2.8130	-0.4155	0.59	2	3.4163	-3.3242	0.74	0.2048	9.8920	-1.8326	2.22	599620					8.7995	-0.4620	1.96	90853
Kids-in-mud No.1	6	2.3110	3.5553	0.83	117	4.4105	2.3979	1.81	1997	2.1270	3.5835	0.69	89					2.98775	3.1781	1.28	302
Kids-in-mud No.2	6	2.3110	4.0604	0.83	194	3.5450	2.3979	1.34	223	2.3110	2.2513	0.83	32					6.1900	1.9021	2.52	169587
=missing information																					

Sources:
Kissel et al., 1996b, Holmes et al, 1996 (submitted for publication) adapted from EPA, Exposure Factors Handbook, 1997 (Table 6 12).
H^{90} values adapted from R.O Gilbert, 1987 Statistical Methods for Environmental Pollution Monitoring (Table A10).

TABLE G-8
Soil Loading Information
Memphis Depot Main Installation RI

C. Calculation of Adherence Factors for Child Receptors

Activity	N	Hands	Hands SL	Hands		Arms	Arms SL	Arms vs	Forearms		Legs	Legs SL	Legs vs	Lower legs		Faces	Faces SL	Faces		Feet	Feet SL	Feet		x =Final SA*SL (all)	Final AF
		$H_{0.90}$	UCL90	SA	SL*SA	$H_{0.90}$	UCL90	SA	SA	SL*SA	$H_{0.90}$	UCL90	SA	SA	SL*SA	$H_{0.90}$	UCL90	SA	SL*SA	$H_{0.90}$	UCL90	SA	SL*SA	Hands, Forearms, Lower legs, Faces, Feet	x/SA
Indoor:																									
Indoor Kids No.1	4	3.0115	0.0274	368	10	3 0115	0.0158	877	395	6	3.6225	0.0331	1593	637	21					2 01475	0.0188	451	8	46	0.025
Indoor Kids No 2	6	1.6810	0.0206	368	8	2.1270	0 0101	877	395	4	1 68	0.0046	1593	637	3					1.8095	0.0161	451	7	22	0.012
Daycare Kids No.1a	6	2.0430	0.2430	368	89	2.0430	0.0574	877	395	23	1.8095	0.0531	1593	637	34					2.5080	0.3094	451	140	285	0.15
Daycare Kids No 1b	6	2 2190	0.4125	368	152	1 9590	0.0617	877	395	24	1.4820	0.0264	1593	637	17					1.63	0.1757	451	79	272	0.15
Daycare Kids No 2	5	1.9070	0.1276	368	47	1.6910	0 0323	877	395	13	1.691	0.0155	1593	637	10					1 5745	0.0560	451	25	95	0.051
Daycare Kids No 3	4	1 7975	0.0489	368	18	1.7035	0.0146	877	395	6	5 0045	0 6120	1593	637	390					7 1683	17	451	7642	8055	4.4
Outdoor:																									
Soccer No 1	8	2.096	0.1192	368	44	2.2514	0.0127	877	395	5	3.5926	0.4631	1593	637	295	1 8366	0.0173	501	9					352	0.19
Soccer No 2	8	3.5926	0.1938	368	71	2 4217	0.0054	877	395	2	4 1486	0.7687	1593	637	490	1 8366	0.0230	501	12					575	0.30
Soccer No 3	7	1 6070	0.0194	368	7	2.1190	0.0036	877	395	1	1 71	0.0126	1593	637	8	1 71	0.0186	501	9					26	0.014

TABLE G-9
Soil Loading Information
Memphis Depot Main Installation RI

D. Calculation of Adherence Factors for Adult Receptors

Activity	N	Hands	Hands SL	Hands		Arms	Arms SL	Arms vs	Forearms		Legs	Legs SL	Legs vs	Lower legs		Faces	Faces SL	Faces		Feet	Feet SL	Feet		x =Final SA*SL (all)	Final AF
		$H_{0.90}$	UCL90	SA	SL*SA	$H_{0.90}$	UCL90	SA	SA	SL*SA	$H_{0.90}$	UCL90	SA	SA	SL*SA	$H_{0.90}$	UCL90	SA	SL*SA	$H_{0.90}$	UCL90	SA	SL*SA	Hands, Forearms, Lower legs, Faces, Feet	x/SA
Outdoor:																									
Groundskeepers No.2	5	2 3935	0.1251	904	113	2.9800	0.0040	1805	1173	5	1 7550	0.0015	5930	2370	4	2 2840	0.0281	603	17					138	0.027
Groundskeepers No.3	7	2.1190	0.0385	904	35	1.9020	0 0024	1805	1173	3	1.834	0.0017	5930	2370	4	2.45	0.0181	603	11	2.4500	0.0164	1225	20	73	0.012
Groundskeepers No.4	7	1.9020	0.0499	904	45	1.8340	0.0151	1805	1173	18	1.902	0.0016	5930	2370	4	1 71	0.0040	603	2	1:6070	0.0255	1225	31	100	0.016
Groundskeepers No.5	8	1 9566	0.0338	904	31	2 8	0.0392	1805	1173	46	1.7852	0.0013	5930	2370	3	2 3366	0.0099	603	6					86	0.017
Gardeners No.1	8	2.1737	0.2229	904	201	2 3366	0.0599	1805	1173	70	1 7852	0.0956	5930	2370	227	1 9566	0.0917	603	55	1 9566	0.2688	1225	329	883	0.14
Gardeners No.2	7	2.9040	0.5335	904	482	2.4500	0.0988	1805	1173	116	1.9700	0.0488	5930	2370	116	1 71	0.0729	603	44	1.712	0.4033	1225	494	1251	0.20
Construction Workers	8	1 8366	0.2456	904	222	1.8366	0 1003	1805	1173	118	1 7852	0.0876	5930	2370	208	1.9566	0.0458	603	28					575	0.11
Utility Workers No.1	5	1 9070	0.3436	904	310	2 9800	0.4150	1805	1173	487						1 755	0.1550	603	93					890	0.33
Utility Workers No.2	6	2.2190	0.3307	904	299	1.9590	0.3279	1805	1173	384						1 68	0.1473	603	89					772	0.29

=missing information was estimated

TAB

Appendix H

TAB

Appendix H

UCL 95% Calculation Methodology

APPENDIX H

UCL 95% Calculation Methodology

A detailed UCL 95% methodology is provided for the development of current EPC values. The following are included in this appendix:

- **Table H-1**–Data Summaries for all Detected Chemicals for all Functional Units and Surrogate Sites
- H2–RADB Statistics

In accordance with Section 4.7.1.4 of the Statement of Work, the following persons performed and checked calculations contained in Appendix H2:

Full Name	Title	Date
Elizabeth R. Garland	Envir. Scientist 2	01/10/00
Vijaya Mylavarapu	Project Scientist 5	1/10/2000

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
34_DEEP	Metal	ALUMINUM	1	1	MG/KG	16800	16800	16800	0		16800	MAXDET
34_DEEP	Metal	ARSENIC	11	11	MG/KG	2	49	12	25	19	25	LOGNORM
34_DEEP	Metal	BARIUM	1	1	MG/KG	147	147	147	0		147	MAXDET
34_DEEP	Metal	BERYLLIUM	11	2	MG/KG	0.1	2	0.41	4	0.71	2	MAXDET
34_DEEP	Metal	CADMIUM	11	3	MG/KG	0.27	0.59	0.42	0.52	0.49	0.52	LOGNORM
34_DEEP	Metal	CALCIUM	1	1	MG/KG	912	912	912	0		912	MAXDET
34_DEEP	Metal	CHROMIUM, TOTAL	11	11	MG/KG	13	124	41	73	61	73	LOGNORM
34_DEEP	Metal	COBALT	1	1	MG/KG	10	10	10	0		10	MAXDET
34_DEEP	Metal	COPPER	11	11	MG/KG	7	52	19	26	25	26	LOGNORM
34_DEEP	Metal	IRON	1	1	MG/KG	24200	24200	24200	0		24200	MAXDET
34_DEEP	Metal	LEAD	11	11	MG/KG	9	960	188	2831	366	960	MAXDET
34_DEEP	Metal	MAGNESIUM	1	1	MG/KG	3030	3030	3030	0		3030	MAXDET
34_DEEP	Metal	MANGANESE	1	1	MG/KG	1090	1090	1090	0		1090	MAXDET
34_DEEP	Metal	NICKEL	11	11	MG/KG	5	21	14	21	17	17	NORM
34_DEEP	Metal	POTASSIUM	1	1	MG/KG	3190	3190	3190	0		3190	MAXDET
34_DEEP	Metal	VANADIUM	1	1	MG/KG	38	38	38	0		38	MAXDET
34_DEEP	Metal	ZINC	11	11	MG/KG	42	577	121	212	209	212	LOGNORM
34_DEEP	PAH	ACENAPHTHENE	15	2	MG/KG	0.11	2	0.73	6	1	2	MAXDET
34_DEEP	PAH	ANTHRACENE	15	3	MG/KG	0.13	2	0.83	9	1	2	MAXDET
34_DEEP	PAH	BENZO(a)ANTHRACENE	15	8	MG/KG	0.18	10	2	56	4	10	MAXDET
34_DEEP	PAH	BENZO(a)PYRENE	15	8	MG/KG	0.13	10	2	45	3	10	MAXDET
34_DEEP	PAH	BENZO(b)FLUORANTHENE	15	8	MG/KG	0.12	10	2	43	3	10	MAXDET
34_DEEP	PAH	BENZO(g,h,i)PERYLENE	15	8	MG/KG	0.13	6	1	20	2	6	MAXDET
34_DEEP	PAH	BENZO(k)FLUORANTHENE	15	8	MG/KG	0.1	12	2	56	4	12	MAXDET
34_DEEP	PAH	CHRYSENE	15	8	MG/KG	0.15	12	2	66	4	12	MAXDET
34_DEEP	PAH	DIBENZ(a,h)ANTHRACENE	15	2	MG/KG	0.21	1	0.72	6	1	1	MAXDET
34_DEEP	PAH	FLUORANTHENE	15	8	MG/KG	0.34	24	4	278	8	24	MAXDET
34_DEEP	PAH	FLUORENE	15	4	MG/KG	0.14	2	0.80	7	1	2	MAXDET
34_DEEP	PAH	INDENO(1,2,3-c,d)PYRENE	15	7	MG/KG	0.48	6	2	37	2	6	MAXDET
34_DEEP	PAH	PHENANTHRENE	15	8	MG/KG	0.37	16	3	116	6	16	MAXDET
34_DEEP	PAH	PYRENE	15	8	MG/KG	0.26	17	3	150	6	17	MAXDET
34_DEEP	VOC	ACETONE	11	8	MG/KG	0.002	0.035	0.0095	0.019	0.015	0.019	LOGNORM
34_DEEP	VOC	METHYLENE CHLORIDE	11	5	MG/KG	0.002	0.003	0.0041	0.0061	0.0052	0.003	MAXDET
34_DEEP	VOC	TOLUENE	11	1	MG/KG	0.002	0.002	0.0055	0.0068	0.0061	0.002	MAXDET
34_DEEP	VOC	Total Xylenes	11	1	MG/KG	0.002	0.002	0.0055	0.0068	0.0061	0.002	MAXDET
34_DEEP	VOC	TRICHLOROETHYLENE (TCE)	11	1	MG/KG	0.004	0.004	0.0055	0.0060	0.0059	0.004	MAXDET
34_SURFSOIL	Metal	ARSENIC	5	5	MG/KG	2	49	15	638	33	49	MAXDET
34_SURFSOIL	Metal	BERYLLIUM	5	1	MG/KG	2	2	0.68	30	1	2	MAXDET
34_SURFSOIL	Metal	CADMIUM	5	1	MG/KG	0.59	0.59	0.56	0.58	0.58	0.59	MAXDET
34_SURFSOIL	Metal	CHROMIUM, TOTAL	5	5	MG/KG	19	124	65	352	110	124	MAXDET
34_SURFSOIL	Metal	COPPER	5	5	MG/KG	7	52	20	85	37	52	MAXDET
34_SURFSOIL	Metal	LEAD	5	5	MG/KG	94	960	399	10041	785	960	MAXDET
34_SURFSOIL	Metal	NICKEL	5	5	MG/KG	5	16	9	18	13	16	MAXDET
34_SURFSOIL	Metal	ZINC	5	5	MG/KG	42	577	193	4923	411	577	MAXDET
34_SURFSOIL	PAH	ACENAPHTHENE	9	2	MG/KG	0.11	2	1	21	2	2	MAXDET
34_SURFSOIL	PAH	ANTHRACENE	9	3	MG/KG	0.13	2	1	31	2	2	MAXDET
34_SURFSOIL	PAH	BENZO(a)ANTHRACENE	9	7	MG/KG	0.49	10	3	19	6	10	MAXDET
34_SURFSOIL	PAH	BENZO(a)PYRENE	9	7	MG/KG	0.48	10	3	15	5	10	MAXDET
34_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	9	7	MG/KG	0.46	10	3	14	5	10	MAXDET
34_SURFSOIL	PAH	BENZO(g,h,i)PERYLENE	9	7	MG/KG	0.41	6	2	8	3	6	MAXDET
34_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	9	7	MG/KG	0.46	12	3	20	6	12	MAXDET
34_SURFSOIL	PAH	CHRYSENE	9	7	MG/KG	0.52	12	4	20	6	12	MAXDET

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
34_SURFSOIL	PAH	DIBENZ(a,h)ANTHRACENE	9	2	MG/KG	0.21	1	1	9	2	1	MAXDET
34_SURFSOIL	PAH	FLUORANTHENE	9	7	MG/KG	0.99	24	7	40	13	24	MAXDET
34_SURFSOIL	PAH	FLUORENE	9	3	MG/KG	0.14	2	1	26	2	2	MAXDET
34_SURFSOIL	PAH	INDENO(1,2,3-c,d)PYRENE	9	7	MG/KG	0.48	6	3	9	4	6	MAXDET
34_SURFSOIL	PAH	PHENANTHRENE	9	7	MG/KG	0.41	16	5	39	9	16	MAXDET
34_SURFSOIL	PAH	PYRENE	9	7	MG/KG	0.94	17	5	26	9	17	MAXDET
34_SURFSOIL	VOC	ACETONE	5	4	MG/KG	0.002	0.035	0.012	0.43	0.025	0.035	MAXDET
34_SURFSOIL	VOC	METHYLENE CHLORIDE	5	3	MG/KG	0.002	0.002	0.0033	0.0076	0.0050	0.002	MAXDET
34_SURFSOIL	VOC	TOLUENE	5	1	MG/KG	0.002	0.002	0.0048	0.0094	0.0063	0.002	MAXDET
34_SURFSOIL	VOC	Total Xylenes	5	1	MG/KG	0.002	0.002	0.0048	0.0094	0.0063	0.002	MAXDET
36_DEEP	Metal	ALUMINUM	4	4	MG/KG	11100	15400	12500	15706	14863	15400	MAXDET
36_DEEP	Metal	ANTIMONY	45	3	MG/KG	2	18	4	5	4	5	LOGNORM
36_DEEP	Metal	ARSENIC	45	45	MG/KG	8	30	20	21	21	21	NORM
36_DEEP	Metal	BARIUM	4	4	MG/KG	89	121	108	131	124	121	MAXDET
36_DEEP	Metal	BERYLLIUM	45	15	MG/KG	0.31	1	0.54	0.58	0.59	0.58	LOGNORM
36_DEEP	Metal	CADMIUM	45	5	MG/KG	0.44	4	0.69	0.77	0.84	0.77	LOGNORM
36_DEEP	Metal	CALCIUM	4	4	MG/KG	510	1990	1213	18939	2120	1990	MAXDET
36_DEEP	Metal	CHROMIUM, TOTAL	45	45	MG/KG	10	33	25	27	26	27	LOGNORM
36_DEEP	Metal	COBALT	4	4	MG/KG	7	9	8	10	9	9	MAXDET
36_DEEP	Metal	COPPER	45	45	MG/KG	16	86	33	37	36	37	LOGNORM
36_DEEP	Metal	IRON	4	4	MG/KG	15600	26400	20075	30858	25988	26400	MAXDET
36_DEEP	Metal	LEAD	45	45	MG/KG	10	142	28	31	34	31	LOGNORM
36_DEEP	Metal	MAGNESIUM	4	4	MG/KG	1740	2570	2108	2750	2540	2570	MAXDET
36_DEEP	Metal	MANGANESE	4	4	MG/KG	418	1050	729	2005	1068	1050	MAXDET
36_DEEP	Metal	MERCURY	45	2	MG/KG	0.06	0.07	0.054	0.059	0.057	0.059	LOGNORM
36_DEEP	Metal	NICKEL	45	45	MG/KG	9	47	33	37	35	37	LOGNORM
36_DEEP	Metal	POTASSIUM	4	4	MG/KG	755	2060	1461	6042	2257	2060	MAXDET
36_DEEP	Metal	SELENIUM	45	9	MG/KG	0.79	2	0.71	0.95	0.82	0.95	LOGNORM
36_DEEP	Metal	SILVER	45	1	MG/KG	0.63	0.63	1	2	1	0.63	MAXDET
36_DEEP	Metal	SODIUM	4	1	MG/KG	110	110	57	320	100	110	MAXDET
36_DEEP	Metal	VANADIUM	4	4	MG/KG	25	31	27	31	30	31	MAXDET
36_DEEP	Metal	ZINC	45	45	MG/KG	56	266	118	130	128	130	LOGNORM
36_DEEP	OCPest	ALPHA-CHLORDANE	44	3	MG/KG	0.0016	0.011	0.0061	0.0027	0.014	0.0027	LOGNORM
36_DEEP	OCPest	DDE	44	4	MG/KG	0.0013	0.36	0.013	0.0067	0.027	0.0067	LOGNORM
36_DEEP	OCPest	DDT	44	5	MG/KG	0.0039	0.23	0.020	0.012	0.038	0.012	LOGNORM
36_DEEP	OCPest	DIELDRIN	44	6	MG/KG	0.0012	3	0.063	0.0098	0.16	0.0098	LOGNORM
36_DEEP	OCPest	GAMMA-CHLORDANE	44	3	MG/KG	0.0024	0.02	0.0062	0.0029	0.014	0.0029	LOGNORM
36_DEEP	PAH	ANTHRACENE	45	1	MG/KG	0.058	0.058	0.20	0.21	0.20	0.058	MAXDET
36_DEEP	PAH	BENZO(a)ANTHRACENE	45	4	MG/KG	0.042	0.14	0.19	0.21	0.20	0.14	MAXDET
36_DEEP	PAH	BENZO(a)PYRENE	45	4	MG/KG	0.048	0.13	0.19	0.21	0.20	0.13	MAXDET
36_DEEP	PAH	BENZO(b)FLUORANTHENE	45	4	MG/KG	0.056	0.21	0.20	0.21	0.20	0.21	MAXDET
36_DEEP	PAH	BENZO(g,h,i)PERYLENE	45	3	MG/KG	0.044	0.11	0.19	0.21	0.20	0.11	MAXDET
36_DEEP	PAH	BENZO(k)FLUORANTHENE	45	4	MG/KG	0.061	0.1	0.19	0.21	0.20	0.1	MAXDET
36_DEEP	PAH	CHRYSENE	45	4	MG/KG	0.063	0.16	0.19	0.21	0.20	0.16	MAXDET
36_DEEP	PAH	FLUORANTHENE	45	4	MG/KG	0.11	0.34	0.20	0.21	0.21	0.21	LOGNORM
36_DEEP	PAH	INDENO(1,2,3-c,d)PYRENE	45	4	MG/KG	0.045	0.1	0.19	0.21	0.20	0.1	MAXDET
36_DEEP	PAH	PHENANTHRENE	45	4	MG/KG	0.053	0.27	0.20	0.21	0.21	0.21	LOGNORM
36_DEEP	PAH	PYRENE	45	4	MG/KG	0.086	0.31	0.20	0.21	0.21	0.21	LOGNORM
36_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	44	17	MG/KG	0.042	3	0.30	0.36	0.42	0.36	LOGNORM
36_DEEP	SVOC	CARBAZOLE	44	1	MG/KG	0.048	0.048	0.20	0.21	0.21	0.048	MAXDET
36_DEEP	SVOC	DI-n-BUTYL PHTHALATE	44	6	MG/KG	0.041	0.12	0.18	0.21	0.20	0.12	MAXDET
36_DEEP	SVOC	PENTACHLOROPHENOL	44	1	MG/KG	0.11	0.11	0.10	0.10	0.10	0.10	LOGNORM

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
36_DEEP	VOC	1,1,2,2-TETRACHLOROETHANE	44	6	MG/KG	0.004	0.02	0.0068	0.0072	0.0075	0.0072	LOGNORM
36_DEEP	VOC	2-HEXANONE	44	1	MG/KG	0.001	0.001	0.0059	0.0065	0.0061	0.001	MAXDET
36_DEEP	VOC	ACETONE	44	10	MG/KG	0.007	0.27	0.023	0.024	0.036	0.024	LOGNORM
36_DEEP	VOC	BENZENE	44	2	MG/KG	0.001	0.002	0.0058	0.0065	0.0061	0.002	MAXDET
36_DEEP	VOC	CARBON DISULFIDE	44	1	MG/KG	0.001	0.001	0.0059	0.0065	0.0061	0.001	MAXDET
36_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	44	6	MG/KG	0.004	0.035	0.0075	0.0080	0.0089	0.0080	LOGNORM
36_DEEP	VOC	METHYLENE CHLORIDE	44	11	MG/KG	0.001	0.01	0.0055	0.0064	0.0059	0.0064	LOGNORM
36_DEEP	VOC	TOTAL 1,2-DICHLOROETHENE	44	2	MG/KG	0.042	0.11	0.0092	0.0090	0.013	0.0090	LOGNORM
36_DEEP	VOC	TRICHLOROETHYLENE (TCE)	44	6	MG/KG	0.001	0.057	0.0073	0.0081	0.0093	0.0081	LOGNORM
36_SURFSOIL	Metal	ALUMINUM	2	2	MG/KG	11100	11200	11150	11335	11466	11200	MAXDET
36_SURFSOIL	Metal	ANTIMONY	17	2	MG/KG	2	18	4	10	5	10	LOGNORM
36_SURFSOIL	Metal	ARSENIC	17	17	MG/KG	11	28	20	22	22	22	NORM
36_SURFSOIL	Metal	BARIUM	2	2	MG/KG	107	114	111	125	133	114	MAXDET
36_SURFSOIL	Metal	BERYLLIUM	17	7	MG/KG	0.31	1	0.53	0.60	0.60	0.60	LOGNORM
36_SURFSOIL	Metal	CADMIUM	17	4	MG/KG	0.84	4	0.89	1	1	1	LOGNORM
36_SURFSOIL	Metal	CALCIUM	2	2	MG/KG	1760	1990	1875	2383	2601	1990	MAXDET
36_SURFSOIL	Metal	CHROMIUM, TOTAL	17	17	MG/KG	12	32	25	29	28	28	NORM
36_SURFSOIL	Metal	COBALT	2	2	MG/KG	7	7	7	7	7	7	MAXDET
36_SURFSOIL	Metal	COPPER	17	17	MG/KG	17	86	35	42	42	42	LOGNORM
36_SURFSOIL	Metal	IRON	2	2	MG/KG	15600	16500	16050	17888	18891	16500	MAXDET
36_SURFSOIL	Metal	LEAD	17	17	MG/KG	13	142	40	55	56	55	LOGNORM
36_SURFSOIL	Metal	MAGNESIUM	2	2	MG/KG	1740	1900	1820	2160	2325	1900	MAXDET
36_SURFSOIL	Metal	MANGANESE	2	2	MG/KG	418	566	492	1033	959	566	MAXDET
36_SURFSOIL	Metal	MERCURY	17	2	MG/KG	0.06	0.07	0.052	0.061	0.058	0.061	LOGNORM
36_SURFSOIL	Metal	NICKEL	17	17	MG/KG	9	43	30	40	35	40	LOGNORM
36_SURFSOIL	Metal	POTASSIUM	2	2	MG/KG	2020	2060	2040	2118	2166	2060	MAXDET
36_SURFSOIL	Metal	SELENIUM	17	6	MG/KG	0.79	2	0.81	1	1	1	LOGNORM
36_SURFSOIL	Metal	SILVER	17	1	MG/KG	0.63	0.63	0.89	5	1	0.63	MAXDET
36_SURFSOIL	Metal	VANADIUM	2	2	MG/KG	26	26	26	27	27	26	MAXDET
36_SURFSOIL	Metal	ZINC	17	17	MG/KG	57	266	125	153	146	153	LOGNORM
36_SURFSOIL	OCPest	ALPHA-CHLORDANE	16	3	MG/KG	0.0016	0.011	0.015	0.021	0.037	0.011	MAXDET
36_SURFSOIL	OCPest	DDE	16	4	MG/KG	0.0013	0.36	0.032	0.090	0.072	0.090	LOGNORM
36_SURFSOIL	OCPest	DDT	16	5	MG/KG	0.0039	0.23	0.052	0.37	0.10	0.23	MAXDET
36_SURFSOIL	OCPest	DIELDRIN	16	6	MG/KG	0.0012	3	0.17	0.36	0.46	0.36	LOGNORM
36_SURFSOIL	OCPest	GAMMA-CHLORDANE	16	3	MG/KG	0.0024	0.02	0.015	0.024	0.038	0.020	MAXDET
36_SURFSOIL	PAH	ANTHRACENE	17	1	MG/KG	0.058	0.058	0.18	0.23	0.20	0.058	MAXDET
36_SURFSOIL	PAH	BENZO(a)ANTHRACENE	17	4	MG/KG	0.042	0.14	0.17	0.22	0.20	0.14	MAXDET
36_SURFSOIL	PAH	BENZO(a)PYRENE	17	4	MG/KG	0.048	0.13	0.17	0.22	0.19	0.13	MAXDET
36_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	17	4	MG/KG	0.056	0.21	0.18	0.22	0.20	0.21	MAXDET
36_SURFSOIL	PAH	BENZO(g,h,i)PERYLENE	17	3	MG/KG	0.044	0.11	0.17	0.23	0.19	0.11	MAXDET
36_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	17	4	MG/KG	0.061	0.1	0.17	0.21	0.19	0.1	MAXDET
36_SURFSOIL	PAH	CHRYSENE	17	4	MG/KG	0.063	0.16	0.18	0.21	0.20	0.16	MAXDET
36_SURFSOIL	PAH	FLUORANTHENE	17	4	MG/KG	0.11	0.34	0.20	0.22	0.22	0.22	LOGNORM
36_SURFSOIL	PAH	INDENO(1,2,3-c,d)PYRENE	17	4	MG/KG	0.045	0.1	0.17	0.22	0.19	0.1	MAXDET
36_SURFSOIL	PAH	PHENANTHRENE	17	4	MG/KG	0.053	0.27	0.19	0.23	0.21	0.23	LOGNORM
36_SURFSOIL	PAH	PYRENE	17	4	MG/KG	0.086	0.31	0.20	0.22	0.22	0.22	LOGNORM
36_SURFSOIL	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	16	9	MG/KG	0.051	3	0.38	0.68	0.69	0.68	LOGNORM
36_SURFSOIL	SVOC	CARBAZOLE	16	1	MG/KG	0.048	0.048	0.19	0.23	0.21	0.048	MAXDET
36_SURFSOIL	SVOC	DI-n-BUTYL PHTHALATE	16	2	MG/KG	0.069	0.12	0.18	0.21	0.20	0.12	MAXDET
36_SURFSOIL	SVOC	PENTACHLOROPHENOL	16	1	MG/KG	0.11	0.11	0.10	0.10	0.10	0.10	LOGNORM
36_SURFSOIL	VOC	1,1,2,2-TETRACHLOROETHANE	16	2	MG/KG	0.004	0.007	0.0059	0.0062	0.0062	0.0062	LOGNORM
36_SURFSOIL	VOC	2-HEXANONE	16	1	MG/KG	0.001	0.001	0.0057	0.0074	0.0062	0.0010	MAXDET

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Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
36_SURFSOIL	VOC	ACETONE	16	4	MG/KG	0.007	0.27	0.035	0.059	0.070	0.059	LOGNORM
36_SURFSOIL	VOC	BENZENE	16	1	MG/KG	0.002	0.002	0.0057	0.0066	0.0062	0.0020	MAXDET
36_SURFSOIL	VOC	CARBON DISULFIDE	16	1	MG/KG	0.001	0.001	0.0057	0.0074	0.0062	0.0010	MAXDET
36_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	16	2	MG/KG	0.025	0.035	0.0090	0.011	0.013	0.011	LOGNORM
36_SURFSOIL	VOC	METHYLENE CHLORIDE	16	3	MG/KG	0.001	0.01	0.006	0.0081	0.0067	0.0081	LOGNORM
36_SURFSOIL	VOC	TRICHLOROETHYLENE (TCE)	16	1	MG/KG	0.005	0.005	0.0059	0.0061	0.0060	0.0050	MAXDET
59_DEEP	Metal	ALUMINUM	2	2	MG/KG	9650	15600	12625	60870	31409	15600	MAXDET
59_DEEP	Metal	ANTIMONY	2	1	MG/KG	0.58	0.58	0.74	3	2	0.58	MAXDET
59_DEEP	Metal	ARSENIC	2	2	MG/KG	8	12	10	30	22	12	MAXDET
59_DEEP	Metal	BARIUM	2	2	MG/KG	97	103	100	112	119	103	MAXDET
59_DEEP	Metal	BERYLLIUM	2	1	MG/KG	0.41	0.41	0.21	2.87E+39	1	0.41	MAXDET
59_DEEP	Metal	CADMIUM	2	1	MG/KG	0.15	0.15	0.18	0.35	0.33	0.15	MAXDET
59_DEEP	Metal	CALCIUM	2	2	MG/KG	986	1980	1483	37072	4621	1980	MAXDET
59_DEEP	Metal	CHROMIUM TOTAL	2	2	MG/KG	13	16	15	24	25	16	MAXDET
59_DEEP	Metal	COBALT	2	2	MG/KG	5	6	6	12	11	6	MAXDET
59_DEEP	Metal	COPPER	2	2	MG/KG	14	19	16	31	30	19	MAXDET
59_DEEP	Metal	IRON	2	2	MG/KG	16500	21300	18900	33854	34054	21300	MAXDET
59_DEEP	Metal	LEAD	2	2	MG/KG	8	15	11	149	33	15	MAXDET
59_DEEP	Metal	MAGNESIUM	2	2	MG/KG	2380	2590	2485	2929	3148	2590	MAXDET
59_DEEP	Metal	MANGANESE	2	2	MG/KG	334	499	417	1314	937	499	MAXDET
59_DEEP	Metal	NICKEL	2	2	MG/KG	14	17	16	22	24	17	MAXDET
59_DEEP	Metal	POTASSIUM	2	2	MG/KG	2060	2900	2480	6057	5132	2900	MAXDET
59_DEEP	Metal	SELENIUM	2	1	MG/KG	1	1	2	4	3	1	MAXDET
59_DEEP	Metal	VANADIUM	2	2	MG/KG	26	31	28	42	45	31	MAXDET
59_DEEP	Metal	ZINC	2	2	MG/KG	39	63	51	242	127	63	MAXDET
59_DEEP	OCPest	ALPHA-CHLORDANE	15	3	MG/KG	0.015	0.08	0.0086	0.021	0.018	0.021	LOGNORM
59_DEEP	OCPest	DDD	15	6	MG/KG	0.0028	0.017	0.014	0.040	0.025	0.017	MAXDET
59_DEEP	OCPest	DDE	15	9	MG/KG	0.002	0.69	0.081	0.54	0.17	0.54	LOGNORM
59_DEEP	OCPest	DDT	15	8	MG/KG	0.0017	0.77	0.086	0.81	0.18	0.77	MAXDET
59_DEEP	OCPest	DIELDRIN	15	3	MG/KG	0.016	0.58	0.050	0.15	0.12	0.15	LOGNORM
59_DEEP	OCPest	GAMMA-CHLORDANE	15	3	MG/KG	0.015	0.061	0.0070	0.016	0.014	0.016	LOGNORM
59_DEEP	PAH	ACENAPHTHENE	15	1	MG/KG	0.059	0.059	0.066	0.099	0.094	0.059	MAXDET
59_DEEP	PAH	BENZO(a)ANTHRACENE	15	2	MG/KG	0.14	0.21	0.081	0.14	0.11	0.14	LOGNORM
59_DEEP	PAH	BENZO(a)PYRENE	15	2	MG/KG	0.14	0.2	0.080	0.14	0.11	0.14	LOGNORM
59_DEEP	PAH	BENZO(b)FLUORANTHENE	15	2	MG/KG	0.13	0.2	0.080	0.14	0.11	0.14	LOGNORM
59_DEEP	PAH	BENZO(g h i)PERYLENE	15	1	MG/KG	0.1	0.1	0.071	0.11	0.099	0.1	MAXDET
59_DEEP	PAH	BENZO(k)FLUORANTHENE	15	2	MG/KG	0.14	0.16	0.078	0.13	0.11	0.13	LOGNORM
59_DEEP	PAH	CHRYSENE	15	2	MG/KG	0.14	0.2	0.080	0.14	0.11	0.14	LOGNORM
59_DEEP	PAH	FLUORANTHENE	15	3	MG/KG	0.08	0.37	0.10	0.21	0.15	0.21	LOGNORM
59_DEEP	PAH	INDENO(1,2 3-c,d)PYRENE	15	1	MG/KG	0.12	0.12	0.076	0.12	0.11	0.12	MAXDET
59_DEEP	PAH	PHENANTHRENE	15	3	MG/KG	0.076	0.24	0.091	0.17	0.13	0.17	LOGNORM
59_DEEP	PAH	PYRENE	15	3	MG/KG	0.064	0.27	0.091	0.17	0.13	0.17	LOGNORM
59_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	2	1	MG/KG	0.13	0.13	0.165	0.60	0.39	0.13	MAXDET
59_DEEP	VOC	ACETONE	3	1	MG/KG	0.095	0.095	0.068	184	0.14	0.095	MAXDET
59_DEEP	VOC	CARBON DISULFIDE	3	1	MG/KG	0.002	0.002	0.0047	0.21	0.0086	0.0020	MAXDET
59_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	3	1	MG/KG	0.009	0.009	0.008	0.015	0.011	0.0090	MAXDET
59_DEEP	VOC	METHYLENE CHLORIDE	3	1	MG/KG	0.002	0.002	0.0047	0.21	0.0086	0.0020	MAXDET
59_DEEP	VOC	TETRACHLOROETHYLENE(PCE)	3	2	MG/KG	0.004	0.073	0.028	349937066	0.094	0.073	MAXDET
59_DEEP	VOC	TOTAL 1 2-DICHLOROETHENE	3	1	MG/KG	0.004	0.004	0.0053	0.0097	0.0073	0.0040	MAXDET
59_DEEP	VOC	Total Xylenes	3	1	MG/KG	0.001	0.001	0.0043	110	0.0092	0.0010	MAXDET
59_DEEP	VOC	TRICHLOROETHYLENE (TCE)	3	1	MG/KG	0.003	0.003	0.0050	0.023	0.0079	0.0030	MAXDET
59_SURFSOIL	Metal	ALUMINUM	1	1	MG/KG	15600	15600	15600	0		15600	MAXDET

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
59_SURFSOIL	Metal	ARSENIC	1	1	MG/KG	12	12	12	0		12	MAXDET
59_SURFSOIL	Metal	BARIUM	1	1	MG/KG	103	103	103	0		103	MAXDET
59_SURFSOIL	Metal	CALCIUM	1	1	MG/KG	986	986	986	0		986	MAXDET
59_SURFSOIL	Metal	CHROMIUM, TOTAL	1	1	MG/KG	16	16	16	0		16	MAXDET
59_SURFSOIL	Metal	COBALT	1	1	MG/KG	6	6	6	0		6	MAXDET
59_SURFSOIL	Metal	COPPER	1	1	MG/KG	19	19	19	0		19	MAXDET
59_SURFSOIL	Metal	IRON	1	1	MG/KG	21300	21300	21300	0		21300	MAXDET
59_SURFSOIL	Metal	LEAD	1	1	MG/KG	15	15	15	0		15	MAXDET
59_SURFSOIL	Metal	MAGNESIUM	1	1	MG/KG	2590	2590	2590	0		2590	MAXDET
59_SURFSOIL	Metal	MANGANESE	1	1	MG/KG	499	499	499	0		499	MAXDET
59_SURFSOIL	Metal	NICKEL	1	1	MG/KG	17	17	17	0		17	MAXDET
59_SURFSOIL	Metal	POTASSIUM	1	1	MG/KG	2060	2060	2060	0		2060	MAXDET
59_SURFSOIL	Metal	VANADIUM	1	1	MG/KG	31	31	31	0		31	MAXDET
59_SURFSOIL	Metal	ZINC	1	1	MG/KG	63	63	63	0		63	MAXDET
59_SURFSOIL	OCPest	ALPHA-CHLORDANE	10	3	MG/KG	0.015	0.08	0.012	0.16	0.027	0.080	MAXDET
59_SURFSOIL	OCPest	DDD	10	6	MG/KG	0.0028	0.017	0.020	0.14	0.037	0.017	MAXDET
59_SURFSOIL	OCPest	DDE	10	9	MG/KG	0.002	0.69	0.12	7	0.26	0.69	MAXDET
59_SURFSOIL	OCPest	DDT	10	8	MG/KG	0.0017	0.77	0.13	17	0.28	0.77	MAXDET
59_SURFSOIL	OCPest	DIELDRIN	10	3	MG/KG	0.016	0.58	0.07398	3	0.18	0.58	MAXDET
59_SURFSOIL	OCPest	GAMMA-CHLORDANE	10	3	MG/KG	0.015	0.061	0.0099	0.096	0.021	0.061	MAXDET
59_SURFSOIL	PAH	ACENAPHTHENE	10	1	MG/KG	0.059	0.059	0.066	0.11	0.097	0.059	MAXDET
59_SURFSOIL	PAH	BENZO(a)ANTHRACENE	10	2	MG/KG	0.14	0.21	0.088	0.20	0.13	0.20	LOGNORM
59_SURFSOIL	PAH	BENZO(a)PYRENE	10	2	MG/KG	0.14	0.2	0.087	0.20	0.13	0.20	LOGNORM
59_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	10	2	MG/KG	0.13	0.2	0.086	0.19	0.13	0.19	LOGNORM
59_SURFSOIL	PAH	BENZO(g,h,i)PERYLENE	10	1	MG/KG	0.1	0.1	0.072	0.13	0.10	0.1	MAXDET
59_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	10	2	MG/KG	0.14	0.16	0.083	0.18	0.12	0.16	MAXDET
59_SURFSOIL	PAH	CHRYSENE	10	2	MG/KG	0.14	0.2	0.087	0.20	0.13	0.20	LOGNORM
59_SURFSOIL	PAH	FLUORANTHENE	10	3	MG/KG	0.08	0.37	0.12	0.36	0.19	0.36	LOGNORM
59_SURFSOIL	PAH	INDENO(1,2,3-c,d)PYRENE	10	1	MG/KG	0.12	0.12	0.081	0.16	0.11	0.12	MAXDET
59_SURFSOIL	PAH	PHENANTHRENE	10	3	MG/KG	0.076	0.24	0.10	0.26	0.15	0.24	MAXDET
59_SURFSOIL	PAH	PYRENE	10	3	MG/KG	0.064	0.27	0.10	0.26	0.16	0.26	LOGNORM
59_SURFSOIL	VOC	ACETONE	2	1	MG/KG	0.095	0.095	0.093	0.10	0.11	0.095	MAXDET
59_SURFSOIL	VOC	CARBON DISULFIDE	2	1	MG/KG	0.002	0.002	0.0040	12	0.017	0.0020	MAXDET
59_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	2	1	MG/KG	0.009	0.009	0.0090	0.0090	0.009	0.0090	MAXDET
59_SURFSOIL	VOC	METHYLENE CHLORIDE	2	1	MG/KG	0.002	0.002	0.0040	12	0.017	0.0020	MAXDET
59_SURFSOIL	VOC	TETRACHLOROETHYLENE(PCE)	2	2	MG/KG	0.004	0.073	0.039	1.22E+23	0.26	0.073	MAXDET
59_SURFSOIL	VOC	TOTAL 1,2-DICHLOROETHENE	2	1	MG/KG	0.004	0.004	0.005	0.016	0.011	0.0040	MAXDET
59_SURFSOIL	VOC	TRICHLOROETHYLENE (TCE)	2	1	MG/KG	0.003	0.003	0.0045	0.11	0.014	0.0030	MAXDET
65_DEEP	GenChem	ALKALINITY, TOTAL (AS CaCO3)	2	2	MG/KG	503000	658000	580500	1082394	1069835	658000	MAXDET
65_DEEP	GenChem	MOISTURE, PERCENT	2	2	PERCENT	5	6	5	6	6	6	MAXDET
65_DEEP	GenChem	pH	2	2	PH UNITS	9	9	9	9	9	9	MAXDET
65_DEEP	GenChem	TOTAL ORGANIC CARBON	2	2	MG/KG	13000	15700	14350	21295	22874	15700	MAXDET
65_DEEP	GeoPhys	CATION-EXCHANGE CAPACITY	2	2	MEQ/100G	3	3	3	4	4	3	MAXDET
65_DEEP	GeoPhys	SIEVE NO. 100, PERCENT PASSING	2	2	PERCENT	42	42	42	43	44	42	MAXDET
65_DEEP	GeoPhys	SIEVE NO. 20, PERCENT PASSING	2	2	PERCENT	75	85	80	104	113	85	MAXDET
65_DEEP	GeoPhys	SIEVE NO. 200, PERCENT PASSING	2	2	PERCENT	34	37	35	41	44	37	MAXDET
65_DEEP	GeoPhys	SIEVE NO. 200L, PERCENT PASSING	2	2	PERCENT	33	36	35	41	44	36	MAXDET
65_DEEP	GeoPhys	SIEVE NO. 40, PERCENT PASSING	2	2	PERCENT	58	66	62	81	89	66	MAXDET
65_DEEP	GeoPhys	SIEVE NO. 80, PERCENT PASSING	2	2	PERCENT	45	45	45	45	45	45	MAXDET
65_DEEP	Metal	ALUMINUM	3	3	MG/KG	3740	13300	6997	858874	16201	13300	MAXDET
65_DEEP	Metal	ANTIMONY	3	2	MG/KG	0.73	2	1	41	3	2	MAXDET
65_DEEP	Metal	ARSENIC	3	3	MG/KG	4	14	8	484	17	14	MAXDET

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TABLE H-1

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Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
65_DEEP	Metal	BARIUM	3	3	MG/KG	44	121	82	989	147	121	MAXDET
65_DEEP	Metal	BERYLLIUM	3	3	MG/KG	0.27	0.47	0.35	0.80	0.53	0.47	MAXDET
65_DEEP	Metal	CADMIUM	3	3	MG/KG	0.12	4	2	1.61E+13	5	4	MAXDET
65_DEEP	Metal	CALCIUM	3	3	MG/KG	1620	144000	93207	2.87E+32	227189	144000	MAXDET
65_DEEP	Metal	CHROMIUM TOTAL	3	3	MG/KG	10	30	17	427	36	30	MAXDET
65_DEEP	Metal	COBALT	3	3	MG/KG	2	7	5	81	8	7	MAXDET
65_DEEP	Metal	COPPER	3	3	MG/KG	10	21	16	70	25	21	MAXDET
65_DEEP	Metal	IRON	3	3	MG/KG	4410	19900	10863	2343608	24454	19900	MAXDET
65_DEEP	Metal	LEAD	3	3	MG/KG	15	98	52	169638	123	98	MAXDET
65_DEEP	Metal	MAGNESIUM	3	3	MG/KG	2180	9700	7157	7600352	14423	9700	MAXDET
65_DEEP	Metal	MANGANESE	3	3	MG/KG	94	541	266	496148	672	541	MAXDET
65_DEEP	Metal	MERCURY	3	2	MG/KG	0.03	0.05	0.04	0.080	0.057	0.05	MAXDET
65_DEEP	Metal	NICKEL	3	3	MG/KG	6	16	11	161	19	16	MAXDET
65_DEEP	Metal	POTASSIUM	3	3	MG/KG	808	2290	1353	24860	2727	2290	MAXDET
65_DEEP	Metal	SELENIUM	3	1	MG/KG	1	1	1	3	2	1	MAXDET
65_DEEP	Metal	SODIUM	3	1	MG/KG	294	294	147	126195	364	294	MAXDET
65_DEEP	Metal	VANADIUM	3	3	MG/KG	8	26	15	389	31	26	MAXDET
65_DEEP	Metal	ZINC	14	14	MG/KG	54	646	156	213	225	213	LOGNORM
65_DEEP	OCPest	DDE	7	7	MG/KG	0.004	7	2	28412	4	7	MAXDET
65_DEEP	OCPest	DDT	7	7	MG/KG	0.0057	10	3	54178	5	10	MAXDET
65_DEEP	OCPest	DIELDRIN	7	3	MG/KG	0.01	0.83	0.55	42	0.98	0.83	MAXDET
65_DEEP	ORG	Total Polynuclear Aromatic Hydrocarbons	20	14	MG/KG	0.265	723	124	69088	202	723	MAXDET
65_DEEP	PAH	ACENAPHTHENE	20	3	MG/KG	1	6	2	5	2	5	LOGNORM
65_DEEP	PAH	ACENAPHTHYLENE	20	1	MG/KG	10	10	2	5	3	5	LOGNORM
65_DEEP	PAH	ANTHRACENE	20	8	MG/KG	0.048	12	2	11	3	11	LOGNORM
65_DEEP	PAH	BENZO(a)ANTHRACENE	20	12	MG/KG	0.085	55	10	278	16	55	MAXDET
65_DEEP	PAH	BENZO(a)PYRENE	20	12	MG/KG	0.081	67	12	370	19	67	MAXDET
65_DEEP	PAH	BENZO(b)FLUORANTHENE	20	12	MG/KG	0.098	65	12	406	20	65	MAXDET
65_DEEP	PAH	BENZO(g h i)PERYLENE	20	12	MG/KG	0.062	48	8	214	14	48	MAXDET
65_DEEP	PAH	BENZO(k)FLUORANTHENE	20	12	MG/KG	0.073	71	12	456	20	71	MAXDET
65_DEEP	PAH	CHRYSENE	20	13	MG/KG	0.05	68	13	603	21	68	MAXDET
65_DEEP	PAH	FLUORANTHENE	20	14	MG/KG	0.066	130	21	1294	34	130	MAXDET
65_DEEP	PAH	FLUORENE	20	3	MG/KG	0.82	5.2	1	4	2	4	LOGNORM
65_DEEP	PAH	INDENO(1 2 3-c d)PYRENE	20	12	MG/KG	0.056	44	9	268	14	44	MAXDET
65_DEEP	PAH	NAPHTHALENE	20	1	MG/KG	0.66	0.66	1	3	2	0.66	MAXDET
65_DEEP	PAH	PHENANTHRENE	20	13	MG/KG	0.089	61	9	135	15	61	MAXDET
65_DEEP	PAH	PYRENE	20	14	MG/KG	0.06	120	18	868	30	120	MAXDET
65_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	14	4	MG/KG	0.1	0.31	0.74	2	1	0.31	MAXDET
65_DEEP	SVOC	CARBAZOLE	14	7	MG/KG	0.048	12	1.83	15	3	12	MAXDET
65_DEEP	SVOC	DI-n-BUTYL PHTHALATE	14	2	MG/KG	0.052	0.056	0.76	3	1	0.056	MAXDET
65_DEEP	SVOC	DIBENZOFURAN	14	2	MG/KG	0.54	2	0.99	3	2	2	MAXDET
65_DEEP	VOC	BENZENE	3	2	MG/KG	0.001	0.004	0.0035	8	0.0074	0.0040	MAXDET
65_DEEP	VOC	BROMOMETHANE	3	1	MG/KG	0.002	0.002	0.0042	0.078	0.0074	0.0020	MAXDET
65_DEEP	VOC	CARBON DISULFIDE	3	1	MG/KG	0.001	0.001	0.0038	23	0.0080	0.0010	MAXDET
65_DEEP	VOC	ETHYLBENZENE	3	1	MG/KG	0.006	0.006	0.0055	0.0066	0.0063	0.0060	MAXDET
65_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	3	2	MG/KG	0.006	0.024	0.012	7	0.030	0.024	MAXDET
65_DEEP	VOC	TOLUENE	3	1	MG/KG	0.012	0.012	0.0075	0.065	0.014	0.012	MAXDET
65_DEEP	VOC	Total Xylenes	3	1	MG/KG	0.009	0.009	0.0065	0.017	0.010	0.009	MAXDET
65_SURFSOIL	GenChem	ALKALINITY TOTAL (AS CaCO3)	2	2	MG/KG	503000	658000	580500	1082394	1069835	658000	MAXDET
65_SURFSOIL	GenChem	MOISTURE, PERCENT	2	2	PERCENT	5	6	5	6	6	6	MAXDET
65_SURFSOIL	GenChem	pH	2	2	PH UNITS	9	9	9	9	9	9	MAXDET
65_SURFSOIL	GenChem	TOTAL ORGANIC CARBON	2	2	MG/KG	13000	15700	14350	21295	22874	15700	MAXDET

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
65_SURFSOIL	GeoPhys	CATION EXCHANGE CAPACITY	2	2	MEQ/100G	3	3	3	4	4	3	MAXDET
65_SURFSOIL	GeoPhys	SIEVE NO 100 PERCENT PASSING	2	2	PERCENT	42	42	42	43	44	42	MAXDET
65_SURFSOIL	GeoPhys	SIEVE NO 20, PERCENT PASSING	2	2	PERCENT	75	85	80	104	113	85	MAXDET
65_SURFSOIL	GeoPhys	SIEVE NO 200 PERCENT PASSING	2	2	PERCENT	34	37	35	41	44	37	MAXDET
65_SURFSOIL	GeoPhys	SIEVE NO 200L PERCENT PASSING	2	2	PERCENT	33	36	35	41	44	36	MAXDET
65_SURFSOIL	GeoPhys	SIEVE NO 40 PERCENT PASSING	2	2	PERCENT	58	66	62	81	89	66	MAXDET
65_SURFSOIL	GeoPhys	SIEVE NO 80 PERCENT PASSING	2	2	PERCENT	45	45	45	45	45	45	MAXDET
65_SURFSOIL	Metal	ALUMINUM	3	3	MG/KG	3740	13300	6997	858874	16201	13300	MAXDET
65_SURFSOIL	Metal	ANTIMONY	3	2	MG/KG	0.73	2	1	41	3	2	MAXDET
65_SURFSOIL	Metal	ARSENIC	3	3	MG/KG	4	14	8	484	17	14	MAXDET
65_SURFSOIL	Metal	BARIUM	3	3	MG/KG	44	121	82	989	147	121	MAXDET
65_SURFSOIL	Metal	BERYLLIUM	3	3	MG/KG	0.27	0.47	0.35	0.80	0.53	0.47	MAXDET
65_SURFSOIL	Metal	CADMIUM	3	3	MG/KG	0.12	4	2	1.61E+13	5	4	MAXDET
65_SURFSOIL	Metal	CALCIUM	3	3	MG/KG	1620	144000	93207	2.87E+32	227189	144000	MAXDET
65_SURFSOIL	Metal	CHROMIUM, TOTAL	3	3	MG/KG	10	30	17	427	36	30	MAXDET
65_SURFSOIL	Metal	COBALT	3	3	MG/KG	2	7	5	81	8	7	MAXDET
65_SURFSOIL	Metal	COPPER	3	3	MG/KG	10	21	16	70	25	21	MAXDET
65_SURFSOIL	Metal	IRON	3	3	MG/KG	4410	19900	10863	2343608	24454	19900	MAXDET
65_SURFSOIL	Metal	LEAD	3	3	MG/KG	15	98	52	169638	123	98	MAXDET
65_SURFSOIL	Metal	MAGNESIUM	3	3	MG/KG	2180	9700	7157	7600352	14423	9700	MAXDET
65_SURFSOIL	Metal	MANGANESE	3	3	MG/KG	94	541	266	496148	672	541	MAXDET
65_SURFSOIL	Metal	MERCURY	3	2	MG/KG	0.03	0.05	0.040	0.080	0.057	0.050	MAXDET
65_SURFSOIL	Metal	NICKEL	3	3	MG/KG	6	16	11	161	19	16	MAXDET
65_SURFSOIL	Metal	POTASSIUM	3	3	MG/KG	808	2290	1353	24860	2727	2290	MAXDET
65_SURFSOIL	Metal	SELENIUM	3	1	MG/KG	1	1	1	3	2	1	MAXDET
65_SURFSOIL	Metal	SODIUM	3	1	MG/KG	294	294	147	126195	364	294	MAXDET
65_SURFSOIL	Metal	VANADIUM	3	3	MG/KG	8	26	15	389	31	26	MAXDET
65_SURFSOIL	Metal	ZINC	10	10	MG/KG	54	646	167	286	268	286	LOGNORM
65_SURFSOIL	OCPest	DDE	7	7	MG/KG	0.004	7	2	28412	4	7	MAXDET
65_SURFSOIL	OCPest	DDT	7	7	MG/KG	0.0057	10	3	54178	5	10	MAXDET
65_SURFSOIL	OCPest	DIELDRIN	7	3	MG/KG	0.01	0.83	0.55	42	0.98	0.83	MAXDET
65_SURFSOIL	ORG	Total Polynuclear Aromatic Hydrocarbons	16	13	MG/KG	1	723	155	71175	249	723	MAXDET
65_SURFSOIL	PAH	ACENAPHTHENE	16	3	MG/KG	1	6	2	8	3	6	MAXDET
65_SURFSOIL	PAH	ACENAPHTHYLENE	16	1	MG/KG	10	10	2	7	3	7	LOGNORM
65_SURFSOIL	PAH	ANTHRACENE	16	8	MG/KG	0.048	12	3	25	4	12	MAXDET
65_SURFSOIL	PAH	BENZO(a)ANTHRACENE	16	12	MG/KG	0.085	55	13	809	20	55	MAXDET
65_SURFSOIL	PAH	BENZO(a)PYRENE	16	12	MG/KG	0.081	67	15	1146	24	67	MAXDET
65_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	16	12	MG/KG	0.098	65	15	1230	25	65	MAXDET
65_SURFSOIL	PAH	BENZO(g,h,i)PERYLENE	16	12	MG/KG	0.062	48	11	749	17	48	MAXDET
65_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	16	12	MG/KG	0.073	71	15	1493	24	71	MAXDET
65_SURFSOIL	PAH	CHRYSENE	16	12	MG/KG	0.11	68	16	1179	25	68	MAXDET
65_SURFSOIL	PAH	FLUORANTHENE	16	13	MG/KG	0.26	130	26	1824	42	130	MAXDET
65_SURFSOIL	PAH	FLUORENE	16	3	MG/KG	0.82	5	2	6	2	5	MAXDET
65_SURFSOIL	PAH	INDENO(1,2,3-c,d)PYRENE	16	12	MG/KG	0.056	44	11	1014	17	44	MAXDET
65_SURFSOIL	PAH	NAPHTHALENE	16	1	MG/KG	0.66	0.66	2	5	2	0.66	MAXDET
65_SURFSOIL	PAH	PHENANTHRENE	16	12	MG/KG	0.18	61	11	227	18	61	MAXDET
65_SURFSOIL	PAH	PYRENE	16	13	MG/KG	0.2	120	23	1289	37	120	MAXDET
65_SURFSOIL	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	10	3	MG/KG	0.1	0.31	1	5	2	0.31	MAXDET
65_SURFSOIL	SVOC	CARBAZOLE	10	7	MG/KG	0.048	12	2	149	5	12	MAXDET
65_SURFSOIL	SVOC	DI-n-BUTYL PHTHALATE	10	1	MG/KG	0.056	0.056	1	7	2	0.056	MAXDET
65_SURFSOIL	SVOC	DIBENZOFURAN	10	2	MG/KG	0.54	2	1	8	2	2	MAXDET
65_SURFSOIL	VOC	BENZENE	3	2	MG/KG	0.001	0.004	0.0035	8	0.0074	0.004	MAXDET

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Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
65_SURFSOIL	VOC	BROMOMETHANE	3	1	MG/KG	0.002	0.002	0.0042	0.078	0.0074	0.002	MAXDET
65_SURFSOIL	VOC	CARBON DISULFIDE	3	1	MG/KG	0.001	0.001	0.0038	23	0.0080	0.001	MAXDET
65_SURFSOIL	VOC	ETHYLBENZENE	3	1	MG/KG	0.006	0.006	0.0055	0.0066	0.0063	0.006	MAXDET
65_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	3	2	MG/KG	0.006	0.024	0.012	7	0.030	0.024	MAXDET
65_SURFSOIL	VOC	TOLUENE	3	1	MG/KG	0.012	0.012	0.0075	0.065	0.014	0.012	MAXDET
65_SURFSOIL	VOC	Total Xylenes	3	1	MG/KG	0.009	0.009	0.0065	0.017	0.010	0.009	MAXDET
66_DEEP	Metal	ALUMINUM	2	2	MG/KG	5120	11000	8060	388279	26623	11000	MAXDET
66_DEEP	Metal	ANTIMONY	2	1	MG/KG	3	3	2	17102	8	3	MAXDET
66_DEEP	Metal	ARSENIC	2	2	MG/KG	1	4	2	7325	10	4	MAXDET
66_DEEP	Metal	BARIUM	2	2	MG/KG	99	154	126	496	301	154	MAXDET
66_DEEP	Metal	BERYLLIUM	2	2	MG/KG	0.23	0.26	0.25	0.31	0.34	0.26	MAXDET
66_DEEP	Metal	CALCIUM	2	2	MG/KG	1830	33800	17815	8.97E+28	118744	33800	MAXDET
66_DEEP	Metal	CHROMIUM, TOTAL	2	2	MG/KG	14	23	19	82	45	23	MAXDET
66_DEEP	Metal	COBALT	2	2	MG/KG	5	17	11	258125	49	17	MAXDET
66_DEEP	Metal	COPPER	2	2	MG/KG	19	39	29	1010	93	39	MAXDET
66_DEEP	Metal	IRON	2	2	MG/KG	9190	24700	16945	11190493	65910	24700	MAXDET
66_DEEP	Metal	LEAD	2	2	MG/KG	11	67	39	3.60E+11	217	67	MAXDET
66_DEEP	Metal	MAGNESIUM	2	2	MG/KG	2050	3630	2840	24878	7828	3630	MAXDET
66_DEEP	Metal	MANGANESE	2	2	MG/KG	49	242	146	2958561894	754	242	MAXDET
66_DEEP	Metal	NICKEL	2	2	MG/KG	16	20	18	29	31	20	MAXDET
66_DEEP	Metal	POTASSIUM	2	2	MG/KG	401	835	618	21798	1988	835	MAXDET
66_DEEP	Metal	SODIUM	2	1	MG/KG	152	152	164	219	240	152	MAXDET
66_DEEP	Metal	VANADIUM	2	2	MG/KG	17	27	22	119	56	27	MAXDET
66_DEEP	Metal	ZINC	2	2	MG/KG	63	541	302	9.24E+15	1812	541	MAXDET
66_DEEP	OCPest	DDD	2	1	MG/KG	0.12	0.12	0.062	3.39E+28	0.43	0.12	MAXDET
66_DEEP	OCPest	DDE	2	1	MG/KG	0.22	0.22	0.11	1.51E+41	0.79	0.22	MAXDET
66_DEEP	OCPest	DDT	2	1	MG/KG	0.57	0.57	0.29	2.60E+65	2	0.57	MAXDET
66_DEEP	PAH	BENZO(a)ANTHRACENE	12	1	MG/KG	5	5	0.64	0.94	1	0.94	LOGNORM
66_DEEP	PAH	BENZO(a)PYRENE	12	1	MG/KG	6	6	0.72	1	2	1	LOGNORM
66_DEEP	PAH	BENZO(b)FLUORANTHENE	12	1	MG/KG	8	8	0.87	1	2	1	LOGNORM
66_DEEP	PAH	BENZO(g h i)PERYLENE	12	1	MG/KG	7	7	0.76	1	2	1	LOGNORM
66_DEEP	PAH	BENZO(k)FLUORANTHENE	12	1	MG/KG	7	7	0.81	1	2	1	LOGNORM
66_DEEP	PAH	CHRYSENE	12	1	MG/KG	9	9	0.96	1	2	1	LOGNORM
66_DEEP	PAH	FLUORANTHENE	12	3	MG/KG	0.061	14	1	3	3	3	LOGNORM
66_DEEP	PAH	INDENO(1 2,3-c d)PYRENE	12	1	MG/KG	6	6	0.71	1	2	1	LOGNORM
66_DEEP	PAH	PHENANTHRENE	12	3	MG/KG	0.052	6	0.67	1	2	1	LOGNORM
66_DEEP	PAH	PYRENE	12	3	MG/KG	0.044	12	1	3	3	3	LOGNORM
66_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	12	2	MG/KG	0.046	5	1	4	2	4	LOGNORM
66_DEEP	SVOC	CARBAZOLE	12	1	MG/KG	2	2	0.32	0.42	0.51	0.42	LOGNORM
66_DEEP	SVOC	DI-n-BUTYL PHTHALATE	12	1	MG/KG	0.044	0.044	0.65	5	2	0.044	MAXDET
66_DEEP	VOC	CARBON TETRACHLORIDE	10	1	MG/KG	0.011	0.011	0.0068	0.0076	0.0077	0.0076	LOGNORM
66_DEEP	VOC	CHLOROFORM	10	3	MG/KG	0.002	0.043	0.0095	0.017	0.016	0.017	LOGNORM
66_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	10	1	MG/KG	0.016	0.016	0.0073	0.0088	0.0090	0.0088	LOGNORM
66_DEEP	VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	10	1	MG/KG	0.006	0.006	0.0063	0.0064	0.0064	0.0060	MAXDET
66_DEEP	VOC	METHYLENE CHLORIDE	10	3	MG/KG	0.001	0.004	0.0052	0.0096	0.0064	0.0040	MAXDET
66_DEEP	VOC	TETRACHLOROETHYLENE(PCE)	10	1	MG/KG	0.004	0.004	0.00605	0.0066	0.0065	0.0040	MAXDET
66_SURFSOIL	Metal	ALUMINUM	1	1	MG/KG	5120	5120	5120	0		5120	MAXDET
66_SURFSOIL	Metal	ANTIMONY	1	1	MG/KG	3	3	3	0		3	MAXDET
66_SURFSOIL	Metal	ARSENIC	1	1	MG/KG	4	4	4	0		4	MAXDET
66_SURFSOIL	Metal	BARIUM	1	1	MG/KG	99	99	99	0		99	MAXDET
66_SURFSOIL	Metal	BERYLLIUM	1	1	MG/KG	0.23	0.23	0.23	0		0.23	MAXDET
66_SURFSOIL	Metal	CALCIUM	1	1	MG/KG	33800	33800	33800	0		33800	MAXDET

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
66_SURFSOIL	Metal	CHROMIUM TOTAL	1	1	MG/KG	23	23	23	0		23	MAXDET
66_SURFSOIL	Metal	COBALT	1	1	MG/KG	17	17	17	0		17	MAXDET
66_SURFSOIL	Metal	COPPER	1	1	MG/KG	39	39	39	0		39	MAXDET
66_SURFSOIL	Metal	IRON	1	1	MG/KG	24700	24700	24700	0		24700	MAXDET
66_SURFSOIL	Metal	LEAD	1	1	MG/KG	67	67	67	0		67	MAXDET
66_SURFSOIL	Metal	MAGNESIUM	1	1	MG/KG	3630	3630	3630	0		3630	MAXDET
66_SURFSOIL	Metal	MANGANESE	1	1	MG/KG	242	242	242	0		242	MAXDET
66_SURFSOIL	Metal	NICKEL	1	1	MG/KG	16	16	16	0		16	MAXDET
66_SURFSOIL	Metal	POTASSIUM	1	1	MG/KG	401	401	401	0		401	MAXDET
66_SURFSOIL	Metal	SODIUM	1	1	MG/KG	152	152	152	0		152	MAXDET
66_SURFSOIL	Metal	VANADIUM	1	1	MG/KG	27	27	27	0		27	MAXDET
66_SURFSOIL	Metal	ZINC	1	1	MG/KG	541	541	541	0		541	MAXDET
66_SURFSOIL	OCPest	DDD	1	1	MG/KG	0.12	0.12	0.12	0		0.1	MAXDET
66_SURFSOIL	OCPest	DDE	1	1	MG/KG	0.22	0.22	0.22	0		0.2	MAXDET
66_SURFSOIL	OCPest	DDT	1	1	MG/KG	0.57	0.57	0.57	0		0.6	MAXDET
66_SURFSOIL	PAH	BENZO(a)ANTHRACENE	5	1	MG/KG	5	5	1	183	3	5	MAXDET
66_SURFSOIL	PAH	BENZO(a)PYRENE	5	1	MG/KG	6	6	1	337	4	6	MAXDET
66_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	5	1	MG/KG	8	8	2	965	5	8	MAXDET
66_SURFSOIL	PAH	BENZO(g h i)PERYLENE	5	1	MG/KG	7	7	2	461	4	7	MAXDET
66_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	5	1	MG/KG	7	7	2	656	5	7	MAXDET
66_SURFSOIL	PAH	CHRYSENE	5	1	MG/KG	9	9	2	1690	6	9	MAXDET
66_SURFSOIL	PAH	FLUORANTHENE	5	2	MG/KG	0.078	14	3	54866	9	14	MAXDET
66_SURFSOIL	PAH	INDENO(1 2 3-c,d)PYRENE	5	1	MG/KG	6	6	1	316	4	6	MAXDET
66_SURFSOIL	PAH	PHENANTHRENE	5	2	MG/KG	0.078	6	1	983	4	6	MAXDET
66_SURFSOIL	PAH	PYRENE	5	2	MG/KG	0.044	12	3	95654	8	12	MAXDET
66_SURFSOIL	SVOC	CARBAZOLE	5	1	MG/KG	2	2	0.47	3	1	2	MAXDET
66_SURFSOIL	SVOC	DI-n-BUTYL PHTHALATE	5	1	MG/KG	0.044	0.044	1	652889	4	0.044	MAXDET
66_SURFSOIL	VOC	CHLOROFORM	4	1	MG/KG	0.005	0.0050	0.0061	0.0076	0.0071	0.005	MAXDET
66_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	4	1	MG/KG	0.016	0.016	0.0086	0.031	0.014	0.016	MAXDET
66_SURFSOIL	VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	4	1	MG/KG	0.006	0.0060	0.0061	0.0065	0.0064	0.006	MAXDET
66_SURFSOIL	VOC	METHYLENE CHLORIDE	4	1	MG/KG	0.004	0.0040	0.0059	0.0091	0.0074	0.004	MAXDET
66_SURFSOIL	VOC	TETRACHLOROETHYLENE(PCE)	4	1	MG/KG	0.004	0.0040	0.0056	0.0081	0.0069	0.004	MAXDET
77_DEEP	GenChem	ALKALINITY TOTAL (AS CaCO3)	1	1	MG/KG	77300	77300	77300	0		77300	MAXDET
77_DEEP	GenChem	MOISTURE PERCENT	1	1	PERCENT	11	11	11	0		11	MAXDET
77_DEEP	GenChem	pH	10	10	PH UNITS	6	9	7	8	8	8	NORM
77_DEEP	GenChem	TOTAL ORGANIC CARBON	1	1	MG/KG	6280	6280	6280	0		6280	MAXDET
77_DEEP	GeoPhys	CATION-EXCHANGE CAPACITY	1	1	MEQ/100G	7	7	7	0		7	MAXDET
77_DEEP	GeoPhys	SIEVE NO 100, PERCENT PASSING	1	1	PERCENT	71	71	71	0		71	MAXDET
77_DEEP	GeoPhys	SIEVE NO 20 PERCENT PASSING	1	1	PERCENT	87	87	87	0		87	MAXDET
77_DEEP	GeoPhys	SIEVE NO 200 PERCENT PASSING	1	1	PERCENT	67	67	67	0		67	MAXDET
77_DEEP	GeoPhys	SIEVE NO 200L PERCENT PASSING	1	1	PERCENT	67	67	67	0		67	MAXDET
77_DEEP	GeoPhys	SIEVE NO 40 PERCENT PASSING	1	1	PERCENT	79	79	79	0		79	MAXDET
77_DEEP	GeoPhys	SIEVE NO 80, PERCENT PASSING	1	1	PERCENT	72	72	72	0		72	MAXDET
77_DEEP	Metal	ALUMINUM	1	1	MG/KG	10100	10100	10100	0		10100	MAXDET
77_DEEP	Metal	ANTIMONY	13	2	MG/KG	1	7	3	7	4	7	LOGNORM
77_DEEP	Metal	ARSENIC	13	13	MG/KG	5	19	12	14	14	14	NORM
77_DEEP	Metal	BARIUM	1	1	MG/KG	114	114	114	0		114	MAXDET
77_DEEP	Metal	BERYLLIUM	13	5	MG/KG	0.18	0.39	0.50	0.63	0.57	0.39	MAXDET
77_DEEP	Metal	CADMIUM	13	4	MG/KG	0.27	1	0.56	0.75	0.68	0.75	LOGNORM
77_DEEP	Metal	CALCIUM	1	1	MG/KG	2020	2020	2020	0		2020	MAXDET
77_DEEP	Metal	CHROMIUM TOTAL	13	13	MG/KG	6	34	21	29	25	25	NORM
77_DEEP	Metal	COBALT	1	1	MG/KG	9	9	9	0		9	MAXDET

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
77_DEEP	Metal	COPPER	13	13	MG/KG	10	52	26	34	31	34	LOGNORM
77_DEEP	Metal	IRON	1	1	MG/KG	18300	18300	18300	0		18300	MAXDET
77_DEEP	Metal	LEAD	13	13	MG/KG	12	71	26	37	35	37	LOGNORM
77_DEEP	Metal	MAGNESIUM	1	1	MG/KG	2290	2290	2290	0		2290	MAXDET
77_DEEP	Metal	MANGANESE	1	1	MG/KG	552	552	552	0		552	MAXDET
77_DEEP	Metal	MERCURY	13	4	MG/KG	0.01	0.14	0.06	0.10	0.08	0.10	LOGNORM
77_DEEP	Metal	NICKEL	13	13	MG/KG	5	46	24	37	31	37	LOGNORM
77_DEEP	Metal	POTASSIUM	1	1	MG/KG	939	939	939	0		939	MAXDET
77_DEEP	Metal	SELENIUM	13	1	MG/KG	1	1	0.56	1	0.73	1	LOGNORM
77_DEEP	Metal	SODIUM	1	1	MG/KG	192	192	192	0		192	MAXDET
77_DEEP	Metal	VANADIUM	1	1	MG/KG	25	25	25	0		25	MAXDET
77_DEEP	Metal	ZINC	13	13	MG/KG	29	121	76	96	89	89	NORM
77_DEEP	OCPest	ALPHA-CHLORDANE	10	2	MG/KG	0.0027	0.024	0.015	0.18	0.033	0.024	MAXDET
77_DEEP	OCPest	DDE	10	3	MG/KG	0.013	0.077	0.036	0.79	0.071	0.077	MAXDET
77_DEEP	OCPest	DDT	10	5	MG/KG	0.0022	0.26	0.071	8	0.13	0.26	MAXDET
77_DEEP	OCPest	DIELDRIN	10	2	MG/KG	0.032	0.26	0.051	2	0.11	0.26	MAXDET
77_DEEP	OCPest	GAMMA-CHLORDANE	10	2	MG/KG	0.0036	0.04	0.017	0.25	0.035	0.04	MAXDET
77_DEEP	PAH	ACENAPHTHENE	13	3	MG/KG	0.086	4	0.76	2	1	2	LOGNORM
77_DEEP	PAH	ANTHRACENE	13	3	MG/KG	0.14	7	0.97	2	2	2	LOGNORM
77_DEEP	PAH	BENZO(a)ANTHRACENE	13	5	MG/KG	0.086	26	4	31	8	26	MAXDET
77_DEEP	PAH	BENZO(a)PYRENE	13	5	MG/KG	0.11	26	4	30	8	26	MAXDET
77_DEEP	PAH	BENZO(b)FLUORANTHENE	13	5	MG/KG	0.13	26	4	29	8	26	MAXDET
77_DEEP	PAH	BENZO(g h i)PERYLENE	13	4	MG/KG	0.1	18	3	19	7	18	MAXDET
77_DEEP	PAH	BENZO(k)FLUORANTHENE	13	5	MG/KG	0.11	20	3	23	7	20	MAXDET
77_DEEP	PAH	CHRYSENE	13	5	MG/KG	0.12	30	4	35	9	30	MAXDET
77_DEEP	PAH	FLUORANTHENE	13	7	MG/KG	0.21	67	8	137	17	67	MAXDET
77_DEEP	PAH	FLUORENE	13	3	MG/KG	0.061	3	0.64	2	1	2	LOGNORM
77_DEEP	PAH	INDENO(1,2,3-c,d)PYRENE	13	4	MG/KG	0.093	17	3	18	6	17	MAXDET
77_DEEP	PAH	PHENANTHRENE	13	6	MG/KG	0.1	36	5	49	10	36	MAXDET
77_DEEP	PAH	PYRENE	13	7	MG/KG	0.2	56	7	93	14	56	MAXDET
77_DEEP	SVOC	BENZYL BUTYL PHTHALATE	10	1	MG/KG	0.077	0.077	1	5	2	0.077	MAXDET
77_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	10	2	MG/KG	0.082	250	26	2458	72	250	MAXDET
77_DEEP	SVOC	CARBAZOLE	10	3	MG/KG	0.12	4	0.7475	2	1	2	LOGNORM
77_DEEP	SVOC	PENTACHLOROPHENOL	10	1	MG/KG	0.32	0.32	0.5845	2	1	0.32	MAXDET
77_DEEP	tbd	Mercury, TCLP	1	1	MG/L	0.00015	0.00015	0.00015	0		0.00015	MAXDET
77_DEEP	tbd	Zinc, TCLP	1	1	MG/L	0.22	0.22	0.22	0		0.22	MAXDET
77_DEEP	VOC	ACETONE	10	3	MG/KG	0.004	0.006	0.0057	0.0062	0.0061	0.006	MAXDET
77_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	10	1	MG/KG	0.004	0.004	0.0058	0.0063	0.0062	0.004	MAXDET
77_DEEP	VOC	METHYLENE CHLORIDE	10	4	MG/KG	0.002	0.003	0.0047	0.0065	0.0057	0.003	MAXDET
77_SURFSOIL	GenChem	ALKALINITY, TOTAL (AS $CaCO_3$)	1	1	MG/KG	77300	77300	77300	0		77300	MAXDET
77_SURFSOIL	GenChem	MOISTURE, PERCENT	1	1	PERCENT	11	11	11	0		11	MAXDET
77_SURFSOIL	GenChem	pH	6	6	PH UNITS	7	9	8	9	9	9	MAXDET
77_SURFSOIL	GenChem	TOTAL ORGANIC CARBON	1	1	MG/KG	6280	6280	6280	0		6280	MAXDET
77_SURFSOIL	GeoPhys	CATION-EXCHANGE CAPACITY	1	1	MEQ/100G	7	7	7	0		7	MAXDET
77_SURFSOIL	GeoPhys	SIEVE NO 100, PERCENT PASSING	1	1	PERCENT	71	71	71	0		71	MAXDET
77_SURFSOIL	GeoPhys	SIEVE NO 20 PERCENT PASSING	1	1	PERCENT	87	87	87	0		87	MAXDET
77_SURFSOIL	GeoPhys	SIEVE NO 200 PERCENT PASSING	1	1	PERCENT	67	67	67	0		67	MAXDET
77_SURFSOIL	GeoPhys	SIEVE NO 200L PERCENT PASSING	1	1	PERCENT	67	67	67	0		67	MAXDET
77_SURFSOIL	GeoPhys	SIEVE NO 40, PERCENT PASSING	1	1	PERCENT	79	79	79	0		79	MAXDET
77_SURFSOIL	GeoPhys	SIEVE NO 80 PERCENT PASSING	1	1	PERCENT	72	72	72	0		72	MAXDET
77_SURFSOIL	Metal	ALUMINUM	1	1	MG/KG	10100	10100	10100	0		10100	MAXDET
77_SURFSOIL	Metal	ANTIMONY	9	2	MG/KG	1	7	2	10	4	7	MAXDET

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Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
77_SURFSOIL	Metal	ARSENIC	9	9	MG/KG	5	19	11	15	14	19	MAXDET
77_SURFSOIL	Metal	BARIUM	1	1	MG/KG	114	114	114	0		114	MAXDET
77_SURFSOIL	Metal	BERYLLIUM	9	5	MG/KG	0.18	0.39	0.43	0.59	0.53	0.39	MAXDET
77_SURFSOIL	Metal	CADMIUM	9	4	MG/KG	0.27	1	0.53	0.82	0.70	1	MAXDET
77_SURFSOIL	Metal	CALCIUM	1	1	MG/KG	2020	2020	2020	0		2020	MAXDET
77_SURFSOIL	Metal	CHROMIUM TOTAL	9	9	MG/KG	6	27	17	25	21	27	MAXDET
77_SURFSOIL	Metal	COBALT	1	1	MG/KG	9	9	9	0		8.8	MAXDET
77_SURFSOIL	Metal	COPPER	9	9	MG/KG	10	52	24	38	33	52	MAXDET
77_SURFSOIL	Metal	IRON	1	1	MG/KG	18300	18300	18300	0		18300	MAXDET
77_SURFSOIL	Metal	LEAD	9	9	MG/KG	12	71	30	53	43	71	MAXDET
77_SURFSOIL	Metal	MAGNESIUM	1	1	MG/KG	2290	2290	2290	0		2290	MAXDET
77_SURFSOIL	Metal	MANGANESE	1	1	MG/KG	552	552	552	0		552	MAXDET
77_SURFSOIL	Metal	MERCURY	9	4	MG/KG	0.01	0.14	0.06	0.16	0.087	0.14	MAXDET
77_SURFSOIL	Metal	NICKEL	9	9	MG/KG	5	39	18	30	24	39	MAXDET
77_SURFSOIL	Metal	POTASSIUM	1	1	MG/KG	939	939	939	0		939	MAXDET
77_SURFSOIL	Metal	SELENIUM	9	1	MG/KG	1	1	0.53	2	0.78	1	MAXDET
77_SURFSOIL	Metal	SODIUM	1	1	MG/KG	192	192	192	0		192	MAXDET
77_SURFSOIL	Metal	VANADIUM	1	1	MG/KG	25	25	25	0		25	MAXDET
77_SURFSOIL	Metal	ZINC	9	9	MG/KG	29	108	71	98	87	108	MAXDET
77_SURFSOIL	OCPest	ALPHA-CHLORDANE	6	2	MG/KG	0.0027	0.024	0.025	5	0.056	0.024	MAXDET
77_SURFSOIL	OCPest	DDE	6	3	MG/KG	0.013	0.077	0.058	29	0.12	0.077	MAXDET
77_SURFSOIL	OCPest	DDT	6	5	MG/KG	0.0022	0.26	0.12	217	0.21	0.26	MAXDET
77_SURFSOIL	OCPest	DIELDRIN	6	2	MG/KG	0.032	0.26	0.083	187	0.18	0.26	MAXDET
77_SURFSOIL	OCPest	GAMMA-CHLORDANE	6	2	MG/KG	0.0036	0.04	0.027	7	0.059	0.04	MAXDET
77_SURFSOIL	PAH	ACENAPHTHENE	9	3	MG/KG	0.086	4	1	7	2	4	MAXDET
77_SURFSOIL	PAH	ANTHRACENE	9	3	MG/KG	0.14	7	1	9	3	7	MAXDET
77_SURFSOIL	PAH	BENZO(a)ANTHRACENE	9	5	MG/KG	0.086	26	6	403	12	26	MAXDET
77_SURFSOIL	PAH	BENZO(a)PYRENE	9	5	MG/KG	0.11	26	6	344	12	26	MAXDET
77_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	9	5	MG/KG	0.13	26	6	297	12	26	MAXDET
77_SURFSOIL	PAH	BENZO(g h i)PERYLENE	9	4	MG/KG	0.1	18	5	197	9	18	MAXDET
77_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	9	5	MG/KG	0.11	20	5	253	10	20	MAXDET
77_SURFSOIL	PAH	CHRYSENE	9	5	MG/KG	0.12	30	6	394	13	30	MAXDET
77_SURFSOIL	PAH	FLUORANTHENE	9	7	MG/KG	0.21	67	11	1407	25	67	MAXDET
77_SURFSOIL	PAH	FLUORENE	9	3	MG/KG	0.061	3	0.83	8	1	3	MAXDET
77_SURFSOIL	PAH	INDENO(1 2 3-c d)PYRENE	9	4	MG/KG	0.093	17	4	197	9	17	MAXDET
77_SURFSOIL	PAH	PHENANTHRENE	9	6	MG/KG	0.1	36	7	600	15	36	MAXDET
77_SURFSOIL	PAH	PYRENE	9	7	MG/KG	0.2	56	10	799	21	56	MAXDET
77_SURFSOIL	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	6	1	MG/KG	250	250	43	877086565	126	250	MAXDET
77_SURFSOIL	SVOC	CARBAZOLE	6	3	MG/KG	0.12	4	1	61	2	4	MAXDET
77_SURFSOIL	SVOC	PENTACHLOROPHENOL	6	1	MG/KG	0.32	0.32	0.90	67	2	0.32	MAXDET
77_SURFSOIL	tbd	Mercury TCLP	1	1	MG/L	0.00015	0.00015	0.00015	0		0.00015	MAXDET
77_SURFSOIL	tbd	Zinc TCLP	1	1	MG/L	0.22	0.22	0.22	0		0.22	MAXDET
77_SURFSOIL	VOC	ACETONE	6	1	MG/KG	0.004	0.004	0.0056	0.0065	0.0062	0.004	MAXDET
77_SURFSOIL	VOC	METHYLENE CHLORIDE	6	3	MG/KG	0.003	0.003	0.0044	0.0066	0.0057	0.003	MAXDET
FU1_DEEP	GenChem	ALKALINITY TOTAL (AS CaCO3)	2	2	MG/KG	503000	658000	580500	1082394	1069835	658000	MAXDET
FU1_DEEP	GenChem	MOISTURE, PERCENT	2	2	PERCENT	5	6	5	6	6	6	MAXDET
FU1_DEEP	GenChem	pH	2	2	PH UNITS	9	9	9	9	9	9	MAXDET
FU1_DEEP	GenChem	TOTAL ORGANIC CARBON	2	2	MG/KG	13000	15700	14350	21295	22874	15700	MAXDET
FU1_DEEP	GeoPhys	CATION-EXCHANGE CAPACITY	2	2	MEQ/100G	3	3	3	4	4	3	MAXDET
FU1_DEEP	GeoPhys	SIEVE NO 100, PERCENT PASSING	2	2	PERCENT	42	42	42	43	44	42	MAXDET
FU1_DEEP	GeoPhys	SIEVE NO 20 PERCENT PASSING	2	2	PERCENT	75	85	80	104	113	85	MAXDET
FU1_DEEP	GeoPhys	SIEVE NO 200 PERCENT PASSING	2	2	PERCENT	34	37	35	41	44	37	MAXDET

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU1_DEEP	GeoPhys	SIEVE NO 200L PERCENT PASSING	2	2	PERCENT	33	36	35	41	44	36	MAXDET
FU1_DEEP	GeoPhys	SIEVE NO 40, PERCENT PASSING	2	2	PERCENT	58	66	62	81	89	66	MAXDET
FU1_DEEP	GeoPhys	SIEVE NO 80 PERCENT PASSING	2	2	PERCENT	45	45	45	45	45	45	MAXDET
FU1_DEEP	Metal	ALUMINUM	18	18	MG/KG	3740	18700	10186	12656	11709	11709	NORM
FU1_DEEP	Metal	ANTIMONY	47	16	MG/KG	0 73	8	2	2	2	2	LOGNORM
FU1_DEEP	Metal	ARSENIC	51	51	MG/KG	1	55	12	15	15	15	LOGNORM
FU1_DEEP	Metal	BARIUM	18	18	MG/KG	44	164	112	131	125	125	NORM
FU1_DEEP	Metal	BERYLLIUM	51	14	MG/KG	0 23	2	0 28	0 84	0 35	0 84	LOGNORM
FU1_DEEP	Metal	CADMIUM	51	18	MG/KG	0 04	4	0 40	0 47	0 53	0 47	LOGNORM
FU1_DEEP	Metal	CALCIUM	18	18	MG/KG	978	144000	18959	40500	37145	40500	LOGNORM
FU1_DEEP	Metal	CHROMIUM, TOTAL	51	51	MG/KG	10	35	14	15	15	15	LOGNORM
FU1_DEEP	Metal	COBALT	18	18	MG/KG	2	17	7	9	9	9	LOGNORM
FU1_DEEP	Metal	COPPER	51	51	MG/KG	8	39	17	19	19	19	LOGNORM
FU1_DEEP	Metal	IRON	18	18	MG/KG	4410	24700	17144	21186	19171	19171	NORM
FU1_DEEP	Metal	LEAD	51	51	MG/KG	7	297	25	28	35	28	LOGNORM
FU1_DEEP	Metal	MAGNESIUM	18	18	MG/KG	1670	9700	3166	3913	4150	3913	LOGNORM
FU1_DEEP	Metal	MANGANESE	18	18	MG/KG	94	1110	476	652	567	567	NORM
FU1_DEEP	Metal	MERCURY	51	11	MG/KG	0 03	2	0 087	0 076	0 16	0 076	LOGNORM
FU1_DEEP	Metal	NICKEL	51	51	MG/KG	4	29	16	18	17	18	LOGNORM
FU1_DEEP	Metal	POTASSIUM	18	18	MG/KG	401	2780	2077	2787	2358	2780	MAXDET
FU1_DEEP	Metal	SELENIUM	51	5	MG/KG	1	3	0 45	0 56	0 58	0 56	LOGNORM
FU1_DEEP	Metal	SILVER	51	6	MG/KG	0 1	0 67	0 51	1	0 63	0 67	MAXDET
FU1_DEEP	Metal	SODIUM	18	2	MG/KG	152	294	56	133	84	133	LOGNORM
FU1_DEEP	Metal	VANADIUM	18	18	MG/KG	8	36	25	30	27	30	LOGNORM
FU1_DEEP	Metal	ZINC	62	62	MG/KG	34	646	88	94	109	94	LOGNORM
FU1_DEEP	OCPest	ALPHA-CHLORDANE	69	2	MG/KG	0 019	0 21	0 058	0 23	0 084	0 21	MAXDET
FU1_DEEP	OCPest	DDD	69	2	MG/KG	0 0028	0 12	0 11	0 44	0 16	0 12	MAXDET
FU1_DEEP	OCPest	DDE	69	45	MG/KG	0 0016	7	0 37	3	0 56	3	LOGNORM
FU1_DEEP	OCPest	DDT	69	45	MG/KG	0 0016	10	0 45	3	0 73	3	LOGNORM
FU1_DEEP	OCPest	DIELDRIN	69	29	MG/KG	0 0049	4	0 36	5	0 51	4	MAXDET
FU1_DEEP	OCPest	GAMMA BHC (LINDANE)	69	3	MG/KG	0 0022	0 0029	0 056	0 21	0 082	0 0029	MAXDET
FU1_DEEP	OCPest	GAMMA-CHLORDANE	69	2	MG/KG	0 02	0 15	0 067	0 29	0 097	0 15	MAXDET
FU1_DEEP	ORG	PETROLEUM HYDROCARBONS	2	2	MG/KG	16	64	40	21063255	193	64	MAXDET
FU1_DEEP	PAH	2-METHYLNAPHTHALENE	70	2	MG/KG	0 19	0 6	1	2	2	0 6	MAXDET
FU1_DEEP	PAH	ACENAPHTHENE	70	9	MG/KG	0 093	6	1	2	2	2	LOGNORM
FU1_DEEP	PAH	ACENAPHTHYLENE	70	1	MG/KG	10	10	1	2	2	2	LOGNORM
FU1_DEEP	PAH	ANTHRACENE	70	19	MG/KG	0 045	12	1	3	2	3	LOGNORM
FU1_DEEP	PAH	BENZO(a)ANTHRACENE	70	25	MG/KG	0 085	55	4	18	7	18	LOGNORM
FU1_DEEP	PAH	BENZO(a)PYRENE	70	25	MG/KG	0 081	67	5	19	7	19	LOGNORM
FU1_DEEP	PAH	BENZO(b)FLUORANTHENE	70	25	MG/KG	0 098	65	5	20	7	20	LOGNORM
FU1_DEEP	PAH	BENZO(g h i)PERYLENE	70	25	MG/KG	0 062	48	3	10	5	10	LOGNORM
FU1_DEEP	PAH	BENZO(k)FLUORANTHENE	70	25	MG/KG	0 073	71	5	21	8	21	LOGNORM
FU1_DEEP	PAH	CHRYSENE	70	27	MG/KG	0 047	68	6	26	8	26	LOGNORM
FU1_DEEP	PAH	DIBENZ(a h)ANTHRACENE	70	2	MG/KG	0 078	2	1	2	2	2	MAXDET
FU1_DEEP	PAH	FLUORANTHENE	70	29	MG/KG	0 066	130	9	73	14	73	LOGNORM
FU1_DEEP	PAH	FLUORENE	70	10	MG/KG	0 066	5	1	2	2	2	LOGNORM
FU1_DEEP	PAH	INDENO(1,2 3-c,d)PYRENE	70	25	MG/KG	0 056	44	4	12	5	12	LOGNORM
FU1_DEEP	PAH	NAPHTHALENE	70	3	MG/KG	0 36	1	1	2	2	1	MAXDET
FU1_DEEP	PAH	PHENANTHRENE	70	26	MG/KG	0 089	61	4	20	6	20	LOGNORM
FU1_DEEP	PAH	PYRENE	70	29	MG/KG	0 058	120	8	47	11	47	LOGNORM
FU1_DEEP	PCB	PCB-1260 (AROCHLOR 1260)	42	2	MG/KG	3	6	2	11	3	6	MAXDET
FU1_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	56	24	MG/KG	0 047	2	0 81	0 98	1	0 98	LOGNORM

TABLE H-1

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Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU1_DEEP	SVOC	CARBAZOLE	56	15	MG/KG	0.045	13	1	0.97	2	0.97	LOGNORM
FU1_DEEP	SVOC	DI-n BUTYL PHTHALATE	56	3	MG/KG	0.052	0.058	0.51	0.54	0.71	0.058	MAXDET
FU1_DEEP	SVOC	DIBENZOFURAN	56	6	MG/KG	0.065	2	0.75	0.69	1	0.69	LOGNORM
FU1_DEEP	VOC	2-HEXANONE	45	2	MG/KG	0.002	0.003	0.006	0.0064	0.0062	0.003	MAXDET
FU1_DEEP	VOC	ACETONE	45	24	MG/KG	0.006	0.078	0.027	0.033	0.038	0.033	LOGNORM
FU1_DEEP	VOC	BENZENE	45	4	MG/KG	0.001	0.006	0.0059	0.0066	0.0062	0.006	MAXDET
FU1_DEEP	VOC	BROMOMETHANE	45	5	MG/KG	0.001	0.002	0.0057	0.0066	0.0060	0.002	MAXDET
FU1_DEEP	VOC	CARBON DISULFIDE	45	3	MG/KG	0.001	0.002	0.0058	0.0068	0.0062	0.002	MAXDET
FU1_DEEP	VOC	ETHYLBENZENE	45	1	MG/KG	0.006	0.006	0.0061	0.0063	0.0063	0.006	MAXDET
FU1_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	45	9	MG/KG	0.001	0.049	0.0098	0.011	0.012	0.011	LOGNORM
FU1_DEEP	VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	45	1	MG/KG	0.006	0.006	0.0061	0.0062	0.0062	0.006	MAXDET
FU1_DEEP	VOC	METHYLENE CHLORIDE	45	1	MG/KG	0.001	0.001	0.006	0.0066	0.0062	0.001	MAXDET
FU1_DEEP	VOC	TETRACHLOROETHYLENE(PCE)	45	3	MG/KG	0.002	0.007	0.0060	0.0063	0.0062	0.0063	LOGNORM
FU1_DEEP	VOC	TOLUENE	45	3	MG/KG	0.001	0.012	0.0061	0.0068	0.0064	0.0068	LOGNORM
FU1_DEEP	VOC	Total Xylenes	45	1	MG/KG	0.009	0.009	0.0062	0.0064	0.0064	0.0064	LOGNORM
FU1_DEEP	VOC	TRICHLOROETHYLENE (TCE)	45	1	MG/KG	0.002	0.002	0.0060	0.0064	0.0062	0.002	MAXDET
FU1_SURFSOIL	GenChem	ALKALINITY TOTAL (AS CaCO3)	2	2	MG/KG	503000	658000	580500	1082394	1069835	658000	MAXDET
FU1_SURFSOIL	GenChem	MOISTURE PERCENT	2	2	PERCENT	5	6	5	6	6	6	MAXDET
FU1_SURFSOIL	GenChem	pH	2	2	PH UNITS	9	9	9	9	9	9	MAXDET
FU1_SURFSOIL	GenChem	TOTAL ORGANIC CARBON	2	2	MG/KG	13000	15700	14350	21295	22874	15700	MAXDET
FU1_SURFSOIL	GeoPhys	CATION-EXCHANGE CAPACITY	2	2	MEQ/100G	3	3	3	4	4	3	MAXDET
FU1_SURFSOIL	GeoPhys	SIEVE NO 100 PERCENT PASSING	2	2	PERCENT	42	42	42	43	44	42	MAXDET
FU1_SURFSOIL	GeoPhys	SIEVE NO 20 PERCENT PASSING	2	2	PERCENT	75	85	80	104	113	85	MAXDET
FU1_SURFSOIL	GeoPhys	SIEVE NO 200 PERCENT PASSING	2	2	PERCENT	34	37	35	41	44	37	MAXDET
FU1_SURFSOIL	GeoPhys	SIEVE NO 200L PERCENT PASSING	2	2	PERCENT	33	36	35	41	44	36	MAXDET
FU1_SURFSOIL	GeoPhys	SIEVE NO 40 PERCENT PASSING	2	2	PERCENT	58	66	62	81	89	66	MAXDET
FU1_SURFSOIL	GeoPhys	SIEVE NO 80 PERCENT PASSING	2	2	PERCENT	45	45	45	45	45	45	MAXDET
FU1_SURFSOIL	Metal	ALUMINUM	10	10	MG/KG	3740	13300	8869	12905	10990	10990	NORM
FU1_SURFSOIL	Metal	ANTIMONY	21	8	MG/KG	0.73	8	2	5	3	5	LOGNORM
FU1_SURFSOIL	Metal	ARSENIC	25	25	MG/KG	3	55	17	26	22	26	LOGNORM
FU1_SURFSOIL	Metal	BARIUM	10	10	MG/KG	44	164	105	136	124	124	NORM
FU1_SURFSOIL	Metal	BERYLLIUM	25	14	MG/KG	0.23	2	0.37	2	0.51	2	LOGNORM
FU1_SURFSOIL	Metal	CADMIUM	25	18	MG/KG	0.04	4	0.54	0.92	0.82	0.92	LOGNORM
FU1_SURFSOIL	Metal	CALCIUM	10	10	MG/KG	1550	144000	32640	821098	65664	144000	MAXDET
FU1_SURFSOIL	Metal	CHROMIUM TOTAL	25	25	MG/KG	10	35	15	16	17	16	LOGNORM
FU1_SURFSOIL	Metal	COBALT	10	10	MG/KG	2	17	7	10	9	10	LOGNORM
FU1_SURFSOIL	Metal	COPPER	25	25	MG/KG	8	39	19	21	21	21	LOGNORM
FU1_SURFSOIL	Metal	IRON	10	10	MG/KG	4410	24700	15579	23466	19027	19027	NORM
FU1_SURFSOIL	Metal	LEAD	25	25	MG/KG	7	297	42	57	61	57	LOGNORM
FU1_SURFSOIL	Metal	MAGNESIUM	10	10	MG/KG	1670	9700	3705	6335	5549	6335	LOGNORM
FU1_SURFSOIL	Metal	MANGANESE	10	10	MG/KG	94	657	388	667	496	496	NORM
FU1_SURFSOIL	Metal	MERCURY	25	11	MG/KG	0.03	2	0.13	0.12	0.27	0.12	LOGNORM
FU1_SURFSOIL	Metal	NICKEL	25	25	MG/KG	4	21	15	17	16	17	LOGNORM
FU1_SURFSOIL	Metal	POTASSIUM	10	10	MG/KG	401	2630	1817	3210	2284	2284	NORM
FU1_SURFSOIL	Metal	SELENIUM	25	5	MG/KG	1	3	0.66	1	0.92	1	LOGNORM
FU1_SURFSOIL	Metal	SILVER	25	1	MG/KG	0.67	0.67	0.29	0.79	0.44	0.67	MAXDET
FU1_SURFSOIL	Metal	SODIUM	10	2	MG/KG	152	294	81	518	131	294	MAXDET
FU1_SURFSOIL	Metal	VANADIUM	10	10	MG/KG	8	29	22	29	26	29	MAXDET
FU1_SURFSOIL	Metal	ZINC	32	32	MG/KG	35	646	114	134	153	134	LOGNORM
FU1_SURFSOIL	OCPest	ALPHA-CHLORDANE	43	2	MG/KG	0.019	0.21	0.092	0.59	0.13	0.21	MAXDET
FU1_SURFSOIL	OCPest	DDD	43	2	MG/KG	0.0028	0.12	0.18	1	0.25	0.12	MAXDET
FU1_SURFSOIL	OCPest	DDE	43	39	MG/KG	0.002	7	0.58	6	0.89	6	LOGNORM

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Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU1_SURFSOIL	OCPest	DDT	43	37	MG/KG	0.0024	10	0.71	5	1	5	LOGNORM
FU1_SURFSOIL	OCPest	DIELDRIN	43	29	MG/KG	0.0049	4	0.58	10	0.81	4	MAXDET
FU1_SURFSOIL	OCPest	GAMMA BHC (LINDANE)	43	1	MG/KG	0.0029	0.0029	0.09	0.52	0.13	0.0029	MAXDET
FU1_SURFSOIL	OCPest	GAMMA-CHLORDANE	43	2	MG/KG	0.02	0.15	0.11	0.73	0.15	0.15	MAXDET
FU1_SURFSOIL	ORG	PETROLEUM HYDROCARBONS	2	2	MG/KG	16	64	40	21063255	193	64	MAXDET
FU1_SURFSOIL	PAH	2 METHYLNAPHTHALENE	40	2	MG/KG	0.19	0.60	2	5	3	0.6	MAXDET
FU1_SURFSOIL	PAH	ACENAPHTHENE	40	9	MG/KG	0.093	6	2	8	3	6	MAXDET
FU1_SURFSOIL	PAH	ACENAPHTHYLENE	40	1	MG/KG	10	10	2	7	3	7	LOGNORM
FU1_SURFSOIL	PAH	ANTHRACENE	40	19	MG/KG	0.045	12	2	13	4	12	MAXDET
FU1_SURFSOIL	PAH	BENZO(a)ANTHRACENE	40	25	MG/KG	0.085	55	8	116	11	55	MAXDET
FU1_SURFSOIL	PAH	BENZO(a)PYRENE	40	25	MG/KG	0.081	67	8	136	13	67	MAXDET
FU1_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	40	25	MG/KG	0.098	65	9	146	13	65	MAXDET
FU1_SURFSOIL	PAH	BENZO(g h i)PERYLENE	40	25	MG/KG	0.062	48	6	59	8	48	MAXDET
FU1_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	40	25	MG/KG	0.073	71	9	157	13	71	MAXDET
FU1_SURFSOIL	PAH	CHRYSENE	40	25	MG/KG	0.11	68	10	182	14	68	MAXDET
FU1_SURFSOIL	PAH	DIBENZ(a h)ANTHRACENE	40	2	MG/KG	0.078	2	2	7	3	2	MAXDET
FU1_SURFSOIL	PAH	FLUORANTHENE	40	27	MG/KG	0.26	130	16	537	23	130	MAXDET
FU1_SURFSOIL	PAH	FLUORENE	40	10	MG/KG	0.066	5	2	7	3	5	MAXDET
FU1_SURFSOIL	PAH	INDENO(1,2,3-c,d)PYRENE	40	25	MG/KG	0.056	44	6	80	9	44	MAXDET
FU1_SURFSOIL	PAH	NAPHTHALENE	40	3	MG/KG	0.36	1	2	5	3	1	MAXDET
FU1_SURFSOIL	PAH	PHENANTHRENE	40	25	MG/KG	0.18	61	8	109	11	61	MAXDET
FU1_SURFSOIL	PAH	PYRENE	40	27	MG/KG	0.2	120	13	325	19	120	MAXDET
FU1_SURFSOIL	PCB	PCB-1260 (AROCHLOR 1260)	34	2	MG/KG	3	6	2	6	3	6	MAXDET
FU1_SURFSOIL	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	26	7	MG/KG	0.064	2	1	3	2	2	MAXDET
FU1_SURFSOIL	SVOC	CARBAZOLE	26	15	MG/KG	0.045	13	2	6	3	6	LOGNORM
FU1_SURFSOIL	SVOC	DI-n-BUTYL PHTHALATE	26	1	MG/KG	0.056	0.056	0.86	2	1	0.056	MAXDET
FU1_SURFSOIL	SVOC	DIBENZOFURAN	26	6	MG/KG	0.065	2	1	3	2	2	MAXDET
FU1_SURFSOIL	VOC	2-HEXANONE	19	2	MG/KG	0.002	0.003	0.0055	0.0064	0.0060	0.003	MAXDET
FU1_SURFSOIL	VOC	ACETONE	19	6	MG/KG	0.007	0.078	0.047	0.12	0.071	0.078	MAXDET
FU1_SURFSOIL	VOC	BENZENE	19	4	MG/KG	0.001	0.006	0.0054	0.0070	0.0060	0.006	MAXDET
FU1_SURFSOIL	VOC	BROMOMETHANE	19	3	MG/KG	0.002	0.002	0.0053	0.0065	0.0059	0.002	MAXDET
FU1_SURFSOIL	VOC	CARBON DISULFIDE	19	3	MG/KG	0.001	0.002	0.0052	0.0074	0.0059	0.002	MAXDET
FU1_SURFSOIL	VOC	ETHYLBENZENE	19	1	MG/KG	0.006	0.006	0.0059	0.0061	0.0061	0.006	MAXDET
FU1_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	19	8	MG/KG	0.006	0.049	0.015	0.022	0.020	0.022	LOGNORM
FU1_SURFSOIL	VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	19	1	MG/KG	0.006	0.006	0.0058	0.0060	0.0060	0.006	MAXDET
FU1_SURFSOIL	VOC	METHYLENE CHLORIDE	19	1	MG/KG	0.001	0.001	0.0055	0.0069	0.0060	0.001	MAXDET
FU1_SURFSOIL	VOC	TETRACHLOROETHYLENE(PCE)	19	1	MG/KG	0.004	0.004	0.0057	0.0060	0.0059	0.004	MAXDET
FU1_SURFSOIL	VOC	TOLUENE	19	3	MG/KG	0.001	0.012	0.0057	0.0076	0.0066	0.0076	LOGNORM
FU1_SURFSOIL	VOC	Total Xylenes	19	1	MG/KG	0.009	0.009	0.0060	0.0064	0.0064	0.0064	LOGNORM
FU1_SURFSOIL	VOC	TRICHLOROETHYLENE (TCE)	19	1	MG/KG	0.002	0.002	0.0056	0.0064	0.0061	0.002	MAXDET
FU2_DEEP	Metal	ALUMINUM	17	17	MG/KG	6550	15900	11075	12375	12187	12375	LOGNORM
FU2_DEEP	Metal	ANTIMONY	35	9	MG/KG	0.42	2	2	3	3	2	MAXDET
FU2_DEEP	Metal	ARSENIC	37	37	MG/KG	2	51	17	22	20	22	LOGNORM
FU2_DEEP	Metal	BARIUM	17	17	MG/KG	93	200	127	142	141	142	LOGNORM
FU2_DEEP	Metal	BERYLLIUM	37	23	MG/KG	0.27	1	0.55	1	0.63	1	LOGNORM
FU2_DEEP	Metal	CADMIUM	37	17	MG/KG	0.03	2	0.50	0.67	0.58	0.67	LOGNORM
FU2_DEEP	Metal	CALCIUM	17	17	MG/KG	986	3550	2109	2393	2349	2393	LOGNORM
FU2_DEEP	Metal	CHROMIUM TOTAL	37	37	MG/KG	8	53	20	24	23	24	LOGNORM
FU2_DEEP	Metal	COBALT	17	17	MG/KG	5	13	8	9	9	9	LOGNORM
FU2_DEEP	Metal	COPPER	37	37	MG/KG	3	55	22	26	25	26	LOGNORM
FU2_DEEP	Metal	IRON	17	17	MG/KG	13800	23000	18282	19676	19544	19544	NORM
FU2_DEEP	Metal	LEAD	37	37	MG/KG	3	318	42	55	58	55	LOGNORM

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU2_DEEP	Metal	MAGNESIUM	17	17	MG/KG	1570	3000	2186	2411	2381	2381	NORM
FU2_DEEP	Metal	MANGANESE	17	17	MG/KG	334	1860	670	806	818	806	LOGNORM
FU2_DEEP	Metal	MERCURY	37	11	MG/KG	0.03	0.08	0.049	0.060	0.054	0.060	LOGNORM
FU2_DEEP	Metal	NICKEL	37	37	MG/KG	4	58	22	26	25	26	LOGNORM
FU2_DEEP	Metal	POTASSIUM	17	17	MG/KG	901	3360	2220	2743	2556	2556	NORM
FU2_DEEP	Metal	SELENIUM	37	10	MG/KG	0.42	2	0.59	0.79	0.71	0.79	LOGNORM
FU2_DEEP	Metal	SODIUM	17	1	MG/KG	218	218	33	116	56	116	LOGNORM
FU2_DEEP	Metal	VANADIUM	17	17	MG/KG	17	37	26	29	29	29	NORM
FU2_DEEP	Metal	ZINC	37	37	MG/KG	11	426	85	100	102	100	LOGNORM
FU2_DEEP	OCPest	ALPHA-CHLORDANE	70	5	MG/KG	0.015	1	0.065	0.14	0.10	0.14	LOGNORM
FU2_DEEP	OCPest	DDD	70	6	MG/KG	0.0028	0.017	0.090	0.20	0.13	0.017	MAXDET
FU2_DEEP	OCPest	DDE	70	36	MG/KG	0.002	1	0.15	0.59	0.20	0.59	LOGNORM
FU2_DEEP	OCPest	DDT	70	33	MG/KG	0.0017	7	0.25	0.87	0.42	0.87	LOGNORM
FU2_DEEP	OCPest	DIELDRIN	70	48	MG/KG	0.0017	10	0.38	3	0.63	3	LOGNORM
FU2_DEEP	OCPest	GAMMA-CHLORDANE	70	5	MG/KG	0.015	1	0.064	0.13	0.10	0.13	LOGNORM
FU2_DEEP	PAH	ACENAPHTHENE	58	3	MG/KG	0.059	0.13	0.083	0.10	0.10	0.10	LOGNORM
FU2_DEEP	PAH	ANTHRACENE	58	2	MG/KG	0.066	0.27	0.085	0.10	0.10	0.10	LOGNORM
FU2_DEEP	PAH	BENZO(a)ANTHRACENE	58	14	MG/KG	0.054	0.57	0.104	0.13	0.13	0.13	LOGNORM
FU2_DEEP	PAH	BENZO(a)PYRENE	58	12	MG/KG	0.054	0.44	0.099	0.13	0.12	0.13	LOGNORM
FU2_DEEP	PAH	BENZO(b)FLUORANTHENE	58	12	MG/KG	0.052	0.46	0.10	0.13	0.12	0.13	LOGNORM
FU2_DEEP	PAH	BENZO(g h i)PERYLENE	58	7	MG/KG	0.045	0.29	0.088	0.11	0.11	0.11	LOGNORM
FU2_DEEP	PAH	BENZO(k)FLUORANTHENE	58	12	MG/KG	0.048	0.4	0.097	0.12	0.12	0.12	LOGNORM
FU2_DEEP	PAH	CHRYSENE	58	15	MG/KG	0.046	0.62	0.098	0.12	0.12	0.12	LOGNORM
FU2_DEEP	PAH	DIBENZ(a h)ANTHRACENE	58	1	MG/KG	0.083	0.083	0.084	0.10	0.10	0.083	MAXDET
FU2_DEEP	PAH	FLUORANTHENE	58	21	MG/KG	0.04	1	0.13	0.16	0.17	0.16	LOGNORM
FU2_DEEP	PAH	FLUORENE	58	2	MG/KG	0.078	0.14	0.083	0.10	0.099	0.10	LOGNORM
FU2_DEEP	PAH	INDENO(1 2 3-c d)PYRENE	58	6	MG/KG	0.066	0.26	0.089	0.11	0.11	0.11	LOGNORM
FU2_DEEP	PAH	PHENANTHRENE	58	16	MG/KG	0.065	1	0.11	0.14	0.14	0.14	LOGNORM
FU2_DEEP	PAH	PYRENE	58	18	MG/KG	0.046	1	0.12	0.14	0.15	0.14	LOGNORM
FU2_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	25	7	MG/KG	0.078	2	0.32	0.37	0.47	0.37	LOGNORM
FU2_DEEP	SVOC	CARBAZOLE	25	2	MG/KG	0.15	0.18	0.21	0.22	0.23	0.18	MAXDET
FU2_DEEP	SVOC	DIBENZOFURAN	25	1	MG/KG	0.056	0.056	0.21	0.23	0.23	0.056	MAXDET
FU2_DEEP	SVOC	PENTACHLOROPHENOL	25	1	MG/KG	0.054	0.054	0.10	0.11	0.11	0.054	MAXDET
FU2_DEEP	VOC	2-HEXANONE	26	1	MG/KG	0.002	0.002	0.0058	0.0064	0.0061	0.002	MAXDET
FU2_DEEP	VOC	ACETONE	26	5	MG/KG	0.004	0.095	0.019	0.025	0.029	0.025	LOGNORM
FU2_DEEP	VOC	BENZENE	26	1	MG/KG	0.002	0.002	0.0058	0.0064	0.0061	0.002	MAXDET
FU2_DEEP	VOC	BROMOMETHANE	26	2	MG/KG	0.002	0.002	0.0057	0.0064	0.0061	0.002	MAXDET
FU2_DEEP	VOC	CARBON DISULFIDE	26	1	MG/KG	0.002	0.002	0.0058	0.0064	0.0061	0.002	MAXDET
FU2_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	26	3	MG/KG	0.009	0.028	0.0075	0.0083	0.0090	0.0083	LOGNORM
FU2_DEEP	VOC	METHYLENE CHLORIDE	26	3	MG/KG	0.002	0.003	0.0056	0.0063	0.0060	0.003	MAXDET
FU2_DEEP	VOC	TETRACHLOROETHYLENE(PCE)	26	3	MG/KG	0.003	0.073	0.0084	0.0089	0.013	0.0089	LOGNORM
FU2_DEEP	VOC	TOLUENE	26	1	MG/KG	0.003	0.003	0.0059	0.0062	0.0061	0.003	MAXDET
FU2_DEEP	VOC	TOTAL 1,2-DICHLOROETHENE	26	1	MG/KG	0.004	0.004	0.0059	0.0061	0.0061	0.004	MAXDET
FU2_DEEP	VOC	Total Xylenes	26	2	MG/KG	0.001	0.001	0.0056	0.0071	0.0061	0.001	MAXDET
FU2_DEEP	VOC	TRICHLOROETHYLENE (TCE)	26	1	MG/KG	0.003	0.003	0.0059	0.0062	0.0061	0.003	MAXDET
FU2_SEDIMENT		HEPTACHLORINATED DIBENZO-p-DIOXINS (TOTAL)	4	4	MG/KG	0.00078	0.012	0.0043	7	0.011	0.012	MAXDET
FU2_SEDIMENT		HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	4	4	MG/KG	0.00017	0.0020	0.00095	0.30	0.0018	0.0020	MAXDET
FU2_SEDIMENT		HEXACHLORINATED DIBENZO-p-DIOXINS (TOTAL)	4	4	MG/KG	0.000056	0.0010	0.00036	0.75	0.00089	0.0010	MAXDET
FU2_SEDIMENT		HEXACHLORINATED DIBENZOFURANS, (TOTAL)	4	3	MG/KG	0.00029	0.00050	0.00028	4.84E+15	0.00053	0.00050	MAXDET
FU2_SEDIMENT		PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	4	1	MG/KG	0.000013	0.000013	0.0000043	0.0028	0.000011	0.000013	MAXDET
FU2_SEDIMENT		PENTACHLORINATED DIBENZOFURANS (TOTAL)	4	3	MG/KG	0.000034	0.00011	0.000046	647	0.000098	0.00011	MAXDET
FU2_SEDIMENT		TETRACHLORINATED DIBENZOFURANS (TOTAL)	4	1	MG/KG	0.000012	0.000012	0.0000047	0.00029	0.000011	0.000012	MAXDET

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TABLE H-1

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Memphis Depot Main Installation RI

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FU2_SEDIMENT	Dioxin	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	4	4	MG/KG	0.00039	0.0064	0.0022	6	0.0056	0.0064	MAXDET
FU2_SEDIMENT	Dioxin	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	4	4	MG/KG	0.000060	0.00056	0.00029	0.035	0.00053	0.00056	MAXDET
FU2_SEDIMENT	Dioxin	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	4	3	MG/KG	0.000012	0.000093	0.000031	0.56	0.000080	0.000093	MAXDET
FU2_SEDIMENT	Dioxin	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	4	3	MG/KG	0.0000043	0.00015	0.000045	82	0.00012	0.00015	MAXDET
FU2_SEDIMENT	Dioxin	OCTACHLORODIBENZO-p-DIOXIN	4	4	MG/KG	0.0043	0.051	0.020	7	0.045	0.051	MAXDET
FU2_SEDIMENT	Dioxin	OCTACHLORODIBENZOFURAN	4	4	MG/KG	0.00012	0.0024	0.0011	7	0.0022	0.0024	MAXDET
FU2_SEDIMENT	Dioxin	TCDD Equivalent	4	4	MG/KG	0.000010	0.00015	0.000053	0.037	0.00013	0.00015	MAXDET
FU2_SEDIMENT	Metal	ALUMINUM	16	16	MG/KG	662	17100	6554	13062	8546	8546	NORM
FU2_SEDIMENT	Metal	ANTIMONY	21	3	MG/KG	0.44	6	0.81	1	1	1	LOGNORM
FU2_SEDIMENT	Metal	ARSENIC	21	21	MG/KG	1	14	6	10	8	10	LOGNORM
FU2_SEDIMENT	Metal	BARIUM	16	16	MG/KG	16	145	84	140	102	102	NORM
FU2_SEDIMENT	Metal	BERYLLIUM	21	18	MG/KG	0.1	1	0.42	0.59	0.51	0.59	LOGNORM
FU2_SEDIMENT	Metal	CADMIUM	21	11	MG/KG	0.15	2	0.52	5	0.75	2	MAXDET
FU2_SEDIMENT	Metal	CALCIUM	16	16	MG/KG	958	158000	26300	130410	48435	130410	LOGNORM
FU2_SEDIMENT	Metal	CHROMIUM, TOTAL	21	21	MG/KG	3	37	12	15	15	15	LOGNORM
FU2_SEDIMENT	Metal	COBALT	16	16	MG/KG	0.76	219	18	30	41	30	LOGNORM
FU2_SEDIMENT	Metal	COPPER	21	21	MG/KG	7	49	17	22	22	22	LOGNORM
FU2_SEDIMENT	Metal	IRON	16	16	MG/KG	2470	19200	10861	17942	13580	17942	LOGNORM
FU2_SEDIMENT	Metal	LEAD	21	21	MG/KG	8	169	32	49	48	49	LOGNORM
FU2_SEDIMENT	Metal	MAGNESIUM	16	16	MG/KG	714	19100	3278	5230	5218	5230	LOGNORM
FU2_SEDIMENT	Metal	MANGANESE	16	16	MG/KG	24	328	187	295	224	224	NORM
FU2_SEDIMENT	Metal	MERCURY	21	4	MG/KG	0.1	0.53	0.073	0.13	0.12	0.13	LOGNORM
FU2_SEDIMENT	Metal	NICKEL	21	21	MG/KG	2	26	12	17	14	14	NORM
FU2_SEDIMENT	Metal	POTASSIUM	16	16	MG/KG	106	3240	1254	3609	1695	1695	NORM
FU2_SEDIMENT	Metal	SELENIUM	21	10	MG/KG	0.71	4	0.88	2	1	2	LOGNORM
FU2_SEDIMENT	Metal	SILVER	21	2	MG/KG	0.28	9	0.57	0.71	1	0.71	LOGNORM
FU2_SEDIMENT	Metal	SODIUM	16	9	MG/KG	41	282	84	151	116	151	LOGNORM
FU2_SEDIMENT	Metal	VANADIUM	16	16	MG/KG	5	39	18	29	22	22	NORM
FU2_SEDIMENT	Metal	ZINC	21	21	MG/KG	33	1170	159	239	257	239	LOGNORM
FU2_SEDIMENT	OCPest	ALDRIN	21	3	MG/KG	0.0092	0.014	0.014	0.035	0.027	0.014	MAXDET
FU2_SEDIMENT	OCPest	ALPHA ENDOSULFAN	21	3	MG/KG	0.0045	0.0081	0.013	0.028	0.027	0.0081	MAXDET
FU2_SEDIMENT	OCPest	ALPHA-CHLORDANE	21	8	MG/KG	0.0043	0.034	0.017	0.050	0.030	0.034	MAXDET
FU2_SEDIMENT	OCPest	DDD	21	16	MG/KG	0.0044	0.4	0.062	0.34	0.098	0.34	LOGNORM
FU2_SEDIMENT	OCPest	DDE	21	17	MG/KG	0.0021	0.79	0.079	0.35	0.15	0.35	LOGNORM
FU2_SEDIMENT	OCPest	DDT	20	8	MG/KG	0.0037	0.093	0.035	0.12	0.062	0.093	MAXDET
FU2_SEDIMENT	OCPest	DIELDRIN	21	10	MG/KG	0.0028	0.16	0.037	0.10	0.064	0.10	LOGNORM
FU2_SEDIMENT	OCPest	ENDRIN	21	5	MG/KG	0.01	0.015	0.027	0.056	0.052	0.015	MAXDET
FU2_SEDIMENT	OCPest	ENDRIN ALDEHYDE	21	4	MG/KG	0.004	0.019	0.025	0.053	0.051	0.019	MAXDET
FU2_SEDIMENT	OCPest	GAMMA-CHLORDANE	21	8	MG/KG	0.0051	0.054	0.019	0.064	0.032	0.054	MAXDET
FU2_SEDIMENT	OCPest	HEPTACHLOR	21	1	MG/KG	0.0018	0.0018	0.013	0.024	0.026	0.0018	MAXDET
FU2_SEDIMENT	OCPest	HEPTACHLOR EPOXIDE	21	1	MG/KG	0.0037	0.0037	0.013	0.025	0.026	0.0037	MAXDET
FU2_SEDIMENT	PAH	2-METHYLNAPHTHALENE	21	2	MG/KG	0.018	0.086	0.20	0.39	0.28	0.086	MAXDET
FU2_SEDIMENT	PAH	ACENAPHTHENE	21	7	MG/KG	0.027	0.25	0.18	0.32	0.26	0.25	MAXDET
FU2_SEDIMENT	PAH	ACENAPHTHYLENE	21	3	MG/KG	0.029	0.066	0.20	0.38	0.28	0.066	MAXDET
FU2_SEDIMENT	PAH	ANTHRACENE	21	10	MG/KG	0.019	0.46	0.19	0.39	0.27	0.39	LOGNORM
FU2_SEDIMENT	PAH	BENZO(a)ANTHRACENE	21	14	MG/KG	0.046	2	0.44	1	0.64	1	LOGNORM
FU2_SEDIMENT	PAH	BENZO(a)PYRENE	21	16	MG/KG	0.041	2	0.42	1	0.64	1	LOGNORM
FU2_SEDIMENT	PAH	BENZO(b)FLUORANTHENE	21	16	MG/KG	0.053	2	0.55	2	0.82	2	LOGNORM
FU2_SEDIMENT	PAH	BENZO(g,h,i)PERYLENE	21	14	MG/KG	0.034	2	0.34	0.92	0.52	0.92	LOGNORM
FU2_SEDIMENT	PAH	BENZO(k)FLUORANTHENE	21	10	MG/KG	0.041	2	0.40	0.98	0.64	0.98	LOGNORM
FU2_SEDIMENT	PAH	CHRYSENE	21	16	MG/KG	0.059	3	0.51	2	0.80	2	LOGNORM
FU2_SEDIMENT	PAH	DIBENZ(a,h)ANTHRACENE	21	5	MG/KG	0.028	0.25	0.20	0.41	0.29	0.25	MAXDET

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU2_SEDIMENT	PAH	FLUORANTHENE	19	13	MG/KG	0.037	3	0.52	2	0.81	2	LOGNORM
FU2_SEDIMENT	PAH	FLUORENE	21	8	MG/KG	0.029	0.33	0.18	0.32	0.26	0.32	LOGNORM
FU2_SEDIMENT	PAH	INDENO(1,2 3-c d)PYRENE	21	13	MG/KG	0.028	2	0.35	1	0.51	1	LOGNORM
FU2_SEDIMENT	PAH	NAPHTHALENE	21	2	MG/KG	0.072	0.081	0.20	0.35	0.28	0.081	MAXDET
FU2_SEDIMENT	PAH	PHENANTHRENE	21	15	MG/KG	0.029	3	0.56	2	0.89	2	LOGNORM
FU2_SEDIMENT	PAH	PYRENE	21	16	MG/KG	0.039	5	0.95	5	2	5	MAXDET
FU2_SEDIMENT	PCB	PCB-1260 (AROCHLOR 1260)	16	1	MG/KG	0.33	0.33	0.32	1	0.65	0.33	MAXDET
FU2_SEDIMENT	SVOC	BENZYL BUTYL PHTHALATE	19	1	MG/KG	0.084	0.084	0.26	0.31	0.34	0.084	MAXDET
FU2_SEDIMENT	SVOC	bis(2 ETHYLHEXYL) PHTHALATE	19	13	MG/KG	0.051	2	0.36	0.61	0.53	0.61	LOGNORM
FU2_SEDIMENT	SVOC	CARBAZOLE	19	9	MG/KG	0.023	0.52	0.25	0.42	0.34	0.42	LOGNORM
FU2_SEDIMENT	SVOC	DI-n-BUTYL PHTHALATE	19	8	MG/KG	0.02	0.045	0.20	0.52	0.29	0.045	MAXDET
FU2_SEDIMENT	SVOC	DI-n-OCTYLPHTHALATE	19	2	MG/KG	0.021	0.09	0.25	0.38	0.33	0.09	MAXDET
FU2_SEDIMENT	SVOC	DIBENZOFURAN	19	4	MG/KG	0.022	0.14	0.23	0.34	0.31	0.14	MAXDET
FU2_SEDIMENT	SVOC	DIETHYL PHTHALATE	19	5	MG/KG	0.026	0.52	0.27	0.48	0.35	0.48	LOGNORM
FU2_SEDIMENT	SVOC	DIMETHYL PHTHALATE	19	1	MG/KG	0.11	0.11	0.26	0.31	0.34	0.11	MAXDET
FU2_SEDIMENT	SVOC	PENTACHLOROPHENOL	19	2	MG/KG	0.12	0.14	0.29	0.43	0.36	0.14	MAXDET
FU2_SEDIMENT	VOC	ACETONE	19	2	MG/KG	0.007	0.013	0.039	0.059	0.079	0.013	MAXDET
FU2_SEDIMENT	VOC	BENZENE	19	1	MG/KG	0.004	0.004	0.0089	0.011	0.013	0.004	MAXDET
FU2_SEDIMENT	VOC	CARBON DISULFIDE	19	5	MG/KG	0.002	0.032	0.0069	0.009	0.0094	0.0089	LOGNORM
FU2_SEDIMENT	VOC	CARBON TETRACHLORIDE	19	4	MG/KG	0.005	0.11	0.017	0.024	0.027	0.024	LOGNORM
FU2_SEDIMENT	VOC	METHYL ETHYL KETONE (2-BUTANONE)	19	8	MG/KG	0.003	0.12	0.014	0.019	0.025	0.019	LOGNORM
FU2_SEDIMENT	VOC	METHYLENE CHLORIDE	19	4	MG/KG	0.001	0.008	0.0092	0.013	0.014	0.008	MAXDET
FU2_SURFSOIL	Metal	ALUMINUM	16	16	MG/KG	6550	15900	11164	12570	12341	12570	LOGNORM
FU2_SURFSOIL	Metal	ANTIMONY	26	8	MG/KG	0.42	2	2	3	2	2	MAXDET
FU2_SURFSOIL	Metal	ARSENIC	28	28	MG/KG	2	51	19	25	22	25	LOGNORM
FU2_SURFSOIL	Metal	BARIUM	16	16	MG/KG	93	200	129	145	144	145	LOGNORM
FU2_SURFSOIL	Metal	BERYLLIUM	28	18	MG/KG	0.27	1	0.49	1	0.56	1.1	MAXDET
FU2_SURFSOIL	Metal	CADMIUM	28	15	MG/KG	0.03	1	0.45	0.64	0.53	0.64	LOGNORM
FU2_SURFSOIL	Metal	CALCIUM	16	16	MG/KG	986	3550	2117	2426	2373	2426	LOGNORM
FU2_SURFSOIL	Metal	CHROMIUM TOTAL	28	28	MG/KG	8	40	17	20	20	20	LOGNORM
FU2_SURFSOIL	Metal	COBALT	16	16	MG/KG	6	13	8	9	9	9	LOGNORM
FU2_SURFSOIL	Metal	COPPER	28	28	MG/KG	3	55	22	27	25	27	LOGNORM
FU2_SURFSOIL	Metal	IRON	16	16	MG/KG	13800	23000	18394	19888	19726	19726	NORM
FU2_SURFSOIL	Metal	LEAD	28	28	MG/KG	3	318	49	74	69	74	LOGNORM
FU2_SURFSOIL	Metal	MAGNESIUM	16	16	MG/KG	1570	3000	2174	2412	2381	2381	NORM
FU2_SURFSOIL	Metal	MANGANESE	16	16	MG/KG	371	1860	691	827	844	827	LOGNORM
FU2_SURFSOIL	Metal	MERCURY	28	11	MG/KG	0.03	0.08	0.049	0.058	0.054	0.058	LOGNORM
FU2_SURFSOIL	Metal	NICKEL	28	28	MG/KG	4	58	21	25	24	25	LOGNORM
FU2_SURFSOIL	Metal	POTASSIUM	16	16	MG/KG	901	3360	2178	2717	2528	2528	NORM
FU2_SURFSOIL	Metal	SELENIUM	28	9	MG/KG	0.42	2	0.56	0.81	0.71	0.81	LOGNORM
FU2_SURFSOIL	Metal	SODIUM	16	1	MG/KG	218	218	29	94	53	94	LOGNORM
FU2_SURFSOIL	Metal	VANADIUM	16	16	MG/KG	17	37	27	29	29	29	NORM
FU2_SURFSOIL	Metal	ZINC	28	28	MG/KG	11	426	86	107	110	107	LOGNORM
FU2_SURFSOIL	OCPest	ALPHA-CHLORDANE	51	5	MG/KG	0.015	1	0.088	0.25	0.14	0.25	LOGNORM
FU2_SURFSOIL	OCPest	DDD	51	6	MG/KG	0.0028	0.017	0.12	0.28	0.18	0.017	MAXDET
FU2_SURFSOIL	OCPest	DDE	51	35	MG/KG	0.002	1	0.20	0.69	0.27	0.69	LOGNORM
FU2_SURFSOIL	OCPest	DDT	51	32	MG/KG	0.0017	7	0.35	1	0.58	1	LOGNORM
FU2_SURFSOIL	OCPest	DIELDRIN	51	42	MG/KG	0.0085	10	0.52	3	0.86	3	LOGNORM
FU2_SURFSOIL	OCPest	GAMMA-CHLORDANE	51	5	MG/KG	0.015	1	0.09	0.23	0.14	0.23	LOGNORM
FU2_SURFSOIL	PAH	ACENAPHTHENE	41	3	MG/KG	0.059	0.13	0.10	0.14	0.12	0.13	MAXDET
FU2_SURFSOIL	PAH	ANTHRACENE	41	2	MG/KG	0.066	0.27	0.10	0.14	0.12	0.14	LOGNORM
FU2_SURFSOIL	PAH	BENZO(a)ANTHRACENE	41	14	MG/KG	0.054	0.57	0.13	0.18	0.16	0.18	LOGNORM

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU2_SURFSOIL	PAH	BENZO(a)PYRENE	41	12	MG/KG	0.054	0.44	0.12	0.17	0.15	0.17	LOGNORM
FU2_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	41	12	MG/KG	0.052	0.46	0.13	0.18	0.15	0.18	LOGNORM
FU2_SURFSOIL	PAH	BENZO(g h i)PERYLENE	41	7	MG/KG	0.045	0.29	0.11	0.15	0.13	0.15	LOGNORM
FU2_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	41	12	MG/KG	0.048	0.4	0.12	0.17	0.15	0.17	LOGNORM
FU2_SURFSOIL	PAH	CHRYSENE	41	15	MG/KG	0.046	0.62	0.12	0.17	0.15	0.17	LOGNORM
FU2_SURFSOIL	PAH	DIBENZ(a h)ANTHRACENE	41	1	MG/KG	0.083	0.083	0.10	0.14	0.12	0.083	MAXDET
FU2_SURFSOIL	PAH	FLUORANTHENE	41	21	MG/KG	0.04	1	0.16	0.23	0.22	0.23	LOGNORM
FU2_SURFSOIL	PAH	FLUORENE	41	2	MG/KG	0.078	0.14	0.10	0.14	0.12	0.14	LOGNORM
FU2_SURFSOIL	PAH	INDENO(1 2 3-c,d)PYRENE	41	6	MG/KG	0.066	0.26	0.11	0.15	0.13	0.15	LOGNORM
FU2_SURFSOIL	PAH	PHENANTHRENE	41	16	MG/KG	0.065	1	0.14	0.19	0.18	0.19	LOGNORM
FU2_SURFSOIL	PAH	PYRENE	41	18	MG/KG	0.046	1	0.15	0.20	0.19	0.20	LOGNORM
FU2_SURFSOIL	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	20	3	MG/KG	0.078	0.23	0.19	0.21	0.21	0.21	LOGNORM
FU2_SURFSOIL	SVOC	CARBAZOLE	20	2	MG/KG	0.15	0.18	0.20	0.20	0.20	0.18	MAXDET
FU2_SURFSOIL	SVOC	DIBENZOFURAN	20	1	MG/KG	0.056	0.056	0.19	0.22	0.21	0.056	MAXDET
FU2_SURFSOIL	SVOC	PENTACHLOROPHENOL	20	1	MG/KG	0.054	0.054	0.10	0.10	0.10	0.054	MAXDET
FU2_SURFSOIL	VOC	2-HEXANONE	21	1	MG/KG	0.002	0.002	0.0058	0.0064	0.0061	0.002	MAXDET
FU2_SURFSOIL	VOC	ACETONE	21	4	MG/KG	0.004	0.095	0.021	0.034	0.033	0.034	LOGNORM
FU2_SURFSOIL	VOC	BENZENE	21	1	MG/KG	0.002	0.002	0.0058	0.0064	0.0061	0.002	MAXDET
FU2_SURFSOIL	VOC	BROMOMETHANE	21	1	MG/KG	0.002	0.002	0.0058	0.0064	0.0061	0.002	MAXDET
FU2_SURFSOIL	VOC	CARBON DISULFIDE	21	1	MG/KG	0.002	0.002	0.0058	0.0064	0.0061	0.002	MAXDET
FU2_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	21	3	MG/KG	0.009	0.028	0.0078	0.0090	0.0098	0.0090	LOGNORM
FU2_SURFSOIL	VOC	METHYLENE CHLORIDE	21	3	MG/KG	0.002	0.003	0.0054	0.0064	0.0059	0.003	MAXDET
FU2_SURFSOIL	VOC	TETRACHLOROETHYLENE(PCE)	21	3	MG/KG	0.003	0.073	0.0089	0.0099	0.014	0.0099	LOGNORM
FU2_SURFSOIL	VOC	TOLUENE	21	1	MG/KG	0.003	0.003	0.0058	0.0062	0.0061	0.003	MAXDET
FU2_SURFSOIL	VOC	TOTAL 1,2-DICHLOROETHENE	21	1	MG/KG	0.004	0.004	0.0059	0.0061	0.0061	0.004	MAXDET
FU2_SURFSOIL	VOC	Total Xylenes	21	1	MG/KG	0.001	0.001	0.0057	0.0070	0.0062	0.001	MAXDET
FU2_SURFSOIL	VOC	TRICHLOROETHYLENE (TCE)	21	1	MG/KG	0.003	0.003	0.0058	0.0062	0.0061	0.003	MAXDET
FU2_SURFWATER	DissMetal	Aluminum, Dissolved	4	2	MG/L	0.014	0.081	0.030	2	0.070	0.081	MAXDET
FU2_SURFWATER	DissMetal	Arsenic Dissolved	20	15	MG/L	0.0018	0.041	0.0078	0.019	0.012	0.019	LOGNORM
FU2_SURFWATER	DissMetal	Calcium, Dissolved	4	4	MG/L	2	10	6	67	10	10	MAXDET
FU2_SURFWATER	DissMetal	Iron Dissolved	4	1	MG/L	0.25	0.25	0.078	840	0.22	0.25	MAXDET
FU2_SURFWATER	DissMetal	Lead, Dissolved	20	4	MG/L	0.0023	0.031	0.0030	0.0034	0.0056	0.0034	LOGNORM
FU2_SURFWATER	DissMetal	Magnesium, Dissolved	4	4	MG/L	0.21	2	0.87	413	2	2	MAXDET
FU2_SURFWATER	DissMetal	Manganese Dissolved	4	3	MG/L	0.0074	0.021	0.0099	36	0.019	0.021	MAXDET
FU2_SURFWATER	DissMetal	Potassium Dissolved	4	3	MG/L	0.75	3	1	51	2	3	MAXDET
FU2_SURFWATER	DissMetal	Sodium, Dissolved	4	1	MG/L	0.91	0.91	0.48	2	0.82	0.91	MAXDET
FU2_SURFWATER	DissMetal	Zinc Dissolved	20	7	MG/L	0.027	0.41	0.053	0.098	0.089	0.098	LOGNORM
FU2_SURFWATER	GenChem	SUSPENDED SOLIDS (RESIDUE NON-FILTERABLE)	15	12	MG/L	6	1180	217	10676	370	1180	MAXDET
FU2_SURFWATER	GenChem	TOTAL ORGANIC CARBON	15	15	MG/L	2	23	10	16	13	13	NORM
FU2_SURFWATER	Metal	ALUMINUM	12	9	MG/L	0.052	0.58	0.16	0.45	0.25	0.45	LOGNORM
FU2_SURFWATER	Metal	ARSENIC	28	15	MG/L	0.0026	0.077	0.012	0.027	0.018	0.027	LOGNORM
FU2_SURFWATER	Metal	BARIUM	12	8	MG/L	0.0127	0.018	0.012	0.017	0.014	0.014	NORM
FU2_SURFWATER	Metal	CALCIUM	12	12	MG/L	2	9	7	9	8	8	NORM
FU2_SURFWATER	Metal	CHROMIUM TOTAL	28	5	MG/L	0.0011	0.019	0.0029	0.0042	0.0044	0.0042	LOGNORM
FU2_SURFWATER	Metal	COPPER	28	3	MG/L	0.0046	0.022	0.0042	0.0057	0.0059	0.0057	LOGNORM
FU2_SURFWATER	Metal	IRON	12	11	MG/L	0.15	0.84	0.38	0.86	0.52	0.84	MAXDET
FU2_SURFWATER	Metal	LEAD	28	17	MG/L	0.0022	0.059	0.0085	0.020	0.013	0.020	LOGNORM
FU2_SURFWATER	Metal	MAGNESIUM	12	12	MG/L	0.29	2	1	2	2	2	LOGNORM
FU2_SURFWATER	Metal	MANGANESE	12	12	MG/L	0.0084	0.068	0.035	0.059	0.046	0.059	LOGNORM
FU2_SURFWATER	Metal	NICKEL	28	6	MG/L	0.00049	0.018	0.0032	0.0062	0.0047	0.0062	LOGNORM
FU2_SURFWATER	Metal	POTASSIUM	12	10	MG/L	1	4	2	4	2	4	LOGNORM
FU2_SURFWATER	Metal	SELENIUM	28	1	MG/L	0.0058	0.0058	0.0011	0.0013	0.0014	0.0013	LOGNORM

TABLE H-1

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Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU2_SURFWATER	Metal	SODIUM	12	3	MG/L	0.96	1	0.58	0.79	0.73	0.79	LOGNORM
FU2_SURFWATER	Metal	VANADIUM	12	2	MG/L	0.0041	0.0043	0.0012	0.0037	0.0019	0.0037	LOGNORM
FU2_SURFWATER	Metal	ZINC	28	19	MG/L	0.0098	0.47	0.064	0.15	0.095	0.15	LOGNORM
FU2_SURFWATER	OCPest	DDE	28	4	MG/L	0.000026	0.000058	0.000050	0.000054	0.000054	0.000054	LOGNORM
FU2_SURFWATER	OCPest	DDT	28	3	MG/L	0.000047	0.00015	0.000055	0.000060	0.000062	0.000060	LOGNORM
FU2_SURFWATER	OCPest	DIELDRIN	28	11	MG/L	0.000035	0.00043	0.000083	0.000097	0.00011	0.000097	LOGNORM
FU2_SURFWATER	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	15	1	MG/L	0.001	0.001	0.0047	0.0061	0.0052	0.001	MAXDET
FU3_DEEP	Dioxin	1 2,3 4 6 7 8-HEPTACHLORODIBENZOFURAN	10	6	MG/KG	0.000004	0.00029	0.00055	0.65	0.00091	0.00029	MAXDET
FU3_DEEP	Dioxin	1 2 3 4,7,8,9-HEPTACHLORODIBENZOFURAN	10	2	MG/KG	0.000002	0.000003	0.0010	5	0.0013	0.000003	MAXDET
FU3_DEEP	Dioxin	1 2 3 4 7 8-HEXACHLORODIBENZOFURAN	10	2	MG/KG	0.000004	0.000004	0.0010	1	0.0013	0.000004	MAXDET
FU3_DEEP	Dioxin	1 2 3 6 7 8-HEXACHLORODIBENZO-P-DIOXIN	10	1	MG/KG	0.000008	0.000008	0.0011	0.029	0.0014	0.000008	MAXDET
FU3_DEEP	Dioxin	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	10	2	MG/KG	0.000001	0.000002	0.0010	26	0.0013	0.000002	MAXDET
FU3_DEEP	Dioxin	1 2 3 7 8 9-HEXACHLORODIBENZO-P-DIOXIN	10	2	MG/KG	0.000005	0.000005	0.0010	0.77	0.0013	0.000005	MAXDET
FU3_DEEP	Dioxin	2 3,4 6 7 8-HEXACHLORODIBENZOFURAN	10	1	MG/KG	0.000003	0.000003	0.0011	0.11	0.0014	0.000003	MAXDET
FU3_DEEP	Dioxin	OCTACHLORODIBENZO-p-DIOXIN	10	10	MG/KG	0.0028	0.010	0.0052	0.0074	0.0067	0.0074	LOGNORM
FU3_DEEP	Dioxin	OCTACHLORODIBENZOFURAN	10	9	MG/KG	0.000002	0.00070	0.00038	0.30	0.00083	0.00070	MAXDET
FU3_DEEP	Dioxin	TCDD Equivalent	10	10	MG/KG	0.0000028	0.000013	0.0000062	0.000010	0.0000084	0.000010	LOGNORM
FU3_DEEP	GenChem	ALKALINITY TOTAL (AS CaCO3)	12	12	MG/KG	737	444000	100876	1956040	169062	444000	MAXDET
FU3_DEEP	GenChem	CHROMIUM HEXAVALENT	4	1	MG/KG	0.12	0.12	0.073	0.17	0.11	0.12	MAXDET
FU3_DEEP	GenChem	MOISTURE PERCENT	12	12	PERCENT	6	29	14	19	18	19	LOGNORM
FU3_DEEP	GenChem	pH	19	19	PH UNITS	6	9	8	8	8	8	NORM
FU3_DEEP	GenChem	TOTAL ORGANIC CARBON	12	12	MG/KG	1650	26900	9800	21568	13629	21568	LOGNORM
FU3_DEEP	GeoPhys	CATION-EXCHANGE CAPACITY	12	12	MEQ/100G	1	14	7	12	9	9	NORM
FU3_DEEP	GeoPhys	SIEVE NO 100 PERCENT PASSING	12	12	PERCENT	44	98	67	79	77	79	LOGNORM
FU3_DEEP	GeoPhys	SIEVE NO 20 PERCENT PASSING	12	12	PERCENT	83	100	90	93	93	93	LOGNORM
FU3_DEEP	GeoPhys	SIEVE NO 200, PERCENT PASSING	12	12	PERCENT	29	98	61	77	73	77	LOGNORM
FU3_DEEP	GeoPhys	SIEVE NO 200L, PERCENT PASSING	12	12	PERCENT	28	97	60	77	72	77	LOGNORM
FU3_DEEP	GeoPhys	SIEVE NO 40 PERCENT PASSING	12	12	PERCENT	67	99	80	86	86	86	LOGNORM
FU3_DEEP	GeoPhys	SIEVE NO 80 PERCENT PASSING	12	12	PERCENT	47	99	69	80	78	80	LOGNORM
FU3_DEEP	Metal	ALUMINUM	48	48	MG/KG	2840	19500	8774	10160	9799	10160	LOGNORM
FU3_DEEP	Metal	ANTIMONY	180	33	MG/KG	0.23	22	2	4	3	4	LOGNORM
FU3_DEEP	Metal	ARSENIC	187	183	MG/KG	0.43	49	10	12	11	12	LOGNORM
FU3_DEEP	Metal	BARIUM	48	48	MG/KG	30	432	103	119	119	119	LOGNORM
FU3_DEEP	Metal	BERYLLIUM	187	90	MG/KG	0.05	2	0.47	0.65	0.51	0.65	LOGNORM
FU3_DEEP	Metal	CADMIUM	187	67	MG/KG	0.07	8	0.60	0.89	0.70	0.89	LOGNORM
FU3_DEEP	Metal	CALCIUM	48	48	MG/KG	912	227000	23105	37247	35681	37247	LOGNORM
FU3_DEEP	Metal	CHROMIUM III	4	4	MG/KG	13	403	142	256532285	357	403	MAXDET
FU3_DEEP	Metal	CHROMIUM, TOTAL	187	187	MG/KG	6	915	52	49	65	49	LOGNORM
FU3_DEEP	Metal	COBALT	48	48	MG/KG	1	10	6	7	6	7	LOGNORM
FU3_DEEP	Metal	COPPER	187	185	MG/KG	4	235	27	31	30	31	LOGNORM
FU3_DEEP	Metal	IRON	48	48	MG/KG	3960	51300	16917	19353	18971	19353	LOGNORM
FU3_DEEP	Metal	LEAD	187	187	MG/KG	3	4150	158	143	213	143	LOGNORM
FU3_DEEP	Metal	MAGNESIUM	48	48	MG/KG	263	10900	2432	3123	2923	3123	LOGNORM
FU3_DEEP	Metal	MANGANESE	48	48	MG/KG	65	1170	403	524	466	524	LOGNORM
FU3_DEEP	Metal	MERCURY	187	30	MG/KG	0.015	2	0.057	0.056	0.075	0.056	LOGNORM
FU3_DEEP	Metal	NICKEL	187	187	MG/KG	3	76	20	22	21	22	LOGNORM
FU3_DEEP	Metal	POTASSIUM	48	44	MG/KG	190	4650	1262	1665	1511	1665	LOGNORM
FU3_DEEP	Metal	SELENIUM	187	39	MG/KG	0.29	10	0.66	0.72	0.77	0.72	LOGNORM
FU3_DEEP	Metal	SILVER	187	5	MG/KG	0.16	3	0.61	1	0.67	1	LOGNORM
FU3_DEEP	Metal	SODIUM	48	9	MG/KG	62	863	105	278	145	278	LOGNORM
FU3_DEEP	Metal	VANADIUM	48	48	MG/KG	7	77	24	27	26	27	LOGNORM
FU3_DEEP	Metal	ZINC	187	187	MG/KG	21	4000	180	170	226	170	LOGNORM

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU3_DEEP	OCPest	ALPHA-CHLORDANE	121	17	MG/KG	0.0014	0.61	0.017	0.013	0.026	0.013	LOGNORM
FU3_DEEP	OCPest	DDD	121	2	MG/KG	0.032	0.046	0.011	0.011	0.015	0.011	LOGNORM
FU3_DEEP	OCPest	DDE	121	30	MG/KG	0.0014	0.17	0.014	0.015	0.019	0.015	LOGNORM
FU3_DEEP	OCPest	DDT	121	38	MG/KG	0.002	0.41	0.028	0.031	0.038	0.031	LOGNORM
FU3_DEEP	OCPest	DIELDRIN	121	22	MG/KG	0.0012	0.18	0.016	0.017	0.021	0.017	LOGNORM
FU3_DEEP	OCPest	GAMMA-CHLORDANE	121	17	MG/KG	0.0017	0.58	0.018	0.014	0.027	0.014	LOGNORM
FU3_DEEP	OCPest	HEPTACHLOR	121	1	MG/KG	0.035	0.035	0.0057	0.0056	0.0077	0.0056	LOGNORM
FU3_DEEP	ORG	PETROLEUM HYDROCARBONS	5	4	MG/KG	3	274	72	9901172	181	274	MAXDET
FU3_DEEP	PAH	2-METHYLNAPHTHALENE	165	3	MG/KG	0.057	0.51	0.33	0.36	0.43	0.36	LOGNORM
FU3_DEEP	PAH	ACENAPHTHENE	165	15	MG/KG	0.047	5	0.32	0.37	0.40	0.37	LOGNORM
FU3_DEEP	PAH	ACENAPHTHYLENE	165	2	MG/KG	0.088	0.14	0.32	0.35	0.42	0.14	MAXDET
FU3_DEEP	PAH	ANTHRACENE	165	17	MG/KG	0.07	11	0.39	0.41	0.52	0.41	LOGNORM
FU3_DEEP	PAH	BENZO(a)ANTHRACENE	165	48	MG/KG	0.039	40	0.86	0.69	1	0.69	LOGNORM
FU3_DEEP	PAH	BENZO(a)PYRENE	165	47	MG/KG	0.039	37	0.79	0.65	1	0.65	LOGNORM
FU3_DEEP	PAH	BENZO(b)FLUORANTHENE	165	48	MG/KG	0.038	39	0.82	0.68	1	0.68	LOGNORM
FU3_DEEP	PAH	BENZO(g,h,i)PERYLENE	165	40	MG/KG	0.037	22	0.57	0.53	0.82	0.53	LOGNORM
FU3_DEEP	PAH	BENZO(k)FLUORANTHENE	165	46	MG/KG	0.043	34	0.84	0.69	1	0.69	LOGNORM
FU3_DEEP	PAH	CHRYSENE	165	52	MG/KG	0.043	46	0.95	0.74	1	0.74	LOGNORM
FU3_DEEP	PAH	DIBENZ(a,h)ANTHRACENE	165	2	MG/KG	0.21	1	0.33	0.36	0.43	0.36	LOGNORM
FU3_DEEP	PAH	FLUORANTHENE	165	55	MG/KG	0.04	71	2	1	2	1	LOGNORM
FU3_DEEP	PAH	FLUORENE	165	18	MG/KG	0.041	5	0.33	0.37	0.41	0.37	LOGNORM
FU3_DEEP	PAH	INDENO(1,2,3-c,d)PYRENE	165	40	MG/KG	0.05	22	0.60	0.56	0.87	0.56	LOGNORM
FU3_DEEP	PAH	NAPHTHALENE	165	5	MG/KG	0.085	0.63	0.32	0.34	0.41	0.34	LOGNORM
FU3_DEEP	PAH	PHENANTHRENE	165	49	MG/KG	0.043	52	1	0.85	2	0.85	LOGNORM
FU3_DEEP	PAH	PYRENE	165	55	MG/KG	0.043	71	1	0.96	2	0.96	LOGNORM
FU3_DEEP	SVOC	BENZYL BUTYL PHTHALATE	68	2	MG/KG	0.083	0.51	0.35	0.30	0.54	0.30	LOGNORM
FU3_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	68	18	MG/KG	0.04	6	0.47	0.46	0.70	0.46	LOGNORM
FU3_DEEP	SVOC	CARBAZOLE	68	9	MG/KG	0.08	10	0.43	0.34	0.69	0.34	LOGNORM
FU3_DEEP	SVOC	DI-n-BUTYL PHTHALATE	68	1	MG/KG	1	1	0.37	0.32	0.56	0.32	LOGNORM
FU3_DEEP	SVOC	DIBENZOFURAN	68	4	MG/KG	0.19	2	0.27	0.27	0.33	0.27	LOGNORM
FU3_DEEP	SVOC	DIETHYL PHTHALATE	68	1	MG/KG	0.9	0.9	0.36	0.31	0.55	0.31	LOGNORM
FU3_DEEP	SVOC	PENTACHLOROPHENOL	68	1	MG/KG	0.68	0.68	0.19	0.16	0.28	0.16	LOGNORM
FU3_DEEP	tbd	Chromium, TCLP	10	3	MG/L	0.0086	0.077	0.013	0.039	0.027	0.039	LOGNORM
FU3_DEEP	tbd	Lead, TCLP	10	6	MG/L	0.0622	1	0.17	0.45	0.38	0.45	LOGNORM
FU3_DEEP	tbd	Mercury, TCLP	10	4	MG/L	0.00013	0.00013	0.000090	0.00012	0.00011	0.00012	LOGNORM
FU3_DEEP	tbd	Nickel, TCLP	10	2	MG/L	0.0538	0.084	0.024	0.042	0.038	0.042	LOGNORM
FU3_DEEP	tbd	Zinc, TCLP	10	10	MG/L	0.0533	3	0.86	4	1	3	MAXDET
FU3_DEEP	VOC	2-HEXANONE	142	4	MG/KG	0.001	0.008	0.0058	0.0061	0.0059	0.0061	LOGNORM
FU3_DEEP	VOC	ACETONE	142	59	MG/KG	0.002	0.1	0.013	0.013	0.016	0.013	LOGNORM
FU3_DEEP	VOC	BENZENE	143	4	MG/KG	0.001	0.002	0.0057	0.0061	0.0059	0.002	MAXDET
FU3_DEEP	VOC	BROMOMETHANE	142	4	MG/KG	0.002	0.007	0.0058	0.0060	0.0059	0.0060	LOGNORM
FU3_DEEP	VOC	CARBON DISULFIDE	142	4	MG/KG	0.001	0.023	0.0059	0.0062	0.0061	0.0062	LOGNORM
FU3_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	142	11	MG/KG	0.003	0.044	0.0069	0.0070	0.0076	0.0070	LOGNORM
FU3_DEEP	VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	142	1	MG/KG	0.002	0.002	0.0059	0.0060	0.0059	0.002	MAXDET
FU3_DEEP	VOC	METHYLENE CHLORIDE	142	45	MG/KG	0.001	0.006	0.0048	0.0054	0.0050	0.0054	LOGNORM
FU3_DEEP	VOC	TOLUENE	143	5	MG/KG	0.001	0.004	0.0057	0.0061	0.0059	0.004	MAXDET
FU3_DEEP	VOC	Total Xylenes	143	3	MG/KG	0.001	0.002	0.0058	0.0060	0.0059	0.002	MAXDET
FU3_DEEP	VOC	TRICHLOROETHYLENE (TCE)	142	4	MG/KG	0.001	0.004	0.0058	0.0060	0.0059	0.004	MAXDET
FU3_SEDIMENT	Metal	ALUMINUM	1	1	MG/KG	3550	3550	3550	0		3550	MAXDET
FU3_SEDIMENT	Metal	ANTIMONY	1	1	MG/KG	28	28	28	0		28	MAXDET
FU3_SEDIMENT	Metal	ARSENIC	1	1	MG/KG	6	6	6	0		6	MAXDET
FU3_SEDIMENT	Metal	BARIUM	1	1	MG/KG	1120	1120	1120	0		1120	MAXDET

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU3_SEDIMENT	Metal	CADMIUM	1	1	MG/KG	84	84	84	0		84	MAXDET
FU3_SEDIMENT	Metal	CALCIUM	1	1	MG/KG	15900	15900	15900	0		15900	MAXDET
FU3_SEDIMENT	Metal	CHROMIUM, TOTAL	1	1	MG/KG	1700	1700	1700	0		1700	MAXDET
FU3_SEDIMENT	Metal	COBALT	1	1	MG/KG	44	44	44	0		44	MAXDET
FU3_SEDIMENT	Metal	COPPER	1	1	MG/KG	153	153	153	0		153	MAXDET
FU3_SEDIMENT	Metal	IRON	1	1	MG/KG	24700	24700	24700	0		24700	MAXDET
FU3_SEDIMENT	Metal	LEAD	1	1	MG/KG	3820	3820	3820	0		3820	MAXDET
FU3_SEDIMENT	Metal	MAGNESIUM	1	1	MG/KG	1590	1590	1590	0		1590	MAXDET
FU3_SEDIMENT	Metal	MANGANESE	1	1	MG/KG	224	224	224	0		224	MAXDET
FU3_SEDIMENT	Metal	MERCURY	1	1	MG/KG	0.1	0.1	0.1	0		0.1	MAXDET
FU3_SEDIMENT	Metal	NICKEL	1	1	MG/KG	30	30	30	0		30	MAXDET
FU3_SEDIMENT	Metal	POTASSIUM	1	1	MG/KG	173	173	173	0		173	MAXDET
FU3_SEDIMENT	Metal	SODIUM	1	1	MG/KG	1330	1330	1330	0		1330	MAXDET
FU3_SEDIMENT	Metal	VANADIUM	1	1	MG/KG	0.1	0.1	0.1	0		0.1	MAXDET
FU3_SEDIMENT	Metal	ZINC	1	1	MG/KG	2550	2550	2550	0		2550	MAXDET
FU3_SEDIMENT	ORG	PETROLEUM HYDROCARBONS	1	1	MG/KG	5980	5980	5980	0		5980	MAXDET
FU3_SEDIMENT	PAH	2-METHYLNAPHTHALENE	1	1	MG/KG	8	8	8	0		8	MAXDET
FU3_SEDIMENT	PAH	ACENAPHTHENE	1	1	MG/KG	0.39	0.39	0.39	0		0.39	MAXDET
FU3_SEDIMENT	PAH	ANTHRACENE	1	1	MG/KG	0.51	0.51	0.51	0		0.51	MAXDET
FU3_SEDIMENT	PAH	BENZO(a)ANTHRACENE	1	1	MG/KG	1	1	1	0		1	MAXDET
FU3_SEDIMENT	PAH	BENZO(a)PYRENE	1	1	MG/KG	0.84	0.84	0.84	0		0.84	MAXDET
FU3_SEDIMENT	PAH	BENZO(b)FLUORANTHENE	1	1	MG/KG	1	1	1	0		1	MAXDET
FU3_SEDIMENT	PAH	BENZO(k)FLUORANTHENE	1	1	MG/KG	1	1	1	0		1	MAXDET
FU3_SEDIMENT	PAH	CHRYSENE	1	1	MG/KG	2	2	2	0		2	MAXDET
FU3_SEDIMENT	PAH	FLUORANTHENE	1	1	MG/KG	2	2	2	0		2	MAXDET
FU3_SEDIMENT	PAH	FLUORENE	1	1	MG/KG	1	1	1	0		0.7	MAXDET
FU3_SEDIMENT	PAH	NAPHTHALENE	1	1	MG/KG	6	6	6	0		6	MAXDET
FU3_SEDIMENT	PAH	PHENANTHRENE	1	1	MG/KG	3	3	3	0		3	MAXDET
FU3_SEDIMENT	PAH	PYRENE	1	1	MG/KG	2	2	2	0		2	MAXDET
FU3_SEDIMENT	SVOC	2,4-DIMETHYLPHENOL	1	1	MG/KG	16	16	16	0		16	MAXDET
FU3_SEDIMENT	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	1	1	MG/KG	12	12	12	0		12	MAXDET
FU3_SEDIMENT	SVOC	CARBAZOLE	1	1	MG/KG	0.4	0.4	0.4	0		0.4	MAXDET
FU3_SEDIMENT	SVOC	ISOPHORONE	1	1	MG/KG	0.4	0.4	0.4	0		0.4	MAXDET
FU3_SURFSOIL	Dioxin	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	6	6	MG/KG	0.000004	0.00029	0.000090	0.16	0.00019	0.00029	MAXDET
FU3_SURFSOIL	Dioxin	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	6	2	MG/KG	0.000002	0.000003	0.00083	2995823	0.0014	0.000003	MAXDET
FU3_SURFSOIL	Dioxin	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	6	2	MG/KG	0.000004	0.000004	0.00083	97669	0.0014	0.000004	MAXDET
FU3_SURFSOIL	Dioxin	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	6	1	MG/KG	0.000008	0.000008	0.0010	10	0.0015	0.000008	MAXDET
FU3_SURFSOIL	Dioxin	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	6	2	MG/KG	0.000001	0.000002	0.00083	201340234	0.0014	0.000002	MAXDET
FU3_SURFSOIL	Dioxin	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	6	2	MG/KG	0.000005	0.000005	0.00084	23047	0.0014	0.000005	MAXDET
FU3_SURFSOIL	Dioxin	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	6	1	MG/KG	0.000003	0.000003	0.0010	493	0.0015	0.000003	MAXDET
FU3_SURFSOIL	Dioxin	OCTACHLORODIBENZO-p-DIOXIN	6	6	MG/KG	0.0028	0.010	0.0056	0.011	0.0080	0.0103	MAXDET
FU3_SURFSOIL	Dioxin	OCTACHLORODIBENZOFURAN	6	6	MG/KG	0.000006	0.00070	0.00021	2	0.00046	0.00070	MAXDET
FU3_SURFSOIL	Dioxin	TCDD Equivalent	6	6	MG/KG	0.0000028	0.000013	0.0000072	0.000019	0.000011	0.000013	MAXDET
FU3_SURFSOIL	GenChem	ALKALINITY, TOTAL (AS CaCO3)	12	12	MG/KG	737	444000	100876	1956040	169062	444000	MAXDET
FU3_SURFSOIL	GenChem	CHROMIUM, HEXAVALENT	4	1	MG/KG	0.12	0.12	0.073	0.17	0.11	0.12	MAXDET
FU3_SURFSOIL	GenChem	MOISTURE, PERCENT	12	12	PERCENT	6	29	14	19	18	19	LOGNORM
FU3_SURFSOIL	GenChem	pH	19	19	PH UNITS	6	9	8	8	8	8	NORM
FU3_SURFSOIL	GenChem	TOTAL ORGANIC CARBON	12	12	MG/KG	1650	26900	9800	21568	13629	21568	LOGNORM
FU3_SURFSOIL	GeoPhys	CATION-EXCHANGE CAPACITY	12	12	MEQ/100G	1	14	7	12	9	9	NORM
FU3_SURFSOIL	GeoPhys	SIEVE NO. 100 PERCENT PASSING	12	12	PERCENT	44	98	67	79	77	79	LOGNORM
FU3_SURFSOIL	GeoPhys	SIEVE NO. 20 PERCENT PASSING	12	12	PERCENT	83	100	90	93	93	93	LOGNORM
FU3_SURFSOIL	GeoPhys	SIEVE NO. 200 PERCENT PASSING	12	12	PERCENT	29	98	61	77	73	77	LOGNORM

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU3_SURFSOIL	GeoPhys	SIEVE NO 200L PERCENT PASSING	12	12	PERCENT	28	97	60	77	72	77	LOGNORM
FU3_SURFSOIL	GeoPhys	SIEVE NO 40 PERCENT PASSING	12	12	PERCENT	67	99	80	86	86	86	LOGNORM
FU3_SURFSOIL	GeoPhys	SIEVE NO 80 PERCENT PASSING	12	12	PERCENT	47	99	69	80	78	80	LOGNORM
FU3_SURFSOIL	Metal	ALUMINUM	26	26	MG/KG	2840	13600	6607	7922	7617	7922	LOGNORM
FU3_SURFSOIL	Metal	ANTIMONY	112	31	MG/KG	0.23	22	2	3	3	3	LOGNORM
FU3_SURFSOIL	Metal	ARSENIC	117	114	MG/KG	0.43	49	10	13	11	13	LOGNORM
FU3_SURFSOIL	Metal	BARIUM	26	26	MG/KG	30	432	96	123	124	123	LOGNORM
FU3_SURFSOIL	Metal	BERYLLIUM	117	53	MG/KG	0.05	2	0.41	0.54	0.44	0.54	LOGNORM
FU3_SURFSOIL	Metal	CADMIUM	117	56	MG/KG	0.08	8	0.73	1	0.88	1	LOGNORM
FU3_SURFSOIL	Metal	CALCIUM	26	26	MG/KG	951	227000	39112	143669	61295	143669	LOGNORM
FU3_SURFSOIL	Metal	CHROMIUM III	4	4	MG/KG	13	403	142	256532285	357	403	MAXDET
FU3_SURFSOIL	Metal	CHROMIUM TOTAL	117	117	MG/KG	6	915	69	72	88	72	LOGNORM
FU3_SURFSOIL	Metal	COBALT	26	26	MG/KG	0.88	9	4	6	5	6	LOGNORM
FU3_SURFSOIL	Metal	COPPER	117	115	MG/KG	4	235	30	39	35	39	LOGNORM
FU3_SURFSOIL	Metal	IRON	26	26	MG/KG	3960	51300	15935	20218	19584	20218	LOGNORM
FU3_SURFSOIL	Metal	LEAD	117	117	MG/KG	3	4150	241	311	326	311	LOGNORM
FU3_SURFSOIL	Metal	MAGNESIUM	26	26	MG/KG	263	10900	2374	3775	3213	3775	LOGNORM
FU3_SURFSOIL	Metal	MANGANESE	26	26	MG/KG	65	634	267	368	325	368	LOGNORM
FU3_SURFSOIL	Metal	MERCURY	117	28	MG/KG	0.015	2	0.063	0.062	0.093	0.062	LOGNORM
FU3_SURFSOIL	Metal	NICKEL	117	117	MG/KG	3	76	18	21	20	21	LOGNORM
FU3_SURFSOIL	Metal	POTASSIUM	26	25	MG/KG	190	4650	1195	1757	1569	1757	LOGNORM
FU3_SURFSOIL	Metal	SELENIUM	117	33	MG/KG	0.29	10	0.72	0.82	0.87	0.82	LOGNORM
FU3_SURFSOIL	Metal	SILVER	117	3	MG/KG	0.31	3	0.58	1	0.67	1	LOGNORM
FU3_SURFSOIL	Metal	SODIUM	26	9	MG/KG	62	863	151	1747	223	863	MAXDET
FU3_SURFSOIL	Metal	VANADIUM	26	26	MG/KG	7	77	21	26	26	26	LOGNORM
FU3_SURFSOIL	Metal	ZINC	117	117	MG/KG	21	4000	249	273	321	273	LOGNORM
FU3_SURFSOIL	OCPest	ALPHA-CHLORDANE	76	17	MG/KG	0.0014	0.61	0.026	0.032	0.041	0.032	LOGNORM
FU3_SURFSOIL	OCPest	DDD	76	2	MG/KG	0.032	0.046	0.016	0.021	0.022	0.021	LOGNORM
FU3_SURFSOIL	OCPest	DDE	76	29	MG/KG	0.0014	0.17	0.021	0.029	0.028	0.029	LOGNORM
FU3_SURFSOIL	OCPest	DDT	76	38	MG/KG	0.002	0.41	0.043	0.073	0.058	0.073	LOGNORM
FU3_SURFSOIL	OCPest	DIELDRIN	76	21	MG/KG	0.0012	0.18	0.024	0.037	0.032	0.037	LOGNORM
FU3_SURFSOIL	OCPest	GAMMA-CHLORDANE	76	17	MG/KG	0.0017	0.58	0.028	0.036	0.043	0.036	LOGNORM
FU3_SURFSOIL	OCPest	HEPTACHLOR	76	1	MG/KG	0.035	0.035	0.008	0.011	0.011	0.011	LOGNORM
FU3_SURFSOIL	ORG	PETROLEUM HYDROCARBONS	3	3	MG/KG	26	274	118	90509517	347	274	MAXDET
FU3_SURFSOIL	PAH	2-METHYLNAPHTHALENE	101	2	MG/KG	0.084	0.51	0.45	0.55	0.60	0.51	MAXDET
FU3_SURFSOIL	PAH	ACENAPHTHENE	101	14	MG/KG	0.047	5	0.43	0.56	0.55	0.56	LOGNORM
FU3_SURFSOIL	PAH	ACENAPHTHYLENE	101	2	MG/KG	0.088	0.14	0.43	0.52	0.59	0.14	MAXDET
FU3_SURFSOIL	PAH	ANTHRACENE	101	16	MG/KG	0.07	11	0.54	0.66	0.75	0.66	LOGNORM
FU3_SURFSOIL	PAH	BENZO(a)ANTHRACENE	101	44	MG/KG	0.039	40	1	1	2	1	LOGNORM
FU3_SURFSOIL	PAH	BENZO(a)PYRENE	101	44	MG/KG	0.039	37	1	1	2	1	LOGNORM
FU3_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	101	45	MG/KG	0.038	39	1	1	2	1	LOGNORM
FU3_SURFSOIL	PAH	BENZO(g h i)PERYLENE	101	37	MG/KG	0.037	22	0.83	0.95	1	0.95	LOGNORM
FU3_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	101	43	MG/KG	0.043	34	1	1	2	1	LOGNORM
FU3_SURFSOIL	PAH	CHRYSENE	101	47	MG/KG	0.043	46	1	2	2	2	LOGNORM
FU3_SURFSOIL	PAH	DIBENZ(a,h)ANTHRACENE	101	2	MG/KG	0.21	1	0.45	0.54	0.60	0.54	LOGNORM
FU3_SURFSOIL	PAH	FLUORANTHENE	101	51	MG/KG	0.04	71	2	3	4	3	LOGNORM
FU3_SURFSOIL	PAH	FLUORENE	101	16	MG/KG	0.041	5	0.44	0.57	0.57	0.57	LOGNORM
FU3_SURFSOIL	PAH	INDENO(1 2,3-c d)PYRENE	101	38	MG/KG	0.05	22	0.89	1	1	1	LOGNORM
FU3_SURFSOIL	PAH	NAPHTHALENE	101	4	MG/KG	0.085	0.63	0.42	0.51	0.57	0.51	LOGNORM
FU3_SURFSOIL	PAH	PHENANTHRENE	101	46	MG/KG	0.043	52	2	2	3	2	LOGNORM
FU3_SURFSOIL	PAH	PYRENE	101	51	MG/KG	0.043	71	2	2	3	2	LOGNORM
FU3_SURFSOIL	SVOC	BENZYL BUTYL PHTHALATE	35	1	MG/KG	0.083	0.083	0.48	0.42	0.85	0.083	MAXDET

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Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU3_SURFSOIL	SVOC	bis(2 ETHYLHEXYL) PHTHALATE	35	11	MG/KG	0.04	6	0.71	0.94	1	0.94	LOGNORM
FU3_SURFSOIL	SVOC	CARBAZOLE	35	8	MG/KG	0.08	10	0.63	0.55	1	0.55	LOGNORM
FU3_SURFSOIL	SVOC	DIBENZOFURAN	35	3	MG/KG	0.49	2	0.32	0.35	0.44	0.35	LOGNORM
FU3_SURFSOIL	SVOC	DIETHYL PHTHALATE	35	1	MG/KG	0.9	0.9	0.50	0.45	0.88	0.45	LOGNORM
FU3_SURFSOIL	SVOC	PENTACHLOROPHENOL	35	1	MG/KG	0.68	0.68	0.26	0.24	0.45	0.24	LOGNORM
FU3_SURFSOIL	tbd	Chromium TCLP	10	3	MG/L	0.0086	0.077	0.013	0.039	0.027	0.039	LOGNORM
FU3_SURFSOIL	tbd	Lead TCLP	10	6	MG/L	0.062	1	0.17	0.45	0.38	0.45	LOGNORM
FU3_SURFSOIL	tbd	Mercury, TCLP	10	4	MG/L	0.00013	0.00013	0.000090	0.00012	0.00011	0.00012	LOGNORM
FU3_SURFSOIL	tbd	Nickel TCLP	10	2	MG/L	0.054	0.084	0.024	0.042	0.038	0.042	LOGNORM
FU3_SURFSOIL	tbd	Zinc TCLP	10	10	MG/L	0.053	3	0.86	4	1	3	MAXDET
FU3_SURFSOIL	VOC	2-HEXANONE	75	2	MG/KG	0.001	0.008	0.0057	0.0060	0.0059	0.0060	LOGNORM
FU3_SURFSOIL	VOC	ACETONE	75	33	MG/KG	0.002	0.072	0.011	0.012	0.014	0.012	LOGNORM
FU3_SURFSOIL	VOC	BENZENE	76	2	MG/KG	0.001	0.002	0.0056	0.0060	0.0058	0.002	MAXDET
FU3_SURFSOIL	VOC	BROMOMETHANE	75	2	MG/KG	0.002	0.002	0.0056	0.0059	0.0058	0.002	MAXDET
FU3_SURFSOIL	VOC	CARBON DISULFIDE	75	1	MG/KG	0.002	0.002	0.0057	0.0059	0.0058	0.002	MAXDET
FU3_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	75	3	MG/KG	0.008	0.044	0.0065	0.0066	0.0074	0.0066	LOGNORM
FU3_SURFSOIL	VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	75	1	MG/KG	0.002	0.002	0.0057	0.0059	0.0058	0.002	MAXDET
FU3_SURFSOIL	VOC	METHYLENE CHLORIDE	75	26	MG/KG	0.001	0.006	0.0047	0.0053	0.0050	0.0053	LOGNORM
FU3_SURFSOIL	VOC	TOLUENE	76	4	MG/KG	0.001	0.002	0.0055	0.0061	0.0057	0.002	MAXDET
FU3_SURFSOIL	VOC	Total Xylenes	76	2	MG/KG	0.001	0.002	0.0056	0.0060	0.0058	0.002	MAXDET
FU3_SURFSOIL	VOC	TRICHLOROETHYLENE (TCE)	75	1	MG/KG	0.001	0.001	0.0057	0.0060	0.0058	0.001	MAXDET
FU4_DEEP	Dioxin	1 2 3 4 6 7 8-HEPTACHLORODIBENZO-p-DIOXIN	36	26	MG/KG	0.000018	0.49	0.017	0.036	0.039	0.036	LOGNORM
FU4_DEEP	Dioxin	1,2,3,4 6 7,8-HEPTACHLORODIBENZOFURAN	37	29	MG/KG	0.000003	0.10	0.0042	0.037	0.0090	0.037	LOGNORM
FU4_DEEP	Dioxin	1 2 3 4 7 8 9-HEPTACHLORODIBENZOFURAN	37	9	MG/KG	0.000009	0.0066	0.0011	0.0048	0.0014	0.0048	LOGNORM
FU4_DEEP	Dioxin	1,2,3,4 7 8-HEXACHLORODIBENZO-p-DIOXIN	37	5	MG/KG	0.000022	0.00013	0.0011	0.0029	0.0012	0.00013	MAXDET
FU4_DEEP	Dioxin	1 2 3 4 7 8-HEXACHLORODIBENZOFURAN	37	11	MG/KG	0.000009	0.0017	0.00095	0.0062	0.0011	0.0017	MAXDET
FU4_DEEP	Dioxin	1 2,3,6 7,8-HEXACHLORODIBENZO-P-DIOXIN	37	18	MG/KG	0.000006	0.0066	0.00090	0.0050	0.0012	0.0050	LOGNORM
FU4_DEEP	Dioxin	1 2,3,6 7 8-HEXACHLORODIBENZOFURAN	37	10	MG/KG	0.000005	0.00050	0.00094	0.0071	0.0011	0.00050	MAXDET
FU4_DEEP	Dioxin	1 2 3 7 8 9-HEXACHLORODIBENZO-P-DIOXIN	37	11	MG/KG	0.000003	0.00050	0.00091	0.0062	0.0011	0.00050	MAXDET
FU4_DEEP	Dioxin	1 2,3,7 8 9-HEXACHLORODIBENZOFURAN	37	2	MG/KG	0.000012	0.000012	0.0012	0.0027	0.0013	0.000012	MAXDET
FU4_DEEP	Dioxin	1 2 3 7 8-PENTACHLORODIBENZO-p-DIOXIN	37	3	MG/KG	0.000007	0.000055	0.0012	0.0032	0.0012	0.000055	MAXDET
FU4_DEEP	Dioxin	1 2,3 7 8-PENTACHLORODIBENZOFURAN	37	2	MG/KG	0.000009	0.000012	0.0012	0.0028	0.0013	0.000012	MAXDET
FU4_DEEP	Dioxin	2 3 4,6 7 8-HEXACHLORODIBENZOFURAN	37	13	MG/KG	0.000005	0.00041	0.00084	0.0057	0.0010	0.00041	MAXDET
FU4_DEEP	Dioxin	2 3,4 7 8-PENTACHLORODIBENZOFURAN	37	2	MG/KG	0.000006	0.000014	0.0012	0.0029	0.0013	0.000014	MAXDET
FU4_DEEP	Dioxin	OCTACHLORODIBENZO-p-DIOXIN	34	31	MG/KG	0.000053	3	0.11	0.14	0.27	0.14	LOGNORM
FU4_DEEP	Dioxin	OCTACHLORODIBENZOFURAN	37	29	MG/KG	0.000003	2	0.067	0.28	0.17	0.28	LOGNORM
FU4_DEEP	Dioxin	TCDD Equivalent	35	35	MG/KG	0.00000077	0.013	0.00043	0.00096	0.0010	0.00096	LOGNORM
FU4_DEEP	GenChem	ALKALINITY TOTAL (AS CaCO3)	3	3	MG/KG	805	465000	155778	6.16E+55	607242	465000	MAXDET
FU4_DEEP	GenChem	MOISTURE, PERCENT	3	3	PERCENT	8	13	10	20	15	13	MAXDET
FU4_DEEP	GenChem	pH	3	3	PH UNITS	6	8	8	11	10	8	MAXDET
FU4_DEEP	GenChem	TOTAL ORGANIC CARBON	3	3	MG/KG	734	27800	11161	4.44E+17	35712	27800	MAXDET
FU4_DEEP	GeoPhys	CATION-EXCHANGE CAPACITY	3	3	MEQ/100G	1	12	6	553715	16	12	MAXDET
FU4_DEEP	GeoPhys	SIEVE NO 100 PERCENT PASSING	3	3	PERCENT	29	99	57	2316	120	99	MAXDET
FU4_DEEP	GeoPhys	SIEVE NO 20, PERCENT PASSING	3	3	PERCENT	81	100	90	111	106	100	MAXDET
FU4_DEEP	GeoPhys	SIEVE NO 200 PERCENT PASSING	3	3	PERCENT	27	99	51	10083	121	99	MAXDET
FU4_DEEP	GeoPhys	SIEVE NO 200L PERCENT PASSING	3	3	PERCENT	24	99	50	16239	122	99	MAXDET
FU4_DEEP	GeoPhys	SIEVE NO 40 PERCENT PASSING	3	3	PERCENT	56	100	73	177	112	100	MAXDET
FU4_DEEP	GeoPhys	SIEVE NO 80, PERCENT PASSING	3	3	PERCENT	31	99	59	1659	119	99	MAXDET
FU4_DEEP	Metal	ALUMINUM	91	91	MG/KG	674	27600	10410	12390	11303	12390	LOGNORM
FU4_DEEP	Metal	ANTIMONY	245	49	MG/KG	0.37	28	3	3	3	3	LOGNORM
FU4_DEEP	Metal	ARSENIC	250	247	MG/KG	1	66	13	16	14	16	LOGNORM
FU4_DEEP	Metal	BARIUM	91	91	MG/KG	7	422	108	144	120	144	LOGNORM

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Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU4_DEEP	Metal	BERYLLIUM	249	131	MG/KG	0.02	2	0.44	0.74	0.47	0.74	LOGNORM
FU4_DEEP	Metal	CADMIUM	250	76	MG/KG	0.03	5	0.54	0.60	0.61	0.60	LOGNORM
FU4_DEEP	Metal	CALCIUM	91	88	MG/KG	479	306000	14801	23094	23303	23094	LOGNORM
FU4_DEEP	Metal	CHROMIUM TOTAL	250	250	MG/KG	2	4385	62	38	95	38	LOGNORM
FU4_DEEP	Metal	COBALT	91	91	MG/KG	0.25	28	7	10	8	10	LOGNORM
FU4_DEEP	Metal	COPPER	250	250	MG/KG	1	1400	31	29	40	29	LOGNORM
FU4_DEEP	Metal	IRON	91	91	MG/KG	1360	66100	17990	21024	19634	21024	LOGNORM
FU4_DEEP	Metal	LEAD	250	250	MG/KG	5	2800	93	65	126	65	LOGNORM
FU4_DEEP	Metal	MAGNESIUM	91	91	MG/KG	122	84200	3269	3476	4782	3476	LOGNORM
FU4_DEEP	Metal	MANGANESE	91	91	MG/KG	34	2960	558	787	635	787	LOGNORM
FU4_DEEP	Metal	MERCURY	250	42	MG/KG	0.01	0.37	0.046	0.051	0.049	0.051	LOGNORM
FU4_DEEP	Metal	NICKEL	250	250	MG/KG	2	65	22	25	24	24	NORM
FU4_DEEP	Metal	POTASSIUM	91	88	MG/KG	89	3710	1349	1809	1499	1499	NORM
FU4_DEEP	Metal	SELENIUM	250	40	MG/KG	0.33	13	0.82	0.80	1	0.80	LOGNORM
FU4_DEEP	Metal	SILVER	250	26	MG/KG	0.045	0.63	0.61	1	0.67	0.63	MAXDET
FU4_DEEP	Metal	SODIUM	91	13	MG/KG	104	1080	93	134	124	134	LOGNORM
FU4_DEEP	Metal	THALLIUM	250	4	MG/KG	3	7	0.68	0.93	0.75	0.93	LOGNORM
FU4_DEEP	Metal	VANADIUM	91	91	MG/KG	3	65	24	27	26	27	LOGNORM
FU4_DEEP	Metal	ZINC	250	249	MG/KG	10	9915	175	141	247	141	LOGNORM
FU4_DEEP	OCPest	ALDRIN	205	1	MG/KG	0.0031	0.0031	0.016	0.0073	0.022	0.0031	MAXDET
FU4_DEEP	OCPest	ALPHA-CHLORDANE	205	23	MG/KG	0.00075	3	0.032	0.011	0.060	0.011	LOGNORM
FU4_DEEP	OCPest	DDD	205	1	MG/KG	0.033	0.033	0.030	0.014	0.043	0.014	LOGNORM
FU4_DEEP	OCPest	DDE	205	33	MG/KG	0.0013	3	0.052	0.021	0.081	0.021	LOGNORM
FU4_DEEP	OCPest	DDT	205	49	MG/KG	0.0024	13	0.12	0.035	0.23	0.035	LOGNORM
FU4_DEEP	OCPest	DIELDRIN	205	45	MG/KG	0.0012	6	0.10	0.034	0.17	0.034	LOGNORM
FU4_DEEP	OCPest	GAMMA-CHLORDANE	205	23	MG/KG	0.00097	3	0.033	0.012	0.060	0.012	LOGNORM
FU4_DEEP	ORG	PETROLEUM HYDROCARBONS	7	3	MG/KG	19	1300	192	7192816	551	1300	MAXDET
FU4_DEEP	PAH	2-METHYLNAPHTHALENE	227	4	MG/KG	0.051	0.13	0.28	0.28	0.34	0.13	MAXDET
FU4_DEEP	PAH	ACENAPHTHENE	227	7	MG/KG	0.041	1	0.28	0.29	0.34	0.29	LOGNORM
FU4_DEEP	PAH	ACENAPHTHYLENE	227	1	MG/KG	0.2	0.2	0.28	0.28	0.33	0.20	MAXDET
FU4_DEEP	PAH	ANTHRACENE	227	14	MG/KG	0.048	2	0.32	0.30	0.42	0.30	LOGNORM
FU4_DEEP	PAH	BENZO(a)ANTHRACENE	227	43	MG/KG	0.037	7	0.33	0.32	0.41	0.32	LOGNORM
FU4_DEEP	PAH	BENZO(a)PYRENE	227	46	MG/KG	0.04	6	0.33	0.32	0.40	0.32	LOGNORM
FU4_DEEP	PAH	BENZO(b)FLUORANTHENE	227	47	MG/KG	0.048	6	0.33	0.32	0.40	0.32	LOGNORM
FU4_DEEP	PAH	BENZO(g h i)PERYLENE	227	37	MG/KG	0.041	4	0.30	0.30	0.36	0.30	LOGNORM
FU4_DEEP	PAH	BENZO(k)FLUORANTHENE	227	44	MG/KG	0.039	6	0.33	0.33	0.41	0.33	LOGNORM
FU4_DEEP	PAH	CHRYSENE	227	46	MG/KG	0.045	7	0.35	0.33	0.43	0.33	LOGNORM
FU4_DEEP	PAH	DIBENZ(a,h)ANTHRACENE	227	6	MG/KG	0.046	0.87	0.26	0.27	0.30	0.27	LOGNORM
FU4_DEEP	PAH	FLUORANTHENE	227	49	MG/KG	0.049	14	0.51	0.41	0.67	0.41	LOGNORM
FU4_DEEP	PAH	FLUORENE	227	7	MG/KG	0.04	0.77	0.32	0.29	0.44	0.29	LOGNORM
FU4_DEEP	PAH	INDENO(1 2,3-c,d)PYRENE	227	32	MG/KG	0.042	4	0.31	0.31	0.37	0.31	LOGNORM
FU4_DEEP	PAH	NAPHTHALENE	227	4	MG/KG	0.045	0.38	0.26	0.28	0.31	0.28	LOGNORM
FU4_DEEP	PAH	PHENANTHRENE	227	43	MG/KG	0.038	10	0.44	0.36	0.59	0.36	LOGNORM
FU4_DEEP	PAH	PYRENE	227	51	MG/KG	0.044	12	0.44	0.38	0.58	0.38	LOGNORM
FU4_DEEP	PCB	PCB-1260 (AROCHLOR 1260)	98	5	MG/KG	0.28	18	0.92	0.87	1.40	0.87	LOGNORM
FU4_DEEP	SVOC	BENZYL BUTYL PHTHALATE	199	5	MG/KG	0.096	0.7	0.22	0.22	0.23	0.22	LOGNORM
FU4_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	199	61	MG/KG	0.038	180	1	0.35	2.68	0.35	LOGNORM
FU4_DEEP	SVOC	CARBAZOLE	199	13	MG/KG	0.035	2	0.22	0.23	0.24	0.23	LOGNORM
FU4_DEEP	SVOC	DI-n-BUTYL PHTHALATE	199	20	MG/KG	0.041	0.21	0.20	0.22	0.21	0.21	MAXDET
FU4_DEEP	SVOC	DI-n-OCTYLPHTHALATE	199	1	MG/KG	0.12	0.12	0.22	0.22	0.23	0.12	MAXDET
FU4_DEEP	SVOC	DIBENZOFURAN	199	4	MG/KG	0.05	0.44	0.22	0.22	0.23	0.22	LOGNORM
FU4_DEEP	SVOC	DIETHYL PHTHALATE	199	1	MG/KG	0.18	0.18	0.22	0.22	0.23	0.18	MAXDET

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU4_DEEP	SVOC	DIMETHYL PHTHALATE	199	1	MG/KG	0.18	0.18	0.22	0.22	0.23	0.18	MAXDET
FU4_DEEP	SVOC	N-NITROSODIPHENYLAMINE	199	1	MG/KG	0.14	0.14	0.22	0.22	0.23	0.14	MAXDET
FU4_DEEP	SVOC	PENTACHLOROPHENOL	202	8	MG/KG	0.048	470	2	0.14	6	0.14	LOGNORM
FU4_DEEP	tbd	Chromium, TCLP	4	1	MG/L	15	15	4	2.03E+41	12	15	MAXDET
FU4_DEEP	tbd	Lead, TCLP	4	1	MG/L	0.080	0.080	0.043	0.16	0.072	0.080	MAXDET
FU4_DEEP	tbd	Mercury TCLP	4	3	MG/L	0.00017	0.00021	0.00016	0.0014	0.00024	0.00021	MAXDET
FU4_DEEP	tbd	Zinc, TCLP	4	3	MG/L	0.15	35	9	1.90E+24	29	35	MAXDET
FU4_DEEP	VOC	1 1 2 2-TETRACHLOROETHANE	204	6	MG/KG	0.004	0.02	0.0062	0.0063	0.0064	0.0063	LOGNORM
FU4_DEEP	VOC	2-HEXANONE	204	2	MG/KG	0.001	0.001	0.006	0.0062	0.0061	0.001	MAXDET
FU4_DEEP	VOC	ACETONE	204	57	MG/KG	0.002	0.31	0.017	0.015	0.022	0.015	LOGNORM
FU4_DEEP	VOC	BENZENE	204	2	MG/KG	0.001	0.002	0.006	0.0061	0.0061	0.002	MAXDET
FU4_DEEP	VOC	BROMOMETHANE	204	4	MG/KG	0.001	0.003	0.0060	0.0062	0.0061	0.003	MAXDET
FU4_DEEP	VOC	CARBON DISULFIDE	204	2	MG/KG	0.001	0.001	0.0060	0.0062	0.0061	0.001	MAXDET
FU4_DEEP	VOC	CHLOROMETHANE	204	2	MG/KG	0.001	0.002	0.0060	0.0061	0.0061	0.002	MAXDET
FU4_DEEP	VOC	ETHYLBENZENE	204	1	MG/KG	0.008	0.008	0.0061	0.0061	0.0061	0.0061	LOGNORM
FU4_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	204	17	MG/KG	0.001	0.044	0.0069	0.0070	0.0075	0.0070	LOGNORM
FU4_DEEP	VOC	METHYLENE CHLORIDE	204	35	MG/KG	0.001	0.01	0.0055	0.0060	0.0057	0.0060	LOGNORM
FU4_DEEP	VOC	TETRACHLOROETHYLENE(PCE)	204	1	MG/KG	0.008	0.008	0.0060	0.0061	0.0061	0.0061	LOGNORM
FU4_DEEP	VOC	TOLUENE	204	4	MG/KG	0.002	0.017	0.0061	0.0062	0.0062	0.0062	LOGNORM
FU4_DEEP	VOC	TOTAL 1 2-DICHLOROETHENE	204	2	MG/KG	0.042	0.11	0.0067	0.0066	0.0076	0.0066	LOGNORM
FU4_DEEP	VOC	Total Xylenes	204	5	MG/KG	0.001	0.002	0.0059	0.0061	0.0060	0.002	MAXDET
FU4_DEEP	VOC	TRICHLOROETHYLENE (TCE)	204	8	MG/KG	0.001	0.057	0.0063	0.0064	0.0067	0.0064	LOGNORM
FU4_SEDIMENT		HEPTACHLORINATED DIBENZO-p-DIOXINS (TOTAL)	2	1	MG/KG	0.0093	0.0093	0.0047	3.16E+127	0.034	0.0093	MAXDET
FU4_SEDIMENT		HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	2	2	MG/KG	0.0000069	0.0043	0.0022	2.03E+118	0.016	0.0043	MAXDET
FU4_SEDIMENT	Dioxin	1 2 3 4 6,7 8-HEPTACHLORODIBENZO-p-DIOXIN	9	7	MG/KG	0.00018	0.024	0.0047	3	0.0095	0.024	MAXDET
FU4_SEDIMENT	Dioxin	1,2,3,4 6,7 8-HEPTACHLORODIBENZOFURAN	9	8	MG/KG	0.0000069	0.0070	0.0014	0.22	0.0028	0.0070	MAXDET
FU4_SEDIMENT	Dioxin	1 2 3 4 7 8 9-HEPTACHLORODIBENZOFURAN	9	3	MG/KG	0.000021	0.00011	0.00063	0.27	0.0010	0.00011	MAXDET
FU4_SEDIMENT	Dioxin	1,2,3,4,7 8-HEXACHLORODIBENZO-p-DIOXIN	9	3	MG/KG	0.000008	0.000014	0.00043	0.28	0.00081	0.000014	MAXDET
FU4_SEDIMENT	Dioxin	1 2 3 4 7,8-HEXACHLORODIBENZOFURAN	9	4	MG/KG	0.00001	0.000074	0.00046	0.97	0.00083	0.000074	MAXDET
FU4_SEDIMENT	Dioxin	1,2 3 6 7 8-HEXACHLORODIBENZO-P-DIOXIN	9	4	MG/KG	0.000007	0.00026	0.00059	2	0.00098	0.00026	MAXDET
FU4_SEDIMENT	Dioxin	1 2 3 6 7 8-HEXACHLORODIBENZOFURAN	9	4	MG/KG	0.000004	0.000079	0.00048	6	0.00085	0.000079	MAXDET
FU4_SEDIMENT	Dioxin	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	9	3	MG/KG	0.000015	0.00015	0.00067	0.97	0.0010	0.00015	MAXDET
FU4_SEDIMENT	Dioxin	2 3 4 6 7 8-HEXACHLORODIBENZOFURAN	9	1	MG/KG	0.000022	0.000022	0.00086	2	0.0012	0.000022	MAXDET
FU4_SEDIMENT	Dioxin	OCTACHLORODIBENZO-p-DIOXIN	9	9	MG/KG	0.00021	0.11	0.029	2	0.052	0.11	MAXDET
FU4_SEDIMENT	Dioxin	OCTACHLORODIBENZOFURAN	9	8	MG/KG	0.000024	0.015	0.0029	2	0.0058	0.015	MAXDET
FU4_SEDIMENT	Dioxin	TCDD Equivalent	9	9	MG/KG	0.00000030	0.00049	0.00010	0.041	0.00020	0.00049	MAXDET
FU4_SEDIMENT	GenChem	CYANIDE	2	1	mg/kg	0.6	0.6	0.35	9260755345	2	0.6	MAXDET
FU4_SEDIMENT	Metal	ALUMINUM	6	6	MG/KG	203	3180	1726	13281	2547	3180	MAXDET
FU4_SEDIMENT	Metal	ANTIMONY	9	1	MG/KG	1	1	0.95	2	1	1	MAXDET
FU4_SEDIMENT	Metal	ARSENIC	9	8	MG/KG	0.26	9	4	32	6	9	MAXDET
FU4_SEDIMENT	Metal	BARIUM	6	6	MG/KG	6	76	34	330	60	76	MAXDET
FU4_SEDIMENT	Metal	BERYLLIUM	9	5	MG/KG	0.05	0.32	0.085	0.59	0.14	0.32	MAXDET
FU4_SEDIMENT	Metal	CADMIUM	9	3	MG/KG	1	3	0.89	5	2	3	MAXDET
FU4_SEDIMENT	Metal	CALCIUM	6	6	MG/KG	24800	243000	118517	1108859	201172	243000	MAXDET
FU4_SEDIMENT	Metal	CHROMIUM, TOTAL	9	9	MG/KG	4	69	22	59	35	69	MAXDET
FU4_SEDIMENT	Metal	COBALT	6	6	MG/KG	2	11	4	12	7	11	MAXDET
FU4_SEDIMENT	Metal	COPPER	9	9	MG/KG	3	53	20	94	32	53	MAXDET
FU4_SEDIMENT	Metal	IRON	6	6	MG/KG	2960	11200	6397	12878	9177	11200	MAXDET
FU4_SEDIMENT	Metal	LEAD	9	9	MG/KG	2	484	74	915	170	484	MAXDET
FU4_SEDIMENT	Metal	MAGNESIUM	6	6	MG/KG	1620	7780	3585	8587	5586	7780	MAXDET
FU4_SEDIMENT	Metal	MANGANESE	6	6	MG/KG	37	313	117	419	203	313	MAXDET
FU4_SEDIMENT	Metal	MERCURY	9	2	MG/KG	0.1	0.12	0.048	0.16	0.073	0.12	MAXDET

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU4_SEDIMENT	Metal	NICKEL	9	8	MG/KG	3	19	7	13	11	19	MAXDET
FU4_SEDIMENT	Metal	POTASSIUM	6	6	MG/KG	76	419	239	523	331	419	MAXDET
FU4_SEDIMENT	Metal	SELENIUM	9	1	MG/KG	0.87	0.87	0.43	2	0.66	0.87	MAXDET
FU4_SEDIMENT	Metal	SODIUM	6	5	MG/KG	64	158	109	222	148	158	MAXDET
FU4_SEDIMENT	Metal	VANADIUM	6	6	MG/KG	2	18	9	30	13	18	MAXDET
FU4_SEDIMENT	Metal	ZINC	9	9	MG/KG	16	260	73	188	120	260	MAXDET
FU4_SEDIMENT	OCPest	ALPHA-CHLORDANE	9	4	MG/KG	0.0032	0.53	0.075	2	0.18	0.53	MAXDET
FU4_SEDIMENT	OCPest	DDD	9	5	MG/KG	0.03	0.99	0.15	4	0.35	0.99	MAXDET
FU4_SEDIMENT	OCPest	DDE	9	6	MG/KG	0.015	0.25	0.069	0.77	0.12	0.25	MAXDET
FU4_SEDIMENT	OCPest	DDT	9	8	MG/KG	0.022	0.27	0.12	3	0.18	0.27	MAXDET
FU4_SEDIMENT	OCPest	DIELDRIN	9	6	MG/KG	0.038	0.31	0.10	4	0.17	0.31	MAXDET
FU4_SEDIMENT	OCPest	ENDRIN	9	1	MG/KG	0.048	0.048	0.0471	0.59	0.081	0.048	MAXDET
FU4_SEDIMENT	OCPest	ENDRIN ALDEHYDE	9	1	MG/KG	0.029	0.029	0.045	0.51	0.079	0.029	MAXDET
FU4_SEDIMENT	OCPest	GAMMA-CHLORDANE	9	4	MG/KG	0.0038	0.65	0.091	4	0.22	0.65	MAXDET
FU4_SEDIMENT	PAH	2-METHYLNAPHTHALENE	9	2	MG/KG	0.026	10	1	27	3	10	MAXDET
FU4_SEDIMENT	PAH	ACENAPHTHENE	9	1	MG/KG	0.061	0.061	0.59	3	1	0.061	MAXDET
FU4_SEDIMENT	PAH	ACENAPHTHYLENE	9	1	MG/KG	0.038	0.038	1	11	2	0.038	MAXDET
FU4_SEDIMENT	PAH	ANTHRACENE	9	4	MG/KG	0.094	7	1	8	2	7	MAXDET
FU4_SEDIMENT	PAH	BENZO(a)ANTHRACENE	9	8	MG/KG	0.06	20	3	34	7	20	MAXDET
FU4_SEDIMENT	PAH	BENZO(a)PYRENE	9	8	MG/KG	0.085	19	2	19	6	19	MAXDET
FU4_SEDIMENT	PAH	BENZO(b)FLUORANTHENE	9	8	MG/KG	0.18	26	3	25	9	26	MAXDET
FU4_SEDIMENT	PAH	BENZO(g h i)PERYLENE	9	7	MG/KG	0.095	0.32	0.89	4	2	0.32	MAXDET
FU4_SEDIMENT	PAH	BENZO(k)FLUORANTHENE	9	8	MG/KG	0.12	25	3	26	8	25	MAXDET
FU4_SEDIMENT	PAH	CHRYSENE	9	8	MG/KG	0.16	30	4	42	10	30	MAXDET
FU4_SEDIMENT	PAH	DIBENZ(a h)ANTHRACENE	9	1	MG/KG	0.09	0.09	1	7	2	0.09	MAXDET
FU4_SEDIMENT	PAH	FLUORANTHENE	9	8	MG/KG	0.16	30	4	60	10	30	MAXDET
FU4_SEDIMENT	PAH	FLUORENE	9	2	MG/KG	0.066	7	1	9	3	7	MAXDET
FU4_SEDIMENT	PAH	INDENO(1 2 3-c d)PYRENE	9	7	MG/KG	0.1	0.39	0.91	4	2	0.39	MAXDET
FU4_SEDIMENT	PAH	PHENANTHRENE	9	8	MG/KG	0.02	33	4	338	11	33	MAXDET
FU4_SEDIMENT	PAH	PYRENE	9	8	MG/KG	0.13	55	7	145	18	55	MAXDET
FU4_SEDIMENT	SVOC	4-METHYLPHENOL (p-CRESOL)	9	1	MG/KG	0.17	0.17	0.60	2	1	0.17	MAXDET
FU4_SEDIMENT	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	9	2	MG/KG	0.074	2	0.521	2	0.86	2	MAXDET
FU4_SEDIMENT	SVOC	CARBAZOLE	9	4	MG/KG	0.1	2	0.53	2	1	2	MAXDET
FU4_SEDIMENT	SVOC	DI-n-BUTYL PHTHALATE	9	1	MG/KG	0.034	0.034	0.59	4	1	0.034	MAXDET
FU4_SEDIMENT	SVOC	DIETHYL PHTHALATE	9	1	MG/KG	8	8	1	7	3	8	MAXDET
FU4_SEDIMENT	SVOC	PENTACHLOROPHENOL	9	2	MG/KG	0.08	0.26	0.80	5	2	0.26	MAXDET
FU4_SEDIMENT	VOC	ACETONE	9	1	MG/KG	0.025	0.025	0.0082	0.012	0.012	0.025	MAXDET
FU4_SEDIMENT	VOC	CARBON TETRACHLORIDE	9	1	MG/KG	0.078	0.078	0.014	0.029	0.029	0.078	MAXDET
FU4_SEDIMENT	VOC	METHYLENE CHLORIDE	9	1	MG/KG	0.045	0.045	0.010	0.018	0.018	0.045	MAXDET
FU4_SEDIMENT	VOC	Total Xylenes	9	1	MG/KG	0.018	0.018	0.0074	0.0097	0.0099	0.018	MAXDET
FU4_SURFSOIL	Dioxin	1 2 3 4 6 7 8-HEPTACHLORODIBENZO-p-DIOXIN	22	20	MG/KG	0.000018	0.023	0.0043	0.076	0.0066	0.023	MAXDET
FU4_SURFSOIL	Dioxin	1,2,3 4,6,7,8-HEPTACHLORODIBENZOFURAN	23	22	MG/KG	0.000003	0.012	0.0018	0.050	0.0030	0.012	MAXDET
FU4_SURFSOIL	Dioxin	1 2 3 4 7 8 9-HEPTACHLORODIBENZOFURAN	23	7	MG/KG	0.000009	0.00018	0.00089	0.0062	0.0011	0.00018	MAXDET
FU4_SURFSOIL	Dioxin	1 2 3 4 7 8-HEXACHLORODIBENZO-p-DIOXIN	23	5	MG/KG	0.000022	0.00013	0.00099	0.0053	0.0012	0.00013	MAXDET
FU4_SURFSOIL	Dioxin	1,2,3 4 7,8 HEXACHLORODIBENZOFURAN	23	9	MG/KG	0.000009	0.00040	0.00080	0.010	0.0010	0.00040	MAXDET
FU4_SURFSOIL	Dioxin	1,2,3 6,7,8-HEXACHLORODIBENZO-P-DIOXIN	23	15	MG/KG	0.000012	0.0013	0.00056	0.0032	0.00077	0.0013	MAXDET
FU4_SURFSOIL	Dioxin	1 2 3 6 7 8-HEXACHLORODIBENZOFURAN	23	8	MG/KG	0.000005	0.00014	0.00083	0.013	0.0010	0.00014	MAXDET
FU4_SURFSOIL	Dioxin	1 2 3 7 8 9-HEXACHLORODIBENZO-P-DIOXIN	23	8	MG/KG	0.000006	0.00029	0.00084	0.0070	0.0010	0.00029	MAXDET
FU4_SURFSOIL	Dioxin	1 2,3 7 8 9-HEXACHLORODIBENZOFURAN	23	1	MG/KG	0.000012	0.000012	0.0012	0.0027	0.0013	0.000012	MAXDET
FU4_SURFSOIL	Dioxin	1,2,3,7 8-PENTACHLORODIBENZO-p-DIOXIN	23	2	MG/KG	0.000012	0.000055	0.0011	0.0033	0.0013	0.000055	MAXDET
FU4_SURFSOIL	Dioxin	1 2,3 7 8-PENTACHLORODIBENZOFURAN	23	1	MG/KG	0.000012	0.000012	0.0012	0.0027	0.0013	0.000012	MAXDET
FU4_SURFSOIL	Dioxin	2,3 4,6,7,8-HEXACHLORODIBENZOFURAN	23	6	MG/KG	0.000028	0.00041	0.0010	0.0039	0.0011	0.00041	MAXDET

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU4_SURFSOIL	Dioxin	2,3,4,7,8-PENTACHLORODIBENZOFURAN	23	1	MG/KG	0.000014	0.000014	0.0012	0.0026	0.0013	0.000014	MAXDET
FU4_SURFSOIL	Dioxin	OCTACHLORODIBENZO-p-DIOXIN	20	20	MG/KG	0.0011	0.072	0.019	0.048	0.027	0.048	LOGNORM
FU4_SURFSOIL	Dioxin	OCTACHLORODIBENZOFURAN	23	22	MG/KG	0.000003	0.040	0.0066	0.30	0.011	0.040	MAXDET
FU4_SURFSOIL	Dioxin	TCDD Equivalent	23	23	MG/KG	0.0000011	0.00047	0.00011	0.00058	0.00015	0.00047	MAXDET
FU4_SURFSOIL	GenChem	ALKALINITY TOTAL (AS CaCO3)	3	3	MG/KG	805	465000	155778	6.16E+55	607242	465000	MAXDET
FU4_SURFSOIL	GenChem	MOISTURE, PERCENT	3	3	PERCENT	8	13	10	20	15	13	MAXDET
FU4_SURFSOIL	GenChem	pH	3	3	PH UNITS	6	8	8	11	10	8	MAXDET
FU4_SURFSOIL	GenChem	TOTAL ORGANIC CARBON	3	3	MG/KG	734	27800	11161	4.44E+17	35712	27800	MAXDET
FU4_SURFSOIL	GeoPhys	CATION-EXCHANGE CAPACITY	3	3	MEQ/100G	1	12	6	553715	16	12	MAXDET
FU4_SURFSOIL	GeoPhys	SIEVE NO 100, PERCENT PASSING	3	3	PERCENT	29	99	57	2316	120	99	MAXDET
FU4_SURFSOIL	GeoPhys	SIEVE NO 20 PERCENT PASSING	3	3	PERCENT	81	100	90	111	106	100	MAXDET
FU4_SURFSOIL	GeoPhys	SIEVE NO 200, PERCENT PASSING	3	3	PERCENT	27	99	51	10083	121	99	MAXDET
FU4_SURFSOIL	GeoPhys	SIEVE NO 200L, PERCENT PASSING	3	3	PERCENT	24	99	50	16239	122	99	MAXDET
FU4_SURFSOIL	GeoPhys	SIEVE NO 40 PERCENT PASSING	3	3	PERCENT	56	100	73	177	112	100	MAXDET
FU4_SURFSOIL	GeoPhys	SIEVE NO 80, PERCENT PASSING	3	3	PERCENT	31	99	59	1659	119	99	MAXDET
FU4_SURFSOIL	Metal	ALUMINUM	38	38	MG/KG	674	27600	8970	12727	10611	12727	LOGNORM
FU4_SURFSOIL	Metal	ANTIMONY	126	41	MG/KG	0.37	28	3	4	4	4	LOGNORM
FU4_SURFSOIL	Metal	ARSENIC	129	126	MG/KG	1	66	13	17	14	17	LOGNORM
FU4_SURFSOIL	Metal	BARIUM	38	38	MG/KG	7	366	83	136	103	136	LOGNORM
FU4_SURFSOIL	Metal	BERYLLIUM	128	72	MG/KG	0.02	2	0.42	0.71	0.45	0.71	LOGNORM
FU4_SURFSOIL	Metal	CADMIUM	129	61	MG/KG	0.12	5	0.69	0.75	0.80	0.75	LOGNORM
FU4_SURFSOIL	Metal	CALCIUM	38	36	MG/KG	479	306000	33583	618114	53235	306000	MAXDET
FU4_SURFSOIL	Metal	CHROMIUM TOTAL	129	129	MG/KG	5	4385	103	67	167	67	LOGNORM
FU4_SURFSOIL	Metal	COBALT	38	38	MG/KG	0.25	19	6	10	7	10	LOGNORM
FU4_SURFSOIL	Metal	COPPER	129	129	MG/KG	1	1400	37	34	55	34	LOGNORM
FU4_SURFSOIL	Metal	IRON	38	38	MG/KG	1360	66100	16196	22288	19744	22288	LOGNORM
FU4_SURFSOIL	Metal	LEAD	129	129	MG/KG	5	2800	165	162	227	162	LOGNORM
FU4_SURFSOIL	Metal	MAGNESIUM	38	38	MG/KG	122	7060	2263	4043	2744	4043	LOGNORM
FU4_SURFSOIL	Metal	MANGANESE	38	38	MG/KG	34	2260	402	718	531	718	LOGNORM
FU4_SURFSOIL	Metal	MERCURY	129	39	MG/KG	0.01	0.11	0.043	0.053	0.046	0.053	LOGNORM
FU4_SURFSOIL	Metal	NICKEL	129	129	MG/KG	2	44	18	22	20	22	LOGNORM
FU4_SURFSOIL	Metal	POTASSIUM	38	37	MG/KG	89	3140	1159	1954	1395	1954	LOGNORM
FU4_SURFSOIL	Metal	SELENIUM	129	32	MG/KG	0.33	13	0.98	1	1	1	LOGNORM
FU4_SURFSOIL	Metal	SILVER	129	17	MG/KG	0.045	0.63	0.57	1	0.65	0.63	MAXDET
FU4_SURFSOIL	Metal	SODIUM	38	10	MG/KG	104	1080	150	487	218	487	LOGNORM
FU4_SURFSOIL	Metal	THALLIUM	129	2	MG/KG	3	7	0.66	0.98	0.77	0.98	LOGNORM
FU4_SURFSOIL	Metal	VANADIUM	38	38	MG/KG	3	51	21	27	24	27	LOGNORM
FU4_SURFSOIL	Metal	ZINC	129	128	MG/KG	10	9915	260	222	397	222	LOGNORM
FU4_SURFSOIL	OCPest	ALPHA-CHLORDANE	92	22	MG/KG	0.00075	3	0.070	0.074	0.13	0.074	LOGNORM
FU4_SURFSOIL	OCPest	DDD	92	1	MG/KG	0.033	0.033	0.065	0.081	0.092	0.033	MAXDET
FU4_SURFSOIL	OCPest	DDE	92	30	MG/KG	0.0013	3	0.11	0.15	0.18	0.15	LOGNORM
FU4_SURFSOIL	OCPest	DDT	92	44	MG/KG	0.0024	13	0.27	0.31	0.51	0.31	LOGNORM
FU4_SURFSOIL	OCPest	DIELDRIN	92	39	MG/KG	0.0012	6	0.23	0.39	0.36	0.39	LOGNORM
FU4_SURFSOIL	OCPest	GAMMA-CHLORDANE	92	22	MG/KG	0.00097	3	0.072	0.087	0.13	0.087	LOGNORM
FU4_SURFSOIL	ORG	PETROLEUM HYDROCARBONS	2	1	MG/KG	1300	1300	650	1.09E+160	4752	1300	MAXDET
FU4_SURFSOIL	PAH	2-METHYLNAPHTHALENE	107	4	MG/KG	0.051	0.13	0.38	0.40	0.50	0.13	MAXDET
FU4_SURFSOIL	PAH	ACENAPHTHENE	107	7	MG/KG	0.041	1	0.39	0.42	0.51	0.42	LOGNORM
FU4_SURFSOIL	PAH	ACENAPHTHYLENE	107	1	MG/KG	0.2	0.2	0.37	0.39	0.50	0.2	MAXDET
FU4_SURFSOIL	PAH	ANTHRACENE	107	12	MG/KG	0.048	2	0.46	0.46	0.67	0.46	LOGNORM
FU4_SURFSOIL	PAH	BENZO(a)ANTHRACENE	107	40	MG/KG	0.037	7	0.50	0.54	0.65	0.54	LOGNORM
FU4_SURFSOIL	PAH	BENZO(a)PYRENE	107	43	MG/KG	0.04	6	0.49	0.54	0.64	0.54	LOGNORM
FU4_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	107	44	MG/KG	0.048	6	0.49	0.54	0.63	0.54	LOGNORM

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU4_SURFSOIL	PAH	BENZO(g h i)PERYLENE	107	35	MG/KG	0.041	4	0.42	0.47	0.54	0.47	LOGNORM
FU4_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	107	42	MG/KG	0.04	6	0.50	0.55	0.65	0.55	LOGNORM
FU4_SURFSOIL	PAH	CHRYSENE	107	43	MG/KG	0.045	7	0.53	0.58	0.70	0.58	LOGNORM
FU4_SURFSOIL	PAH	DIBENZ(a h)ANTHRACENE	107	6	MG/KG	0.046	0.87	0.33	0.37	0.42	0.37	LOGNORM
FU4_SURFSOIL	PAH	FLUORANTHENE	107	44	MG/KG	0.049	14	0.86	0.85	1	0.85	LOGNORM
FU4_SURFSOIL	PAH	FLUORENE	107	7	MG/KG	0.04	0.77	0.47	0.43	0.72	0.43	LOGNORM
FU4_SURFSOIL	PAH	INDENO(1 2 3-c d)PYRENE	107	31	MG/KG	0.042	4	0.44	0.49	0.56	0.49	LOGNORM
FU4_SURFSOIL	PAH	NAPHTHALENE	107	4	MG/KG	0.045	0.38	0.35	0.38	0.45	0.38	MAXDET
FU4_SURFSOIL	PAH	PHENANTHRENE	107	39	MG/KG	0.038	10	0.73	0.69	1	0.69	LOGNORM
FU4_SURFSOIL	PAH	PYRENE	107	46	MG/KG	0.05	12	0.73	0.74	1	0.74	LOGNORM
FU4_SURFSOIL	PCB	PCB-1260 (AROCHLOR 1260)	47	5	MG/KG	0.28	18	2	7	3	7	LOGNORM
FU4_SURFSOIL	SVOC	BENZYL BUTYL PHTHALATE	83	3	MG/KG	0.11	0.7	0.22	0.23	0.25	0.23	LOGNORM
FU4_SURFSOIL	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	83	36	MG/KG	0.038	3	0.30	0.34	0.38	0.34	LOGNORM
FU4_SURFSOIL	SVOC	CARBAZOLE	83	12	MG/KG	0.035	2	0.24	0.26	0.29	0.26	LOGNORM
FU4_SURFSOIL	SVOC	DI-n-BUTYL PHTHALATE	83	9	MG/KG	0.041	0.13	0.21	0.23	0.24	0.13	MAXDET
FU4_SURFSOIL	SVOC	DI-n-OCTYLPHTHALATE	83	1	MG/KG	0.12	0.12	0.23	0.24	0.25	0.12	MAXDET
FU4_SURFSOIL	SVOC	DIBENZOFURAN	83	4	MG/KG	0.05	0.44	0.24	0.25	0.27	0.25	LOGNORM
FU4_SURFSOIL	SVOC	DIETHYL PHTHALATE	83	1	MG/KG	0.18	0.18	0.23	0.24	0.25	0.18	MAXDET
FU4_SURFSOIL	SVOC	PENTACHLOROPHENOL	83	7	MG/KG	0.048	0.3	0.12	0.12	0.13	0.12	LOGNORM
FU4_SURFSOIL	tbd	Chromium, TCLP	4	1	MG/L	15	15	4	2.03E+41	12	15	MAXDET
FU4_SURFSOIL	tbd	Lead, TCLP	4	1	MG/L	0.080	0.080	0.043	0.16	0.072	0.080	MAXDET
FU4_SURFSOIL	tbd	Mercury, TCLP	4	3	MG/L	0.00017	0.00021	0.00016	0.0014	0.00024	0.00021	MAXDET
FU4_SURFSOIL	tbd	Zinc TCLP	4	3	MG/L	0.15	35	9	1.90E+24	29	35	MAXDET
FU4_SURFSOIL	VOC	1,1,2,2-TETRACHLOROETHANE	88	2	MG/KG	0.004	0.007	0.0058	0.0059	0.0059	0.0059	LOGNORM
FU4_SURFSOIL	VOC	2-HEXANONE	88	2	MG/KG	0.001	0.001	0.0058	0.0061	0.0059	0.001	MAXDET
FU4_SURFSOIL	VOC	ACETONE	88	26	MG/KG	0.002	0.31	0.021	0.016	0.030	0.016	LOGNORM
FU4_SURFSOIL	VOC	BENZENE	88	1	MG/KG	0.002	0.002	0.0058	0.0060	0.0059	0.002	MAXDET
FU4_SURFSOIL	VOC	BROMOMETHANE	88	2	MG/KG	0.001	0.003	0.0058	0.0061	0.0059	0.003	MAXDET
FU4_SURFSOIL	VOC	CARBON DISULFIDE	88	2	MG/KG	0.001	0.001	0.0057	0.0061	0.0059	0.001	MAXDET
FU4_SURFSOIL	VOC	ETHYLBENZENE	88	1	MG/KG	0.008	0.008	0.0059	0.0060	0.0060	0.0060	LOGNORM
FU4_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	88	8	MG/KG	0.006	0.044	0.0073	0.0075	0.0084	0.0075	LOGNORM
FU4_SURFSOIL	VOC	METHYLENE CHLORIDE	88	18	MG/KG	0.001	0.01	0.0054	0.0061	0.0057	0.0061	LOGNORM
FU4_SURFSOIL	VOC	TETRACHLOROETHYLENE(PCE)	88	1	MG/KG	0.008	0.008	0.0059	0.0060	0.0060	0.0060	LOGNORM
FU4_SURFSOIL	VOC	TOLUENE	88	3	MG/KG	0.002	0.017	0.0061	0.0063	0.0064	0.0063	LOGNORM
FU4_SURFSOIL	VOC	Total Xylenes	88	4	MG/KG	0.001	0.002	0.0057	0.0061	0.0059	0.002	MAXDET
FU4_SURFSOIL	VOC	TRICHLOROETHYLENE (TCE)	88	1	MG/KG	0.005	0.005	0.0058	0.0059	0.0059	0.005	MAXDET
FU4_SURFWATER	Dioxin	1 2 3 4 6 7,8-HEPTACHLORODIBENZOFURAN	7	4	MG/L	0.000000071	0.00000071	0.0000055	0.074	0.000010	0.00000071	MAXDET
FU4_SURFWATER	Dioxin	1,2,3,7 8,9-HEXACHLORODIBENZOFURAN	7	3	MG/L	0.00000006	0.00000023	0.0000072	0.51	0.000012	0.00000023	MAXDET
FU4_SURFWATER	Dioxin	2 3 4 6 7 8-HEXACHLORODIBENZOFURAN	7	4	MG/L	0.0000015	0.0000051	0.0000052	0.000064	0.000009	0.0000051	MAXDET
FU4_SURFWATER	Dioxin	OCTACHLORODIBENZO-p-DIOXIN	7	7	MG/L	0.00000016	0.000027	0.0000071	0.00037	0.000014	0.000027	MAXDET
FU4_SURFWATER	Dioxin	OCTACHLORODIBENZOFURAN	7	6	MG/L	0.000000081	0.0000013	0.0000039	0.00069	0.000011	0.0000013	MAXDET
FU4_SURFWATER	Dioxin	TCDD Equivalent	7	7	MG/L	0.00000000016	0.00000054	0.00000017	0.60	0.00000031	0.00000054	MAXDET
FU4_SURFWATER	DissMetal	Aluminum Dissolved	4	1	MG/L	0.32	0.32	0.1071	390	0.28	0.32	MAXDET
FU4_SURFWATER	DissMetal	Arsenic, Dissolved	7	5	MG/L	0.0042	0.089	0.017	0.79	0.041	0.089	MAXDET
FU4_SURFWATER	DissMetal	Barium Dissolved	4	4	MG/L	0.019	0.029	0.023	0.031	0.028	0.029	MAXDET
FU4_SURFWATER	DissMetal	Calcium Dissolved	4	4	MG/L	7	24	17	79	25	24	MAXDET
FU4_SURFWATER	DissMetal	Chromium, Dissolved	7	2	MG/L	0.0022	0.004	0.0017	0.0028	0.0025	0.004	MAXDET
FU4_SURFWATER	DissMetal	Copper Dissolved	7	1	MG/L	0.030	0.030	0.0070	0.050	0.014	0.030	MAXDET
FU4_SURFWATER	DissMetal	Iron, Dissolved	4	4	MG/L	0.072	0.45	0.21	7	0.41	0.45	MAXDET
FU4_SURFWATER	DissMetal	Lead Dissolved	7	2	MG/L	0.0028	0.0071	0.0021	0.0055	0.0038	0.0071	MAXDET
FU4_SURFWATER	DissMetal	Magnesium, Dissolved	4	4	MG/L	2	2	2	2	2	2	MAXDET
FU4_SURFWATER	DissMetal	Manganese Dissolved	4	4	MG/L	0.0031	0.010	0.0068	0.028	0.010	0.0102	MAXDET

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Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU4_SURFWATER	DissMetal	Potassium, Dissolved	4	4	MG/L	2	3	2	4	3	3	MAXDET
FU4_SURFWATER	DissMetal	Selenium Dissolved	7	1	MG/L	0 010	0 010	0 0020	0 0079	0 0047	0 0101	MAXDET
FU4_SURFWATER	DissMetal	Sodium Dissolved	4	4	MG/L	0 57	2	1	7	2	2	MAXDET
FU4_SURFWATER	DissMetal	Vanadium, Dissolved	4	2	MG/L	0 0018	0 0093	0 0032	3	0 0080	0 0093	MAXDET
FU4_SURFWATER	DissMetal	Zinc Dissolved	7	2	MG/L	0 019	0 059	0 015	0 074	0 030	0 059	MAXDET
FU4_SURFWATER	Metal	ALUMINUM	4	4	MG/L	0 23	2	0 71	49	2	2	MAXDET
FU4_SURFWATER	Metal	ARSENIC	7	5	MG/L	0 0046	0 013	0 0052	0 035	0 0081	0 013	MAXDET
FU4_SURFWATER	Metal	BARIUM	4	4	MG/L	0 020	0 034	0 026	0 039	0 033	0 034	MAXDET
FU4_SURFWATER	Metal	CALCIUM	4	4	MG/L	6	30	18	195	29	30	MAXDET
FU4_SURFWATER	Metal	CHROMIUM TOTAL	7	4	MG/L	0 0029	0 0082	0 0031	0 0089	0 0050	0 0082	MAXDET
FU4_SURFWATER	Metal	COPPER	7	1	MG/L	0 059	0 059	0 011	0 067	0 027	0 059	MAXDET
FU4_SURFWATER	Metal	IRON	4	4	MG/L	0 312	3	0 92	138	2	3	MAXDET
FU4_SURFWATER	Metal	LEAD	7	6	MG/L	0 0026	0 039	0 01	0 080	0 020	0 039	MAXDET
FU4_SURFWATER	Metal	MAGNESIUM	4	4	MG/L	1	2	2	3	2	2	MAXDET
FU4_SURFWATER	Metal	MANGANESE	4	4	MG/L	0 011	0 049	0 02	0 25	0 044	0 049	MAXDET
FU4_SURFWATER	Metal	NICKEL	7	6	MG/L	0 006	0 012	0 0078	0 013	0 010	0 012	MAXDET
FU4_SURFWATER	Metal	POTASSIUM	4	4	MG/L	2	3	2	4	3	3	MAXDET
FU4_SURFWATER	Metal	SODIUM	4	4	MG/L	0 58	2	1	6	2	2	MAXDET
FU4_SURFWATER	Metal	VANADIUM	4	2	MG/L	0 0032	0 004	0 0022	0 094	0 0041	0 004	MAXDET
FU4_SURFWATER	Metal	ZINC	7	7	MG/L	0 025	0 063	0 041	0 056	0 051	0 063	MAXDET
FU4_SURFWATER	OCPest	DDT	7	4	MG/L	0 000066	0 00022	0 000084	0 00014	0 00013	0 00022	MAXDET
FU4_SURFWATER	OCPest	DIELDRIN	7	5	MG/L	0 000034	0 00024	0 00012	0 00036	0 00018	0 00024	MAXDET
FU4_SURFWATER	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	7	1	MG/L	0 019	0 019	0 007	0 011	0 011	0 019	MAXDET
FU4_SURFWATER	SVOC	PENTACHLOROPHENOL	7	3	MG/L	0 006	0 013	0 0051	0 011	0 0080	0 013	MAXDET
FU5_DEEP	GenChem	ALKALINITY, TOTAL (AS CaCO3)	3	3	MG/KG	77300	752000	485100	1 88E+12	1089887	752000	MAXDET
FU5_DEEP	GenChem	MOISTURE PERCENT	3	3	PERCENT	3	11	6	337	13	11	MAXDET
FU5_DEEP	GenChem	pH	20	20	PH UNITS	6	9	8	8	8	8	LOGNORM
FU5_DEEP	GenChem	TOTAL ORGANIC CARBON	3	3	MG/KG	6280	12300	9487	29421	14594	12300	MAXDET
FU5_DEEP	GeoPhys	CATION-EXCHANGE CAPACITY	3	2	MEQ/100G	0 8	7	3	3519010326	9	7	MAXDET
FU5_DEEP	GeoPhys	SIEVE NO 100 PERCENT PASSING	3	3	PERCENT	40	71	51	135	80	71	MAXDET
FU5_DEEP	GeoPhys	SIEVE NO 20 PERCENT PASSING	3	3	PERCENT	76	87	80	93	90	87	MAXDET
FU5_DEEP	GeoPhys	SIEVE NO 200 PERCENT PASSING	3	3	PERCENT	32	67	44	216	78	67	MAXDET
FU5_DEEP	GeoPhys	SIEVE NO 200L PERCENT PASSING	3	3	PERCENT	32	67	44	229	77	67	MAXDET
FU5_DEEP	GeoPhys	SIEVE NO 40 PERCENT PASSING	3	3	PERCENT	58	79	66	95	85	79	MAXDET
FU5_DEEP	GeoPhys	SIEVE NO 80 PERCENT PASSING	3	3	PERCENT	43	72	53	122	81	72	MAXDET
FU5_DEEP	Metal	ALUMINUM	14	14	MG/KG	1950	12200	9619	12952	10803	12200	MAXDET
FU5_DEEP	Metal	ANTIMONY	36	4	MG/KG	0 87	7	3	4	3	4	LOGNORM
FU5_DEEP	Metal	ARSENIC	40	40	MG/KG	4	29	13	15	14	14	NORM
FU5_DEEP	Metal	BARIUM	14	14	MG/KG	22	122	91	122	105	105	NORM
FU5_DEEP	Metal	BERYLLIUM	40	20	MG/KG	0 18	1	0 54	0 61	0 59	0 61	LOGNORM
FU5_DEEP	Metal	CADMIUM	40	13	MG/KG	0 02	77	3	3	6	3	LOGNORM
FU5_DEEP	Metal	CALCIUM	14	14	MG/KG	1050	39800	5445	9638	10319	9638	LOGNORM
FU5_DEEP	Metal	CHROMIUM, TOTAL	40	40	MG/KG	6	48	22	26	25	25	NORM
FU5_DEEP	Metal	COBALT	14	14	MG/KG	3	17	7	9	9	9	LOGNORM
FU5_DEEP	Metal	COPPER	40	40	MG/KG	9	52	23	26	25	26	LOGNORM
FU5_DEEP	Metal	IRON	14	14	MG/KG	6430	24800	16274	19373	18307	18307	NORM
FU5_DEEP	Metal	LEAD	40	40	MG/KG	6	109	24	28	29	28	LOGNORM
FU5_DEEP	Metal	MAGNESIUM	14	14	MG/KG	917	2390	1785	2103	2015	2015	NORM
FU5_DEEP	Metal	MANGANESE	14	14	MG/KG	44	2260	546	1147	799	1147	LOGNORM
FU5_DEEP	Metal	MERCURY	40	7	MG/KG	0 01	0 14	0 050	0 067	0 058	0 067	LOGNORM
FU5_DEEP	Metal	NICKEL	40	40	MG/KG	4	46	23	28	26	28	LOGNORM
FU5_DEEP	Metal	POTASSIUM	14	11	MG/KG	523	2500	1287	3222	1705	1705	NORM

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU5_DEEP	Metal	SELENIUM	40	6	MG/KG	0.76	2	0.59	0.81	0.70	0.81	LOGNORM
FU5_DEEP	Metal	SILVER	40	1	MG/KG	0.6	0.6	0.68	3	0.84	0.6	MAXDET
FU5_DEEP	Metal	SODIUM	14	2	MG/KG	133	192	63	86	85	86	LOGNORM
FU5_DEEP	Metal	THALLIUM	40	1	MG/KG	0.23	0.23	0.69	1	0.84	0.23	MAXDET
FU5_DEEP	Metal	VANADIUM	14	14	MG/KG	7	37	25	31	28	28	NORM
FU5_DEEP	Metal	ZINC	40	40	MG/KG	21	132	72	86	81	81	NORM
FU5_DEEP	OCPest	ALPHA CHLORDANE	32	6	MG/KG	0.00068	0.14	0.034	0.11	0.060	0.11	LOGNORM
FU5_DEEP	OCPest	DDD	32	2	MG/KG	0.013	0.022	0.058	0.15	0.11	0.022	MAXDET
FU5_DEEP	OCPest	DDE	32	15	MG/KG	0.002	0.077	0.064	0.21	0.11	0.077	MAXDET
FU5_DEEP	OCPest	DDT	32	16	MG/KG	0.0022	0.26	0.088	0.44	0.14	0.26	MAXDET
FU5_DEEP	OCPest	DIELDRIN	32	16	MG/KG	0.0041	1	0.19	1	0.35	1	LOGNORM
FU5_DEEP	OCPest	GAMMA-CHLORDANE	32	6	MG/KG	0.00069	0.15	0.035	0.12	0.061	0.12	LOGNORM
FU5_DEEP	PAH	2-METHYLNAPHTHALENE	51	1	MG/KG	0.12	0.12	0.57	0.57	0.85	0.12	MAXDET
FU5_DEEP	PAH	ACENAPHTHENE	51	7	MG/KG	0.086	4	0.53	0.58	0.72	0.58	LOGNORM
FU5_DEEP	PAH	ANTHRACENE	51	11	MG/KG	0.068	7	0.62	0.68	0.90	0.68	LOGNORM
FU5_DEEP	PAH	BENZO(a)ANTHRACENE	51	22	MG/KG	0.054	26	2	2	3	2	LOGNORM
FU5_DEEP	PAH	BENZO(a)PYRENE	51	21	MG/KG	0.057	26	2	2	3	2	LOGNORM
FU5_DEEP	PAH	BENZO(b)FLUORANTHENE	51	21	MG/KG	0.05	26	2	2	3	2	LOGNORM
FU5_DEEP	PAH	BENZO(g h i)PERYLENE	51	17	MG/KG	0.062	18	1	2	2	2	LOGNORM
FU5_DEEP	PAH	BENZO(k)FLUORANTHENE	51	21	MG/KG	0.047	20	2	2	3	2	LOGNORM
FU5_DEEP	PAH	CHRYSENE	51	23	MG/KG	0.04	30	2	2	3	2	LOGNORM
FU5_DEEP	PAH	DIBENZ(a h)ANTHRACENE	51	2	MG/KG	1	4	0.60	0.61	0.90	0.61	LOGNORM
FU5_DEEP	PAH	FLUORANTHENE	51	27	MG/KG	0.047	67	4	6	6	6	LOGNORM
FU5_DEEP	PAH	FLUORENE	51	7	MG/KG	0.061	3	0.46	0.53	0.63	0.53	LOGNORM
FU5_DEEP	PAH	INDENO(1,2 3-c,d)PYRENE	51	18	MG/KG	0.059	17	1	2	2	2	LOGNORM
FU5_DEEP	PAH	NAPHTHALENE	51	2	MG/KG	0.19	1	0.55	0.55	0.81	0.55	LOGNORM
FU5_DEEP	PAH	PHENANTHRENE	51	25	MG/KG	0.055	36	2	3	4	3	LOGNORM
FU5_DEEP	PAH	PYRENE	51	28	MG/KG	0.04	56	3	5	5	5	LOGNORM
FU5_DEEP	SVOC	4-METHYLPHENOL (p-CRESOL)	41	1	MG/KG	0.056	0.056	0.48	0.44	0.80	0.056	MAXDET
FU5_DEEP	SVOC	BENZYL BUTYL PHTHALATE	41	1	MG/KG	0.077	0.077	0.48	0.43	0.80	0.077	MAXDET
FU5_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	41	9	MG/KG	0.046	250	7	1	17	1	LOGNORM
FU5_DEEP	SVOC	CARBAZOLE	41	7	MG/KG	0.048	4	0.45	0.46	0.68	0.46	LOGNORM
FU5_DEEP	SVOC	DI-n-BUTYL PHTHALATE	41	6	MG/KG	0.07	0.14	0.47	0.43	0.79	0.14	MAXDET
FU5_DEEP	SVOC	DIBENZOFURAN	41	3	MG/KG	0.11	1.2	0.45	0.40	0.75	0.40	LOGNORM
FU5_DEEP	SVOC	PENTACHLOROPHENOL	41	2	MG/KG	0.04	0.32	0.25	0.23	0.41	0.23	LOGNORM
FU5_DEEP	tbd	Mercury TCLP	1	1	MG/L	0.00015	0.00015	0.00015	0		0.00015	MAXDET
FU5_DEEP	tbd	Zinc TCLP	1	1	MG/L	0.22	0.22	0.22	0		0.22	MAXDET
FU5_DEEP	VOC	2-HEXANONE	41	3	MG/KG	0.002	0.003	0.0059	0.0064	0.0064	0.003	MAXDET
FU5_DEEP	VOC	ACETONE	41	16	MG/KG	0.004	0.079	0.023	0.026	0.036	0.026	LOGNORM
FU5_DEEP	VOC	BENZENE	41	1	MG/KG	0.002	0.002	0.0060	0.0064	0.0065	0.002	MAXDET
FU5_DEEP	VOC	BROMOMETHANE	41	1	MG/KG	0.002	0.002	0.0060	0.0064	0.0065	0.002	MAXDET
FU5_DEEP	VOC	CARBON DISULFIDE	41	1	MG/KG	0.037	0.037	0.0069	0.0073	0.0082	0.0073	LOGNORM
FU5_DEEP	VOC	ETHYLBENZENE	41	1	MG/KG	0.002	0.002	0.0060	0.0064	0.0065	0.002	MAXDET
FU5_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	41	8	MG/KG	0.002	0.076	0.0099	0.011	0.013	0.011	LOGNORM
FU5_DEEP	VOC	METHYLENE CHLORIDE	41	10	MG/KG	0.002	0.006	0.0051	0.0058	0.0055	0.0058	LOGNORM
FU5_DEEP	VOC	TETRACHLOROETHYLENE(PCE)	41	2	MG/KG	0.001	0.002	0.0059	0.0066	0.0064	0.002	MAXDET
FU5_DEEP	VOC	TOLUENE	41	2	MG/KG	0.001	0.007	0.0060	0.0067	0.0065	0.0067	LOGNORM
FU5_DEEP	VOC	TOTAL 1,2-DICHLOROETHENE	41	1	MG/KG	0.002	0.002	0.006	0.0064	0.0064	0.002	MAXDET
FU5_DEEP	VOC	Total Xylenes	41	1	MG/KG	0.009	0.009	0.0062	0.0065	0.0066	0.0065	LOGNORM
FU5_DEEP	VOC	TRICHLOROETHYLENE (TCE)	41	2	MG/KG	0.085	0.4	0.017	0.012	0.034	0.012	LOGNORM
FU5_SURFSOIL	GenChem	ALKALINITY, TOTAL (AS $CaCO_3$)	3	3	MG/KG	77300	752000	485100	1.88E+12	1089887	752000	MAXDET
FU5_SURFSOIL	GenChem	MOISTURE, PERCENT	3	3	PERCENT	3	11	6	337	13	11	MAXDET

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU5_SURFSOIL	GenChem	pH	8	8	PH UNITS	7	9	8	9	9	9	MAXDET
FU5_SURFSOIL	GenChem	TOTAL ORGANIC CARBON	3	3	MG/KG	6280	12300	9487	29421	14594	12300	MAXDET
FU5_SURFSOIL	GeoPhys	CATION-EXCHANGE CAPACITY	3	2	MEQ/100G	0 8	7	3	3519010326	9	7	MAXDET
FU5_SURFSOIL	GeoPhys	SIEVE NO 100 PERCENT PASSING	3	3	PERCENT	40	71	51	135	80	71	MAXDET
FU5_SURFSOIL	GeoPhys	SIEVE NO 20 PERCENT PASSING	3	3	PERCENT	76	87	80	93	90	87	MAXDET
FU5_SURFSOIL	GeoPhys	SIEVE NO 200 PERCENT PASSING	3	3	PERCENT	32	67	44	216	78	67	MAXDET
FU5_SURFSOIL	GeoPhys	SIEVE NO 200L PERCENT PASSING	3	3	PERCENT	32	67	44	229	77	67	MAXDET
FU5_SURFSOIL	GeoPhys	SIEVE NO 40 PERCENT PASSING	3	3	PERCENT	58	79	66	95	85	79	MAXDET
FU5_SURFSOIL	GeoPhys	SIEVE NO 80 PERCENT PASSING	3	3	PERCENT	43	72	53	122	81	72	MAXDET
FU5_SURFSOIL	Metal	ALUMINUM	9	9	MG/KG	1950	12200	8908	15006	10707	12200	MAXDET
FU5_SURFSOIL	Metal	ANTIMONY	16	3	MG/KG	0 87	7	2	6	3	6	LOGNORM
FU5_SURFSOIL	Metal	ARSENIC	20	20	MG/KG	5	29	12	15	14	15	LOGNORM
FU5_SURFSOIL	Metal	BARIUM	9	9	MG/KG	22	122	102	173	122	122	MAXDET
FU5_SURFSOIL	Metal	BERYLLIUM	20	13	MG/KG	0 18	0 56	0 45	0 54	0 51	0 54	LOGNORM
FU5_SURFSOIL	Metal	CADMIUM	20	11	MG/KG	0 02	6	0 78	4	1	4	LOGNORM
FU5_SURFSOIL	Metal	CALCIUM	9	9	MG/KG	1580	39800	7320	26274	15155	39800	MAXDET
FU5_SURFSOIL	Metal	CHROMIUM, TOTAL	20	20	MG/KG	6	35	17	22	21	22	LOGNORM
FU5_SURFSOIL	Metal	COBALT	9	9	MG/KG	3	12	7	10	9	12	MAXDET
FU5_SURFSOIL	Metal	COPPER	20	20	MG/KG	10	52	21	25	25	25	LOGNORM
FU5_SURFSOIL	Metal	IRON	9	9	MG/KG	6430	19800	15526	20258	18030	19800	MAXDET
FU5_SURFSOIL	Metal	LEAD	20	20	MG/KG	9	109	28	39	37	39	LOGNORM
FU5_SURFSOIL	Metal	MAGNESIUM	9	9	MG/KG	1160	2390	1972	2353	2240	2390	MAXDET
FU5_SURFSOIL	Metal	MANGANESE	9	9	MG/KG	44	713	489	1459	617	713	MAXDET
FU5_SURFSOIL	Metal	MERCURY	20	7	MG/KG	0 01	0 14	0 050	0 085	0 065	0 085	LOGNORM
FU5_SURFSOIL	Metal	NICKEL	20	20	MG/KG	4	39	18	24	21	21	NORM
FU5_SURFSOIL	Metal	POTASSIUM	9	8	MG/KG	743	2500	1645	5992	2167	2500	MAXDET
FU5_SURFSOIL	Metal	SELENIUM	20	3	MG/KG	0 76	1	0 53	0 89	0 67	0 89	LOGNORM
FU5_SURFSOIL	Metal	SILVER	20	1	MG/KG	0 6	0 6	0 48	3	0 69	0 6	MAXDET
FU5_SURFSOIL	Metal	SODIUM	9	2	MG/KG	133	192	76	131	110	192	MAXDET
FU5_SURFSOIL	Metal	VANADIUM	9	9	MG/KG	7	28	21	30	25	28	MAXDET
FU5_SURFSOIL	Metal	ZINC	20	20	MG/KG	29	108	66	77	75	77	LOGNORM
FU5_SURFSOIL	OCPest	ALPHA-CHLORDANE	23	6	MG/KG	0 00068	0 14	0 047	0 24	0 08	0 14	MAXDET
FU5_SURFSOIL	OCPest	DDD	23	2	MG/KG	0 013	0 022	0 081	0 30	0 15	0 022	MAXDET
FU5_SURFSOIL	OCPest	DDE	23	14	MG/KG	0 0038	0 077	0 089	0 27	0 15	0 077	MAXDET
FU5_SURFSOIL	OCPest	DDT	23	15	MG/KG	0 0022	0 26	0 12	0 37	0 19	0 26	MAXDET
FU5_SURFSOIL	OCPest	DIELDRIN	23	15	MG/KG	0 0041	1	0 27	2	0 48	1	MAXDET
FU5_SURFSOIL	OCPest	GAMMA-CHLORDANE	23	6	MG/KG	0 00069	0 15	0 048	0 26	0 084	0 15	MAXDET
FU5_SURFSOIL	PAH	2-METHYLNAPHTHALENE	30	1	MG/KG	0 12	0 12	0 82	1	1	0 12	MAXDET
FU5_SURFSOIL	PAH	ACENAPHTHENE	30	7	MG/KG	0 086	4	0 75	1	1	1	LOGNORM
FU5_SURFSOIL	PAH	ANTHRACENE	30	8	MG/KG	0 14	7	0 92	1	1	1	LOGNORM
FU5_SURFSOIL	PAH	BENZO(a)ANTHRACENE	30	17	MG/KG	0 07	26	3	9	5	9	LOGNORM
FU5_SURFSOIL	PAH	BENZO(a)PYRENE	30	16	MG/KG	0 064	26	3	8	5	8	LOGNORM
FU5_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	30	16	MG/KG	0 08	26	3	8	5	8	LOGNORM
FU5_SURFSOIL	PAH	BENZO(g h i)PERYLENE	30	14	MG/KG	0 062	18	2	6	4	6	LOGNORM
FU5_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	30	16	MG/KG	0 077	20	3	8	4	8	LOGNORM
FU5_SURFSOIL	PAH	CHRYSENE	30	17	MG/KG	0 081	30	3	10	5	10	LOGNORM
FU5_SURFSOIL	PAH	DIBENZ(a h)ANTHRACENE	30	2	MG/KG	1	4	0 88	1	1	1	LOGNORM
FU5_SURFSOIL	PAH	FLUORANTHENE	30	21	MG/KG	0 047	67	6	41	10	41	LOGNORM
FU5_SURFSOIL	PAH	FLUORENE	30	7	MG/KG	0 061	3	0 65	1	0 91	1	LOGNORM
FU5_SURFSOIL	PAH	INDENO(1 2 3-c d)PYRENE	30	14	MG/KG	0 059	17	2	6	4	6	LOGNORM
FU5_SURFSOIL	PAH	NAPHTHALENE	30	2	MG/KG	0 19	1	0 78	1	1	1	LOGNORM
FU5_SURFSOIL	PAH	PHENANTHRENE	30	19	MG/KG	0 055	36	4	16	6	16	LOGNORM

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU5_SURFSOIL	PAH	PYRENE	30	22	MG/KG	0.04	56	5	32	9	32	LOGNORM
FU5_SURFSOIL	SVOC	4-METHYLPHENOL (p-CRESOL)	20	1	MG/KG	0.056	0.056	0.77	1	1	0.056	MAXDET
FU5_SURFSOIL	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	20	4	MG/KG	0.1	250	13	11	35	11	LOGNORM
FU5_SURFSOIL	SVOC	CARBAZOLE	20	6	MG/KG	0.12	4	0.71	1	1	1	LOGNORM
FU5_SURFSOIL	SVOC	DIBENZOFURAN	20	3	MG/KG	0.11	1	0.70	0.87	1	0.87	LOGNORM
FU5_SURFSOIL	SVOC	PENTACHLOROPHENOL	20	2	MG/KG	0.04	0.32	0.40	0.59	0.74	0.32	MAXDET
FU5_SURFSOIL	tbd	Mercury TCLP	1	1	MG/L	0.00015	0.00015	0.00015	0		0.00015	MAXDET
FU5_SURFSOIL	tbd	Zinc, TCLP	1	1	MG/L	0.22	0.22	0.22	0		0.22	MAXDET
FU5_SURFSOIL	VOC	2-HEXANONE	20	3	MG/KG	0.002	0.003	0.0053	0.0061	0.0058	0.003	MAXDET
FU5_SURFSOIL	VOC	ACETONE	20	4	MG/KG	0.004	0.005	0.037	0.087	0.062	0.005	MAXDET
FU5_SURFSOIL	VOC	BENZENE	20	1	MG/KG	0.002	0.002	0.0055	0.0061	0.0059	0.002	MAXDET
FU5_SURFSOIL	VOC	BROMOMETHANE	20	1	MG/KG	0.002	0.002	0.0055	0.0061	0.0059	0.002	MAXDET
FU5_SURFSOIL	VOC	CARBON DISULFIDE	20	1	MG/KG	0.037	0.037	0.0073	0.0083	0.010	0.0083	LOGNORM
FU5_SURFSOIL	VOC	ETHYLBENZENE	20	1	MG/KG	0.002	0.002	0.0055	0.0061	0.0059	0.002	MAXDET
FU5_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	20	5	MG/KG	0.016	0.076	0.013	0.019	0.020	0.019	LOGNORM
FU5_SURFSOIL	VOC	METHYLENE CHLORIDE	20	4	MG/KG	0.003	0.006	0.0052	0.0058	0.0056	0.0058	LOGNORM
FU5_SURFSOIL	VOC	TOLUENE	20	2	MG/KG	0.001	0.007	0.0055	0.0068	0.0060	0.0068	LOGNORM
FU5_SURFSOIL	VOC	Total Xylenes	20	1	MG/KG	0.009	0.009	0.0059	0.0062	0.0062	0.0062	LOGNORM
FU6_DEEP	Metal	ALUMINUM	14	14	MG/KG	5120	14200	10934	12487	11994	11994	NORM
FU6_DEEP	Metal	ANTIMONY	23	9	MG/KG	0.42	3	1	2	2	2	LOGNORM
FU6_DEEP	Metal	ARSENIC	24	24	MG/KG	1	35	14	22	17	22	LOGNORM
FU6_DEEP	Metal	BARIUM	14	14	MG/KG	78	163	107	120	119	120	LOGNORM
FU6_DEEP	Metal	BERYLLIUM	24	18	MG/KG	0.23	0.61	0.43	0.77	0.48	0.61	MAXDET
FU6_DEEP	Metal	CADMIUM	24	14	MG/KG	0.04	0.62	0.37	0.53	0.45	0.53	LOGNORM
FU6_DEEP	Metal	CALCIUM	14	14	MG/KG	954	33800	4071	5472	8128	5472	LOGNORM
FU6_DEEP	Metal	CHROMIUM TOTAL	24	24	MG/KG	11	28	17	19	19	19	LOGNORM
FU6_DEEP	Metal	COBALT	14	14	MG/KG	5	17	7	8	9	8	LOGNORM
FU6_DEEP	Metal	COPPER	24	24	MG/KG	9	51	23	28	26	28	LOGNORM
FU6_DEEP	Metal	IRON	14	14	MG/KG	9190	24700	16028	18081	17790	18081	LOGNORM
FU6_DEEP	Metal	LEAD	24	24	MG/KG	7	136	28	42	38	42	LOGNORM
FU6_DEEP	Metal	MAGNESIUM	14	14	MG/KG	1480	3630	2186	2432	2426	2432	LOGNORM
FU6_DEEP	Metal	MANGANESE	14	14	MG/KG	49	681	448	735	521	521	NORM
FU6_DEEP	Metal	MERCURY	24	8	MG/KG	0.02	0.12	0.037	0.054	0.046	0.054	LOGNORM
FU6_DEEP	Metal	NICKEL	24	24	MG/KG	12	42	20	23	24	23	LOGNORM
FU6_DEEP	Metal	POTASSIUM	14	14	MG/KG	401	2740	1823	2762	2191	2740	MAXDET
FU6_DEEP	Metal	SELENIUM	24	11	MG/KG	0.66	2	0.85	2	1	1	NORM
FU6_DEEP	Metal	SODIUM	14	2	MG/KG	152	274	92	145	125	145	LOGNORM
FU6_DEEP	Metal	VANADIUM	14	14	MG/KG	17	32	25	27	26	26	NORM
FU6_DEEP	Metal	ZINC	24	24	MG/KG	27	541	91	116	127	116	LOGNORM
FU6_DEEP	OCPest	ALPHA-CHLORDANE	30	2	MG/KG	0.0032	0.049	0.026	0.11	0.039	0.049	MAXDET
FU6_DEEP	OCPest	DDD	30	3	MG/KG	0.0056	0.13	0.053	0.23	0.079	0.13	MAXDET
FU6_DEEP	OCPest	DDE	30	13	MG/KG	0.0086	1	0.11	0.72	0.19	0.72	LOGNORM
FU6_DEEP	OCPest	DDT	30	13	MG/KG	0.0068	2	0.18	2	0.31	2	LOGNORM
FU6_DEEP	OCPest	DIELDRIN	30	12	MG/KG	0.016	0.73	0.14	2	0.21	0.73	MAXDET
FU6_DEEP	OCPest	GAMMA-CHLORDANE	30	2	MG/KG	0.0037	0.055	0.027	0.12	0.040	0.055	MAXDET
FU6_DEEP	ORG	Total Polynuclear Aromatic Hydrocarbons	33	9	MG/KG	0.18	99	6	7	12	7	LOGNORM
FU6_DEEP	PAH	ANTHRACENE	33	3	MG/KG	0.038	3	0.60	0.99	0.94	0.99	LOGNORM
FU6_DEEP	PAH	BENZO(a)ANTHRACENE	33	6	MG/KG	0.049	7	0.69	1	1	1	LOGNORM
FU6_DEEP	PAH	BENZO(a)PYRENE	33	6	MG/KG	0.06	6	0.69	0.98	1	0.98	LOGNORM
FU6_DEEP	PAH	BENZO(b)FLUORANTHENE	33	5	MG/KG	0.06	8	0.78	1	1	1	LOGNORM
FU6_DEEP	PAH	BENZO(g,h,i)PERYLENE	33	6	MG/KG	0.044	7	0.63	0.92	1	0.92	LOGNORM
FU6_DEEP	PAH	BENZO(k)FLUORANTHENE	33	5	MG/KG	0.066	7	0.79	1	1	1	LOGNORM

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU6_DEEP	PAH	CHRYSENE	33	6	MG/KG	0.069	9	0.86	1	1	1	LOGNORM
FU6_DEEP	PAH	FLUORANTHENE	33	9	MG/KG	0.061	20	1	2	3	2	LOGNORM
FU6_DEEP	PAH	FLUORENE	33	1	MG/KG	2	2	0.59	0.87	0.91	0.87	LOGNORM
FU6_DEEP	PAH	INDENO(1,2,3-c,d)PYRENE	33	5	MG/KG	0.042	6	0.66	1	1	1	LOGNORM
FU6_DEEP	PAH	PHENANTHRENE	33	7	MG/KG	0.048	18	1	1	2	1	LOGNORM
FU6_DEEP	PAH	PYRENE	33	9	MG/KG	0.044	14	1	2	2	2	LOGNORM
FU6_DEEP	PCB	PCB-1260 (AROCHLOR 1260)	22	1	MG/KG	6	6	0.85	7	1	6	MAXDET
FU6_DEEP	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	24	4	MG/KG	0.046	5	0.71	0.93	1	0.93	LOGNORM
FU6_DEEP	SVOC	CARBAZOLE	24	2	MG/KG	0.063	2	0.32	0.38	0.46	0.38	LOGNORM
FU6_DEEP	SVOC	DI-n-BUTYL PHTHALATE	24	1	MG/KG	0.044	0.044	0.49	0.87	0.92	0.044	MAXDET
FU6_DEEP	VOC	2-HEXANONE	29	3	MG/KG	0.002	0.004	0.016	0.013	0.034	0.004	MAXDET
FU6_DEEP	VOC	ACETONE	29	1	MG/KG	0.004	0.004	0.035	0.053	0.055	0.004	MAXDET
FU6_DEEP	VOC	BENZENE	29	5	MG/KG	0.001	2	0.093	0.068	0.21	0.068	LOGNORM
FU6_DEEP	VOC	BROMOMETHANE	29	4	MG/KG	0.001	0.004	0.016	0.013	0.034	0.004	MAXDET
FU6_DEEP	VOC	CARBON DISULFIDE	29	1	MG/KG	0.008	0.008	0.017	0.013	0.034	0.008	MAXDET
FU6_DEEP	VOC	CARBON TETRACHLORIDE	29	1	MG/KG	0.011	0.011	0.017	0.013	0.034	0.011	MAXDET
FU6_DEEP	VOC	CHLOROFORM	29	3	MG/KG	0.002	0.043	0.018	0.015	0.035	0.015	LOGNORM
FU6_DEEP	VOC	CHLOROMETHANE	29	1	MG/KG	0.002	0.002	0.016	0.013	0.034	0.002	MAXDET
FU6_DEEP	VOC	ETHYLBENZENE	29	3	MG/KG	0.001	0.36	0.021	0.018	0.042	0.018	LOGNORM
FU6_DEEP	VOC	METHYL ETHYL KETONE (2-BUTANONE)	29	3	MG/KG	0.016	0.017	0.019	0.018	0.037	0.017	MAXDET
FU6_DEEP	VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	29	1	MG/KG	0.006	0.006	0.016	0.012	0.034	0.006	MAXDET
FU6_DEEP	VOC	METHYLENE CHLORIDE	29	6	MG/KG	0.001	0.009	0.016	0.013	0.034	0.009	MAXDET
FU6_DEEP	VOC	TETRACHLOROETHYLENE(PCE)	29	2	MG/KG	0.004	0.013	0.017	0.013	0.034	0.013	LOGNORM
FU6_DEEP	VOC	TOLUENE	29	1	MG/KG	0.004	0.004	0.016	0.012	0.034	0.004	MAXDET
FU6_DEEP	VOC	Total Xylenes	29	7	MG/KG	0.001	0.57	0.046	0.047	0.087	0.047	LOGNORM
FU6_DEEP	VOC	TRICHLOROETHYLENE (TCE)	29	2	MG/KG	0.002	0.002	0.016	0.013	0.034	0.002	MAXDET
FU6_SEDIMENT	Metal	ALUMINUM	2	2	MG/KG	3270	8210	5740	1591849	21336	8210	MAXDET
FU6_SEDIMENT	Metal	ANTIMONY	2	2	MG/KG	154	1210	682	1.42E+15	4016	1210	MAXDET
FU6_SEDIMENT	Metal	ARSENIC	2	1	MG/KG	5	5	3	69830844889	17	5	MAXDET
FU6_SEDIMENT	Metal	BARIUM	2	2	MG/KG	3630	3650	3640	3676	3703	3650	MAXDET
FU6_SEDIMENT	Metal	BERYLLIUM	2	1	MG/KG	0.33	0.33	0.17	1.11E+48	1	0.33	MAXDET
FU6_SEDIMENT	Metal	CADMIUM	2	2	MG/KG	27	33	30	43	47	33	MAXDET
FU6_SEDIMENT	Metal	CALCIUM	2	2	MG/KG	30800	79100	54950	20187045	207433	79100	MAXDET
FU6_SEDIMENT	Metal	CHROMIUM, TOTAL	2	2	MG/KG	158	257	208	1039	520	257	MAXDET
FU6_SEDIMENT	Metal	COBALT	2	2	MG/KG	65	91	78	181	159	91	MAXDET
FU6_SEDIMENT	Metal	COPPER	2	2	MG/KG	2500	14200	8350	4.56E+12	45287	14200	MAXDET
FU6_SEDIMENT	Metal	IRON	2	2	MG/KG	95900	133000	114450	263246	231575	133000	MAXDET
FU6_SEDIMENT	Metal	LEAD	2	2	MG/KG	3110	3570	3340	4374	4792	3570	MAXDET
FU6_SEDIMENT	Metal	MAGNESIUM	2	2	MG/KG	11600	17000	14300	41372	31348	17000	MAXDET
FU6_SEDIMENT	Metal	MANGANESE	2	2	MG/KG	505	739	622	1789	1361	739	MAXDET
FU6_SEDIMENT	Metal	MERCURY	2	1	MG/KG	0.67	0.67	0.34	3.02E+69	2	0.67	MAXDET
FU6_SEDIMENT	Metal	NICKEL	2	2	MG/KG	83	139	111	692	289	139	MAXDET
FU6_SEDIMENT	Metal	POTASSIUM	2	2	MG/KG	1050	1400	1225	2431	2330	1400	MAXDET
FU6_SEDIMENT	Metal	SELENIUM	2	2	MG/KG	50	182	116	8004619	533	182	MAXDET
FU6_SEDIMENT	Metal	SILVER	2	1	MG/KG	49	49	25	4.68E+82	179	49	MAXDET
FU6_SEDIMENT	Metal	SODIUM	2	2	MG/KG	804	1750	1277	70344	4264	1750	MAXDET
FU6_SEDIMENT	Metal	THALLIUM	2	1	MG/KG	21	21	11	4.79E+34	75	21	MAXDET
FU6_SEDIMENT	Metal	VANADIUM	2	2	MG/KG	12	15	13	27	26	15	MAXDET
FU6_SEDIMENT	Metal	ZINC	2	2	MG/KG	4980	5570	5275	6562	7138	5570	MAXDET
FU6_SEDIMENT	ORG	PETROLEUM HYDROCARBONS	2	2	MG/KG	1410	1460	1435	1535	1593	1460	MAXDET
FU6_SEDIMENT	PAH	ACENAPHTHENE	2	1	MG/KG	0.56	0.56	1	651	4	0.56	MAXDET
FU6_SEDIMENT	PAH	ANTHRACENE	2	1	MG/KG	1	1	1	2	2	1	MAXDET

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU6_SEDIMENT	PAH	BENZO(a)ANTHRACENE	2	2	MG/KG	3	7	5	250	16	7	MAXDET
FU6_SEDIMENT	PAH	BENZO(a)PYRENE	2	2	MG/KG	3	5	4	42	12	5	MAXDET
FU6_SEDIMENT	PAH	BENZO(b)FLUORANTHENE	2	2	MG/KG	5	9	7	83	19	9	MAXDET
FU6_SEDIMENT	PAH	BENZO(g h,i)PERYLENE	2	2	MG/KG	0 39	2	1	1779262792	7	2	MAXDET
FU6_SEDIMENT	PAH	BENZO(k)FLUORANTHENE	2	1	MG/KG	3	3	4	6	6	3	MAXDET
FU6_SEDIMENT	PAH	CHRYSENE	2	2	MG/KG	5	10	7	149	23	10	MAXDET
FU6_SEDIMENT	PAH	DIBENZ(a h)ANTHRACENE	2	1	MG/KG	0 86	0 86	1	9	3	0 86	MAXDET
FU6_SEDIMENT	PAH	FLUORANTHENE	2	2	MG/KG	3	9	6	11502	25	9	MAXDET
FU6_SEDIMENT	PAH	FLUORENE	2	1	MG/KG	0 6	0 6	1	277	4	0 6	MAXDET
FU6_SEDIMENT	PAH	INDENO(1 2 3-c d)PYRENE	2	1	MG/KG	2	2	2	3	3	2	MAXDET
FU6_SEDIMENT	PAH	PHENANTHRENE	2	2	MG/KG	2	7	4	167076	19	7	MAXDET
FU6_SEDIMENT	PAH	PYRENE	2	2	MG/KG	6	10	8	57	21	10	MAXDET
FU6_SEDIMENT	SVOC	4-METHYLPHENOL (p-CRESOL)	2	1	MG/KG	5	5	3	6874	14	5	MAXDET
FU6_SEDIMENT	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	2	2	MG/KG	8	13	10	77	28	13	MAXDET
FU6_SEDIMENT	SVOC	CARBAZOLE	2	1	MG/KG	0 83	0 83	1	12	3	0 83	MAXDET
FU6_SEDIMENT	SVOC	PHENOL	2	1	MG/KG	0 76	0 76	1	127	4	0 76	MAXDET
FU6_SURFSOIL	Metal	ALUMINUM	7	7	MG/KG	5120	13400	10617	14321	12632	13400	MAXDET
FU6_SURFSOIL	Metal	ANTIMONY	13	4	MG/KG	0 7	3	1	2	2	2	LOGNORM
FU6_SURFSOIL	Metal	ARSENIC	14	14	MG/KG	4	35	18	29	23	29	LOGNORM
FU6_SURFSOIL	Metal	BARIUM	7	7	MG/KG	87	163	110	131	129	163	MAXDET
FU6_SURFSOIL	Metal	BERYLLIUM	14	11	MG/KG	0 23	0 53	0 42	1	0 49	0 53	MAXDET
FU6_SURFSOIL	Metal	CADMIUM	14	9	MG/KG	0 04	0 62	0 39	0 74	0 51	0 51	NORM
FU6_SURFSOIL	Metal	CALCIUM	7	7	MG/KG	954	33800	6508	38526	15359	33800	MAXDET
FU6_SURFSOIL	Metal	CHROMIUM, TOTAL	14	14	MG/KG	11	28	17	19	19	19	LOGNORM
FU6_SURFSOIL	Metal	COBALT	7	7	MG/KG	5	17	8	12	11	17	MAXDET
FU6_SURFSOIL	Metal	COPPER	14	14	MG/KG	12	51	26	33	31	33	LOGNORM
FU6_SURFSOIL	Metal	IRON	7	7	MG/KG	14700	24700	18086	21159	20773	24700	MAXDET
FU6_SURFSOIL	Metal	LEAD	14	14	MG/KG	10	136	40	70	56	70	LOGNORM
FU6_SURFSOIL	Metal	MAGNESIUM	7	7	MG/KG	1480	3630	2329	2980	2829	3630	MAXDET
FU6_SURFSOIL	Metal	MANGANESE	7	7	MG/KG	242	601	466	614	552	601	MAXDET
FU6_SURFSOIL	Metal	MERCURY	14	7	MG/KG	0 02	0 12	0 043	0 062	0 055	0 062	LOGNORM
FU6_SURFSOIL	Metal	NICKEL	14	14	MG/KG	12	40	19	23	23	23	LOGNORM
FU6_SURFSOIL	Metal	POTASSIUM	7	7	MG/KG	401	2650	1768	4165	2354	2650	MAXDET
FU6_SURFSOIL	Metal	SELENIUM	14	6	MG/KG	0 66	2	0 84	2	1	2	LOGNORM
FU6_SURFSOIL	Metal	SODIUM	7	1	MG/KG	152	152	64	116	95	152	MAXDET
FU6_SURFSOIL	Metal	VANADIUM	7	7	MG/KG	20	29	24	27	27	29	MAXDET
FU6_SURFSOIL	Metal	ZINC	14	14	MG/KG	40	541	116	165	177	165	LOGNORM
FU6_SURFSOIL	OCPest	ALPHA-CHLORDANE	23	2	MG/KG	0 0032	0 049	0 033	0 23	0 050	0 049	MAXDET
FU6_SURFSOIL	OCPest	DDD	23	3	MG/KG	0 0056	0 13	0 068	0 47	0 10	0 13	MAXDET
FU6_SURFSOIL	OCPest	DDE	23	13	MG/KG	0 0086	1	0 15	2	0 24	1	MAXDET
FU6_SURFSOIL	OCPest	DDT	23	13	MG/KG	0 0068	2	0 23	4	0 40	2	MAXDET
FU6_SURFSOIL	OCPest	DIELDRIN	23	12	MG/KG	0 016	0 73	0 18	4	0 26	0 73	MAXDET
FU6_SURFSOIL	OCPest	GAMMA-CHLORDANE	23	2	MG/KG	0 0037	0 055	0 035	0 26	0 052	0 055	MAXDET
FU6_SURFSOIL	ORG	Total Polynuclear Aromatic Hydrocarbons	16	8	MG/KG	0 2	99	12	168	26	99	MAXDET
FU6_SURFSOIL	PAH	ANTHRACENE	16	3	MG/KG	0 038	3	0 97	5	2	3	MAXDET
FU6_SURFSOIL	PAH	BENZO(a)ANTHRACENE	16	6	MG/KG	0 049	7	1	5	2	5	LOGNORM
FU6_SURFSOIL	PAH	BENZO(a)PYRENE	16	6	MG/KG	0 06	6	1	4	2	4	LOGNORM
FU6_SURFSOIL	PAH	BENZO(b)FLUORANTHENE	16	5	MG/KG	0 06	8	1	6	2	6	LOGNORM
FU6_SURFSOIL	PAH	BENZO(g h,i)PERYLENE	16	6	MG/KG	0 044	7	1	4	2	4	LOGNORM
FU6_SURFSOIL	PAH	BENZO(k)FLUORANTHENE	16	5	MG/KG	0 066	7	1	7	2	7	LOGNORM
FU6_SURFSOIL	PAH	CHRYSENE	16	6	MG/KG	0 069	9	2	6	3	6	LOGNORM
FU6_SURFSOIL	PAH	FLUORANTHENE	16	8	MG/KG	0 078	20	3	13	5	13	LOGNORM

TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU6_SURFSOIL	PAH	FLUORENE	16	1	MG/KG	2	2	1	3	2	2	MAXDET
FU6_SURFSOIL	PAH	INDENO(1 2,3-c d)PYRENE	16	5	MG/KG	0.042	6	1	5	2	5	LOGNORM
FU6_SURFSOIL	PAH	PHENANTHRENE	16	6	MG/KG	0.048	18	2	11	4	11	LOGNORM
FU6_SURFSOIL	PAH	PYRENE	16	8	MG/KG	0.044	14	2	11	4	11	LOGNORM
FU6_SURFSOIL	PCB	PCB-1260 (AROCHLOR 1260)	15	1	MG/KG	6	6	1	8	2	6	MAXDET
FU6_SURFSOIL	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	11	1	MG/KG	0.14	0.14	0.86	2	2	0.14	MAXDET
FU6_SURFSOIL	SVOC	CARBAZOLE	11	2	MG/KG	0.063	2	0.45	1	0.77	1	LOGNORM
FU6_SURFSOIL	SVOC	DI-n-BUTYL PHTHALATE	11	1	MG/KG	0.044	0.044	0.82	8	2	0.044	MAXDET
FU6_SURFSOIL	VOC	2 HEXANONE	13	3	MG/KG	0.002	0.004	0.0054	0.0067	0.0061	0.004	MAXDET
FU6_SURFSOIL	VOC	BENZENE	13	2	MG/KG	0.001	0.001	0.0052	0.0089	0.0062	0.001	MAXDET
FU6_SURFSOIL	VOC	BROMOMETHANE	13	2	MG/KG	0.002	0.004	0.0055	0.0067	0.0061	0.004	MAXDET
FU6_SURFSOIL	VOC	CARBON DISULFIDE	13	1	MG/KG	0.008	0.008	0.006	0.0065	0.0065	0.0065	NORM
FU6_SURFSOIL	VOC	CHLOROFORM	13	1	MG/KG	0.005	0.005	0.0057	0.0061	0.0060	0.005	MAXDET
FU6_SURFSOIL	VOC	CHLOROMETHANE	13	1	MG/KG	0.002	0.002	0.0055	0.0067	0.0062	0.002	MAXDET
FU6_SURFSOIL	VOC	ETHYLBENZENE	13	1	MG/KG	0.001	0.001	0.0055	0.0078	0.0062	0.001	MAXDET
FU6_SURFSOIL	VOC	METHYL ETHYL KETONE (2-BUTANONE)	13	2	MG/KG	0.016	0.017	0.011	0.016	0.015	0.016	LOGNORM
FU6_SURFSOIL	VOC	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	13	1	MG/KG	0.006	0.006	0.0057	0.0061	0.0060	0.006	MAXDET
FU6_SURFSOIL	VOC	METHYLENE CHLORIDE	13	2	MG/KG	0.004	0.005	0.0055	0.0060	0.0060	0.005	MAXDET
FU6_SURFSOIL	VOC	TETRACHLOROETHYLENE(PCE)	13	2	MG/KG	0.004	0.013	0.0060	0.0071	0.0071	0.0071	LOGNORM
FU6_SURFSOIL	VOC	TOLUENE	13	1	MG/KG	0.004	0.004	0.0057	0.0062	0.0061	0.004	MAXDET
FU6_SURFSOIL	VOC	Total Xylenes	13	1	MG/KG	0.003	0.003	0.0056	0.0064	0.0061	0.003	MAXDET
FU6_SURFSOIL	VOC	TRICHLOROETHYLENE (TCE)	13	1	MG/KG	0.002	0.002	0.0055	0.0067	0.0062	0.002	MAXDET
FU7_GW	Metal	ALUMINUM	54	42	MG/L	0.0113	126	4	9	8	9	LOGNORM
FU7_GW	Metal	ANTIMONY	60	3	MG/L	0.0017	0.0022	0.0024	0.0028	0.0027	0.0022	MAXDET
FU7_GW	Metal	ARSENIC	60	8	MG/L	0.0023	0.091	0.0031	0.0023	0.0056	0.0023	LOGNORM
FU7_GW	Metal	BARIUM	54	54	MG/L	0.031	0.39	0.12	0.13	0.14	0.13	LOGNORM
FU7_GW	Metal	BERYLLIUM	60	9	MG/L	0.00018	0.0059	0.00025	0.00025	0.00042	0.00025	LOGNORM
FU7_GW	Metal	CADMIUM	60	26	MG/L	0.0003	0.085	0.0041	0.010	0.0069	0.010	LOGNORM
FU7_GW	Metal	CALCIUM	54	54	MG/L	11	116	22	24	26	24	LOGNORM
FU7_GW	Metal	CHROMIUM TOTAL	60	36	MG/L	0.0012	0.28	0.017	0.027	0.027	0.027	LOGNORM
FU7_GW	Metal	COBALT	54	27	MG/L	0.00088	0.086	0.0060	0.011	0.0092	0.011	LOGNORM
FU7_GW	Metal	COPPER	60	27	MG/L	0.0011	0.21	0.014	0.026	0.022	0.026	LOGNORM
FU7_GW	Metal	IRON	55	49	MG/L	0.048	136	8	39	13	39	LOGNORM
FU7_GW	Metal	LEAD	60	28	MG/L	0.0011	0.11	0.0055	0.0062	0.0087	0.0062	LOGNORM
FU7_GW	Metal	MAGNESIUM	54	54	MG/L	4	19	10	11	10	11	LOGNORM
FU7_GW	Metal	MANGANESE	54	47	MG/L	0.00092	3	0.20	0.90	0.30	0.90	LOGNORM
FU7_GW	Metal	MERCURY	60	4	MG/L	0.00013	0.00029	0.000063	0.000068	0.000073	0.000068	LOGNORM
FU7_GW	Metal	NICKEL	60	30	MG/L	0.00085	0.21	0.010	0.021	0.016	0.021	LOGNORM
FU7_GW	Metal	POTASSIUM	54	40	MG/L	0.85	14	2	3	3	3	LOGNORM
FU7_GW	Metal	SELENIUM	60	3	MG/L	0.0041	0.006	0.0016	0.0018	0.0018	0.0018	LOGNORM
FU7_GW	Metal	SILVER	60	1	MG/L	0.011	0.011	0.00057	0.00053	0.00087	0.00053	LOGNORM
FU7_GW	Metal	SODIUM	54	46	MG/L	7	43	18	21	20	21	LOGNORM
FU7_GW	Metal	VANADIUM	54	37	MG/L	0.00031	0.26	0.012	0.021	0.020	0.021	LOGNORM
FU7_GW	Metal	ZINC	60	29	MG/L	0.0027	0.35	0.037	0.060	0.051	0.060	LOGNORM
FU7_GW	PAH	CHRYSENE	48	1	MG/L	0.001	0.001	0.0049	0.0053	0.0051	0.001	MAXDET
FU7_GW	SVOC	bis(2-ETHYLHEXYL) PHTHALATE	48	5	MG/L	0.001	0.019	0.0059	0.0064	0.0071	0.0064	LOGNORM
FU7_GW	SVOC	DIETHYL PHTHALATE	48	1	MG/L	0.001	0.001	0.0049	0.0053	0.0051	0.001	MAXDET
FU7_GW	SVOC	DI-n-BUTYL PHTHALATE	48	1	MG/L	0.002	0.002	0.0049	0.0051	0.0050	0.002	MAXDET
FU7_GW	SVOC	DI-n-OCTYLPHTHALATE	48	1	MG/L	0.004	0.004	0.0050	0.0050	0.0050	0.004	MAXDET
FU7_GW	VOC	1 1 1-TRICHLOROETHANE	73	4	MG/L	0.001	0.014	0.0049	0.0053	0.0052	0.0053	LOGNORM
FU7_GW	VOC	1 1 2 2-TETRACHLOROETHANE	73	2	MG/L	0.002	0.004	0.0049	0.0050	0.0050	0.004	MAXDET
FU7_GW	VOC	1,2-DICHLOROETHANE	73	1	MG/L	0.001	0.001	0.0049	0.0051	0.0050	0.001	MAXDET

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TABLE H-1

Data Summaries for all Detected Chemicals for All Functional Units and Surrogate Sites

Memphis Depot Main Installation RI

Area of Concern	Class	Parameter Name	Number of Analyses	Number of Detects	Units	Minimum Detected Concentration	Maximum Detected Concentration	Arithmetic Mean Value*	UCL95 Lognormal	UCL95 Normal	EPC	Basis
FU7_GW	VOC	2-HEXANONE	73	1	MG/L	0 005	0 005	0 0050	0 0050	0 005	0 005	MAXDET
FU7_GW	VOC	ACETONE	73	3	MG/L	0 014	0 19	0 0081	0 0069	0 012	0 0069	LOGNORM
FU7_GW	VOC	BENZENE	74	1	MG/L	0 003	0 003	0 0048	0 0052	0 0050	0 003	MAXDET
FU7_GW	VOC	BROMODICHLOROMETHANE	73	2	MG/L	0 001	0 002	0 0048	0 0051	0 0050	0 002	MAXDET
FU7_GW	VOC	BROMOFORM	73	1	MG/L	0 001	0 001	0 0049	0 0051	0 0050	0 001	MAXDET
FU7_GW	VOC	CARBON DISULFIDE	73	1	MG/L	0 001	0 001	0 0049	0 0051	0 0050	0 001	MAXDET
FU7_GW	VOC	CARBON TETRACHLORIDE	73	10	MG/L	0 001	0 004	0 0046	0 0051	0 0048	0 004	MAXDET
FU7_GW	VOC	CHLOROBENZENE	73	2	MG/L	0 001	0 004	0 0049	0 0051	0 0050	0 004	MAXDET
FU7_GW	VOC	CHLOROETHANE	73	1	MG/L	0 001	0 001	0 0049	0 0052	0 0050	0 001	MAXDET
FU7_GW	VOC	CHLOROFORM	73	9	MG/L	0 001	0 005	0 0045	0 0052	0 0048	0 005	MAXDET
FU7_GW	VOC	CHLOROMETHANE	73	1	MG/L	0 001	0 001	0 0049	0 0052	0 0050	0 001	MAXDET
FU7_GW	VOC	DIBROMOCHLOROMETHANE	73	2	MG/L	0 001	0 002	0 0048	0 0051	0 0050	0 002	MAXDET
FU7_GW	VOC	METHYL ETHYL KETONE (2-BUTANONE)	73	4	MG/L	0 004	0 009	0 0051	0 0051	0 0052	0 0051	LOGNORM
FU7_GW	VOC	TETRACHLOROETHYLENE(PCE)	73	28	MG/L	0 001	0 12	0 012	0 013	0 016	0 013	LOGNORM
FU7_GW	VOC	TOLUENE	74	1	MG/L	0 002	0 002	0 0048	0 0052	0 0050	0 0020	MAXDET
FU7_GW	VOC	TOTAL 1 2-DICHLOROETHENE	73	7	MG/L	0 001	0 009	0 0048	0 0053	0 0050	0 0053	LOGNORM
FU7_GW	VOC	TRICHLOROETHYLENE (TCE)	73	25	MG/L	0 001	0 058	0 0061	0 0068	0 0076	0 0068	LOGNORM

Notes
* = Arithmetic Mean Value consists of both detects and half the detection limit of nondetects
DEEP = Soil column, 0-10 feet bgs
GW = Groundwater
SURFSOIL = Surface soil 0-2 feet bgs

APPENDIX H2

RADB Statistics

This section describes the statistics used in the RADB toolset. The exposure point concentration (EPC) is calculated in the RADB toolset. The EPC is defined as the highest exposure that is reasonably expected to occur at a site (EPA, 1989). The EPC is used to calculate the potential risk posed by a site and is calculated using EPA guidance for statistical analysis of groundwater monitoring data (EPA, 1989 and EPA, 1992a), where appropriate.

The specific statistical methodology used to evaluate the EPC is described below. Section 1.1 describes the methodology for small data sets (data sets with less than ten analytical results). Section 1.2 describes the basic tests and equations used to select the statistical protocol. Section 1.3 describes the specific statistical tests used to evaluate the normality of the data set, thereby selecting the appropriate equations for calculating the EPC. Section 1.4 presents the references that serve as the basis of the statistical protocol.

1.1 EPC for Data Sets with Less than 10 Analytical Results

For data sets consisting of nine or less valid analytical results, the maximum detected concentration is used as the EPC.

1.2 EPC for Data Sets with 10 or More Analytical Results

For data sets with ten or more analytical results, the methodology used for calculating the EPC is described below.

There are two different ways to calculate the EPC in the RADB toolset, using a frequency of non-detect analysis or a simple EPC calculation. The methodology for the simple EPC calculation used for the Depot is presented graphically in Figure 1-1.

1.2.1 Calculation of 95% Upper Confidence Limit (UCL_{95})

If the data set was distributed normally, the 95 percent UCL was calculated using the following formula (EPA, 1992a):

$$UCL = \bar{x} + t\left(\frac{s}{\sqrt{n}}\right) \qquad (1)$$

Where:

UCL = upper confidence limit

$\bar{x}$ = mean of the untransformed data

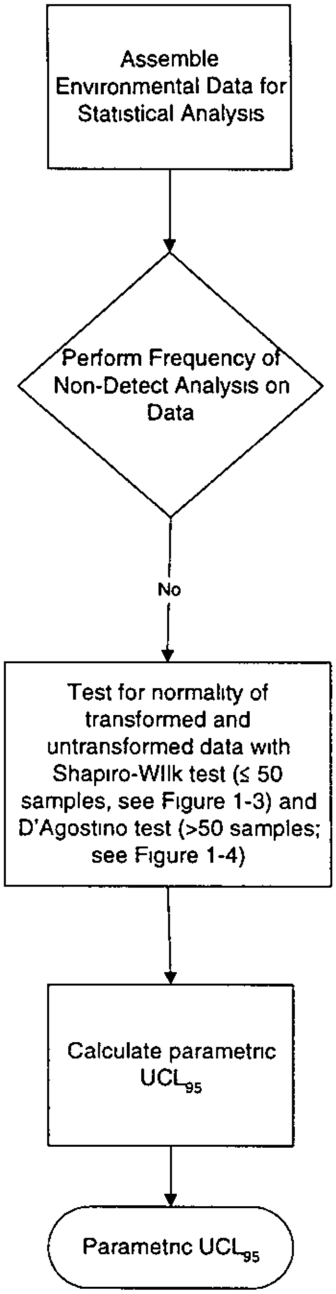

FIGURE 1-1
Overview of Statistical Protocol

t = Student-t statistic (e.g., from Table A2 published in Gilbert, 1987)

s = standard deviation of the untransformed data

n = number of samples

If the data set was distributed lognormally, the 95 percent UCL was calculated using the following formula (EPA, 1992a):

$$UCL = e^{\left(\bar{x}+0.5s^2+sH/\sqrt{n-1}\right)} \qquad (2)$$

Where:

UCL = upper confidence limit

e = constant (base of the natural log, equal to 2.718)

$\bar{x}$ = mean of the log-transformed data

s = standard deviation of the log-transformed data

H = H-statistic (Table A12 in Gilbert, 1987)

n = number of samples

If the Shapiro-Wilk test indicated that the data for data sets between 9 and 50 samples follow both normal and lognormal distributions, the distribution with the largest W-test statistic was selected, and the 95 percent UCL was calculated using either Equation 1 or Equation 2, as appropriate.

If the D'Agostino test indicated that the data of sets with more than 50 samples fit both normal and lognormal distributions, the assumption was that the data was distributed lognormally and the 95 percent UCL was calculated using log-transformed data and Equation 2. This assumption was based on Gilbert's *Statistical Methods for Environmental Pollution Monitoring* (1987) and the Resource Conservation and Recovery Act (RCRA) guidance for statistical analysis of data (EPA, 1989). These references state that, in general, environmental data most closely follow a lognormal distribution. The RCRA guidance explains that pollutant sources are randomly and repeatedly diluted by mixing in the environmental media, which leads mathematically to a lognormal distribution of concentrations. Therefore, the lognormal distribution is usually more appropriate as a default statistical model than the normal distribution.

If either test (Shapiro-Wilk or D'Agostino) indicated that the data set did not fit either the normal or lognormal distributions, a nonparametric confidence interval was calculated according the methodology in the RCRA guidance (EPA, 1989) described in Section 1.3.3 below.

All calculated 95 percent UCLs were compared to the maximum detected concentration, and if the 95 percent UCL was greater than the maximum detected concentration, then the maximum detected concentration was used as the EPC.

1.3 Statistical Tests for Calculating Sample Set Normality

The statistical tests used to evaluate the normality of the sample set are described below. The normality of the sample set was used for selecting the most representative equation for calculating the EPC.

1.3.1 Shapiro-Wilk Test (10 to 50 Analytical Results)

The Shapiro-Wilk test (W-test) was used for data sets with 4 to 50 analytical results. The W-test is based on the assumption that if a set of data (or the natural log values of a data set) is normally distributed, the ordered values should be highly correlated with corresponding quantiles taken from a normal distribution. The W-test gives substantial weight to evidence of non-normality in the tails of the distribution, where the robustness of statistical tests based on the normality assumption is most severely affected (EPA, 1992b).

The methodology used to calculate the EPC based on the W-test is presented graphically in Figure 1-2. The following steps were followed to calculate the W-test statistic:

1. Begin with the log transformed data set and order the data from smallest to largest concentration $\left(x_{(i)}\right)$ and from largest to the smallest concentration $\left(x_{(n-i+1)}\right)$; where n is the number of observations.
2. Compute the differences $x_{(n-i+1)} - x_{(i)}$.
3. Compute k as the greatest integer less than or equal to $n/2$, where n is the number of samples and k is used to identify the coefficients for the W-test.
4. Look up the coefficient a_{n-i+1} from Table A-1 in the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Addendum to Interim Final Guidance* (EPA, 1992b).
5 Compute the mean ($\bar{x}$) and standard deviation (SD) of the log transformed data set using the following formulas:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \tag{3}$$

Where:

n	=	total number of observations
x_i	=	i[th] observation
$\bar{x}$	=	mean of the log transformed data

and

$$SD = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} \tag{4}$$

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Where:

SD	=	standard deviation of the log transformed data
x_i	=	i^{th} observation
$\bar{x}$	=	mean of the log transformed data (from Equation 3)
n	=	total number of observations

6. Calculate the W-test statistic using the following equation:

$$W = \left[\frac{b}{SD\sqrt{n-1}} \right]^2 \qquad (5)$$

and

$$b = \sum_{i=1}^{k} a_{n-i+1} \left(x_{(n-i+1)} - x_{(i)} \right) \qquad (6)$$

Where:

SD	=	standard deviation of the log transformed data
n	=	total number of observations
a_{n-i+1}	=	coefficient for the W-test

7. Compare the W-test statistic to the 5 percent critical value for sample size n in Table A-2 of *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Addendum to Interim Final Guidance* (EPA, 1992b). If the W-statistic is greater than the critical value, the data set is considered normally distributed.

8. The same tests for normality are conducted on the untransformed data using the methods described above. If both the untransformed data set and log-transformed data set had W-test statistics greater than the critical value, the distribution with the greater test statistic was selected for calculating the 95 percent UCL.

9 If the W-test indicated that the data set deviated from both the normal and lognormal distributions, a nonparametric UCI was calculated according to methodology described in Section 1.3.3.

1.3.2 D'Agostino's Test (More than 50 Analytical Results)

The D'Agostino test was used to evaluate the normality of the data sets with more than 50 samples. The methodology used to calculate the EPC based on the D'Agostino test is presented graphically in Figure 1-3. The test uses the following steps (Gilbert, 1987):

1. Order the data from smallest to largest.

2. Compute the D statistic from the following equation:

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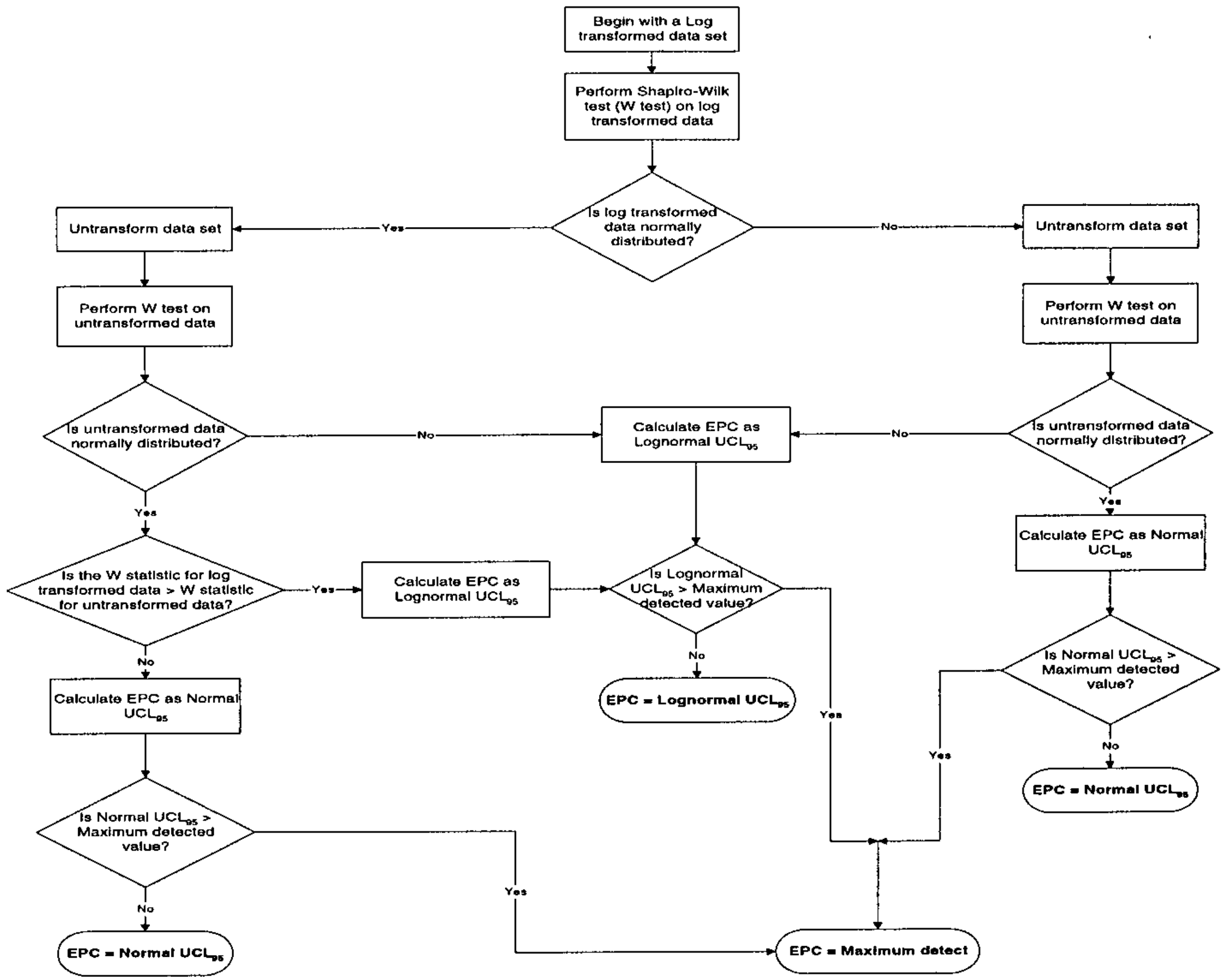

FIGURE 1-2
Shapiro-Wilk test (W test) Protocol

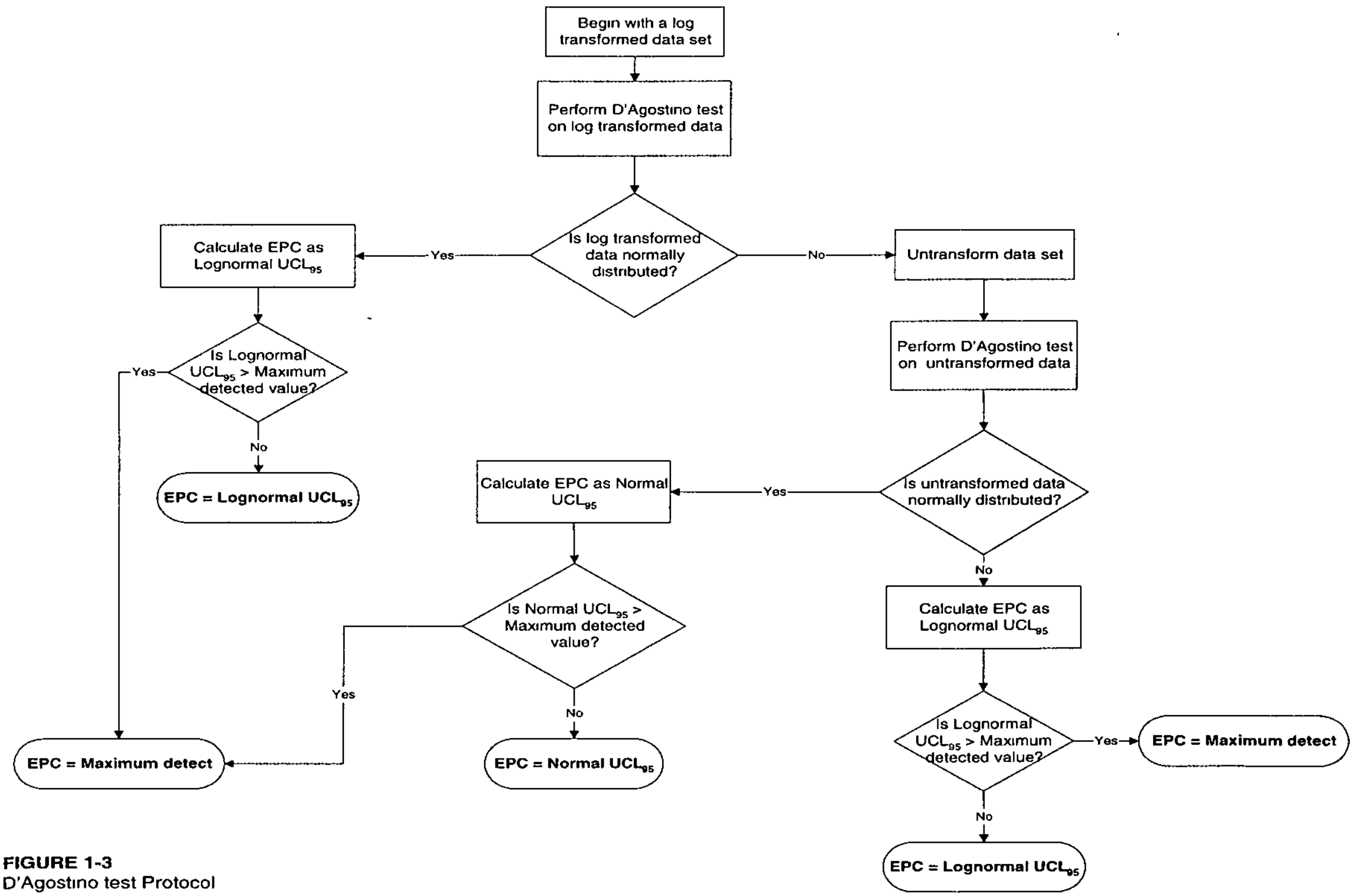

FIGURE 1-3
D'Agostino test Protocol

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$$D = \frac{\sum_{i=1}^{n}\left[i - \frac{1}{2}(n+1)\right]x_{[i]}}{n^2 s} \tag{7}$$

where

$$s = \left[\frac{1}{n}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2\right]^{\frac{1}{2}} \tag{8}$$

and

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \tag{9}$$

3. Transform the D statistic to the statistic Y by computing:

$$Y = \frac{D - 0.28209479}{0.02998598 / \sqrt{n}} \tag{10}$$

If n is large and the data are drawn from a normal distribution, then the expected value of Y is zero. For nonnormal distributions, Y will tend to be either less than or greater than zero, depending on the particular distribution. This fact necessitates a two-tailed test.

If Y is less than the $\alpha/2$ (i.e., 0.025) quantile or greater than the 1-$\alpha/2$ (i.e., 0.975) quantile of the distribution of Y (Table A8 in Gilbert, 1987), the untransformed data do not fit a normal distribution at the 95 percent significance level (or α = 0.05).

If the data do not follow a normal distribution, then the values are transformed by taking the natural logarithm of each concentration value to check if the data are distributed lognormally. The same tests for distribution fit were conducted on the log-transformed data using the methods described above. If the test indicated the untransformed data set and log transformed data set do not follow a normal distribution, a nonparametric upper confidence interval is evaluated (Section 1.3.3).

1.4 References

EPA, 1989. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Interim Final Guidance.* Office of Solid Waste Management Division. PB89-151047. April.

EPA, 1992a. *Supplemental Guidance to RAGS: Calculating the Concentration Term.* Office of Solid Waste and Emergency Response. Publication 9285.7-081. May.

EPA, 1992b. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Addendum to Interim Final Guidance.* Office of Solid Waste, Permits and State Programs Division. June.

Gilbert, 1987. R.O. Gilbert. *Statistical Methods for Environmental Pollution Monitoring.* Van Nostrand Reinhold. New York.

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TAB

Appendix I

TAB

Appendix I

Risk and Hazard Estimations for all FUs/
Surrogate Sites

Risk and Hazard Estimations for all FUs and Surrogate Sites

The following are included in this appendix:

- **I-1**–Risk estimation methodology tables
- **I-2**–FU1 Soils
- **I-3**–FU2 Soils (Parcel 3 and Site 59, FU2 Sediments; FU2 Surface Water
- **I-4**–FU3 Soils; FU3 Sediments
- **I-5**–FU4 Soils; FU4 Sediments
- **I-6**–FU5 Soils
- **I-7**–FU6 Soils; FU6 Sediments
- **I-8**–FU7 Groundwater

In accordance with Section 4.7.1.4 of the Statement of Work, the following persons performed and checked calculations contained in this appendix:

Full Name	Title	Date
Elizabeth L. Harland	Envir. Scientist 2	01/10/00
[illegible]	Project Scientist 5	1/10/2000.

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Appendix I-1
Risk Methodology Tabl(

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TABLE I1-1

Risk Methodology for Ingestion of Soil/Sediment

Memphis Depot Main Installation RI

Carcinogenic

Intake $\frac{mg}{kg\text{-}day} = \frac{Cs \times IR \times FI \times EF \times ED \times CF}{BW \times ATc}$

Noncarcinogenic

Intake $\frac{mg}{kg\text{-}day} = \frac{Cs \times IR \times FI \times EF \times ED \times CF}{BW \times ATnc}$

where

Cs	=	concentration of chemical (e g , mg/kg soil)
IR	=	media intake rate (e g , kg soil ingested/day)
FI	=	fraction ingested (unitless)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
CF	=	conversion factor (kg/mg)
BW	=	body weight (kg)
ATc	=	carcinogenic averaging time (lifetime over which exposure is averaged, in days)
ATnc	=	noncarcinogenic averaging time (ED over which exposure is averaged, in days)

Example calculations for an industrial worker are provided below

TCDD EPC = 1 30E-05

Carcinogenic

Intake $\frac{mg}{kg\text{-}day} = \frac{Cs \times IR \times FI \times EF \times ED \times CF}{BW \times ATc} = \frac{EPC \times 50 \times 1 \times 250 \times 25 \times 1E\text{-}6}{70 \times 25550} = \frac{4\ 06E\text{-}06}{1\ 79E{+}06} = 2\ 27E\text{-}12$

Noncarcinogenic

Intake $\frac{mg}{kg\text{-}day} = \frac{Cs \times IR \times FI \times EF \times ED \times CF}{BW \times ATnc} = \frac{EPC \times 50 \times 1 \times 250 \times 25 \times 1E\text{-}6}{70 \times 9125} = \frac{4\ 06E\text{-}06}{6\ 39E{+}05} = 6\ 36E\text{-}12$

TABLE I1-2

Risk Methodology for Dermal Exposure to Soil/Sediment

Memphis Depot Main Installation RI

Carcinogenic

$$\text{Intake} \quad \frac{mg}{kg\text{-}day} = \frac{Cs \times SA \times AF \times ABS \times ET \times EF \times ED \times CF}{BW \times ATc}$$

Noncarcinogenic

$$\text{Intake} \quad \frac{mg}{kg\text{-}day} = \frac{Cs \times SA \times AF \times ABS \times ET \times EF \times ED \times CF}{BW \times ATnc}$$

where

Cs	=	concentration of chemical (e g , mg/kg soil)
SA	=	surface area (cm^2)
AF	=	soil-skin adherence factor (mg/cm^2)
ABS	=	chemical-specific absorption factor (unitless)
ET	=	exposure time (hours/hours)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
CF	=	conversion factor (kg/mg)
BW	=	body weight (kg)
ATc	=	carcinogenic averaging time (lifetime over which exposure is averaged, in days)
ATnc	=	noncarcinogenic averaging time (ED over which exposure is averaged, in days)

Example calculations for an industrial worker are provided below

TCDD EPC = 1 30E-05

ABS = 3.00E-02

Carcinogenic

$$\text{Intake} \quad \frac{mg}{kg\text{-}day} = \frac{Cs \times SA \times AF \times ABS \times ET \times EF \times ED \times CF}{BW \times ATc} = \frac{EPC \times 2679 \times \ 03 \times ABS \times 1 \times 250 \times 25 \times 1E\text{-}6}{70 \times 25550} = \frac{1\ 96E\text{-}07}{1\ 79E\text{+}06} = 1\ 10E\text{-}13$$

Noncarcinogenic

$$\text{Intake} \quad \frac{mg}{kg\text{-}day} = \frac{Cs \times SA \times AF \times ABS \times ET \times EF \times ED \times CF}{BW \times ATnc} = \frac{EPC \times 2679 \times \ 03 \times ABS \times 1 \times 250 \times 25 \times 1E\text{-}6}{70 \times 9125} = \frac{1\ 96E\text{-}07}{6\ 39E\text{+}05} = 3\ 07E\text{-}13$$

TABLE I1-3

Risk Methodology for Inhalation of Soil Particulates

Memphis Depot Main Installation RI

Carcinogenic

$$\text{Intake}\ \frac{\text{mg}}{\text{kg-day}} = \frac{\text{Cs x ((1/PEF)+(1/VFind)) x IRinh x FI x EF x ED}}{\text{BW x ATc}}$$

Noncarcinogenic

$$\text{Intake}\ \frac{\text{mg}}{\text{kg-day}} = \frac{\text{Cs x ((1/PEF)+(1/VFind)) x IRinh x FI x EF x ED}}{\text{BW x ATnc}}$$

where

Cs	=	concentration of chemical (e g , mg/kg soil)
PEF	=	particulate emission factor (m^3/kg)
VFind	=	chemical-specific volatilization factor (m^3/kg) - industrial
ET	=	exposure time (hours/hours)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
CF	=	conversion factor (kg/mg)
BW	=	body weight (kg)
ATc	=	carcinogenic averaging time (lifetime over which exposure is averaged, in days)
ATnc	=	noncarcinogenic averaging time (ED over which exposure is averaged, in days)

Example calculations for an industrial worker are provided below

TCDD	EPC	=	1 30E-05
	VFind	=	1 10E+07

Carcinogenic

$$\text{Intake}\ \frac{\text{mg}}{\text{kg-day}} = \frac{\text{Cs x ((1/PEF)+(1/VFind)) x IRinh x FI x EF x ED}}{\text{BW x ATc}} = \frac{\text{EPC x (1/1 32e+9) x (1/VFind) x 20 x 1 x 250 x 25}}{\text{70 x 25550}} = \frac{\text{1 49E-07}}{\text{1 79E+06}} = \text{8 33E-14}$$

Noncarcinogenic

$$\text{Intake}\ \frac{\text{mg}}{\text{kg-day}} = \frac{\text{Cs x ((1/PEF)+(1/VFind)) x IRinh x FI x EF x ED}}{\text{BW x ATnc}} = \frac{\text{EPC x (1/1 32e+9) x (1/VFind) x 20 x 1 x 250 x 25}}{\text{70 x 9125}} = \frac{\text{1 49E-07}}{\text{6 39E+05}} = \text{2 33E-13}$$

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TABLE I1-4

Risk Methodology for Ingestion of Groundwater

Memphis Depot Main Installation RI

Carcinogenic

$$\text{Intake}\ \frac{mg}{kg\text{-}day} = \frac{Cgw \times IR \times EF \times ED}{BW \times ATc}$$

Noncarcinogenic

$$\text{Intake}\ \frac{mg}{kg\text{-}day} = \frac{Cgw \times IR \times EF \times ED}{BW \times ATnc}$$

where

Cgw	=	concentration of chemical (e g , mg/L in water)
IR	=	media intake rate (e g , L water ingested/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
ATc	=	carcinogenic averaging time (lifetime over which exposure is averaged, in days)
ATnc	=	noncarcinogenic averaging time (ED over which exposure is averaged, in days)

Example calculations for an industrial worker are provided below

TCDD EPC = 1 30E-05

Carcinogenic

$$\text{Intake}\ \frac{mg}{kg\text{-}day} = \frac{Cgw \times IR \times EF \times ED}{BW \times ATc} = \frac{EPC \times 50 \times 250 \times 25}{70 \times 25550} = \frac{4\ 06E{+}00}{1\ 79E{+}06} = 2\ 27E\text{-}06$$

Noncarcinogenic

$$\text{Intake}\ \frac{mg}{kg\text{-}day} = \frac{Cgw \times IR \times EF \times ED}{BW \times ATnc} = \frac{EPC \times 50 \times 250 \times 25}{70 \times 9125} = \frac{4\ 06E{+}00}{6\ 39E{+}05} = 6\ 36E\text{-}06$$

TABLE I1-5

Risk Methodology for Dermal Exposure to Groundwater

Memphis Depot Main Installation RI

Carcinogenic

Intake $\frac{mg}{kg\text{-}day} = \frac{Cgw \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times ATc}$

Noncarcinogenic

Intake $\frac{mg}{kg\text{-}day} = \frac{Cgw \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times ATnc}$

where

Cgw	=	concentration of chemical (e g , mg/L in water)
SA	=	surface area (cm^2)
PC	=	chemical-specific permeability constant (cm/hr)
ET	=	exposure time (hours/hours)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
CF	=	conversion factor (L/cm^3)
BW	=	body weight (kg)
ATc	=	carcinogenic averaging time (lifetime over which exposure is averaged, in days)
ATnc	=	noncarcinogenic averaging time (ED over which exposure is averaged, in days)

Example calculations for an industrial worker are provided below

TCDD EPC = 1 30E-05

PC = 1 4E+00

Carcinogenic

Intake $\frac{mg}{kg\text{-}day} = \frac{Cgw \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times ATc} = \frac{EPC \times 2679 \times PC \times 1 \times 250 \times 25 \times 1E\text{-}3}{70 \times 25550} = \frac{3\ 05E\text{-}01}{1\ 79E\text{+}06} = 1\ 70E\text{-}07$

Noncarcinogenic

Intake $\frac{mg}{kg\text{-}day} = \frac{Cgw \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times ATnc} = \frac{EPC \times 2679 \times PC \times 1 \times 250 \times 25 \times 1E\text{-}3}{70 \times 9125} = \frac{3\ 05E\text{-}01}{6\ 39E\text{+}05} = 4\ 77E\text{-}07$

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Appendix I-2
A. FU1 Soils

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TABLE I2-1a
FU1 Surface Soil -Hypothetical Current/Future Maintenance Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 c	50 c
FI =	Fraction Ingested (unitless)	0 5	0 5
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 e,g	0 03 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles:*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 i	1 32E+09 i
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) j	(Chemical Specific) j
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday

c = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

d = Maintenance activity assumed to be once a week throughout the year (excluding vacation)

e= U S EPA Exposure Factors Handbook, August 1997

f = Surface area of 1/2 head, forearms and the hands of an adult worker

g = AF calculated for soil adherence can be found in Appendix G

h = Chemical-specific absorption factors are found in Appendix G

i = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996

j = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C , December 1998

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TABLE I2-1b

FU1 Surface Soil -Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	ANTIMONY	D					4 62E+00	2 00E-02	0 001	8 08E-08		2 60E-10		4 90E-11	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		2 63E+01	4 10E-01	0 03	4 59E-07	6 9E-07	4 43E-08	1 6E-07	2 78E-10	4 2E-09
MG/KG	MERCURY	D					1 22E-01	1 00E-04	0 001	2 13E-09		6 84E-12		1 29E-12	
MG/KG	DDE	B2	3 40E-01	4 86E-01			5 82E+00	7 00E-01	0 1	1 02E-07	3 5E-08	3 27E-08	1 6E-08	6 17E-11	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01		5 30E+00	7 00E-01	0 1	9 27E-08	3 2E-08	2 98E-08	1 4E-08	5 62E-11	1 9E-11
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		8 08E-01	5 00E-01	0 1	1 41E-08	2 3E-07	4 54E-09	1 5E-07	8 56E-12	1 4E-10
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 22E+00	2 00E+00		3 23E+00	9 00E-01	0 06	5 65E-08	1 1E-07	1 09E-08	2 4E-08	3 42E-11	6 8E-11
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		1 11E+01	3 10E-01	0 1	1 94E-07	1 4E-07	6 24E-08	1.5E-07	1 18E-10	3 6E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		1 26E+01	3 10E-01	0 13	2 20E-07	1 6E-06	9 18E-08	2 2E-06	1 33E-10	4 1E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		1 28E+01	3 10E-01	0 1	2 24E-07	1 6E-07	7 21E-08	1 7E-07	1 36E-10	4 2E-11
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		1 30E+01	3 10E-01	0 1	2 27E-07	1 7E-08	7 29E-08	1 7E-08	1 37E-10	4 3E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			3 06E+00	7 00E-01	0 1	5 36E-08	1 1E-09	1 72E-08	4 9E-10	3 25E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		1 38E+01	3 10E-01	0 1	2 42E-07	1 8E-09	7 77E-08	1 8E-09	1 47E-10	4 5E-13
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		3 04E+00	3 10E-01	0 1	5 31E-08	3 9E-07	1 71E-08	4 0E-07	3 22E-11	1 0E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		8 97E+00	3 10E-01	0 1	1 57E-07	1 1E-07	5 04E-08	1 2E-07	9 50E-11	2 9E-11
MG/KG	PETROLEUM HYDROCARBONS					9 13E+11	6 41E+01	5 00E-01	0 01	1 12E-06		3 60E-08		6 80E-10	
	Total Risk										**4E-06**		**3E-06**		**5E-09**
													Total Risk =	**7E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I2-1c

FU1 Surface Soil -Hypothetical Current/Future Maintenance Worker Non-carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			4 62E+00	2 00E-02	0 001	2 26E-07	0 0006	7 27E-10	0 00009	1 37E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			2 63E+01	4 10E-01	0 03	1 29E-06	0 004	1 24E-07	0 001	7 79E-10	
MG/KG	MERCURY	D			8 57E-05		1 22E-01	1 00E-04	0 001	5 96E-09		1 91E-11		3 61E-12	0 00000004
MG/KG	DDE	B2					5 82E+00	7 00E-01	0 1	2 85E-07		9 16E-08		1 73E-10	
MG/KG	DDT	B2	5 00E-04	3 50E-04			5 30E+00	7 00E-01	0 1	2 60E-07	0 0005	8 34E-08	0 0002	1 57E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			8 08E-01	5 00E-01	0 1	3 95E-08	0 0008	1 27E-08	0 0005	2 40E-11	
MG/KG	PCB-1260 (AROCLOR 1260)	B2					3 23E+00	9 00E-01	0 06	1 58E-07		3 05E-08		9 59E-11	
MG/KG	BENZO(a)ANTHRACENE	B2					1 11E+01	3 10E-01	0 1	5 43E-07		1 75E-07		3 29E-10	
MG/KG	BENZO(a)PYRENE	B2					1 26E+01	3 10E-01	0 13	6 15E-07		2 57E-07		3 73E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2					1 28E+01	3 10E-01	0 1	6 28E-07		2 02E-07		3 80E-10	
MG/KG	BENZO(k)FLUORANTHENE	B2					1 30E+01	3 10E-01	0 1	6 35E-07		2 04E-07		3 85E-10	
MG/KG	CARBAZOLE	B2					3 06E+00	7 00E-01	0 1	1 50E-07		4 82E-08		9 09E-11	
MG/KG	CHRYSENE	B2					1 38E+01	3 10E-01	0 1	6 77E-07		2 18E-07		4 10E-10	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					3 04E+00	3 10E-01	0 1	1 49E-07		4 78E-08		9 00E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					8 97E+00	3 10E-01	0 1	4 39E-07		1 41E-07		2 66E-10	
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	6 00E-02	9 13E+11	6 41E+01	5 00E-01	0 01	3 14E-06	0 00008	1 01E-07	0 000005	1 90E-09	0 00000003
	Hazard Index										**0.006**		**0.002**		**0.00000007**
													Total HI=	**0 01**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I2-2a
FU1 Surface Soil -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = U S EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996
h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C , December 1998

TABLE I2-2b

FU1 Surface Soil Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ANTIMONY	D					4 62E+00	2 00E-02	0 001	8 08E-07		1 30E-09		2 45E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		2 63E+01	4 10E-01	0 03	4 59E-06	6 9E-06	2 21E-07	8 1E-07	1 39E-09	2 1E-08
MG/KG	MERCURY	D					1 22E-01	1 00E-04	0 001	2 13E-08		3 42E-11		6 45E-12	
MG/KG	DDE	B2	3 40E-01	4 86E-01			5 82E+00	7 00E-01	0 1	1 02E-06	3 5E-07	1 64E-07	7 9E-08	3 08E-10	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01		5 30E+00	7 00E-01	0 1	9 27E-07	3 2E-07	1 49E-07	7 2E-08	2 81E-10	9 5E-11
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		8 08E-01	5 00E-01	0 1	1 41E-07	2 3E-06	2 27E-08	7 3E-07	4 28E-11	6 8E-10
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 22E+00	2 00E+00		3 23E+00	9 00E-01	0 06	5 65E-07	1 1E-06	5 45E-08	1 2E-07	1 71E-10	3 4E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		1 11E+01	3 10E-01	0 1	1 94E-06	1 4E-06	3 12E-07	7 3E-07	5 88E-10	1 8E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		1 26E+01	3 10E-01	0 13	2 20E-06	1 6E-05	4 59E-07	1 1E-05	6 66E-10	2 1E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		1 28E+01	3 10E-01	0 1	2 24E-06	1 6E-06	3 60E-07	8 5E-07	6 79E-10	2 1E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		1 30E+01	3 10E-01	0 1	2 27E-06	1 7E-07	3 65E-07	8 6E-08	6 87E-10	2 1E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			3 06E+00	7 00E-01	0 1	5 36E-07	1 1E-08	8 61E-08	2 5E-09	1 62E-10	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		1 38E+01	3 10E-01	0 1	2 42E-06	1 8E-08	3 89E-07	9 2E-09	7 33E-10	2 3E-12
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		3 04E+00	3 10E-01	0 1	5 31E-07	3 9E-06	8 53E-08	2 0E-06	1 61E-10	5 0E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		8 97E+00	3 10E-01	0 1	1 57E-06	1 1E-06	2 52E-07	5 9E-07	4 75E-10	1 5E-10
MG/KG	PETROLEUM HYDROCARBONS					9 13E+11	6 41E+01	5 00E-01	0 01	1 12E-05		1 80E-07		3 40E-09	
	Total Risk										**4E-05**		**2E-05**		**3E-08**
													Total Risk =	**5E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I2-2c

FU1 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D	4 00E 04	8 00E-06			4 62E+00	2 00E-02	0 001	2 26E-06	0 006	3 64E-09	0 0005	6 85E-10	
MG/KG	ARSENIC	A	3 00E 04	1 23E-04			2 63E+01	4 10E-01	0 03	1 29E-05	0 04	6 20E-07	0 005	3 90E-09	
MG/KG	MERCURY	D			8 57E-05		1 22E 01	1 00E-04	0 001	5 96E-08		9 57E-11		1 80E-11	0 0000002
MG/KG	DDE	B2					5 82E+00	7 00E-01	0 1	2 85E-06		4 58E-07		8 63E-10	
MG/KG	DDT	B2	5 00E-04	3 50E-04			5 30E+00	7 00E-01	0 1	2 60E-06	0 005	4 17E-07	0 001	7 86E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			8 08E-01	5 00E-01	0 1	3 95E-07	0 008	6 35E-08	0 003	1 20E-10	
MG/KG	PCB-1260 (AROCLOR 1260)	B2					3 23E+00	9 00E-01	0 06	1 58E-06		1 53E-07		4 79E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					1 11E+01	3 10E-01	0 1	5 43E-06		8 73E-07		1 65E-09	
MG/KG	BENZO(a)PYRENE	B2					1 26E+01	3 10E-01	0 13	6 15E-06		1 29E-06		1 86E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2					1 28E+01	3 10E-01	0 1	6 28E-06		1 01E-06		1 90E 09	
MG/KG	BENZO(k)FLUORANTHENE	B2					1 30E+01	3 10E-01	0 1	6 35E-06		1 02E-06		1 92E 09	
MG/KG	CARBAZOLE	B2					3 06E+00	7 00E-01	0 1	1 50E-06		2 41E-07		4 54E 10	
MG/KG	CHRYSENE	B2					1 38E+01	3 10E-01	0 1	6 77E-06		1 09E-06		2 05E-09	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					3 04E+00	3 10E-01	0 1	1 49E-06		2 39E-07		4 50E-10	
MG/KG	INDENO(1,2 3-c,d)PYRENE	B2					8 97E+00	3 10E-01	0 1	4 39E-06		7 06E-07		1 33E-09	
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	6 00E-02	9 13E+11	6 41E+01	5 00E-01	0 01	3 14E-05	0 0008	5 04E-07	0 00003	9 52E-09	0 0000002
	Hazard Index										**0 06**		**0 009**		**0 0000004**
													Total HI=	**0 1**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I2-3a
FU1 Soil Column -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles:*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity.
c = U S EPA Exposure Factors Handbook, August 1997.
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996
h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C , December 1998

TABLE I2-3b
FU1 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario
Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ANTIMONY	D					2 39E+00	2 00E-02	0 001	4 17E-07		6 71E-10		1 27E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 49E+01	4 10E-01	0 03	2 60E-06	3 9E-06	1 26E-07	4 6E-07	7 89E-10	1 2E-08
MG/KG	MERCURY	D					7 56E-02	1 00E-04	0 001	1 32E-08		2 12E-11		4 00E-12	
MG/KG	DDE	B2	3 40E-01	4 86E-01			3 24E+00	7 00E-01	0 1	5 66E-07	1 9E-07	9 10E-08	4 4E-08	1 72E-10	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01		3 21E+00	7 00E-01	0 1	5 61E-07	1 9E-07	9 03E-08	4 4E-08	1 70E-10	5 8E-11
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		4 00E+00	5 00E-01	0 1	6 99E-07	1 1E-05	1 12E-07	3 6E-06	2 12E-10	3 4E-09
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		1 81E+01	3 10E-01	0 1	3 15E-06	2 3E-06	5 07E-07	1 2E-06	9 56E-10	3 0E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		1 92E+01	3 10E-01	0 13	3 36E-06	2 5E-05	7 02E-07	1 7E-05	1 02E-09	3 2E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		2 05E+01	3 10E-01	0 1	3 57E-06	2 6E-06	5 75E-07	1 4E-06	1 08E-09	3 4E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		2 09E+01	3 10E-01	0 1	3 65E-06	2 7E-07	5 86E-07	1 4E-07	1 10E-09	3 4E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			9 74E-01	7 00E-01	0 1	1 70E-07	3 4E-09	2 74E-08	7 8E-10	5 16E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		2 60E+01	3 10E-01	0 1	4 55E-06	3 3E-08	7 31E-07	1 7E-08	1 38E-09	4 3E-12
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		2 10E+00	3 10E-01	0 1	3 67E-07	2 7E-06	5 90E-08	1 4E-06	1 11E-10	3 4E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		1 16E+01	3 10E-01	0 1	2 03E-06	1 5E-06	3 26E-07	7 7E-07	6.16E-10	1 9E-10
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 22E+00	2 00E+00		6 30E+00	9 00E-01	0 06	1 10E-06	2 2E-06	1 06E-07	2 4E-07	3 34E-10	6 7E-10
MG/KG	PETROLEUM HYDROCARBONS					9 13E+11	6 41E+01	5 00E-01	0 01	1 12E-05		1 80E-07		3 40E-09	
	Total Risk										**5E-05**		**3E-05**		**2E-08**
												Total Risk =		**8E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I2-3c

FU1 Soil Column-Hypothetical Future Industrial Worker Non-carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			2 39E+00	2 00E-02	0 001	1 17E-06	0 003	1 88E-09	0 0002	3 54E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			1 49E+01	4 10E-01	0 03	7 29E-06	0 02	3 52E-07	0 003	2 21E-09	
MG/KG	MERCURY	D			8 57E-05		7 56E-02	1 00E-04	0 001	3 70E-08		5 95E-11		1 12E-11	0 0000001
MG/KG	DDE	B2					3 24E+00	7 00E-01	0 1	1 58E-06		2 55E-07		4 80E-10	
MG/KG	DDT	B2	5 00E-04	3 50E-04			3 21E+00	7 00E-01	0 1	1 57E-06	0 003	2 53E-07	0 0007	4 76E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			4 00E+00	5 00E-01	0 1	1 96E-06	0 04	3 15E-07	0 01	5 93E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					1 81E+01	3 10E-01	0 1	8 83E-06		1 42E-06		2 68E-09	
MG/KG	BENZO(a)PYRENE	B2					1 92E+01	3 10E-01	0 13	9 41E-06		1 97E-06		2 85E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2					2 05E+01	3 10E-01	0 1	1 00E-05		1 61E-06		3 03E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2					2 09E+01	3 10E-01	0 1	1 02E-05		1 64E-06		3 09E-09	
MG/KG	CARBAZOLE	B2					9 74E-01	7 00E-01	0 1	4 77E-07		7 66E-08		1 44E-10	
MG/KG	CHRYSENE	B2					2 60E+01	3 10E-01	0 1	1 27E-05		2 05E-06		3 86E-09	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					2 10E+00	3 10E-01	0 1	1 03E-06		1 65E-07		3 11E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					1 16E+01	3 10E-01	0 1	5 69E-06		9 14E-07		1 72E-09	
MG/KG	PCB-1260 (AROCLOR 1260)	B2					6 30E+00	9 00E-01	0 06	3 08E-06		2 97E-07		9 34E-10	
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	6 00E-02	9 13E+11	6 41E+01	5 00E-01	0 01	3 14E-05	0 0008	5 04E-07	0 00003	9 52E-09	0 0000002
	Hazard Index										**0 07**		**0.02**		**0.0000003**
													Total HI=	**0.09**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I2-4a
FU1 (SS65A) Surface Soil - Hypothetical Future On-site Residential (Adult) Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only).	
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT	**CDIadj =** Cs * FI * EF * CF * IRadj / AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	N/A	100 a
IRadj =	Age-adjusted Ingestion Rate (mg - year)/(kg - day)	114 29 a,b	N/A
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	Cs * SA * AF * ABS * ET * EF * ED * CF / BW * AT	**CDIadj=** Cs * SAadj * AF * ABS * ET * EF * CF / AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	N/A	5049 d,e
SAadj =	Age-adjusted Surface Area (cm2 - year)/(kg)	2671 d,e,f	N/A
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 d,g	0 03 d,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Inhalation:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	Cs * (1/PEF) * IR_Inh * ET * EF * ED / BW * AT	**CDIadj=** Cs * (1/PEF) * IR_Inhadj * ET * EF / AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 i	1 32E+09 i
IR_Inh =	Inhalation Rate (m3/day)	N/A	20 a
IR_Inhadj =	Age-adjusted Inhalation Rate (m3 - year)/(kg - day)	12 85714286 a,j	N/A
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70}$$

114.29 (mg-year)/(kg-day)

c = Time spent outdoors in the contaminated areas based on the nature of the activity

d= U S EPA Exposure Factors Handbook, August 1997

e = Surface area of 1/2 head, hands, forearms, lower legs & feet of an adult

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{2351 \times 6}{15} + \frac{5049 \times (30-6)}{70}$$

2671 (cm2-year)/(kg)

g = AF calculated for soil adherence can be found in Appendix G

h = Chemical-specific absorption factors are found in Appendix G

i = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996

j = Age-adjusted inhalation rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR\text{-}Inh\ adj = \frac{IR\text{-}Inh\ c \times EDc}{BWc} + \frac{IR\text{-}Inh\ a \times (EDa - EDc)}{BWa} = \frac{15 \times 6}{15} + \frac{20 \times (30-6)}{70}$$

12.86 (m3-year)/(kg-day)

TABLE I2-4b

FU1 (SS65A) Surface Soil - Hypothetical Future On-site Residential (Adult) Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFI**	**EPC**	**ABSgi**	**ABS**	**CDIadj**	**ELCR**	**CDIadj**	**ELCR**	**CDIadj**	**ELCR**
MG/KG	Acenaphthylene	D				9 50E+00	3 10E-01	0 01	1 49E-05		1 74E-08		2 11E-10	
MG/KG	Anthracene	D				3 50E+00	7 60E-01	0 01	5 48E-06		6 40E-09		7 78E-11	
MG/KG	Benzo(a)anthracene	B2	7 30E-01	2 35E+00	3 10E-01	3 70E+01	3 10E-01	0 1	5 79E-05	4 2E-05	6 77E-07	1 6E-06	8 23E-10	2 6E-10
MG/KG	Benzo(a)pyrene	B2	7 30E+00	2 35E+01	3 10E+00	6 70E+01	3 10E-01	0 13	1 05E-04	7 7E-04	1 59E-06	3 8E-05	1 49E-09	4 6E-09
MG/KG	Benzo(b)fluoranthene	B2	7 30E-01	2 35E+00	3 10E-01	6 50E+01	3 10E-01	0 1	1 02E-04	7.4E-05	1 19E-06	2 8E-06	1 45E-09	4 5E-10
MG/KG	Benzo(g,h,i)perylene	D				4 20E+01	3 10E-01	0 01	6 58E-05		7 69E-08		9 34E-10	
MG/KG	Benzo(k)fluoranthene	B2	7 30E-02	2 35E-01	3 10E-02	7 10E+01	3 10E-01	0 1	1 11E-04	8 1E-06	1 30E-06	3 1E-07	1 58E-09	4 9E-11
MG/KG	Carbazole	B2	2 00E-02	2 86E-02		1 60E+00	7 00E-01	0 1	2 50E-06	5 0E-08	2 93E-08	8 4E-10	3 56E-11	
MG/KG	Chrysene	B2	7 30E-03	2 35E-02	3 10E-03	4 70E+01	3 10E-01	0 1	7 36E-05	5 4E-07	8 60E-07	2 0E-08	1 05E-09	3 2E-12
MG/KG	Fluoranthene	D				4.40E+01	3 10E-01	0 01	6 89E-05		8 05E-08		9 78E-10	
MG/KG	Indeno(1,2,3-c,d)pyrene	B2	7 30E-01	2 35E+00	3 10E-01	3 90E+01	3 10E-01	0 1	6 11E-05	4 5E-05	7.14E-07	1 7E-06	8 67E-10	2 7E-10
MG/KG	Phenanthrene	D				7 30E+00	7 30E-01	0 01	1 14E-05		1 34E-08		1 62E-10	
MG/KG	Pyrene	D				5 20E+01	3 10E-01	0 01	8 14E-05		9 51E-08		1 16E-09	
MG/KG	Zinc	D				6 46E+02	2 00E-01	0 001	1 01E-03		1 18E-07		1 44E-08	
	Total Risk									**9.4E-04**		**4.4E-05**		**5.6E-09**
											Total Risk =		**1E-03**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I2-4c
FU1 (SS65A) Surface Soil - Hypothetical Future On-site Residential (Adult) Noncarcinogenic Scenario
Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation CDI
MG/KG	Acenaphthylene	D	6 00E-02	1 86E-02		9 50E+00	3 10E-01	0 01	1 30E-05	0 0002	3 29E-08	0 000002	3 29E-10
MG/KG	Anthracene	D	3 00E-01	2 28E-01		3 50E+00	7 60E-01	0 01	4 79E-06	0 00002	1 21E-08	0 00000005	1 21E-10
MG/KG	Benzo(a)anthracene	B2				3 70E+01	3 10E-01	0 1	5 07E-05		1 28E-06		1 28E-09
MG/KG	Benzo(a)pyrene	B2				6 70E+01	3 10E-01	0 13	9 18E-05		3 01E-06		2 32E-09
MG/KG	Benzo(b)fluoranthene	B2				6 50E+01	3 10E-01	0 1	8 90E-05		2 25E-06		2 25E-09
MG/KG	Benzo(g,h,i)perylene	D	3 00E-02	9 30E-03		4 20E+01	3 10E-01	0 01	5 75E-05	0 002	1 45E-07	0 00002	1 45E-09
MG/KG	Benzo(k)fluoranthene	B2				7 10E+01	3 10E-01	0 1	9 73E-05		2 46E-06		2 46E-09
MG/KG	Carbazole	B2				1 60E+00	7 00E-01	0 1	2 19E-06		5 53E-08		5 53E-11
MG/KG	Chrysene	B2				4 70E+01	3 10E-01	0 1	6 44E-05		1 63E-06		1 63E-09
MG/KG	Fluoranthene	D	4 00E-02	1 24E-02		4 40E+01	3 10E-01	0 01	6 03E-05	0 002	1 52E-07	0 00001	1 52E-09
MG/KG	Indeno(1,2,3-c,d)pyrene	B2				3 90E+01	3 10E-01	0 1	5 34E-05		1 35E-06		1 35E-09
MG/KG	Phenanthrene	D				7 30E+00	7 30E-01	0 01	1 00E-05		2 52E-08		2 53E-10
MG/KG	Pyrene	D	3 00E-02	9 30E-03		5 20E+01	3 10E-01	0 01	7 12E-05	0 002	1 80E-07	0 00002	1 80E-09
MG/KG	Zinc	D	3 00E-01	6 00E-02		6 46E+02	2 00E-01	0 001	8 85E-04	0 003	2 23E-07	0 000004	2 23E-08
	Hazard Index									**0 009**		**0.00005**	
												Total HI=	**0 009**

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I2-5a
FU1 (SS65A) Surface Soil - Hypothetical Future On-site Residential (Child) Scenario
Memphis Depot Main Installation RI

		Carcinogenic (optional - do not use)	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	200 a	200 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
CDI =	Cs * SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2351 c,d	2351 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 15 c,e	0 15 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0 167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m3/day)	15 a	15 a
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0.167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas based on the nature of the activity
c= U S EPA Exposure Factors Handbook, August 1997.
d = Surface area of 1/2 head, hands, forearms, lower legs & feet of a child (age 1-6 years).
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance· Technical Background Document, May 1996

TABLE I2-5b

FU1 (SS42) Surface Soil - Hypothetical Future On-Site Residential (Child) Carcinogenic Scenario (Optional Use)

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	Acenaphthylene	D				9 50E+00	3 10E-01	0 01	1 04E-05		3 06E-08		9 86E-11	
MG/KG	Anthracene	D				3 50E+00	7 60E-01	0 01	3 84E-06		1 13E-08		3 63E-11	
MG/KG	Benzo(a)anthracene	B2	7 30E-01	2 35E+00	3 10E-01	3 70E+01	3 10E-01	0 1	4 05E-05	2 96E-05	1 19E-06	2 81E-06	3.84E-10	1 19E-10
MG/KG	Benzo(a)pyrene	B2	7 30E+00	2 35E+01	3 10E+00	6 70E+01	3 10E-01	0 13	7 34E-05	5 36E-04	2 81E-06	6 61E-05	6 95E-10	2 16E-09
MG/KG	Benzo(b)fluoranthene	B2	7 30E-01	2 35E+00	3 10E-01	6 50E+01	3 10E-01	0 1	7 12E-05	5 20E-05	2 09E-06	4 93E-06	6 75E-10	2 09E-10
MG/KG	Benzo(g,h,i)perylene	D				4 20E+01	3 10E-01	0 01	4 60E-05		1 35E-07		4 36E-10	
MG/KG	Benzo(k)fluoranthene	B2	7 30E-02	2 35E-01	3 10E-02	7 10E+01	3 10E-01	0 1	7 78E-05	5 68E-06	2 29E-06	1 67E-07	7 37E-10	1 74E-10
MG/KG	Carbazole	B2				1 60E+00	7 00E-01	0 1	1 75E-06		5 15E-08		1 66E-11	
MG/KG	Chrysene	B2				4 70E+01	3 10E-01	0 1	5 15E-05		1.51E-06		4 88E-10	
MG/KG	Fluoranthene	D				4 40E+01	3 10E-01	0 01	4 82E-05		1 42E-07		4 57E-10	
MG/KG	Indeno(1,2,3-c,d)pyrene	B2				3 90E+01	3 10E-01	0 1	4 27E-05		1 26E-06		4 05E-10	
MG/KG	Phenanthrene	D				7 30E+00	7 30E-01	0 01	8 00E-06		2 35E-08		7 58E-11	
MG/KG	Pyrene	D				5 20E+01	3 10E-01	0 01	5 70E-05		1 67E-07		5 40E-10	
MG/KG	Zinc	D				6 46E+02	2 00E-01	0 001	7 08E-04		2 08E-07		6 70E-09	
	Total Risk									**6E-04**		**7E-05**		**3E-09**
											Total Risk =		**7E-04**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I2-5c

FU1 (SS65A) Surface Soil - Hypothetical Future On-site Residential (Child) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**
MG/KG	Acenaphthylene	D	6 00E-02	1 86E-02		9 50E+00	3 10E-01	0 01	1 21E-04	0 002	3 57E-07	0 00002	1 15E-09
MG/KG	Anthracene	D	3 00E-01	2 28E-01		3 50E+00	7 60E-01	0 01	4 47E-05	0 0001	1 32E-07	0 0000006	4 24E-10
MG/KG	Benzo(a)anthracene	B2				3 70E+01	3 10E-01	0 1	4 73E-04		1 39E-05		4 48E-09
MG/KG	Benzo(a)pyrene	B2				6 70E+01	3 10E-01	0 13	8 57E-04		3 27E-05		8 11E-09
MG/KG	Benzo(b)fluoranthene	B2				6 50E+01	3 10E-01	0 1	8 31E-04		2 44E-05		7 87E-09
MG/KG	Benzo(g,h,i)perylene	D	3 00E-02	9 30E-03		4 20E+01	3 10E-01	0 01	5 37E-04	0 02	1 58E-06	0 0002	5 09E-09
MG/KG	Benzo(k)fluoranthene	B2				7 10E+01	3 10E-01	0 1	9 08E-04		2 67E-05		8 60E-09
MG/KG	Carbazole	B2				1 60E+00	7 00E-01	0 1	2 05E-05		6 01E-07		1 94E-10
MG/KG	Chrysene	B2				4 70E+01	3 10E-01	0 1	6 01E-04		1 77E-05		5 69E-09
MG/KG	Fluoranthene	D	4 00E-02	1 24E-02		4 40E+01	3 10E-01	0 01	5 63E-04	0 01	1 65E-06	0 0001	5 33E-09
MG/KG	Indeno(1,2,3-c,d)pyrene	B2				3 90E+01	3 10E-01	0 1	4 99E-04		1 47E-05		4 72E-09
MG/KG	Phenanthrene	D				7 30E+00	7 30E-01	0 01	9 33E-05		2 74E-07		8 84E-10
MG/KG	Pyrene	D	3 00E-02	9 30E-03		5 20E+01	3 10E-01	0 01	6 65E-04	0 02	1 95E-06	0 0002	6 30E-09
MG/KG	Zinc	D	3 00E-01	6 00E-02		6 46E+02	2 00E-01	0 001	8 26E-03	0 03	2 43E-06	0 00004	7 82E-08
	Hazard Index									**0.08**		**0.0006**	
												Total HI=	**0.08**

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I2-6a
Site #65 Surface Soil -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0.03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	100% b	100% b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = U S EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance Technical Backgrounc Document, May 1996

TABLE I2-6b

Site 65 Surface Soil -Hypothetical Future Industrial Worker Carcinogenic Scenaric

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFI	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	2 00E+01	3 10E-01	1 00E-01	3E-06	2 55E-06	5 61E-07	1 32E-06	1 06E-09	3 28E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	2 40E+01	3 10E-01	1 30E-01	4E-06	3 06E-05	8 77E-07	2 06E-05	1 27E-09	3 94E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3.10E-01	2 47E+01	3 10E-01	1 00E-01	4E-06	3 14E-06	6 92E-07	1 63E-06	1 31E-09	4 05E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02	2 45E+01	3 10E-01	1 00E-01	4E-06	3 12E-07	6 88E-07	1 62E-07	1 30E-09	4 02E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02		4 64E+00	7 00E-01	1 00E-01	8E-07	1 62E-08	1 30E-07	3 72E-09	2 46E-10	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	2 54E+01	3 10E-01	1 00E-01	4E-06	3 23E-08	7 12E-07	1 68E-08	1 34E-09	4 16E-12
MG/KG	DDE	B2	3 40E-01	4 86E-01		3 74E+00	7 00E-01	1 00E-01	7E-07	2 22E-07	1 05E-07	5 10E-08	1 98E-10	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01	5 35E+00	7 00E-01	1 00E-01	9E-07	3 18E-07	1.50E-07	7 30E-08	2 83E-10	9 62E-11
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01	9 80E-01	5 00E-01	1 00E-01	2E-07	2 74E-06	2 75E-08	8 80E-07	5 19E-11	8 30E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	1 71E+01	3 10E-01	1 00E-01	3E-06	2 18E-06	4 80E-07	1.13E-06	9 05E-10	2 80E-10
	Total Risk									**4.21E-05**		**2.59E-05**		**5.92E-09**
												Total Risk =	**7E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I2-6c

Site 65 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	BENZO(a)ANTHRACENE	B2				2 00E+01	3 10E-01	1 00E-01	9 768E-06		1 57E-06		2 96E-09	
MG/KG	BENZO(a)PYRENE	B2				2 40E+01	3 10E-01	1 30E-01	1 175E-05		2 45E-06		3 56E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2				2 47E+01	3 10E-01	1 00E-01	1 206E-05		1 94E-06		3 66E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2				2 45E+01	3 10E-01	1 00E-01	1 198E-05		1 93E-06		3 63E-09	
MG/KG	CARBAZOLE	B2				4 64E+00	7 00E-01	1 00E-01	2 27E-06		3 65E-07		6 88E-10	
MG/KG	CHRYSENE	B2				2 54E+01	3 10E-01	1 00E-01	1 24E-05		1 99E-06		3 76E-09	
MG/KG	DDE	B2				3 74E+00	7 00E-01	1 00E-01	1 828E-06		2 94E-07		5 54E-10	
MG/KG	DDT	B2	5 00E-04	3 50E-04		5 35E+00	7 00E-01	1 00E-01	2 619E-06	0 005	4 21E-07	0 001	7 94E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05		9 80E-01	5 00E-01	1 00E-01	4 792E-07	0 01	7 70E-08	0 003	1 45E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				1 71E+01	3 10E-01	1 00E-01	8 361E-06		1 34E-06		2 53E-09	
	Hazard Index									**0.01**		**0.004**		
												Total HI=	**0 02**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I2-7a
Site 65 Soil Column -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic		Noncarcinogenic
Ingestion:				
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
IR =	Ingestion Rate (mg/day)	50	a	50 a
FI =	Fraction Ingested (unitless)	1		1
EF =	Exposure Frequency (day/year)	250	a	250 a
ED =	Exposure Duration (year)	25	a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06		0.000001
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a
Dermal:				
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
SA =	Surface Area (cm2)	2679	c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.03	c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific)	f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1.000	b	1 b
EF =	Exposure Frequency (day/year)	250	a	250 a
ED =	Exposure Duration (year)	25	a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06		0 000001
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a
Particulate Inhalation:				
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09	g	1.32E+09 g
IR =	Inhalation Rate (m3/day)	20	a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1.000	b	1 b
EF =	Exposure Frequency (day/year)	250	a	250 a
ED =	Exposure Duration (year)	25	a	25 a
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a

References:
a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = U S EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Backgrounc Document, May 1996

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TABLE I2-7b

Site 65 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	1 62E+01	3 10E-01	1 00E-01	3E-06	2 07E-06	4 56E-07	1 07E-06	8 59E-10	2 66E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	1 95E+01	3 10E-01	1 30E-01	3E-06	2 48E-05	7 10E-07	1 67E-05	1 03E-09	3.19E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	2 00E+01	3 10E-01	1 00E-01	3E-06	2 55E-06	5 62E-07	1 32E-06	1 06E-09	3 28E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02	1 99E+01	3 10E-01	1 00E-01	3E-06	2 53E-07	5 58E-07	1 31E-07	1 05E-09	3 26E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02		3 38E+00	7 00E-01	1 00E-01	6E-07	1 18E-08	9 50E-08	2 72E-09	1 79E-10	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	2 06E+01	3 10E-01	1 00E-01	4E-06	2 63E-08	5 79E-07	1 36E-08	1 09E-09	3 38E-12
MG/KG	DDE	B2	3 40E-01	4 86E-01		3 74E+00	7 00E-01	1 00E-01	7E-07	2 22E-07	1 05E-07	5 10E-08	1 98E-10	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01	5 35E+00	7 00E-01	1 00E-01	9E-07	3 18E-07	1 50E-07	7 30E-08	2 83E-10	9 62E-11
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01	9 80E-01	5 00E-01	1 00E-01	2E-07	2 74E-06	2 75E-08	8 80E-07	5 19E-11	8 30E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	1 39E+01	3 10E-01	1 00E-01	2E-06	1 77E-06	3 90E-07	9 18E-07	7 35E-10	2 28E-10
	Total Risk									**4.21E-05**		**2.59E-05**		**5.92E-09**
												Total Risk =	**7E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I2-7c

Site 65 Soil Column -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	BENZO(a)ANTHRACENE	B2	0 00E+00		0 00E+00	1 62E+01	3 10E-01	1 00E-01	7 941E-06		1 28E-06		2 41E-09	
MG/KG	BENZO(a)PYRENE	B2	0 00E+00		0 00E+00	1 95E+01	3 10E-01	1 30E-01	9 518E-06		1 99E-06		2 88E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2	0 00E+00		0 00E+00	2 00E+01	3 10E-01	1 00E-01	9 783E-06		1 57E-06		2.96E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2	0 00E+00		0 00E+00	1 99E+01	3 10E-01	1 00E-01	9 719E-06		1 56E-06		2 95E-09	
MG/KG	CARBAZOLE	B2	0 00E+00		0 00E+00	3 38E+00	7 00E-01	1 00E-01	1 655E-06		2 66E-07		5 02E-10	
MG/KG	CHRYSENE	B2	0 00E+00		0 00E+00	2 06E+01	3 10E-01	1 00E-01	1 008E-05		1 62E-06		3 05E-09	
MG/KG	DDE	B2	0 00E+00		0 00E+00	3 74E+00	7 00E-01	1 00E-01	1 828E-06		2 94E-07		5 54E-10	
MG/KG	DDT	B2	5 00E-04	3 50E-04	0 00E+00	5 35E+00	7 00E-01	1 00E-01	2 619E-06	0 005	4 21E-07	0.001	7 94E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	0 00E+00	9 80E-01	5 00E-01	1 00E-01	4 792E-07	0 01	7 70E-08	0 003	1 45E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	0 00E+00		0 00E+00	1 39E+01	3 10E-01	1 00E-01	6 794E-06		1 09E-06		2 06E-09	
	Hazard Index									**0.01**		**0.004**		
												Total HI=	**0.02**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I2-8a
Site 65 Soil Column -Hypothetical Current/Future Utility Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic		Noncarcinogenic
Ingestion:				
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
IR =	Ingestion Rate (mg/day)	100	c	100 c
FI =	Fraction Ingested (unitless)	0 5		0 5
EF =	Exposure Frequency (day/year)	24	d	24 d
ED =	Exposure Duration (year)	25	a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06		0 000001
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a
Dermal:				
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
SA =	Surface Area (cm2)	2679	e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 1	e,g	0 1 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific)	h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1	b	1 b
EF =	Exposure Frequency (day/year)	24	d	24 d
ED =	Exposure Duration (year)	25	a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06		0.000001
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a
Particulate Inhalation:				
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
PEF =	Particulate Emission Factor (m3/kg)	1.32E+09	i	1.32E+09 i
IR =	Inhalation Rate (m3/day)	20	a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	100%	b	1 b
EF =	Exposure Frequency (day/year)	24	d	24 d
ED =	Exposure Duration (year)	25	a	25 a
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday
c = Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
d = Utility activity assumed to be twice a month throughout the year
e= U S EPA Exposure Factors Handbook, August 1997
f = Surface area of 1/2 head, forearms and the hands of an adult worker
g = AF calculated for soil adherence can be found in Appendix G
h = Chemical-specific absorption factors are found in Appendix G
i = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance. Technical Backgrounc Document, May 1996

TABLE I2-8b

Site 65 Soil Column -Hypothetical Current/Future Utility Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal			Inhalation
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	1 62E+01	3 10E-01	1 00E-01	3E-07	1 99E-07	1 46E-07	3 44E-07	8 25E-11	2 56E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	1 95E+01	3 10E-01	1 30E-01	3E-07	2 38E-06	2 27E-07	5 35E-06	9 89E-11	3 07E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	2 00E+01	3 10E-01	1 00E-01	3E-07	2 45E-07	1 80E-07	4 23E-07	1 02E-10	3 15E-11
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02	1 99E+01	3 10E-01	1 00E-01	3E-07	2 43E-08	1 79E-07	4 20E-08	1 01E-10	3 13E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02		3 38E+00	7 00E-01	1 00E-01	6E-08	1 14E-09	3 04E-08	8 69E-10	1 72E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	2 06E+01	3 10E-01	1 00E-01	3E-07	2 52E-09	1 85E-07	4 36E-09	1 05E-10	3 25E-13
MG/KG	DDE	B2	3 40E-01	4 86E-01		3 74E+00	7 00E-01	1 00E-01	6E-08	2 13E-08	3 36E-08	1 63E-08	1 90E-11	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01	5 35E+00	7 00E-01	1 00E-01	9E-08	3 05E-08	4 81E-08	2 34E-08	2 72E-11	9 24E-12
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01	9 80E-01	5 00E-01	1 00E-01	2E-08	2 63E-07	8 80E-09	2 82E-07	4 98E-12	7 97E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	1 39E+01	3 10E-01	1 00E-01	2E-07	1 70E-07	1 25E-07	2 94E-07	7 06E-11	2 19E-11
	Total Risk									**3 34E-06**		**6.78E-06**		**4.78E-10**
												Total Risk =	**1E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I2-8c

Site 65 Soil Column -Hypothetical Current/Future Utility Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	BENZO(a)ANTHRACENE	B2				1 62E+01	3 10E-01	1 00E-01	7 623E-07		4 08E-07		2 31E-10	
MG/KG	BENZO(a)PYRENE	B2				1 95E+01	3 10E-01	1 30E-01	9 138E-07		6 36E-07		2 77E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2				2 00E+01	3 10E-01	1 00E-01	9 392E-07		5 03E-07		2 85E-10	
MG/KG	BENZO(k)FLUORANTHENE	B2				1 99E+01	3 10E-01	1 00E-01	9 33E-07		5 00E-07		2 83E-10	
MG/KG	CARBAZOLE	B2				3 38E+00	7 00E-01	1 00E-01	1 589E-07		8 51E-08		4 82E-11	
MG/KG	CHRYSENE	B2				2 06E+01	3 10E-01	1 00E-01	9 675E-07		5 18E-07		2 93E-10	
MG/KG	DDE	B2				3 74E+00	7 00E-01	1 00E-01	1 754E-07		9 40E-08		5 32E-11	
MG/KG	DDT	B2	5 00E-04	3 50E-04		5 35E+00	7 00E-01	1 00E-01	2 514E-07	0 0005	1 35E-07	0 0004	7 62E-11	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05		9 80E-01	5 00E-01	1 00E-01	4 601E-08	0 0009	2 46E-08	0 001	1 39E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				1 39E+01	3 10E-01	1 00E-01	6 522E-07		3 49E-07		1 98E-10	
	Hazard Index									**0.001**		**0.001**		
												Total HI=	**0.003**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

Appendix I-3
A. FU2 Soils (Parcel 3 & Site 59)
B. FU2 Sediments
C. FU2 Surface Water

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TABLE I3-1a
Soil - Hypothetical Future On-site Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IRing =	Ingestion Rate (mg/event)	50 a	50 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2/event)	2458 b	2458 b
AF =	Soil-Skin Adherence Factor (mg/cm2)	1 c	1 c
ABS =	Absorption Factor (unitless)	(Chemical Specific) d	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dust Inhalation:			
CDI =	$\frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 e	1 32E+09 e
VF =	Volatilization Factor (m3/kg)	(Chemical Specific) f	(Chemical Specific) f
IRinh =	Inhalation Rate (m3/event)	20 a	20 a
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
b = Surface area of hands, 1/2 arms and 1/2 head (face) of an adult worker, adapted from CEHT, Technical Report: Soil Cleanup Target Levels for FDEP, September 2, 1997
c = U.S EPA Dermal Exposure Assessment Principles and Application, January 1992.
d = Chemical-specific absorption factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999.
e = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance. Technical Background Document, May 1996.
f = Chemical-specific volatilization factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999

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TABLE I3-1b
Soil - Future Hypothetical On-Site Worker Carcinogenic Scenario
Memphis Depot Main Installation RI

								Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFi	EPC	ABS	VFres	CDI	ELCR	CDI	ELCR	CDI	ELCR
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1.51E+01	2.93E+01	0 001		5 12E-06	8E-06	2 52E-07	4E-07	1 55E-09	2E-08
MG/KG	CHROMIUM	A		4.20E+01	2 15E+01	0 001		3 76E-06		1.85E-07		1 14E-09	5E-08
MG/KG	COPPER	D			3 09E+01	0 001		5 40E-06		2.66E-07		1.64E-09	
MG/KG	MANGANESE	D			9 83E+02	0 001		1 72E-04		8 44E-06		5 20E-08	
MG/KG	NICKEL	0			2 59E+01	0 001		4 52E-06		2 22E-07		1 37E-09	
MG/KG	LEAD	B2			7 59E+01	0 001		1 33E-05		6 52E-07		4 02E-09	
MG/KG	ALPHA-CHLORDANE	B2	3 50E-01	3 50E-01	2 25E-01	0 04		3 94E-08	1E-08	7.74E-08	3E-08	1.19E-11	4E-12
MG/KG	GAMMA-CHLORDANE	B2	3 50E-01	3 50E-01	2 68E-01	0 04		4 68E-08	2E-08	9 19E-08	3E-08	1 42E-11	5E-12
MG/KG	DIELDRIN	B2	1 60E+01	1 61E+01	2 21E+00	0 03		3 87E-07	6E-06	5 71E-07	9E-06	1 17E-10	2E-09
MG/KG	DDE	B2	3 40E-01		8 05E-01	0.03		1.41E-07	5E-08	2 07E-07	7E-08	4 26E-11	
MG/KG	DDT	B2	3.40E-01	3 40E-01	9 63E-01	0.03		1.68E-07	6E-08	2 48E-07	8E-08	5 10E-11	2E-11
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	3 10E-01	2 51E-01	0 1	1 09E+07	4.38E-08	3E-08	2 15E-07	2E-07	1.62E-09	5E-10
MG/KG	BENZO(a)PYRENE	B2	7.30E+00	3 10E+00	2 56E-01	0.1	2 96E+07	4 47E-08	3E-07	2 20E-07	2E-06	6.18E-10	2E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3 10E-01	2 83E-01	0.1	5.72E+06	4 94E-08	4E-08	2 43E-07	2E-07	3 47E-09	1E-09
	Total Risk								1E-05		1E-05		8E-08
											Total Risk =	**3E-05**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I3-1c
Soil - Hypothetical Future On-site Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDI**	**EPC**	**ABS**	**VFres**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		2 93E+01	0 001		1 43E-05	0 05	7 05E-07	0 002	4 35E-09	
MG/KG	CHROMIUM	A	3 50E+00	5.71E-07	2 15E+01	0 001		1 05E-05	0 000003	5 18E-07	0 0000001	3 19E-09	0 006
MG/KG	COPPER	D	3 50E+00		3 09E+01	0 001		1 51E-05	0 000004	7 44E-07	0 0000002	4 59E-09	
MG/KG	MANGANESE	D	2 30E-02		9 83E+02	0 001		4 81E-04	0 02	2 36E-05	0 001	1 46E-07	
MG/KG	NICKEL	0	2 00E-02		2 59E+01	0 001		1 27E-05	0 0006	6 22E-07	0 00003	3 84E-09	
MG/KG	LEAD	B2			7 59E+01	0 001		3 71E-05		1 82E-06		1 12E-08	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04		2 25E-01	0 04		1 10E-07	0 0002	2 17E-07	0 0004	3 34E-11	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04		2 68E-01	0 04		1 31E-07	0 0003	2 57E-07	0 0005	3 97E-11	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	2 21E+00	0 03		1 08E-06	0 02	1 60E-06	0 03	3 28E-10	0 000000000003
MG/KG	DDE	B2			8 05E-01	0 03		3 94E-07		5 81E-07		1 19E-10	
MG/KG	DDT	B2	5 00E-04		9 63E-01	0 03		4 71E-07	0 0009	6 95E-07	0 001	1 43E-10	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			2 51E-01	0 1	1 09E+07	1 23E-07		6 02E-07		4 53E-09	
MG/KG	BENZO(a)PYRENE	B2			2 56E-01	0 1	2 96E+07	1 25E-07		6 15E-07		1 73E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 83E-01	0 1	5 72E+06	1 38E-07		6 80E-07		9 72E-09	
	Hazard Index								0 09		0 04		0 006
											Total HI=	**0.1**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-2a

Soil - Hypothetical Future Golfer Exposure Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IRing * FI * EFDadj * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IRing =	Ingestion Rate (mg/event)	50 a	50 a
FI =	Fraction Ingested (unitless)	100%	100%
EFDadj =	Time-adjusted Exposure Frequency (events, for 30 years)	4680 b	4680 b
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	9125 c
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EFDadj * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	
SA =	Surface Area (cm2/event)	4371 d	4371 d
AF =	Soil-Skin Adherence Factor (mg/cm2)	1 e	1 e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (event/day)	0 083 g	0 083 g
EFDadj =	Time-adjusted Exposure Frequency (events, for 30 years)	4680 b	4680 b
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	9125 c
Dust Inhalation:			
CDI =	Cs * ((1/VF)+(1/PEF)) * IRinh * EFDadj / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 h	1 32E+09 h
VF =	Volatilization Factor (m3/kg)	(Chemical Specific) i	(Chemical Specific) i
IRinh =	Inhalation Rate (m3/event)	1 67 j	1 67 j
EFDadj =	Time-adjusted Exposure Frequency (events, for 30 years)	4680 b	4680 b
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	9125 c

References:

a = Best professional judgment based on a golfer's behavior, soil intake is assumed to 50 mg for a 2 hour golfing event

b = Golf activity over thirty years is assumed to be twice a week for twenty years, and five times a week for ten years, per best professional judgment. This accumulates to 4,680 days over thirty years

EFDadj = (104 days/yr x 20 yrs) + (260 days/yr x 10 yrs) = 4680 days

c = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

d = Surface area of hands, 1/2 arms and 1/2 legs of an adult, adapted from CEHT, Technical Report Soil Cleanup Target Levels, for FDEP, September 2, 1997

e = U S EPA Dermal Exposure Assessment Principles and Application, January 1992

f = Chemical-specific absorption factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999.

g = Time spent outdoors playing golf per best professional judgment (2-hour event per 24-hour day)

h = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996

i = Chemical-specific volatilization factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999

j = Inhalation rate is determined by 20 m3/day divided by 24 hours/day, and multiplied by the 2 hours/event.

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TABLE I3-2b

Soil - Hypothetical Future Golfer Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFi	EPC	ABS	VFres	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1.51E+01	4 30E+01	0 001		5 63E-06	8E-06	4 09E-08	6E-08	1 42E-10	2E-09
MG/KG	CHROMIUM	A		4 20E+01	2 57E+01	0 001		3 36E-06		2 44E-08		8 50E-11	4E-09
MG/KG	COPPER	D			2.90E+01	0 001		3 80E-06		2 75E-08		9 58E-11	
MG/KG	LEAD	B2			1 23E+02	0 001		1 61E-05		1 17E-07		4 07E-10	
MG/KG	MANGANESE	D			1.86E+03	0 001		2 43E-04		1 77E-06		6 15E-09	
MG/KG	NICKEL				3 18E+01	0 001		4 16E-06		3 02E-08		1 05E-10	
MG/KG	ALPHA-CHLORDANE	B2	3 50E-01	3 50E-01	3 52E-01	0 04		4 61E-08	2E-08	1 34E-08	5E-09	1.16E-12	4E-13
MG/KG	GAMMA-CHLORDANE	B2	3 50E-01	3 50E-01	4 04E-01	0 04		5 28E-08	2E-08	1.53E-08	5E-09	1 33E-12	5E-13
MG/KG	DIELDRIN	B2	1 60E+01	1 61E+01	3 38E+00	0 03		4.43E-07	7E-06	9 63E-08	2E-06	1 12E-11	2E-10
MG/KG	DDE	B2	3 40E-01		1 10E+00	0 03		1.44E-07	5E-08	3 13E-08	1E-08	3.63E-12	0E+00
MG/KG	DDT	B2	3 40E-01	3 40E-01	1 49E+00	0.03		1.95E-07	7E-08	4.24E-08	1E-08	4 92E-12	2E-12
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	3 10E-01	2.26E-01	0 1	1 09E+07	2 96E-08	2E-08	2 14E-08	2E-08	9.11E-11	3E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3 10E+00	2 32E-01	0 1	2 96E+07	3 04E-08	2E-07	2.21E-08	2E-07	3 50E-11	1E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3.10E-01	2 78E-01	0 1	5 72E+06	3 64E-08	3E-08	2.64E-08	2E-08	2 13E-10	7E-11
	Total Risk								2E-05		2E-06		6E-09
											Total Risk =	1 78E-05	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-2c

Soil - Hypothetical Future Golfer Noncarcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDi	EPC	ABS	VFres	CDI	HQ	CDI	HQ	CDI	HQ
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04	0 00E+00	4 30E+01	0 001		1 58E-05	0 05	1 14E-07	0 0004	3 98E-10	
MG/KG	CHROMIUM	A	5 00E-03	5 71E-07	2 57E+01	0 001		9 42E-06	0 002	6 84E-08	0 00001	2 38E-10	0 0004
MG/KG	COPPER	D	3 50E+00		2 90E+01	0 001		1 06E-05	0 000003	7 71E-08	0 00000002	2 68E-10	
MG/KG	LEAD	B2			1 23E+02	0 001		4 51E-05		3 27E-07		1 14E-09	
MG/KG	MANGANESE	D	2 30E-02		1 86E+03	0 001		6 81E-04	0 03	4 94E-06	0 0002	1 72E-08	
MG/KG	NICKEL	0	2 00E-02		3 18E+01	0 001		1 16E-05	0 0006	8 45E-08	0 000004	2 94E-10	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04		3 52E-01	0 04		1 29E-07	0 0003	3 75E-08	0 00007	3 26E-12	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04		4 04E-01	0 04		1 48E-07	0 0003	4 29E-08	0 00009	3 74E-12	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	3 38E+00	0 03		1 24E-06	0 02	2 70E-07	0 005	3 13E-11	0 0000000000003
MG/KG	DDE	B2			1 10E+00	0 03		4 03E-07		8 77E-08		1 02E-11	
MG/KG	DDT	B2	5 00E-04		1 49E+00	0 03		5 45E-07	0 001	1 19E-07	0 0002	1 38E-11	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	0 00E+00	0 00E+00	2 26E-01	0 1	1 09E+07	8 28E-08		6 01E-08		2 55E-10	
MG/KG	BENZO(a)PYRENE	B2	0 00E+00	0 00E+00	2 32E-01	0 1	2 96E+07	8 51E-08		6 17E-08		9 80E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2	0 00E+00	0 00E+00	2 78E-01	0 1	5 72E+06	1 02E-07		7 39E-08		5 96E-10	
	Hazard Index								0 1		0 006		0 0004
										Total HI =	**0.1**		

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-3a
Soil - Hypothetical Future Ballplayer (Youth) Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	**Cs * IRing * FI * EF * ED * CF / BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IRing =	Ingestion Rate (mg/event)	200 a	200 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	20 b	20 b
ED =	Exposure Duration (year)	8 c	8 c
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	30 d	30 d
AT =	Averaging Time (days)	25550 e	2920 e
Dermal:			
CDI =	**Cs * SA * AF * ABS * ET * EF * ED * CF / BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2/event)	2080 f	2080 f
AF =	Soil-Skin Adherence Factor (mg/cm2)	1 g	1 g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (events/day)	0.0625 i	0 0625 i
EF =	Exposure Frequency (events/year)	20 b	20 b
ED =	Exposure Duration (year)	8 c	8 c
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	30 d	30 d
AT =	Averaging Time (days)	25550 e	2920 e
Dust Inhalation:			
CDI =	**Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED / BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 j	1 32E+09 j
VF =	Volatilization Factor (m3/kg)	(Chemical Specific) k	(Chemical Specific) k
IRinh =	Inhalation Rate (m3/event)	1 25 l	1 25 l
EF =	Exposure Frequency (events/year)	20 b	20 b
ED =	Exposure Duration (year)	8 c	8 c
BW =	Body Weight (kg)	30 d	30 d
AT =	Averaging Time (days)	25550 e	2920 e

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
b = Outdoor activity assumed to be twice a week during season, plus practice games per U S EPA memo, March 1997 (total of 20 days/year).
c = Exposure duration of 8 years, per U.S EPA memo, March 1997.
d = Age-adjusted body weight for youth (age 5-13 years) at 50th percentile, per U S EPA memo, March 1997
e = Best professional judgement
f = Surface area of 1/2 arms and head of a youth (5-13 years), adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997
g = U S. EPA Dermal Exposure Assessment: Principles and Application, January 1992
h = Chemical-specific absorption factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999
i = Time spent outdoors playing baseball per best professional judgment (1.5 hour event/24 hour day)
j = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996
k = Chemical-specific volatilization factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999
l = Inhalation rate is determined by 20 m3/day divided by 24 hours/day, and multiplied by the 1 5 hours/event.

TABLE I3-3b

Soil - Hypothetical Future Ballplayer (Youth) Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFi**	**EPC**	**ABS**	**VFres**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1 51E+01	2 18E+01	0 001		9 10E-07	1E-06	5.92E-10	9E-10	4 31E-12	7E-11
MG/KG	CHROMIUM	A		4 20E+01	1 89E+01	0 001		7 89E-07		5 13E-10		3 74E-12	2E-10
MG/KG	COPPER	D			2 54E+01	0 001		1 06E-06		6 89E-10		5.02E-12	
MG/KG	LEAD	B2			4 86E+01	0 001		2 03E-06		1 32E-09		9 61E-12	
MG/KG	MANGANESE	D			9.70E+02	0 001		4 05E-05		2 63E-08		1 92E-10	
MG/KG	NICKEL	0			2 06E+01	0 001		8 60E-07		5 59E-10		4 07E-12	
MG/KG	DIELDRIN	B2	1 60E+01	1 61E+01	1 10E+00	0 03		4 59E-08	7E-07	8 95E-10	1E-08	2.17E-13	4E-12
MG/KG	DDE	B2	3 40E-01		8 60E-02	0 03		3 59E-09	1E-09	7.00E-11	2E-11	1 70E-14	
MG/KG	DDT	B2	3 40E-01	3 40E-01	7 10E-02	0 03		2 96E-09	1E-09	5 78E-11	2E-11	1 40E-14	5E-15
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	3 10E-01	7 60E-02	0 1	1 09E+07	3 17E-09	2E-09	2 06E-10	2E-10	1 83E-12	6E-13
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3 10E+00	8 20E-02	0 1	2 96E+07	3 42E-09	2E-08	2 23E-10	2E-09	7 39E-13	2E-12
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3 10E-01	8 90E-02	0 1	5 72E+06	3 72E-09	3E-09	2 42E-10	2E-10	4 08E-12	1E-12
	Total Risk								2E-06		2E-08		2E-10
											Total Risk =	**2E-06**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposur

TABLE I3-3c

Soil - Hypothetical Future Ballplayer (Youth) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDi	EPC	ABS	VFres	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation CDI	Inhalation HQ
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		2 18E+01	0 001		7 96E-06	0 03	5 18E-09	0 00002	3 77E-11	
MG/KG	CHROMIUM	A	5 00E-03	5 71E-07	1 89E+01	0 001		6 90E-06	0 001	4 49E-09	0 0000009	3 27E-11	0 00006
MG/KG	COPPER	D	3 50E+00		2 54E+01	0 001		9 28E-06	0 000003	6 03E-09	0 000000002	4 39E-11	
MG/KG	LEAD	B2			4 86E+01	0 001		1 78E-05		1 15E-08		8.41E-11	
MG/KG	MANGANESE	D	2 30E-02		9 70E+02	0 001		3 54E-04	0 02	2 30E-07	0 00001	1.68E-09	
MG/KG	NICKEL	0	2 00E-02		2 06E+01	0 001		7 53E-06	0 0004	4 89E-09	0 0000002	3 56E-11	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	1 10E+00	0 03		4 02E-07	0 008	7 84E-09	0 0002	1 90E-12	0 00000000000002
MG/KG	DDE	B2			8 60E-02	0.03		3 14E-08		6 13E-10		1 49E-13	
MG/KG	DDT	B2	5 00E-04		7 10E-02	0 03		2 59E-08	0 00005	5 06E-10	0 000001	1 23E-13	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			7 60E-02	0 1	1 09E+07	2 78E-08		1 80E-09		1 61E-11	
MG/KG	BENZO(a)PYRENE	B2			8 20E-02	0 1	2 96E+07	3 00E-08		1 95E-09		6 47E-12	
MG/KG	BENZO(b)FLUORANTHENE	B2			8 90E-02	0 1	5 72E+06	3 25E-08		2 11E-09		3 57E-11	
	Hazard Index								0 05		0 0002		0 00006
											Total HI=	**0.05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-4a

Soil - Future Recreational Child Scenario - Playground

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IRing * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IRing =	Ingestion Rate (mg/event)	200 a	200 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	64 b	64 b
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
CDI =	Cs * SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2/event)	2394 c	2394 c
AF =	Soil-Skin Adherence Factor (mg/cm2)	1 d	1 d
ABS =	Absorption Factor (unitless)	(Chemical Specific) e	(Chemical Specific) e
ET =	Exposure Time (event/day)	0.167 f	0.167 f
EF =	Exposure Frequency (events/year)	64 b	64 b
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dust Inhalation:			
CDI =	Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1.32E+09 g
VF =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IRinh =	Inhalation Rate (m3/event)	2 5 i	2 5 i
EF =	Exposure Frequency (events/year)	64 b	64 b
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.

b = Best professional judgment Child visiting park 2 days/wk during 8 (waEPCr) months of the year

c = Surface area of hands, 1/2 arms, 1/2 legs and feet of a child (age 1-6 years), adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997.

d = U.S EPA Dermal Exposure Assessment. Principles and Application, January 1992

e = Chemical-specific absorption factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999.

f = Time spent outdoors, best professional judgment (4 hour event/24 hour day)

g = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance Technical Background Document, May 1996

h = Chemical-specific volatilization factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999.

i = Inhalation rate is determined by 15 m3/day divided by 24 hours/day, and multiplied by the 4 hours/event

TABLE I3-4b
Soil - Future Recreational Child Carcinogenic Scenario -Playground
Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFi	EPC	ABS	VFres	Ingestion		Dermal		Inhalation	
								CDI	ELCR	CDI	ELCR	CDI	ELCR
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1 51E+01	1 94E+01	0 001		3 89E-06	6E-06	7 76E-09	1E-08	3 68E-11	6E-10
MG/KG	CHROMIUM	A		4 20E+01	1 63E+01	0 001		3 27E-06		6.52E-09		3 09E-11	1E-09
MG/KG	COPPER	D			5 54E+01	0 001		1 11E-05		2 21E-08		1.05E-10	
MG/KG	LEAD	B2			6 88E+01	0 001		1 38E-05		2 75E-08		1 31E-10	
MG/KG	MANGANESE	D			8 99E+02	0 001		1 80E-04		3 59E-07		1.71E-09	
MG/KG	NICKEL	0			2 11E+01	0 001		4 23E-06		8.44E-09		4 00E-11	
MG/KG	DIELDRIN	B2	1 60E+01	1 61E+01	7 10E-01	0 03		1.42E-07	2E-06	8 52E-09	1E-07	1.35E-12	2E-11
MG/KG	DDE	B2	3.40E-01		4.30E-01	0 03		8 62E-08	3E-08	5 16E-09	2E-09	8.16E-13	0E+00
MG/KG	DDT	B2	3 40E-01	3 40E-01	2 00E-01	0 03		4 01E-08	1E-08	2 40E-09	8E-10	3.80E-13	1E-13
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	3 10E-01	5 70E-01	0 1	1 09E+07	1 14E-07	8E-08	2.28E-08	2E-08	1 32E-10	4E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3 10E+00	4 40E-01	0 1	2 96E+07	8 82E-08	6E-07	1 76E-08	1E-07	3 81E-11	1E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3 10E-01	4 60E-01	0 1	5 72E+06	9 22E-08	7E-08	1 84E-08	1E-08	2 02E-10	6E-11
	Total Risk								9E-06		3E-07		2E-09
											Total Risk =	**9E-06**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I3-4c

Soil - Future Recreational Child Noncarcinogenic Scenario - Playground

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDi	EPC	ABS	VFres	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation CDI	Inhalation HQ
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		1 94E+01	0 001		4 54E-05	0 2	9 05E-08	0 0003	4 30E-10	
MG/KG	CHROMIUM	A	5 00E-03	5 71E-07	1 63E+01	0 001		3 81E-05	0 008	7 60E-08	0 00002	3 61E-10	0 0006
MG/KG	COPPER	D	3 50E+00		5 54E+01	0 001		1 30E-04	0 00004	2 58E-07	0 00000007	1 23E-09	
MG/KG	LEAD	B2			6 88E+01	0 001		1 61E-04		3 21E-07		1 52E-09	
MG/KG	MANGANESE	D	2 30E-02		8 99E+02	0 001		2 10E-03	0 09	4 19E-06	0 0002	1 99E-08	
MG/KG	NICKEL	0	2 00E-02		2 11E+01	0 001		4 93E-05	0 002	9 84E-08	0 000005	4 67E-10	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	7 10E-01	0 03		1 66E-06	0 03	9 93E-08	0 002	1 57E-11	0 0000000000002
MG/KG	DDE	B2			4 30E-01	0 03		1 01E-06		6 02E-08		9 52E-12	
MG/KG	DDT	B2	5 00E-04		2 00E-01	0 03		4 68E-07	0 0009	2 80E-08	0 00006	4 43E-12	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			5 70E-01	0 1	1 09E+07	1 33E-06		2 66E-07		1 54E-09	
MG/KG	BENZO(a)PYRENE	B2			4 40E-01	0 1	2 96E+07	1 03E-06		2 05E-07		4 44E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2			4 60E-01	0 1	5 72E+06	1 08E-06		2 15E-07		2 36E-09	
	Hazard Index		0 00E+00						0 3		0 003		0 0006
											Total HI=	**0.3**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-5a
Soil - Hypothetical Future Residential Adult Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			

Intake for non-carcinogenic compounds

$$CDI = \frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$$

Age-specific intake (for carcinogenic compounds only):

$$CDIadj = \frac{Cs * FI * EF * CF * IRadj}{AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IRadj =	Age-Specific Factor (ingestion) (mg - year)/(kg - day)	114 29 g	na
IRing =	Ingestion Rate (mg/event)	na	100 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	na	30 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	na	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2/event)	5419 b	5419 b
AF =	Soil-Skin Adherence Factor (mg/cm2)	1 c	1 c
ABS =	Absorption Factor (unitless)	(Chemical Specific) d	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 e	1 32E+09 e
VF =	Volatilization Factor (m3/kg)	(Chemical Specific) f	(Chemical Specific) f
IRinh =	Inhalation Rate (m3/event)	20 a	20 a
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

References:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991

b = Surface area of hands, 1/2 arms, 1/2 legs and feet of an adult, adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997.

c = U S EPA Dermal Exposure Assessment Principles and Application, January 1992

d = Chemical-specific absorption factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999

e = Particulate emission factor (PEF), adapted from U.S EPA, Soil Screening Guidance Technical Background Document, May 1996

f = Chemical-specific volatilization factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999

g = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70}$$

= Data'!F23 (mg-year)/(kg-day)

TABLE I3-5b

Soil - Future Hypothetical Residential Adult Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFi**	**EPC**	**ABS**	**VFres**	**CDIadj**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1.51E+01	2.93E+01	0 001		4 59E-05	7E-05	9 33E-07	1E-06	2 61E-09	4E-08
MG/KG	CHROMIUM	A		4 20E+01	2 15E+01	0 001		3 37E-05		6 85E-07		1 92E-09	8E-08
MG/KG	COPPER	D			3.09E+01	0 001		4 84E-05		9 84E-07		2.75E-09	
MG/KG	MANGANESE	D			9 83E+02	0 001		1 54E-03		3 13E-05		8 74E-08	
MG/KG	NICKEL	0			2 59E+01	0 001		4 05E-05		8 23E-07		2 30E-09	
MG/KG	LEAD	B2			7 59E+01	0 001		1 19E-04		2 41E-06		6.75E-09	
MG/KG	ALPHA-CHLORDANE	B2	3 50E-01	3 50E-01	2 25E-01	0 04		3 53E-07	1E-07	2 87E-07	1E-07	2 00E-11	7E-12
MG/KG	GAMMA-CHLORDANE	B2	3 50E-01	3 50E-01	2 68E-01	0 04		4 19E-07	1E-07	3 41E-07	1E-07	2 38E-11	8E-12
MG/KG	DIELDRIN	B2	1 60E+01	1 61E+01	2 21E+00	0 03		3 47E-06	6E-05	2.11E-06	3E-05	1 97E-10	3E-09
MG/KG	DDE	B2	3 40E-01		8 05E-01	0 03		1.26E-06	4E-07	7 68E-07	3E-07	7 16E-11	
MG/KG	DDT	B2	3 40E-01	3 40E-01	9 63E-01	0 03		1.51E-06	5E-07	9 19E-07	3E-07	8 56E-11	3E-11
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	3 10E-01	2 51E-01	0 1	1.09E+07	3 92E-07	3E-07	7 97E-07	6E-07	2 72E-09	8E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3 10E+00	2 56E-01	0 1	2 96E+07	4 01E-07	3E-06	8 14E-07	6E-06	1.04E-09	3E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3.10E-01	2 83E-01	0 1	5 72E+06	4 43E-07	3E-07	9.00E-07	7E-07	5 83E-09	2E-09
	Total Risk								1E-04		4E-05		1E-07
											Total Risk =	**2E-04**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-5c

Soil - Hypothetical Future Residential Adult Noncarcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDi	EPC	ABS	VFres	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation CDI	Inhalation HQ
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		2 93E+01	0 001		4 02E-05	0 1	2 18E-06	0 007	6 08E-09	
MG/KG	CHROMIUM	A	3 50E+00	5 71E-07	2 15E+01	0 001		2 95E-05	0 000008	1 60E-06	0 0000005	4 47E-09	0 008
MG/KG	COPPER	D	3 50E+00		3 09E+01	0 001		4 24E-05	0 00001	2 30E-06	0 0000007	6 42E-09	
MG/KG	MANGANESE	D	2 30E-02		9 83E+02	0 001		1 35E-03	0 06	7 30E-05	0 003	2 04E-07	
MG/KG	NICKEL	0	2 00E-02		2 59E+01	0 001		3 54E-05	0 002	1 92E-06	0 0001	5 37E-09	
MG/KG	LEAD	B2			7 59E+01	0 001		1 04E-04		5 63E-06		1 57E-08	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04		2 25E-01	0 04		3 09E-07	0 0006	6 69E-07	0 001	4 68E-11	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04		2 68E-01	0 04		3 67E-07	0 0007	7 95E-07	0 002	5 55E-11	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	2 21E+00	0 03		3 03E-06	0 06	4 93E-06	0 1	4 60E-10	0 000000000005
MG/KG	DDE	B2			8 05E-01	0 03		1 10E-06		1 79E-06		1 67E-10	
MG/KG	DDT	B2	5 00E-04		9 63E-01	0 03		1 32E-06	0 003	2 14E-06	0 004	2 00E-10	
	Semivolatiles	0											
MG/KG	BENZO(a)ANTHRACENE	B2			2 51E-01	0 1	1 09E+07	3 43E-07		1 86E-06		6 35E-09	
MG/KG	BENZO(a)PYRENE	B2			2 56E-01	0 1	2 96E+07	3 50E-07		1 90E-06		2 42E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 83E-01	0 1	5 72E+06	3 87E-07		2 10E-06		1 36E-08	
	Hazard Index								0 3		0 1		0 008
											Total HI=	**0.4**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index												

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TABLE I3-6a

Soil - Hypothetical Future Residential Child Scenario

Memphis Depot Main Installation RI

		Carcinogenic (optional)	Noncarcinogenic
Ingestion:			
CDI =	Cs * IRing * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IRing =	Ingestion Rate (mg/event)	200 a	200 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	350 b	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
CDI =	Cs * SA * AF * ABS * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2/event)	2394 c	2394 b
AF =	Soil-Skin Adherence Factor (mg/cm2)	1 d	1 c
ABS =	Absorption Factor (unitless)	(Chemical Specific) e	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	350 b	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dust Inhalation:			
CDI =	Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 f	1.32E+09 e
VF =	Volatilization Factor (m3/kg)	(Chemical Specific) g	(Chemical Specific) f
IRinh =	Inhalation Rate (m3/event)	15 a	15 a
EF =	Exposure Frequency (events/year)	350 b	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.

c = Surface area of hands, 1/2 arms, 1/2 legs and feet of a child (age 1-6 years), adapted from CEHT, Technical Report: Soil Cleanup Target Levels for FDEP, September 2, 1997.

d = U.S EPA Dermal Exposure Assessment. Principles and Application, January 1992

e = Chemical-specific absorption factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999.

f = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance. Technical Background Document, May 1996

g = Chemical-specific volatilization factors are found in Appendix C of the Parcel 3 Streamlined Risk Assessment, 1999

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TABLE I3-6b

Soil - Future Hypothetical Residential Child Carcinogenic Scenario (optional)

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFi	EPC	ABS	VFres	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1 51E+01	2 93E+01	0 001		3 21E-05	5E-05	3 85E-07	6E-07	1 83E-09	3E-08
MG/KG	CHROMIUM	A		4 20E+01	2 15E+01	0 001		2 36E-05		2 83E-07		1.34E-09	6E-08
MG/KG	COPPER	D			3 09E+01	0 001		3 39E-05		4 06E-07		1 93E-09	0E+00
MG/KG	MANGANESE	D			9 83E+02	0 001		1 08E-03		1 29E-05		6 12E-08	0E+00
MG/KG	NICKEL	0			2.59E+01	0 001		2.84E-05		3 39E-07		1 61E-09	0E+00
MG/KG	LEAD	B2			7 59E+01	0 001		8 31E-05		9 95E-07		4 72E-09	0E+00
MG/KG	ALPHA-CHLORDANE	B2	3 50E-01	3 50E-01	2 25E-01	0 04		2.47E-07	9E-08	1 18E-07	4E-08	1 40E-11	5E-12
MG/KG	GAMMA-CHLORDANE	B2	3 50E-01	3 50E-01	2 68E-01	0 04		2 93E-07	1E-07	1 40E-07	5E-08	1.67E-11	6E-12
MG/KG	DIELDRIN	B2	1 60E+01	1 61E+01	2 21E+00	0.03		2 43E-06	4E-05	8 71E-07	1E-05	1 38E-10	2E-09
MG/KG	DDE	B2	3 40E-01		8 05E-01	0 03		8 82E-07	3E-07	3 17E-07	1E-07	5 01E-11	0E+00
MG/KG	DDT	B2	3 40E-01	3 40E-01	9 63E-01	0 03		1 06E-06	4E-07	3 79E-07	1E-07	6.00E-11	2E-11
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	3 10E-01	2 51E-01	0 1	1 09E+07	2 75E-07	2E-07	3 29E-07	2E-07	1 90E-09	6E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3.10E+00	2 56E-01	0 1	2 96E+07	2 80E-07	2E-06	3 36E-07	2E-06	7.26E-10	2E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3 10E-01	2 83E-01	0.1	5 72E+06	3 10E-07	2E-07	3 71E-07	3E-07	4 08E-09	1E-09
	Total Risk								9E-05		2E-05		9E-08
											Total Risk =	**1E-04**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-6c
Soil - Hypothetical Future Residential Child Noncarcinogenic Scenario
Memphis Depot Main Installation RI

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDi**	**EPC**	**ABS**	**VFres**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		2 93E+01	0 001		3 75E-04	1 2	4 49E-06	0 01	2 13E-08	
MG/KG	CHROMIUM	A	3 50E+00	5 71E-07	2 15E+01	0 001		2 75E-04	0 00008	3 30E-06	0 0000009	1 56E-08	0 03
MG/KG	COPPER	D	3 50E+00		3 09E+01	0 001		3 95E-04	0 0001	4 73E-06	0 000001	2 25E-08	
MG/KG	MANGANESE	D	2 30E-02		9 83E+02	0 001		1 26E-02	0 5	1 50E-04	0 007	7 14E-07	
MG/KG	NICKEL	0	2 00E-02		2 59E+01	0 001		3 31E-04	0 02	3 96E-06	0 0002	1 88E-08	
MG/KG	LEAD	B2			7 59E+01	0 001		9 70E-04		1 16E-05		5 51E-08	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04		2 25E-01	0 04		2 88E-06	0 006	1 38E-06	0 003	1 64E-10	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04		2 68E-01	0 04		3 42E-06	0 007	1 64E-06	0 003	1 94E-10	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	2 21E+00	0 03		2 83E-05	0 6	1 02E-05	0 2	1 61E-09	0 00000000002
MG/KG	DDE	B2			8 05E-01	0 03		1 03E-05		3 70E-06		5 85E-10	
MG/KG	DDT	B2	5 00E-04		9 63E-01	0 03		1 23E-05	0 02	4 42E-06	0 009	6 99E-10	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			2 51E-01	0 1	1 09E+07	3 20E-06		3 83E-06		2 22E-08	
MG/KG	BENZO(a)PYRENE	B2			2 56E-01	0 1	2 96E+07	3 27E-06		3 91E-06		8 47E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 83E-01	0 1	5 72E+06	3 61E-06		4 33E-06		4 76E-08	
	Hazard Index								2 4		0 2		0 03
											Total HI=	**2.7**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-7a
Site #59 Surface Soil -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic		Noncarcinogenic	
Ingestion:					
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT				
Cs =	Concentration in soil (mg/kg)	EPC		EPC	
IR =	Ingestion Rate (mg/day)	50	a	50	a
FI =	Fraction Ingested (unitless)	1		1	
EF =	Exposure Frequency (day/year)	250	a	250	a
ED =	Exposure Duration (year)	25	a	25	a
CF =	Conversion Factor (kg/mg)	1 00E-06		1 00E-06	
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	9125	a
Dermal:					
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT				
Cs =	Concentration in soil (mg/kg)	EPC		EPC	
SA =	Surface Area (cm2)	2679	c,d	2679	c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03	c,e	0 03	c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific)	f	(Chemical Specific)	f
ET =	Exposure Time (8 hours per 8 hour workday)	1	b	1	b
EF =	Exposure Frequency (day/year)	250	a	250	a
ED =	Exposure Duration (year)	25	a	25	a
CF =	Conversion Factor (kg/mg)	1 00E-06		1 00E-06	
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	9125	a
Particulate Inhalation:		***for volatiles:***			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC	
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09	g	1 32E+09	g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific)	h	(Chemical Specific)	h
IR =	Inhalation Rate (m3/day)	20	a	20	a
ET =	Exposure Time (8 hours per 8 hour workday)	1	b	1	b
EF =	Exposure Frequency (day/year)	250	a	250	a
ED =	Exposure Duration (year)	25	a	25	a
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	9125	a

References
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure
'85 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = U S EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker.
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996
h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F.A.C., December 1998

TABLE I3-7b
Site #59 Surface Soil -Hypothetical Future Industrial Worker Carcinogenic Scenario
Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01	5 80E-01	5 00E-01	0 1	1 01E-07	1 62E-06	1 63E-08	5 21E-07	3 07E-11	4 91E-10
MG/KG	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	7 30E-02	1 00E+00	0 01	1 28E-08	6 63E-10	2 05E-10	1 07E-11	1 79E-06	3 57E-09
	Total Risk									**1.62E-06**		**5 21E-07**		**4.06E-09**
												Total Risk =	**2E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-7c

Site #59 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	0 00E+00	5 80E-01	5 00E-01	0 1	2 84E-07	0 006	4 56E-08	0 002	8 60E-11
MG/KG	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 40E-01	7 30E-02	1 00E+00	0 01	3 57E-08	0 000004	5 74E-10	0 00000006	5 00E-06
	Hazard Index									**0.006**		**0.002**	
												Total HI=	**0.008**

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I3-8a
Site #59 Soil Column -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic		Noncarcinogenic
Ingestion:				
CDI =	**Cs * IR * FI * EF * ED * CF** / **BW * AT**			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
IR =	Ingestion Rate (mg/day)	50	a	50 a
FI =	Fraction Ingested (unitless)	1		1
EF =	Exposure Frequency (day/year)	250	a	250 a
ED =	Exposure Duration (year)	25	a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06		1.00E-06
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a
Dermal:				
CDI =	**Cs *SA * AF * ABS * ET * EF * ED * CF** / **BW * AT**			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
SA =	Surface Area (cm2)	2679	c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03	c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific)	f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1.000	b	1 b
EF =	Exposure Frequency (day/year)	250	a	250 a
ED =	Exposure Duration (year)	25	a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06		1 00E-06
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a
Particulate Inhalation:		***for volatiles:***		
CDI =	**Cs * (1/PEF) * IR * ET * EF * ED** / **BW * AT**	**Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED** / **BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC		EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09	g	1.32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific)	h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 000	a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1	b	1 b
EF =	Exposure Frequency (day/year)	250	a	250 a
ED =	Exposure Duration (year)	25	a	25 a
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure
?85 6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = U S. EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G.
g = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance Technical Backgrounc
Document, May 1996.
h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F.A.C.,
December 1998.

TABLE I3-8b

Site #59 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01	1 55E-01	5 00E-01	0 1	2 71E-08	4 33E-07	4 35E-09	1 39E-07	8 20E-12	1 31E-10
MG/KG	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	7 30E-02	1 00E+00	0 01	1 28E-08	6 63E-10	2 05E-10	1 07E-11	1 79E-06	3 57E-09
	Total Risk									**4.34E-07**		**1.39E-07**		**3.70E-09**
												Total Risk =	**6E-07**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-8c

Site #59 Soil Column -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	0 00E+00	1 55E-01	5 00E-01	0 1	7 58E-08	0 002	1 22E-08	0 0005	2 30E-11	
MG/KG	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 40E-01	7 30E-02	1 00E+00	0 01	3 57E-08	0 000004	5 74E-10	0 00000006	5 00E-06	0 00004
	Hazard Index									**0.002**		**0.0005**		**0.00004**
												Total HI=	**0.002**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-9a
Site #59 Soil Column -Hypothetical Current/Future Utility Worker Scenario
Memphi Depot Main Installation RI

		Carcinogenic		Noncarcinogenic
Ingestion:				
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
IR =	Ingestion Rate (mg/day)	100	c	100 c
FI =	Fraction Ingested (unitless)	0 5		0.5
EF =	Exposure Frequency (day/year)	24	d	24 d
ED =	Exposure Duration (year)	25	a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06		1.00E-06
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a
Dermal:				
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC
SA =	Surface Area (cm2)	2679	e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 1	e,g	0 1 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific)	h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1	b	1 b
EF =	Exposure Frequency (day/year)	24	d	24 d
ED =	Exposure Duration (year)	25	a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06		1 00E-06
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a
Particulate Inhalation:		***for volatiles:***		
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC		EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09	i	1 32E+09 i
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific)	j	(Chemical Specific) j
IR =	Inhalation Rate (m3/day)	20	a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1	b	1 b
EF =	Exposure Frequency (day/year)	24	d	24 d
ED =	Exposure Duration (year)	25	a	25 a
BW =	Body Weight (kg)	70	a	70 a
AT =	Averaging Time (days)	25550	a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure '85 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday
c = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
d = Utility activity assumed to be twice a month throughout the year
e= U S EPA Exposure Factors Handbook, August 1997
f = Surface area of 1/2 head, forearms and the hands of an adult worker.
g = AF calculated for soil adherence can be found in Appendix G
h = Chemical-specific absorption factors are found in Appendix G
i = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance: Technical Background Document, May 1996
j = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F.A C. December 1998

TABLE I3-9b

Site #59 Soil Column -Hypothetical Current/Future Utility Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFI**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01	1 55E-01	5 00E-01	0 1	2 60E-09	4 16E-08	1 39E-09	4 46E-08	7 88E-13	1 26E-11
MG/KG	TETRACHLOROETHYLENE(PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	7 30E-02	1 00E+00	0 01	1 22E-09	6 37E-11	6 56E-11	3 41E-12	1 71E-07	3 43E-10
	Total Risk									**4.16E-08**		**4.46E-08**		**3.55E-10**
												Total Risk =	**9E-08**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-9c

Site #59 Soil Column -Hypothetical Current/Future Utility Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	0 00E+00	1 55E-01	5 00E-01	0 1	7 28E-09	0 0001	3 90E-09	0 0002	2 21E-12	
MG/KG	TETRACHLOROETHYLENE(PCE)	C-B2	1 00E-02	1 00E-02	1 40E-01	7 30E-02	1 00E+00	0 01	3 43E-09	0 0000003	1 84E-10	0 00000002	4 80E-07	0 000003
	Hazard Index									**0.0001**		**0.0002**		**0 000003**
												Total HI=	**0.0003**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-10a
FU2 Sediment- Hypothetical Future Recreational (Youth) Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Csd * IR * FI * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	100 a, b	100 a, b
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	10 a	10 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	45 a	45 a
AT =	Averaging Time (days)	25550 c	3650 c
Dermal:			
CDI =	Csd * SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	4785 d	4785 d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 1 e	0 1 e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (6 hours per 24 hour day)	0 25 g	0 25 g
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	10 a	10 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	45 a	45 a
AT =	Averaging Time (days)	25550 c	3650 c

Inhalation: Not an applicable pathway

References:
a = Values suggested by Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
b = A conservative ingestion rate based on residential soil intake is assumed
c = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
d = Surface area of hands, 1/2 arms, 1/2 legs and feet of a youth (9-18 yrs) assumed to be same for sediment and surfacewater, adapted from U S EPA Exposure Factors Handbook, August 1997
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = 6 hours per a 24 hour day are assumed to be spent in Depot retention ponds for recreation

TABLE I3-10b

FU2 Sediment- Hypothetical Future Recreational (Youth) Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ALUMINUM				8 55E+03	0 1	0 001	3 34E-04	0E+00	4 00E-07	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	9 72E+00	0 41	0 03	3 80E-07	6E-07	1 37E-08	5E-08
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 05E-01	0 5	0 1	4 10E-09	7E-08	4 91E-10	2E-08
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	1 46E+00	0 31	0 1	5 70E-08	4E-08	6 82E-09	2E-08
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	1 21E+00	0 31	0 13	4 73E-08	3E-07	7 35E-09	2E-07
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	1 99E+00	0 31	0 1	7 79E-08	6E-08	9 32E-09	2E-08
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	1 64E+00	0 31	0 1	6 43E-08	5E-10	7 70E-09	2E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	1 02E+00	0 31	0 1	4 00E-08	3E-08	4 78E-09	1E-08
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 11E+00	3 30E-01	0 95	0 15	1 29E-08	3E-08	2 32E-09	5E-09
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01	1 40E-01	1	0 24	5 48E-09	7E-10	1 57E-09	2E-10
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	5 34E-05	0 5	0 03	2 09E-12	3E-07	7 49E-14	2E-08
MG/KG	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	2 40E-02	0 65	0 01	9 39E-10	1E-10	1 12E-11	2E-12
	Total Risk								**1E-06**		**3E-07**
									Total Risk =	**2E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure										

TABLE I3-10c

FU2 Sediment- Hypothetical Future Recreational (Youth) Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ALUMINUM		1 00E+00	1 00E-01	8 55E+03	0 1	0 001	2 34E-03	0 002	2 80E-06	0 00003
MG/KG	ARSENIC	A	3 00E-04	1 23E-04	9 72E+00	0 41	0 03	2 66E-06	0 009	9 56E-08	0 0008
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	1 05E-01	0 5	0 1	2 87E-08	0 0006	3 44E-09	0 0001
MG/KG	BENZO(a)ANTHRACENE	B2			1 46E+00	0 31	0 1	3 99E-07		4 77E-08	
MG/KG	BENZO(a)PYRENE	B2			1 21E+00	0 31	0 13	3 31E-07		5 15E-08	
MG/KG	BENZO(b)FLUORANTHENE	B2			1 99E+00	0 31	0 1	5 45E-07		6 52E-08	
MG/KG	CHRYSENE	B2			1 64E+00	0 31	0 1	4 50E-07		5 39E-08	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2			1 02E+00	0 31	0 1	2 80E-07		3 35E-08	
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E-05	1 90E-05	3 30E-01	0 95	0 15	9 04E-08	0 005	1 62E-08	0 0009
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02	1 40E-01	1	0 24	3 84E-08	0 000001	1 10E-08	0 0000004
MG/KG	TCDD Equivalent	B2			5 34E-05	0 5	0 03	1 46E-11		5 25E-13	
MG/KG	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04	2 40E-02	0 65	0 01	6 57E-09	0 000009	7 86E-11	0 0000002
	Hazard Index								**0 02**		**0.002**
										Total HI=	**0 02**
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index										

TABLE I3-11a

FU2 Sediment- Hypothetical Future Recreational (Adult) Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Csd * IR * FI * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	100 a, b	100 a, b
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	30 c	30 c
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	10950 c
Dermal:			
CDI =	Csd * SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	5671 d	5671 d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 1 e	0 1 e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (6 hours per 24 hour day)	0 25 g	0 25 g
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	30 c	30 c
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	10950 c

Inhalation: Not an applicable pathway

References:

a = Values suggested by Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

b = A conservative ingestion rate based on residential soil intake is assumed

c = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991

d = Surface area of hands, 1/2 arms, 1/2 legs and feet of an adult assumed to be same for sediment and surfacewater, adapted from U S EPA Exposure Factors Handbook, August 1997

e = AF calculated for soil adherence can be found in Appendix G

f = Chemical-specific absorption factors are found in Appendix G

g = 6 hours per a 24 hour day are assumed to be spent in Depot retention ponds for recreation

TABLE I3-11b

FU2 Sediment- Hypothetical Future Recreational (Adult) Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ALUMINUM				8 55E+03	0 1	0 001	6 45E-04	0E+00	9 15E-07	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	9 72E+00	0 41	0 03	7 34E-07	1E-06	3 12E-08	1E-07
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 05E-01	0 5	0 1	7 92E-09	1E-07	1.12E-09	4E-08
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	1 46E+00	0 31	0 1	1 10E-07	8E-08	1.56E-08	4E-08
MG/KG	BENZO(a)PYRENE	B2	7.30E+00	2 35E+01	1 21E+00	0 31	0 13	9 12E-08	7E-07	1.68E-08	4E-07
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	1.99E+00	0 31	0 1	1 50E-07	1E-07	2.13E-08	5E-08
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	1 64E+00	0 31	0 1	1 24E-07	9E-10	1 76E-08	4E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	1 02E+00	0 31	0 1	7 71E-08	6E-08	1.09E-08	3E-08
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2.00E+00	2 11E+00	3 30E-01	0 95	0.15	2 49E-08	5E-08	5 30E-09	1E-08
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01	1 40E-01	1	0.24	1 06E-08	1E-09	3 60E-09	4E-10
MG/KG	TCDD Equivalent	B2	1.50E+05	3 00E+05	5 34E-05	0.5	0 03	4 03E-12	6E-07	1.71E-13	5E-08
MG/KG	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	2 40E-02	0 65	0 01	1 81E-09	2E-10	2.57E-11	5E-12
	Total Risk		**0.00E+00**						**3E-06**		**7E-07**
								Total Risk =		**4E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-11c

FU2 Sediment- Hypothetical Future Recreational (Adult) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	EPC	ABSgi	ABS	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ
MG/KG	ALUMINUM		1 00E+00	1 00E-01	8 55E+03	0 1	0 001	1 51E-03	0 002	2.13E-06	0 00002
MG/KG	ARSENIC	A	3 00E-04	1 23E-04	9 72E+00	0 41	0.03	1.71E-06	0 006	7.28E-08	0 0006
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	1 05E-01	0 5	0 1	1 85E-08	0 0004	2.62E-09	0 0001
MG/KG	BENZO(a)ANTHRACENE	B2			1.46E+00	0.31	0 1	2 57E-07		3 64E-08	
MG/KG	BENZO(a)PYRENE	B2			1 21E+00	0.31	0.13	2 13E-07		3.92E-08	
MG/KG	BENZO(b)FLUORANTHENE	B2			1 99E+00	0 31	0 1	3 50E-07		4 97E-08	
MG/KG	CHRYSENE	B2			1 64E+00	0 31	0 1	2.90E-07		4 11E-08	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2			1 02E+00	0 31	0 1	1 80E-07		2 55E-08	
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E-05	1 90E-05	3 30E-01	0 95	0 15	5.81E-08	0 003	1.24E-08	0 0007
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02	1 40E-01	1	0 24	2 47E-08	0 0000008	8 39E-09	0.0000003
MG/KG	TCDD Equivalent	B2			5 34E-05	0 5	0 03	9 40E-12		4 00E-13	
MG/KG	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04	2 40E-02	0 65	0 01	4.23E-09	0 000006	5 99E-11	0 0000001
	Hazard Index								**0.01**		**0.001**
										Total HI=	**0.01**

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I3-12a
FU2 Sediment- Hypothetical Future Recreational (Child) Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Csd * IR * FI * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	200 a, b	200 a, b
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 c	2190 c
Dermal:			
CDI =	Csd * SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	1851 d	1851 d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.1 e	0 1 e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (6 hours per 24 hour day)	0 25 g	0.25 g
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 c	2190 c

Inhalation: Not an applicable pathway

References:
a = Values suggested by Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
b = A conservative ingestion rate based on residential soil intake is assumed
c = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.
d = Surface area of hands, 1/2 arms, 1/2 legs and feet of a child (1-6 yrs) assumed to be same for sediment and surfacewater, adapted from U S EPA Exposure Factors Handbook, August 1997
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G.
g = 6 hours per a 24 hour day are assumed to be spent in Depot retention ponds for recreation

TABLE I3-12b

FU2 Sediment- Hypothetical Future Recreational (Child) Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR
MG/KG	ALUMINUM				8 55E+03	0 1	0 001	1 20E-03	0E+00	2 79E-07	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	9 72E+00	0.41	0 03	1 37E-06	2E-06	9 51E-09	3E-08
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 05E-01	0 5	0 1	1 48E-08	2E-07	3 42E-10	1E-08
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2.35E+00	1 46E+00	0 31	0 1	2 05E-07	1E-07	4 75E-09	1E-08
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	1 21E+00	0 31	0 13	1.70E-07	1E-06	5 12E-09	1E-07
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	1 99E+00	0 31	0 1	2 80E-07	2E-07	6 49E-09	2E-08
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	1.64E+00	0 31	0 1	2 32E-07	2E-09	5 36E-09	1E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2.35E+00	1 02E+00	0 31	0.1	1 44E-07	1E-07	3 33E-09	8E-09
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 11E+00	3 30E-01	0 95	0 15	4 65E-08	9E-08	1 61E-09	3E-09
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01	1 40E-01	1	0 24	1 97E-08	2E-09	1.10E-09	1E-10
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	5 34E-05	0 5	0 03	7.52E-12	1E-06	5 22E-14	2E-08
MG/KG	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	2 40E-02	0 65	0 01	3 38E-09	4E-10	7.82E-12	2E-12
	Total Risk		**0.00E+00**						**5E-06**		**2E-07**
								Total Risk =		**5E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I3-12c

FU2 Sediment- Hypothetical Future Recreational (Child) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ALUMINUM		1.00E+00	1 00E-01	8 55E+03	0 1	0 001	1 40E-02	0 01	3.25E-06	0.00003
MG/KG	ARSENIC	A	3 00E-04	1 23E-04	9.72E+00	0.41	0 03	1 60E-05	0 05	1.11E-07	0 0009
MG/KG	DIELDRIN	B2	5.00E-05	2 50E-05	1 05E-01	0 5	0 1	1 72E-07	0 003	3 99E-09	0 0002
MG/KG	BENZO(a)ANTHRACENE	B2			1.46E+00	0 31	0 1	2 39E-06		5 54E-08	
MG/KG	BENZO(a)PYRENE	B2			1.21E+00	0 31	0 13	1 99E-06		5.97E-08	
MG/KG	BENZO(b)FLUORANTHENE	B2			1 99E+00	0 31	0 1	3 27E-06		7.57E-08	
MG/KG	CHRYSENE	B2			1 64E+00	0 31	0 1	2 70E-06		6 25E-08	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2			1 02E+00	0 31	0 1	1 68E-06		3 88E-08	
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E-05	1 90E-05	3 30E-01	0 95	0 15	5 42E-07	0 03	1.88E-08	0 001
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02	1 40E-01	1	0.24	2.30E-07	0 000008	1 28E-08	0 0000004
MG/KG	TCDD Equivalent	B2			5 34E-05	0 5	0 03	8 77E-11		6 09E-13	
MG/KG	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04	2 40E-02	0 65	0.01	3 94E-08	0 00006	9 13E-11	0 0000002
	Hazard Index								**0.1**		**0.002**
										Total HI=	**0.1**

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index

TABLE I3-13a

FU2 Impoundment/Ditch Sediment -Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Csd * IR * FI * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a, b	50 a, b
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	50 i	50 i
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d
Dermal:			
CDI =	Csd *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 1 g,f	0.1 g,f
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (4 hours per 8 hour workday)	0 5 c	0.5 c
EF =	Exposure Frequency (day/year)	50 i	50 i
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d

Inhalation: No values available for inhalation pathway

References:

a = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

b = A conservative ingestion rate based on industrial soil intake is assumed

c = 2 hours of an 8-hour workday is assumed to be spent outdoors in the contaminated areas based on the nature of the activity

d = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991

e = Surface area of hands, 1/2 arms and face (1/2 head) of an adult worker

f = U S EPA Exposure Factors Handbook, August 1997.

g = AF calculated for soil adherence can be found in Appendix G.

h = Chemical-specific absorption factors are found in Appendix G

i = Once a week is assumed to be spent outdoors in the contaminated areas based on the nature of the activity

TABLE I3-13b

FU2 Impoundment/Ditch Sediment -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR
MG/KG	ALUMINUM	0	0 00E+00		8 55E+03	1.00E-01	0 001	2 99E-04	0 00E+00	8.00E-07	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	9 72E+00	4 10E-01	0 03	3 40E-07	5 09E-07	2 73E-08	9 99E-08
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 05E-01	5 00E-01	0 1	3 66E-09	5 86E-08	9 82E-10	3.14E-08
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	2 35E+00	1 46E+00	3 10E-01	0.1	5 09E-08	3.72E-08	1 36E-08	3 21E-08
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	1 21E+00	3 10E-01	0 13	4 22E-08	3 08E-07	1 47E-08	3 46E-07
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	1 99E+00	3 10E-01	0 1	6 95E-08	5 08E-08	1 86E-08	4 39E-08
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	1 64E+00	3 10E-01	0 1	5 74E-08	4 19E-10	1 54E-08	3 62E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	1.02E+00	3 10E-01	0 1	3 57E-08	2 61E-08	9 56E-09	2 25E-08
MG/KG	PCB-1260 (AROCHLOR 1260)	B2	2 00E+00	2 11E+00	3 30E-01	9 50E-01	0 15	1 15E-08	2 31E-08	4 63E-09	9 76E-09
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01	1 40E-01	1 00E+00	0 24	4 89E-09	5 87E-10	3 15E-09	3 77E-10
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	5 34E-05	5 00E-01	0.03	1 86E-12	2 80E-07	1.50E-13	4 50E-08
MG/KG	CARBON TETRACHLORIDE	B2	1.30E-01	2 00E-01	2 40E-02	6 50E-01	0 01	8 38E-10	1 09E-10	2 25E-11	4 49E-12
	Total Risk								**1.3E-06**		**6.3E-07**
									Total Risk=	**2E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-13c

FU2 Impoundment/Ditch Sediment -Hypothetical Future Industrial Worker Non-carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	RfDo	RfDd	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ
MG/KG	ALUMINUM	0	1 00E+00	1 00E-01	8.55E+03	1 00E-01	0 001	8 36E-04	0 0008	2.24E-06	0.00002
MG/KG	ARSENIC	A	3 00E-04	1 23E-04	9 72E+00	4 10E-01	0 03	9 51E-07	0 003	7 64E-08	0 0006
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	1 05E-01	5 00E-01	0 1	1 03E-08	0 0002	2.75E-09	0 0001
MG/KG	BENZO(a)ANTHRACENE	B2	0 00E+00		1 46E+00	3 10E-01	0 1	1 43E-07		3 82E-08	
MG/KG	BENZO(a)PYRENE	B2	0 00E+00		1.21E+00	3 10E-01	0 13	1 18E-07		4.12E-08	
MG/KG	BENZO(b)FLUORANTHENE	B2	0 00E+00		1.99E+00	3 10E-01	0 1	1.95E-07		5 22E-08	
MG/KG	CHRYSENE	B2	0 00E+00		1 64E+00	3 10E-01	0 1	1 61E-07		4 31E-08	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	0 00E+00		1 02E+00	3.10E-01	0 1	9 99E-08		2.68E-08	
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E-05	1 90E-05	3 30E-01	9 50E-01	0 15	3.23E-08	0 002	1.30E-08	0 0007
MG/KG	PENTACHLOROPHENOL	B2	3.00E-02	3.00E-02	1 40E-01	1 00E+00	0 24	1 37E-08	0 0000005	8 81E-09	0 0000003
MG/KG	TCDD Equivalent	B2	0 00E+00		5 34E-05	5 00E-01	0 03	5 22E-12		4 20E-13	
MG/KG	CARBON TETRACHLORIDE	B2	7.00E-04	4 55E-04	2 40E-02	6.50E-01	0 01	2 35E-09	0 000003	6 29E-11	0 0000001
	Hazard Index								**0.006**		**0.001**
									Total HI =	**0.007**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I3-14a

FU2 Sediment -Hypothetical Current/Future Maintenance Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Csd * IR * FI * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a, b	50 a, b
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	12 d	12 d
ED =	Exposure Duration (year)	25 e	25 e
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 e	70 e
AT =	Averaging Time (days)	25550 e	9125 e
Dermal:			
CDI =	Csd *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	2679 f,g	2679 f,g
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 1 g,h	0 1 g,h
ABS =	Absorption Factor (unitless)	(Chemical Specific) i	(Chemical Specific) i
ET =	Exposure Time (4 hours per 8 hour workday)	0.5 c	0.5 c
EF =	Exposure Frequency (day/year)	12 d	12 d
ED =	Exposure Duration (year)	25 e	25 e
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 e	70 e
AT =	Averaging Time (days)	25550 e	9125 e

Inhalation: No values available for inhalation pathway

References:

a = Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

b = A conservative ingestion rate based on industrial soil intake is assumed

c = Half a workday is assumed to be spent outdoors in the contaminated areas based on the nature of the activity.

d = Once a month maintenance activity throughout the year is assumed

e = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.

f = Surface area of hands, 1/2 arms and face (1/2 head) of an adult worker

g = U S.EPA Exposure Factors Handbook, August 1997.

h = AF calculated for soil adherence can be found in Appendix G

i = Chemical-specific absorption factors are found in Appendix G

TABLE I3-14b

FU2 Sediment -Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR
MG/KG	ALUMINUM				8 55E+03	1 00E-01	0 001	7.17E-05	0 0E+00	1 92E-07	0.0E+00
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	9 72E+00	4.10E-01	0 03	8 15E-08	1 2E-07	6 55E-09	2 4E-08
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 05E-01	5 00E-01	0 1	8 80E-10	1 4E-08	2 36E-10	7 5E-09
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	1.46E+00	3 10E-01	0 1	1 22E-08	8 9E-09	3.27E-09	7.7E-09
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	1.21E+00	3.10E-01	0 13	1 01E-08	7 4E-08	3 53E-09	8 3E-08
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	1 99E+00	3 10E-01	0 1	1 67E-08	1 2E-08	4 47E-09	1.1E-08
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	1 64E+00	3.10E-01	0 1	1 38E-08	1 0E-10	3 69E-09	8 7E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	1 02E+00	3 10E-01	0 1	8 57E-09	6 3E-09	2 29E-09	5.4E-09
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 11E+00	3 30E-01	9 50E-01	0 15	2.77E-09	5 5E-09	1.11E-09	2 3E-09
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01	1.40E-01	1 00E+00	0 24	1.17E-09	1 4E-10	7 55E-10	9.1E-11
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	5 34E-05	5 00E-01	0 03	4 48E-13	6 7E-08	3 60E-14	1 1E-08
MG/KG	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	2 40E-02	6 50E-01	0 01	2 01E-10	2 6E-11	5 39E-12	1 1E-12
	Total Risk								**3.1E-07**		**1.5E-07**
									Total Risk=	**5E-07**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I3-14c

FU2 Sediment -Hypothetical Current/Future Maintenance Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	EPC	ABSgi	ABS	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ
MG/KG	ALUMINUM		1 00E+00	1 00E-01	8 55E+03	1 00E-01	0 001	2 01E-04	2 0E-04	5 38E-07	5.4E-06
MG/KG	ARSENIC	A	3 00E-04	1 23E-04	9 72E+00	4 10E-01	0 03	2 28E-07	7 6E-04	1 83E-08	1.5E-04
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	1 05E-01	5 00E-01	0 1	2 46E-09	4 9E-05	6 60E-10	2.6E-05
MG/KG	BENZO(a)ANTHRACENE	B2			1 46E+00	3 10E-01	0 1	3 42E-08		9 16E-09	
MG/KG	BENZO(a)PYRENE	B2			1 21E+00	3 10E-01	0 13	2 84E-08		9 88E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2			1 99E+00	3 10E-01	0 1	4 67E-08		1 25E-08	
MG/KG	CHRYSENE	B2			1 64E+00	3 10E-01	0 1	3 86E-08		1 03E-08	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2			1 02E+00	3 10E-01	0 1	2 40E-08		6 43E-09	
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E-05	1 90E-05	3 30E-01	9 50E-01	0.15	7.75E-09	3 9E-04	3.11E-09	1 6E-04
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02	1 40E-01	1 00E+00	0 24	3 29E-09	1 1E-07	2 11E-09	7 0E-08
MG/KG	TCDD Equivalent	B2			5 34E-05	5 00E-01	0 03	1 25E-12		1 01E-13	
MG/KG	CARBON TETRACHLORIDE	B2	7 00E-04	4 55E-04	2 40E-02	6 50E-01	0 01	5 63E-10	8 0E-07	1 51E-11	3.3E-08
	Hazard Index								**0.001**		**0.0003**
									Total HI=	**0.002**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-15a
FU2 Surface Water- Hypothetical Future Recreational (Youth) Scenario
Memphis Depot Main Installation RI

Ingestion:

		Carcinogenic	Noncarcinogenic
CDI =	**Csw * IR * ET * EF * ED** / **BW * AT**		
Csw =	Concentration in surfacewater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/hour) - wading	0 05 a	0 05 a
ET =	Exposure Time (hours/day)	6 b	6 b
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	10 a	10 a
BW =	Body Weight (kg)	45 a	45 a
AT =	Averaging Time (days)	25550 a,c	3650 a,c

Dermal.

CDI =	**Csw *SA * PC * ET * EF * ED * CF** / **BW * AT**		
Csw =	Concentration in surfacewater (mg/L)	(EPC)	(EPC)
SA =	Surface Area (cm2) - wading	13118 d	13118 d
PC =	Dermal PeEPCability Constant (cm/hr)	(Chemical Specific) e	(Chemical Specific) e
ET =	Exposure Time (hours/day)	6 b	6 b
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	10 a	10 a
CF =	Conversion Factor (L/cm3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	45 a	45 a
AT =	Averaging Time (days)	25550 a,c	3650 a,c

Inhalation: Not an applicable pathway

References·
a = Values suggested by Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
b = 6 hours per a 24 hour day are assumed to be spent in Depot retention ponds for recreation
c = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
d = Total Body Surface Area represents whole body (average of male & female youths), calculated from data withdrawn from U S EPA Exposure Factors Handbook, August 1997
e = Dermal PeEPCability Constant for water (0 001) used for constituents without a PC value, all values adapted from U S EPA Dermal Exposure Assessment Principles and Applications, January 1992 (see Appendix G)

TABLE I3-15b
FU2 Surface Water- Hypothetical Future Recreational (Youth) Carcinogenic Scenario
Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**EPC**	**ABSgi**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/L	ARSENIC	A	1 50E+00	4E+00	2.75E-02	4 10E-01	1 60E-04	3.23E-06	5E-06	1 355E-07	5E-07
MG/L	DDE	B2	3 40E-01	5E-01	5 39E-05	7 00E-01	2.40E-01	6.33E-09	2E-09	3.988E-07	2E-07
MG/L	DDT	B2	3 40E-01	5E-01	5.97E-05	7.00E-01	4 30E-01	7.01E-09	2E-09	7.909E-07	4E-07
MG/L	DIELDRIN	B2	1.60E+01	3E+01	9.72E-05	5.00E-01	1.60E-02	1.14E-08	2E-07	4.79E-08	2E-06
MG/L	LEAD	B2			1.97E-02	1 50E-01	4 00E-06	2.31E-06		2 423E-09	
MG/L	ZINC	D			1 50E-01	2 00E-01	6.00E-04	1.76E-05		2.766E-06	
	Total Risk								**5E-06**		**3E-06**
								Total Risk=		**8E-06**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-15c

FU2 Surface Water- Hypothetical Future Recreational (Youth) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**
MG/L	ARSENIC	A	3 00E-04	1 23E-04	2 75E-02	4.10E-01	1 60E-04	2.26E-05	0.08	9 48E-07	0.008
MG/L	DDE	B2			5 39E-05	7 00E-01	2.40E-01	4 43E-08		2.79E-06	
MG/L	DDT	B2	5 00E-04	3.50E-04	5 97E-05	7.00E-01	4 30E-01	4.91E-08	0 0001	5.54E-06	0.02
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05	9 72E-05	5.00E-01	1 60E-02	7.99E-08	0 002	3.35E-07	0.01
MG/L	LEAD	B2			1 97E-02	1 50E-01	4.00E-06	1 62E-05		1.70E-08	
MG/L	ZINC	D	3.00E-01	6 00E-02	1 50E-01	2 00E-01	6.00E-04	1 23E-04	0.0004	1.94E-05	0 0003
	Hazard Index								**0.08**		**0.04**
									Total HI=	**0.1**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient; HI = Hazard Index

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TABLE I3-16a
FU2 Surface Water- Hypothetical Future Recreational (Adult) Scenario
Memphis Depot Main Installation RI

Ingestion:

$$CDI = \frac{Csw * IR * ET * EF * ED}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Csw =	Concentration in surfacewater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/hour) - wading	0 05 a	0 05 a
ET =	Exposure Time (hours/day)	6 b	6 b
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a,c	10950 a,c

Dermal:

$$CDI = \frac{Csw * SA * PC * ET * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Csw =	Concentration in surfacewater (mg/L)	(EPC)	(EPC)
SA =	Surface Area (cm2) - wading	20000 d	20000 d
PC =	Dermal PeEPCability Constant (cm/hr)	(Chemical Specific) e	(Chemical Specific) e
ET =	Exposure Time (hours/day)	6 b	6 b
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a,c	10950 a,c

Inhalation: Not an applicable pathway

References.
a = Values suggested by Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
b = 6 hours per a 24 hour day are assumed to be spent in Depot retention ponds for recreation
c = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
d = Total Body Surface Area represents whole body (average of male & female adults), calculated from data withdrawn from U S EPA Exposure Factors Handbook, August 1997
e = Dermal PeEPCability Constant for water (0 001) used for constituents without a PC value, all values adapted from U S EPA Dermal Exposure Assessment Principles and Applications, January 1992 (see Appendix G)

TABLE I3-16b

FU2 Surface Water- Hypothetical Future Recreational (Adult) Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR
MG/L	ARSENIC	A	1 50E+00	4E+00	2 75E-02	4 10E-01	1 60E-04	6.22E-06	9E-06	3.983E-07	1E-06
MG/L	DDE	B2	3.40E-01	5E-01	5 39E-05	7.00E-01	2 40E-01	1 22E-08	4E-09	1 173E-06	6E-07
MG/L	DDT	B2	3 40E-01	5E-01	5 97E-05	7.00E-01	4 30E-01	1 35E-08	5E-09	2 325E-06	1E-06
MG/L	DIELDRIN	B2	1 60E+01	3E+01	9 72E-05	5.00E-01	1 60E-02	2 20E-08	4E-07	1.408E-07	5E-06
MG/L	LEAD	B2			1.97E-02	1 50E-01	4.00E-06	4 45E-06		7 125E-09	
MG/L	ZINC	D			1 50E-01	2.00E-01	6 00E-04	3 39E-05		8 132E-06	
	Total Risk								**1E-05**		**8E-06**
								Total Risk=		**2E-05**	

Notes. WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure

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TABLE I3-16c
FU2 Surface Water- Hypothetical Future Recreational (Adult) Noncarcinogenic Scenario
Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**
MG/L	ARSENIC	A	3 00E-04	1.23E-04	2.75E-02	4.10E-01	1 60E-04	1.45E-05	0.05	9.29E-07	0 008
MG/L	DDE	B2			5 39E-05	7 00E-01	2 40E-01	2 85E-08		2.74E-06	
MG/L	DDT	B2	5.00E-04	3 50E-04	5.97E-05	7 00E-01	4 30E-01	3 15E-08	0.0001	5 43E-06	0.02
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05	9 72E-05	5.00E-01	1 60E-02	5.13E-08	0 001	3.29E-07	0 01
MG/L	LEAD	B2			1 97E-02	1 50E-01	4 00E-06	1 04E-05		1 66E-08	
MG/L	ZINC	D	3.00E-01	6 00E-02	1.50E-01	2.00E-01	6.00E-04	7 91E-05	0 0003	1.90E-05	0 0003
	Hazard Index								**0.05**		**0.04**
									Total HI=	**0.1**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index

TABLE 13-17a
FU2 Surface Water- Hypothetical Future Recreational (Child) Scenario
Memphis Depot Main Installation RI

Ingestion:

		Carcinogenic	Noncarcinogenic
CDI =	Csw * IR * ET * EF * ED / BW * AT		
Csw =	Concentration in surfacewater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/hour) - wading	0 05 a	0 05 a
ET =	Exposure Time (hours/day)	6 a	6 a
EF =	Exposure Frequency (day/year)	45 a,b	45 a,b
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a,c	2190 a,c

Dermal:

CDI =	Csw *SA * PC * ET * EF * ED * CF / BW * AT		
Csw =	Concentration in surfacewater (mg/L)	(EPC)	(EPC)
SA =	Surface Area (cm2) - wading	6557 d	6557 d
PC =	Dermal PeEPCability Constant (cm/hr)	(Chemical Specific) e	(Chemical Specific) e
ET =	Exposure Time (hours/day)	6 a	6 a
EF =	Exposure Frequency (day/year)	45 a	45 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a,c	2190 a,c

Inhalation: Not an applicable pathway

References.

a = Values suggested by Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
b = 6 hours per a 24 hour day are assumed to be spent in Depot retention ponds for recreation
c = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
d = Total Body Surface Area represents whole body (average of male & female children), calculated from data withdrawn from U S EPA Exposure Factors Handbook, August 1997
e = Dermal PeEPCability Constant for water (0 001) used for constituents without a PC value, all values adapted from U S EPA Dermal Exposure Assessment Principles and Applications, January 1992 (see Appendix G)

TABLE I3-17b

FU2 Surface Water- Hypothetical Future Recreational (Child) Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**EPC**	**ABSgi**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/L	ARSENIC	A	1.50E+00	4E+00	2 75E-02	4 10E-01	1 60E-04	5.81E-06	9E-06	1.219E-07	4E-07
MG/L	DDE	B2	3 40E-01	5E-01	5 39E-05	7 00E-01	2 40E-01	1 14E-08	4E-09	3.588E-07	2E-07
MG/L	DDT	B2	3.40E-01	5E-01	5.97E-05	7.00E-01	4.30E-01	1 26E-08	4E-09	7.116E-07	3E-07
MG/L	DIELDRIN	B2	1 60E+01	3E+01	9 72E-05	5 00E-01	1 60E-02	2 05E-08	3E-07	4 309E-08	1E-06
MG/L	LEAD	B2			1 97E-02	1 50E-01	4 00E-06	4.16E-06		2.18E-09	
MG/L	ZINC	D			1 50E-01	2.00E-01	6.00E-04	3 16E-05		2 488E-06	
	Total Risk								**9E-06**		**2E-06**
									Total Risk=	**1E-05**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-17c

FU2 Surface Water- Hypothetical Future Recreational (Child) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**
MG/L	ARSENIC	A	3 00E-04	1 23E-04	2 75E-02	4.10E-01	1 60E-04	6.78E-05	0 2	1.42E-06	0 012
MG/L	DDE	B2			5 39E-05	7 00E-01	2 40E-01	1.33E-07		4.19E-06	
MG/L	DDT	B2	5 00E-04	3.50E-04	5 97E-05	7 00E-01	4 30E-01	1 47E-07	0 0003	8 30E-06	0.02
MG/L	DIELDRIN	B2	5 00E-05	2 50E-05	9.72E-05	5 00E-01	1.60E-02	2 40E-07	0 005	5 03E-07	0.02
MG/L	LEAD	B2			1.97E-02	1.50E-01	4 00E-06	4.85E-05		2.54E-08	
MG/L	ZINC	D	3 00E-01	6.00E-02	1 50E-01	2 00E-01	6 00E-04	3 69E-04	0 001	2 90E-05	0.0005
	Hazard Index								**0.2**		**0.06**
									Total HI=	**0.3**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient; HI = Hazard Index

TABLE I3-18a

FU2 Surface Water - Hypothetical Future Industnal Worker Scenanc

Memphis Depot Main Installation RI

Ingestion:

CDI = $\frac{Csw * IR * ET * EF * ED}{BW * AT}$

		Carcinogenic	Noncarcinogenic
Csw =	Concentration in surfacewater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/hour) - wading	0.01 a	0 01 a
ET =	Exposure Time (hours/day)	4 b	4 b
EF =	Exposure Frequency (day/year)	50 g	50 g
ED =	Exposure Duration (year)	25 c	25 c
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	9125 c

Dermal:

CDI = $\frac{Csw * SA * PC * ET * EF * ED * CF}{BW * AT}$

		Carcinogenic	Noncarcinogenic
Csw =	Concentration in surfacewater (mg/L)	(EPC)	(EPC)
SA =	Surface Area (cm2) - wading	2679 d,e	2679 d,e
PC =	Dermal PeEPCability Constant (cm/hr)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (hours/day)	4 b	4 b
EF =	Exposure Frequency (day/year)	50 g	50 g
ED =	Exposure Duration (year)	25 c	25 c
CF =	Conversion Factor (L/cm3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	9125 c

Inhalation: No values available for inhalation pathway

a = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

b = Half a work-day is assumed to be spent in the lake/pond while working.

c = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

d = U S EPA Exposure Factors Handbook, August 1997

e = Surface area of hands, 1/2 arms, and face (1/2 head) of an adult worker is assumed to be same for sediment and surfacewater

f = Dermal PeEPCability Constant for water (0 001) used for constituents without a PC value, all values adapted from U S. EPA Dermal Exposure Assessment. Principles and Applications, January 1992. (see Appendix G)

g = Once a week is assumed to be spent outdoors in the contaminated areas based on the nature of the activity

TABLE I3-18b

FU2 Surface Water - Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**EPC**	**ABSgi**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/L	ARSENIC	A	1.50E+00	3.66E+00	2.75E-02	4.10E-01	1.60E-04	7.68E-07	1.2E-06	3.29E-08	1.2E-07
MG/L	DDE	B2	3.40E-01	4.86E-01	5.39E-05	7.00E-01	2.40E-01	1.51E-09	5.1E-10	9.70E-08	4.7E-08
MG/L	DDT	B2	3.40E-01	4.86E-01	5.97E-05	7.00E-01	4.30E-01	1.67E-09	5.7E-10	1.92E-07	9.3E-08
MG/L	DIELDRIN	B2	1.60E+01	3.20E+01	9.72E-05	5.00E-01	1.60E-02	2.72E-09	4.3E-08	1.16E-08	3.7E-07
MG/L	LEAD	B2			1.97E-02	1.50E-01	4.00E-06	5.50E-07		5.89E-10	
MG/L	ZINC	D			1.50E-01	2.00E-01	6.00E-04	4.18E-06		6.72E-07	
	Total Risk								**1E-06**		**6E-07**
								Total Risk=		**2E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure

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TABLE I3-18c
FU2 Surface Water - Hypothetical Future Industrial Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	RfDo	RfDd	EPC	ABSgi	PC	CDI	HQ	CDI	HQ
MG/L	ARSENIC	A	3 00E-04	1 23E-04	2.75E-02	4.10E-01	1 60E-04	2.15E-06	0 007	9 22E-08	0 0007
MG/L	DDE	B2			5 39E-05	7 00E-01	2 40E-01	4.22E-09		2.72E-07	
MG/L	DDT	B2	5 00E-04	3 50E-04	5 97E-05	7.00E-01	4.30E-01	4 67E-09	0 000009	5 38E-07	0 002
MG/L	DIELDRIN	B2	5 00E-05	2.50E-05	9.72E-05	5 00E-01	1 60E-02	7 61E-09	0 0002	3 26E-08	0 001
MG/L	LEAD	B2			1 97E-02	1.50E-01	4.00E-06	1.54E-06		1.65E-09	
MG/L	ZINC	D	3 00E-01		1.50E-01	2 00E-01	6 00E-04	1 17E-05	0 00004	1 88E-06	
	Hazard Index								**0.007**		**0.004**
									Total HI=	**0.01**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index

TABLE I3-19a
FU2 Surface Water - Hypothetical Current/Future Maintenance Worker Scenaric
Memphis Depot Main Installation RI

Ingestion:

CDI = $\frac{Csw * IR * ET * EF * ED}{BW * AT}$

		Carcinogenic	Noncarcinogenic
Csw =	Concentration in surfacewater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/hour) - wading	0 01 a	0.01 a
ET =	Exposure Time (hours/day)	4 b	4 b
EF =	Exposure Frequency (day/year)	12 c	12 c
ED =	Exposure Duration (year)	25 d	25 d
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d

Dermal:

CDI = $\frac{Csw * SA * PC * ET * EF * ED * CF}{BW * AT}$

		Carcinogenic	Noncarcinogenic
Csw =	Concentration in surfacewater (mg/L)	(EPC)	(EPC)
SA =	Surface Area (cm2) - wading	2679 e,f	2679 e,f
PC =	Dermal PeEPCability Constant (cm/hr)	(Chemical Specific) g	(Chemical Specific) g
ET =	Exposure Time (hours/day)	4 b	4 b
EF =	Exposure Frequency (day/year)	12 c	12 c
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (L/cm3)	1 00E-03	1.00E-03
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d

Inhalation: No values available for inhalation pathway

References:

a = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
b = Half a work-day is assumed to be spent in the lake/pond while sampling/maintenance.
c = Once a month maintenance activity at lake/pond throughout the year.
d = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.
e = U S EPA Exposure Factors Handbook, August 1997.
f = Surface area of hands, 1/2 arms, and face (1/2 head) of an adult worker is assumed to be same for sediment and surfacewater
g = Dermal PeEPCability Constant for water (0.001) used for constituents without a PC value; all values adapted from U S EPA Dermal Exposure Assessment Principles and Applications, January 1992 (see Appendix G)

TABLE I3-19b

FU2 Surface Water - Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	PC	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR
MG/L	ARSENIC	A	1 50E+00	3 66E+00	2 75E-02	4 10E-01	1 60E-04	1.84E-07	2.8E-07	7 90E-09	2.9E-08
MG/L	DDE	B2	3.40E-01	4 86E-01	5.39E-05	7.00E-01	2 40E-01	3 62E-10	1 2E-10	2.33E-08	1.1E-08
MG/L	DDT	B2	3.40E-01	4.86E-01	5.97E-05	7.00E-01	4.30E-01	4 01E-10	1.4E-10	4.61E-08	2.2E-08
MG/L	DIELDRIN	B2	1 60E+01	3 20E+01	9 72E-05	5 00E-01	1.60E-02	6.52E-10	1 0E-08	2.79E-09	8.9E-08
MG/L	LEAD	B2			1 97E-02	1 50E-01	4 00E-06	1 32E-07		1.41E-10	
MG/L	ZINC	D			1 50E-01	2 00E-01	6 00E-04	1.00E-06		1 61E-07	
	Total Risk								**3E-07**		**2E-07**
									Total Risk=	**4E-07**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I3-19c

FU2 Surface Water - Hypothetical Current/Future Maintenance Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**
MG/L	ARSENIC	A	3 00E-04	1 23E-04	2.75E-02	4.10E-01	1 60E-04	5.16E-07	0 002	2 21E-08	0.0002
MG/L	DDE	B2			5.39E-05	7 00E-01	2.40E-01	1.01E-09		6.52E-08	
MG/L	DDT	B2	5 00E-04	3 50E-04	5 97E-05	7.00E-01	4 30E-01	1.12E-09	0 000002	1.29E-07	0 0004
MG/L	DIELDRIN	B2	5 00E-05	2.50E-05	9 72E-05	5 00E-01	1 60E-02	1.83E-09	0.00004	7 83E-09	0.0003
MG/L	LEAD	B2			1.97E-02	1 50E-01	4.00E-06	3.69E-07		3.96E-10	
MG/L	ZINC	D	3.00E-01	6 00E-02	1 50E-01	2.00E-01	6 00E-04	2.81E-06	0 000009	4.52E-07	0.000008
	Hazard Index								**0.002**		**0.0009**
									Total HI=	**0.003**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient; HI = Hazard Index

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Appendix I-4
A. FU3 Soils
B. FU3 Sediments

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TABLE I4-1a
FU3 Surface Soil -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles:*	
CDI =	$\frac{Cs * (1/PEF) * IR * ET * EF * ED}{BW * AT}$	$\frac{Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED}{BW * AT}$	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09 g	1 32E+09 g
VFind =	Volatilization Factor (m^3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m^3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = U.S. EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix L
f = Chemical-specific absorption factors are found in Appendix L
g = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance Technical Background Document, May-1996.
h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C., December 1998

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TABLE I4-1b

FU3 Surface Soil -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ANTIMONY	D					3 47E+00	2 00E-02	0 001	6 06E-07		9 74E-10		1 84E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 25E+01	4 10E-01	0 03	2 19E-06	3 3E-06	1 06E-07	3 9E-07	6 63E-10	1 0E-08
MG/KG	CADMIUM	B1			6 30E+00		1 26E+00	1 00E-02	0 01	2 20E-07		3 54E-09		6 67E-11	4 2E-10
MG/KG	CHROMIUM, TOTAL	A			4 20E+01		7 20E+01	2 00E-02	0 001	1 26E-05		2 02E-08		3 81E-09	1 6E-07
MG/KG	MERCURY	D					6 19E-02	1 00E-04	0 001	1 08E-08		1 74E-11		3 28E-12	
MG/KG	SELENIUM	D					8 21E-01	4 40E-01	0 001	1 43E-07		2 31E-10		4 35E-11	
MG/KG	VANADIUM						2 56E+01	1 00E-02	0 001	4 47E-06		7 19E-09		1 36E-09	
MG/KG	ZINC	D					2 73E+02	2 00E-01	0 001	4 77E-05		7 67E-08		1 45E-08	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		3 74E-02	5 00E-01	0 1	6 54E-09	1 0E-07	1 05E-09	3 4E-08	1 98E-12	3 2E-11
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		1 40E+00	3 10E-01	0 1	2 45E-07	1 8E-07	3 93E-08	9 3E-08	7 42E-11	2 3E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		1 31E+00	3 10E-01	0 13	2 29E-07	1 7E-06	4 78E-08	1 1E-06	6 94E-11	2 2E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		1 39E+00	3 10E-01	0 1	2 42E-07	1 8E-07	3 89E-08	9 2E-08	7.34E-11	2 3E-11
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		1 43E+00	3 10E-01	0 1	2 51E-07	1 8E-08	4 03E-08	9 5E-09	7.59E-11	2 4E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			5 51E-01	7 00E-01	0 1	9 63E-08	1 9E-09	1 55E-08	4 4E-10	2 92E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		1 61E+00	3 10E-01	0 1	2 82E-07	2 1E-09	4 53E-08	1 1E-09	8 54E-11	2 6E-13
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		5 40E-01	3 10E-01	0 1	9 44E-08	6 9E-07	1 52E-08	3 6E-07	2 86E-11	8 9E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		1 05E+00	3 10E-01	0 1	1 84E-07	1 3E-07	2 95E-08	7 0E-08	5 56E-11	1 7E-11
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			2 42E-01	1 00E+00	0 24	4 23E-08	5 1E-09	1 63E-08	2 0E-09	1 28E-11	
MG/KG	PETROLEUM HYDROCARBONS					9 13E+11	2 74E+02	5 00E-01	0 01	4 79E-05		7 70E-07		1 45E-08	
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	1 50E+05	1 12E+07	1 31E-05	5 00E-01	0 03	2 29E-12	3 4E-07	1 10E-13	3 3E-08	8 22E-14	1 2E-08
	Total Risk										**6.6E-06**		**2.2E-06**		**1.8E-07**
												Total Risk =		**9E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I4-1c
FU3 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D	4.00E-04	8.00E-06			3.47E+00	2.00E-02	0.001	1.70E-06	0.004	2.73E-09	0.0003	5.14E-10	
MG/KG	ARSENIC	A	3.00E-04	1.23E-04			1.25E+01	4.10E-01	0.03	6.13E-06	0.02	2.95E-07	0.002	1.86E-09	
MG/KG	CADMIUM	B1	1.00E-03	1.00E-05			1.26E+00	1.00E-02	0.01	6.16E-07	0.0006	9.90E-09	0.001	1.87E-10	
MG/KG	CHROMIUM, TOTAL	A	3.00E-03	6.00E-05	2.86E-05		7.20E+01	2.00E-02	0.001	3.52E-05	0.01	5.66E-08	0.0009	1.07E-08	0.0004
MG/KG	MERCURY	D			8.57E-05		6.19E-02	1.00E-04	0.001	3.03E-08		4.87E-11		9.18E-12	0.0000001
MG/KG	SELENIUM	D	5.00E-03	2.20E-03			8.21E-01	4.40E-01	0.001	4.02E-07	0.00008	6.46E-10	0.0000003	1.22E-10	
MG/KG	VANADIUM		7.00E-03	7.00E-05			2.56E+01	1.00E-02	0.001	1.25E-05	0.002	2.01E-08	0.0003	3.80E-09	
MG/KG	ZINC	D	3.00E-01	6.00E-02			2.73E+02	2.00E-01	0.001	1.34E-04	0.0004	2.15E-07	0.000004	4.05E-08	
MG/KG	DIELDRIN	B2	5.00E-05	2.50E-05			3.74E-02	5.00E-01	0.1	1.83E-08	0.0004	2.94E-09	0.0001	5.55E-12	
MG/KG	BENZO(a)ANTHRACENE	B2					1.40E+00	3.10E-01	0.1	6.85E-07		1.10E-07		2.08E-10	
MG/KG	BENZO(a)PYRENE	B2					1.31E+00	3.10E-01	0.13	6.41E-07		1.34E-07		1.94E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2					1.39E+00	3.10E-01	0.1	6.78E-07		1.09E-07		2.06E-10	
MG/KG	BENZO(k)FLUORANTHENE	B2					1.43E+00	3.10E-01	0.1	7.02E-07		1.13E-07		2.13E-10	
MG/KG	CARBAZOLE	B2					5.51E-01	7.00E-01	0.1	2.70E-07		4.33E-08		8.17E-11	
MG/KG	CHRYSENE	B2					1.61E+00	3.10E-01	0.1	7.89E-07		1.27E-07		2.39E-10	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					5.40E-01	3.10E-01	0.1	2.64E-07		4.25E-08		8.01E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					1.05E+00	3.10E-01	0.1	5.14E-07		8.26E-08		1.56E-10	
MG/KG	PENTACHLOROPHENOL	B2	3.00E-02	3.00E-02			2.42E-01	1.00E+00	0.24	1.18E-07	0.000004	4.57E-08	0.000002	3.59E-11	
MG/KG	PETROLEUM HYDROCARBONS		4.00E-02	2.00E-02	6.00E-02	9.13E+11	2.74E+02	5.00E-01	0.01	1.34E-04	0.003	2.15E-06	0.0001	4.07E-08	0.0000007
MG/KG	TCDD Equivalent	B2				1.12E+07	1.31E-05	5.00E-01	0.03	6.41E-12		3.09E-13		2.30E-13	
	Hazard Index										**0.04**		**0.005**		**0.0004**
													Total HI=	**0.05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I4-2a
FU3 Surface Soil -Hypothetical Current/Future Maintenance Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic		Noncarcinogenic	
Ingestion:					
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT				
Cs =	Concentration in soil (mg/kg)	EPC		EPC	
IR =	Ingestion Rate (mg/day)	50	c	50	c
FI =	Fraction Ingested (unitless)	0.5		0.5	
EF =	Exposure Frequency (day/year)	50	d	50	d
ED =	Exposure Duration (year)	25	a	25	a
CF =	Conversion Factor (kg/mg)	1.00E-06		1.00E-06	
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	9125	a
Dermal:					
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT				
Cs =	Concentration in soil (mg/kg)	EPC		EPC	
SA =	Surface Area (cm^2)	2679	e,f	2679	e,f
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.03	e,g	0.03	e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific)	h	(Chemical Specific)	h
ET =	Exposure Time (8 hours per 8 hour workday)	1	b	1	b
EF =	Exposure Frequency (day/year)	50	d	50	d
ED =	Exposure Duration (year)	25	a	25	a
CF =	Conversion Factor (kg/mg)	1.00E-06		1.00E-06	
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	9125	a
Inhalation:		*for volatiles.*			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT			
Cs =	Concentration in soil (mg/kg)	EPC		EPC	
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09	i	1 32E+09	i
VFind =	Volatilization Factor (m^3/kg)	(Chemical Specific)	j	(Chemical Specific)	j
IR =	Inhalation Rate (m^3/day)	20	a	20	a
ET =	Exposure Time (8 hours per 8 hour workday)	1	b	1	b
EF =	Exposure Frequency (day/year)	50	d	50	d
ED =	Exposure Duration (year)	25	a	25	a
BW =	Body Weight (kg)	70	a	70	a
AT =	Averaging Time (days)	25550	a	9125	a

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday.
c = Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.
d = Maintenance activity assumed to be once a week throughout the year (excluding vacation).
e= U S EPA Exposure Factors Handbook, August 1997
f = Surface area of 1/2 head, forearms and the hands of an adult worker.
g = AF calculated for soil adherence can be found in Appendix L
h = Chemical-specific absorption factors are found in Appendix L.
i = Particulate emission factor (PEF), adapted from U S.EPA, Soil Screening Guidance. Technical Background Document, May 1996
j = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C., December 1998.

TABLE I4-2b

FU3 Surface Soil -Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	ANTIMONY	D					3 47E+00	2 00E-02	0 001	6 06E-08		1 95E-10		3 67E-11	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 25E+01	4 10E-01	0 03	2 19E-07	3 3E-07	2 11E-08	7 7E-08	1 33E-10	2 0E-09
MG/KG	CADMIUM	B1			6 30E+00		1 26E+00	1 00E-02	0 01	2 20E-08		7 07E-10		1 33E-11	8 4E-11
MG/KG	CHROMIUM, TOTAL	A			4 20E+01		7 20E+01	2 00E-02	0 001	1 26E-06		4 04E-09		7 62E-10	3 2E-08
MG/KG	MERCURY	D					6 19E-02	1 00E-04	0 001	1 08E-09		3 48E-12		6 56E-13	
MG/KG	SELENIUM	D					8 21E-01	4 40E-01	0 001	1 43E-08		4 61E-11		8 70E-12	
MG/KG	VANADIUM						2 56E+01	1.00E-02	0 001	4 47E-07		1.44E-09		2 71E-10	
MG/KG	ZINC	D					2 73E+02	2 00E-01	0 001	4 77E-06		1 53E-08		2 89E-09	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		3 74E-02	5 00E-01	0 1	6 54E-10	1 0E-08	2 10E-10	6 7E-09	3 97E-13	6 3E-12
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		1 40E+00	3 10E-01	0 1	2 45E-08	1 8E-08	7 87E-09	1 9E-08	1.48E-11	4 6E-12
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		1 31E+00	3 10E-01	0 13	2 29E-08	1.7E-07	9 57E-09	2 3E-07	1 39E-11	4 3E-11
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		1 39E+00	3 10E-01	0 1	2 42E-08	1 8E-08	7 79E-09	1 8E-08	1 47E-11	4 6E-12
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		1 43E+00	3 10E-01	0 1	2 51E-08	1 8E-09	8 06E-09	1 9E-09	1 52E-11	4 7E-13
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			5 51E-01	7 00E-01	0 1	9 63E-09	1 9E-10	3 10E-09	8 8E-11	5 84E-12	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		1 61E+00	3 10E-01	0 1	2 82E-08	2 1E-10	9 05E-09	2 1E-10	1 71E-11	5 3E-14
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		5 40E-01	3 10E-01	0 1	9 44E-09	6 9E-08	3 03E-09	7 1E-08	5 72E-12	1 8E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		1 05E+00	3 10E-01	0 1	1 84E-08	1 3E-08	5 90E-09	1 4E-08	1 11E-11	3 4E-12
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			2 42E-01	1 00E+00	0 24	4 23E-09	5 1E-10	3 26E-09	3 9E-10	2 56E-12	
MG/KG	PETROLEUM HYDROCARBONS					9 13E+11	2 74E+02	5 00E-01	0 01	4 79E-06		1 54E-07		2 91E-09	
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	1 50E+05	1 12E+07	1 31E-05	5 00E-01	0 03	2 29E-13	3 4E-08	2 21E-14	6 6E-09	1 64E-14	2 5E-09
	Total Risk										**6.6E-07**		**4.4E-07**		**3.7E-08**
													Total Risk =	**1E-06**	

Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I4-2c

FU3 Surface Soil -Hypothetical Current/Future Maintenance Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D	4.00E-04	8.00E-06			3.47E+00	2.00E-02	0.001	1.70E-07	0.0004	5.46E-10	0.00007	1.03E-10	
MG/KG	ARSENIC	A	3.00E-04	1.23E-04			1.25E+01	4.10E-01	0.03	6.13E-07	0.002	5.91E-08	0.0005	3.71E-10	
MG/KG	CADMIUM	B1	1.00E-03	1.00E-05			1.26E+00	1.00E-02	0.01	6.16E-08	0.00006	1.98E-09	0.0002	3.73E-11	
MG/KG	CHROMIUM, TOTAL	A	3.00E-03	6.00E-05	2.86E-05		7.20E+01	2.00E-02	0.001	3.52E-06	0.001	1.13E-08	0.0002	2.13E-09	0.00007
MG/KG	MERCURY	D			8.57E-05		6.19E-02	1.00E-04	0.001	3.03E-09		9.74E-12		1.84E-12	0.00000002
MG/KG	SELENIUM	D	5.00E-03	2.20E-03			8.21E-01	4.40E-01	0.001	4.02E-08	0.000008	1.29E-10	0.00000006	2.43E-11	
MG/KG	VANADIUM		7.00E-03	7.00E-05			2.56E+01	1.00E-02	0.001	1.25E-06	0.0002	4.03E-09	0.00006	7.59E-10	
MG/KG	ZINC	D	3.00E-01	6.00E-02			2.73E+02	2.00E-01	0.001	1.34E-05	0.00004	4.29E-08	0.0000007	8.10E-09	
MG/KG	DIELDRIN	B2	5.00E-05	2.50E-05			3.74E-02	5.00E-01	0.1	1.83E-09	0.00004	5.89E-10	0.00002	1.11E-12	
MG/KG	BENZO(a)ANTHRACENE	B2					1.40E+00	3.10E-01	0.1	6.85E-08		2.20E-08		4.15E-11	
MG/KG	BENZO(a)PYRENE	B2					1.31E+00	3.10E-01	0.13	6.41E-08		2.68E-08		3.89E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2					1.39E+00	3.10E-01	0.1	6.78E-08		2.18E-08		4.11E-11	
MG/KG	BENZO(k)FLUORANTHENE	B2					1.43E+00	3.10E-01	0.1	7.02E-08		2.26E-08		4.25E-11	
MG/KG	CARBAZOLE	B2					5.51E-01	7.00E-01	0.1	2.70E-08		8.67E-09		1.63E-11	
MG/KG	CHRYSENE	B2					1.61E+00	3.10E-01	0.1	7.89E-08		2.54E-08		4.78E-11	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					5.40E-01	3.10E-01	0.1	2.64E-08		8.49E-09		1.60E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					1.05E+00	3.10E-01	0.1	5.14E-08		1.65E-08		3.12E-11	
MG/KG	PENTACHLOROPHENOL	B2	3.00E-02	3.00E-02			2.42E-01	1.00E+00	0.24	1.18E-08	0.0000004	9.14E-09	0.0000003	7.18E-12	
MG/KG	PETROLEUM HYDROCARBONS		4.00E-02	2.00E-02	6.00E-02	9.13E+11	2.74E+02	5.00E-01	0.01	1.34E-05	0.0003	4.31E-07	0.00002	8.14E-09	0.0000001
MG/KG	TCDD Equivalent	B2				1.12E+07	1.31E-05	5.00E-01	0.03	6.41E-13		6.18E-14		4.61E-14	
	Hazard Index										**0.004**		**0.001**		**0.00007**
													Total HI=	**0.005**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index														

TABLE I4-3a
FU3 Soil Column -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	**Cs * IR * FI * EF * ED * CF** / **BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	**Cs *SA * AF * ABS * ET * EF * ED * CF** / **BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0 03 c,e	0.03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles.*	
CDI =	**Cs * (1/PEF) * IR * ET * EF * ED** / **BW * AT**	**Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED** / **BW * AT**	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09 g	1 32E+09 g
VFind =	Volatilization Factor (m^3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m^3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity.
c = U S EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker.
e = AF calculated for soil adherence can be found in Appendix L
f = Chemical-specific absorption factors are found in Appendix L
g = Particulate emission factor (PEF), adapted from U.S EPA, Soil Screening Guidance Technical Background Document, May 1996.
h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C., December 1998.

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TABLE I4-3b
FU3 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario
Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ANTIMONY	D					3 50E+00	2 00E-02	0 001	6 12E-07		9 84E-10		1 85E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 20E+01	4 10E-01	0 03	2 09E-06	3 1E-06	1 01E-07	3 7E-07	6 34E-10	9 6E-09
MG/KG	CADMIUM	B1			6 30E+00		8 88E-01	1 00E-02	0 01	1 55E-07		2 50E-09		4 70E-11	3 0E-10
MG/KG	CHROMIUM, TOTAL	A			4 20E+01		4 92E+01	2 00E-02	0 001	8 60E-06		1 38E-08		2 61E-09	1 1E-07
MG/KG	COPPER	D					3 09E+01	3 00E-01	0 001	5 39E-06		8 67E-09		1 63E-09	
MG/KG	MERCURY	D					5 63E-02	1 00E-04	0 001	9 84E-09		1 58E-11		2 98E-12	
MG/KG	SELENIUM	D					7 17E-01	4 40E-01	0 001	1 25E-07		2 01E-10		3 80E-11	
MG/KG	VANADIUM						2 69E+01	1 00E-02	0 001	4 71E-06		7 57E-09		1 43E-09	
MG/KG	ZINC	D					1 70E+02	2 00E-01	0 001	2 96E-05		4 76E-08		8 98E-09	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		1 75E-02	5 00E-01	0 1	3 05E-09	4 9E-08	4 90E-10	1 6E-08	9 25E-13	1 5E-11
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		6 87E-01	3 10E-01	0 1	1 20E-07	8 8E-08	1 93E-08	4 5E-08	3 64E-11	1 1E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		6 51E-01	3 10E-01	0 13	1 14E-07	8 3E-07	2 38E-08	5 6E-07	3 45E-11	1 1E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		6 76E-01	3 10E-01	0 1	1 18E-07	8 6E-08	1 90E-08	4 5E-08	3 58E-11	1 1E-11
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		6 91E-01	3 10E-01	0 1	1 21E-07	8 8E-09	1 94E-08	4 6E-09	3 66E-11	1.1E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			3 39E-01	7 00E-01	0 1	5 93E-08	1 2E-09	9 53E-09	2 7E-10	1 80E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		7 44E-01	3 10E-01	0 1	1 30E-07	9 5E-10	2 09E-08	4 9E-10	3 94E-11	1 2E-13
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		3 59E-01	3 10E-01	0 1	6 27E-08	4 6E-07	1 01E-08	2 4E-07	1 90E-11	5 9E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		5 63E-01	3 10E-01	0 1	9 84E-08	7 2E-08	1 58E-08	3 7E-08	2 98E-11	9 2E-12
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			1 57E-01	1 00E+00	0 24	2 75E-08	3 3E-09	1 06E-08	1 3E-09	8 35E-11	
MG/KG	PETROLEUM HYDROCARBONS					9 13E+11	2 74E+02	5 00E-01	0 01	4 79E-05		7 70E-07		1 45E-08	
MG/KG	TCDD Equivalent	B2	1 50E+05		1 50E+05	1 12E+07	1 00E-05	5 00E-01	0 03	1 75E-12	2 6E-07	8 44E-14		6 29E-14	9 4E-09
	Total Risk										**5 0E-06**		**1.3E-06**		**1.3E-07**
												Total Risk =		**6E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I4-3c
FU3 Soil Column-Hypothetical Future Industrial Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			3 50E+00	2 00E-02	0 001	1 71E-06	0 004	2 75E-09	0 0003	5 19E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			1 20E+01	4 10E-01	0 03	5 86E-06	0 02	2 83E-07	0 002	1 78E-09	
MG/KG	CADMIUM	B1	1 00E-03	1 00E-05			8 88E-01	1 00E-02	0 01	4 35E-07	0 0004	6 99E-09	0 0007	1 32E-10	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6.00E-05	2 86E-05		4 92E+01	2 00E-02	0 001	2 41E-05	0 008	3 87E-08	0 0006	7 29E-09	0 0003
MG/KG	COPPER	D	3 70E-02	1 11E-02			3 09E+01	3 00E-01	0 001	1 51E-05	0 0004	2 43E-08	0 000002	4 58E-09	
MG/KG	MERCURY	D			8 57E-05		5 63E-02	1 00E-04	0 001	2 76E-08		4 43E-11		8 35E-12	0 0000001
MG/KG	SELENIUM	D	5 00E-03	2 20E-03			7 17E-01	4 40E-01	0 001	3 51E-07	0 00007	5 64E-10	0 0000003	1 06E-10	
MG/KG	VANADIUM		7 00E-03	7 00E-05			2 69E+01	1 00E-02	0 001	1 32E-05	0 002	2 12E-08	0 0003	3 99E-09	
MG/KG	ZINC	D	3 00E-01	6 00E-02			1 70E+02	2 00E-01	0 001	8 30E-05	0 0003	1 33E-07	0 000002	2 52E-08	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			1 75E-02	5 00E-01	0 1	8 54E-09	0 0002	1 37E-09	0 00005	2 59E-12	
MG/KG	BENZO(a)ANTHRACENE	B2					6 87E-01	3 10E-01	0 1	3 36E-07		5 40E-08		1 02E-10	
MG/KG	BENZO(a)PYRENE	B2					6 51E-01	3 10E-01	0 13	3 19E-07		6 66E-08		9 65E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2					6 76E-01	3 10E-01	0 1	3 31E-07		5 32E-08		1 00E-10	
MG/KG	BENZO(k)FLUORANTHENE	B2					6 91E-01	3 10E-01	0 1	3 38E-07		5 44E-08		1 02E-10	
MG/KG	CARBAZOLE	B2					3 39E-01	7 00E-01	0 1	1 66E-07		2 67E-08		5 03E-11	
MG/KG	CHRYSENE	B2					7 44E-01	3 10E-01	0 1	3 64E-07		5 85E-08		1 10E-10	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					3 59E-01	3 10E-01	0 1	1 76E-07		2 82E-08		5 32E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					5 63E-01	3 10E-01	0 1	2 75E-07		4 43E-08		8 35E-11	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			1 57E-01	1 00E+00	0 24	7 70E-08	0 000003	2 97E-08	0 000001	8 35E-11	
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	6 00E-02	9 13E+11	2 74E+02	5 00E-01	0 01	1 34E-04	0 003	2 15E-06	0 0001	4.07E-08	0 0000007
MG/KG	TCDD Equivalent	B2				1 12E+07	1 00E-05	5 00E-01	0 03	4 90E-12		2 36E-13		1.76E-13	
	Hazard Index										**0.04**		**0.004**		**0.0003**
													Total HI=	**0.04**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I4-4a
FU3 Surface Soil - Hypothetical Future On-Site Residential (Adult) Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{Cs * FI * EF * CF * IR_{adj}}{AT}$	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	N/A	100 a
IR_{adj} =	Age-adjusted Ingestion Rate (mg - year)/(kg - day)	114 29 a,b	N/A
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$	$\frac{Cs * SA_{adj} * AF * ABS * ET * EF * CF}{AT}$	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	5049 d,e
SA_{adj} =	Age-adjusted Surface Area (cm^2 - year)/(kg)	2671 d,e,f	N/A
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0 03 d,g	0 03 d,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Inhalation:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{Cs * (1/PEF) * IR\_Inh * ET * EF * ED}{BW * AT}$	$CDI = \frac{Cs * (1/PEF) * IR\_Inh_{adj} * ET * E}{AT}$	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09 i	1 32E+09 i
IR_Inh =	Inhalation Rate (m^3/day)	N/A	20 a
IR_Inh_{adj} =	Age-adjusted Inhalation Rate (m^3 - year)/(kg - day)	12 85714286 a,j	N/A
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70}$$

114.29 (mg-year)/(kg-day)

c = Time spent outdoors in the contaminated areas based on the nature of the activity

d= U S EPA Exposure Factors Handbook, August 1997

e = Surface area of 1/2 head, hands, forearms, lower legs & feet of an adult

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{2351 \times 6}{15} + \frac{5049 \times (30-6)}{70}$$

2671 (cm^2-year)/(kg)

g = AF calculated for soil adherence can be found in Appendix L.

h = Chemical-specific absorption factors are found in Appendix L

i = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996

j = Age-adjusted inhalation rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR\text{-}Inh\ adj = \frac{IR\text{-}Inh\ c \times EDc}{BWc} + \frac{IR\text{-}Inh\ a \times (EDa - EDc)}{BWa} = \frac{15 \times 6}{15} + \frac{20 \times (30-6)}{70}$$

12 86 (m^3-year)/(kg-day)

TABLE I4-4b

FU3 B(26 2) Surface Soil - Hypothetical Future On-Site Residential (Adult) Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	ABS	CDI_{adj}	ELCR	CDI_{adj}	ELCR	CDI_{adj}	ELCR
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	4.00E+01	3 10E-01	0 1	6 26E-05	4.6E-05	7 32E-07	1.7E-06	8 90E-10	2 8E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	3 70E+01	3 10E-01	0 13	5 79E-05	4 2E-04	8 80E-07	2 1E-05	8 23E-10	2 6E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	3 90E+01	3 10E-01	0 1	6 11E-05	4 5E-05	7 14E-07	1 7E-06	8.67E-10	2.7E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02	3 40E+01	3 10E-01	0 1	5 32E-05	3 9E-06	6 22E-07	1.5E-07	7 56E-10	2 3E-11
MG/KG	CHRYSENE	B2	7.30E-03	2 35E-02	3 10E-03	4 60E+01	3 10E-01	0 1	7 20E-05	5 3E-07	8 42E-07	2 0E-08	1 02E-09	3.2E-12
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	2 20E+01	3 10E-01	0 1	3 44E-05	2 5E-05	4.03E-07	9 5E-07	4.89E-10	1 5E-10
	Total Risk									**5.4E-04**		**2 5E-05**		**3.3E-09**
												Total Risk =	**6E-04**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I4-4c
FU3 B(26 2) Surface Soil - Hypothetical Future On-Site Residential (Adult) Noncarcinogenic Scenario
Defense Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	Ingestion		Dermal		Inhalation	
									CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	BENZO(a)ANTHRACENE	B2				4.00E+01	3.10E-01	0.1	5 48E-05		1.38E-06		1 38E-09	
MG/KG	BENZO(a)PYRENE	B2				3 70E+01	3 10E-01	0 13	5 07E-05		1 66E-06		1 28E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2				3 90E+01	3.10E-01	0 1	5 34E-05		1 35E-06		1.35E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2				3 40E+01	3 10E-01	0 1	4 66E-05		1.18E-06		1 18E-09	
MG/KG	CHRYSENE	B2				4.60E+01	3 10E-01	0.1	6 30E-05		1.59E-06		1 59E-09	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				2 20E+01	3 10E-01	0 1	3 01E-05		7 61E-07		7.61E-10	
	Hazard Index													
												Total HI=		

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Inde

TABLE I4-5a
FU3 Surface Soil - Hypothetical Future On-Site Residential (Child) Scenario
Memphis Depot Main Installation RI

		Carcinogenic (optional)	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	200 a	200 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
CDI =	Cs * SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2)	2351 c,d	2351 c,d
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0 15 c,e	0 15 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0 167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m^3/day)	15 a	15 a
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0.167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas based on the nature of the activity
c= U S EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, hands, forearms, lower legs & feet of a child (age 1-6 years)
e = AF calculated for soil adherence can be found in Appendix L
f = Chemical-specific absorption factors are found in Appendix L
g = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technica Background Document, May 1996

TABLE I4-5b

FU3 B(26 2) Surface Soil - Hypothetical Future On-Site Residential (Child) Carcinogenic Scenario (optional use)

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	4.00E+01	3.10E-01	0 1	4 38E-05	3 20E-05	1 29E-06	3 03E-06	4.15E-10	1 29E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2.35E+01	3 10E+00	3 70E+01	3 10E-01	0 13	4 05E-05	2.96E-04	1.55E-06	3 65E-05	3.84E-10	1 19E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	3 90E+01	3.10E-01	0 1	4 27E-05	3 12E-05	1 26E-06	2 96E-06	4.05E-10	1.25E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02	3 40E+01	3 10E-01	0 1	3 73E-05	2 72E-06	1 09E-06	2.58E-07	3.53E-10	1 09E-11
MG/KG	CHRYSENE	B2	7.30E-03	2 35E-02	3 10E-03	4 60E+01	3 10E-01	0 1	5 04E-05	3 68E-07	1 48E-06	3 49E-08	4.77E-10	1 48E-12
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	2 20E+01	3.10E-01	0.1	2.41E-05	1 76E-05	7 09E-07	1 67E-06	2.28E-10	7 08E-11
	Total Risk									**4E-04**		**4E-05**		**2E-09**
											Total Risk =		**4E-04**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure													

TABLE I4-5c

FU3 B(26 2) Surface Soil - Hypothetical Future On-Site Residential (Child) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	BENZO(a)ANTHRACENE	B2				4 00E+01	3 10E-01	0 1	5 11E-04		1 50E-05		4 84E-09	
MG/KG	BENZO(a)PYRENE	B2				3 70E+01	3 10E-01	0 13	4 73E-04		1 81E-05		4 48E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2				3 90E+01	3 10E-01	0 1	4 99E-04		1 47E-05		4 72E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2				3 40E+01	3 10E-01	0 1	4 35E-04		1 28E-05		4 12E-09	
MG/KG	CHRYSENE	B2				4 60E+01	3 10E-01	0 1	5 88E-04		1 73E-05		5 57E-09	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				2 20E+01	3 10E-01	0 1	2 81E-04		8 27E-06		2 66E-09	
	Hazard Index													
												Total HI=		
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index													

TABLE I4-6a
Surrogate Site #34 Soil Column -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09 g	1.32E+09 g
IR =	Inhalation Rate (m^3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity.
c = U S EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker.
e = AF calculated for soil adherence can be found in Appendix L
f = Chemical-specific absorption factors are found in Appendix L.
g = Particulate emission factor (PEF), adapted from U.S EPA, Soil Screening Guidance Technical Background Document, May 1996

TABLE I4-6b
Surrogate Site #34 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario
Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	2.46E+01	4.10E-01	0.03	4.30E-06	6.5E-06	2.08E-07	7.6E-07	1.30E-09	2.0E-08
MG/KG	CHROMIUM, TOTAL	A			4.20E+01	7.27E+01	2.00E-02	0.001	1.27E-05		2.04E-08		3.85E-09	1.6E-07
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	2.35E+00	3.10E-01	1.00E+01	3.10E-01	0.1	1.75E-06	1.3E-06	2.81E-07	6.6E-07	5.29E-10	1.6E-10
MG/KG	BENZO(a)PYRENE	B2	7.30E+00	2.35E+01	3.10E+00	9.50E+00	3.10E-01	0.13	1.66E-06	1.2E-05	3.47E-07	8.2E-06	5.03E-10	1.6E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7.30E-01	2.35E+00	3.10E-01	9.50E+00	3.10E-01	0.1	1.66E-06	1.2E-06	2.67E-07	6.3E-07	5.03E-10	1.6E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7.30E-02	2.35E-01	3.10E-02	1.20E+01	3.10E-01	0.1	2.10E-06	1.5E-07	3.37E-07	7.9E-08	6.35E-10	2.0E-11
MG/KG	CHRYSENE	B2	7.30E-03	2.35E-02	3.10E-03	1.20E+01	3.10E-01	0.1	2.10E-06	1.5E-08	3.37E-07	7.9E-09	6.35E-10	2.0E-12
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7.30E+00	2.35E+01	3.10E+00	1.20E+00	3.10E-01	0.1	2.10E-07	1.5E-06	3.37E-08	7.9E-07	6.35E-11	2.0E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7.30E-01	2.35E+00	3.10E-01	6.20E+00	3.10E-01	0.1	1.08E-06	7.9E-07	1.74E-07	4.1E-07	3.28E-10	1.0E-10
	Total Risk									**2.4E-05**		**1.2E-05**		**1.8E-07**
												Total Risk =	**4E-05**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure

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TABLE I4-6c

Surrogate Site #34 Soil Column -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ARSENIC	A	3 00E-04	1 23E-04		2 46E+01	4 10E-01	0 03	1 21E-05	0 04	5 81E-07	0 005	3 65E-09	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05	7 27E+01	2 00E-02	0 001	3 56E-05	0 01	5 72E-08	0 001	1 08E-08	0 0004
MG/KG	BENZO(a)ANTHRACENE	B2				1 00E+01	3 10E-01	0 1	4 89E-06		7 86E-07		1 48E-09	
MG/KG	BENZO(a)PYRENE	B2				9 50E+00	3 10E-01	0 13	4 65E-06		9 71E-07		1 41E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2				9 50E+00	3 10E-01	0 1	4 65E-06		7 47E-07		1.41E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2				1 20E+01	3 10E-01	0 1	5 87E-06		9 44E-07		1 78E-09	
MG/KG	CHRYSENE	B2				1 20E+01	3 10E-01	0 1	5 87E-06		9 44E-07		1 78E-09	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2				1 20E+00	3 10E-01	0 1	5 87E-07		9 44E-08		1 78E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				6 20E+00	3 10E-01	0 1	3 03E-06		4 88E-07		9 19E-10	
	Hazard Index									**0.05**		**0.006**		**0.0004**
												Total HI=	**0.06**	
Notes	WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Inde													

TABLE I4-7a
Surrogate Site #34 Soil Column -Hypothetical Current/Future Utility Worker Scenario
Memphis Depot Main Installation RI

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		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	100 c	100 c
FI =	Fraction Ingested (unitless)	0 5	0 5
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2)	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.1 e,g	0 1 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09 i	1 32E+09 i
IR =	Inhalation Rate (m^3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday
c = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
d = Utility activity assumed to be twice a month throughout the year
e= U S EPA Exposure Factors Handbook, August 1997
f = Surface area of 1/2 head, forearms and the hands of an adult worker
g = AF calculated for soil adherence can be found in Appendix L
h = Chemical-specific absorption factors are found in Appendix L
i = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996

TABLE I4-7b
Surrogate Site #34 Soil Column -Hypothetical Current/Future Utility Worker Carcinogenic Scenario
Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	2 46E+01	4 10E-01	0.03	4 13E-07	6 2E-07	6.64E-08	2 4E-07	1 25E-10	1.9E-09
MG/KG	CHROMIUM, TOTAL	A			4 20E+01	7 27E+01	2 00E-02	0 001	1 22E-06		6 54E-09		3.70E-10	1.6E-08
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	1 00E+01	3 10E-01	0 1	1 68E-07	1 2E-07	8 99E-08	2.1E-07	5 08E-11	1.6E-11
MG/KG	BENZO(a)PYRENE	B2	7.30E+00	2 35E+01	3 10E+00	9 50E+00	3 10E-01	0 13	1.59E-07	1 2E-06	1.11E-07	2 6E-06	4.83E-11	1.5E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7.30E-01	2.35E+00	3 10E-01	9 50E+00	3.10E-01	0 1	1 59E-07	1 2E-07	8.54E-08	2 0E-07	4 83E-11	1.5E-11
MG/KG	BENZO(k)FLUORANTHENE	B2	7.30E-02	2 35E-01	3 10E-02	1 20E+01	3 10E-01	0 1	2 01E-07	1.5E-08	1 08E-07	2 5E-08	6 10E-11	1.9E-12
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3.10E-03	1 20E+01	3 10E-01	0 1	2 01E-07	1 5E-09	1.08E-07	2 5E-09	6 10E-11	1 9E-13
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2.35E+01	3 10E+00	1 20E+00	3 10E-01	0.1	2 01E-08	1 5E-07	1 08E-08	2 5E-07	6 10E-12	1 9E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7.30E-01	2 35E+00	3 10E-01	6 20E+00	3 10E-01	0.1	1 04E-07	7.6E-08	5 57E-08	1 3E-07	3 15E-11	9 8E-12
	Total Risk									**2.3E-06**		**3.7E-06**		**1.8E-08**
												Total Risk =	**6E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure													

TABLE I4-7c
Surrogate Site #34 Soil Column -Hypothetical Current/Future Utility Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ARSENIC	A	3 00E-04	1 23E-04		2 46E+01	4 10E-01	0 03	1 16E-06	0 004	1 86E-07	0 002	3 51E-10	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05	7 27E+01	2 00E-02	0 001	3 42E-06	0 001	1 83E-08	0 0003	1 04E-09	0 00004
MG/KG	BENZO(a)ANTHRACENE	B2				1 00E+01	3 10E-01	0 1	4 70E-07		2 52E-07		1 42E-10	
MG/KG	BENZO(a)PYRENE	B2				9 50E+00	3 10E-01	0 13	4 46E-07		3 11E-07		1 35E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2				9 50E+00	3 10E-01	0 1	4 46E-07		2 39E-07		1 35E-10	
MG/KG	BENZO(k)FLUORANTHENE	B2				1 20E+01	3 10E-01	0 1	5 64E-07		3 02E-07		1 71E-10	
MG/KG	CHRYSENE	B2				1 20E+01	3 10E-01	0 1	5 64E-07		3 02E-07		1 71E-10	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2				1 20E+00	3 10E-01	0 1	5 64E-08		3 02E-08		1 71E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				6 20E+00	3 10E-01	0 1	2 91E-07		1 56E-07		8 82E-11	
	Hazard Index									**0.005**		**0.002**		**0.00004**
												Total HI=	**0.007**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I4-8a
Surrogate Site #34 Surface Soil -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m^3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = U S EPA Exposure Factors Handbook, August 1997.
d = Surface area of 1/2 head, forearms and the hands of an adult worker.
e = AF calculated for soil adherence can be found in Appendix L.
f = Chemical-specific absorption factors are found in Appendix L.
g = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance· Technical Background Document, May 1996

TABLE I4-8b

Surrogate Site #34 Surface Soil -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	4 92E+01	4 10E-01	0 03	8 60E-06	1 3E-05	4 15E-07	1.5E-06	2 61E-09	3.9E-08
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	1 00E+01	3 10E-01	0 1	1 75E-06	1 3E-06	2 81E-07	6.6E-07	5 29E-10	1 6E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	9 50E+00	3 10E-01	0 13	1 66E-06	1 2E-05	3 47E-07	8.2E-06	5 03E-10	1.6E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	9 50E+00	3 10E-01	0 1	1.66E-06	1 2E-06	2 67E-07	6.3E-07	5 03E-10	1 6E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02	1 20E+01	3 10E-01	0.1	2.10E-06	1.5E-07	3 37E-07	7.9E-08	6 35E-10	2 0E-11
MG/KG	CHROMIUM, TOTAL	A			4 20E+01	1 24E+02	2 00E-02	0 001	2 17E-05		3.48E-08		6 57E-09	2 8E-07
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	1 20E+01	3 10E-01	0 1	2 10E-06	1 5E-08	3 37E-07	7 9E-09	6 35E-10	2 0E-12
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7.30E+00	2 35E+01	3 10E+00	1 20E+00	3 10E-01	0 1	2 10E-07	1 5E-06	3 37E-08	7.9E-07	6 35E-11	2.0E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7.30E-01	2 35E+00	3 10E-01	6 20E+00	3 10E-01	0.1	1 08E-06	7 9E-07	1 74E-07	4 1E-07	3 28E-10	1.0E-10
	Total Risk									**3.0E-05**		**1.2E-05**		**3.2E-07**
												Total Risk =	**4E-05**	

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I4-8c
Surrogate Site #34 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ARSENIC	A	3 00E-04	1 23E-04		4.92E+01	4 10E-01	0 03	2 41E-05	0 08	1 16E-06	0 009	7 29E-09	
MG/KG	BENZO(a)ANTHRACENE	B2				1 00E+01	3.10E-01	0 1	4 89E-06		7 86E-07		1 48E-09	
MG/KG	BENZO(a)PYRENE	B2				9 50E+00	3 10E-01	0 13	4 65E-06		9 71E-07		1.41E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2				9.50E+00	3 10E-01	0 1	4 65E-06		7 47E-07		1.41E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2				1 20E+01	3 10E-01	0 1	5 87E-06		9 44E-07		1.78E-09	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05	1 24E+02	2 00E-02	0 001	6 07E-05	0 02	9 75E-08	0 002	1 84E-08	0 0006
MG/KG	CHRYSENE	B2				1.20E+01	3 10E-01	0 1	5 87E-06		9 44E-07		1.78E-09	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2				1.20E+00	3 10E-01	0 1	5 87E-07		9 44E-08		1 78E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				6 20E+00	3 10E-01	0 1	3 03E-06		4 88E-07		9 19E-10	
	Hazard Index									0 1		0.01		0.0006
												Total HI=	0.1	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Inde													

TABLE I4-9a
FU3 Sump Sediment -Hypothetical Current/Future Maintenance Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	**Csd * IR * FI * EF * ED * CF / BW * AT**		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a, b	50 a, b
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	12 d	12 d
ED =	Exposure Duration (year)	25 e	25 e
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 e	70 e
AT =	Averaging Time (days)	25550 e	9125 e
Dermal:			
CDI =	**Csd *SA * AF * ABS * ET * EF * ED * CF / BW * AT**		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2) - wading	2679 f,g	2679 f,g
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.1 g,h	0.1 g,h
ABS =	Absorption Factor (unitless)	(Chemical Specific) i	(Chemical Specific) i
ET =	Exposure Time (4 hours per 8 hour workday)	0 5 c	0 5 c
EF =	Exposure Frequency (day/year)	12 d	12 d
ED =	Exposure Duration (year)	25 e	25 e
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 e	70 e
AT =	Averaging Time (days)	25550 e	9125 e

Inhalation: No values available for inhalation pathway

References:
a = Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
b = A conservative ingestion rate based on industrial soil intake is assumed.
c = Half a workday is assumed to be spent outdoors in the contaminated areas based on the nature of the activity
d = Once a month maintenance activity throughout the year is assumed.
e = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991
f = Surface area of hands, 1/2 arms and face (1/2 head) of an adult worker
g = U S EPA Exposure Factors Handbook, August 1997.
h = AF calculated for soil adherence can be found in Appendix L
i = Chemical-specific absorption factors are found in Appendix L.

TABLE I4-9b

FU3 Sump Sediment -Hypothetical Current/Future Carcinogenic Maintenance Worker Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR
MG/KG	ANTIMONY	D			2 84E+01	2 00E-02	0.001	2.38E-07		6.38E-10	
MG/KG	BARIUM	D			1.12E+03	7.00E-02	0 001	9 39E-06		2.52E-08	
MG/KG	CADMIUM	B1			8 43E+01	1 00E-02	0.01	7.07E-07		1.89E-08	
MG/KG	CHROMIUM, TOTAL	A			1.70E+03	2 00E-02	0 001	1.43E-05		3 82E-08	
MG/KG	ZINC	D			2.55E+03	2.00E-01	0.001	2.14E-05		5.73E-08	
MG/KG	2,4-DIMETHYLPHENOL				1.60E+01	6 50E-01	0 01	1.34E-07		3.59E-09	
MG/KG	2-METHYLNAPHTHALENE	D			8.20E+00	8.00E-01	0.01	6 88E-08		1.84E-09	
MG/KG	PETROLEUM HYDROCARBONS				5 98E+03	5 00E-01	0 01	5 02E-05		1.34E-06	
	Total Risk										
								Total Risk=			

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; ELCR = Excess Lifetime Cancer Exposure

TABLE I4-9c
FU3 Sump Sediment -Hypothetical Current/Future Noncarcinogenic Maintenance Worker Scenario
Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D	4.00E-04	8 00E-06	2 84E+01	2.00E-02	0 001	6.67E-07	0.002	1.79E-09	0.0002
MG/KG	BARIUM	D	7 00E-02	4.90E-03	1 12E+03	7 00E-02	0.001	2 63E-05	0 0004	7.05E-08	0.00001
MG/KG	CADMIUM	B1	1.00E-03	1.00E-05	8.43E+01	1 00E-02	0 01	1 98E-06	0.002	5 30E-08	0.005
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6.00E-05	1.70E+03	2 00E-02	0.001	3.99E-05	0 01	1.07E-07	0 002
MG/KG	ZINC	D	3 00E-01	6.00E-02	2 55E+03	2.00E-01	0 001	5 99E-05	0 0002	1 60E-07	0.000003
MG/KG	2,4-DIMETHYLPHENOL		2.00E-02	1.30E-02	1 60E+01	6 50E-01	0.01	3 76E-07	0 00002	1 01E-08	0.0000008
MG/KG	2-METHYLNAPHTHALENE	D	2.00E-02	1.60E-02	8 20E+00	8 00E-01	0 01	1.93E-07	0.00001	5 16E-09	0.0000003
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	5.98E+03	5 00E-01	0.01	1.40E-04	0 004	3.76E-06	0.0002
	Hazard Index								**0.02**		**0.008**
									Total HI=	**0.03**	
Notes	WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Inde›										

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TABLE I4-10a
FU3 Sump Sediment -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{\text{Csd * IR * FI * EF * ED * CF}}{\text{BW * AT}}$		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a, b	50 a, b
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 d	250 d
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d
Dermal:			
CDI =	$\frac{\text{Csd *SA * AF * ABS * ET * EF * ED * CF}}{\text{BW * AT}}$		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm^2) - wading	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm^2)	0.1 g,f	0 1 g,f
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (4 hours per 8 hour workday)	0.5 c	0.5 c
EF =	Exposure Frequency (day/year)	250 d	250 d
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d

Inhalation: No values available for inhalation pathway

References:
a = Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.
b = A conservative ingestion rate based on industrial soil intake is assumed
c = Half a workday is assumed to be spent outdoors in the contaminated areas based on the nature of the activity.
d = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.
e = Surface area of hands, 1/2 arms and face (1/2 head) of an adult worker
f = U.S EPA Exposure Factors Handbook, August 1997
g = AF calculated for soil adherence can be found in Appendix L
h = Chemical-specific absorption factors are found in Appendix L

TABLE I4-10b

FU3 Sump Sediment -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ANTIMONY	D			2 84E+01	2 00E-02	0.001	4 96E-06		1 33E-08	
MG/KG	BARIUM	D			1 12E+03	7.00E-02	0 001	1.96E-04		5.24E-07	
MG/KG	CADMIUM	B1			8 43E+01	1 00E-02	0 01	1 47E-05		3 95E-07	
MG/KG	CHROMIUM, TOTAL	A			1.70E+03	2 00E-02	0 001	2.97E-04		7.96E-07	
MG/KG	ZINC	D			2 55E+03	2.00E-01	0 001	4 46E-04		1.19E-06	
MG/KG	2,4-DIMETHYLPHENOL				1.60E+01	6.50E-01	0.01	2 80E-06		7.49E-08	
MG/KG	2-METHYLNAPHTHALENE	D			8.20E+00	8 00E-01	0 01	1 43E-06		3 84E-08	
MG/KG	PETROLEUM HYDROCARBONS				5.98E+03	5 00E-01	0.01	1 04E-03		2 80E-05	
	Total Risk										
								Total Risk=			
Notes	WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure										

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Appendix I5
FU4 Soils
FU4 Sediment

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TABLE I5-1a

FU4 Surface Soil -Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity

c = EPA Exposure Factors Handbook, August 1997.

d = Surface area of 1/2 head, forearms and the hands of an adult worker.

e = AF calculated for soil adherence can be found in Appendix G.

f = Chemical-specific absorption factors are found in Appendix G.

g = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance. Technical Background Document, May 1996

h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C , December 1998.

TABLE I5-1b

FU4 Surface Soil -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ALUMINUM						1 27E+04	1 00E-01	0 001	2 22E-03		3 57E-06		6 74E-07	
MG/KG	ANTIMONY	D					4 33E+00	2 00E-02	0 001	7 56E-07		1 22E-09		2 29E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 69E+01	4 10E-01	0 03	2 95E-06	4 4E-06	1 42E-07	5 2E-07	8.94E-10	1 4E-08
MG/KG	CHROMIUM, TOTAL	A			4 20E+01		6 69E+01	2 00E-02	0 001	1 17E-05		1 88E-08		3 54E-09	1 5E-07
MG/KG	COPPER	D					3 43E+01	3 00E-01	0 001	6 00E-06		9 64E-09		1 82E-09	
MG/KG	MANGANESE	D					7 18E+02	4 00E-02	0 001	1 25E-04		2 02E-07		3 80E-08	
MG/KG	SELENIUM	D					1 12E+00	4 40E-01	0 001	1 95E-07		3 14E-10		5 92E-11	
MG/KG	THALLIUM	D					9 84E-01	1 50E-01	0 001	1 72E-07		2 76E-10		5 21E-11	
MG/KG	ZINC	D					2 22E+02	2 00E-01	0 001	3 88E-05		6 24E-08		1 18E-08	
MG/KG	ALPHA-CHLORDANE	B2	3 50E-01	7 00E-01	3 50E-01		7 37E-02	5 00E-01	0 04	1 29E-08	4 5E-09	8 28E-10	5 8E-10	3 90E-12	1 4E-12
MG/KG	DDE	B2	3 40E-01	4 86E-01			1 50E-01	7 00E-01	0 1	2 63E-08	8 9E-09	4 22E-09	2 1E-09	7 96E-12	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01		3 08E-01	7 00E-01	0 1	5 38E-08	1 8E-08	8 64E-09	4 2E-09	1 63E-11	5 5E-12
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		3 90E-01	5 00E-01	0 1	6 81E-08	1 1E-06	1 09E-08	3 5E-07	2 06E-11	3 3E-10
MG/KG	GAMMA-CHLORDANE	B2	3 50E-01	7 00E-01	3 50E-01		8 70E-02	5 00E-01	0 04	1 52E-08	5 3E-09	9 77E-10	6 8E-10	4 61E-12	1 6E-12
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 22E+00	2 00E+00		6 64E+00	9 00E-01	0 06	1 16E-06	2 3E-06	1 12E-07	2 5E-07	3 52E-10	7 0E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		5 44E-01	3 10E-01	0 1	9 51E-08	6 9E-08	1 53E-08	3 6E-08	2 88E-11	8 9E-12
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		5 38E-01	3 10E-01	0 13	9 40E-08	6 9E-07	1 96E-08	4.6E-07	2 85E-11	8 8E-11
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		5 40E-01	3 10E-01	0 1	9 44E-08	6 9E-08	1 52E-08	3 6E-08	2 86E-11	8 9E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			2 64E-01	7 00E-01	0 1	4 62E-08	9 2E-10	7 42E-09	2 1E-10	1 40E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		5 82E-01	3 10E-01	0 1	1 02E-07	7 4E-10	1 63E-08	3 8E-10	3 08E-11	9 5E-14
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		3 66E-01	3 10E-01	0 1	6 40E-08	4 7E-07	1 03E-08	2 4E-07	1 94E-11	6 0E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		4 87E-01	3 10E-01	0 1	8 50E-08	6 2E-08	1 37E-08	3 2E-08	2 58E-11	8 0E-12
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			1 21E-01	1 00E+00	0 24	2 12E-08	2 5E-09	1 63E-09	2 0E-10	1 28E-12	
MG/KG	PETROLEUM HYDROCARBONS						1 30E+03	5 00E-01	0 01	2 27E-04		3 65E-06		6 88E-08	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	1 58E+04	5 94E-03	7 00E-01	0 01	1 04E-09	2 08E-10	1 67E-11	4 77E-12	2 63E-08	5 33E-09
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	1 50E+05		4 66E-04	5 00E-01	0 03	8 15E-11	1 2E-05	3 93E-12	1 2E-06	2 47E-14	3 7E-09
	Total Risk										**2E-05**		**3E-06**		**2E-07**
													Total Risk =	**2E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I5-1c

FU4 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ALUMINUM		1 00E+00	1 00E-01	1 00E-03		1 27E+04	1 00E-01	0 001	6 23E-03	0 006	1 00E-05	0 0001	1 89E-06	0 002
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			4 33E+00	2 00E-02	0 001	2 12E-06	0 005	3 40E-09	0 0004	6 42E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			1 69E+01	4 10E-01	0 03	8 26E-06	0 03	3 98E-07	0 003	2 50E-09	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05		6 69E+01	2 00E-02	0 001	3 27E-05	0 01	5 26E-08	0 0009	9 92E-09	0 0003
MG/KG	COPPER	D	4 00E-02	1 20E-02			3 43E+01	3 00E-01	0 001	1 68E-05	0 0004	2 70E-08	0 000002	5 09E-09	
MG/KG	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05		7 18E+02	4 00E-02	0 001	3 51E-04	0 003	5 65E-07	0 0001	1 06E-07	0 007
MG/KG	SELENIUM	D	5 00E-03	2 20E-03			1 12E+00	4 40E-01	0 001	5 47E-07	0 0001	8.79E-10	0 0000004	1 66E-10	
MG/KG	THALLIUM	D	7 00E-05	1 05E-05			9 84E-01	1 50E-01	0 001	4 81E-07	0 007	7 74E-10	0 00007	1.46E-10	
MG/KG	ZINC	D	3 00E-01	6 00E-02			2 22E+02	2 00E-01	0 001	1 09E-04	0 0004	1 75E-07	0 000003	3 29E-08	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04	2 50E-04	2 00E-04		7 37E-02	5 00E-01	0 04	3 61E-08	0 00007	2 32E-09	0 000009	1 09E-11	0 00000005
MG/KG	DDE	B2					1 50E-01	7 00E-01	0 1	7 35E-08		1 18E-08		2 23E-11	
MG/KG	DDT	B2	5 00E-04	3 50E-04			3 08E-01	7 00E-01	0 1	1 51E-07	0 0003	2 42E-08	0 00007	4 56E-11	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			3 90E-01	5 00E-01	0 1	1 91E-07	0 004	3 06E-08	0 001	5 78E-11	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04	2 50E-04	2 00E-04		8 70E-02	5 00E-01	0 04	4 26E-08	0 00009	2 74E-09	0 00001	1 29E-11	0 00000006
MG/KG	PCB-1260 (AROCLOR 1260)	B2					6 64E+00	9 00E-01	0 06	3 25E-06		3 13E-07		9 84E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					5 44E-01	3 10E-01	0 1	2 66E-07		4 28E-08		8 07E-11	
MG/KG	BENZO(a)PYRENE	B2					5 38E-01	3 10E-01	0 13	2 63E-07		5 50E-08		7.98E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2					5 40E-01	3 10E-01	0 1	2 64E-07		4 25E-08		8 01E-11	
MG/KG	CARBAZOLE	B2					2 64E-01	7 00E-01	0 1	1.29E-07		2 08E-08		3.92E-11	
MG/KG	CHRYSENE	B2					5 82E-01	3 10E-01	0 1	2 85E-07		4 57E-08		8 62E-11	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					3 66E-01	3 10E-01	0 1	1 79E-07		2 88E-08		5 43E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					4 87E-01	3 10E-01	0 1	2 38E-07		3 83E-08		7 21E-11	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			1 21E-01	1 00E+00	0 24	5 93E-08	0 0000020	2 29E-08	0 0000008	1 80E-11	
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	6 00E-02		1 30E+03	5 00E-01	0 01	6 36E-04	0 02	1 02E-05	0 0005	1 93E-07	0 000003
MG/KG	1,1,2,2-TETRACHLOROETHANE	C				1 58E+04	5 94E-03	7 00E-01	0 01	2 91E-09		4 67E-11		7 36E-08	
MG/KG	TCDD Equivalent	B2					4 66E-04	5 00E-01	0 03	2 28E-10		1 10E-11		6 92E-14	
	Hazard Index										**0.08**		**0.007**		**0.01**
													Total HI=	**0.1**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I5-2a

FU4 Soil Column -Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	**Cs * IR * FI * EF * ED * CF** / **BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	**Cs *SA * AF * ABS * ET * EF * ED * CF** / **BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles*	
CDI =	**Cs * (1/PEF) * IR * ET * EF * ED** / **BW * AT**	**Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED** / **BW * AT**	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1.32E+09 g	1.32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991.

b = Time spent outdoors in the contaminated areas using best professional judgment, based on the nature of the activity

c = EPA Exposure Factors Handbook, August 1997

d = Surface area of 1/2 head, forearms and the hands of an adult worker

e = AF calculated for soil adherence can be found in Appendix G

f = Chemical-specific absorption factors are found in Appendix G

g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance: Technical Backgrounc Document, May 1996.

h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F.A.C. December 1998

TABLE I5-2b

FU4 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ALUMINUM						1.24E+04	1.00E-01	0.001	2.16E-03		3.48E-06		6.56E-07	
MG/KG	ANTIMONY	D					3.45E+00	2.00E-02	0.001	6.03E-07		9.70E-10		1.83E-10	
MG/KG	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01		1.57E+01	4.10E-01	0.03	2.74E-06	4.1E-06	1.32E-07	4.8E-07	8.31E-10	1.3E-08
MG/KG	CHROMIUM, TOTAL	A			4.20E+01		3.76E+01	2.00E-02	0.001	6.56E-06		1.05E-08		1.99E-09	8.4E-08
MG/KG	COBALT						9.91E+00	8.00E-01	0.001	1.73E-06		2.78E-09		5.25E-10	
MG/KG	COPPER	D					2.94E+01	3.00E-01	0.001	5.14E-06		8.26E-09		1.56E-09	
MG/KG	MANGANESE	D					7.87E+02	4.00E-02	0.001	1.38E-04		2.21E-07		4.17E-08	
MG/KG	SELENIUM	D					7.96E-01	4.40E-01	0.001	1.39E-07		2.24E-10		4.22E-11	
MG/KG	THALLIUM	D					9.33E-01	1.50E-01	0.001	1.63E-07		2.62E-10		4.94E-11	
MG/KG	ZINC	D					1.41E+02	2.00E-01	0.001	2.47E-05		3.97E-08		7.48E-09	
MG/KG	DDE	B2	3.40E-01	4.86E-01			2.06E-02	7.00E-01	0.1	3.60E-09	1.2E-09	5.78E-10	2.8E-10	1.09E-12	
MG/KG	DDT	B2	3.40E-01	4.86E-01	3.40E-01		3.53E-02	7.00E-01	0.1	6.17E-09	2.1E-09	9.92E-10	4.8E-10	1.87E-12	6.4E-13
MG/KG	ALPHA-CHLORDANE	B2	3.50E-01	7.00E-01	3.50E-01		1.06E-02	5.00E-01	0.04	1.85E-09	6.5E-10	1.19E-10	8.3E-11	5.59E-13	2.0E-13
MG/KG	DIELDRIN	B2	1.60E+01	3.20E+01	1.60E+01		3.44E-02	5.00E-01	0.1	6.01E-09	9.6E-08	9.66E-10	3.1E-08	1.82E-12	2.9E-11
MG/KG	GAMMA-CHLORDANE	B2	3.50E-01	7.00E-01	3.50E-01		1.18E-02	5.00E-01	0.04	2.06E-09	7.2E-10	1.32E-10	9.3E-11	6.24E-13	2.2E-13
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2.00E+00	2.22E+00	2.00E+00		8.65E-01	9.00E-01	0.06	1.51E-07	3.0E-07	1.46E-08	3.2E-08	4.58E-11	9.2E-11
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	2.35E+00	3.10E-01		3.23E-01	3.10E-01	0.1	5.65E-08	4.1E-08	9.08E-09	2.1E-08	1.71E-11	5.3E-12
MG/KG	BENZO(a)PYRENE	B2	7.30E+00	2.35E+01	3.10E+00		3.20E-01	3.10E-01	0.13	5.60E-08	4.1E-07	1.17E-08	2.8E-07	1.70E-11	5.3E-11
MG/KG	BENZO(b)FLUORANTHENE	B2	7.30E-01	2.35E+00	3.10E-01		3.22E-01	3.10E-01	0.1	5.63E-08	4.1E-08	9.05E-09	2.1E-08	1.71E-11	5.3E-12
MG/KG	CARBAZOLE	B2	2.00E-02	2.86E-02			2.29E-01	7.00E-01	0.1	3.99E-08	8.0E-10	6.42E-09	1.8E-10	1.21E-11	
MG/KG	CHRYSENE	B2	7.30E-03	2.35E-02	3.10E-03		3.35E-01	3.10E-01	0.1	5.85E-08	4.3E-10	9.40E-09	2.2E-10	1.77E-11	5.5E-14
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7.30E+00	2.35E+01	3.10E+00		2.70E-01	3.10E-01	0.1	4.72E-08	3.4E-07	7.58E-09	1.8E-07	1.43E-11	4.4E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7.30E-01	2.35E+00	3.10E-01		3.07E-01	3.10E-01	0.1	5.37E-08	3.9E-08	8.63E-09	2.0E-08	1.63E-11	5.0E-12
MG/KG	PENTACHLOROPHENOL	B2	1.20E-01	1.20E-01			1.44E-01	1.00E+00	0.24	2.52E-08	3.0E-09	9.74E-09	1.2E-09	7.65E-12	
MG/KG	PETROLEUM HYDROCARBONS	0					1.30E+03	5.00E-01	0.01	2.27E-04		3.65E-06		6.88E-08	
MG/KG	TOTAL 1,2-DICHLOROETHENE	0				2.61E+03	6.58E-03	1.00E+00	0.01	1.15E-09		1.85E-11		1.76E-07	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C	2.00E-01	2.86E-01	2.03E-01	1.58E+04	6.30E-03	7.00E-01	0.01	1.10E-09	2.2E-10	1.77E-11	5.1E-12	2.78E-08	5.6E-09
MG/KG	TRICHLOROETHYLENE (TCE)	B2	1.10E-02	7.33E-02	6.00E-03	3.65E+03	6.41E-03	1.50E-01	0.01	1.12E-09	1.2E-11	1.80E-11	1.3E-12	1.23E-07	7.4E-10
MG/KG	TCDD Equivalent	B2	1.50E+05	3.00E+05	1.50E+05		9.62E-04	5.00E-01	0.03	1.68E-10	2.5E-05	8.11E-12	2.4E-06	5.09E-14	7.6E-09
	Total Risk										**3E-05**		**3E-06**		**1E-07**
												Total Risk =		**3E-05**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I5-2c
FU4 Soil Column Hypothetical Future Industrial Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ALUMINUM		1 00E+00	1 00E-01	1 00E-03		1 24E+04	1 00E-01	0 001	6 06E-03	0 006	9 74E-06	0 0001	1 84E-06	0 002
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			3 45E+00	2 00E-02	0 001	1 69E-06	0 004	2 71E-09	0 0003	5 12E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			1 57E+01	4 10E-01	0 03	7 68E-06	0 03	3 70E-07	0 003	2 33E-09	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05		3 76E+01	2 00E-02	0 001	1 84E-05	0 006	2 95E-08	0 0005	5 57E-09	0 0002
MG/KG	COBALT		6 00E-02	4 80E-02			9 91E+00	8 00E-01	0 001	4 85E-06	0 00008	7 79E-09	0 00000016	1 47E-09	
MG/KG	COPPER	D	4 00E-02	1 20E-02			2 94E+01	3 00E-01	0 001	1 44E-05	0 0004	2 31E-08	0 000002	4 36E-09	
MG/KG	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05		7 87E+02	4 00E-02	0 001	3 85E-04	0 003	6 19E-07	0 0001	1 17E-07	0 008
MG/KG	SELENIUM	D	5 00E-03	2 20E-03			7 96E-01	4 40E-01	0 001	3 90E-07	0 00008	6 26E-10	0 0000003	1 18E-10	
MG/KG	THALLIUM	D	7 00E-05	1 05E-05			9 33E-01	1 50E-01	0 001	4 56E-07	0 007	7 34E-10	0 00007	1 38E-10	
MG/KG	ZINC	D	3 00E-01	6 00E-02			1 41E+02	2 00E-01	0 001	6 92E-05	0 0002	1 11E-07	0 000002	2 10E-08	
MG/KG	DDE	B2					2 06E-02	7 00E-01	0 1	1 01E-08		1 62E-09		3 05E-12	
MG/KG	DDT	B2	5 00E-04	3 50E-04			3 53E-02	7 00E-01	0 1	1 73E-08	0 00003	2 78E-09	0 000008	5 24E-12	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04	2 50E-04	2 00E-04		1 06E-02	5 00E-01	0 04	5 17E-09	0 00001	3 32E-10	0 000001	1 57E-12	0 000000008
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			3 44E-02	5 00E-01	0 1	1 68E-08	0 0003	2 70E-09	0 0001	5 10E-12	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04	2 50E-04	2 00E-04		1 18E-02	5 00E-01	0 04	5 77E-09	0 00001	3 71E-10	0 000001	1 75E-12	0 000000009
MG/KG	PCB-1260 (AROCLOR 1260)	B2					8 65E-01	9 00E-01	0 06	4 23E-07		4 08E-08		1 28E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					3 23E-01	3 10E-01	0 1	1 58E-07		2 54E-08		4 79E-11	
MG/KG	BENZO(a)PYRENE	B2					3 20E-01	3 10E-01	0 13	1 57E-07		3 27E-08		4 75E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2					3 22E-01	3 10E-01	0 1	1 58E-07		2 53E-08		4 78E-11	
MG/KG	CARBAZOLE	B2					2 29E-01	7 00E-01	0 1	1 12E-07		1 80E-08		3 39E-11	
MG/KG	CHRYSENE	B2					3 35E-01	3 10E-01	0 1	1 64E-07		2 63E-08		4 96E-11	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					2 70E-01	3 10E-01	0 1	1 32E-07		2 12E-08		4 00E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					3 07E-01	3 10E-01	0 1	1 50E-07		2 42E-08		4 55E-11	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			1 44E-01	1 00E+00	0 24	7 07E-08	0 000002	2 73E-08	0 0000009	2 14E-11	
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	6 00E-02		1 30E+03	5 00E-01	0 01	6 36E-04	0 02	1 02E-05	0 0005	1 93E-07	0 000003
MG/KG	TOTAL 1,2-DICHLOROETHENE					2 61E+03	6 58E-03	1 00E+00	0 01	3 22E-09		5 17E-11		4 94E-07	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C				1 58E+04	6 30E-03	7 00E-01	0 01	3 08E-09		4 95E-11		7 79E-08	
MG/KG	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 65E+03	6 41E-03	1 50E-01	0 01	3 13E-09	0 0000005	5 04E-11	0 00000006	3 43E-07	
MG/KG	TCDD Equivalent	B2					9 62E-04	5 00E-01	0 03	4 71E-10		2 27E-11		1 43E-13	
	Hazard Index										**0.07**		**0 005**		**0.01**
													Total HI=	**0 08**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I5-3a

FU4 Surface Soil -Hypothetical Current/Future Maintenance Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	**Cs * IR * FI * EF * ED * CF** / **BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 c	50 c
FI =	Fraction Ingested (unitless)	0.5	0.5
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	**Cs *SA * AF * ABS * ET * EF * ED * CF** / **BW * AT**		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 e,g	0.03 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles.*	
CDI =	**Cs * (1/PEF) * IR * ET * EF * ED** / **BW * AT**	**Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED** / **BW * AT**	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 i	1.32E+09 i
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) j	(Chemical Specific) j
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991

b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday

c = Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

d = Maintenance activity assumed to be once a week throughout the year (excluding vacation).

e= U S EPA Exposure Factors Handbook, August 1997

f = Surface area of 1/2 head, forearms and the hands of an adult worker.

g = AF calculated for soil adherence can be found in Appendix G.

h = Chemical-specific absorption factors are found in Appendix G

i = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance. Technical Background Document, May 1996.

j = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C , December 1998

TABLE I5-3b

FU4 Surface Soil -Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	ALUMINUM						1 27E+04	1 00E-01	0 001	2 22E-04		7 15E-07		1 35E-07	
MG/KG	ANTIMONY	D					4 33E+00	2 00E-02	0 001	7 56E-08		2 43E-10		4 58E-11	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 69E+01	4 10E-01	0 03	2 95E-07	4 4E-07	2 85E-08	1 0E-07	1 79E-10	2 7E-09
MG/KG	CHROMIUM, TOTAL	A			4 20E+01		6 69E+01	2 00E-02	0 001	1 17E-06		3 76E-09		7 09E-10	3 0E-08
MG/KG	COPPER	D					3 43E+01	3 00E-01	0 001	6 00E-07		1 93E-09		3 64E-10	
MG/KG	MANGANESE	D					7 18E+02	4 00E-02	0 001	1 25E-05		4 03E-08		7 60E-09	
MG/KG	SELENIUM	D					1 12E+00	4 40E-01	0 001	1 95E-08		6 28E-11		1 18E-11	
MG/KG	THALLIUM	D					9 84E-01	1 50E-01	0 001	1 72E-08		5 53E-11		1 04E-11	
MG/KG	ZINC	D					2 22E+02	2 00E-01	0 001	3 88E-06		1 25E-08		2 35E-09	
MG/KG	ALPHA-CHLORDANE	B2	3 50E-01	7 00E-01	3 50E-01		7 37E-02	5 00E-01	0 04	1 29E-09	4 5E-10	1 66E-10	1 2E-10	7 80E-13	2 7E-13
MG/KG	DDE	B2	3 40E-01	4 86E-01			1 50E-01	7 00E-01	0 1	2 63E-09	8 9E-10	8 44E-10	4 1E-10	1 59E-12	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01		3 08E-01	7 00E-01	0 1	5 38E-09	1 8E-09	1 73E-09	8 4E-10	3 26E-12	1 1E-12
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		3 90E-01	5 00E-01	0 1	6 81E-09	1 1E-07	2 19E-09	7 0E-08	4 13E-12	6 6E-11
MG/KG	GAMMA-CHLORDANE	B2	3 50E-01	7 00E-01	3 50E-01		8 70E-02	5 00E-01	0 04	1 52E-09	5 3E-10	1 95E-10	1 4E-10	9 21E-13	3 2E-13
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 22E+00	2 00E+00		6 64E+00	9 00E-01	0 06	1 16E-07	2 3E-07	2 24E-08	5 0E-08	7 03E-11	1 4E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		5 44E-01	3 10E-01	0 1	9 51E-09	6 9E-09	3 06E-09	7 2E-09	5 77E-12	1 8E-12
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		5 38E-01	3 10E-01	0 13	9 40E-09	6 9E-08	3 93E-09	9 3E-08	5 70E-12	1 8E-11
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		5 40E-01	3 10E-01	0 1	9 44E-09	6 9E-09	3 03E-09	7 1E-09	5 72E-12	1 8E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			2 64E-01	7 00E-01	0 1	4 62E-09	9 2E-11	1 48E-09	4 2E-11	2 80E-12	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		5 82E-01	3 10E-01	0 1	1 02E-08	7 4E-11	3 27E-09	7 7E-11	6 16E-12	1 9E-14
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		3 66E-01	3 10E-01	0 1	6 40E-09	4 7E-08	2 06E-09	4 8E-08	3 88E-12	1 2E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		4 87E-01	3 10E-01	0 1	8 50E-09	6 2E-09	2 73E-09	6 4E-09	5 15E-12	1 6E-12
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			1 21E-01	1 00E+00	0 24	2 12E-09	2 5E-10	1 63E-09	2 0E-10	1 28E-12	
MG/KG	PETROLEUM HYDROCARBONS	0					1 30E+03	5 00E-01	0 01	2 27E-05		7 30E-07		1 38E-08	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	1 58E+04	5 94E-03	7 00E-01	0 01	1 04E-10	2 08E-11	3 34E-12	9 54E-13	5 26E-09	1 07E-09
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	1 50E+05		4 66E-04	5 00E-01	0 03	8 15E-12	1 2E-06	7 86E-13	2 4E-07	4 94E-15	7 4E-10
	Total Risk										**2E-06**		**6E-07**		**3E-08**
													Total HI=	**3E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure														

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TABLE I5-3c
FU4 Surface Soil -Hypothetical Current/Future Maintenance Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ALUMINUM		1 00E+00	1 00E-01	1 00E-03		1 27E+04	1 00E-01	0 001	6 23E-04	0 0006	2 00E-06	0 00002	3 77E-07	0 0004
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			4 33E+00	2 00E-02	0 001	2 12E-07	0 0005	6 81E-10	0 00009	1 28E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			1 69E+01	4 10E-01	0 03	8 26E-07	0 003	7 97E-08	0 0006	5 01E-10	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05		6 69E+01	2 00E-02	0 001	3 27E-06	0 001	1 05E-08	0 0002	1 98E-09	0 00007
MG/KG	COPPER	D	4 00E-02	1 20E-02			3 43E+01	3 00E-01	0 001	1 68E-06	0 00004	5 40E-09	0 0000004	1 02E-09	
MG/KG	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05		7 18E+02	4 00E-02	0 001	3 51E-05	0 0003	1 13E-07	0 00002	2 13E-08	0 001
MG/KG	SELENIUM	D	5 00E-03	2 20E-03			1 12E+00	4 40E-01	0 001	5 47E-08	0 00001	1 76E-10	0 00000008	3 31E-11	
MG/KG	THALLIUM	D	7 00E-05	1 05E-05			9 84E-01	1 50E-01	0 001	4 81E-08	0 0007	1 55E-10	0 00001	2 92E-11	
MG/KG	ZINC	D	3 00E-01	6 00E-02			2 22E+02	2 00E-01	0 001	1 09E-05	0 00004	3 49E-08	0 0000006	6 59E-09	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04	2 50E-04	2 00E-04		7 37E-02	5 00E-01	0 04	3 61E-09	0 000007	4 64E-10	0 000002	2 19E-12	0 00000001
MG/KG	DDE	B2					1 50E-01	7 00E-01	0 1	7 35E-09		2 36E-09		4 46E-12	
MG/KG	DDT	B2	5 00E-04	3 50E-04			3 08E-01	7 00E-01	0 1	1 51E-08	0 00003	4 84E-09	0 00001	9 12E-12	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			3 90E-01	5 00E-01	0 1	1 91E-08	0 0004	6 13E-09	0 0002	1 16E-11	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04	2 50E-04	2 00E-04		8 70E-02	5 00E-01	0 04	4 26E-09	0 000009	5 47E-10	0 000002	2 58E-12	0 00000001
MG/KG	PCB-1260 (AROCLOR 1260)	B2					6 64E+00	9 00E-01	0 06	3 25E-07		6 26E-08		1 97E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					5 44E-01	3 10E-01	0 1	2 66E-08		8 56E-09		1.61E-11	
MG/KG	BENZO(a)PYRENE	B2					5 38E-01	3 10E-01	0 13	2 63E-08		1 10E-08		1 60E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2					5 40E-01	3 10E-01	0 1	2 64E-08		8 49E-09		1 60E-11	
MG/KG	CARBAZOLE	B2					2 64E-01	7 00E-01	0 1	1 29E-08		4 16E-09		7 84E-12	
MG/KG	CHRYSENE	B2					5 82E-01	3 10E-01	0 1	2 85E-08		9 15E-09		1 72E-11	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					3 66E-01	3 10E-01	0 1	1 79E-08		5 76E-09		1 09E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					4 87E-01	3 10E-01	0 1	2 38E-08		7 65E-09		1 44E-11	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			1 21E-01	1 00E+00	0 24	5 93E-09	0 0000002	4 57E-09	0 0000002	3 59E-12	
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	6 00E-02		1 30E+03	5 00E-01	0 01	6 36E-05	0 002	2 04E-06	0 0001	3 85E-08	0 0000006
MG/KG	1,1,2,2-TETRACHLOROETHANE	C				1 58E+04	5 94E-03	7 00E-01	0 01	2 91E-10		9 35E-12		1 47E-08	
MG/KG	TCDD Equivalent	B2					4 66E-04	5 00E-01	0 03	2 28E-11		2 20E-12		1.38E-14	
	Hazard Index										**0 008**		**0 001**		**0.002**
													Total HI=	**0 01**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I5-4a
FU4 (SS14A) Surface Soil - Hypothetical Future On-site Residential (Adult) Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT	**CDIadj = Cs * FI * EF * CF * IRadj / AT**	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	N/A	100 a
IRadj =	Age-adjusted Ingestion Rate (mg - year)/(kg - day)	114 29 a,b	N/A
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	Cs * SA * AF * ABS * ET * EF * ED * CF / BW * AT	Cs * SAadj * AF * ABS * ET * EF * CF / AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	N/A	5049 d,e
SAadj =	Age-adjusted Surface Area (cm2 - year)/(kg)	2671 d,e,f	N/A
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 d,g	0 03 d,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Inhalation:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	Cs * (1/PEF) * IR_Inh * ET * EF * ED / BW * AT	**CDI =** Cs * (1/PEF) * IR_Inhadj * ET * EF / AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 i	1 32E+09 i
IR_Inh =	Inhalation Rate (m3/day)	N/A	20 a
IR_Inhadj =	Age-adjusted Inhalation Rate (m3 - year)/(kg - day)	12 85714286 a,j	N/A
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0.167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70}$$

114.29 (mg-year)/(kg-day)

c = Time spent outdoors in the contaminated areas based on the nature of the activity

d= EPA Exposure Factors Handbook, August 1997

e = Surface area of 1/2 head, hands, forearms, lower legs & feet of an adult

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{2351 \times 6}{15} + \frac{5049 \times (30-6)}{70}$$

2671 (cm2-year)/(kg)

g = AF calculated for soil adherence can be found in Appendix G

h = Chemical-specific absorption factors are found in Appendix G

i = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Background Document, May 1996

j = Age-adjusted inhalation rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR\text{-}Inh\ adj = \frac{IR\text{-}Inh\ c \times EDc}{BWc} + \frac{IR\text{-}Inh\ a \times (EDa - EDc)}{BWa} = \frac{15 \times 6}{15} + \frac{20 \times (30-6)}{70}$$

12.86 (m3-year)/(kg-day)

TABLE I5-4b

FU4 (SS14A) Surface Soil - Hypothetical Future On-site Residential (Adult) Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	CDIadj	ELCR	CDIadj	ELCR	CDIadj	ELCR
MG/KG	Benzo(a)anthracene	B2	7 30E-01	2 35E+00	3 10E-01	0 00E+00	2 90E+00	3 10E-01	0 1	4 54E-06	3 3E-06	5 31E-08	1 2E-07	6 45E-11	2.0E-11
MG/KG	Benzo(a)pyrene	B2	7 30E+00	2 35E+01	3 10E+00	0 00E+00	2 50E+00	3 10E-01	0 13	3 91E-06	2 9E-05	5 95E-08	1.4E-06	5 56E-11	1 7E-10
MG/KG	Carbazole	B2	2 00E-02	2 86E-02		0 00E+00	1 00E+00	7 00E-01	0 1	1 57E-06	3 1E-08	1 83E-08	5 2E-10	2 22E-11	
MG/KG	Chrysene	B2	7 30E-03	2 35E-02	3 10E-03	0 00E+00	3 10E+00	3.10E-01	0 1	4 85E-06	3 5E-08	5 67E-08	1 3E-09	6 89E-11	2.1E-13
MG/KG	Pentachlorophenol	B2	1 20E-01	1 20E-01		0 00E+00	1 10E-01	1 00E+00	0 24	1 72E-07	2 1E-08	4 83E-09	5 8E-10	2 45E-12	
	Total Risk										**3.2E-05**		**1.5E-06**		**1.9E-10**
													Total Risk =	**3E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure														

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TABLE I5-4c

FU4 (SS14A) Surface Soil - Hypothetical Future On-site Residential (Adult) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	Benzo(a)anthracene	B2				0 00E+00	2 90E+00	3 10E-01	0 1	3 97E-06		1 00E-07		1 00E-10	
MG/KG	Benzo(a)pyrene	B2				0 00E+00	2 50E+00	3 10E-01	0 13	3 42E-06		1 12E-07		8 65E-11	
MG/KG	Carbazole	B2				0 00E+00	1 00E+00	7 00E-01	0 1	1 37E-06		3 46E-08		3 46E-11	
MG/KG	Chrysene	B2				0 00E+00	3 10E+00	3 10E-01	0 1	4 25E-06		1 07E-07		1 07E-10	
MG/KG	Pentachlorophenol	B2	3 00E-02	3 00E-02		0 00E+00	1 10E-01	1 00E+00	0 24	1 51E-07	0 000005	9 13E-09	0 0000003	3 81E-12	
	Hazard Index										**0.000005**		**0.0000003**		
													Total HI=	**0.000005**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I5-5a
FU4 (SS14A) Surface Soil - Hypothetical Future On-site Residential (Child) Scenario
Memphis Depot Main Installation RI

		Carcinogenic (optional)	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	200 a	200 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2351 c,d	2351 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 15 c,e	0 15 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0 167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	$\frac{Cs * (1/PEF) * IR * ET * EF * ED}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1.32E+09 g	1.32E+09 g
IR =	Inhalation Rate (m3/day)	15 a	15 a
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0 167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas based on the nature of the activity.
c= EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, hands, forearms, lower legs & feet of a child (age 1-6 years).
e = AF calculated for soil adherence can be found in Appendix G.
f = Chemical-specific absorption factors are found in Appendix G.
g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance: Technical Background Document, May 1996.

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TABLEI5-5b

FU4 (SS14A) Surface Soil - Hypothetical Future On-site Residential (Child) Carcinogenic Scenario - Optional Use

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	Benzo(a)anthracene	B2	7 30E-01	2 35E+00	3 10E-01		2 90E+00	3 10E-01	0 1	3 18E-06	2 32E-06	9 34E-08	2 20E-07	3 01E-11	9 33E-12
MG/KG	Benzo(a)pyrene	B2	7 30E+00	2 35E+01	3 10E+00		2 50E+00	3 10E-01	0 13	2 74E-06	2 00E-05	1 05E-07	2 46E-06	2 59E-11	8 04E-11
MG/KG	Carbazole	B2	2 00E-02	2 86E-02			1 00E+00	7 00E-01	0 1	1 10E-06	2 19E-08	3 22E-08	9 20E-10	1 04E-11	
MG/KG	Chrysene	B2	7 30E-03	2 35E-02	3 10E-03		3 10E+00	3 10E-01	0 1	3 40E-06	2 48E-08	9 98E-08	2 35E-09	3 22E-11	9 97E-14
MG/KG	Pentachlorophenol	B2	1 20E-01	1 20E-01			1 10E-01	1 00E+00	0 24	1 21E-07	1 45E-08	8 50E-09	1 02E-09	1 14E-12	
	Total Risk										**2.24E-05**		**2.69E-06**		**8.99E-11**
												Total Risk =		**3E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I5-5c

FU4 (SS14A) Surface Soil - Hypothetical Future On-site Residential (Child) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	Benzo(a)anthracene	B2					2 90E+00	3 10E-01	0 1	3.71E-05		1.09E-06		3 51E-10	
MG/KG	Benzo(a)pyrene	B2					2 50E+00	3 10E-01	0 13	3.20E-05		1.22E-06		3 03E-10	
MG/KG	Carbazole	B2					1.00E+00	7 00E-01	0 1	1 28E-05		3 76E-07		1 21E-10	
MG/KG	Chrysene	B2					3 10E+00	3.10E-01	0 1	3 96E-05		1 16E-06		3 75E-10	
MG/KG	Pentachlorophenol	B2	3 00E-02	3 00E-02			1 10E-01	1 00E+00	0 24	1 41E-06	0 00005	9 92E-08	0.000003	1 33E-11	
	Hazard Index										**0.00005**		**0.000003**		
													Total HI=	**0.00005**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index

TABLE I5-6a
Site #36 Surface Soil -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)		1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity.
c = EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Background Document, May 1996.

TABLE I5-6b

Site #36 Surface Soil -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Intallation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFI	VFind	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	ANTIMONY	D					9 72E+00	2 00E-02	0 001	1 70E-06		2 73E-09		5 15E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		2 18E+01	4 10E-01	0 03	3 80E-06	5 7E-06	1 83E-07	6 7E-07	1 15E-09	1 7E-08
MG/KG	SELENIUM	D					1 35E+00	4 40E-01	0 001	2 37E-07		3 80E-10		7 17E-11	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		3 59E-01	5 00E-01	0 1	6 27E-08	1 0E-06	1 01E-08	3 2E-07	1.90E-11	3 0E-10
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			1 02E-01	1 00E+00	0 24	1 78E-08	2 1E-09	6 87E-09	8 2E-10	5 39E-12	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	1 58E+04	6 23E-03	7 00E-01	0 01	1 09E-09	2 2E-10	1 75E-11	5 0E-12	2 76E-08	5 6E-09
	Total Risk										**6.7E-06**		**9.9E-07**		**2.3E-08**
													Total Risk =	**8E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I5-6c

Site #36 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D		8 00E-06			9 72E+00	2 00E-02	0 001	4 76E-06		7 64E-09	0 001	1 44E-09	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			2 18E+01	4 10E-01	0 03	1 06E-05	0 04	5 13E-07	0 004	3 23E-09	
MG/KG	SELENIUM	D		2 20E-03			1 35E+00	4 40E-01	0 001	6 62E-07		1 06E-09	0 0000005	2 01E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			3 59E-01	5 00E-01	0 1	1 76E-07	0 004	2 82E-08	0 001	5 32E-11	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			1 02E-01	1 00E+00	0 24	4 98E-08	0 000002	1 92E-08	0 0000006	1 51E-11	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C				1 58E+04	6 23E-03	7 00E-01	0 01	3 05E-09		4 90E-11		7 72E-08	
	Hazard Index										**0.05**		**0.006**		
													Total HI=	**0.06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I5-7a
Site #36 Soil Column -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	$\frac{Cs * (1/PEF) * IR * ET * EF * ED}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1.32E+09 g
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Backgrounc Document, May 1996

TABLE I5-7b

Site #36 Soil Column Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ANTIMONY	D					5 02E+00	2 00E-02	0 001	8 77E-07		1 41E-09		2 66E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		2 10E+01	4 10E-01	0 03	3 67E-06	5 5E-06	1 77E-07	6 5E-07	1.11E-09	1 7E-08
MG/KG	CHROMIUM, TOTAL	A			4 20E+01		2 70E+01	2 00E-02	0 001	4 72E-06		7 59E-09		1 43E-09	6 0E-08
MG/KG	COPPER	D					3 67E+01	3 00E-01	0 001	6 41E-06		1 03E-08		1 94E-09	
MG/KG	SELENIUM	D					9 52E-01	4 40E-01	0 001	1 66E-07		2 67E-10		5 04E-11	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		9 76E-03	5 00E-01	0 1	1 70E-09	2 7E-08	2 74E-10	8 8E-09	5 17E-13	8 3E-12
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			1 02E-01	1 00E+00	0 24	1 78E-08	2 1E-09	6 88E-09	8 3E-10	5 40E-12	
MG/KG	TOTAL 1,2-DICHLOROETHENE					2 61E+03	8 98E-03	1 00E+00	0 01	1 57E-09		2 52E-11		2 41E-07	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	1 58E+04	7 21E-03	7 00E-01	0 01	1 26E-09	2 5E-10	2 02E-11	5 8E-12	3 19E-08	6 5E-09
MG/KG	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	3 65E+03	8 08E-03	1 50E-01	0 01	1 41E-09	1 6E-11	2 27E-11	1 7E-12	1 55E-07	9 3E-10
	Total Risk										**5 5E-06**		**6 6E-07**		**8.4E-08**
													Total Risk =	**6E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I5-7c

Site #36 Soil Column -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			5 02E+00	2 00E-02	0 001	2 45E-06	0 006	3 95E-09	0 0005	7 44E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			2 10E+01	4 10E-01	0 03	1 03E-05	0 03	4 95E-07	0 004	3 11E-09	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05		2 70E+01	2 00E-02	0 001	1 32E-05	0 004	2 12E-08	0 0004	4 00E-09	0 0001
MG/KG	COPPER	D	4 00E-02	1 20E-02			3 67E+01	3 00E-01	0 001	1 79E-05	0 0004	2 88E-08	0 000002	5 44E-09	
MG/KG	SELENIUM	D	5 00E-03	2 20E-03			9 52E-01	4 40E-01	0 001	4 66E-07	0 00009	7 49E-10	0 0000003	1 41E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			9 76E-03	5 00E-01	0 1	4 77E-09	0 0001	7 67E-10	0 00003	1 45E-12	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			1 02E-01	1 00E+00	0 24	4 99E-08	0 000002	1 93E-08	0 0000006	1 51E-11	
MG/KG	TOTAL 1,2-DICHLOROETHENE		9 00E-03	9 00E-03		2 61E+03	8 98E-03	1 00E+00	0 01	4 39E-09	0 0000005	7 06E-11	0 000000008	6 74E-07	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C				1 58E+04	7 21E-03	7 00E-01	0 01	3 53E-09		5 67E-11		8 92E-08	
MG/KG	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 65E+03	8 08E-03	1 50E-01	0 01	3 95E-09	0 0000007	6 36E-11	0 00000007	4 33E-07	
	Hazard Index										**0 05**		**0 005**		**0 0001**
													Total HI=	**0 05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index														

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TABLE I5-8a
Site #36 Soil Column -Hypothetical Current/Future Utility Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	100 c	100 c
FI =	Fraction Ingested (unitless)	0.5	0 5
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.1 e,g	0 1 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1.32E+09 i	1 32E+09 i
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday
c = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
d = Utility activity assumed to be twice a month throughout the year
e= EPA Exposure Factors Handbook, August 1997
f = Surface area of 1/2 head, forearms and the hands of an adult worker
g = AF calculated for soil adherence can be found in Appendix G
h = Chemical-specific absorption factors are found in Appendix G
i = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Backgrounc Document, May 1996.

TABLE I5-8b

Site #36 Soil Column Hypothetical Current/Future Utility Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ANTIMONY	D					5 02E+00	2 00E-02	0 001	8 42E-08		4 51E-10		2 55E-11	
MG/KG	ARSENIC	A	1.50E+00	3 66E+00	1 51E+01		2 10E+01	4 10E-01	0 03	3 52E-07	5 3E-07	5 66E-08	2 1E-07	1 07E-10	1 6E-09
MG/KG	CHROMIUM, TOTAL	A			4 20E+01		2 70E+01	2 00E-02	0 001	4 53E-07		2 43E-09		1 37E-10	5.8E-09
MG/KG	COPPER	D					3 67E+01	3 00E-01	0 001	6 15E-07		3 30E-09		1 86E-10	
MG/KG	SELENIUM	D					9 52E-01	4 40E-01	0 001	1 60E-08		8 56E-11		4 84E-12	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		9 76E-03	5 00E-01	0 1	1 64E-10	2 6E-09	8 77E-11	2 8E-09	4 96E-14	7 9E-13
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			1 02E-01	1 00E+00	0 24	1 71E-09	2.1E-10	2 20E-09	2 6E-10	5 19E-13	
MG/KG	TOTAL 1,2-DICHLOROETHENE					2 61E+03	8 98E-03	1 00E+00	0 01	1 51E-10		8 07E-12		2 31E-08	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	1 58E+04	7 21E-03	7 00E-01	0 01	1 21E-10	2 4E-11	6 48E-12	1 9E-12	3 06E-09	6 2E-10
MG/KG	TRICHLOROETHYLENE (TCE)	B2	1 10E-02		6 00E-03	3 65E+03	8 08E-03	1 50E-01	0 01	1 36E-10	1 5E-12	7 26E-12		1 48E-08	8 9E-11
	Total Risk										**5.3E-07**		**2.1E-07**		**8.1E-09**
													Total Risk =	**7E-07**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I5-8c

Site #36 Soil Column -Hypothetical Current/Future Utility Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			5 02E+00	2 00E-02	0 001	2 36E-07	0 0006	1 26E-09	0 0002	7 14E-11	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			2 10E+01	4 10E-01	0 03	9 86E-07	0 003	1.58E-07	0 001	2 99E-10	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05		2 70E+01	2 00E-02	0 001	1 27E-06	0 0004	6 80E-09	0 0001	3 84E-10	0 00001
MG/KG	COPPER	D	4 00E-02	1 20E-02			3 67E+01	3 00E-01	0 001	1 72E-06	0 00004	9 23E-09	0 0000008	5 22E-10	
MG/KG	SELENIUM	D	5 00E-03	2 20E-03			9 52E-01	4 40E-01	0 001	4 47E-08	0 000009	2 40E-10	0 0000001	1 36E-11	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			9 76E-03	5 00E-01	0 1	4 58E-10	0 000009	2.45E-10	0 00001	1 39E-13	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			1 02E-01	1 00E+00	0 24	4 79E-09	0 0000002	6 16E-09	0 0000002	1 45E-12	
MG/KG	TOTAL 1,2-DICHLOROETHENE		9 00E-03	9 00E-03		2 61E+03	8 98E-03	1 00E+00	0 01	4 22E-10	0 00000005	2 26E-11	0 000000003	6 47E-08	
MG/KG	1,1,2,2-TETRACHLOROETHANE	C				1 58E+04	7 21E-03	7 00E-01	0 01	3 39E-10		1 81E-11		8 57E-09	
MG/KG	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 65E+03	8 08E-03	1 50E-01	0 01	3 80E-10	0 00000006	2 03E-11	0 00000002	4 16E-08	
	Hazard Index										**0.004**		**0.002**		**0.00001**
													Total HI=	**0 006**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I5-9a
FU4 Ditch Sediment -Hypothetical Current/Future Maintenance Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Csd * IR * FI * EF * ED * CF}{BW * AT}$		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a, b	50 a, b
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	12 d	12 d
ED =	Exposure Duration (year)	25 e	25 e
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 e	70 e
AT =	Averaging Time (days)	25550 e	9125 e
Dermal:			
CDI =	$\frac{Csd * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	2679 f,g	2679 f,g
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 1 g,h	0 1 g,h
ABS =	Absorption Factor (unitless)	(Chemical Specific) i	(Chemical Specific) i
ET =	Exposure Time (4 hours per 8 hour workday)	0 5 c	0 5 c
EF =	Exposure Frequency (day/year)	12 d	12 d
ED =	Exposure Duration (year)	25 e	25 e
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 e	70 e
AT =	Averaging Time (days)	25550 e	9125 e

Inhalation: No values available for inhalation pathway

References:

a = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.
b = A conservative ingestion rate based on industrial soil intake is assumed.
c = Half a workday is assumed to be spent outdoors in the contaminated areas based on the nature of the activity.
d = Once a month maintenance activity throughout the year is assumed.
e = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.
f = Surface area of hands, 1/2 arms and face (1/2 head) of an adult worker
g = EPA Exposure Factors Handbook, August 1997
h = AF calculated for soil adherence can be found in Appendix G.
i = Chemical-specific absorption factors are found in Appendix G

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TABLE I5-9b

FU4 Ditch Sediment -Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR
MG/KG	CHROMIUM, TOTAL	A			6 85E+01	2 00E-02	0 001	5 75E-07		1 54E-09	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	3.10E-01	5 00E-01	0 1	2 60E-09	4 16E-08	6 97E-10	2 23E-08
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	2 00E+01	3 10E-01	0 1	1 68E-07	1 22E-07	4 49E-08	1.06E-07
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	1 90E+01	3 10E-01	0.13	1.59E-07	1.16E-06	5 55E-08	1 31E-06
MG/KG	BENZO(b)FLUORANTHENE	B2	7.30E-01	2 35E+00	2 60E+01	3 10E-01	0 1	2 18E-07	1 59E-07	5 84E-08	1.38E-07
MG/KG	BENZO(k)FLUORANTHENE	B2	7.30E-02	2.35E-01	2 50E+01	3 10E-01	0 1	2 10E-07	1 53E-08	5 62E-08	1 32E-08
MG/KG	CARBAZOLE	B2	2 00E-02	2.86E-02	2 40E+00	7 00E-01	0 1	2 01E-08	4 03E-10	5 39E-09	1.54E-10
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 00E+01	3 10E-01	0.1	2 52E-07	1.84E-09	6.74E-08	1.59E-09
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 90E-01	3 10E-01	0 1	3 27E-09	2 39E-09	8 76E-10	2 06E-09
MG/KG	2-METHYLNAPHTHALENE	D			1 00E+01	8 00E-01	0 01	8.39E-08		2 25E-09	
MG/KG	4-METHYLPHENOL (p-CRESOL)	C			1.70E-01	6.50E-01	0 01	1 43E-09		3 82E-11	
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01	2 60E-01	1 00E+00	0 24	2.18E-09	2 62E-10	1.40E-09	1.68E-10
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	4 94E-04	5 00E-01	0.03	4.15E-12	6 22E-07	3 33E-13	1 00E-07
MG/KG	CARBON TETRACHLORIDE	B2	1 30E-01	2 00E-01	7 80E-02	6.50E-01	0 01	6 54E-10	8 50E-11	1 75E-11	3 51E-12
MG/KG	METHYLENE CHLORIDE	B2	7 50E-03	7 89E-03	4 50E-02	9 50E-01	0 01	3.77E-10	2 83E-12	1 01E-11	7 98E-14
	Total Risk								**2E-06**		**2E-06**
									Total Risk=	**4E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure										

TABLE I5-9c

FU4 Ditch Sediment -Hypothetical Current/Future Maintenance Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	EPC	ABSgi	ABS	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6.00E-05	6.85E+01	2 00E-02	0 001	1 61E-06	0 0005	4 31E-09	0 00007
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	3 10E-01	5 00E-01	0 1	7 28E-09	0 0001	1 95E-09	0 00008
MG/KG	BENZO(a)ANTHRACENE	B2			2 00E+01	3 10E-01	0 1	4 70E-07		1.26E-07	
MG/KG	BENZO(a)PYRENE	B2			1 90E+01	3 10E-01	0 13	4 46E-07		1.55E-07	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 60E+01	3 10E-01	0.1	6 11E-07		1 64E-07	
MG/KG	BENZO(k)FLUORANTHENE	B2			2 50E+01	3 10E-01	0.1	5.87E-07		1 57E-07	
MG/KG	CARBAZOLE	B2			2 40E+00	7 00E-01	0.1	5 64E-08		1.51E-08	
MG/KG	CHRYSENE	B2			3 00E+01	3 10E-01	0 1	7 05E-07		1 89E-07	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2			3 90E-01	3 10E-01	0 1	9 16E-09		2 45E-09	
MG/KG	2-METHYLNAPHTHALENE	D	2 00E-02	1 60E-02	1 00E+01	8 00E-01	0 01	2 35E-07	0 00001	6 29E-09	0 0000004
MG/KG	4-METHYLPHENOL (p-CRESOL)	C	5 00E-03	3 25E-03	1.70E-01	6 50E-01	0 01	3 99E-09	0 0000008	1 07E-10	0 00000003
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02	2.60E-01	1 00E+00	0 24	6 11E-09	0 0000002	3 93E-09	0 0000001
MG/KG	TCDD Equivalent	B2			4 94E-04	5 00E-01	0 03	1.16E-11		9 33E-13	
MG/KG	CARBON TETRACHLORIDE	B2	7.00E-04	4 55E-04	7 80E-02	6 50E-01	0 01	1 83E-09	0 000003	4 91E-11	0 0000001
MG/KG	METHYLENE CHLORIDE	B2	6.00E-02	5 70E-02	4 50E-02	9 50E-01	0 01	1 06E-09	0 00000002	2.83E-11	0 0000000005
	Hazard Index								**0.0007**		**0.0002**
									Total HI=	**0.0008**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I5-10a

FU4 Ditch Sediment -Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Csd * IR * FI * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a, b	50 a, b
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	50 c	50 c
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d
Dermal:			
CDI =	Csd *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.1 g,f	0 1 g,f
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (2 hours per 8 hour workday)	0.25 i	0 25 i
EF =	Exposure Frequency (day/year)	50 c	50 c
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d

Inhalation: No values available for inhalation pathway

References:

a = Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.
b = A conservative ingestion rate based on industrial soil intake is assumed.
c = Exposure is assumed to be once a week (excluding vacation).
d = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.
e = Surface area of hands, 1/2 arms and face (1/2 head) of an adult worker.
f =EPA Exposure Factors Handbook, August 1997
g = AF calculated for soil adherence can be found in Appendix G.
h = Chemical-specific absorption factors are found in Appendix G
i = 2 hours of a workday is assumed to be spent outdoors in the contaminated areas based on the nature of the activity.

TABLE I5-10b

FU4 Ditch Sediment -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR
MG/KG	CHROMIUM, TOTAL	A			6 85E+01	2 00E-02	0 001	2 39E-06		3 21E-09	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	3 10E-01	5 00E-01	0.1	1 08E-08	1 73E-07	1 45E-09	4 64E-08
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	2 00E+01	3 10E-01	0 1	6 99E-07	5 10E-07	9 36E-08	2.20E-07
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	1 90E+01	3 10E-01	0 13	6 64E-07	4 85E-06	1 16E-07	2 72E-06
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	2 60E+01	3 10E-01	0 1	9 09E-07	6 63E-07	1 22E-07	2 87E-07
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	2 50E+01	3 10E-01	0 1	8 74E-07	6 38E-08	1 17E-07	2.76E-08
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02	2 40E+00	7 00E-01	0.1	8 39E-08	1 68E-09	1.12E-08	3.21E-10
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 00E+01	3.10E-01	0.1	1 05E-06	7.65E-09	1 40E-07	3.31E-09
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 90E-01	3 10E-01	0 1	1 36E-08	9.95E-09	1 83E-09	4 30E-09
MG/KG	2-METHYLNAPHTHALENE	D			1 00E+01	8 00E-01	0 01	3 49E-07		4 68E-09	
MG/KG	4-METHYLPHENOL (p-CRESOL)	C			1 70E-01	6 50E-01	0 01	5 94E-09		7 96E-11	
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01	2 60E-01	1 00E+00	0 24	9 09E-09	1 09E-09	2 92E-09	3 51E-10
MG/KG	TCDD Equivalent	B2	1 50E+05	3 00E+05	4 94E-04	5 00E-01	0 03	1 73E-11	2 59E-06	6.94E-13	2 08E-07
MG/KG	CARBON TETRACHLORIDE	B2	1 30E-01	2.00E-01	7 80E-02	6 50E-01	0 01	2 73E-09	3 54E-10	3.65E-11	7.30E-12
MG/KG	METHYLENE CHLORIDE	B2	7 50E-03	7.89E-03	4 50E-02	9 50E-01	0 01	1 57E-09	1 18E-11	2.11E-11	1.66E-13
	Total Risk								**8.9E-06**		**3.5E-06**
									Total Risk=	**1E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I5-10c

FU4 Ditch Sediment -Hypothetical Future Industrial Worker Noncarcinogenic Scenarc

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	RfDo	RfDd	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	6 85E+01	2.00E-02	0 001	6 70E-06	0 002	8 98E-09	0 0001
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05	3 10E-01	5 00E-01	0 1	3 03E-08	0.0006	4 06E-09	0.0002
MG/KG	BENZO(a)ANTHRACENE	B2			2 00E+01	3 10E-01	0.1	1.96E-06		2 62E-07	
MG/KG	BENZO(a)PYRENE	B2			1 90E+01	3 10E-01	0 13	1 86E-06		3 24E-07	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 60E+01	3 10E-01	0 1	2.54E-06		3 41E-07	
MG/KG	BENZO(k)FLUORANTHENE	B2			2 50E+01	3 10E-01	0.1	2 45E-06		3 28E-07	
MG/KG	CARBAZOLE	B2			2 40E+00	7 00E-01	0 1	2 35E-07		3 15E-08	
MG/KG	CHRYSENE	B2			3 00E+01	3 10E-01	0 1	2 94E-06		3 93E-07	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2			3 90E-01	3 10E-01	0 1	3 82E-08		5 11E-09	
MG/KG	2-METHYLNAPHTHALENE	D	2 00E-02	1 60E-02	1 00E+01	8.00E-01	0 01	9 78E-07	0 00005	1 31E-08	0 0000008
MG/KG	4-METHYLPHENOL (p-CRESOL)	C	5 00E-03	3 25E-03	1.70E-01	6 50E-01	0 01	1 66E-08	0.000003	2 23E-10	0 00000007
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02	2.60E-01	1 00E+00	0 24	2 54E-08	0.0000008	8 18E-09	0 0000003
MG/KG	TCDD Equivalent	B2			4.94E-04	5 00E-01	0 03	4 84E-11		1 94E-12	
MG/KG	CARBON TETRACHLORIDE	B2	7.00E-04	4 55E-04	7.80E-02	6 50E-01	0 01	7 63E-09	0.00001	1 02E-10	0 0000002
MG/KG	METHYLENE CHLORIDE	B2	6 00E-02	5 70E-02	4 50E-02	9.50E-01	0 01	4 40E-09	0 00000007	5 90E-11	0 000000001
	Hazard Index								**0.003**		**0.0003**
									Total HI =	**0.003**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

Appendix I-6
A. FU5 Soils

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TABLE I6-1a
FU5 Surface Soil—Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas using best professional judgment, based on the nature of the activity.
c = EPA Exposure Factors Handbook, August 1997.
d = Surface area of 1/2 head, forearms and the hands of an adult worker.
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance. Technical Background Document, May 1996.
h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F.A.C., December 1998

TABLE I6-1b
FU5 Surface Soil—Hypothetical Future Industrial Worker Carcinogenic Scenario
Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ANTIMONY	D					6 33E+00	2 00E-02	0 001	1 11E-06		1 78E-09		3 35E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 46E+01	4 10E-01	0 03	2 55E-06	3 8E-06	1 23E-07	4 5E-07	7 73E-10	1 2E-08
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		1 10E+00	5 00E-01	0 1	1 92E-07	3 1E-06	3 09E-08	9 9E-07	5 82E-11	9 3E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		8 99E+00	3 10E-01	0 1	1 57E-06	1 1E-06	2 53E-07	5 9E-07	4 76E-10	1 5E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		8.41E+00	3 10E-01	0 13	1 47E-06	1 1E-05	3 07E-07	7 2E-06	4 45E-10	1 4E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		8 14E+00	3 10E-01	0 1	1 42E-06	1 0E-06	2 29E-07	5 4E-07	4 31E-10	1 3E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		7 78E+00	3 10E-01	0 1	1 36E-06	9 9E-08	2 18E-07	5 1E-08	4 12E-10	1 3E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			1 12E+00	7 00E-01	0 1	1 95E-07	3 9E-09	3 13E-08	9.0E-10	5 91E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		1 01E+01	3 10E-01	0 1	1 77E-06	1 3E-08	2 84E-07	6 7E-09	5 36E-10	1 7E-12
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		1 34E+00	3 10E-01	0 1	2 34E-07	1.7E-06	3 76E-08	8 8E-07	7 08E-11	2 2E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		6 49E+00	3 10E-01	0 1	1 13E-06	8 3E-07	1 82E-07	4 3E-07	3 44E-10	1 1E-10
MG/KG	4-METHYLPHENOL (p-CRESOL)	C					5 60E-02	6 50E-01	0 01	9 78E-09		1 57E-10		2 97E-12	
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			3 20E-01	1 00E+00	0 24	5 59E-08	6 7E-09	2 16E-08	2 6E-09	1 69E-11	
	Total Risk										**2E-05**		**1E-05**		**1E-08**
												Total Risk =		**3E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I6-1c

FU5 Surface Soil—Hypothetical Future Industrial Worker Non-carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			6.33E+00	2.00E-02	0 001	3 10E-06	0 008	4 98E-09	0 0006	9 38E-10	
MG/KG	ARSENIC	A	3 00E-04	1.23E-04			1 46E+01	4 10E-01	0 03	7 14E-06	0.02	3 45E-07	0 003	2 16E-09	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			1 10E+00	5 00E-01	0.1	5 38E-07	0 01	8.65E-08	0.003	1 63E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					8 99E+00	3 10E-01	0 1	4.40E-06		7.07E-07		1 33E-09	
MG/KG	BENZO(a)PYRENE	B2					8 41E+00	3 10E-01	0 13	4 12E-06		8 60E-07		1 25E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2					8 14E+00	3 10E-01	0 1	3 98E-06		6 40E-07		1 21E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2					7 78E+00	3 10E-01	0 1	3 80E-06		6.12E-07		1 15E-09	
MG/KG	CARBAZOLE	B2					1 12E+00	7 00E-01	0 1	5 46E-07		8 77E-08		1 65E-10	
MG/KG	CHRYSENE	B2					1 01E+01	3 10E-01	0 1	4.95E-06		7 96E-07		1 50E-09	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					1 34E+00	3 10E-01	0 1	6 54E-07		1.05E-07		1 98E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					6 49E+00	3 10E-01	0 1	3 18E-06		5.11E-07		9 63E-10	
MG/KG	4-METHYLPHENOL (p-CRESOL)	C	5 00E-03	3 25E-03			5 60E-02	6 50E-01	0 01	2 74E-08	0 000005	4.40E-10	0 0000001	8 30E-12	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			3 20E-01	1 00E+00	0 24	1 57E-07	0 000005	6.04E-08	0 000002	4 74E-11	
	Hazard Index										**0.04**		**0.007**		
													Total HI=	**0.05**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index

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TABLE I6-2a
FU5 Soil Column—Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles.*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1.32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Time spent outdoors in the contaminated areas using best professional judgment, based on the nature of the activity

c = U S EPA Exposure Factors Handbook, August 1997

d = Surface area of 1/2 head, forearms and the hands of an adult worker

e = AF calculated for soil adherence can be found in Appendix G

f = Chemical-specific absorption factors are found in Appendix G

g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Backgrounc Document, May 1996.

h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A C , December 1998.

TABLE I6-2b

FU5 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	ANTIMONY	D					4 28E+00	2 00E-02	0 001	7 48E-07		1 20E-09		2 27E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 41E+01	4 10E-01	0 03	2 46E-06	3 7E-06	1 19E-07	4 3E-07	7 47E-10	1 1E-08
MG/KG	CADMIUM	B1			6 30E+00		2 61E+00	1 00E-02	0 01	4 56E-07		7 32E-09		1 38E-10	8 7E-10
MG/KG	CHROMIUM, TOTAL	A			4 20E+01		2 51E+01	2 00E-02	0 001	4 38E-06		7 04E-09		1 33E-09	5 6E-08
MG/KG	COPPER	D					2 64E+01	3 00E-01	0 001	4 61E-06		7 41E-09		1,40E-09	
MG/KG	MANGANESE	D					1 15E+03	4 00E-02	0 001	2 00E-04		3 22E-07		6 07E-08	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		1 07E+00	5 00E-01	0 1	1 86E-07	3 0E-06	3 00E-08	9 6E-07	5 65E-11	9 0E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		2 08E+00	3 10E-01	0 1	3 64E-07	2 7E-07	5 85E-08	1 4E-07	1,10E-10	3 4E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		2 01E+00	3 10E-01	0 13	3 51E-07	2 6E-06	7 32E-08	1 7E-06	1 06E-10	3 3E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		2 03E+00	3 10E-01	0 1	3 54E-07	2 6E-07	5 69E-08	1 3E-07	1,07E-10	3 3E-11
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		1 91E+00	3 10E-01	0 1	3 33E-07	2.4E-08	5 36E-08	1 3E-08	1 01E-10	3 1E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			4 60E-01	7 00E-01	0 1	8 03E-08	1 6E-09	1 29E-08	3 7E-10	2 43E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		2 42E+00	3 10E-01	0 1	4 22E-07	3 1E-09	6 78E-08	1 6E-09	1 28E-10	4 0E-13
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		6 14E-01	3 10E-01	0 1	1 07E-07	7 8E-07	1 72E-08	4.1E-07	3 25E-11	1 0E-10
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		1 60E+00	3 10E-01	0 1	2 80E-07	2 0E-07	4 50E-08	1 1E-07	8 49E-11	2 6E-11
MG/KG	4-METHYLPHENOL (p-CRESOL)	C					5 60E-02	6 50E-01	0 01	9 78E-09		1 57E-10		2 97E-12	
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			2 26E-01	1 00E+00	0 24	3 96E-08	4 7E-09	1 53E-08	1 8E-09	1 20E-11	
MG/KG	TOTAL 1,2-DICHLOROETHENE					2 61E+03	2 00E-03	1 00E+00	0 01	3 49E-10		5 62E-12		5 37E-08	
MG/KG	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	3 65E+03	1 21E-02	1 50E-01	0 01	2 12E-09	2 3E-11	3 41E-11	2 5E-12	2 33E-07	1 4E-09
	Total Risk										**1E-05**		**4E-06**		**7E-08**
												Total Risk =		**1E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure														

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TABLE I6-2c

FU5 Soil Column-Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			4 28E+00	2 00E-02	0 001	2 09E-06	0 005	3 37E-09	0 0004	6 35E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			1 41E+01	4 10E-01	0 03	6 90E-06	0 02	3 33E-07	0 003	2 09E-09	
MG/KG	CADMIUM	B1	1 00E-03	1 00E-05			2 61E+00	1 00E-02	0 01	1 28E-06	0 001	2 05E-08	0 002	3 87E-10	
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05		2 51E+01	2 00E-02	0 001	1 23E-05	0 004	1 97E-08	0 0003	3 72E-09	0 0001
MG/KG	COPPER	D	4 00E-02	1 20E-02			2 64E+01	3 00E-01	0 001	1 29E-05	0 0003	2 07E-08	0 000002	3 91E-09	
MG/KG	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05		1 15E+03	4 00E-02	0 001	5 61E-04	0 004	9 02E-07	0 0002	1.70E-07	0 01
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			1 07E+00	5 00E-01	0 1	5 22E-07	0 01	8 39E-08	0 003	1 58E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					2 08E+00	3 10E-01	0 1	1 02E-06		1 64E-07		3 09E-10	
MG/KG	BENZO(a)PYRENE	B2					2 01E+00	3 10E-01	0 13	9 81E-07		2 05E-07		2 97E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2					2 03E+00	3 10E-01	0 1	9 91E-07		1 59E-07		3 00E-10	
MG/KG	BENZO(k)FLUORANTHENE	B2					1 91E+00	3 10E-01	0 1	9 34E-07		1 50E-07		2 83E-10	
MG/KG	CARBAZOLE	B2					4 60E-01	7 00E-01	0 1	2 25E-07		3 62E-08		6 82E-11	
MG/KG	CHRYSENE	B2					2 42E+00	3 10E-01	0 1	1 18E-06		1 90E-07		3 58E-10	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					6 14E-01	3 10E-01	0 1	3 00E-07		4 83E-08		9 10E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					1 60E+00	3 10E-01	0 1	7 84E-07		1 26E-07		2 38E-10	
MG/KG	4-METHYLPHENOL (p-CRESOL)	C	5 00E-03	3 25E-03			5 60E-02	6 50E-01	0 01	2 74E-08	0 000005	4 40E-10	0 0000001	8.30E-12	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			2 26E-01	1 00E+00	0 24	1 11E-07	0 000004	4 27E-08	0 000001	3 36E-11	
MG/KG	TOTAL 1,2-DICHLOROETHENE	0	9 00E-03	9 00E-03		2 61E+03	2 00E-03	1 00E+00	0 01	9 78E-10	0 0000001	1 57E-11	0 000000002	1 50E-07	
MG/KG	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 65E+03	1 21E-02	1 50E-01	0 01	5 94E-09	0 000001	9 55E-11	0 0000001	6 51E-07	
	Hazard Index										**0.05**		**0 009**		**0.01**
													Total HI=	**0 07**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I6-3a
FU5 Surface Soil -Hypothetical Current/Future Maintenance Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 c	50 c
FI =	Fraction Ingested (unitless)	0.5	0.5
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.03 e,g	0 03 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1.32E+09 i	1 32E+09 i
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) j	(Chemical Specific) j
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:
a = EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday
c = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.
d = Maintenance activity assumed to be once a week throughout the year (excluding vacation)
e= EPA Exposure Factors Handbook, August 1997.
f = Surface area of 1/2 head, forearms and the hands of an adult worker.
g = AF calculated for soil adherence can be found in Appendix G
h = Chemical-specific absorption factors are found in Appendix G.
i = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance· Technical Background Document, May 1996.
j = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A.C , December 1998.

TABLE I6-3b

FU5 Surface Soil -Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ANTIMONY	D					6 33E+00	2 00E-02	0 001	1 11E-07		3 55E-10		6 70E-11	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		1 46E+01	4 10E-01	0 03	2 55E-07	3 8E-07	2 46E-08	9 0E-08	1 55E-10	2 3E-09
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		1 10E+00	5 00E-01	0 1	1 92E-08	3 1E-07	6 18E-09	2 0E-07	1 16E-11	1 9E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		8 99E+00	3 10E-01	0 1	1 57E-07	1 1E-07	5 05E-08	1 2E-07	9 52E-11	3 0E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		8 41E+00	3 10E-01	0 13	1 47E-07	1 1E-06	6 14E-08	1 4E-06	8.91E-11	2 8E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		8 14E+00	3 10E-01	0 1	1 42E-07	1 0E-07	4 57E-08	1 1E-07	8.62E-11	2 7E-11
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02		7 78E+00	3 10E-01	0 1	1 36E-07	9 9E-09	4 37E-08	1 0E-08	8 23E-11	2 6E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			1 12E+00	7 00E-01	0 1	1 95E-08	3 9E-10	6 27E-09	1 8E-10	1.18E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		1 01E+01	3 10E-01	0 1	1 77E-07	1 3E-09	5 69E-08	1 3E-09	1 07E-10	3 3E-13
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	3 10E+00		1 34E+00	3 10E-01	0 1	2 34E-08	1 7E-07	7 51E-09	1 8E-07	1.42E-11	4 4E-11
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		6 49E+00	3 10E-01	0 1	1 13E-07	8 3E-08	3 65E-08	8 6E-08	6 88E-11	2.1E-11
MG/KG	4-METHYLPHENOL (p-CRESOL)	C					5 60E-02	6 50E-01	0 01	9 78E-10		3 15E-11		5 93E-13	
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01			3 20E-01	1 00E+00	0 24	5 59E-09	6 7E-10	4 31E-09	5 2E-10	3 39E-12	
	Total Risk										**2E-06**		**2E-06**		**3E-09**
													Total Risk =	**4E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I6-3c

FU5 Surface Soil -Hypothetical Current/Future Maintenance Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06			6 33E+00	2 00E-02	0 001	3 10E-07	0 0008	9 95E-10	0 0001	1 88E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			1 46E+01	4 10E-01	0 03	7 14E-07	0 002	6 89E-08	0 0006	4 33E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			1 10E+00	5 00E-01	0 1	5 38E-08	0 001	1.73E-08	0 0007	3 26E-11	
MG/KG	BENZO(a)ANTHRACENE	B2					8 99E+00	3 10E-01	0 1	4 40E-07		1 41E-07		2 67E-10	
MG/KG	BENZO(a)PYRENE	B2					8 41E+00	3 10E-01	0 13	4 12E-07		1 72E-07		2 49E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2					8 14E+00	3 10E-01	0 1	3 98E-07		1 28E-07		2 41E-10	
MG/KG	BENZO(k)FLUORANTHENE	B2					7 78E+00	3 10E-01	0 1	3 80E-07		1 22E-07		2 31E-10	
MG/KG	CARBAZOLE	B2					1 12E+00	7 00E-01	0 1	5 46E-08		1 75E-08		3 31E-11	
MG/KG	CHRYSENE	B2					1 01E+01	3 10E-01	0 1	4 95E-07		1 59E-07		3 00E-10	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2					1 34E+00	3 10E-01	0 1	6 54E-08		2 10E-08		3 96E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					6 49E+00	3 10E-01	0 1	3 18E-07		1 02E-07		1 93E-10	
MG/KG	4-METHYLPHENOL (p-CRESOL)	C	5 00E-03	3 25E-03			5 60E-02	6 50E-01	0 01	2 74E-09	0 0000005	8 81E-11	0 00000003	1 66E-12	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02			3 20E-01	1 00E+00	0 24	1 57E-08	0 0000005	1 21E-08	0 0000004	9 49E-12	
	Hazard Index										**0.004**		**0 001**		
													Total HI=	**0.006**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

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TABLE I6-4a
FU5 (SS77C) Surface Soil - Hypothetical Future On-Site Residential (Adult) Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$	**CDIadj =** $\frac{Cs * FI * EF * CF * IRadj}{AT}$	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	N/A	100 a
IRadj =	Age-adjusted Ingestion Rate (mg - year)/(kg - day)	114 29 a,b	N/A
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$	$\frac{Cs * SAadj * AF * ABS * ET * EF * CF}{AT}$	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	N/A	5049 d,e
SAadj =	Age-adjusted Surface Area (cm2 - year)/(kg)	2671 d,e,f	N/A
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 d,g	0 03 d,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Inhalation:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{Cs * (1/PEF) * IR\_Inh * ET * EF * ED}{BW * AT}$	**CDI =** $\frac{Cs * (1/PEF) * IR\_Inhadj * ET * EF}{AT}$	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 i	1 32E+09 i
IR_Inh =	Inhalation Rate (m3/day)	N/A	20 a
IR_Inhadj =	Age-adjusted Inhalation Rate (m3 - year)/(kg - day)	12 85714286 a,j	N/A
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70}$$

114.29 (mg-year)/(kg-day)

c = Time spent outdoors in the contaminated areas based on the nature of the activity

d= EPA Exposure Factors Handbook, August 1997

e = Surface area of 1/2 head, hands, forearms, lower legs & feet of an adult

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{2351 \times 6}{15} + \frac{5049 \times (30-6)}{70}$$

2671 (cm2-year)/(kg)

g = AF calculated for soil adherence can be found in Appendix L

h = Chemical-specific absorption factors are found in Appendix L

i = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Background Document, May 1996

j = Age-adjusted inhalation rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR\text{-}Inh\ adj = \frac{IR\text{-}Inh\ c \times EDc}{BWc} + \frac{IR\text{-}Inh\ a \times (EDa - EDc)}{BWa} = \frac{15 \times 6}{15} + \frac{20 \times (30-6)}{70}$$

12.86 (m3-year)/(kg-day)

TABLE I6-4b

FU5 (SS77C) Surface Soil - Hypothetical Future On-site Residential (Adult) Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDIadj	Ingestion ELCR	Dermal CDIadj	Dermal ELCR	Inhalation CDIadj	Inhalation ELCR
MG/KG	Benzo(a)anthracene	B2	7.30E-01	2.35E+00	3.10E-01		2.60E+01	3.10E-01	0.1	4.07E-05	3.0E-05	4.76E-07	1.1E-06	5.78E-10	1.8E-10
MG/KG	Benzo(a)pyrene	B2	7.30E+00	2.35E+01	3.10E+00		2.60E+01	3.10E-01	0.13	4.07E-05	3.0E-04	6.18E-07	1.5E-05	5.78E-10	1.8E-09
MG/KG	Benzo(b)fluoranthene	B2	7.30E-01	2.35E+00	3.10E-01		2.60E+01	3.10E-01	0.1	4.07E-05	3.0E-05	4.76E-07	1.1E-06	5.78E-10	1.8E-10
MG/KG	Indeno(1,2,3-c,d)pyrene	B2	7.30E-01	2.35E+00	3.10E-01		1.70E+01	3.10E-01	0.1	2.66E-05	1.9E-05	3.11E-07	7.3E-07	3.78E-10	1.2E-10
	Total Risk										**3.8E-04**		**1.8E-05**		**2.3E-09**
													Total Risk =	**4E-04**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I6-4c

FU5 (SS77C) Surface Soil - Hypothetical Future On-Site Residential (Adult) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	Benzo(a)anthracene	B2					2 60E+01	3.10E-01	0.1	3.56E-05		8 99E-07		8.99E-10	
MG/KG	Benzo(a)pyrene	B2					2 60E+01	3.10E-01	0 13	3 56E-05		1.17E-06		8.99E-10	
MG/KG	Benzo(b)fluoranthene	B2					2 60E+01	3.10E-01	0 1	3 56E-05		8.99E-07		8.99E-10	
MG/KG	Indeno(1,2,3-c,d)pyrene	B2					1 70E+01	3.10E-01	0.1	2 33E-05		5.88E-07		5.88E-10	
	Hazard Index														
												Total HI=			

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index

TABLE I6-5a
FU5 (SS77C) Surface Soil—Hypothetical Future On-site Residential (Child) Scenario
Memphis Depot Main Installation RI

		Carcinogenic (optional)	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	200 a	200 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2351 c,d	2351 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.15 c,e	0 15 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (4 hours per 24-hour day)	0.167 b	0.167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	$\frac{Cs * (1/PEF) * IR * ET * EF * ED}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1.32E+09 g
IR =	Inhalation Rate (m3/day)	15 a	15 a
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0 167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance· "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas based on the nature of the activity.
c= EPA Exposure Factors Handbook, August 1997.
d = Surface area of 1/2 head, hands, forearms, lower legs & feet of a child (age 1-6 years).
e = AF calculated for soil adherence can be found in Appendix G.
f = Chemical-specific absorption factors are found in Appendix G.
g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Background Document, May 1996

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TABLE I6-5b

FU5 (SS77C) Surface Soil—Hypothetical Future On-Site Residential (Child) Carcinogenic Scenario - optional use

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation		
Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	Benzo(a)anthracene	B2	7 30E-01	2 35E+00	3 10E-01		2 60E+01	3 10E-01	1.00E-01	2 85E-05	2 08E-05	8 37E-07	1 97E-06	2 70E-10	8 36E-11
MG/KG	Benzo(a)pyrene	B2	7 30E+00	2 35E+01	3 10E+00		2 60E+01	3 10E-01	1 30E-01	2 85E-05	2 08E-04	1 09E-06	2.56E-05	2 70E-10	8 36E-10
MG/KG	Benzo(b)fluoranthene	B2	7 30E-01	2 35E+00	3 10E-01		2 60E+01	3 10E-01	1 00E-01	2 85E-05	2 08E-05	8.37E-07	1 97E-06	2 70E-10	8 36E-11
MG/KG	Indeno(1,2,3-c,d)pyrene	B2	7 30E-01	2 35E+00	3 10E-01		1 70E+01	3 10E-01	1 00E-01	1 86E-05	1 36E-05	5 47E-07	1 29E-06	1.76E-10	5 47E-11
	Total Risk										**2.63E-04**		**3.09E-05**		**1.06E-09**
												Total Risk =		**3E-04**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I6-5c

FU5 (SS77C) Surface Soil—Hypothetical Future On-site Residential (Child) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	Benzo(a)anthracene	B2					2.60E+01	3 10E-01	0 1	3 32E-04		9.77E-06		3.15E-09	
MG/KG	Benzo(a)pyrene	B2					2 60E+01	3.10E-01	0 13	3 32E-04		1.27E-05		3 15E-09	
MG/KG	Benzo(b)fluoranthene	B2					2.60E+01	3 10E-01	0 1	3 32E-04		9 77E-06		3.15E-09	
MG/KG	Indeno(1,2,3-c,d)pyrene	B2					1 70E+01	3 10E-01	0.1	2 17E-04		6 39E-06		2 06E-09	
	Hazard Index														
													Total HI=		

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index

488 571

TABLE I6-6a

Screening Site 77 Surface Soil—Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0.03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity

c = EPA Exposure Factors Handbook, August 1997.

d = Surface area of 1/2 head, forearms and the hands of an adult worker

e = AF calculated for soil adherence can be found in Appendix G.

f = Chemical-specific absorption factors are found in Appendix G

g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Background Document, May 1996

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TABLE I6-6b

Screening Site 77 Surface Soil—Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ANTIMONY	D				7.40E+00	2.00E-02	0.001	1.29E-06		2.08E-09		3.92E-10	
MG/KG	ARSENIC	A	1.50E+00	3.66E+00	1.51E+01	1.87E+01	4.10E-01	0.03	3.27E-06	4.9E-06	1.58E-07	5.8E-07	9.90E-10	1.5E-08
MG/KG	DIELDRIN	B2	1.60E+01	3.20E+01	1.60E+01	2.60E-01	5.00E-01	0.1	4.54E-08	7.3E-07	7.30E-09	2.3E-07	1.38E-11	2.2E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	2.35E+00	3.10E-01	2.60E+01	3.10E-01	0.1	4.54E-06	3.3E-06	7.30E-07	1.7E-06	1.38E-09	4.3E-10
MG/KG	BENZO(a)PYRENE	B2	7.30E+00	2.35E+01	3.10E+00	2.60E+01	3.10E-01	0.13	4.54E-06	3.3E-05	9.49E-07	2.2E-05	1.38E-09	4.3E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7.30E-01	2.35E+00	3.10E-01	2.60E+01	3.10E-01	0.1	4.54E-06	3.3E-06	7.30E-07	1.7E-06	1.38E-09	4.3E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7.30E-02	2.35E-01	3.10E-02	2.00E+01	3.10E-01	0.1	3.49E-06	2.6E-07	5.62E-07	1.3E-07	1.06E-09	3.3E-11
MG/KG	CARBAZOLE	B2	2.00E-02	2.86E-02		4.00E+00	7.00E-01	0.1	6.99E-07	1.4E-08	1.12E-07	3.2E-09	2.12E-10	
MG/KG	CHRYSENE	B2	7.30E-03	2.35E-02	3.10E-03	3.00E+01	3.10E-01	0.1	5.24E-06	3.8E-08	8.43E-07	2.0E-08	1.59E-09	4.9E-12
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7.30E-01	2.35E+00	3.10E-01	1.70E+01	3.10E-01	0.1	2.97E-06	2.2E-06	4.77E-07	1.1E-06	9.00E-10	2.8E-10
MG/KG	PENTACHLOROPHENOL	B2	1.20E-01	1.20E-01		3.20E-01	1.00E+00	0.24	5.59E-08	6.7E-09	2.16E-08	2.6E-09	1.69E-11	
	Total Risk									**4.8E-05**		**2.8E-05**		**2.1E-08**
												Total Risk =	**8E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I6-6c

Screening Site 77 Surface Soil—Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation CDI	Inhalation HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06		7 40E+00	2 00E-02	0 001	3 62E-06	0 009	5 82E-09	0 0007	1 10E-09	
MG/KG	ARSENIC	A	3 00E-04	1.23E-04		1 87E+01	4 10E-01	0 03	9 15E-06	0 03	4 41E-07	0 004	2 77E-09	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05		2 60E-01	5 00E-01	0 1	1 27E-07	0 003	2 04E-08	0 0008	3 85E-11	
MG/KG	BENZO(a)ANTHRACENE	B2				2 60E+01	3 10E-01	0 1	1 27E-05		2 04E-06		3 85E-09	
MG/KG	BENZO(a)PYRENE	B2				2 60E+01	3 10E-01	0 13	1 27E-05		2 66E-06		3 85E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2				2 60E+01	3 10E-01	0 1	1 27E-05		2 04E-06		3 85E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2				2 00E+01	3 10E-01	0 1	9 78E-06		1 57E-06		2 97E-09	
MG/KG	CARBAZOLE	B2				4 00E+00	7 00E-01	0 1	1 96E-06		3 15E-07		5 93E-10	
MG/KG	CHRYSENE	B2				3 00E+01	3 10E-01	0 1	1 47E-05		2 36E-06		4 45E-09	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				1 70E+01	3 10E-01	0 1	8.32E-06		1 34E-06		2 52E-09	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02		3 20E-01	1 00E+00	0 24	1 57E-07	0 000005	6.04E-08	0 000002	4 74E-11	
	Hazard Index									**0.04**		**0.005**		
												Total HI=	**0 05**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I6-7a
Screening Site 77 Soil Column—Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.03 c,e	0.03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1.32E+09 g
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance· Technical Backgrounc Document, May 1996.

TABLE I6-7b
Screening Site 77 Soil Column—Hypothetical Future Industrial Worker Carcinogenic Scenario
Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	ANTIMONY	D				7 23E+00	2 00E-02	0 001	1 26E-06		2 03E-09		3 83E-10	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	1 35E+01	4 10E-01	0 03	2 37E-06	3 6E-06	1 14E-07	4 2E-07	7 17E-10	1 1E-08
MG/KG	COPPER	D				3 42E+01	3 00E-01	0 001	5 97E-06	0 0E+00	9 59E-09		1 81E-09	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01	2 60E-01	5 00E-01	0 1	4 54E-08	7 3E-07	7 30E-09	2 3E-07	1 38E-11	2 2E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	2 60E+01	3 10E-01	0 1	4 54E-06	3 3E-06	7 30E-07	1 7E-06	1 38E-09	4 3E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	2 60E+01	3 10E-01	0 13	4 54E-06	3 3E-05	9 49E-07	2 2E-05	1 38E-09	4 3E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	2 60E+01	3 10E-01	0 1	4 54E-06	3 3E-06	7 30E-07	1 7E-06	1 38E-09	4.3E-10
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02	2 00E+01	3 10E-01	0 1	3 49E-06	2 6E-07	5 62E-07	1 3E-07	1 06E-09	3 3E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02		2 34E+00	7 00E-01	0 1	4 10E-07	8 2E-09	6 58E-08	1 9E-09	1 24E-10	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	3 00E+01	3 10E-01	0 1	5 24E-06	3 8E-08	8 43E-07	2 0E-08	1 59E-09	4 9E-12
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	1 70E+01	3 10E-01	0 1	2 97E-06	2 2E-06	4 77E-07	1 1E-06	9 00E-10	2 8E-10
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01		3 20E-01	1 00E+00	0 24	5 59E-08	6 7E-09	2 16E-08	2 6E-09	1 69E-11	--
	Total Risk									**4.7E-05**		**2.8E-05**		**1.6E-08**
												Total Risk =	**7E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I6-7c

Screening Site 77 Soil Column—Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06		7 23E+00	2 00E-02	0 001	3 54E-06	0 009	5 68E-09	0 0007	1 07E-09	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04		1 35E+01	4 10E-01	0 03	6 63E-06	0 02	3 20E-07	0 003	2 01E-09	
MG/KG	COPPER	D	4 00E-02	1 20E-02		3 42E+01	3 00E-01	0 001	1 67E-05	0 0004	2 69E-08	0 000002	5 06E-09	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05		2 60E-01	5 00E-01	0 1	1 27E-07	0 003	2 04E-08	0 0008	3 85E-11	
MG/KG	BENZO(a)ANTHRACENE	B2				2 60E+01	3 10E-01	0 1	1 27E-05		2 04E-06		3 85E-09	
MG/KG	BENZO(a)PYRENE	B2				2 60E+01	3 10E-01	0 13	1.27E-05		2 66E-06		3 85E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2				2 60E+01	3 10E-01	0 1	1 27E-05		2 04E-06		3.85E-09	
MG/KG	BENZO(k)FLUORANTHENE	B2				2 00E+01	3 10E-01	0 1	9 78E-06		1 57E-06		2.97E-09	
MG/KG	CARBAZOLE	B2				2 34E+00	7 00E-01	0 1	1 15E-06		1 84E-07		3 48E-10	
MG/KG	CHRYSENE	B2				3 00E+01	3.10E-01	0 1	1 47E-05		2 36E-06		4.45E-09	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				1 70E+01	3 10E-01	0 1	8 32E-06		1 34E-06		2 52E-09	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02		3 20E-01	1 00E+00	0 24	1.57E-07	0 000005	6 04E-08	0 000002	4 74E-11	
	Hazard Index									**0.03**		**0.004**		
												Total HI=	**0.04**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index

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TABLE I6-8a
Screening Site 77 Soil Column—Hypothetical Current/Future Utility Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	100 c	100 c
FI =	Fraction Ingested (unitless)	0 5	0 5
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 1 e,g	0 1 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	$\frac{Cs * (1/PEF) * IR * ET * EF * ED}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1.32E+09 i	1 32E+09 i
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285.6-03, March 25, 1991
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday
c = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
d = Utility activity assumed to be twice a month throughout the year.
e= EPA Exposure Factors Handbook, August 1997
f = Surface area of 1/2 head, forearms and the hands of an adult worker
g = AF calculated for soil adherence can be found in Appendix G
h = Chemical-specific absorption factors are found in Appendix G
i = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance: Technical Backgrounc Document, May 1996

TABLE I6-8b

Screening Site 77 Soil Column—Hypothetical Current/Future Utility Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	ANTIMONY	D				7 23E+00	2 00E-02	0 001	1 21E-07		6 50E-10		3 67E-11	
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	1 35E+01	4 10E-01	0 03	2 27E-07	3 4E-07	3 65E-08	1 3E-07	6 89E-11	1 0E-09
MG/KG	COPPER	D				3 42E+01	3 00E-01	0 001	5 73E-07		3 07E-09		1 74E-10	
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01	2 60E-01	5 00E-01	0 1	4 36E-09	7 0E-08	2 34E-09	7 5E-08	1 32E-12	2 1E-11
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	2 60E+01	3 10E-01	0 1	4 36E-07	3 2E-07	2 34E-07	5 5E-07	1 32E-10	4 1E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	2 60E+01	3 10E-01	0 13	4 36E-07	3 2E-06	3 04E-07	7 2E-06	1 32E-10	4 1E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	2 60E+01	3 10E-01	0 1	4 36E-07	3 2E-07	2 34E-07	5 5E-07	1 32E-10	4 1E-11
MG/KG	BENZO(k)FLUORANTHENE	B2	7 30E-02	2 35E-01	3 10E-02	2 00E+01	3 10E-01	0 1	3 35E-07	2 4E-08	1 80E-07	4 2E-08	1 02E-10	3 2E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02		2 34E+00	7 00E-01	0 1	3 93E-08	7 9E-10	2 11E-08	6 0E-10	1 19E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	3 00E+01	3 10E-01	0 1	5 03E-07	3 7E-09	2 70E-07	6 3E-09	1 52E-10	4 7E-13
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	1 70E+01	3 10E-01	0 1	2 85E-07	2 1E-07	1 53E-07	3 6E-07	8 64E-11	2.7E-11
MG/KG	PENTACHLOROPHENOL	B2	1 20E-01	1 20E-01		3 20E-01	1 00E+00	0 24	5 37E-09	6 4E-10	6 90E-09	8 3E-10	1 63E-12	
	Total Risk									**4.5E-06**		**8.9E-06**		**1.6E-09**
												Total Risk	**1E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure													

TABLE I-68c

Screening Site 77 Soil Column—Hypothetical Current/Future Utility Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06		7 23E+00	2 00E-02	0 001	3 39E-07	0 0008	1 82E-09	0 0002	1 03E-10	
MG/KG	ARSENIC	A	3 00E-04	1 23E-04		1 35E+01	4 10E-01	0 03	6 36E-07	0 002	1 02E-07	0 0008	1 93E-10	
MG/KG	COPPER	D	4 00E-02	1 20E-02		3 42E+01	3 00E-01	0 001	1 60E-06	0 00004	8 59E-09	0 0000007	4 86E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05		2 60E-01	5 00E-01	0 1	1 22E-08	0 0002	6 54E-09	0 0003	3 70E-12	
MG/KG	BENZO(a)ANTHRACENE	B2				2 60E+01	3 10E-01	0 1	1 22E-06		6 54E-07		3 70E-10	
MG/KG	BENZO(a)PYRENE	B2				2 60E+01	3 10E-01	0 13	1 22E-06		8 51E-07		3 70E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2				2 60E+01	3 10E-01	0 1	1 22E-06		6 54E-07		3 70E-10	
MG/KG	BENZO(k)FLUORANTHENE	B2				2 00E+01	3 10E-01	0 1	9 39E-07		5 03E-07		2 85E-10	
MG/KG	CARBAZOLE	B2				2 34E+00	7 00E-01	0 1	1 10E-07		5 90E-08		3 34E-11	
MG/KG	CHRYSENE	B2				3 00E+01	3 10E-01	0 1	1 41E-06		7 55E-07		4 27E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				1 70E+01	3 10E-01	0.1	7 98E-07		4 28E-07		2 42E-10	
MG/KG	PENTACHLOROPHENOL	B2	3 00E-02	3 00E-02		3 20E-01	1 00E+00	0 24	1 50E-08	0 0000005	1 93E-08	0 0000006	4 55E-12	
	Hazard Index									**0.003**		**0.001**		
												Total HI=	**0.005**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

Appendix I7
FU6 Soils
FU6 Sediment

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TABLE I7-1a

FU6 Surface Soil -Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles:*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1.32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Time spent outdoors in the contaminated areas using best professional judgment, based on the nature of the activity

c = EPA Exposure Factors Handbook, August 1997

d = Surface area of 1/2 head, forearms and the hands of an adult worker.

e = AF calculated for soil adherence can be found in Appendix G

f = Chemical-specific absorption factors are found in Appendix G

g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Background Document, May 1996

h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F.A.C , December 1998

TABLE I7-1b

FU6 Surface Soil -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		2 85E+01	4 10E-01	0 03	4 99E-06	7 5E-06	2 40E-07	8 8E-07	1 51E-09	2 3E-08
MG/KG	DDE	B2	3 40E-01	4 86E-01			1 20E+00	7 00E-01	0 1	2 10E-07	7 1E-08	3 37E-08	1 6E-08	6 35E-11	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01		1 80E+00	7 00E-01	0 1	3 15E-07	1 1E-07	5 06E-08	2 5E-08	9 53E-11	3 2E-11
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		7 30E-01	5 00E-01	0 1	1 28E-07	2 0E-06	2 05E-08	6 6E-07	3 87E-11	6 2E-10
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 22E+00	2 00E+00		6 30E+00	9 00E-01	0 06	1 10E-06	2 2E-06	1 06E-07	2 4E-07	3 34E-10	6 7E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		4 54E+00	3 10E-01	0 1	7 93E-07	5 8E-07	1 27E-07	3 0E-07	2 40E-10	7 5E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		4 39E+00	3 10E-01	0 13	7 67E-07	5 6E-06	1 60E-07	3 8E-06	2 32E-10	7 2E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		6 16E+00	3 10E-01	0 1	1 08E-06	7 9E-07	1 73E-07	4 1E-07	3 26E-10	1 0E-10
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			1 03E+00	7 00E-01	0 1	1 79E-07	3 6E-09	2 88E-08	8 2E-10	5 44E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		6 27E+00	3 10E-01	0.1	1 09E-06	8 0E-09	1 76E-07	4 1E-09	3 32E-10	1 0E-12
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		5 32E+00	3 10E-01	0 1	9 30E-07	6 8E-07	1 49E-07	3 5E-07	2 82E-10	8 7E-11
	Total Risk										**2E-05**		**7E-06**		**3E-08**
												Total Risk =		**3E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I7-1c

FU6 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			2 85E+01	4 10E-01	0 03	1 40E-05	0 05	6 73E-07	0 005	4.23E-09	
MG/KG	DDE	B2					1.20E+00	7 00E-01	0 1	5 87E-07		9 44E-08		1 78E-10	
MG/KG	DDT	B2	5 00E-04	3 50E-04			1 80E+00	7 00E-01	0 1	8 81E-07	0 002	1.42E-07	0 0004	2 67E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			7.30E-01	5 00E-01	0 1	3 57E-07	0 007	5 74E-08	0 002	1.08E-10	
MG/KG	PCB-1260 (AROCLOR 1260)	B2					6 30E+00	9 00E-01	0 06	3 08E-06		2 97E-07		9 34E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					4 54E+00	3 10E-01	0.1	2 22E-06		3 57E-07		6 73E-10	
MG/KG	BENZO(a)PYRENE	B2					4 39E+00	3 10E-01	0 13	2 15E-06		4 48E-07		6 50E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2					6 16E+00	3 10E-01	0.1	3 01E-06		4.84E-07		9 13E-10	
MG/KG	CARBAZOLE	B2					1 03E+00	7 00E-01	0 1	5 02E-07		8 07E-08		1 52E-10	
MG/KG	CHRYSENE	B2					6.27E+00	3.10E-01	0 1	3 07E-06		4 93E-07		9 29E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					5.32E+00	3 10E-01	0 1	2 60E-06		4.19E-07		7 89E-10	
	Hazard Index										**0.06**		**0.008**		
													Total HI=	**0.06**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Index

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TABLE I7-2a

FU6 Soil Column -Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles*	
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT	Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED / BW * AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) h	(Chemical Specific) h
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Time spent outdoors in the contaminated areas using best professional judgment, based on the nature of the activity.

c = EPA Exposure Factors Handbook, August 1997

d = Surface area of 1/2 head, forearms and the hands of an adult worker

e = AF calculated for soil adherence can be found in Appendix G

f = Chemical-specific absorption factors are found in Appendix G

g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Background Document, May 1996.

h = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F A.C , December 1998

TABLE I7-2b

FU6 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**VFInd**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		2 16E+01	4 10E-01	0 03	3 77E-06	5 7E-06	1 82E-07	6 6E-07	1 14E-09	1 7E-08
MG/KG	COPPER	D					2 77E+01	3 00E-01	0 001	4 83E-06		7 77E-09		1 46E-09	
MG/KG	DDE	B2	3 40E-01	4 86E-01			7 17E-01	7 00E-01	0 1	1 25E-07	4 3E-08	2 01E-08	9 8E-09	3 80E-11	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01		1 67E+00	7 00E-01	0 1	2 93E-07	1 0E-07	4 70E-08	2 3E-08	8 87E-11	3 0E-11
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		7 30E-01	5 00E-01	0 1	1 28E-07	2 0E-06	2 05E-08	6 6E-07	3 87E-11	6 2E-10
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 22E+00	2 00E+00		6 30E+00	9 00E-01	0 06	1 10E-06	2 2E-06	1 06E-07	2 4E-07	3 34E-10	6 7E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		9 98E-01	3 10E-01	0 1	1 74E-07	1 3E-07	2 80E-08	6 6E-08	5 28E-11	1 6E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		9 85E-01	3 10E-01	0 13	1 72E-07	1 3E-06	3 60E-08	8 5E-07	5 21E-11	1 6E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		1 16E+00	3 10E-01	0 1	2 03E-07	1 5E-07	3 27E-08	7 7E-08	6 16E-11	1 9E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			3 81E-01	7.00E-01	0 1	6 66E-08	1 3E-09	1 07E-08	3 1E-10	2 02E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		1 17E+00	3 10E-01	0 1	2 05E-07	1 5E-09	3 29E-08	7 8E-10	6 21E-11	1 9E-13
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		1 05E+00	3 10E-01	0 1	1 84E-07	1 3E-07	2 96E-08	7 0E-08	5 58E-11	1 7E-11
MG/KG	BENZENE	A	2 90E-02	2 99E-02	2 73E-02	3 07E+03	6 78E-02	9 70E-01	0 01	1 18E-08	3 4E-10	1 90E-10	5 7E-12	1 55E-06	4 2E-08
MG/KG	METHYLENE CHLORIDE	B2	7 50E-03	7 89E-03	1 65E-03	2 80E+03	9 00E-03	9 50E-01	0 01	1 57E-09	1 2E-11	2 53E-11	2 0E-13	2 25E-07	3 7E-10
MG/KG	Total Xylenes	D				4 45E+03	4 68E-02	9 20E-01	0 01	8 18E-09		1 31E-10		7 35E-07	
	Total Risk										**1E-05**		**3E-06**		**6E-08**
												Total Risk =		**1E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure														

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TABLE I7-2c
FU6 Soil Column-Hypothetical Future Industrial Worker Noncarcinogenic Scenario
Memphis Depot Main Installation R

Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation CDI	Inhalation HQ
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			2 16E+01	4 10E-01	0 03	1 05E-05	0 04	5 09E-07	0 004	3 20E-09	
MG/KG	COPPER	D	4 00E-02	1 20E-02			2 77E+01	3 00E-01	0 001	1 35E-05	0 0003	2 18E-08	0 000002	4 10E-09	
MG/KG	DDE	B2					7 17E-01	7 00E-01	0 1	3 51E-07		5 64E-08		1 06E-10	
MG/KG	DDT	B2	5 00E-04	3 50E-04			1 67E+00	7 00E-01	0 1	8 19E-07	0 002	1 32E-07	0 0004	2 48E-10	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			7 30E-01	5 00E-01	0 1	3 57E-07	0 007	5 74E-08	0 002	1 08E-10	
MG/KG	PCB-1260 (AROCLOR 1260)	B2					6 30E+00	9 00E-01	0 06	3 08E-06		2 97E-07		9 34E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					9 98E-01	3 10E-01	0 1	4 88E-07		7 85E-08		1.48E-10	
MG/KG	BENZO(a)PYRENE	B2					9 85E-01	3 10E-01	0 13	4 82E-07		1 01E-07		1.46E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2					1 16E+00	3 10E-01	0 1	5 69E-07		9 14E-08		1 72E-10	
MG/KG	CARBAZOLE	B2					3 81E-01	7 00E-01	0 1	1 86E-07		3 00E-08		5 65E-11	
MG/KG	CHRYSENE	B2					1 17E+00	3 10E-01	0 1	5 73E-07		9 22E-08		1 74E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					1 05E+00	3 10E-01	0 1	5 16E-07		8 29E-08		1 56E-10	
MG/KG	BENZENE	A				3 07E+03	6 78E-02	9 70E-01	0 01	3 32E-08		5 33E-10		4 33E-06	
MG/KG	METHYLENE CHLORIDE	B2	6 00E-02	5 70E-02	8 57E-01	2 80E+03	9 00E-03	9 50E-01	0 01	4 40E-09	0 00000007	7 08E-11	0 000000001	6 29E-07	0 0000007
MG/KG	Total Xylenes	D	2 00E+00	1 84E+00		4 45E+03	4 68E-02	9 20E-01	0 01	2 29E-08	0 00000001	3 68E-10	0 0000000002	2 06E-06	
	Hazard Index										**0.04**		**0.007**		**0.0000007**
													Total HI=	**0.05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I7-3a
FU6 Surface Soil -Hypothetical Current/Future Maintenance Worker Scenario
Memphis Depot Main Installation Ri

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 c	50 c
FI =	Fraction Ingested (unitless)	0.5	0 5
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 e,g	0 03 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:		*for volatiles:*	
CDI =	$\frac{Cs * (1/PEF) * IR * ET * EF * ED}{BW * AT}$	$\frac{Cs * ((1/VFind)+(1/PEF)) * IR * ET * EF * ED}{BW * AT}$	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 i	1 32E+09 i
VFind =	Volatilization Factor (m3/kg)	(Chemical Specific) j	(Chemical Specific) j
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	50 d	50 d
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday
c = Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.
d = Maintenance activity assumed to be once a week throughout the year (excluding vacation).
e= EPA Exposure Factors Handbook, August 1997.
f = Surface area of 1/2 head, forearms and the hands of an adult worker
g = AF calculated for soil adherence can be found in Appendix G
h = Chemical-specific absorption factors are found in Appendix G
i = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance: Technical Background Document, May 1996.
j = Industrial volatilization factor (VFind) adapted from FDEP Brownfields Table 4, Chapter 62-777, F.A C , December 1998

TABLE I7-3b

FU6 Surface Soil -Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFI	VFInd	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01		2 85E+01	4 10E-01	0 03	4 99E-07	7 5E-07	4 81E-08	1 8E-07	3 02E-10	4 6E-09
MG/KG	DDE	B2	3 40E-01	4 86E-01			1 20E+00	7 00E-01	0 1	2 10E-08	7 1E-09	6 74E-09	3 3E-09	1 27E-11	
MG/KG	DDT	B2	3 40E-01	4 86E-01	3 40E-01		1 80E+00	7 00E-01	0 1	3 15E-08	1 1E-08	1 01E-08	4 9E-09	1 91E-11	6 5E-12
MG/KG	DIELDRIN	B2	1 60E+01	3 20E+01	1 60E+01		7 30E-01	5 00E-01	0 1	1 28E-08	2 0E-07	4 10E-09	1 3E-07	7 73E-12	1 2E-10
MG/KG	PCB-1260 (AROCLOR 1260)	B2	2 00E+00	2 22E+00	2 00E+00		6 30E+00	9 00E-01	0 06	1 10E-07	2 2E-07	2 12E-08	4 7E-08	6 67E-11	1 3E-10
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01		4 54E+00	3 10E-01	0 1	7 93E-08	5 8E-08	2 55E-08	6 0E-08	4 81E-11	1.5E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00		4 39E+00	3 10E-01	0 13	7 67E-08	5 6E-07	3 20E-08	7 5E-07	4 65E-11	1 4E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01		6 16E+00	3 10E-01	0 1	1 08E-07	7 9E-08	3 46E-08	8 1E-08	6 52E-11	2 0E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02			1 03E+00	7 00E-01	0 1	1 79E-08	3 6E-10	5 77E-09	1 6E-10	1 09E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03		6 27E+00	3 10E-01	0 1	1 09E-07	8 0E-10	3 52E-08	8 3E-10	6 64E-11	2 1E-13
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01		5 32E+00	3 10E-01	0 1	9 30E-08	6 8E-08	2 99E-08	7 0E-08	5 64E-11	1 7E-11
	Total Risk										**2E-06**		**1E-06**		**5E-09**
													Total Risk =	**3E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I7-3c

FU6 Surface Soil -Hypothetical Current/Future Maintenance Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	ARSENIC	A	3 00E-04	1 23E-04			2 85E+01	4 10E-01	0 03	1 40E-06	0 005	1 35E-07	0 001	8 46E-10	
MG/KG	DDE	B2					1 20E+00	7 00E-01	0 1	5 87E-08		1 89E-08		3 56E-11	
MG/KG	DDT	B2	5 00E-04	3 50E-04			1 80E+00	7 00E-01	0 1	8 81E-08	0 0002	2 83E-08	0 00008	5.34E-11	
MG/KG	DIELDRIN	B2	5 00E-05	2 50E-05			7 30E-01	5 00E-01	0 1	3 57E-08	0 0007	1 15E-08	0 0005	2 16E-11	
MG/KG	PCB-1260 (AROCLOR 1260)	B2					6 30E+00	9.00E-01	0 06	3 08E-07		5 95E-08		1 87E-10	
MG/KG	BENZO(a)ANTHRACENE	B2					4 54E+00	3 10E-01	0 1	2 22E-07		7.14E-08		1 35E-10	
MG/KG	BENZO(a)PYRENE	B2					4 39E+00	3 10E-01	0 13	2 15E-07		8 97E-08		1 30E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2					6.16E+00	3 10E-01	0 1	3 01E-07		9 69E-08		1 83E-10	
MG/KG	CARBAZOLE	B2					1 03E+00	7 00E-01	0 1	5 02E-08		1 61E-08		3 04E-11	
MG/KG	CHRYSENE	B2					6 27E+00	3 10E-01	0 1	3 07E-07		9 86E-08		1 86E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2					5 32E+00	3 10E-01	0 1	2 60E-07		8 37E-08		1.58E-10	
	Hazard Index										**0.006**		**0.002**		
													Total HI=	**0.007**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient; HI = Hazard Inde

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TABLE I7-4a

FU6 (SS66A) Surface Soil - Hypothetical Future On-Site Residential (Adult) Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT	CDIadj = Cs * FI * EF * CF * IRadj / AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	N/A	100 a
IRadj =	Age-adjusted Ingestion Rate (mg - year)/(kg - day)	114 29 a,b	N/A
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	Cs * SA * AF * ABS * ET * EF * ED * CF / BW * AT	Cs * SAadj * AF * ABS * ET * EF * CF / AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	N/A	5049 d,e
SAadj =	Age-adjusted Surface Area (cm2 - year)/(kg)	2671 d,e,f	N/A
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 d,g	0 03 d,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	Chemical Specific) h
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Inhalation:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	Cs * (1/PEF) * IR_Inh * ET * EF * ED / BW * AT	CDI = Cs * (1/PEF) * IR_Inhadj * ET * EF / AT	
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 i	1 32E+09 i
IR_Inh =	Inhalation Rate (m3/day)	N/A	20 a
IR_Inhadj =	Age-adjusted Inhalation Rate (m3 - year)/(kg - day)	12 85714286 a,j	N/A
ET =	Exposure Time (4 hours per 24-hour day)	0 167 c	0 167 c
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	N/A	30 a
BW =	Body Weight (kg)	N/A	70 a
AT =	Averaging Time (days)	25550 a	10950 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70}$$

114.29 (mg-year)/(kg-day)

c = Time spent outdoors in the contaminated areas based on the nature of the activity

d= EPA Exposure Factors Handbook, August 1997

e = Surface area of 1/2 head, hands, forearms, lower legs & feet of an adult

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{2351 \times 6}{15} + \frac{5049 \times (30-6)}{70}$$

2671 (cm2-year)/(kg)

g = AF calculated for soil adherence can be found in Appendix G

h = Chemical-specific absorption factors are found in Appendix G

i = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance Technical Background Document, May 1996

j = Age-adjusted inhalation rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IR\text{-}Inh\ adj = \frac{IR\text{-}Inh\ c \times EDc}{BWc} + \frac{IR\text{-}Inh\ a \times (EDa - EDc)}{BWa} = \frac{15 \times 6}{15} + \frac{20 \times (30-6)}{70}$$

12.86 (m3-year)/(kg-day)

TABLE I7-4b

FU6 (SS66A) Surface Soil - Hypothetical Future On-site Residential (Adult) Carcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	CDIadj	ELCR	CDIadj	ELCR	CDIadj	ELCR
MG/KG	Benzo(a)anthracene	B2	7 30E-01	2 35E+00	3 10E-01		5 40E+00	3 10E-01	0.1	8 45E-06	6 2E-06	9 88E-08	2.3E-07	1.20E-10	3 7E-11
MG/KG	Benzo(a)pyrene	B2	7 30E+00	2 35E+01	3 10E+00		6 30E+00	3 10E-01	0 13	9 86E-06	7 2E-05	1 50E-07	3 5E-06	1 40E-10	4 3E-10
MG/KG	Benzo(b)fluoranthene	B2	7 30E-01	2 35E+00	3 10E-01		8 10E+00	3 10E-01	0 1	1 27E-05	9 3E-06	1.48E-07	3 5E-07	1 80E-10	5 6E-11
MG/KG	Carbazole	B2	2 00E-02	2 86E-02			1 50E+00	7 00E-01	0 1	2 35E-06	4 7E-08	2 74E-08	7.8E-10	3 34E-11	
MG/KG	Chrysene	B2	7 30E-03	2.35E-02	3 10E-03		9 20E+00	3 10E-01	0 1	1.44E-05	1 1E-07	1 68E-07	4.0E-09	2 05E-10	6 3E-13
MG/KG	Indeno(1,2,3-c,d)pyrene	B2	7 30E-01	2 35E+00	3 10E-01		6.20E+00	3 10E-01	0 1	9.71E-06	7 1E-06	1.13E-07	2.7E-07	1 38E-10	4 3E-11
	Total Risk										**9.5E-05**		**4.4E-06**		**5.7E-10**
													Total Risk =	**1E-04**	

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I7-4c

FU6 (SS66A) Surface Soil - Hypothetical Future On-site Residential (Adult) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**VFind**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	Benzo(a)anthracene	B2					5 40E+00	3 10E-01	0.1	7 40E-06		1.87E-07		1 87E-10	
MG/KG	Benzo(a)pyrene	B2					6 30E+00	3.10E-01	0 13	8 63E-06		2.83E-07		2 18E-10	
MG/KG	Benzo(b)fluoranthene	B2					8 10E+00	3 10E-01	0 1	1 11E-05		2.80E-07		2 80E-10	
MG/KG	Carbazole	B2					1 50E+00	7 00E-01	0 1	2 05E-06		5 19E-08		5 19E-11	
MG/KG	Chrysene	B2					9 20E+00	3 10E-01	0 1	1 26E-05		3.18E-07		3 18E-10	
MG/KG	Indeno(1,2,3-c,d)pyrene	B2					6 20E+00	3.10E-01	0 1	8 49E-06		2.14E-07		2 14E-10	
	Hazard Index														
												Total HI=			

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Index

TABLE I7-5a

FU6 (SS66A) Surface Soil - Hypothetical Future On-site Residential (Child) Scenario

Memphis Depot Main Installation RI

		Carcinogenic (optional)	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	200 a	200 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
CDI =	Cs * SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2351 c,d	2351 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 15 c,e	0 15 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0.167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m3/day)	15 a	15 a
ET =	Exposure Time (4 hours per 24-hour day)	0 167 b	0 167 b
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.

b = Time spent outdoors in the contaminated areas based on the nature of the activity

c= EPA Exposure Factors Handbook, August 1997.

d = Surface area of 1/2 head, hands, forearms, lower legs & feet of a child (age 1-6 years).

e = AF calculated for soil adherence can be found in Appendix G

f = Chemical-specific absorption factors are found in Appendix G.

g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance. Technical Background Document, May 1996.

TABLE I7-5b

FU6 (SS66A) Surface Soil - Hypothetical Future On-site Residential (Child) Carcinogenic Scenario - optional use

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	VFind	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	Benzo(a)anthracene	B2	7 30E-01	2 35E+00	3 10E-01		5 40E+00	3 10E-01	0 1	5 92E-06	4 32E-06	1 74E-07	4 10E-07	5 60E-11	1 74E-11
MG/KG	Benzo(a)pyrene	B2	7 30E+00	2 35E+01	3 10E+00		6 30E+00	3 10E-01	0 13	6 90E-06	5 04E-05	2 64E-07	6 21E-06	6 54E-11	2 03E-10
MG/KG	Benzo(b)fluoranthene	B2	7 30E-01	2 35E+00	3 10E-01		8 10E+00	3 10E-01	0 1	8 88E-06	6 48E-06	2 61E-07	6 14E-07	8 41E-11	2 61E-11
MG/KG	Carbazole	B2	2 00E-02	2 86E-02			1 50E+00	7 00E-01	0 1	1 64E-06	3 29E-08	4 83E-08	1 38E-09	1 56E-11	
MG/KG	Chrysene	B2	7 30E-03	2 35E-02	3 10E-03		9 20E+00	3 10E-01	0 1	1 01E-05	7 36E-08	2 96E-07	6 98E-09	9 55E-11	2 96E-13
MG/KG	Indeno(1,2,3-c,d)pyrene	B2	7 30E-01	2 35E+00	3 10E-01		6 20E+00	3 10E-01	0 1	6 79E-06	4 96E-06	2 00E-07	4 70E-07	6 43E-11	1 99E-11
	Total Risk										**6.6E-05**		**7.7E-06**		**2 7E-10**
												Total Risk =		**7E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I7-5c

FU6 (SS66A) Surface Soil - Hypothetical Future On-site Residential (Child) Noncarcinogenic Scenario

Memphis Depot Main Installation RI

										Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	VFind	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	Benzo(a)anthracene	B2					5 40E+00	3 10E-01	0 1	6.90E-05		2.03E-06		6.54E-10	
MG/KG	Benzo(a)pyrene	B2					6 30E+00	3 10E-01	0.13	8 05E-05		3.08E-06		7 63E-10	
MG/KG	Benzo(b)fluoranthene	B2					8.10E+00	3.10E-01	0 1	1 04E-04		3.04E-06		9.81E-10	
MG/KG	Carbazole	B2					1.50E+00	7 00E-01	0.1	1.92E-05		5 64E-07		1.82E-10	
MG/KG	Chrysene	B2					9 20E+00	3 10E-01	0 1	1 18E-04		3 46E-06		1.11E-09	
MG/KG	Indeno(1,2,3-c,d)pyrene	B2					6 20E+00	3 10E-01	0 1	7.93E-05		2 33E-06		7 51E-10	
	Hazard Index														
												Total HI=			

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration; HQ = Hazard Quotient, HI = Hazard Inde)

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TABLE I7-6a

Site #66 Surface Soil -Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Time spent outdoors in the contaminated areas using best professional judgment, based on the nature of the activity

c = EPA Exposure Factors Handbook, August 1997

d = Surface area of 1/2 head, forearms and the hands of an adult worker

e = AF calculated for soil adherence can be found in Appendix G

f = Chemical-specific absorption factors are found in Appendix G

g = Particulate emission factor (PEF), adapted from EPA, Soil Screening Guidance: Technical Backgrounc Document, May 1996

TABLE I7-6b

Site #66 Surface Soil -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	ABS	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	5 40E+00	3 10E-01	0 1	9 44E-07	6 9E-07	1 52E-07	3 6E-07	2 86E-10	8 9E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	6 30E+00	3 10E-01	0 13	1 10E-06	8 0E-06	2 30E-07	5 4E-06	3 34E-10	1 0E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	8 10E+00	3 10E-01	0 1	1 42E-06	1 0E-06	2 27E-07	5.4E-07	4 29E-10	1 3E-10
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02		1 50E+00	7 00E-01	0 1	2 62E-07	5 2E-09	4 21E-08	1 2E-09	7 94E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	9 20E+00	3 10E-01	0 1	1 61E-06	1 2E-08	2 58E-07	6 1E-09	4 87E-10	1 5E-12
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	6 20E+00	3 10E-01	0 1	1 08E-06	7 9E-07	1 74E-07	4 1E-07	3 28E-10	1 0E-10
	Total Risk									**1.1E-05**		**6.7E-06**		**1.4E-09**
												Total Risk =	**2E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I7-6c

Site #66 Surface Soil -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
MG/KG	BENZO(a)ANTHRACENE	B2				5 40E+00	3 10E-01	0 1	2 64E-06		4 25E-07		8 01E-10	
MG/KG	BENZO(a)PYRENE	B2				6 30E+00	3 10E-01	0.13	3 08E-06		6 44E-07		9 34E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2				8 10E+00	3 10E-01	0.1	3.96E-06		6 37E-07		1 20E-09	
MG/KG	CARBAZOLE	B2				1 50E+00	7 00E-01	0 1	7.34E-07		1 18E-07		2 22E-10	
MG/KG	CHRYSENE	B2				9 20E+00	3 10E-01	0 1	4 50E-06		7 23E-07		1 36E-09	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				6 20E+00	3 10E-01	0 1	3 03E-06		4 88E-07		9 19E-10	
	Hazard Index													
											Total HI=			

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I7-7a
Site #66 Soil Column -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a	50 a
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 c,d	2679 c,d
AF =	Soil-Skin Adherence Factor (mg/cm2)	0 03 c,e	0 03 c,e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	$\frac{Cs * (1/PEF) * IR * ET * EF * ED}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1.32E+09 g	1 32E+09 g
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas using best professional judgement, based on the nature of the activity
c = U S. EPA Exposure Factors Handbook, August 1997
d = Surface area of 1/2 head, forearms and the hands of an adult worker
e = AF calculated for soil adherence can be found in Appendix G
f = Chemical-specific absorption factors are found in Appendix G
g = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Backgrounc Document, May 1996.

TABLE I7-7b

Site #66 Soil Column -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	9 43E-01	3 10E-01	0 1	1 65E-07	1 2E-07	2 65E-08	6 2E-08	4 99E-11	1 5E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	1 06E+00	3 10E-01	0 13	1 85E-07	1 4E-06	3 87E-08	9 1E-07	5 61E-11	1.7E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	1 30E+00	3 10E-01	0 1	2 26E-07	1 7E-07	3 64E-08	8 6E-08	6 86E-11	2 1E-11
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02		4 25E-01	7 00E-01	0 1	7 43E-08	1 5E-09	1 19E-08	3 4E-10	2 25E-11	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	1 44E+00	3 10E-01	0 1	2 52E-07	1 8E-09	4 05E-08	9 5E-10	7 63E-11	2 4E-13
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	1 05E+00	3 10E-01	0 1	1 83E-07	1 3E-07	2 94E-08	6 9E-08	5 54E-11	1 7E-11
	Total Risk									**1.8E-06**		**1.1E-06**		**2.3E-10**
												Total Risk =	**2.9E-06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

TABLE I7-7c

Site #66 Soil Column -Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ	CDI	HQ
MG/KG	BENZO(a)ANTHRACENE	B2				9 43E-01	3 10E-01	0.1	4 61E-07		7 42E-08		1 40E-10	
MG/KG	BENZO(a)PYRENE	B2				1 06E+00	3 10E-01	0 13	5 18E-07		1 08E-07		1 57E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2				1 30E+00	3 10E-01	0 1	6 34E-07		1 02E-07		1 92E-10	
MG/KG	CARBAZOLE	B2				4 25E-01	7 00E-01	0 1	2 08E-07		3 34E-08		6 30E-11	
MG/KG	CHRYSENE	B2				1 44E+00	3.10E-01	0 1	7 05E-07		1 13E-07		2 14E-10	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				1 05E+00	3 10E-01	0.1	5 12E-07		8 23E-08		1 55E-10	
	Hazard Index													
												Total HI=		

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

488 603

TABLE I7-8a
Site #66 Soil Column -Hypothetical Current/Future Utility Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	Cs * IR * FI * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	100 c	100 c
FI =	Fraction Ingested (unitless)	0.5	0 5
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
CDI =	Cs *SA * AF * ABS * ET * EF * ED * CF / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
SA =	Surface Area (cm2)	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.1 e,g	0 1 e,g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Particulate Inhalation:			
CDI =	Cs * (1/PEF) * IR * ET * EF * ED / BW * AT		
Cs =	Concentration in soil (mg/kg)	EPC	EPC
PEF =	Particulate Emission Factor (m3/kg)	1 32E+09 i	1 32E+09 i
IR =	Inhalation Rate (m3/day)	20 a	20 a
ET =	Exposure Time (8 hours per 8 hour workday)	1 b	1 b
EF =	Exposure Frequency (day/year)	24 d	24 d
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = Time spent outdoors in the contaminated areas based on the nature of the activity, assuming full workday
c = Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.
d = Utility activity assumed to be twice a month throughout the year
e= U S EPA Exposure Factors Handbook, August 1997
f = Surface area of 1/2 head, forearms and the hands of an adult worker.
g = AF calculated for soil adherence can be found in Appendix G.
h = Chemical-specific absorption factors are found in Appendix G.
i = Particulate emission factor (PEF), adapted from U S.EPA, Soil Screening Guidance· Technical Background Document, May 1996

TABLE I7-8b

Site #66 Soil Column -Hypothetical Current/Future Utility Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR	CDI	ELCR
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	3 10E-01	9 43E-01	3 10E-01	0 1	1 58E-08	1 2E-08	8 48E-09	2 0E-08	4 79E-12	1 5E-12
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	3 10E+00	1 06E+00	3 10E-01	0 13	1 78E-08	1 3E-07	1 24E-08	2 9E-07	5 39E-12	1 7E-11
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	3 10E-01	1 30E+00	3 10E-01	0 1	2 17E-08	1 6E-08	1 16E-08	2 7E-08	6 59E-12	2 0E-12
MG/KG	CARBAZOLE	B2	2 00E-02	2 86E-02		4 25E-01	7 00E-01	0 1	7 13E-09	1 4E-10	3 82E-09	1 1E-10	2 16E-12	
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	3 10E-03	1 44E+00	3 10E-01	0 1	2 42E-08	1 8E-10	1 30E-08	3 1E-10	7 33E-12	2 3E-14
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	3 10E-01	1 05E+00	3 10E-01	0 1	1 76E-08	1 3E-08	9 41E-09	2 2E-08	5 32E-12	1 6E-12
	Total Risk									**1.7E-07**		**3 6E-07**		**2.2E-11**
												Total Risk =	**5E-07**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

488 605

TABLE I7-8c

Site #66 Soil Column -Hypothetical Current/Future Utility Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	ABS	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation CDI	Inhalation HQ
MG/KG	BENZO(a)ANTHRACENE	B2				9 43E-01	3 10E-01	0 1	4 43E-08		2 37E-08		1 34E-11	
MG/KG	BENZO(a)PYRENE	B2				1.06E+00	3 10E-01	0 13	4 98E-08		3 47E-08		1.51E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2				1 30E+00	3 10E-01	0 1	6 09E-08		3 26E-08		1.84E-11	
MG/KG	CARBAZOLE	B2				4 25E-01	7 00E-01	0 1	2 00E-08		1.07E-08		6 05E-12	
MG/KG	CHRYSENE	B2				1 44E+00	3 10E-01	0 1	6 77E-08		3 63E-08		2 05E-11	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2				1 05E+00	3.10E-01	0.1	4.92E-08		2 63E-08		1 49E-11	
	Hazard Index													
										Total HI=				

Notes: WOE = Weight of Evidence; CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

TABLE I7-9a

FU6 Sediment -Hypothetical Current/Future Maintenance Worker Scenarıc

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Csd * IR * FI * EF * ED * CF}{BW * AT}$		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a, b	50 a, b
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	12 d	12 d
ED =	Exposure Duration (year)	25 e	25 e
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 e	70 e
AT =	Averaging Time (days)	25550 e	9125 e
Dermal:			
CDI =	$\frac{Csd * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	2679 f,g	2679 f,g
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.1 g,h	0.1 g,h
ABS =	Absorption Factor (unitless)	(Chemical Specific) i	(Chemical Specific) i
ET =	Exposure Time (4 hours per 8 hour workday)	0 5 c	0.5 c
EF =	Exposure Frequency (day/year)	12 d	12 d
ED =	Exposure Duration (year)	25 e	25 e
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 e	70 e
AT =	Averaging Time (days)	25550 e	9125 e

Inhalation: No values available for inhalation pathway

References:

a = Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

b = A conservative ingestion rate based on industrial soil intake is assumed.

c = Half a workday is assumed to be spent outdoors in the contaminated areas based on the nature of the activity

d = Once a month maintenance activity throughout the year is assumed

e = U S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991

f = Surface area of hands, 1/2 arms and face (1/2 head) of an adult worker

g = U.S.EPA Exposure Factors Handbook, August 1997.

h = AF calculated for soil adherence can be found in Appendix G

i = Chemical-specific absorption factors are found in Appendix G

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TABLE I7-9b

FU6 Sediment -Hypothetical Current/Future Maintenance Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**EPC**	**ABSgi**	**ABS**	**CDI**	**ELCR**	**CDI**	**ELCR**
MG/KG	ANTIMONY	D			1 21E+03	2 00E-02	0 001	1 01E-05		2 72E-08	
MG/KG	BARIUM	D			3 65E+03	7 00E-02	0 001	3 06E-05		8 20E-08	
MG/KG	CADMIUM	B1			3 25E+01	1 00E-02	0 01	2 73E-07		7 30E-09	
MG/KG	CHROMIUM, TOTAL	A			2 57E+02	2 00E-02	0 001	2 16E-06		5 77E-09	
MG/KG	COPPER	D			1 42E+04	3 00E-01	0 001	1 19E-04		3 19E-07	
MG/KG	NICKEL	D			1 39E+02	2 70E-01	0 001	1 17E-06		3 12E-09	
MG/KG	SELENIUM	D			1 82E+02	4 40E-01	0 001	1 53E-06		4 09E-09	
MG/KG	SILVER	D			4 90E+01	1 80E-01	0 001	4 11E-07		1 10E-09	
MG/KG	THALLIUM	D			2 10E+01	1 50E-01	0 001	1 76E-07		4 72E-10	
MG/KG	ZINC	D			5 57E+03	2 00E-01	0 001	4 67E-05		1 25E-07	
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	2 35E+00	6 50E+00	3 10E-01	0 1	5 45E-08	3 98E-08	1 46E-08	3 44E-08
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	5 40E+00	3 10E-01	0 13	4 53E-08	3 31E-07	1 58E-08	3 71E-07
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	2 35E+00	8 70E+00	3 10E-01	0 1	7 30E-08	5 33E-08	1 95E-08	4 60E-08
MG/KG	CHRYSENE	B2	7 30E-03	2 35E-02	9 80E+00	3 10E-01	0 1	8 22E-08	6 00E-10	2 20E-08	5 19E-10
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2 35E+01	8 60E-01	3 10E-01	0 1	7 21E-09	5 27E-08	1 93E-09	4 55E-08
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7 30E-01	2 35E+00	2 20E+00	3 10E-01	0 1	1 85E-08	1 35E-08	4 94E-09	1 16E-08
MG/KG	4-METHYLPHENOL (p-CRESOL)	C			5 10E+00	6 50E-01	0 01	4 28E-08		1 15E-09	
MG/KG	PETROLEUM HYDROCARBONS				1 46E+03	5 00E-01	0 01	1 22E-05		3 28E-07	
	Total Risk								**5E-07**		**5E-07**
									Total Risk=	**1E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure										

TABLE I7-9c

FU6 Sediment -Hypothetical Current/Future Maintenance Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	RfDo	RfDd	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06	1.21E+03	2 00E-02	0 001	2 84E-05	0 07	7.61E-08	0.01
MG/KG	BARIUM	D	7 00E-02	4 90E-03	3 65E+03	7 00E-02	0 001	8 57E-05	0 001	2 30E-07	0 00005
MG/KG	CADMIUM	B1	1 00E-03	1 00E-05	3.25E+01	1.00E-02	0 01	7 63E-07	0 0008	2 04E-08	0 002
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 57E+02	2 00E-02	0 001	6.04E-06	0 002	1 62E-08	0 0003
MG/KG	COPPER	D	4 00E-02	1 20E-02	1.42E+04	3 00E-01	0 001	3 33E-04	0 008	8.93E-07	0.00007
MG/KG	NICKEL	D	2 00E-02	5 40E-03	1 39E+02	2 70E-01	0 001	3 26E-06	0 0002	8 74E-09	0 000002
MG/KG	SELENIUM	D	5 00E-03	2 20E-03	1 82E+02	4 40E-01	0 001	4 27E-06	0 0009	1 14E-08	0 000005
MG/KG	SILVER	D	5 00E-03	9 00E-04	4.90E+01	1 80E-01	0 001	1 15E-06	0 0002	3 08E-09	0 000003
MG/KG	THALLIUM	D	7 00E-05	1 05E-05	2 10E+01	1 50E-01	0 001	4 93E-07	0 007	1 32E-09	0 0001
MG/KG	ZINC	D	3 00E-01	6 00E-02	5 57E+03	2 00E-01	0 001	1 31E-04	0 0004	3 50E-07	0.000006
MG/KG	BENZO(a)ANTHRACENE	B2			6 50E+00	3 10E-01	0 1	1.53E-07		4 09E-08	
MG/KG	BENZO(a)PYRENE	B2			5 40E+00	3 10E-01	0 13	1 27E-07		4 42E-08	
MG/KG	BENZO(b)FLUORANTHENE	B2			8 70E+00	3 10E-01	0.1	2 04E-07		5 47E-08	
MG/KG	CHRYSENE	B2			9 80E+00	3 10E-01	0 1	2.30E-07		6.17E-08	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2			8 60E-01	3.10E-01	0 1	2 02E-08		5.41E-09	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2			2 20E+00	3 10E-01	0 1	5 17E-08		1.38E-08	
MG/KG	4-METHYLPHENOL (p-CRESOL)	C	5 00E-03	3 25E-03	5.10E+00	6 50E-01	0 01	1 20E-07	0 00002	3 21E-09	0 000001
MG/KG	PETROLEUM HYDROCARBONS	0	4 00E-02	2 00E-02	1.46E+03	5 00E-01	0 01	3 43E-05	0 0009	9.19E-07	0 00005
	Hazard Index								**0.09**		**0.01**
									Total HI=	**0.1**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

488 608

TABLE I7-10a
FU6 Sump Sediment -Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
CDI =	$\frac{Csd * IR * FI * EF * ED * CF}{BW * AT}$		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
IR =	Ingestion Rate (mg/day)	50 a, b	50 a, b
FI =	Fraction Ingested (unitless)	1	1
EF =	Exposure Frequency (day/year)	50 c	50 c
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d
Dermal:			
CDI =	$\frac{Csd * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$		
Csd =	Concentration in sediment (mg/kg)	EPC	EPC
SA =	Surface Area (cm2) - wading	2679 e,f	2679 e,f
AF =	Soil-Skin Adherence Factor (mg/cm2)	0.1 g,f	0 1 g,f
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (1 hour per 8 hour workday)	0.125 i	0 125 i
EF =	Exposure Frequency (day/year)	50 c	50 c
ED =	Exposure Duration (year)	25 d	25 d
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 d	70 d
AT =	Averaging Time (days)	25550 d	9125 d

Inhalation: No values available for inhalation pathway

References:

a = Supplemental Guidance to RAGS. Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995
b = A conservative ingestion rate based on industrial soil intake is assumed
c = Exposure is assumed to be once a week (excluding vacation)
d = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.
e = Surface area of hands, 1/2 arms and face (1/2 head) of an adult worker
f = U S EPA Exposure Factors Handbook, August 1997
g = AF calculated for soil adherence can be found in Appendix G
h = Chemical-specific absorption factors are found in Appendix G
i = One hour of a workday is assumed to be spent outdoors in the contaminated areas based on the nature of the activity

TABLE I7-10b

FU6 Sump Sediment -Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	SFo	SFd	EPC	ABSgi	ABS	CDI	ELCR	CDI	ELCR
MG/KG	ANTIMONY	D			1 21E+03	2 00E-02	0 001	4 23E-05		2 83E-08	
MG/KG	BARIUM	D			3 65E+03	7 00E-02	0 001	1 28E-04		8 54E-08	
MG/KG	CADMIUM	B1			3 25E+01	1 00E-02	0 01	1 14E-06		7.61E-09	
MG/KG	CHROMIUM, TOTAL	A			2 57E+02	2 00E-02	0 001	8 98E-06		6 02E-09	
MG/KG	COPPER	D			1 42E+04	3 00E-01	0 001	4 96E-04		3 32E-07	
MG/KG	NICKEL	D			1 39E+02	2 70E-01	0 001	4 86E-06		3 25E-09	
MG/KG	SELENIUM	D			1.82E+02	4 40E-01	0 001	6 36E-06		4 26E-09	
MG/KG	SILVER	D			4 90E+01	1.80E-01	0 001	1 71E-06		1.15E-09	
MG/KG	THALLIUM	D			2 10E+01	1.50E-01	0 001	7 34E-07		4 91E-10	
MG/KG	ZINC	D			5 57E+03	2 00E-01	0 001	1 95E-04		1 30E-07	
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	2 35E+00	6 50E+00	3 10E-01	0 1	2 27E-07	1 66E-07	1 52E-08	3 58E-08
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	2 35E+01	5 40E+00	3 10E-01	0.13	1 89E-07	1 38E-06	1 64E-08	3 87E-07
MG/KG	BENZO(b)FLUORANTHENE	B2	7.30E-01	2 35E+00	8 70E+00	3 10E-01	0 1	3 04E-07	2 22E-07	2 04E-08	4 79E-08
MG/KG	CHRYSENE	B2	7.30E-03	2.35E-02	9 80E+00	3 10E-01	0 1	3 42E-07	2 50E-09	2 29E-08	5 40E-10
MG/KG	DIBENZ(a,h)ANTHRACENE	B2	7 30E+00	2.35E+01	8 60E-01	3 10E-01	0 1	3 01E-08	2.19E-07	2 01E-09	4 74E-08
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2	7.30E-01	2.35E+00	2 20E+00	3 10E-01	0 1	7 69E-08	5 61E-08	5 15E-09	1.21E-08
MG/KG	4-METHYLPHENOL (p-CRESOL)	C			5 10E+00	6 50E-01	0 01	1 78E-07		1 19E-09	
MG/KG	PETROLEUM HYDROCARBONS				1 46E+03	5 00E-01	0 01	5 10E-05		3.42E-07	
	Total Risk								**2 0E-06**		**5.3E-07**
									Total Risk=	**3E-06**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure

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TABLE I7-10c
FU6 Sump Sediment -Hypothetical Future Industrial Worker Noncarcinogenic Scenario
Memphis Depot Main Installation RI

								Ingestion		Dermal	
Units	Chemical	WOE	RfDo	RfDd	EPC	ABSgi	ABS	CDI	HQ	CDI	HQ
MG/KG	ANTIMONY	D	4 00E-04	8 00E-06	1 21E+03	2 00E-02	0 001	1 18E-04	0 3	7 93E-08	0 01
MG/KG	BARIUM	D	7 00E-02	4 90E-03	3 65E+03	7 00E-02	0.001	3 57E-04	0 005	2.39E-07	0.00005
MG/KG	CADMIUM	B1	1.00E-03	1 00E-05	3 25E+01	1 00E-02	0 01	3 18E-06	0 003	2 13E-08	0 002
MG/KG	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2.57E+02	2 00E-02	0 001	2 51E-05	0 008	1 68E-08	0 0003
MG/KG	COPPER	D	4 00E-02	1 20E-02	1 42E+04	3 00E-01	0 001	1 39E-03	0 03	9.31E-07	0.00008
MG/KG	NICKEL	D	2 00E-02	5 40E-03	1 39E+02	2.70E-01	0 001	1 36E-05	0 0007	9 11E-09	0 000002
MG/KG	SELENIUM	D	5 00E-03	2 20E-03	1 82E+02	4 40E-01	0 001	1 78E-05	0.004	1.19E-08	0.000005
MG/KG	SILVER	D	5 00E-03	9 00E-04	4 90E+01	1.80E-01	0 001	4 79E-06	0 001	3 21E-09	0.000004
MG/KG	THALLIUM	D	7 00E-05	1 05E-05	2 10E+01	1.50E-01	0 001	2.05E-06	0 03	1.38E-09	0 0001
MG/KG	ZINC	D	3 00E-01	6 00E-02	5 57E+03	2 00E-01	0 001	5 45E-04	0.002	3 65E-07	0.000006
MG/KG	BENZO(a)ANTHRACENE	B2			6 50E+00	3.10E-01	0 1	6 36E-07		4 26E-08	
MG/KG	BENZO(a)PYRENE	B2			5 40E+00	3 10E-01	0 13	5 28E-07		4 60E-08	
MG/KG	BENZO(b)FLUORANTHENE	B2			8 70E+00	3.10E-01	0 1	8 51E-07		5 70E-08	
MG/KG	CHRYSENE	B2			9.80E+00	3 10E-01	0 1	9 59E-07		6 42E-08	
MG/KG	DIBENZ(a,h)ANTHRACENE	B2			8 60E-01	3 10E-01	0 1	8 41E-08		5.64E-09	
MG/KG	INDENO(1,2,3-c,d)PYRENE	B2			2 20E+00	3.10E-01	0 1	2 15E-07		1.44E-08	
MG/KG	4-METHYLPHENOL (p-CRESOL)	C	5 00E-03	3 25E-03	5 10E+00	6 50E-01	0 01	4 99E-07	0 0001	3 34E-09	0 000001
MG/KG	PETROLEUM HYDROCARBONS		4 00E-02	2 00E-02	1 46E+03	5 00E-01	0 01	1 43E-04	0 004	9.57E-07	0.00005
	Hazard Index								**0.4**		**0.01**
								Total HI =		**0.4**	

Notes· WOE = Weight of Evidence, CDI = Chronic Daily Intake; EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index

Appendix I-8
A. FU7 Groundwater

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TABLE I8-1a
FU7 Groundwater (Potable Use) - Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} *SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Inhalation:
CDI = **Ingestion CDI from above** [g]

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Default factors adapted from EPA Exposure Factors Handbook, August 1997
c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
g = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

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TABLE I8-1b

FU7 Groundwater (Potable Use) - Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					9 53E+00	1 00E-01	1 60E-04	3 33E-02		9 99E-08		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	2 34E-03	4 10E-01	1 60E-04	8 16E-06	1 2E-05	2 45E-11	9 0E-11	
MG/L	BERYLLIUM	B1			8 40E+00	2 57E-04	1 00E-02	1 60E-04	8 96E-07		2 69E-12		
MG/L	CADMIUM	B1			6 30E+00	8 13E-03	1 00E-02	1 00E-03	2 84E-05		5 33E-10		
MG/L	CHROMIUM, TOTAL	A			4 20E+01	2 94E-02	2 00E-02	1 00E-03	1 03E-04		1 93E-09		
MG/L	MANGANESE	D				9 97E-01	4 00E-02	1 60E-04	3 48E-03		1 04E-08		
MG/L	NICKEL	D				2 23E-02	2 70E-01	1 00E-04	7 80E-05		1 46E-10		
MG/L	VANADIUM					1 92E-02	1 00E-02	1 60E-04	6 70E-05		2 01E-10		
	Total Risk									**1 2E-05**		**9 0E-11**	
											Total Risk =	**1E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake invalid for inorganics in water

TABLE I8-1c

FU7 Groundwater (Potable Use) - Hypothetical Future Industrial Worker Noncarcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation* HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01	1 00E+00	9 53E+00	1 00E-01	1 60E-04	9 32E-02	0 09	2 80E-07	0 000003	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		2 34E-03	4 10E-01	1 60E-04	2 29E-05	0 08	6 86E-11	0 0000006	
MG/L	BERYLLIUM	B1	2 00E-03	2 00E-05	5 70E-06	2 57E-04	1 00E-02	1 60E-04	2 51E-06	0 001	7 53E-12	0 0000004	
MG/L	CADMIUM	B1	1 00E-03	1 00E-05		8 13E-03	1 00E-02	1 00E-03	7 95E-05	0 08	1 49E-09	0 0001	
MG/L	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05	2 94E-02	2 00E-02	1 00E-03	2 87E-04	0 1	5 39E-09	0 00009	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	9 97E-01	4 00E-02	1 60E-04	9 75E-03	0 07	2 93E-08	0 000005	
MG/L	NICKEL	D	2 00E-02	5 40E-03		2 23E-02	2 70E-01	1 00E-04	2 18E-04	0 01	4 09E-10	0 00000008	
MG/L	VANADIUM		7 00E-03	7 00E-05		1 92E-02	1 00E-02	1 60E-04	1 88E-04	0 03	5 63E-10	0 000008	
	Hazard Index									**0.5**		**0 0003**	
											Total Hazard Index =	**0.5**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake invalid for inorganics in water

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TABLE I8-2a

FU7 Groundwater (Potable Use) - Hypothetical Future Residential Adult Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic

Ingestion:

Intake for r CDI = $\frac{C_{gw} * IR * EF * ED}{BW * AT}$

Age-specific intake (for carcinogenic compounds only):

$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$

		Carcinogenic	Noncarcinogenic
	Concentration in groundwater (mg/L)	EPC	EPC
C_{gw} =	Ingestion Rate (L/day)	N/A	2 a
IR =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
IR_{adj} =	Exposure Frequency (day/year)	350 a	350 a
EF =	Exposure Duration (year)	30 a	30 a
ED =	Body Weight (kg)	70 a	70 a
BW =	Averaging Time (days)	25550 a	10950 a
AT =			

Dermal:

Intake for r CDI = $\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$

Age-specific intake (for carcinogenic compounds only)

$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$

		Carcinogenic	Noncarcinogenic
	Concentration in groundwater (mg/L)	EPC	EPC
C_{gw} =	Surface Area (cm^2)	N/A	20000 b,c
SA =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
SA_{adj} =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
PC =	Exposure Time (hr/day)	0.007 b,e	0 007 b,e
ET =	Exposure Frequency (day/year)	350 a	350 a
EF =	Exposure Duration (year)	30 a	30 a
ED =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
CF =	Body Weight (kg)	70 a	70 a
BW =	Averaging Time (days)	25550 a	10950 a
AT =			

Inhalation Ingestion CDI from above[f]

CDI =

References:

a = U S E OSWER Directive 9285 6-03, March 25, 1991

b = Age-ac IRadj = $\frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-ad SAadj = $\frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$

9480 (cm^2-year)/(kg)

d = Derma from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-2b

FU7 Groundwater (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation* ELCR
MG/L	ALUMINUM					9 53E+00	1 00E-01	1 60E-04	1 42E-01		1 39E-06		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	2 34E-03	4 10E-01	1 60E-04	3 47E-05	5 2E-05	3 40E-10	1 2E-09	
MG/L	BERYLLIUM	B1			8 40E+00	2 57E-04	1 00E-02	1 60E-04	3 82E-06		3 73E-11		
MG/L	CADMIUM	B1			6 30E+00	8 13E-03	1 00E-02	1 00E-03	1 21E-04		7 39E-09		
MG/L	CHROMIUM, TOTAL	A			4 20E+01	2 94E-02	2 00E-02	1 00E-03	4 37E-04		2 67E-08		
MG/L	MANGANESE	D				9 97E-01	4 00E-02	1 60E-04	1 48E-02		1 45E-07		
MG/L	NICKEL	D				2 23E-02	2 70E-01	1 00E-04	3 32E-04		2 03E-09		
MG/L	VANADIUM					1 92E-02	1 00E-02	1 60E-04	2 85E-04		2 79E-09		
	Total Risk									**5 2E-05**		**1.2E-09**	
											Total Risk =	**5E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake invalid for inorganics in water

488 618

TABLE I8-2c

FU7 Groundwater (Potable Use) - Hypothetical Future Residential Adult Noncarcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01	1 00E+00	9 53E+00	1 00E-01	1 60E-04	2 61E-01	0 3	2 92E-06	0 00003	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		2 34E-03	4 10E-01	1 60E-04	6 40E-05	0 2	7 17E-10	0 000006	
MG/L	BERYLLIUM	B1	2 00E-03	2 00E-05	5 70E-06	2 57E-04	1 00E-02	1 60E-04	7 03E-06	0 004	7 87E-11	0 000004	
MG/L	CADMIUM	B1	1 00E-03	1 00E-05		8 13E-03	1 00E-02	1 00E-03	2 23E-04	0 2	1 56E-08	0 002	
MG/L	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05	2 94E-02	2 00E-02	1 00E-03	8 05E-04	0 3	5 63E-08	0 0009	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	9 97E-01	4 00E-02	1 60E-04	2 73E-02	0 2	3 06E-07	0 00005	
MG/L	NICKEL	D	2 00E-02	5 40E-03		2 23E-02	2 70E-01	1 00E-04	6 11E-04	0 03	4 28E-09	0 0000008	
MG/L	VANADIUM		7 00E-03	7 00E-05		1 92E-02	1 00E-02	1 60E-04	5 25E-04	0 08	5 89E-09	0 00008	
	Hazard Index									1		0 003	
											Total HI =	1	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake invalid for inorganics in water

TABLE I8-3a

FU7 Groundwater (Potable Use) - Hypothetical Future Residential Child Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds.			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = US EPA Exposure Factors Handbook, August 1997 Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment· Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

488 621

TABLE I8-3b

FU 7 Groundwater (Potable Use) - Future Residential Child Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	ALUMINUM					9 53E+00	1 00E-01	1 60E-04	5 22E-02		3 83E-07		
MG/L	ARSENIC	A	1 50E+00	3 66E+00	1 51E+01	2 34E-03	4 10E-01	1 60E-04	1 28E-05	1 9E-05	9 40E-11	3 4E-10	
MG/L	BERYLLIUM	B1			8 40E+00	2 57E-04	1 00E-02	1 60E-04	1 41E-06		1 03E-11		
MG/L	CADMIUM	B1			6 30E+00	8 13E-03	1 00E-02	1 00E-03	4 45E-05		2 04E-09		
MG/L	CHROMIUM, TOTAL	A			4 20E+01	2 94E-02	2 00E-02	1 00E-03	1 61E-04		7 39E-09		
MG/L	MANGANESE	D				9 97E-01	4 00E-02	1 60E-04	5 46E-03		4 01E-08		
MG/L	NICKEL	D				2 23E-02	2 70E-01	1 00E-04	1 22E-04		5 61E-10		
MG/L	VANADIUM					1 92E-02	1 00E-02	1 60E-04	1 05E-04		7 72E-10		
	Total Risk									**1.9E-05**		**3.4E-10**	
											Total Risk =	**2E-05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake invalid for inorganics in water

488 622

TABLE I8-3c

FU7 Groundwater (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation* HQ
MG/L	ALUMINUM		1 00E+00	1 00E-01	1 00E+00	9 53E+00	1 00E-01	1 60E-04	6 09E-01	0 6	4 47E-06	0 00004	
MG/L	ARSENIC	A	3 00E-04	1 23E-04		2 34E-03	4 10E-01	1 60E-04	1 49E-04	0 5	1 10E-09	0 000009	
MG/L	BERYLLIUM	B1	2 00E-03	2 00E-05	5 70E-06	2 57E-04	1 00E-02	1 60E-04	1 64E-05	0 008	1 20E-10	0 000006	
MG/L	CADMIUM	B1	1 00E-03	1 00E-05		8 13E-03	1 00E-02	1 00E-03	5 20E-04	0 5	2 39E-08	0 002	
MG/L	CHROMIUM, TOTAL	A	3 00E-03	6 00E-05	2 86E-05	2 94E-02	2 00E-02	1 00E-03	1 88E-03	0 6	8 62E-08	0 001	
MG/L	MANGANESE	D	1 40E-01	5 60E-03	1 43E-05	9 97E-01	4 00E-02	1 60E-04	6 37E-02	0 5	4 68E-07	0 00008	
MG/L	NICKEL	D	2 00E-02	5 40E-03		2 23E-02	2 70E-01	1 00E-04	1 43E-03	0 07	6 55E-09	0 000001	
MG/L	VANADIUM		7 00E-03	7 00E-05		1 92E-02	1 00E-02	1 60E-04	1 23E-03	0 2	9 00E-09	0 0001	
	Hazard Index									**3**		**0 004**	
											Total HI =	**3**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake invalid for inorganics in water

488 623

TABLE I8-4a
FU7 Plume A Groundwater (Potable Use) - Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Inhalation:

CDI = **Ingestion CDI from above** [g]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Default factors adapted from EPA Exposure Factors Handbook, August 1997

c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

g = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-4b

FU7 Plume A Groundwater (Potable Use) - Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	CHLOROBENZENE	D				4 00E-03	3 10E-01	4 10E-02	1 40E-05		1 07E-08		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	3 94E-02	1 00E+00	4 80E-02	1 38E-04	7 2E-06	1 24E-07	6 4E-09	2 8E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	7 90E-03	1 50E-01	1 60E-02	2 76E-05	3 0E-07	8 29E-09	6 1E-10	1 7E-07
	Total Risk									**7.5E-06**		**7.1E-09**	**4.4E-07**
Notes											**Total Risk =**	**8E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

488 624

TABLE I8-4c

FU7 Plume A Groundwater (Potable Use) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**	**HQ**
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	4 00E-03	3 10E-01	4 10E-02	3 91E-05	0 002	3 01E-08	0 000005	0 007
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	3 94E-02	1 00E+00	4 80E-02	3 86E-04	0 04	3 47E-07	0 00003	0 002
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		7 90E-03	1 50E-01	1 60E-02	7 73E-05	0 01	2 32E-08	0 00003	
	Hazard Index									**0 05**		**0.00007**	**0 009**
											Total HI =	**0.06**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

TABLE I8-5a
FU7 Plume A Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1.00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:			
CDI =	**Ingestion CDI from above** [g]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Default factors adapted from EPA Exposure Factors Handbook, August 1997

c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

g = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

488 627

TABLE I8-5b

FU7 Plume A Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	CHLOROBENZENE	D				4 00E-03	3 10E-01	4 10E-02	1 40E-05		1 07E-08		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1 20E-01	1 00E+00	4 80E-02	4 19E-04	2 2E-05	3 77E-07	2 0E-08	8 4E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	3 10E-02	1 50E-01	1 60E-02	1 08E-04	1 2E-06	3 25E-08	2 4E-09	6 5E-07
	Total Risk									**2.3E-05**		**2.2E-08**	**1.5E-06**
Notes											**Total Risk =**	**2E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE 18-5c

FU7 Plume A Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation* HQ
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	4 00E-03	3 10E-01	4 10E-02	3 91E-05	0 002	3 01E-08	0 000005	0 007
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 20E-01	1 00E+00	4 80E-02	1 17E-03	0 1	1 06E-06	0 0001	0 007
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 10E-02	1 50E-01	1 60E-02	3 03E-04	0 05	9 10E-08	0 0001	
	Hazard Index									**0.2**		**0.0002**	**0.01**
											Total HI =	**0.2**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

488 628

488 629

TABLE I8-6a

FU7 Plume A Groundwater (Potable Use) - Hypothetical Future Residential Adult Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only).	
CDI =	$\frac{C_{gw} *SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} *SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-6b

FU7 Plume A Groundwater (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	CHLOROBENZENE	D				4 00E-03	3 10E-01	4 10E-02	5 95E-05		1 49E-07		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	3 94E-02	1 00E+00	4 80E-02	5 86E-04	3 0E-05	1 72E-06	8 9E-08	1 2E-06
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	7 90E-03	1 50E-01	1 60E-02	1 18E-04	1 3E-06	1 15E-07	8 4E-09	7 1E-07
	Total Risk									**3 2E-05**		**9.8E-08**	**1.9E-06**
Notes											**Total Risk =**	**3E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-6c

FU7 Plume A Groundwater (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**	**HQ**
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	4 00E-03	3 10E-01	4 10E-02	1 10E-04	0 005	3 15E-07	0 00005	0 02
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	3 94E-02	1 00E+00	4 80E-02	1.08E-03	0 1	3 63E-06	0 0004	0 006
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		7 90E-03	1 50E-01	1 60E-02	2 17E-04	0 04	2 43E-07	0 0003	
	Hazard Index									**0 1**		**0.0007**	**0.03**
											Total HI =	**0 2**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-7a
FU7 Plume A Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} *SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} *SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above**[f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-7b
FU7 Plume A Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario
Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	CHLOROBENZENE	D				4 00E-03	3 10E-01	4 10E-02	5 95E-05		1 49E-07		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1 20E-01	1 00E+00	4 80E-02	1 78E-03	9 3E-05	5 24E-06	2 7E-07	3 6E-06
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	3 10E-02	1 50E-01	1 60E-02	4 61E-04	5 1E-06	4 51E-07	3 3E-08	2 8E-06
	Total Risk									**9 8E-05**		**3.1E-07**	**6.3E-06**
Notes											**Total Risk =**	**1E-04**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-7c

FU7 Plume A Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**	**HQ**
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	4 00E-03	3 10E-01	4 10E-02	1 10E-04	0 005	3 15E-07	0 00005	0 02
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 20E-01	1 00E+00	4 80E-02	3 29E-03	0 3	1 10E-05	0 001	0 02
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 10E-02	1 50E-01	1 60E-02	8 49E-04	0 1	9 51E-07	0 001	
	Hazard Index									**0.5**		**0 002**	**0.04**
											Total HI =	**0.5**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

488 634

488 635

TABLE I8-8a
FU7 Plume A Groundwater (Potable Use) - Hypothetical Future Residential Child Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds.			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Inhalation:
CDI = **Ingestion CDI from above** [f]

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997
Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment: Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-8b

FU7 Plume A Groundwater (Potable Use) - Future Residential Child Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation* ELCR
MG/L	CHLOROBENZENE	D				4 00E-03	3 10E-01	4 10E-02	2 19E-05		4 12E-08		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	3 94E-02	1 00E+00	4 80E-02	2 16E-04	1 1E-05	4 76E-07	2 5E-08	4 3E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	7 90E-03	1 50E-01	1 60E-02	4 33E-05	4 8E-07	3 18E-08	2 3E-09	2 6E-07
	Total Risk									**1.2E-05**		**2.7E-08**	**6 9E-07**
Notes											**Total Risk =**	**1E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

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TABLE I8-8c

FU7 Plume A Groundwater (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDI	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	4 00E-03	3 10E-01	4 10E-02	2 56E-04	0 01	4 81E-07	0 00008	0 04
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	3 94E-02	1 00E+00	4 80E-02	2 52E-03	0 3	5 55E-06	0 0006	0 01
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		7 90E-03	1 50E-01	1 60E-02	5 05E-04	0 08	3 71E-07	0 0004	
	Hazard Index									**0.3**		**0.001**	**0.06**
											Total HI =	**0.4**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-9a

FU7 Plume A Max Groundwater (Potable Use) - Hypothetical Future Residential Child Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = US EPA Exposure Factors Handbook, August 1997 Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS, Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-9b

FU7 Plume A Max Groundwater (Potable Use) - Future Residential Child Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	CHLOROBENZENE	D				4 00E-03	3 10E-01	4 10E-02	2 19E-05		4 12E-08		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1 20E-01	1 00E+00	4 80E-02	6 58E-04	3 4E-05	1 45E-06	7 5E-08	1 3E-06
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	3 10E-02	1 50E-01	1 60E-02	1 70E-04	1 9E-06	1 25E-07	9 1E-09	1 0E-06
	Total Risk									**3.6E-05**		**8 4E-08**	**2.3E-06**
Notes											**Total Risk =**	**4E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-9c

FU7 Plume A Max Groundwater (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	4 00E-03	3 10E-01	4 10E-02	2 56E-04	0 01	4 81E-07	0 00008	0 04
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 20E-01	1 00E+00	4 80E-02	7 67E-03	0 8	1 69E-05	0 002	0 04
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 10E-02	1 50E-01	1 60E-02	1 98E-03	0 3	1 46E-06	0 002	
	Hazard Index									**1**		**0 003**	**0.09**
											Total HI =	**1**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

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TABLE I8-10a
FU7 Plume B Groundwater (Potable Use) - Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:			
CDI =	**Ingestion CDI from above** [g]		

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Default factors adapted from EPA Exposure Factors Handbook, August 1997
c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
g = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-10b

FU7 Plume B Groundwater (Potable Use) - Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	4 00E-03	7 00E-01	9 00E-03	1 40E-05	2 8E-06	2 36E-09	6 7E-10	2 8E-06
MG/L	CHLOROBENZENE	D				1 00E-03	3 10E-01	4 10E-02	3 49E-06		2 69E-09		
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	1 00E-03	8 00E-01	4 20E-03	3 49E-06	4 5E-08	2 75E-10	4 5E-12	2 1E-08
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	9 41E-03	1 00E+00	4 80E-02	3 29E-05	1 7E-06	2 96E-08	1 5E-09	6 6E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	9 30E-03	1 50E-01	1 60E-02	3 25E-05	3 6E-07	9 75E-09	7 2E-10	1 9E-07
	Total Risk									**4.9E-06**		**2.9E-09**	**3.1E-06**
Notes											**Total Risk =**	**8E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

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TABLE I8-10c

FU7 Plume B Groundwater (Potable Use) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenari

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDi**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**	**HQ**
MG/L	1,1,2,2-TETRACHLOROETHANE	C				4 00E-03	7 00E-01	9 00E-03	3 91E-05		6 61E-09		
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	1 00E-03	3 10E-01	4 10E-02	9.78E-06	0 0005	7 52E-09	0 000001	0 002
MG/L	CHLOROMETHANE	C				1 00E-03	8 00E-01	4 20E-03	9 78E-06		7 71E-10		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	9 41E-03	1 00E+00	4 80E-02	9 20E-05	0 009	8 29E-08	0 000008	0 0005
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		9 30E-03	1 50E-01	1 60E-02	9 10E-05	0 02	2 73E-08	0 00003	
	Hazard Index									**0 02**		**0.00004**	**0 002**
											Total HI =	**0.03**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

TABLE I8-11a

FU7 Plume B Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds.			
CDI =	$\frac{C_{gw} *SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:			
CDI =	**Ingestion CDI from above** [g]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Default factors adapted from EPA Exposure Factors Handbook, August 1997

c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event.

g = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

488 645

TABLE I8-11b

FU7 Plume B Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	4 00E-03	7 00E-01	9 00E-03	1 40E-05	2 8E-06	2 36E-09	6 7E-10	2 8E-06
MG/L	CHLOROBENZENE	D				1 00E-03	3 10E-01	4 10E-02	3 49E-06		2 69E-09		
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	1 00E-03	8 00E-01	4 20E-03	3 49E-06	4 5E-08	2 75E-10	4 5E-12	2 1E-08
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1 60E-02	1 00E+00	4 80E-02	5 59E-05	2 9E-06	5 03E-08	2 6E-09	1 1E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	5 80E-02	1 50E-01	1 60E-02	2 03E-04	2 2E-06	6 08E-08	4 5E-09	1 2E-06
	Total Risk									**8.0E-06**		**7.8E-09**	**4.2E-06**
Notes											**Total Risk =**	**1E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-11c

FU7 Plume B Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				4 00E-03	7 00E-01	9 00E-03	3 91E-05		6 61E-09		
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	1 00E-03	3 10E-01	4 10E-02	9 78E-06	0 0005	7 52E-09	0 000001	0 002
MG/L	CHLOROMETHANE	C				1 00E-03	8 00E-01	4 20E-03	9 78E-06		7 71E-10		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 60E-02	1 00E+00	4 80E-02	1 57E-04	0 02	1 41E-07	0 00001	0 0009
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		5 80E-02	1 50E-01	1 60E-02	5 68E-04	0 09	1 70E-07	0 0002	
	Hazard Index									**0.1**		**0.0002**	**0.003**
											Total HI =	**0.1**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake												

488 647

TABLE I8-12a
FU7 Plume B Groundwater (Potable Use) - Hypothetical Future Residential Adult Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:
CDI = **Ingestion CDI from above**[f]

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event

f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-12b

FU7 Plume B Groundwater (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	4 00E-03	7 00E-01	9 00E-03	5 95E-05	1 2E-05	3 27E-08	9 4E-09	1 2E-05
MG/L	CHLOROBENZENE	D				1 00E-03	3 10E-01	4 10E-02	1 49E-05		3 73E-08		
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	1 00E-03	8 00E-01	4 20E-03	1 49E-05	1 9E-07	3 82E-09	6 2E-11	8 9E-08
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	9 41E-03	1 00E+00	4 80E-02	1 40E-04	7 3E-06	4 10E-07	2 1E-08	2 8E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	9 30E-03	1 50E-01	1 60E-02	1 38E-04	1 5E-06	1 35E-07	9 9E-09	8 3E-07
	Total Risk									**2.1E-05**		**4.1E-08**	**1.3E-05**
Notes											**Total Risk =**	**3E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

488 648

TABLE I8-12c

FU7 Plume B Groundwater (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				4 00E-03	7 00E-01	9 00E-03	1 10E-04		6 90E-08		
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	1 00E-03	3 10E-01	4 10E-02	2 74E-05	0 001	7 86E-08	0 00001	0 005
MG/L	CHLOROMETHANE	C				1 00E-03	8 00E-01	4 20E-03	2 74E-05		8 05E-09		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	9 41E-03	1 00E+00	4 80E-02	2 58E-04	0 03	8 66E-07	0 00009	0 002
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		9 30E-03	1 50E-01	1 60E-02	2 55E-04	0 04	2 85E-07	0 0003	
	Hazard Index									**0.07**		**0.0004**	**0.006**
											Total HI =	**0.08**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

TABLE I8-13a

FU7 Plume B Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Scenarı

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds:		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds.		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = Ingestion CDI from above[f]

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e., inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995.

488 651

TABLE I8-13b

FU7 Plume B Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	4 00E-03	7 00E-01	9 00E-03	5 95E-05	1 2E-05	3 27E-08	9 4E-09	1.2E-05
MG/L	CHLOROBENZENE	D				1 00E-03	3 10E-01	4 10E-02	1 49E-05		3 73E-08		
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	1 00E-03	8 00E-01	4 20E-03	1 49E-05	1 9E-07	3 82E-09	6 2E-11	8 9E-08
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1 60E-02	1 00E+00	4 80E-02	2 38E-04	1 2E-05	6 98E-07	3 6E-08	4 8E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	5 80E-02	1 50E-01	1 60E-02	8 63E-04	9 5E-06	8 44E-07	6 2E-08	5 2E-06
	Total Risk									**3.4E-05**		**1.1E-07**	**1.8E-05**
Notes											**Total Risk =**	**5E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-13c

FU7 Plume B Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				4 00E-03	7 00E-01	9 00E-03	1 10E-04		6.90E-08		
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	1 00E-03	3 10E-01	4 10E-02	2 74E-05	0 001	7 86E-08	0 00001	0 005
MG/L	CHLOROMETHANE	C				1 00E-03	8 00E-01	4 20E-03	2 74E-05		8 05E-09		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 60E-02	1 00E+00	4 80E-02	4 38E-04	0 04	1 47E-06	0 0001	0 003
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		5 80E-02	1 50E-01	1 60E-02	1 59E-03	0 3	1 78E-06	0 002	
	Hazard Index									**0.3**		**0.002**	**0.007**
											Total HI =	**0.3**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

488 652

TABLE I8-14a
FU7 Plume B Groundwater (Potable Use) - Hypothetical Future Residential Child Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = US EPA Exposure Factors Handbook, August 1997 Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-14b

FU7 Plume B Groundwater (Potable Use) - Future Residential Child Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	4 00E-03	7 00E-01	9 00E-03	2 19E-05	4 4E-06	9 05E-09	2 6E-09	4 4E-06
MG/L	CHLOROBENZENE	D				1 00E-03	3 10E-01	4 10E-02	5 48E-06		1 03E-08		
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	1 00E-03	8 00E-01	4 20E-03	5 48E-06	7 1E-08	1 06E-09	1 7E-11	3 3E-08
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	9 41E-03	1 00E+00	4 80E-02	5 15E-05	2 7E-06	1 14E-07	5 9E-09	1 0E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	9 30E-03	1 50E-01	1 60E-02	5 10E-05	5 6E-07	3 74E-08	2 7E-09	3 1E-07
	Total Risk									**7.7E-06**		**1.1E-08**	**4.9E-06**
Notes											**Total Risk =**	**1E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

488 654

TABLE I8-14c

FU7 Plume B Groundwater (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**RfDo**	**RfDd**	**RfDI**	**EPC**	**ABSgi**	**PC**	**CDI**	**HQ**	**CDI**	**HQ**	**HQ**
MG/L	1,1,2,2-TETRACHLOROETHANE	C				4 00E-03	7 00E-01	9 00E-03	2 56E-04		1 06E-07		
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	1 00E-03	3 10E-01	4 10E-02	6 39E-05	0 003	1 20E-07	0 00002	0 01
MG/L	CHLOROMETHANE	C				1 00E-03	8 00E-01	4 20E-03	6 39E-05		1 23E-08		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	9 41E-03	1 00E+00	4 80E-02	6 01E-04	0 06	1 32E-06	0 0001	0 004
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		9 30E-03	1 50E-01	1 60E-02	5 94E-04	0 1	4 37E-07	0 0005	
	Hazard Index									**0.2**		**0.0006**	**0.01**
											Total HI =	**0 2**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index; * = inhalation intake (CDI) = ingestion intake

TABLE I8-15a
FU7 Plume B Max Groundwater (Potable Use) - Hypothetical Future Residential Child Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0.007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.
b = US EPA Exposure Factors Handbook, August 1997 Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.
c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

488 657

TABLE I8-15b

FU7 Plume B Max Groundwater (Potable Use) - Future Residential Child Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	4 00E-03	7 00E-01	9 00E-03	2 19E-05	4 4E-06	9 05E-09	2 6E-09	4.4E-06
MG/L	CHLOROBENZENE	D				1 00E-03	3 10E-01	4 10E-02	5 48E-06		1 03E-08		
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	1 00E-03	8 00E-01	4 20E-03	5 48E-06	7 1E-08	1 06E-09	1 7E-11	3 3E-08
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	1 60E-02	1 00E+00	4 80E-02	8 77E-05	4 6E-06	1 93E-07	1 0E-08	1 8E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	5 80E-02	1 50E-01	1 60E-02	3 18E-04	3 5E-06	2 33E-07	1 7E-08	1 9E-06
	Total Risk									**1 3E-05**		**3.0E-08**	**6.6E-06**
Notes											**Total Risk =**	**2E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-15c

FU7 Plume B Max Groundwater (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				4 00E-03	7 00E-01	9 00E-03	2 56E-04		1 06E-07		
MG/L	CHLOROBENZENE	D	2 00E-02	6 20E-03	5 70E-03	1 00E-03	3 10E-01	4 10E-02	6 39E-05	0 003	1 20E-07	0 00002	0 01
MG/L	CHLOROMETHANE	C				1 00E-03	8 00E-01	4 20E-03	6 39E-05		1 23E-08		
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	1 60E-02	1 00E+00	4 80E-02	1 02E-03	0 1	2 25E-06	0 0002	0 006
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		5 80E-02	1 50E-01	1 60E-02	3 71E-03	0 6	2 72E-06	0 003	
	Hazard Index									**0.7**		**0.003**	**0 02**
											Total HI =	**0.7**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

488 658

TABLE I8-16a
FU7 Plume C Groundwater (Potable Use) - Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:			
CDI =	**Ingestion CDI from above** [g]		

References:
a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991
b = Default factors adapted from EPA Exposure Factors Handbook, August 1997
c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker
d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value; all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992
e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event
g = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-16b

FU7 Plume C Groundwater (Potable Use) - Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	2 00E-03	7 00E-01	9 00E-03	6 99E-06	1 4E-06	1 18E-09	3 4E-10	1 4E-06
MG/L	CHLOROETHANE		2 90E-03	3 63E-03		1 00E-03	8 00E-01	8 00E-03	3 49E-06	1 0E-08	5 24E-10	1 9E-12	
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	2 00E-03	8 00E-01	4 20E-03	6 99E-06	9 1E-08	5 50E-10	8 9E-12	4 2E-08
MG/L	DIBROMOCHLOROMETHANE	C	8 40E-02	1 40E-01		1 50E-03	6 00E-01	3 90E-03	5 24E-06	4 4E-07	3 83E-10	5 4E-11	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	5 55E-03	1 00E+00	4 80E-02	1 94E-05	1 0E-06	1 75E-08	9 1E-10	3 9E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	6 83E-03	1 50E-01	1 60E-02	2 39E-05	2 6E-07	7 16E-09	5 2E-10	1 4E-07
	Total Risk									**3 2E-06**		**1.8E-09**	**1.6E-06**
Notes											**Total Risk =**	**5E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

488 661

TABLE I8-16c

FU7 Plume C Groundwater (Potable Use) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				2 00E-03	7 00E-01	9 00E-03	1 96E-05		3 30E-09		
MG/L	CHLOROETHANE		4 00E-01	3 20E-01	2 90E+00	1 00E-03	8 00E-01	8 00E-03	9 78E-06	0 00002	1 47E-09	0 000000005	0 000003
MG/L	CHLOROMETHANE	C				2 00E-03	8 00E-01	4 20E-03	1 96E-05		1 54E-09		
MG/L	DIBROMOCHLOROMETHANE	C	2 00E-02	1 20E-02		1 50E-03	6 00E-01	3 90E-03	1 47E-05	0 0007	1 07E-09	0 00000009	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	5 55E-03	1 00E+00	4 80E-02	5 43E-05	0 005	4 89E-08	0 000005	0 0003
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 83E-03	1 50E-01	1 60E-02	6 68E-05	0 01	2 00E-08	0 00002	
	Hazard Index									**0.02**		**0.00003**	**0.0003**
											Total HI =	**0 02**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

TABLE I8-17a
FU7 Plume C Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Scenario
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	2679 b,c	2679 b,c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a
Inhalation:			
CDI =	**Ingestion CDI from above** [g]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Default factors adapted from EPA Exposure Factors Handbook, August 1997.

c = Surface area represents 1/2 head, 1/2 arms, and the hands of an adult worker

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

g = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

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TABLE I8-17b

FU7 Plume C Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation* ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	2 00E-03	7 00E-01	9 00E-03	6 99E-06	1 4E-06	1 18E-09	3 4E-10	1 4E-06
MG/L	CHLOROETHANE		2 90E-03	3 63E-03		1 00E-03	8 00E-01	8 00E-03	3 49E-06	1 0E-08	5 24E-10	1 9E-12	
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	2 00E-03	8 00E-01	4 20E-03	6 99E-06	9 1E-08	5 50E-10	8 9E-12	4 2E-08
MG/L	DIBROMOCHLOROMETHANE	C	8 40E-02	1 40E-01		2 00E-03	6 00E-01	3 90E-03	6 99E-06	5 9E-07	5 11E-10	7 2E-11	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	9 00E-03	1 00E+00	4 80E-02	3 15E-05	1 6E-06	2 83E-08	1 5E-09	6 3E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	3 70E-02	1 50E-01	1 60E-02	1 29E-04	1 4E-06	3 88E-08	2 8E-09	7 8E-07
	Total Risk									**5.1E-06**		**4.7E-09**	**2.3E-06**
Notes											**Total Risk =**	**7E-06**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-17c

FU7 Plume C Max Groundwater (Potable Use) - Hypothetical Future Industrial Worker Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				2 00E-03	7 00E-01	9 00E-03	1 96E-05		3 30E-09		
MG/L	CHLOROETHANE		4 00E-01	3 20E-01	2 90E+00	1 00E-03	8 00E-01	8 00E-03	9 78E-06	0 00002	1 47E-09	0 000000005	0 000003
MG/L	CHLOROMETHANE	C				2 00E-03	8 00E-01	4 20E-03	1 96E-05		1 54E-09		
MG/L	DIBROMOCHLOROMETHANE	C	2 00E-02	1 20E-02		2 00E-03	6 00E-01	3 90E-03	1 96E-05	0 001	1 43E-09	0 0000001	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	9 00E-03	1 00E+00	4 80E-02	8 81E-05	0 009	7 93E-08	0 000008	0 0005
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 70E-02	1 50E-01	1 60E-02	3 62E-04	0 06	1 09E-07	0 0001	
	Hazard Index									**0 07**		**0 0001**	**0 0005**
											Total HI =	**0 07**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

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TABLE I8-18a

FU7 Plume C Groundwater (Potable Use) - Hypothetical Future Residential Adult Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only):	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1 1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds.		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} *SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} *SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults).

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992.

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i.e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-18b

FU7 Plume C Groundwater (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	2 00E-03	7 00E-01	9 00E-03	2 97E-05	5 9E-06	1 64E-08	4 7E-09	6 0E-06
MG/L	CHLOROETHANE		2 90E-03	3 63E-03		1 00E-03	8 00E-01	8 00E-03	1 49E-05	4 3E-08	7 27E-09	2 6E-11	
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	2 00E-03	8 00E-01	4 20E-03	2 97E-05	3 9E-07	7 64E-09	1 2E-10	1 8E-07
MG/L	DIBROMOCHLOROMETHANE	C	8 40E-02	1 40E-01		1 50E-03	6 00E-01	3 90E-03	2 23E-05	1 9E-06	5 32E-09	7 4E-10	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	5 55E-03	1 00E+00	4 80E-02	8 25E-05	4 3E-06	2 42E-07	1 3E-08	1 7E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	6 83E-03	1 50E-01	1 60E-02	1 02E-04	1 1E-06	9 93E-08	7 3E-09	6 1E-07
	Total Risk									**1.4E-05**		**2.5E-08**	**7.0E-06**
Notes											**Total Risk =**	**2E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

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TABLE I8-18c

FU7 Plume C Groundwater (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation* HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				2 00E-03	7 00E-01	9 00E-03	5 48E-05		3 45E-08		
MG/L	CHLOROETHANE		4 00E-01	3 20E-01	2 90E+00	1 00E-03	8 00E-01	8 00E-03	2 74E-05	0 00007	1 53E-08	0 00000005	0 000009
MG/L	CHLOROMETHANE	C				2 00E-03	8 00E-01	4 20E-03	5 48E-05		1 61E-08		
MG/L	DIBROMOCHLOROMETHANE	C	2 00E-02	1 20E-02		1 50E-03	6 00E-01	3 90E-03	4 11E-05	0 002	1 12E-08	0 0000009	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	5 55E-03	1 00E+00	4 80E-02	1 52E-04	0 02	5 11E-07	0 00005	0 0009
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 83E-03	1 50E-01	1 60E-02	1 87E-04	0 03	2 09E-07	0 0002	
	Hazard Index									**0.05**		**0.0003**	**0.0009**
											Total HI =	**0 05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

TABLE I8-19a
FU7 Plume C Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Scenarıc
Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * EF * CF * IR_{adj}}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	N/A	2 a
IR_{adj} =	Age-adjusted Ingestion Rate (L-year/kg-day)	1.1 b	N/A
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{C_{gw} * SA_{adj} * PC * ET * EF * CF}{AT}$	
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	N/A	20000 b,c
SA_{adj} =	Age-adjusted Surface Area (cm^2-yr/kg)	9480 b,c	N/A
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (L/cm^3)	1.00E-03	1 00E-03
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

Inhalation:
CDI = **Ingestion CDI from above**[f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{1 \times 6}{15} + \frac{2 \times (30-6)}{70}$$

1.09 (L-year)/(kg-day)

b = USEPA Exposure Factors Handbook, August 1997

c = Total Body Surface Area represents whole body (average of male & female adults)

f = Age-adjusted surface area for adults, adjusted for body weight and time for carcinogenic exposure.

$$SAadj = \frac{SAc \times EDc}{BWc} + \frac{SAa \times (EDa - EDc)}{BWa} = \frac{6557 \times 6}{15} + \frac{20000 \times (30-6)}{70}$$

9480 (cm^2-year)/(kg)

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS· Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-19b

FU7 Plume C Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	2 00E-03	7 00E-01	9 00E-03	2 97E-05	5 9E-06	1 64E-08	4 7E-09	6 0E-06
MG/L	CHLOROETHANE		2 90E-03	3 63E-03		1 00E-03	8 00E-01	8 00E-03	1 49E-05	4.3E-08	7 27E-09	2 6E-11	
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	2 00E-03	8 00E-01	4 20E-03	2 97E-05	3 9E-07	7 64E-09	1 2E-10	1 8E-07
MG/L	DIBROMOCHLOROMETHANE	C	8 40E-02	1 40E-01		2 00E-03	6 00E-01	3 90E-03	2 97E-05	2 5E-06	7 09E-09	9 9E-10	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	9 00E-03	1 00E+00	4 80E-02	1 34E-04	7 0E-06	3 93E-07	2 0E-08	2 7E-07
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	3 70E-02	1 50E-01	1 60E-02	5 50E-04	6 1E-06	5 38E-07	3 9E-08	3 3E-06
	Total Risk									**2 2E-05**		**6.6E-08**	**9.8E-06**
Notes											**Total Risk =**	**3E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-19c

FU7 Plume C Max Groundwater (Potable Use) - Hypothetical Future Residential Adult Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDI	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				2 00E-03	7 00E-01	9 00E-03	5 48E-05		3 45E-08		
MG/L	CHLOROETHANE		4 00E-01	3 20E-01	2 90E+00	1 00E-03	8 00E-01	8 00E-03	2 74E-05	0 00007	1 53E-08	0 00000005	0 000009
MG/L	CHLOROMETHANE	C				2 00E-03	8 00E-01	4 20E-03	5 48E-05		1 61E-08		
MG/L	DIBROMOCHLOROMETHANE	C	2 00E-02	1 20E-02		2 00E-03	6 00E-01	3 90E-03	5 48E-05	0 003	1 50E-08	0 000001	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	9 00E-03	1 00E+00	4 80E-02	2 47E-04	0 02	8 28E-07	0 00008	0 001
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 70E-02	1 50E-01	1 60E-02	1 01E-03	0 2	1 14E-06	0 001	
	Hazard Index									**0 2**		**0.001**	**0.001**
											Total HI =	**0.2**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = Ingestion intake												

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TABLE I8-20a

FU7 Plume C Groundwater (Potable Use) - Hypothetical Future Residential Child Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds			
CDI =	$\dfrac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\dfrac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Inhalation:

CDI = **Ingestion CDI from above** [f]

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = US EPA Exposure Factors Handbook, August 1997 Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old))

d = Dermal Permeability Constant for water (0.001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0.007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

TABLE I8-20b

FU7 Plume C Groundwater (Potable Use) - Future Residential Child Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	SFo	SFd	SFi	EPC	ABSgi	PC	CDI	ELCR	CDI	ELCR	ELCR
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	2 00E-03	7 00E-01	9 00E-03	1 10E-05	2 2E-06	4 53E-09	1 3E-09	2 2E-06
MG/L	CHLOROETHANE		2 90E-03	3 63E-03		1 00E-03	8 00E-01	8 00E-03	5 48E-06	1 6E-08	2 01E-09	7 3E-12	
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	2 00E-03	8 00E-01	4 20E-03	1 10E-05	1 4E-07	2 11E-09	3 4E-11	6 6E-08
MG/L	DIBROMOCHLOROMETHANE	C	8 40E-02	1 40E-01		1 50E-03	6 00E-01	3 90E-03	8 22E-06	6 9E-07	1 47E-09	2 1E-10	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	5 55E-03	1 00E+00	4 80E-02	3 04E-05	1 6E-06	6 70E-08	3 5E-09	6 1E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	6 83E-03	1 50E-01	1 60E-02	3 74E-05	4 1E-07	2 75E-08	2 0E-09	2 2E-07
	Total Risk									5.0E-06		7.0E-09	2.6E-06
Notes											**Total Risk =**	8E-06	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

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TABLE I8-20c

FU7 Plume C Groundwater (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				2 00E-03	7 00E-01	9 00E-03	1 28E-04		5 28E-08		
MG/L	CHLOROETHANE		4 00E-01	3 20E-01	2 90E+00	1 00E-03	8 00E-01	8 00E-03	6 39E-05	0 0002	2 35E-08	0 00000007	0 00002
MG/L	CHLOROMETHANE	C				2 00E-03	8 00E-01	4 20E-03	1 28E-04		2 46E-08		
MG/L	DIBROMOCHLOROMETHANE	C	2 00E-02	1 20E-02		1 50E-03	6 00E-01	3 90E-03	9 59E-05	0 005	1 72E-08	0 000001	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	5 55E-03	1 00E+00	4 80E-02	3 55E-04	0 04	7 81E-07	0 00008	0 002
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		6 83E-03	1 50E-01	1 60E-02	4 36E-04	0 07	3 20E-07	0 0004	
	Hazard Index									**0.1**		**0.0004**	**0.002**
											Total HI =	**0.1**	

Notes: WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake

TABLE I8-21a

FU7 Plume C Max Groundwater (Potable Use) - Hypothetical Future Residential Child Scenario

Memphis Depot Main Installation RI

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * IR * EF * ED}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
IR =	Ingestion Rate (L/day)	1 a	1 a
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Dermal:			
Intake for non-carcinogenic and carcinogenic compounds:			
CDI =	$\frac{C_{gw} * SA * PC * ET * EF * ED * CF}{BW * AT}$		
C_{gw} =	Concentration in groundwater (mg/L)	EPC	EPC
SA =	Surface Area (cm^2)	6557 b, c	6557 b, c
PC =	Dermal Permeability Constant (cm/hr)	(Chemical Specific) d	(Chemical Specific) d
ET =	Exposure Time (hr/day)	0 007 b,e	0 007 b,e
EF =	Exposure Frequency (day/year)	350 a	350 a
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (L/cm^3)	1 00E-03	1 00E-03
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a
Inhalation:			
CDI =	**Ingestion CDI from above** [f]		

References:

a = U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991

b = US EPA Exposure Factors Handbook, August 1997 Manual, Supplemental Guidance, Dermal Risk Assessment, Interim Guidance, May 1998.

c = Total Body Surface Area represents whole body (average of male & female children (1-6 years old)).

d = Dermal Permeability Constant for water (0 001) used for constituents without a PC value, all values adapted from EPA, Dermal Exposure Assessment Principles and Applications, January 1992

e = 10 minute event x 1 hour/60 minutes x 1 day/24 hours = 0 007 day per event

f = follows EPA Region IV guidance (i e , inhalation of groundwater volatiles while showering/bathing is accounted for by doubling the ingestion volume), USEPA Supplemental Guidance to RAGS Region 4 Bulletins, Human Health Risk Assessment, Interim, November 1995

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TABLE I8-21b

FU7 Plume C Max Groundwater (Potable Use) - Future Residential Child Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	**Chemical**	**WOE**	**SFo**	**SFd**	**SFi**	**EPC**	**ABSgi**	**PC**	**CDI**	**ELCR**	**CDI**	**ELCR**	**ELCR**
MG/L	1,1,2,2-TETRACHLOROETHANE	C	2 00E-01	2 86E-01	2 03E-01	2 00E-03	7 00E-01	9 00E-03	1 10E-05	2 2E-06	4 53E-09	1 3E-09	2 2E-06
MG/L	CHLOROETHANE		2 90E-03	3 63E-03		1 00E-03	8 00E-01	8 00E-03	5 48E-06	1 6E-08	2 01E-09	7 3E-12	
MG/L	CHLOROMETHANE	C	1 30E-02	1 63E-02	6 00E-03	2 00E-03	8 00E-01	4 20E-03	1 10E-05	1 4E-07	2 11E-09	3 4E-11	6 6E-08
MG/L	DIBROMOCHLOROMETHANE	C	8 40E-02	1 40E-01		2 00E-03	6 00E-01	3 90E-03	1 10E-05	9 2E-07	1 96E-09	2 7E-10	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	5 20E-02	5 20E-02	2 00E-03	9 00E-03	1.00E+00	4 80E-02	4 93E-05	2 6E-06	1 09E-07	5 6E-09	9 9E-08
MG/L	TRICHLOROETHYLENE (TCE)	B2	1 10E-02	7 33E-02	6 00E-03	3 70E-02	1 50E-01	1 60E-02	2 03E-04	2 2E-06	1 49E-07	1 1E-08	1 2E-06
	Total Risk									**8.1E-06**		**1.8E-08**	**3.6E-06**
Notes											**Total Risk =**	**1E-05**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, ELCR = Excess Lifetime Cancer Exposure, * = inhalation intake (CDI) = ingestion intake												

TABLE I8-21c

FU7 Plume C Max Groundwater (Potable Use) - Hypothetical Future Residential Child Non-Carcinogenic Scenario

Memphis Depot Main Installation RI

									Ingestion		Dermal		Inhalation*
Units	Chemical	WOE	RfDo	RfDd	RfDi	EPC	ABSgi	PC	CDI	HQ	CDI	HQ	HQ
MG/L	1,1,2,2-TETRACHLOROETHANE	C				2 00E-03	7 00E-01	9 00E-03	1 28E-04		5 28E-08		
MG/L	CHLOROETHANE		4 00E-01	3 20E-01	2 90E+00	1 00E-03	8 00E-01	8 00E-03	6 39E-05	0 0002	2 35E-08	0 00000007	0 00002
MG/L	CHLOROMETHANE	C				2 00E-03	8 00E-01	4 20E-03	1 28E-04		2 46E-08		
MG/L	DIBROMOCHLOROMETHANE	C	2 00E-02	1 20E-02		2 00E-03	6 00E-01	3 90E-03	1 28E-04	0 006	2 29E-08	0 000002	
MG/L	TETRACHLOROETHYLENE (PCE)	C-B2	1 00E-02	1 00E-02	1 71E-01	9 00E-03	1 00E+00	4 80E-02	5 75E-04	0 06	1 27E-06	0 0001	0 003
MG/L	TRICHLOROETHYLENE (TCE)	B2	6 00E-03	9 00E-04		3 70E-02	1 50E-01	1 60E-02	2 37E-03	0 4	1 74E-06	0 002	
	Hazard Index									**0.5**		**0.002**	**0.003**
											Total HI =	**0.5**	
Notes	WOE = Weight of Evidence, CDI = Chronic Daily Intake, EPC = Exposure Point Concentration, HQ = Hazard Quotient, HI = Hazard Index, * = inhalation intake (CDI) = ingestion intake												

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TAB

Appendix J

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Appendix J

Supplementary Toxicity Material

APPENDIX J

Supplementary Toxicity Material

This appendix contains information from the Superfund Technical Support Center, Environmental Criteria and Assessment Office.

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Superfund Technical Support Center

Environmental Criteria and Assessment Office
U.S. Environmental Protection Agency
26 West Martin Luther King Dr., MS-117
Cincinnati, Ohio 45268

Joan Dollarhide, Director (513) 569-7539, TSC Hotline (513) 569-7300, FAX (513) 569-7159

January 5, 1995

Carol Sweeney
USEPA Region 10
1200 Sixth Ave., (ES-098)
Seattle, WA 98101

ASSISSTANCE REQUESTED. Provisional RfD for Aluminum (CASRN 7429-90-5) (East Michaud Flats Contamination/Pocatello, Idaho)

ENCLOSED INFORMATION: Risk Assessment Issue Paper for: Derivation of Provisional RfD for Aluminum (CASRN 7429-90-5)

BE ADVISED: It is to be noted that the values provided in the Risk Assessment Issue Papers are provisional only, and have not been through the U.S. EPA formal review process. Therefore, they do not represent a U.S. EPA-verified assessment. If you have any questions regarding this information, please contact Joan Dollarhide at (513) 569-7539.

Attachments

cc: K. Steinman (Ecology and Environment)

Support provided by LABAT-ANDERSON, Incorporated under contract 68-W4-0028.

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Attachment

[THIS ISSUE PAPER WAS REVIEWED BY DR. SUSAN VELAZQUEZ/ECAO-CIN. THE ASSESSMENT UNDERWENT RFD/RFC WORK GROUP REVIEW ON AUGUST 3, 1994. THE ASSESSMENT IS STILL UNDER REVIEW.]

(94-001b/6-20-94)

Risk Assessment Issue Paper for:
Derivation of a Provisional Oral RfD for Aluminum (CASRN 7429-90-5)

INTRODUCTION

The following literature searches were performed for toxicity data on aluminum and its compounds: TOXLINE (1988-1993, oral strategy; 1981-1993, inhalation strategy), CANCERLINE (1991-1993, oral strategy; 1981-1993, inhalation strategy), MEDLINE (1986-1991, pharmacokinetic strategy), TSCATS, RTECS and HSDB. Reviews of aluminum include a Health Effects Assessment (U.S. EPA, 1987a) and an ATSDR Toxicological Profile (1992). These reviews were used to supplement the literature searches as well as secondary sources for some data. The ATSDR profile was primarily used as a literature search supplement because a number of inaccuracies were found in the document. Other sources of information that were consulted include the Drinking Water Regulations and Health Advisories list (U.S. EPA, 1994a) and NTP Status Report (NTP, 1994).

There currently are no health risk values for aluminum in IRIS (U.S. EPA, 1994b), the HEAST and Supplements (U.S. EPA, 1994e), or under discussion by the RfD/RfC or CRAVE Work Groups (U.S. EPA, 1994c, 1994d). The HEAST indicates that data are inadequate for quantitative risk assessment of aluminum.

Major sources of human exposure to aluminum (Al^{3+}) include food (due to its use in food additives, food and beverage packaging and cooking utensils), drinking water and aluminum-containing medications (particularly antacid, buffered aspirin, antiulcer and antidiarrheal formulations) (Marquis, 1989; Lione, 1985). Iyengar et al. (1987) estimated that a typical American consumes 14.3 mg Al/day (0.2 mg Al/kg day). This value is consistent with a range of 1-20 mg/day (0.014-0.3 mg/kg-day) for normal oral daily aluminum intake from food and water reported by other investigators (Ganrot, 1986; Wilhelm et al., 1990). Users of aluminum-containing medications can ingest much larger amounts of aluminum, possibly as high as 840-5000 mg/day (12-71 mg/kg-day) from antacids, 126-728 mg/day (1.8-10.4 mg/kg-day) from buffered aspirins and 828 mg/day (11.8 mg/kg-day) from antiulceratives when taken at recommended dosages (Lione, 1985). Long-term use of many aluminum-containing medications (e.g., antacids for minor gastric distress, buffered aspirin for rheumatoid arthritis), however, appears to increase with age and is most common in elderly populations who simultaneously experience reduced renal function associated with advancing age (Lione, 1985).

There are sufficient animal and human data demonstrating that aluminum is absorbed from the gastrointestinal tract, but the mechanism(s) of absorption and chemical forms able to pass through the intestinal wall are not known (Wilhelm et al., 1990; Lione et al., 1985). The amount of aluminum that is absorbed is influenced by many factors, including chemical form and concentration, gastrointestinal pH and interaction with dietary constituents. There are large variations and discrepancies in quantitative estimates of aluminum oral absorption due to these factors, as well as differences in methods of estimating absorption (Wilhelm et al., 1990). The influence of some of these factors on aluminum absorption is illustrated by the findings of two animal studies (Yokel and McNamara, 1988; Gupta et al., 1986) which used a preferred method for estimating extent of absorption (comparison of areas under plasma concentration-time curves after oral and intravenous dosing). Using a single oral dose of aluminum chloride, aluminum absorption was estimated to be 0.57% in rabbits treated with 333 mg Al/kg (Yokel and McNamara, 1988) and 27% in rats treated with 8.1 mg Al/kg (Gupta et al., 1986). Following a single maximum safe oral dose of the water soluble compounds aluminum chloride (333 mg Al/kg), aluminum nitrate (934 mg Al/kg), aluminum citrate (1081 mg Al/kg) and aluminum lactate (2942 mg Al/kg) in rabbits, aluminum absorption was 0.57%, 1.16%, 2.18% and 0.63%, respectively (Yokel and McNamara, 1988). Aluminum absorption in rabbits similarly treated with the water insoluble compounds aluminum hydroxide (780 mg Al/kg), aluminum borate (2736 mg Al/kg, using a molecular weight of 273.6), aluminum glycinate (1351 mg Al/kg) and aluminum sucrose sulfate (20,867 mg Al/kg) was 0.45%, 0.27%, 0.39% and 0.60%, respectively (Yokel and McNamara, 1988). In general, the animal data suggest that dose and species may have a larger influence on aluminum absorption than differences in chemical form or conditions within the gastrointestinal tract (Wilhelm et al., 1990). Fractional uptake of aluminum in humans under normal conditions (i.e., with no intake of large quantities of aluminum from medicine) was estimated to be 0.1-0.3% assuming an intake of 20 mg Al/day (0.3 mg Al/kg-day) and urinary excretion of 20-50 μg Al/day (0.3-0.7 mg Al/kg-day) (Ganrot, 1986).

Absorption of aluminum is influenced by gastrointestinal conditions and content because aluminum can form various complexes with different solubilities and oxidation states depending on pH and interactions with dietary constituents. At low pH (3-5) in aqueous solutions, the soluble (ionic) forms of the aluminum prevail (Al^{3+}); at high pH (>8), aluminum in the form of soluble AlO_3^{3-} is present; and at pH 5-8, the aluminum is predominantly in the form of $Al(OH)_4^-$, which is insoluble (van der Voet and de Wolff, 1986; Wilhelm et al., 1990). Ingested constituents that can influence absorption by forming complexes with aluminum include phosphate, fluoride, calcium, citrate and lactate. For example, aluminum is used to bind dietary phosphorus and decrease its absorption as a control for hyperphosphatemia, and citrate and lactate are complexing agents that can significantly increase aluminum absorption (Slanina et al., 1984, 1985, 1986; Partridge et al., 1989; Domingo et al. 1991; Ittel et al., 1991; Lione et al., 1985; Wilhelm et al., 1990).

Aluminum has not been shown to have a definite biological function and was long regarded as nontoxic, largely because gastrointestinal absorption is normally minimal. In the past two decades, health effects research in humans and animals has shown that elevated levels of aluminum in the body may be toxic, particularly to the central nervous, skeletal and hematological systems. Much of the evidence for those effects, however, has been obtained under atypical exposure conditions in which the gastrointestinal barrier is bypassed. A number of animal studies, for example, administered aluminum by parenteral or intracranial injection. In humans, the preponderance of data are from studies of patients with reduced renal function who accumulated aluminum as a result of long-term intravenous hemodialysis therapy with aluminum-containing dialysis fluid and, in many cases, concurrent administration of high oral doses of aluminum hydroxide or other aluminum salts to regulate phosphate levels. These human data may be of limited relevance to the general population due to excessive blood uptake and lack of renal excretion. Health effects associated with exposure to aluminum via hemodialysis (e.g., dialysis encephalopathy) have largely disappeared with improved dialysis water purification (Ganrot, 1986). While providing evidence that aluminum is an important etiologic factor in dialysis-related disorders, it should be noted that purification also removed other potentially toxic metals from the dialysis water. For ingested aluminum in people that are healthy (i.e., have normal renal function), the main known adverse effects are related to phosphate depletion and/or accumulation of aluminum in bone (e.g., osteomalacia) resulting from high-dose long-term use of aluminum-containing medications.

One of the greatest health concerns regarding aluminum is its neurological effects. In humans, dialysis encephalopathy syndrome is the only neurologic condition commonly accepted as caused by aluminum (Ganrot, 1986). Dialysis encephalopathy is degenerative and characterized by the progressive loss of speech, motor and cognitive functions, with death typically occurring within 1-6 months. Autopsies of these patients revealed increased concentrations of aluminum in the gray matter and cerebral spinal fluid (CSF) but no conclusive evidence of neurofibrillary degeneration or other neuropathological changes despite the elevated aluminum levels.

Aluminum is proposed as having an association with three forms of chronic encephalopathy in humans: senile dementia of the Alzheimer type (SDAT, Alzheimer's Disease), endemic Amyotrophic Lateral Sclerosis (ALS) and endemic Parkinsonism-dementia (PD, a mixture of Parkinsonism and senile dementia), but there is no evidence that it plays a causal role in the development of these diseases (Ganrot, 1986; Lione, 1985). SDAT is clinically characterized by progressive deterioration of memory and intellect, but these symptoms are uncharacteristic and difficult to distinguish from other types of brain failure or from symptoms of normal aging. SDAT is defined chiefly by hallmark neuropathological signs, including neuronal depletion and general cell atrophy in the brain, and neurofibrillary degeneration, presence of senile plaques (amyloid fibrils surrounded by glial cells and degenerated axonal nerve endings) and granulovacuolar degeneration of the entire CNS. ALS and PD have been observed endemically in Guam and parts of western New Guinea and Japan. Both conditions are progressive and have some clinical and neuropathologic similarities to SDAT, including brain atrophy and particular neuronal changes (Ganrot, 1986). The proposed associations between aluminum and SDAT, ALS and PD are largely based on increased concentrations of aluminum in the brain, spinal cord and/or CNS lesions of some affected people. There is equivocal evidence for some general similarity of neuropathologic lesions (e.g., neurofibrillary degeneration) in SDAT patients and certain animal species treated with high doses of aluminum (e.g., rabbits treated by intracranial injection), although these lesions have not been observed in people with dialysis encephalopathy (Ganrot, 1986). Endemic ALS and PD appear to be largely associated with natural environmental factors, in particular excess aluminum in conjunction with deficient magnesium and calcium in drinking water and soil, but a causal relationship has not been proven.

The neurotoxicity of aluminum is well documented in certain animal species. Aluminum induces a spectrum of behavioral abnormalities and brain neurofibrillary degenerative changes in rabbits and cats when injected intracranially or parenterally in high doses, but hamsters and monkeys are much less sensitive (Ganrot, 1986; Lione, 1985). It should be noted that the neurofibrillary changes in affected animals differ in morphological detail from those associated with SDAT. As discussed subsequently in the Oral Toxicity section, oral doses of aluminum can induce neurobehavioral effects in adult mice and rats and particularly in their developing offspring.

Osteomalacia was frequently observed among long-term dialysis patients with neurological signs and is commonly attributed to aluminum overload (Ganrot, 1986; Lione, 1985). This bone condition is characterized by widened osteoid (unmineralized bone matrix) with no fibrosis, reduced mineralization rate, skeletal pain and a strong tendency for fractures, lack of response to vitamin D therapy, and increased aluminum concentration in bone. Effects on bone histology and elevated bone aluminum levels have also been observed in patients with normal renal function who received total parenteral nutrition with aluminum-contaminated casein as a protein source, and in parenteral aluminum loading induced osteomalacia in rats and dogs (Lione, 1985). As discussed subsequently in the Oral Toxicity section, skeletal effects have been observed in the offspring of aluminum-treated rats and mice. Many of the observed effects on bone are related to direct deposition of aluminum, but aluminum may also induce osteomalacia by forming insoluble complexes with phosphates in the gastrointestinal tract. These complexes are not easily absorbed and long term exposure to aluminum may result in hypophosphatemia which in turn leads to hypercalciuria and bone resorption. Ingested aluminum can also inhibit gastrointestinal absorption of fluoride which may contribute to skeletal demineralization (Lione, 1985).

Aluminum-associated anemia has been observed in dialysis patients who later developed neurological and skeletal effects (Ganrot, 1986; Lione, 1985). This is a microcytic hypochromic anemia that is distinct from the anemias commonly found in dialysis patients without aluminum overload, is not due to iron deficiency and may be related to decreased hemoglobin synthesis. Aluminum has also induced a microcytic anemia when injected intraperitoneally in rats (Lione, 1985).

<u>ORAL TOXICITY</u>

Numerous subchronic animal studies were located but only those that pertain to defining the threshold region of the dose-response curve are summarized. Groups of 10 female Sprague-Dawley rats were administered aluminum nitrate nonahydrate in drinking water at doses of 360, 720 and 3600 mg/kg-day (26, 52 and 259 mg Al/kg-day, respectively) for 100 days (Domingo et al., 1987). A control group received distilled water only. The level of aluminum in the diet was not reported. A significant decrease ($p<0.05$) in body weight gain was observed in the 259 mg Al/kg-day group. The investigators found that the decreased body weight gain (≈50% less than controls) was the result of decreased food intake. Overall, no consistent variations in hematological (hemoglobin, hematocrit) or clinical chemistry (SGOT, SGPT, alkaline phosphatase, urea, creatinine, total protein, cholesterol, glucose) parameters were observed. No histopathological alterations in the heart, liver, kidney, spleen, brain and cerebellum were observed. The rats were concurrently exposed to high doses of nitrate as high as approximately 475 times the RfD for nitrate (1.6 mg nitrate-nitrogen/kg-day) which is based on methemoglobinemia in humans (U.S. EPA, 1994a, 1994b). Due to the nitrate co-exposure, the effect on food consumption/body weight cannot be conclusively attributed to aluminum alone.

In a limited subchronic/three-generation study lasting 180-390 days, Ondreicka et al. (1966) exposed groups of 7 female and 3 male Dobra Voda mice to 0 or 19.3 mg Al/kg-day as aluminum chloride in drinking water. The diet contained 160 to 180 ppm aluminum. Using a food factor of 0.15 kg diet/kg body weight/day based on recommended values for food consumption and body weight for chronic exposure (U.S. EPA, 1987b), the dietary aluminum intake is estimated to be 24-27 mg/kg-day. Thus, the total aluminum intakes were 24 mg/kg-day (controls) and 43.3 mg/kg-day (using the 24 mg/kg-day diet estimate). The P_0 group produced 3 litters and the F_{1a} group produced 2 litters. The weanlings were exposed to aluminum in the drinking water starting at 4 weeks of age. Body weight gain was unaffected in the treated P_0 group but markedly decreased ($p<0.001$) in the treated F_{1a}, F_{1c}, F_{2a}, and F_{2b} groups. No effects on erythrocyte count, hemoglobin levels, or histopathology of the liver, spleen, and kidneys were observed in the P_0, F_1 or F_2 generations at the end of the study. No significant differences were seen in the number of litters or offspring between the exposed and control groups. This study identifies a LOAEL of 43.3 mg Al/kg-day.

Groups of 6 male Beagle dogs were fed a diet providing 0, 118, 317 or 1034 mg/kg-day sodium aluminum phosphate (0, 3.4, 9.0 or 29.4 mg Al/kg-day, respectively) for 6 months (Katz et al., 1984). Groups of 6 females were similarly fed 0, 112, 361 or 1087 mg/kg-day sodium aluminum phosphate (0, 3.2, 10.3 or 30.9 mg Al/kg-day, respectively). Information regarding level of aluminum in the diet was not reported. No compound related effects on body weight gain, hematological and clinical chemistry parameters (parameters not specified), or histopathological endpoints (major organs and tissues examined) were observed. A highest NOEL of 30.9 mg Al/kg-day was identified in this study, but this does not include contribution of aluminum from the basal diet.

The aforementioned studies have a common limitation in that neurotoxicity was not assessed. Neurotoxicity was evaluated in other subchronic as well as developmental studies as discussed below. In one of these studies, groups of 15 female Swiss-Webster mice (9-13 weeks old) were fed diets containing aluminum as aluminum lactate at 25 (controls), 500 or 1000 mg Al/kg diet (3.3, 65 or 130 mg Al/kg bw/day) for 6 weeks (Golub et al., 1989). No mice were exposed to lactate alone. No statistically significant differences in food intake or body weight gain were observed, but mice fed the highest aluminum concentration gained less weight than the controls or low-dose group. A significant decrease (20%) in total, vertical, and horizontal movement was observed in the 130 mg Al/kg-day group. Activity in the 65 mg Al/kg-day group was not significantly different than the controls. Thus, the highest NOEL is 65 mg Al/kg-day and the LOAEL is 130 mg Al/kg-day.

Neurobehavioral effects of aluminum lactate were also evaluated in groups of 12 female

N:NIH Swiss Webster mice (4.5-5.5 weeks old) that were fed 25 (controls) or 1000 µg Al/g diet for 90 days (Golub et al., 1992a). Using a food factor of 0.19 kg diet/kg body weight/day calculated using an algorithm relating food consumption to body weight (U.S. EPA, 1987b) and reported body weight data (the time-weighted average weight is 25.4 g), the dosage in the treated mice is estimated to be 190 mg Al/kg-day. This estimate is similar to dosages corresponding to the same dietary concentration of aluminum lactate used in developmental studies by the same group of investigators discussed below (Donald et al., 1989, Golub et al., 1992b). No mice were exposed to lactate alone. The neurobehavioral test battery used by Donald et al. (1989) was administered at the beginning of the experiment (day 0) and at 45 and 90 (±3) days, and motor activity was evaluated at 45 and 90 days. Aluminum levels were measured in brain, femur and liver at the end of the exposure period. Body weight was significantly ($p=0.03$) increased in the treated mice but no exposure-related changes in food intake or overt signs of neurotoxicity were observed. Results of the neurobehavioral tests showed significantly decreased hindlimb grip strength ($p=0.012$) at 90 days, decreased air puff startle response ($p=0.044$) at 90 days and decreased auditory startle response ($p=0.011$) at 45 days in the treated mice. Spontaneous motor activity was reduced at 90 days as indicated by decreased total activity counts ($p=0.015$), horizontal activity counts ($p=0.036$) and percentage of intervals with high activity counts ($p=0.036$). Aluminum concentrations in the brain and liver were increased approximately threefold ($p\leq0.001$) in the treated mice, but brain and liver lipid peroxidation indices were not altered. Concurrent exposure to a low level of dietary manganese (3 µg Mn/g diet) showed no interactive effects between aluminum excess and manganese deficiency on any of the preceding endpoints. The results of this study are generally consistent with findings of decreased motor activity in adult mice exposed to the same concentration of aluminum lactate for 6 weeks in the earlier study of Golub et al. (1989)

Groups of 6 male albino rats were administered 0 or 25 mg Al/kg-day as aluminum nitrate in normal saline by gavage, 10% ethanol in drinking water, or 25 mg Al/kg-day by gavage combined with 10% ethanol in drinking water, 6 days/week for 6 weeks (Flora et al., 1991). The level of aluminum in the diet was not reported. Urinary δ-aminolevulinic acid (ALA), blood ALA-dehydratase (ALAD), blood zinc protoporphyrin (ZPP), glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) in serum and liver, and brain biogenic amines and their metabolites [dopamine (DA), norepinephrine (NE), 5-hydroxytryptamine (5-HT), homovanillic acid (HVA) and 5-hydroxyindolacetic acid (5-HIAA)] were evaluated at the end of the treatment period. Treatment with aluminum alone caused significantly increased blood ALAD ($p<0.01$), decreased liver GPT ($p<0.05$), decreased brain DA ($p<0.01$), increased brain NE ($p<0.05$) and decreased brain 5-HT ($p<0.05$). Compared to treatment with aluminum alone, concurrent exposure to ethanol and aluminum produced significantly decreased ALAD, increased ALA, increased ZPP, increased liver GPT, increased serum GOT and increased brain HVA. Significant changes found only in the combined aluminum and ethanol group included increased serum GPT, increased brain NE and decreased brain 5-HT. Treatment with ethanol alone only inhibited blood ALAD. The rats were co-exposed to relatively high levels of nitrate [comparable to those in the Domingo et al. (1987) subchronic study], but it seems likely that some of the changes (i.e., effects on brain chemicals) are related to aluminum which is known to be neurotoxic. Because the toxicological significance of the changes is unclear due to lack of evaluation of neurobehavioral performance and other endpoints, the 25 mg Al/kg-day dose is a NOAEL. This value does not include contribution of aluminum from the basal diet.

Chronic drinking water studies which evaluated the carcinogenicity of potassium aluminum sulfate in rats and mice (Schroeder and Mitchener, 1975a,b) provide little information on noncarcinogenic endpoints and are reviewed in a separate Risk Assessment Issue Paper (Evaluation of Carcinogenicity of Aluminum).

Developmental toxicity, particularly effects on postnatal neurobehavioral development, have been investigated in a number of studies with aluminum compounds. Bernuzzi et al. (1989) exposed groups of 6-12 pregnant Wistar rats to aluminum chloride or aluminum lactate in the diet on gestational days 1 through 21. The rats received nominal daily doses of 0, 100, 300, 400 mg Al/kg as aluminum chloride or 0, 100, 200, 400 mg Al/kg as aluminum lactate. No rats were exposed to lactate alone, and information regarding level of aluminum in the basal diet was not reported. On the average, there was a less than 10% decrease in maternal body weight gain and no effect on food or water intake. No significant difference in litter size was observed. However, postnatal mortality increased 55% and 26% ($p<0.05$) in offspring of the rats exposed to 300 or 400 mg Al/kg-day, respectively. The offspring of dams fed > 300 mg Al/kg-day weighed significantly less ($p<0.05$) than controls on postnatal day 1. Decreased body weight was also observed on postnatal days 4 and 14 in the offspring of rats fed 400 mg Al/kg-day as aluminum lactate. The following tests were used to assess neuromotor development (maturation): righting reflex, grasping reflex, negative geotaxis, suspension test, and locomotor coordination. The tests were performed on postnatal day 4, 6, 9, 12 and 20, respectively. Impairment of neuromotor development (righting and grasping reflexes) was observed in the pups exposed to ≥ 200 mg Al/kg-day. Impaired grasping reflex was also observed in the 100 mg/kg-day aluminum lactate group. Offspring of rats fed 400 mg/kg-day also exhibited altered performance on the locomotor coordination test. It is inappropriate to use these findings in risk assessment because they are not corroborated by a follow-up study (Muller et al., 1990) which suggests that they could be due to factors other than aluminum.

Unlike Bernuzzi et al. (1989), Muller et al. (1990) found that ingestion of 400 mg Al/kg-day as aluminum lactate had no effect on postnatal mortality, body weight and righting and grasping reflex tests. According to Muller et al. (1990), the contradictions between the studies could be related to environmental modifications. In particular, the mothers and pups were much more protected in the Muller et al. (1990) study than in the previous one because they were housed in plastic cages instead of wire mesh cages and received cotton to build nests. Body temperature of the pups therefore may have been more adequately maintained in the Muller et al. (1990) study. As discussed in this study, toxicity in pups can be confounded by insufficient body temperature, and delayed pup weight gain could explain the differences in neuromotor performance. Additional information on the Muller et al. (1990) study is summarized below.

Muller et al. (1990) administered diets supplemented with 0 or 400 mg Al/kg-day as aluminum lactate to groups of 6-9 pregnant Wistar rats on days 1-7, 1-14, or 1-21 of gestation. No rats were exposed to lactate alone, and information regarding level of aluminum in the basal diet was not reported. Neuromotor development was assessed on postnatal days 4, 6, 9, 12, and 20 using tests of righting reflex, grasping reflex, negative geotaxis, suspension, and locomotor coordination, respectively. Learning ability was also tested on postnatal day 65 using operant conditioning. No effects on maternal body weight or food intake was observed in dams exposed on gestational days 1-7 or 1-14. In the dams exposed on gestational days 1-21, a significant decrease in maternal body weight (26 and 35%, respectively) was observed on days 16 and 19 of gestation. Decreased food intake was also observed on day 19 of gestation. No effects on litter size, postnatal mortality, or postnatal body weight were observed. Impairment of neuromotor development ($p<0.05$) was observed in 2 of the 5 tests (negative geotaxis and locomotor coordination); no differences between the three treated groups were observed. For the operant conditioning test, there were significant differences ($p<0.05$) between the treated and control young rats. No differences between the 3 treated groups were observed. The LOAEL for developmental toxicity is 400 mg Al/kg-day, but this does not include contribution of aluminum from the basal diet.

Groups of 10 pregnant Sprague Dawley rats were administered 180, 360, or 720 mg/kg-day aluminum nitrate nonahydrate by gavage (13, 26, 52 mg Al/kg-day) on days 6-14 of gestation (Paternain et al., 1988). A vehicle (water) only control group was used. The level of aluminum in the diet was not reported. Aluminum exposed dams gained significantly less weight ($p<0.05$) than the controls. No significant effect on the numbers of litters, corpora lutea, total implants, live fetuses, resorptions, or runt fetuses were observed. Significant decreases ($p<0.001$) in fetal body weight and tail length were observed at all three aluminum doses; decreased ($p<0.001$) fetal body length was also observed at the 52 mg Al/kg-day dose level. No consistent external or visceral malformations were observed in the offspring. A significant ($p<0.05$) increase in the incidence of skeletal malformations (delayed ossification, hypoplastic deformed ribs) was observed at all three treatment levels. The incidence of hematomas was significantly increased ($p<0.05$) at the high dose. Because the rats were co-exposed to relatively high levels of nitrate [comparable to those in the Domingo et al. (1987) subchronic study], the effects cannot be conclusively attributed to aluminum alone.

Domingo et al. (1989) administered by gavage 0, 66.5, 133, or 266 mg/kg-day aluminum hydroxide (0, 23.9, 47.8, 95.5 mg Al/kg-day) to groups of 20 pregnant Swiss mice on days 6-15 of gestation. The level of aluminum in the diet was not reported. The dams were killed on gestational day 18. No compound-related effects were observed on maternal mortality, clinical signs, body weight, food intake, or absolute or relative heart, lung, spleen, liver, kidney and brain weights. In addition, no compound-related effects were observed on numbers of implantations, resorptions, live and dead fetuses, sex ratio, and the incidences of external malformations, internal soft-tissue defects or skeletal abnormalities. This study identifies a NOEL of 95.5 mg Al/kg-day for developmental toxicity in mice, however, neuromotor development was not assessed and contribution of aluminum from the basal diet is not known

In a study designed to evaluate the influence of citrate on the potential developmental toxicity of aluminum, groups of 15-19 Sprague-Dawley rats were administered distilled water (controls) or 133 mg Al/kg-day as aluminum hydroxide (384 mg/kg-day), aluminum citrate (1064 mg/kg-day) or aluminum hydroxide (384 mg/kg-day) concurrent with citric acid (62 mg/kg-day) by gavage on gestation days 6-15 (Gomez et al., 1991). The level of aluminum in the diet was not reported and no rats were exposed to citric acid alone. Terminations were performed on gestation day 20. Maternal and fetal evaluations showed exposure-related effects in the group exposed only to concurrent aluminum hydroxide and citric acid. Significant ($p<0.05$) changes in the concurrent aluminum hydroxide and citric acid group included reduced maternal weight gain on gestation days 6-20 (but not for days 0-20 or at sacrifice on day 20), reduced fetal body weight and some skeletal variations (increased delayed occipital and sternebrae ossification and increased absence of xiphoides). No effects were seen on maternal food consumption or clinical signs, maternal absolute or relative liver, kidney or brain weights, gravid uterine weight, corpora lutea/dam, implantations/litter, pre- or postimplantation loss/litter, viable or nonviable implants/litter, fetal sex ratio or fetal malformations (external, visceral or skeletal). This study identifies a NOEL of 133 mg Al/kg-day for nonneurobehavioral developmental toxicity of aluminum hydroxide and aluminum citrate in rats. Confidence in this NOEL is low because aluminum hydroxide administered concurrently with citric acid induced developmental effects, and because the dose does not include contribution of aluminum from the basal diet. The NOEL is consistent with the developmental NOEL of 95.5 mg Al/kg-day for aluminum hydroxide in mice (Domingo et al., 1989).

Groups of 16 pregnant Swiss-Webster mice were fed 25 (control group), 500 or 1000 mg Al/kg diet as aluminum lactate throughout gestation and lactation (Donald et al., 1989). The control diet was fed to pups that were selected for postweaning neurobehavioral assessment. Reported maternal doses were 5, 100 and 200 mg Al/kg-day at the beginning of pregnancy and 10.5, 210 and 420 mg Al/kg-day near the end of lactation. No mice were exposed to lactate alone. There were no treatment-related changes in maternal survival, body weight (measured on gestation days 0 and 16 and postnatal days 0, 5, 10, 15 and 20), food intake, toxic signs or neurobehavior (evaluated after pups were weaned at postnatal day 21 using the same test battery used for the pups and described below), or on litter size or postnatal growth and development in pups as assessed by body weight, toxic signs on days 0-55, and crown-rump length on days 0 and 20. Neurobehavioral maturation was tested in 2 pups per litter on days 8-18 with a 12 item test battery (fore- and hindlimb grasp, fore- and hindpaw placement on sticks of 2 widths, vibrissa placing, visual placing, auditory and air puff startle, eye opening, and screen grasp, cling and climb). A neurobehavioral test battery was administered to 6 pups per litter at age 25 days (4 days postweaning) or 39 days (fore- and hindlimb grip strengths, temperature sensitivity of tail, negative geotaxis, startle reflex to air puff and auditory stimuli) or age 21 and 35 days (foot splay). The pre-weaning neurobehavioral testing showed that a significant ($p=0.007$) number of pups in the high dose group had impaired vertical screen climb performance. The postweaning neurobehavioral assessment showed significantly ($p<0.05$) altered performance on several tests. These included decreased forelimb grip strength at age 39 days in the low dose group, increased hindlimb grip strength at age 25 days in both low and high dose groups, increased foot splay distance at age 21 days in both low and high dose groups and at age 35 days in the low dose group, and increased forelimb grip strength at age 25 days and decreased thermal sensitivity at age 25 and 39 days in the high dose group. There were no treatment-related changes in concentrations of aluminum in pup liver or bone (brain tissue was not analyzed). Because the Muller et al. (1990) study indicates that exposure during the first 14 days of gestation can produce neurobehavioral effects in offspring in the absence of maternal toxicity, the maternal dosage reported for the low dose group at the beginning of gestation is used to define a developmental LOAEL of 100 mg Al/kg-day.

In a more recent study of similar design by the same group of investigators, groups of 14 and 9 female Swiss Webster mice (6-8 weeks old) were fed 25 (control) or 1000 µg Al/g diet as aluminum lactate, respectively, during gestation and lactation (Golub et al., 1992b). The 1000 µg/g concentration was selected based on the findings of Donald et al. (1989) showing neurobehavioral effects in weanlings at this level. No mice were exposed to lactate alone. Using dam food intake and body weight values estimated from reported data, maternal doses are estimated to be approximately 4.3 and 174 mg Al/kg-day at the beginning of gestation and 4.8 and 607 at the end of the lactation period. At birth, litters were fostered either within or between groups to provide 4 groups of offspring that were exposed to excess aluminum via maternal diet during gestation, lactation, both or neither (i.e., 25 ppm during gestation and lactation, 1000 ppm during gestation and 25 ppm during lactation, 25 ppm during gestation and 1000 ppm during lactation, and 1000 ppm during gestation and lactation). Maternal effects included significantly ($p \leq 0.015$) reduced (10-12%) body weight gain and food intake in the treated group during late pregnancy and lactation, and signs of neurotoxicity (hindlimb splaying and dragging) in one treated dam at postnatal day 21 (weaning); this dam had seizures and died 4 days later. No treatment-related effects on litter size, birth weight, crown-rump length, righting ability at birth, sex ratio or postnatal survival were observed. Both gestation-only and lactation-only exposure caused significantly ($p<0.05$) decreased body weight gain in the treated pups beginning on postnatal day 10; combined gestation and lactation exposure produced the greatest decrease (approximately 24% at weaning). Neurobehavioral testing using the same battery as Donald et al. (1989) was performed at weaning on the dams and on a total of 12, 16, 12 and 6 pups (1 male and 1 female pup per litter) from the control, gestation-only, lactation-only and combined gestation and lactation groups, respectively. Results of this testing showed effects only in pups, including significantly decreased forelimb grip strength ($p \leq 0.0027$) after gestation-only exposure, increased hindlimb grip strength ($p \leq 0.004$) after both gestation and lactation exposure, decreased temperature sensitivity ($p \leq 0.004$) after lactation-only exposure, and longer negative geotaxis latency ($p=0.008$) after lactation-only exposure. In general, the findings of this study are consistent with those of Donald et al. (1989) in showing neurodevelopmental effects at the 1000 µg/g dietary concentration, although intake dosages are dissimilar at the end of lactation. Using the dosage at the beginning of gestation, this study defines a LOAEL of 174 mg/kg-day for developmental effects.

The Donald et al. (1989) study differs from that of Golub et al. (1992b) in that offspring were not fostered, were tested at a later age (25 vs. 21 days), were allowed 4 days of recovery from the treated diet prior to testing, participated in other behavioral tests currently, and experienced no growth retardation. The effects found only in the cross-fostered groups in the Golub et al. (1992b) study (lower forelimb strength after gestation exposure and altered negative geotaxis latencies after lactation only exposure) were not observed by Donald et al. (1989). Increased footsplay was observed by Donald et al. (1989) but not by Golub et al. (1992b), perhaps due to an opposing effect of smaller pup body size in this study. Neither gestation or lactation exposure affected pup brain or liver aluminum concentrations, but lactation exposure caused significantly lower manganese and iron concentrations in liver and manganese concentrations in brain.

In a study designed to evaluate the influence of lactate on the potential developmental toxicity of aluminum, groups of 11-13 Swiss albino (CD-1) mice were administered 57.5 mg Al/kg as aluminum hydroxide (166 mg/kg-day), aluminum lactate (627 mg/kg-day) or aluminum hydroxide (166 mg/kg-day) concurrent with lactic acid (570 mg/kg-day) by gavage on gestation days 6-15 (Colomina et al., 1992). Other groups were treated with only lactic acid (570 mg/kg-day, equivalent to the amount in 627 mg/kg of aluminum lactate) or distilled water (controls). The level of aluminum in the diet was not reported. Fetal evaluations were performed on gestation day 18, including examinations for skeletal and visceral abnormalities in approximately two-thirds and one-third of the pups, respectively. The investigators noted that the dose of aluminum (57.5 mg/kg-day) is equivalent to ingestion of 3.5 g Al/day by a 60 kg person, which is higher than the usual quantities of aluminum ingested therapeutically for peptic disorders. Maternal body weight gain was significantly lower than control values in the aluminum lactate-treated mice when evaluated over gestation days 6-9 (92%, p<0.001), 6-12 (55.6%, p<0.01) and 0-18 (38.5%, p<0.001), and in the mice treated with combined aluminum hydroxide and lactic acid evaluated over gestation days 6-12 (37.8%, p<0.05), 6-15 (42.7%, p<0.01) and 0-18 (15.7%, p<0.05). The decreased maternal weight gain in the aluminum lactate group was accompanied by significantly reduced food consumption during gestation days 6-18. Other significant effects in the aluminum lactate group included 16% reduced fetal body weight (p<0.01) and increased incidences of cleft palate (13.2%, p<0.05), dorsal hyperkyphosis (i.e., excessive flexion of spine) (13.5%, p<0.05) and delayed parietal ossification (15.4%, p<0.01). These developmental effects were not observed in any of the control or aluminum hydroxide exposed pups, and the only other significant changes in the other groups were decreased maternal relative liver weight and delayed fetal parietal ossification in the lactic acid only exposure group. Other types of internal or skeletal malformations or variations were not found in any of the fetuses. Additionally, no effects were seen on maternal absolute or relative kidney weight, gravid uterine weight, numbers of implantation sites/litter, live or dead fetuses, resorptions, postimplantation loss/litter, litters with dead fetuses or fetal sex ratio in any of the groups. As for the Domingo et al. (1989) and Gomez et al. (1991) studies, the lack of developmental effects of aluminum hydroxide at the tested dose could be related to low solubility and absorption.

DERIVATION OF ORAL RfD

Oral risk assessment of aluminum must consider variations in absorption and toxicity due to factors such as chemical form and interactions with dietary constituents, as well as normal levels of intake and intake from medicinal use. As discussed in the Introduction, there are large variations and discrepancies in quantitative estimates of gastrointestinal absorption of aluminum. It is reasonably well established, however, that water soluble aluminum compounds are better absorbed than water insoluble aluminum compounds, and that absorption of aluminum is increased by concurrent ingestion of complexing agents such as citrate and lactate. Data on soluble aluminum compounds, particularly the most highly absorbable forms such as aluminum citrate and aluminum lactate, therefore provide a more conservative basis for risk assessment. Due to an insufficiency of oral data on sensitive effects of aluminum in healthy humans (e.g., people with normal kidney function), the risk assessment will be based on animal data.

Developmental effects (particularly neurobehavioral deficits and decreased body weight gain, and possibly skeletal abnormalities) are the most sensitive endpoints of aluminum toxicity observed in orally exposed animals. There has been much interest in the neurobehavioral effects of aluminum in adult and developing animals, and a LOAEL of 100 mg Al/kg-day is identified for minimal neurotoxicity in the offspring of mice exposed to dietary aluminum lactate (soluble aluminum) during gestation and lactation (Donald et al., 1989). The neurotoxicity associated with the critical LOAEL is consistent with LOAELs from other developmental and subchronic neurobehavioral studies in mice and rats which used higher dietary dosages of aluminum lactate or aluminum chloride (Golub et al., 1989, 1992a, 1992b; Bernuzzi et al., 1989; Muller et al., 1990). None of the animal neurobehavioral development studies, however, investigated morphological abnormalities (i.e., external, visceral and skeletal).

Nonneurotoxic fetal effects were reported in two studies (Colomina et al., 1992; Paternain et al., 1988) at aluminum dosages lower than the 100 mg Al/kg-day LOAEL for developmental neurotoxicity (Donald et al., 1989), but these data are unsuitable for risk assessment for various reasons as discussed below. In particular, insufficient information on dietary aluminum (aluminum content and/or feed type) was reported which is problematic because it is known that diet can significantly add to total aluminum exposure. For example, Golub et al. (1992a) reported that commercial grain-based mouse feeds contain high levels of aluminum (200-1200 ppm), as well as excess and variable amounts of essential and nonessential trace minerals and metal binding ligands, whereas trace metal levels are precisely determined in diets that are semipurified. Additionally, these studies used bolus (gavage) treatment, which is a less relevant method of exposure than diet which was used in the critical study (Donald et al., 1989). Also maternal effects were observed at the fetotoxic doses in the Colomina et al. (1992) and Paternian et al. (1988) studies.

Colomina et al. (1992) reported reduced fetal body weight and increased incidences of cleft palate and skeletal changes (dorsal hyperkyphosis and delayed parietal ossification) in fetuses of mice exposed by gavage to 57.5 mg Al/kg as aluminum lactate on gestation days 6-15. In addition to insufficient information on dietary aluminum (commercial rather than semipurified feed was used), the usefulness of this study for risk assessment is limited by the insufficient information on basal dietary aluminum (commercial rather than semipurified feed was used) and the possibility that the effects of the 57.5 mg Al/kg-day treatment with aluminum lactate were related to the method of treatment. As there were no effects on maternal body weight gain at a dietary dosage of 100 mg Al/kg-day with aluminum lactate in the Donald et al. (1989) study, and effects on maternal body weight in other studies at higher dietary dosages were less severe and not consistently observed, the effects observed by Colomina et al. (1992) could be related to the bolus treatment.

Paternain et al. (1988) found decreased maternal body weight and an increased incidence of skeletal changes (delayed ossification, hypoplastic deformed ribs), but no consistent effects on external or visceral malformations, in rats treated with 13-52 mg Al/kg-day as aluminum nitrate by gavage on gestation days 6-14. Due to the lack of information on dietary aluminum as well as the co-exposure to nitrate, this study has limited usefulness for risk assessment.

There are some corroborating data for the skeletal variations observed by Colomina et al. (1992) and Paternain et al. (1988), but cleft palate has not been reported by investigators other than Colomina et al. (1992). The reason for this is unclear, but it could be related to differences in species and/or effective doses due to variations in aluminum dietary content and factors affectir absorption such as chemical form (e.g., use of less absorbable aluminum hydroxide). For example, offspring of rats that were treated with 133 mg Al/kg as aluminum hydroxide combined with citric acid, by gavage on gestation days 6-15, had skeletal variations (increased delayed occipital and sternebrae ossification and increased absence of xiphoides) and reduced fetal weight (Gomez et al., 1991). There were no external, visceral or skeletal abnormalities, however, in offspring of rats similarly treated with aluminum hydroxide alone or aluminum citrate (Gomez et al., 1991), or in mice treated with 23.9-95.5 mg Al/kg-day as aluminum hydroxide by gavage on gestation days 6-15 (Domingo et al., 1989). Studies in which aluminum lactate or aluminum chloride was injected in rats, mice or rabbits during gestation found effects on skeletal ossification but no evidence of cleft palate or other teratogenicity (Colomina et al., 1992; ATSDR, 1992). Additionally, the oral neurobehavioral development studies reported nothing that raises suspicion for induction of cleft palate even though they used dietary dosages of aluminum lactate higher than the gavage dosage that induced cleft palate.

Other developmental studies with aluminum hydroxide and/or citrate in mice and rats identified NOELs which are equivalent to (95.5 mg Al/kg-day) or greater than (133 mg Al/kg-day) the 100 mg Al/kg-day critical LOAEL (Domingo et al., 1989; Gomez et al., 1991), but these NOELs do not reflect developmental neurotoxicity because this sensitive endpoint was not evaluated. This overlap between the critical LOAEL and these NOELs could also be related to differences in effective doses due to variations in unreported aluminum dietary content and factors affecting absorption such as chemical form (e.g., the use of less absorbable aluminum hydroxide).

Systemic toxicity data for dosages below levels inducing developmental effects include a LOAEL of 43.3 mg Al/kg-day for decreased body weight gain in mice exposed to aluminum chloride for 180-390 days (Ondreicka et al., 1966), but this study is inappropriate for risk assessment due to small sample size, and poor reporting of study details. Aluminum nitrate caused alterations in levels of brain biogenic amines and hepatic and hematological indices in rats exposed to 21.4 mg Al/kg-day for 6 weeks (Flora et al., 1991). This dose is a NOAEL because insufficient information is available to determine if the effects are adverse, however, confidence in the value is low due to a lack of information on level of dietary aluminum.

Based on the preceding considerations related to the Colomina et al. (1992) and Paternain et al. (1988) studies, particularly concern associated with the lack of information on actual dosage, occurrence of maternal toxicity and uncertain relevance of bolus treatment to human exposure, it is most appropriate to use the LOAEL of 100 mg Al/kg-day for minimal neurotoxicity in the offspring of mice (Donald et al., 1989) as the basis for the RfD. The LOAEL is considered minimal because the results of the postweaning neurobehavioral test battery indicate that performance deficits may be marginal. In particular, of the three observed effects (decreased forelimb and increased hindlimb grip strengths, increased hindlimb foot splay distance), one effect (increased grip strength) has unclear toxicological significance and two effects (increased grip strength and foot splay distance) did not persist after two weeks of nonexposure. Application of an uncertainty factor of 100 (3 for use of a minimal LOAEL, 10 for interspecies extrapolation, and 3 for intrahuman variability) results in a provisional RfD of 1E-0 mg Al/kg-day. A factor of 3 is used for intrahuman variability because the critical effect is in a sensitive subgroup (i.e., developing infants exposed during pregnancy and lactation). The provisional RfD of 1E-0 mg Al/kg-day is approximately 3-fold higher than estimated normal daily aluminum intake of approximately 0.2-0.3 mg/kg-day (Iyengar et al., 1987; Ganrot, 1986; Wilhelm et al., 1990). Chronic users of medications such as antacids, buffered aspirins and antiulceratives can ingest much larger amounts of aluminum, possibly as high as 10-70 mg/kg-day, but do not represent the most sensitive population (developing infants) as indicated by the animal data.

Medium confidence is placed in the critical study as it only identifies a LOAEL for a sensitive effect and evaluated small numbers of animals. Confidence in the data base is low because the most reliable supporting data for neurotoxicity of aluminum in humans is of limited general relevance (e.g., dialysis encephalopathy is manifested in patients with impaired renal function and excessive aluminum uptake from intravenous exposure), neurotoxicity has not been assessed in animals chronically exposed to aluminum, developmental morphology has not been adequately investigated in two animal species, and a well-designed two generation reproduction study is lacking. These limitations in the aluminum data base do not increase uncertainty in the RfD; therefore, a data base uncertainty factor was not used. Reflecting the low confidence in the data base, there is low confidence in the RfD. The aluminum form should be considered when using the RfD because it is based on conservative data (i.e., soluble aluminum compounds) and differences in the absorption of aluminum compounds may be large. However, the range of uncertainty associated with the RfD lessens concern for differences in absorption due to chemical form or other factors.

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March 19, 1999

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ASSISTANCE REQUESTED: Chronic Oral Toxicity Information for Cobalt and Trichloroethylene *(Defense Depot Memphis / Memphis, MI)*

ENCLOSED INFORMATION: Attachment 1: **Risk Assessment Issue Paper for: Provisional RfD for Cobalt (7440-48-4)**

STSC has no current Chronic Oral RfD for Trichloroethylene, Harlal Choudhury has to authorize the release of this retired issue paper. Unfortunately, he will be out of the office until next week. In the meantime, it may be helpful to call the chemical contact, Jim Cogliano at 202-564-3269. If you have any questions please feel free to call.

BE ADVISED: It is to be noted that the attached Risk Assessment Issue Papers have not been through the U.S. EPA's formal review process. Therefore, they do not represent a U.S. EPA verified assessment. If you have any questions regarding this information, please contact the STSC at (513) 569-7300.

Attachments

Attachment 1

(96-027/12-01-97)

Risk Assessment Issue Paper for:
Provisional RfD for Cobalt (7440-48-4)

Cobalt has been found to stimulate the production of red blood cells in humans and, therefore, has been used as a treatment for anemia. In 12 anemic, anephric patients undergoing dialysis, treatment with 0.18 mg cobalt/kg/day as cobalt chloride for 12 weeks resulted in a significant rise in hemoglobin (Duckham and Lee, 1976). Taylor et al. (1977) reported similar effects in 8 anephric patients treated with 0.16-0.32 mg cobalt/kg/day as cobalt chloride for 12-32 weeks. In both studies, hemoglobin levels returned to pre-treatment levels following the cessation of treatment. Similar effects were reported in nonanemic humans and animals (Davis and Fields, 1958; Krasovskii and Fridlyand, 1971). Reversible polycythemia was reported in 6 normal male subjects following treatment with 1 mg cobalt/kg/day as cobalt chloride for 25 days (Davis and Fields, 1958). In normal rats, treatment with 0.5 mg cobalt/kg/day, but not 0.05 mg/kg/day, as cobalt chloride resulted in polycythemia and an increase in hemoglobin (Krasovskii and Fridlyand, 1971). An increase in hematocrit and hemoglobin levels was not observed, however, in pregnant women treated with 0.5-0.6 mg cobalt/kg/day for 90 days in an attempt to alleviate the anemia often found during pregnancy (Holly, 1955).

Much of the oral data in humans deals with the cardiomyopathy seen in people who drank large quantities of beer containing cobalt chloride (used to stabilize the foam) (Alexander, 1969, 1972; Morin et al., 1971). The people ingested 0.04-0.14 mg cobalt/kg/day (approximately 8-30 pints of beer daily) over a period of years (Alexander, 1969, 1972; Morin et al., 1971). The cardiomyopathy in the beer-drinkers, termed "beer-cobalt cardiomyopathy," was fatal to 43% of the subjects within several years, with approximately 18% of these deaths occurring within the first several days. The beer-cobalt cardiomyopathy appeared to be similar to alcoholic cardiomyopathy and beriberi, but the onset of the beer-cobalt cardiomyopathy was much more abrupt. The practice of adding cobalt to beer to stabilize the foam has been discontinued. It should be noted, however, that the cardiomyopathy may have also been due to the fact that the beer-drinkers had protein-poor diets and may have had prior cardiac and hepatic damage from alcohol abuse. Treatment of both pregnant and nonpregnant anemic patients with comparable or much higher doses of cobalt (0.09-1 mg cobalt/kg/day) did not result in effects on the heart (Duckham and Lee, 1976; Davis and Fields, 1958; Holly, 1955; Taylor et al., 1977).

Cobalt has been found to be a sensitizer in humans. Individuals are sensitized following dermal or inhalation exposure, but flares of dermatitis may be triggered following cobalt ingestion. One study was located that orally challenged cobalt-exposed workers in order to assess sensitization (Veien et al., 1987). In this study, several patients with eczema of the hands were challenged orally with 1 mg cobalt (0.014 mg cobalt/kg/day as cobalt sulfate) in tablet form once per week for 3 weeks and 28/47 patients had a flare of dermatitis following the oral challenge (Veien et al., 1987). Forty-seven patients had positive patch tests to cobalt (13 to cobalt alone and 34 to nickel and cobalt) and 7 of the 13 patients that patch tested positive to cobalt reacted to the oral challenge. Using both the oral challenge and dermal patch tests, it was determined that the cobalt allergy was systemically induced. The exposure levels associated with sensitization to cobalt following inhalation or dermal exposure were not established.

Interrelationships have been found to exist between cobalt and nickel sensitization (Bencko et al., 1983; Rystedt and Fisher, 1983; Veien et al., 1987). In guinea pigs, nickel and cobalt sensitization appear to be interrelated and mutually enhancing (Lammintausta et al., 1985). Therefore, it is possible that in people sensitized by nickel, exposure to cobalt may result in an allergic reaction. The elicitation of an allergic response in cobalt-sensitized workers was considered for the derivation of an oral RfD. An oral RfD was not derived because a NOAEL for the elicitation of the allergic response in humans was not defined and, because interrelationships exist between cobalt and nickel sensitization, people sensitized by nickel may have an allergic reaction following cobalt exposure. Consequently, it is impossible to certify that an RfD based on this effect would provide sufficient protection for sensitive individuals.

Three studies were located examining the developmental effects of orally administered cobalt (given as cobalt chloride) in rodents (Domingo et al., 1985; Paternain et al., 1988; Seidenberg et al., 1986). Domingo et al. (1985) treated pregnant female rats to 5.4 to 21.8 mg cobalt/kg/day from gestation day 14 through lactation day 21. Fetal effects included stunted growth of the pups at 5.4 mg cobalt/kg/day and decreased survival at 21.8 mg cobalt/kg/day. These effects occurred at levels that were maternally toxic (authors did not specify the effects), therefore, the effects may be a result of maternal toxicity and not cobalt treatment. No teratogenic effects were reported.

No significant effects on fetal growth or survival were found in rats exposed to 6.2 to 24.8 mg cobalt/kg/day during gestation days 6-15 (Paternain et al., 1988), although a nonsignificant increase in the incidence of stunted fetuses was found in the animals treated with 12.4 or 24.8 mg cobalt/kg/day. Maternal effects, however, including reduced body weight and food consumption and altered hematological parameters, were reported. No fetal effects were reported in mice exposed to 81.7 mg cobalt/kg/day during gestation days 8-12 (Seidenberg et al., 1986), but a significant decrease in maternal weight was found.

Several studies reported testicular degeneration and atrophy in rats exposed to 5.7 to 30.2 mg cobalt/kg/day as cobalt chloride for 2-3 months in the diet or in the drinking water (Corrier et al., 1985; Domingo et al., 1984; Mollenhauer et al., 1985; Nation et al., 1983; Pedigo et al., 1988).

Given the database, the most sensitive indicators of cobalt toxicity following oral exposure are the increase in hemoglobin in both humans and animals, and the elicitation of dermatitis in sensitized individuals.

An alternative approach was likewise evaluated based on the hematological effects of cobalt treatment (increase in hemoglobin) in anemic dialysis patients (Duckham and Lee, 1976). The results of this study are supported by a similar study in anephric patients (Taylor et al., 1977). Hematological effects of cobalt were also found in studies in normal humans (Davis and Fields, 1958) and rats (Krasovskii and Fridlyand, 1971) indicating that the effect is not limited to anephric individuals. The data of Davis and Fields (1958) reported hemoglobin increase of 6-11 % over "normal" in "normal" volunteers given 0.96 mg cobalt/kg/day as cobaltous chloride. However, the data of Duckham and Lee (1976) describes a case of refractory anemia in patients with chronic renal failure that upon treatment with 0.18 mg cobalt/kg/day for 12 weeks responded favorably. The patients hemoglobin levels were increased to levels at or near low "normal" clinical levels from levels clinically described as anemic. The anemia recurred following cessation of treatment. Thus, this effect of cobalt administration in the Duckham and Lee (1976) study (and likewise that of Taylor et al., 1977) cannot be termed adverse, but are actually clinically beneficial to patients with renal disease. Consequently, these data cannot be used to derive an oral RfD.

Summary of Additonal Oral Studies on Cobalt to be Included in Master List Uptate

Male Sprague-Dawley rats (12 per group) were exposed to one of three diets: control diet, a diet containing 12% protein ("protein-restricted" control) or the protein-restricted diet containing cobalt sulfate at a concentration to achieve 8.4 mg Co/kg-day (40 mg $CoSO_4 \cdot 7H_2O$/kg-day) (Pehrsson et al., 1991). After eight weeks rats, were euthanized and hearts were isolated and perfused in a Langendorff perfusion circuit for assessment of left ventricular function. Body weights of rats exposed to 8.4 mg Co/kg-day were significantly lower (37%, $p<0.05$) than rats maintained on the protein-restricted control diet. No significant differences in left ventricular function were observed between the three diet groups. Myocardial Co concentrations were 1.5-4 mg Co/kg wet weight after eight weeks of exposure to 8.4 mg Co/kg-day compared to 0.05-0.18 after eight weeks on either of the two control diets. In a subsequent follow-up study (see below), cardiac function was assessed in rats after a 16 or 24 week exposure Co; the longer exposure duration resulted in higher myocardial Co concentrations and impairment of left ventricular function (Haga et al., 1996).

In the follow-up study, male Sprague-Dawley rats (12-16 per group) were exposed to a conventional control diet or a diet containing cobalt sulfate to achieve a daily intake of 8.4 mg Co/kg-day (40 mg $CoSO_4 \cdot 7H_2O$/kg-day) (Haga et al., 1996). The Co intake in the control group was not reported. After 16 or 24 weeks on the diets, rats were euthanized and hearts were isolated and perfused in a Langendorff perfusion circuit for assessment of left ventricular function. Body weights of rats exposed to 8 4 mg Co/kg-day were significantly lower than control rats after 16 weeks (26%, $p<0.0001$) and 24 weeks of exposure (31%, $p<0.001$). The ratio of left ventricular weight to body weight was significantly higher in rats exposed to 8.4 mg Co/kg-day for 24 weeks (30%, $p<0.001$). After 16 weeks of exposure, coronary flow index was significantly higher compared with controls ($p<0.01$) suggesting lower flow resistance in the coronary vascular bed. After 24 weeks of exposure, impairment of left ventricular function was more pronounced and characterized by decreased myocardial distensibility (reduced left ventricular pressure decay during diastole and pressure rise during systole, compared with control) in addition to reduced coronary flow resistance. Thus, the LOAEL was 40 mg/kg-day for left ventricular hypertrophy and impaired systolic and diastolic left ventricular function. Myocardial Co concentrations were 10-11 mg Co/kg wet weight after 16 and 24 weeks of exposure, compared with 0.12-0.13 mg Co/kg in the controls. The higher Co concentrations are 2-3 times greater than the Co concentrations achieved in the previous study of Pehrsson et al. (1991), and may explain why impaired ventricular function was evident after the longer exposure duration used in the Haga et al. (1996) study. [Hearts from human victims of "beer drinkers' myocardiopathy" were found to have a mean cobalt concentration of 0.48 mg Co/kg comapred to 0.04 mg Co/kg in controls (Sullivan et al., 1968).]

Male guinea pigs (20 per group) were exposed to one of six isocaloric diets for 5 weeks: standard Purina Guinea Chow (SGPC), SPGC plus 20 mg/kg-day Co as cobalt sulfate, SPGC (liquefied) plus 2 g/day ethanol with or without 20 mg/kg-day Co, SPGC (liquefied) plus sucrose with or without 20 mg/kg-day Co (Mohiuddin et al., 1970). Mortality at 5 weeks in the cobalt groups was 4-5 of 20; compared with 0-1/20 in the groups that did not receive the Co supplemented diets. Guinea pigs in the Co-supplemented groups had tachypnea, weakness and hindlimb paralysis (incidence not reported). Absolute and relative heart weights in all Co-supplemented groups were significantly greater than in the groups not supplemented with Co (28%, $p<0.01$). Gross examination of the heart after five weeks of exposure revealed pericardial effusion in 45-50% of all of the Co-supplemented guinea pigs and in none of the guinea pigs that did not receive Co. Microscopic examination revealed in all of the Co-supplemented groups, but not the other groups: pericardial thickening; myocardial degeneration without inflammation (e.g., absence of cellular infiltration) characterized by loss of myofribrillar material, vacuolization and increased intracellular lipid and glycogen content; endocardial edema and thickening; and thrombi in all heart chambers. Electron microscopic examination revealed in the Co-supplemented groups: loss of intracellular myofibrillar elements, changes in mitochondria shape, size and cristae morphology, dilated sarcoplasmic reticulum, intracellular lipid droplets. A greater incidence of abnormal electrocardiograms (ECG) including bradycardia, loss of QRS voltage and repolarization abnormalities were recorded in the Co-supplemented groups beginning in the 3rd and 4th weeks of exposure (65% abnormal ECG in SPGC group plus Co compared with 5% in the SPGC group). Specific ECG abnormalities consisted of a greater incidence in the Co-supplemented group (e.g., incidence in SPGC plus Co/incidence in SPGC) of bradycardia (80%/5%), decreased QRS voltage (75%/10%), A-V conduction delay (25%/5%) and S-T changes (65%/5%). The 20 mg Co/kg-day exposure used in this study defines a FEL for mortality and functional and histopathologic heart lesions in guinea pigs exposed to Co in food for five weeks.

In a subchronic reproductive study, adult male B6C3F1 mice were exposed to drinking water containing 400 mg Co/L as cobaltous chloride or given drinking water without Co supplementation (control); mice were fed Purina Rodent Chow (Pedigo and Vernon, 1993). The estimated dosage assuming an adult body weight of 0.04 kg and default drinking water intakes for male B6C3F1 mice (U.S. EPA, 1987) was 93 mg Co/kg-day. A dominant lethal assay was conducted after 10 weeks of exposure: Co-exposed and control males (10 per group) were mated with control females over a period of two weeks; pregnant females were euthanized on day 19 of pregnancy and fetuses were evaluated for gross abnormalities, response to tactile stimuli, and size (data not reported); resorptions and preimplantation losses were quantified. Males from both groups were euthanized after the dominant lethal assay was completed and epididymal sperm concentration and sperm motion characteristics. In a concurrent fertility study, males from the Co-exposed and control groups were mated overnight with control females (superovulated by injection of pregnant mare serum gonadotropin) after 7 and 10 weeks of exposure to Co and 2, 6 and 8 weeks after cessation of exposure to Co. Pregnant females were euthanized on day 2 of pregnancy and the number of ova/embryos and percentage of embryos that were 2-cell or greater (fertilized) were determined. The dominant lethal assay showed a significantly ($p \leq 0.001$) lower percentage of pregnant females (58% vs 91%) and average number of implantations per female (6.5 vs 8.3) in the cobalt-exposed groups compared controls and a significantly higher average number of preimplantation losses in the cobalt-exposed group (2.4 vs 0.43); post-implantation losses were not different in the two groups. Sperm concentration was significantly lower after 10 weeks of exposure to Co compared with control and remained significantly lower eight weeks after exposure to Co ceased. Sperm motion (motility, path velocity, progressive velocity, linearity, progressive motility and track speed) was significantly depressed after 10 weeks of exposure to Co compared with controls but recovered eight weeks after exposure to Co ceased. After 12 weeks of exposure, male fertility rate in the Co-exposed groups was significantly reduced compared with males in the control group (1.8% ova fertilized vs 82.4% fertilized) and recovered to control levels eight weeks after exposure to Co ceased. This study defines a LOAEL of 93 mg Co/kg-day for impairment of reproduction in mice.

The only known nutritional, but vital function of cobalt is as a cofactor of vitamin B_{12}. In humans, vitamin B_{12} is derived from bacterial synthesis and therefore, cobalt is essential for animal species, such as ruminants, that depend totally on their bacterial flora for vitamin B_{12}. There is no evidence that the intake of cobalt is ever limiting in the human diet, and therefore no RDA is deemed necessary for cobalt (NRC, 1989). It should be noted that the average daily intake of cobalt in humans ranges from approximately 0.002-0.008 mg cobalt/kg/day in adults (0.16-0.58 mg cobalt/day ÷ 70 kg; Tipton et al., 1966; Schroeder et al., 1967) and 0.01-0.06 mg cobalt/kg/day in children (0.3-1.77 mg cobalt/day ÷ 28 kg; NRC, 1989; Murthy et al., 1971). Murthy et al. (1971) indicated that the children in this study ranged in age from 9-12 years. Using the average weight of 28 kg for children aged 7-10 years (NRC, 1989), the average daily intake for the children in this study ranged from 0.01-0.06 mg/kg/day. If the default adult weight of 70 kg is used with the Murthy data, then the range of intake would be from 0.004-0.025 mg/kg/day.

The effects of chronic occupational exposure to cobalt on the respiratory system are well documented. Cobalt has been found to be the etiologic agent in hard metal disease. The observed effects include respiratory irritation, wheezing, asthma, pneumonia and fibrosis and have been found to occur at exposure levels ranging from 0.003 to 0.893 mg cobalt/m^3 over a period of 2-17 years (Davison et al., 1983; Demedts et al., 1984; Kusaka et al., 1986a;b; Raffn et al., 1988; Shirakawa et al., 1988; Sprince et al., 1988).

Studies have implicated cobalt as a sensitizer in humans. Although the minimum exposure level associated with cobalt sensitization has not been determined, work-related asthma was found in hard metal workers who were occupationally exposed (for greater than 3 years) to levels of cobalt ranging from 0.007 to 0.893 mg cobalt/m^3 (Shirakawa et al., 1988). Given the database, the most sensitive indicators of cobalt toxicity by inhalation exposure are the effects on the respiratory system in both humans and animals and allergic responses in cobalt-sensitized individuals.

The data described above does not identify a single study, animal or human, that could be used to properly derive an oral RfD. In unusual circumstances, i.e., excessive beer drinking or through occupational sensitization, cobalt has been shown to manifest toxicological symptomatology. However, these reports provide inadequate data on which to derive an RfD. Furthermore, use of inhalation data to derive an oral RfD is precluded due to portal of entry effects. It is apparent that the upper range of average intake for children (0.06 mg/kg/day) is below the levels of cobalt needed to induce polycythemia in both renally comprised patients (0.18 mg/kg/day) and normal patients (0.96 mg/kg/day).

Therefore, in lieu of an oral RfD for cobalt and given the ubiquitous nature of cobalt and the relatively well characterized intake of cobalt in food, it is recommended that the intake levels described above be used as guidance for oral exposure to cobalt.

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ASSISTANCE REQUESTED: Chemical Toxicity for Several Chemicals (DDMT site)

ENCLOSED INFORMATION:

Attachment 1: **Risk Assessment Issue Paper for: Derivation of Oral Slope Factor for Chloroethane (CASRN 75-00-3)**

Attachment 2: **Risk Assessment Issue Paper for: Derivation of Provisional RfD for Chloroethane (Ethyl Chloride) (CASRN 75-00-3)**

Attachment 3: **Draft Risk Assessment Paper for: The Development of a Provisional Oral Subchronic RfD for Carbon Tetrachloride (CASRN 56-23-5)**

Attachment 4: **Risk Assessment Issue Paper for: Provisional RfD for Cobalt (7440-48-4)**

Attachment 5: **Risk Assessment Issue Paper for: Feasibility of RfD Derivation for 2-Methylnaphthalene (CASRN 91-57-6)**

Attachment 6: **Risk Assessment Issue Paper for:**

Deriving Toxicity Values for Acute Exposure to PCBs (CASRN 1336-36-3): The Development of Provisional RfDs and RfCs for Oral, Inhalation and Dermal Exposure

Attachment 7: **Risk Assessment Issue Paper for: Carcinogenicity Information for Tetrachloroethylene (perchloroethylene, PERC) (CASRN 127-18-4)**

Attachment 8: **Risk Assessment Issue Paper for: Derivation of Provisional RfC for Tetrachloroethylene (CASRN 127-18-4)**

Attachment 9: **Risk Assessment Issue Paper for: Carcinogenicity Information for Trichloroethylene (TCE) (CASRN 79-01-6)**

Please note that the attached risk assessment issue papers for chloroethane are more than two years old, and therefore no longer considered current by STSC. Harlal Choudhury, NCEA-Cin, has authorized these issue papers to be sent in conjunction with this request.

BE ADVISED: It is to be noted that the attached Risk Assessment Issue Papers have not been through the U.S. EPA's formal review process. Therefore, they do not represent a U.S. EPA verified assessment. If you have any questions regarding this information, please contact the STSC at (513) 569-7300.

Attachments

Attachment 1

(93-20/04-05-93)

Risk Assessment Issue Paper for:
Derivation of Oral Slope Factor for
Chloroethane (CASRN 75-00-3)

The carcinogenic assessment for chloroethane has recently been reevaluated. A final decision was not made regarding a weight-of-evidence classification for chloroethane (Group C or Group B2), however the issues involved in making such a decision are outlined below.

ECAO-Cincinnati has been working on a quantitative carcinogenicity assessment for chloroethane and other chlorinated ethanes that may incorporate pharmacokinetic modeling. However, this effort is not yet completed and is not available at this time.

The following sources were checked for pertinent review documents and information: IRIS (U.S. EPA, 1996a), HEAST (U.S. EPA, 1995), RfD/RfC and CRAVE Work Group Status Reports (U.S. EPA 1996b,c), OHEA/CARA list (U.S. EPA, 1994b), Drinking Water Regulations and Health Advisories list (U.S. EPA, 1994a), and NTP Status Reports (NTP, 1993a,b). These documents include: the ATSDR Toxicological Profile for Chloroethane (ATSDR, 1989), an RQ document (U.S. EPA, 1983), a Drinking Water Health Advisory (U.S. EPA, 1986a), and a TIER I document (U.S. EPA, 1988). The following computer searches, performed in May 1991 and updated in March 1993, were screened to identify additional pertinent studies not discussed in review documents: TOXLINE (inhalation toxicity and cancer stratagey from 1965-1993, oral toxicity and cancer strategies from 1981-1993), CANCERLINE (1981-1993), MEDLINE 1989-1991, RTECS and HSDB.

WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- Group B2, probable human carcinogen classification may be appropriate.
Basis -- There appear to be no human data available, and the available animal data are restricted to a 2-year inhalation NTP bioassay in rats and mice. NTP concluded that clear evidence of carcinogenicity was presented for female mice displaying uncommon carcinomas of the uterus and liver tumors. Data for male mice were considered by the investigators to be inadequate to assess carcinogenic activity due to decreased survival not related to carcinogenic effects, although increased incidence of alveolar/bronchiolar tumors were observed in exposed male mice. NTP reported that equivocal evidence was found for male and female rats displaying skin neoplasms and uncommon malignant astrocytomas of the brain, respectively.

HUMAN CARCINOGENICITY DATA -- Data regarding the carcinogenicity of chloroethane in humans were not located in the available literature.

ANIMAL CARCINOGENICITY DATA -- Data regarding the carcinogenicity of chloroethane in animals are restricted to a report on two-year inhalation studies in B6C3F1 mice and F344/N rats (NTP, 1989). For each species, groups of 50 animals of each sex were exposed to chloroethane concentrations of 0 (inhalation chamber controls) or 15,000 ppm 6 hours per day, 5 days per week for 102 weeks (rats) or 100 weeks (mice). In a preliminary study of the same two species, groups of 10 animals of each sex were exposed to chloroethane concentrations of 0, 2,500, 5,000, 10,000 or 19,000 ppm 6 hours/day, 5 days/week for 13 weeks. No histopathological effects or increased mortality associated with exposure were noted in either species in the 13-week studies, but the final mean body weights of all exposed groups were lower than those of the controls. The largest reduction in body weight was observed in male mice exposed to the highest concentration; mean body weights were 8% lower than that of control males. Even though the preliminary study did not clearly define a MTD for chloroethane, the authors apparently chose the 15,000 ppm level for the 2-year study because of concerns about the potential flammability and explosion hazard of higher concentrations.

No significant differences in survival were noted between exposed and control groups of rats of either sex, but survival of exposed and control male rats was unusually low at the end of the study. The authors reported that unusually high incidences of mononuclear cell leukemia in both control and exposed groups of male rats may have contributed to the high mortality. The authors also reported that survival for all groups was sufficient through weeks 90 and 95 to evaluate carcinogenicity. At the end of the study (102 weeks), survival for male rats was 16/50 (controls) and 8/50 (exposed) and for female rats was 31/50 (controls) and 22/50 (exposed); however, at 90 weeks, survival was 37/50 (control) and 31/50 (exposed) for respective male groups and 43/50 (control) and 33/50 (exposed) for females. Mean body weights of exposed male rats were 4%-8% lower than those of controls after week 33 and in exposed female rats body weights ranged from 5-13% lower than controls after week 11.

Three exposed female rats displayed uncommon astrocytomas (malignant glial cell tumors of the brain). The authors reported that although the overall incidence of malignant glial cell tumors (3/50) was not statistically significantly different from the concurrent controls (0/50), it was statistically significantly increased ($P<0.05$) relative to incidences for previous chamber control groups at the study laboratory (1/297) or for untreated control female F344/N rats from previous NTP studies (23/1,969 = 1%). Primary tumors of glial cell origin were also observed in male rats. One control male had a malignant oligodendroglioma. A benign oligodendroglioma and a malignant astrocytoma were observed in two exposed males.

Five exposed male rats had epithelial tumors of several types with similar characteristics (trichoepithelioma, sebaceous gland adenoma, and basal cell carcinoma). The combined overall incidence (5/50) was not significantly different from the concurrent control incidence (0/50), but statistical significance (P<0.05) could be demonstrated when comparisons were made to historical incidences in chamber controls at the study laboratory (2/300) or in untreated controls in NTP studies (30/1,936 = 1.5%).

The authors concluded that the study provided equivocal evidence of carcinogenic activity in both male and female F344/N rats, because although comparisons with concurrent controls indicated no carcinogenic effect, comparisons with historical controls indicated a carcinogenic effect.

Survival of exposed mice was significantly lower than that of control mice; statistical significance for reduced survival was demonstrated for exposed male mice after day 330 and for exposed female mice after day 574. All surviving mice were sacrificed at 100 weeks. Mean body weights of exposed male mice were up to 13% higher than control male mice. Mean body weights for exposed and female mice were generally similar throughout the study.

Decreased survivability in exposed male mice was not related to tumor occurrences. The authors noted that greater than normal incidences of nonneoplastic urogenital lesions were observed in both control and exposed male mice and that this occurrence may have contributed to the reduced survival. The overall incidences of alveolar/bronchiolar adenomas (8/48) and of alveolar/bronchiolar adenomas and carcinomas (combined) (10/48) were statistically significantly greater (P<0.05) than respective incidences for control male mice (3/50 and 5/50). The authors, however, considered the study of male B6C3F1 mice inadequate to evaluate carcinogenic activity because of the reduced survival.

Most of the early mortalities in exposed female mice were associated with carcinomas of the uterus. The overall incidence of uterine carcinomas (all of endometrial gland origin) in exposed female mice (43/50) was greater than that of the concurrent controls (0/49). Uterine carcinomas were first noted on day 469 of the study. The tumors were highly malignant, and, in 34 animals, metastasized to other organs. Exposed female mice also displayed statistically significantly higher (P<0.05) overall incidences of hepatocellular carcinomas (7/48) and hepatocellular carcinomas and adenomas (combined) (8/48) compared to respective incidences in control female mice (3/49 and 3/49). The authors concluded that there was clear evidence of carcinogenic activity in female B6C3F1 mice.

SUPPORTING DATA FOR CARCINOGENICITY -- Two reports provided evidence for the mutagenicity of chloroethane in the closed-desiccator Salmonella typhimurium test for reverse mutations. Riccio et al. (1983) observed mutations in strains TA98, TA100, TA1535 and TA1537 in both the presence and absence of metabolic activation. NTP (1989) observed mutagenic activity in strain TA1535 with or without activation and in strain TA100 only with activation, but no mutagenic activity was observed in strain TA98 with or without activation.

ATSDR (1989) reported that genotoxic activity was not observed in micronucleus tests on bone marrow samples from mice exposed to chloroethane and in cell transformation assays on mouse BALB/c-3T3 cells.

Chloroethane is structurally related to 1,1-dichloroethane, a possible human carcinogen, and to 1,2-dichloroethane and dichloromethane, both of which are probable human carcinogens (The EPA carcinogen assessments for these related compounds are on IRIS [U.S. EPA, 1994]).

QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

A q1* for chloroethane is derived below from the NTP (1989) inhalation bioassay data. It should be emphasized that there are uncertainties associated with this value due to the inclusion of only a single high exposure level in the study and the necessity of making the assumption that the carcinogenic effects of chloroethane are not specific for the inhalation route.

The occurrence of uterine carcinomas in female mice was the most dramatic carcinogenic response in the NTP bioassay and therefore appears to provide the most appropriate basis for the derivation of an oral q1*. Statistical adjustments for decreased survival in exposed female mice could be made in a comprehensive quantitative analysis, but, due to time constraints, these adjustments will not be made in the derivation herein. The incidences for the control (0/49) and exposed (43/50) groups were fit to a linearized, multistage model (Global 86). Calculations were based on extra risk. The daily dose for the exposed group of female mice (adjusted for the intermittent experimental exposure protocol) was estimated as follows:

Dose = (39,582.8 mg/m^3) (6h/24h x 5d/7d) (0.052 m^3/d) (0.031 kg)$^{-1}$

Dose = 11,856.6 mg/kg/day

where:

39,582.8 mg/m^3 = Exposure conc. = 15,000 ppm x 64.52/24.45, assuming 25 C and 760 mm Hg;

0.031 kg = time-weighted average body weight for female mice estimated from data in the NTP (1989) report;

0.052 m^3/day = inhalation rate (IR) for mice which was estimated using the following equation as described in U.S. EPA (1987):

$IR = 1.99\ [\text{body weight}]^{1\ 0496}$.

The Global 86 model estimated the q1* for mice to be 2.21E-4 per (mg/kg)/day. A human q1* was derived by multiplying the mouse q1* by the cube root of the ratio of the reference human body weight (70 kg) to the animal body weight (0.031 kg), and then by the cube of the lifespan of the animal (100 weeks) to the duration of the experiment as described in the following equation:

Human q1* = 2.21E-4 per (mg/kg)/day x $[70\ \text{kg}/0.031\ \text{kg}]^{1/3}$ x $[100/100]^3$

Human q1* = 2.21E-4 per (mg/kg)/day) x [13.12] x [1]

Human q1* = 2.9E-3 per (mg/kg)/day).

In summary, an oral cancer toxicity value of 2.9E-3 per (mg/kg)/day has been derived for chloroethane based upon incidence data for uterine carcinomas in female B6C3F1 mice exposed to inhaled chloroethane.

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Attachment 2

(96-032 / 08-30-96)

Risk Assessment Issue Paper for:
Derivation of Provisional RfD for Chloroethane (Ethyl Chloride)
(CASRN 75-00-3)

INTRODUCTION

Chloroethane is a colorless gas at room temperature and atmospheric pressure that is produced for use as an alkylating agent (ACGIH, 1991; Budavari, 1989). It was used predominantly for the manufacture of tetraethyl lead. Currently, the major use is as a blowing agent in foamed plastics (Bucher et al., 1995). Chloroethane is also used as a topical anesthetic, as a refrigerant, and in the manufacture of pharmaceuticals, dyes and other chemicals (ATSDR, 1989).

The following sources were checked for pertinent review documents and information: IRIS (U.S. EPA, 1996), HEAST (U.S. EPA, 1995a,b), RfD/RfC and CRAVE Work Group Status Reports (U.S. EPA, 1995c), CARA lists (U.S. EPA, 1991, 1994), the Drinking Water Regulations and Health Advisories list (U.S. EPA, 1995d), the ATSDR Toxicological Profile database (ATSDR, 1996) and NTP Management Status and Results Reports (NTP, 1996a,b). An inhalation RfC for chloroethane, based on developmental toxicity in mice, is available on IRIS (U.S. EPA, 1996). The health effects associated with exposure to chloroethane have been reviewed by the U.S. EPA (1988a) and the ATSDR (1989). These reviews cited no toxicological or pharmacokinetic data for oral exposures to chloroethane.

Literature searches of TOXLINE (oral toxicity and cancer strategies from 1981-1993, inhalation toxicity and cancer strategy from 1965-1993), CANCERLINE (1981-1993), RTECS and HSDB for chloroethane were conducted in March 1993. Update literature searches of TOXLINE (December 1992 - July 1996), MEDLINE (health effects, toxicity and pharmacokinetic strategies from 1993-1996), DART and TSCATS (health effects) were conducted in July 1996 and screened in August 1996 to identify additional relevant data on chloroethane.

INHALATION RfC

An inhalation RfC for chloroethane (ethyl chloride) was verified in 1990 and is available on IRIS (U.S. EPA, 1996). The principal study for the RfC was a developmental inhalation study conducted with pregnant CF-1 mice (Scortichini et al., 1986). The study identified a NOAEL

(1504 ppm [4.0 g/cu. m] for 6 hours per day on days 6 through 15 of gestation) and a LOAEL (4946 ppm [13 g/cu.m] with the same protocol) for delayed fetal ossification. In deriving the RfC from the NOAEL, duration adjustments were not made because the noted effects were developmental. To derive a NOAEL(HEC) from the mouse NOAEL, the attainment of periodicity was assumed. A default value of 1 was used for the ratio of the mouse to human blood:gas partition coefficients, because, although the coefficient for humans is known, that for mice is unknown. The NOAEL(HEC) (4.0 g/cu.m) was divided by an uncertainty factor of 300 (3 for interspecies extrapolation due to dosimetric adjustment of inhaled concentration, 10 for intraspecies variability, 10 for data base deficiencies because of the lack of a multigeneration reproductive study and definitive developmental toxicity studies) to obtain an inhalation RfC of 1E+1 mg/cu.m. Confidence in the principal study was medium because it did not establish a firm concentration-response relationship with an adverse effect and did not include an exposure level that produced maternal toxicity. Confidence in the data base was medium because of the lack of a multigeneration reproductive study, and lack of a developmental study in a second species. Medium confidence in the RfC followed.

Additional studies considered in the RfC derivation included NTP (1989) subchronic and chronic mouse and rat bioassays that found no exposure-related nonneoplastic histological changes or body weight changes (subchronic NOAEL: 19,000 ppm [50.1 g/cu.m] 6 hours per day, 5 days per week for 13 weeks; chronic NOAEL: 15,000 ppm [39.6 g/cu. m] 6 hours per day, 5 days per week for 102 weeks [rats] or 100 weeks [mice]). However, uterine tumors were found in mice, but not in rats.

PHARMACOKINETIC AND METABOLISM STUDIES

Several investigators (Dow Chemical Co., 1992; Fedtke et al., 1994a,b; Gargas et al., 1990; Pottenger et al., 1992) have studied the metabolism of chloroethane in an effort to discern the mechanism for induction of rare uterine tumors in female mice (NTP, 1989). A high-dose dependent disposition and GSH-dependent metabolism in mice has been suggested to account for the development of tumors in mice and not in rats (Pottenger et al., 1992). Fedtke et al. (1994a,b) examined cytochrome P450-dependent and GSH-dependent metabolism in a series of *in vitro* and *in vivo* experiments in groups of male and female rats and mice exposed to 15,000 ppm chloroethane or air for 6 hours/day for 5 days. The authors concluded that chloroethane may be oxidatively dechlorinated by cytochrome P450 to form acetaldehyde, which enters the 2-carbon pool and is further metabolized to ethanol and acetic acid, and that species differences in oxidative metabolism were not significant. In addition, rate constants estimated for rats from these experiments were consistent with those estimated earlier by Gargas et al. (1990) in a PB-PK model for chloroalkanes in the rat. It also was found that chloroethane may be conjugated with glutathione, converted to the mercapturic acid and excreted in the urine as the acetylated (both species) or non-acetylated (mice only) mercapturic acid. The rate of hepatic glutathione conjugation of chloroethane (measured by GSH-transferase specific activity) was found to be higher in both sexes of mice compared with rats. When GSH concentrations were measured in the lungs, liver, kidneys and uterus, GSH was decreased in the lung and uterus of mice after exposure to 15,000 ppm, 6 hours/day for 5 days, compared with GSH concentrations in these tissues after exposure to air. Decreases in GSH levels were also found in rats, but to a lesser degree in the lungs than those found in mice. Further research is needed to understand these apparent differences in organ and species GSH content. It is not clear whether the parent compound or a metabolite are responsible for the induction of cancer and/or the noncancer toxicity of chloroethane.

DERIVATION OF PROVISIONAL RfD

The IRIS Supportive Documentation (U.S. EPA, 1988b) explains that adverse effects from one route of exposure may be assumed to be relevant to another route, unless convincing evidence exists to the contrary. Factors that would argue against a route-to-route extrapolation include lack of data for a least one route of exposure, portal of entry effects (such as first pass effects or toxicity or reactivity at the site of contact), and significant differences in relative absorption efficiencies between the routes. Animal studies with chloroethane indicate that the target organ following inhalation is not the respiratory system (portal of entry), but a remote site (i.e., for the RfC, delayed fetal ossification is the critical effect). This finding, together with the limited pharmacokinetic data available for chloroethane, suggests derivation of a provisional oral RfD based upon inhalation data is feasible.

While Gargas et al. (1990) have proposed a PB-PK model for chloroethane, their experiments were conducted in rats and the most sensitive species for the RfC was mice. Chloroethane appears to be metabolized primarily by the liver, and to a lesser extend by other organs, following high-dose, short-term inhalation exposure in both rats and mice (Fedtke et al., 1994a, b). There appear to be species differences in the metabolism of chloroethane, particularly in Phase II conjugation with glutathione (Fedtke et al., 1994a, b; Pottenger et al., 1992). Decreases in glutathione noted in the lungs of mice exposed to short-term, high-doses of chloroethane do not necessarily affect the feasibility of a route-to-route extrapolation, since the target organ in mice is a "distant site", i.e., the developing fetus.

Since quantitative absorption data for the oral route are not available, relative absorption efficiencies between the two routes cannot be ascertained. Chloroethane is a gas at room temperature and atmospheric pressure, making oral exposures unlikely. However, it can be assumed that once chloroethane is absorbed by the gastrointestinal tract, the pathway(s) of metabolism would at least be qualitatively similar to those following inhalation exposure in the same species. The kinetic behavior of chloroethane is assumed to be independent of exposure route once chloroethane is absorbed. Given that the liver has a high metabolic capacity for chloroethane, quantitative differences in the metabolism between oral and inhalation exposure may exist, but it is difficult to predict what consequences these quantitative differences would have on toxicity given the current data. Therefore, in the absence of definitive data to preclude a route-to-route extrapolation for chloroethane an approach is proposed herein. This approach appears to be consistent with principles put forth by Pepelko (1987) and EPA in their 1990 Route-to-Route Extrapolation for Risk Assessment Workshop (Gerrity and Henry, 1990).

A reasonable method for determining an oral RfD from an animal inhalation NOAEL is to derive the NOAEL(HEC) from the duration-adjusted animal NOAEL, followed by derivation of an estimated oral human equivalent NOAEL [NOAEL(OHE)] using the following equation:

$$\text{NOAEL(OHE)} = \text{NOAEL(HEC)} \times \text{RAF} \times \text{IR(human)} \times (\text{BWH})^{-1},$$

where:

RAF	= ratio of absorption efficiencies to account for difference between respiratory and gastrointestinal systems,
IR(human)	= human inhalation rate (20 cu.m/day), and
BWH	= human body weight (70 kg).

It is uncertain if application of an absorption factor is warranted in this method, because of the application of the ratio of the blood:gas coefficients in the derivation of the NOAEL(HEC). There are no available data on the absorption of chloroethane following oral administration. For the purposes of this exercise, an absorption ratio of 1 has been applied; oral and inhalation absorption have been assumed to be equal.

For the case of chloroethane and the NOAEL from the Scortichini et al. (1986) study, the NOAEL(HEC) of 4 g/cu.m would be multiplied as noted above to obtain a NOAEL(OHE) of 1.143 g/kg-day. Division by an uncertainty factor of 3,000 (300 as discussed for the inhalation RfC and 10 for the route-to-route extrapolation) obtains a provisional oral RfD of 4E-1 mg/kg-day. An additional UF of 10 is applied for the route-to-route extrapolation because there are no oral toxicity data and a paucity of toxicokinetic data. Low confidence would be associated with this RfD because, although confidence in the principal study is medium, confidence in the data base is low due to lack of toxicological data for oral exposure and lack of a multigeneration reproductive study and a developmental study in a second species.

SUMMARY

In summary, this issue paper discusses the derivation of a provisional oral RfD for chloroethane from animal inhalation data. A route-to-route extrapolation appears to be feasible based on available inhalation data although there are no oral toxicological data and limited toxicokinetic information. The approach described is consistent with EPA principles for route-to-route extrapolation as discussed by Pepelko (1987) and Gerrity and Henry (1990). A provisional value of 4E-1 mg/kg-day is proposed that employs an additional uncertainty factor of 10 for route-to-route extrapolation.

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Draft Risk Assessment Paper for:
The Development of a Provisional Oral Subchronic
RfD for Carbon Tetrachloride (CASRN 56-23-5)

INTRODUCTION

A verified chronic oral RfD of 7E-4 mg/kg-day is specified for carbon tetrachloride (CTC) on IRIS (U.S. EPA, 1998). The database also ascribes a carcinogenic weight-of-evidence classification of B2 to the compound, and specifies a carcinogenic slope factor of 1.3E-1 (mg/kg-day)$^{-1}$, a drinking water unit risk of 3.7E-6 (µg/L)$^{-1}$, and an inhalation unit risk of 1.5E-5 (µg/m^3)$^{-1}$ (U.S. EPA, 1998). HEAST contains an inhalation slope factor of 5.3E-2 (mg/kg-day)$^{-1}$ for the compound (U.S. EPA, 1997). Occupational standards and guidelines have been assigned to CTC, such as a TWA-TLV and ceiling STEL of 5 ppm (31 mg/m^3) and 10 ppm (62 mg/m^3), respectively, with accompanying skin and carcinogen notations (ACGIH, 1998). Other occupational standards include, from NIOSH, a ceiling REL of 2 ppm (12.6 mg/m^3) and an IDLH of 200 ppm (1260 mg/m^3), and, from OSHA, TWA and ceiling PELs of 10 and 25 ppm respectively, plus a limiting concentration of 200 ppm to which no-one should be exposed for more than 5 minutes every 4 hours (NIOSH, 1994). An ATSDR Toxicological Profile for the compound contains an acute inhalation MRL of 0.2 ppm, an intermediate inhalation MRL of 0.05 ppm, an acute oral MRL of 0.02 mg/kg-day, and an intermediate oral MRL of 0.007 mg/kg-day (ATSDR, 1994). The U.S. EPA's CARA list contains a number of documents on CTC (U.S. EPA, 1994), including WQCDs (U.S. EPA, 1980; 1989a), HADs (U.S. EPA, 1982; 1984a), HEAs (U.S. EPA, 1984b; 1989b), an RQ document for the compound's carcinogenicity (U.S. EPA, 1989c), and an MA (U.S. EPA, 1985).

Research papers pertinent to the potential subchronic toxicological effects of CTC were sought through computer searches of the HSDB, RTECS, MEDLINE and TOXLINE (and its subfiles) databases, covering 1994-1998. The literature searches were conducted in October 1998.

REVIEW OF THE PERTINENT LITERATURE

As noted in ATSDR (1994), CTC was used as a precursor or intermediate in the manufacture of a number of industrially important chemicals, such as components of refrigerants, cleaning fluids, propellants for aerosols, etc. Since the use of some of these products is being phased out, occupational exposure to CTC might be expected to decline. However, environmental exposure to the compound remains possible because of past and present releases. Thus, the compound has been detected in at least 25% of the U.S. EPA's National Priority List (NPL) sites (ATSDR, 1994).

Case reports of human exposure, poisoning incidents, and occupational surveys point overwhelmingly to the liver as the primary target organ for the compound's toxic effects. (Tomenson et al., 1995). Experimental studies in animals have supported this conclusion by the demonstration of changes in liver function, and altered morphology and/or histopathology, resulting from acute or longer term CTC administration. For example, the verified chronic oral RfD on IRIS (U.S. EPA, 1998) is based on a subchronic oral gavage study of CTC in male Sprague-Dawley rats, in which evidence of impaired liver function and the appearance of histopathological lesions was noted at the mid- and high-dose levels (10 and 33 mg/kg-day, respectively). These data suggested the low-dose level of 1 mg/kg-day as a NOAEL for liver toxicity (Bruckner et al., 1986). Second, the IRIS compileres chose a number of experimental studies in which tumors had been formed in the liver as a result of CTC administration to develop carcinogenic slope factor and drinking water unit risk values for the compound (U.S. EPA, 1998). Third, the biomedical/toxicological literature contains many reports of studies that featured the administration of CTC as a means of inducing liver injury experimentally. Such systems have found use as a "test-bed" for studying the potentiating or mediating effects of other compounds or agents on liver toxicity (the cirrhosis model), or as a vehicle for identifying the biochemical and/or physiological changes that may have mechanistic importance as the organ becomes diseased.

In the paragraphs that follow, recent (1994-1998) articles on the longer-term toxicological effects of CTC in experimental animals and human beings have been sought and evaluated, and their utility for the development of quantitative toxicity values compared to those that formed the basis for the toxicity values that are available on IRIS or HEAST (U.S. EPA, 1998; 1997). In general, few if any of the more recent research articles on CTC have employed dose ranges at or near the threshold for the onset of the compound's toxic effects. Rather, dose levels have been chosen explicitly to ensure the formation of histopathological lesions of the liver, thereby providing a cirrhosis/fibrosis model on which other parameters could be tested or evaluated.

The principal study reported in the IRIS to derive the verified chronic RfD for CTC was that of Bruckner et al. (1986), who exposed male Sprague-Dawley rats to CTC by gavage in corn oil, using acute, subacute, and subchronic dosing regimens. For subchronic exposure, 15-16 animals/group were administered 0, 1, 10 or 33 mg/kg CTC, 5 days/week, for 12 weeks. Body weights were recorded twice weekly, and blood samples were obtained from all subjects prior to dosing on weeks 2, 4, 6, 8, 10, and 12. A key feature of the protocol was the use of a 2-week post-treatment period, in which surviving rats were allowed to recover prior to termination. Blood samples were also taken at the end of this period. A small number of clinical chemistry parameters, including the activities of sorbitol dehydrogenase (SDH), glutamate pyruvate transaminase (GPT), ornithine carbamyl transferase (OCT), and the concentration of BUN, were measured in serum as indicators of possible impairment of liver or kidney function. Excised pieces of liver and kidney were examined histopathologically.

The high-dose animals displayed marked evidence of hepatic toxicity, and the activities of OCT, GPT and SDH in serum were all elevated. Similarly, the most severe histopathological effects in the liver were evident in this group of animals. By contrast, the animals displayed few if any signs of nephrotoxicity. Fewer histopathological lesions were evident in the livers of those animals allowed a 2-week recovery period prior to sacrifice, suggesting the ability of the rat liver to recover from at least some of the toxicological impacts of CTC. However, the comparatively mild hepatocellular vacuolization that was evident at term in the mid-dose animals appeared to persist throughout the recovery period, as indicated by the existence of this feature in the majority of the survivors in this sub-group (4/7). By analogy to the histopathological manifestations of CTC toxicity, changes in the clinical chemistry parameters were also comparatively mild in the mid-dose group, with no changes in the activity of OCT or GPT, but a 3-fold increase in the activity of SDH after 12 weeks. From these data, the authors suggested a NOAEL for the hepatotoxic effects of CTC of 1 mg/kg-day, a value converting to a TWA-NOAEL of 0.71 mg/kg-day, based on the frequency of exposure (5/7 days in a week).

Data from a number of other subchronic toxicological studies that were cited on IRIS (U.S. EPA, 1998) lend support to the results of Bruckner et al. (1986). For example, Hayes et al. (1986) carried out a similar experiment in CD-mice in which, in the subchronic section of the study, 0, 12, 120, 540 and 1200 mg/kg-day CTC was administered to 20/sex/group by gavage in corn oil, every day for 90 days. Two groups of controls were included in the experimental design, consisting of 20 untreated mice and 20 receiving corn oil. A wide range of hematological, clinical chemistry and urinalysis parameters were measured at term, followed at necropsy, morphological examination of selected organs, and by histopathological examination of the liver and kidney.

CTC at the target dose levels appeared unrelated to changes in body weight, hematological or urinalysis parameters. However, a number of serum enzyme activities normally indicative of maintenance of liver homeostasis were dose-dependently increased, while blood glucose concentrations were reduced. On histopathological examination, though no treatment-related lesions were evident in the kidney of treated animals, evidence of hepatotoxicity was noted at every dose level. Consequently, the lowest dose of 12 mg/kg-day could be assigned as a LOAEL, based on the altered histopathology of the liver.

Condie et al. (1986) reported one of a number of studies that have evaluated the possible effects of vehicle on the toxicity of CTC in experimental animals. Twelve CD-1 mice/sex/group were gavaged 5 days/week for approximately 12 weeks at concentration of 0, 1.2, 12, or 120 mg/kg in either corn oil or Tween-60. During the in-life portion of the experiment, clinical signs were observed daily, while body weights, food and water consumption were recorded twice weekly. At termination, all animals were necropsied, and whole livers were excised to permit the determination of absolute and relative organ weight. Blood samples were obtained to analysis for alanine aminotransferase (ALT), aspartate aminotransferase (AST), and lactate dehydrogenase (LDH) activities in serum, and pieces of the excised livers were processed for histopathological examination.

CTC in corn oil had a much more marked effect on the change in serum enzyme activities than did equivalent amounts of the compound in Tween-60 (Condie et al., 1986). Similarly, judged subjectively, the more severe histopathological effects of CTC on the liver appeared to be associated with the corn oil vehicle. The authors considered 12 mg/kg-day to be a NOAEL for the histopathological effects of CTC in Tween-60, whereas 1.2 mg/kg-day was a more appropriate choice for the compound in corn oil.

Taken together, the points-of-departure for the subchronic hepatic toxicity in Sprague-Dawley rats and CD-1 mice in the subject studies show good consistency, with the unadjusted NOAELs falling in the region of 1 to 1.2 mg/kg-day, and a LOAEL of 12 mg/kg-day where no NOAEL was available. With a dose of 1 mg/kg-day serving as a basis for the TWA-NOAEL of 0.71 mg/kg-day as derived by the IRIS compilers, the consistency of these data lends support to the chronic and subchronic RfDs of 7E-4 mg/kg-day and 7E-3, respectively, as set forth in IRIS or HEAST (U.S. EPA, 1997; 1998).

Among more recent studies that have addressed the toxicity of CTC, the ability of the liver to recover from some of the compound's toxic effects was explored by Allis et al. (1990), who gavaged 48 male F344 rats/group with 0, 20 or 40 mg CTC/kg in corn oil, 5 days/week, for 12 weeks. Twenty-four animals/dose level provided blood samples that were used to assess clinical chemistry parameters. Homogenized pieces of liver were used as enzyme source in the measurement of cytochrome P450 activity. Other pieces of tissue were used for histopathological processing. Six animals from each dose levels were terminated on days, 1, 3, 8 and 15, post-exposure. The other set of 24 rats/group was used to measure radiolabeled sulfur colloid and 2-deoxyglucose uptake, again with 6 animals/group being examined on days, 1, 8, 15 and 22, post-exposure.

After 12 weeks, clinical chemistry measurements and morphological and histopathological examinations in the first set of rats suggested an increasing morphological and physiological impact on the liver, as the dose of CTC was increased. This was exemplified at both administered doses by increases in the serum activity of certain liver enzymes such as ALT, AST, alkaline phosphatase (AP) and LDH, and, in liver homogenates, by a reduction in the activity of cytochrome P450. Histopathologically, CTC effects were marked by the onset of cellular necrosis, and by vacuolar degeneration and cirrhosis, the most clear-cut lesions being apparent at the higher dose. However, these lesions and the clinical chemistry changes associated with them, became progressively less apparent in the post-exposure groups, suggesting that, at the termination of CTC treatment, rat livers may have the ability to recover from the well-known toxicological effects of the compound, in agreement with the results of Bruckner et al. (1986).

A more recent report by Bruckner's group re-examined the importance of vehicle in the oral toxicity of CTC, using male Sprague-Dawley rats as the animal model (Koporec et al., 1995). Eleven animals/group were gavaged at 0, 25 or 100 mg/kg in either corn oil or 1% Emulphor, 5 times/week, for 13 weeks. Three control groups were employed, one receiving no treatment, one receiving corn oil and the third receiving Emulphor. Body weights were recorded weekly, and blood samples were taken after 4, 8, and 13 weeks for the measurement of serum enzyme activities. At termination, excised pieces of liver were examined histopathologically, measured for triglyceride content, and used to prepare microsomes for cytochrome P450 and glucose 6 phosphatase assays.

Survival was poor among the high-dose groups, with approximately 70% of the subjects that received 100 mg/kg CTC in Emulphor dying prior to termination. In general, the number of deaths in rats receiving Emulphor were higher than in those receiving corn oil at the same CTC concentrations. By contrast, animals in all the control groups survived. Exposed animals displayed a reduced body weight gain in response to CTC, an effect that was more marked in those animals receiving corn oil versus Emulphor. However, the various treatments did not have much effect on liver weight. Serum enzyme activities and tissue indices such as triglyceride concentration showed profound changes in relation to the dose of CTC, as shown in Table 1. However, overall, there were no significant differences in serum enzyme activities as a result of dosing vehicle. There was a dose-related effect of CTC on the histopathology of the liver, though again, with comparatively few effects due to vehicle. For example, hepatic lesions evident at 25 mg/kg were characterized by centrilobular degeneration irrespective of vehicle, while lesions were uniformly present at the higher dose level. The deposition of collagen was typical of that seen in hepatitis or cirrhosis, and there were some signs of accompanying bile duct proliferation. Overall, however, these effects appeared not to be exacerbated by the choice of dosing vehicle, in contrast to the results reported by Condie et al. (1986) in CD-1 mice.

Table 1. **Effects of CTC and Dosing Vehicles on Serum Enzyme Activities and Liver Parameters**

CTC Treatment Groups/Vehicle	**Sorbitol Dehydrogenase (mU/mL)**			**Alanine aminotransferase (mμ/mL)**		
	4 weeks	**8 weeks**	**13 weeks**	**4 weeks**	**8 weeks**	**13 weeks**
Untreated	3 0 ± 0.9 (11)			19.3 ± 3.2 (11)		
EM control	3 4 ± 1.0 (10)			19.3 ± 2.3 (10)		
CO control	3.6 ± 1.0 (10)			18.3 ± 3.3 (11)		
25 mg/kg in EM	15 ± 8 (4)	26 ± 17 (5)	44 ± 18 (8)	24.3 ± 2.8 (4)	37.1 ± 11 (5)	38.8 ± 7.2 (8)
25 mg/kg in CO	23 ± 13 (5)	36 ± 8 (5)	41 ± 34 (10)	30.8 ± 5.7 (5)	39.9 ± 4.8 (5)	46.5 ± 23 (10)
100 mg/kg in EM	283 ± 165 (4)	344 ± 81 (5)	144 ± 58 (4)	457 ± 204 (4)	471 ± 56 (5)	182 ± 60 (4)

100 mg/kg in CO	211 ± 120 (4)	443 ± 94 (5)	100 ± 48 (6)	392 ± 279 (4)	655 ± 183 (5)	168 ± 58 (6)

Tissue Indices at termination	Cyt. P450 (nmol/mg protein)	G-6-Pase (μmol Pi/h/mg protein)	Triglyceride (μmol/g liver)
Untreated	0.83 ± 0 06	17.7 ± 1.0	18.1 ±0.9
EM control	0.74 ± 0.03	20.6 ± 1.6	16.6 ± 1.6
CO control	0.82 ± 0.07	18.7 ± 1.5	23.4 ±2.9
25 mg/kg in EM	0.71 ± 0.05	16.0 ± 2.3	36.4 ± 3.1
25 mg/kg in CO	0.84 ± 0.14	15.4 ± 2.9	26.4 ± 4.9
100 mg/kg in EM	0.46 ± 0.06	10.0 ± 1.8	28.6 ± 0.9
100 mg/kg in CO	0 45 ± 0.05	9.0 ± 1 1	27.9 ± 4.3

data taken from Koporec et al. (1995). EM = Emulphor, CO = corn oil.

Another study that addressed the issue of the effect of vehicle on the hepatotoxicity of CTC was that of Szende et al. (1994) who administered 0.2 mL/kg via gavage, 3 times/week for 8 weeks, to varying numbers of male F344 rats. A number of natural oils were used to disperse the compound, including sunflower oil, olive oil, corn oil and fish oil. Based on a compound density of 1.594 g/cc, the chosen dose level approximated to 320 mg/kg, with a full range of CTC-free oil-only control groups included in the study design. Though body weights and those of potential target organs such as the liver, spleen and testis were recorded, the primary endpoint was the histopathology of the liver and, as an index of fibrosis, the semi-quantitative estimates of the percentage of collagen content in picrosirius-stained liver sections.

Liver sections of animals exposed to CTC in corn oil, sunflower oil and fish oil displayed significantly more collagen than their respective controls, while the degree of apparent fibrosis in animals receiving the compound in olive oil was intermediate, as shown in Table 2.

Table 2. **CTC-Induced Liver Fibrosis: Effects of Various Edible Oils as Gavage Vehicle**

Treatment Group	Collagen Fiber (%)	n
Sunflower oil + CTC (320 mg/kg)	6.39 ± 3.60*	30
Corn oil + CTC (320 mg/kg)	7.51 ± 2.80*	20
Olive oil + CTC (320 mg/kg)	2.11 ± 0.54	15
Fish oil + CTC (320 mg/kg)	6.09 ± 1.80*	15
Sunflower oil controls	0 44 ± 0.20	5

Corn oil controls	0.88 ± 0.30	5
Olive oil controls	0.55 ± 0.10	5
Untreated controls	0.57 ± 0.30	5

data taken from Szende et al. (1994). * versus olive oil + CTC group

Examples of recent studies that examined the ability of experimental administration of CTC to serve as a "cirrhosis/fibrosis model" may be found in the reports of Delrat et al. (1994) and Frezza et al. (1994). Thus, Delrat et al. (1994) created a "hepatic insufficiency model" by the intragastric and/or intraperitoneal administration of the compound to groups of 4 New Zealand white rabbits at 0.035 and 0.1 mL/kg (equivalent to doses of 56 and 159 mg/kg, respectively), twice a week for 8 weeks. Intragastric and intraperitoneal controls received 0.1 mL/kg corn oil alone, using the same dosing regimen. Once a week, immediately prior to CTC administration, blood samples were taken for the measurement of ALT, AST and gamma glutamyl transferase (γ-GT) activities, plus the concentrations of creatinine, bilirubin and total protein. At termination, excised liver pieces were examined histopathologically, and other portions were used to measure microsomal cytochrome P450, UDPglucuronyltransferase (UDPGT) and cytosolic glutathione S-transferase activities. However, the primary endpoints of the study were the extent to which the experimentally induced liver displayed impaired metabolism of the xenobiotics, antipyrine and indocyanine green (ICG). These compounds were administered to CTC-treated and control rabbits by a single intravenous bolus injection at 30 mg/kg and 1 mg/kg respectively, after the 8 weeks of CTC treatment. Serial blood samples were then taken for xenobiotic analysis from zero time to 4 hours, thereby permitting an assessment of their respective pharmacokinetic parameters.

There were no treatment-related changes in the concentrations of protein, creatinine or bilirubin in the blood of New Zealand white rabbits. However, serum enzymes such as ALT, AST and γ-GT displayed a spike of activity after the first treatment, with a subsequent reduction to near normal levels. Histopathological examination of liver biopsy specimens displayed the onset of "pericentrilobular post-necrotic fibrosis", though with no evidence of any accompanying cirrhosis. Microsomal cytochrome P450 and cytosolic glutathione S-transferase activities were dose-dependently reduced irrespective of the route of CTC administration, though that of UDPGT was unchanged. In conjunction with these CTC-induced changes, the pharmacokinetic parameters of antipyrine displayed a dose-related reduction in clearance rate (CL_T), increased area under the time/concentration curve (AUC), but a broadly similar "volume of distribution at steady state (Vd_{ss})." By contrast, the pharmacokinetic parameters of ICG, a compound that is widely used to assess hepatic blood flow because of its high extraction ratio, displayed markedly lower VD_{ss} values, indicating that the hepatic injury induced by CTC appeared to be associated with altered hepatic blood flow.

Frezza et al. (1994) provided another example of an experimental study featuring the use of CTC to induce liver damage pursuant to the assessment of related biochemical and/or nutritional parameters. Female Sprague-Dawley rats received amounts of CTC by gavage (vehicle unstated) that increased periodically (from 0.08 mL to 1.6 mL) across the 30 week dosing period. At sacrifice, blood sample were taken for the measurement of trace elements, sex hormones and liver function enzymes, while all livers were examined histopathologically.

All 20 animals were reported to have developed liver cirrhosis, while six rats displayed hepatocellular carcinomas. Marked fluctuation was evident in the plasma concentrations of zinc, copper and estradiol, in relation to the histopathological state of the liver (hepatocellular carcinoma bearing versus cirrhosis only). However, the etiological significance of these findings remains unclear.

Included among recent studies that have explored the toxicokinetics of CTC in relation to the compound's hepatotoxicity are two reports by Sanzgiri et al. (1995; 1997) who examined the toxicological effects of route and pattern of exposure on the deposition of CTC in the circulation and on its delivery to certain target organs. Using a 2-way mask, the authors exposed male Sprague-Dawley rats to CTC for 2 hours via inhalation at 100 and 1000 ppm, concentrations that the authors calculated to be equivalent to dose levels of 17.5 and 179 mg/kg, respectively. These doses were subsequently administered to other rats either as a bolus gavage injection or as a gastric infusion over the same period of time as the inhalation dosing regimen (2 hours). Serial samples of blood for CTC analysis were taken from 2-60 minutes, and at intervals up to 12 hours after exposure. After 24 hours, the animals were sacrificed and further samples of blood were taken to measure the activities of SDH and AP. Excised pieces of liver were used to make microsomal preparations that were used as enzyme source in the measurement of the activities of cytochrome P450 and glucose 6 phosphatase (G6Pase).

From the hepatotoxicological standpoint, animals exposed to 17.5 mg/kg CTC showed comparatively few changes in the serum activities of SDH or AP, though the liver activities of cytochrome P450 and G6Pase were decreased compared to control. However, at the higher dose, serum activities of SDH and AP were elevated compared to controls. In general, there appeared to be more profound changes in those animals receiving CTC as a bolus, compared to those receiving the compound via inhalation or as a gastric infusion. Similarly, pharmacokinetic parameters such as the AUC and the maximum blood concentration (C_{max}) were markedly elevated in those animals receiving CTC as a bolus (Sanzgiri et al., 1995). When specific concentrations of CTC were measured in the major tissues, the liver concentrations were shown to become temporarily elevated, though the highest specific concentrations were subsequently found in adipose tissue (Sanzgiri et al., 1997). The authors noted that, as levels of the parent compound diminished rapidly in the liver, a poor correlation between CTC levels in liver and alterations of hepatotoxicity endpoints would be anticipated at the later time points. They therefore considered that measuring the quantity of reactive CTC metabolites in the liver during the initial minutes after dosing might better relate the toxic consequences of CTC exposure to its dosimetry.

An example of a recent study that investigated toxicological endpoints of CTC other than liver toxicity is that of Narotsky et al. (1997) who administered CTC at 0, 25, 50 or 75 mg/kg-day to pregnant F344 rats in either corn oil or 10% Emulphor on gestation days (GD) 6-15. Litters were examined post-natally, and those dams not delivering were examined at autopsy for full litter resorptions (FLR) using 10% ammonium sulfide as a stain. FLRs were evident at the two highest doses of CTC, with the incidences of FLR much higher in subjects receiving the compound in corn oil versus the aqueous vehicle. By contrast, surviving litters displayed no effects on gestation length, post-natal survival or pup morphology, and, while some fluctuations in pup weights were evident, these were probably unrelated to dose. Using the GD 6-15 dosing regimen, the authors considered a dose of 25 mg/kg to be a NOAEL for CTC's developmental effects (FLRs). This range of doses is far in excess of the 1 mg/kg-day value that was identified as a NOAEL for the compound's hepatotoxic effects (Bruckner et al., 1986).

DERIVATION OF A PROVISIONAL SUBCHRONIC ORAL RfD

The report by Bruckner et al. (1986) is the critical study on the oral toxicity of CTC, since the range of doses employed allowed a sub-threshold dose of 1 mg/kg-day for the compound's hepatotoxic effects to be unequivocally identified. Accordingly, this dose level serves herein as the NOAEL for developing a provisional subchronic RfD.

To calculate the provisional subchronic RfD the NOAEL is first adjusted for daily exposure, thus:

NOAEL (mg/kg-day) = 1 mg/kg x 5 days/7 days

= 0.71 mg/kg-day

The subchronic RfD = NOAEL / UF x MF

= 0.71 mg/kg-day /100 x 1

= **7E-3** mg/kg-day

where: the uncertainty factor (UF) of 100 is calculated from factors of 10 for extrapolation from rats to humans and 10 to protect sensitive subpopulations.

Confidence in the Derived Provisional Subchronic RfD

Confidence in the above derivation can be evaluated in light of (1) the apparent scientific rigor with which the principal study was carried out, (2) the thoroughness with which the study's findings were documented, (3) the extent of any emerging consensus bounding the choice of principal effect, (4) the level of agreement with other studies on the likely quantitative point-of-departure for the compound's toxic effects, and (5) the completeness of the toxicokinetic database.

According to the first four criteria, the derived provisional subchronic RfD of 7E-3 mg/kg-day appears to warrant high confidence since the overwhelming body of experimental studies point to the liver as CTC's primary target organ. In addition, a number of other studies have indicated that 1 mg/kg-day is a suitable unadjusted NOAEL for the subchronic toxicity of the compound when administered orally by gavage in corn oil (Hayes et al., 1986; Condie et al., 1986). The Bruckner et al (1986) study appears to have been rigorously carried out and documented, although one possible caveat surrounds the restriction of the histopathological evaluations to the liver and kidney only. Judging the derived provisional subchronic oral RfD against the final criterion (completeness of the toxicological database for the compound) tempers the overall confidence in the derivation, since, as pointed out by the IRIS compilers (U.S. EPA, 1998), there is a comparatively small body of information on the compound's reproductive/developmental toxicity, with no 2-generation study. This data gap justifies the choice of *medium* for the overall level of confidence ascribed to the derived provisional subchronic RfD.

Remaining uncertainties include the justification for including or excluding a further UF component (3 or 10) to cover the incompleteness of the toxicological database referred to above. In this assessment, while recognizing that certain data elements pertaining to the possible reproductive/developmental toxicity of CTC are missing, choosing to exclude this UF component from the final derivation centers on the likelihood that, based on existing evidence, the reproductive/developmental NOAEL may be at least an order of magnitude greater than that observed for the compound's hepatotoxic effects.

RISK CHARACTERIZATION FOR CARBON TETRACHLORIDE

Cancer Hazard Summary In accordance with the U.S. EPA's Guidelines for Carcinogenic Risk Assessment (U.S. EPA, 1986), IRIS ascribes a weight-of-evidence classification for CTC of "B2" -a probable human carcinogen based on inadequate evidence in human beings and sufficient evidence in animals (U.S. EPA, 1998). In terms of the descriptors provided in the agency's Proposed Guidelines for Carcinogenic Risk Assessment (U.S. EPA, 1996) CTC is *likely to be carcinogenic to humans via the oral route of exposure*. This weight-of-evidence is based on a number of experimental studies describing the onset of CTC-induced hepatocellular adenomas and carcinomas that IRIS used in combination to derive a carcinogenic oral slope factor and inhalation unit risk for the compound (U.S. EPA, 1998). The existence of a number of experimental studies in which liver tumors were formed in a range of animal models justifies ascribing the weight-of-evidence classification to the higher end of the confidence range.

SUPPORTING INFORMATION

Human Data No data were identified that address the potential toxicity/carcinogenicity of the compound in human beings.

Animal Data Included in the positive carcinogenicity data discussed in IRIS, were the formation of hepatocellular adenomas and carcinomas in Osborne-Mendel rats, B6C3F1, C3H, A, Y, C and L mice, and Syrian Golden Hamsters (U.S. EPA, 1998). As discussed earlier, the article by Frezza et al. (1994) reported hepatocellular carcinoma formation in Sprague-Dawley rats after 30 weeks of oral administration. Taken together, these data affirm the capacity of CTC to induce liver tumors in a range of species and strains of laboratory animal.

Mutagenicity In a range of experimental systems and studies discussed and tabulated by ATSDR (1994), CTC appeared to lack the capacity to induce mutagenic or genotoxic effects.

MODE OF ACTION

Since CTC has been found to be largely negative for the induction of genotoxic/mutagenic effects, it can be reasonably assumed that the carcinogenic effects of the compound may resemble those of its structural analogue, chloroform, a compound whose carcinogenicity has been shown to critically depend on tissue damage followed by hepatocellular regeneration and repair rather than perturbation of the genome (Butterworth et al., 1995). Among the mechanisms that have been invoked as being etiologically important in the toxicity of CTC is the compound's metabolism by the cytochrome P450 mixed-function oxidase system (ATSDR, 1994). Therefore, this step may represent the initial process in the induction of tumor formation by CTC.

DISCUSSION

The studies that were evaluated for their demonstration of the ability of CTC to induce liver tumors were deficient in some form (U.S. EPA, 1998). Therefore the geometric mean tumor incidence data from each individual study were used to calculate a carcinogenic slope factor of 1E-1 (mg/kg-day)$^{-1}$.

BRIEFING SUMMARY

Routes	Class	Designation or Rationale	Dose Response
oral	likely	high	linear (default)

Basis for classification/dose response

1. **Human data:** None

2. **Animal data:** A number of studies have demonstrated the formation of tumors in the liver of experimental animals.

3. **Structural analog data:** A number of chlorinated alkanes have been shown to induce tumors in laboratory animals, including CTC's closest structural analogue, chloroform.

4. **Other key data:** The compound's active metabolites are considered etiologically important in its carcinogenicity.

5. **Mode of action:** The carcinogenicity of CTC is thought to be unrelated to any direct effects of the compound or its metabolites on the genome. An emerging consensus appears to favor the tissue necrosis/regeneration model as a mechanism by which CTC brings about tumor formation.

6. **Hazard classification/uncertainties:** Because of the multiplicity of the data, confidence in the chosen weight-of-evidence descriptor for the compound is high. However, deriving a consensus carcinogenic slope factor represents an attempt to reduce uncertainty in the quantitative findings of studies that, in themselves, may lack critical information or statistical power.

7. **Dose response:** Linearity has been assumed by default.

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Attachment 4

(96-027/12-01-97)

**Risk Assessment Issue Paper for:
Provisional RfD for Cobalt (7440-48-4)**

Cobalt has been found to stimulate the production of red blood cells in humans and, therefore, has been used as a treatment for anemia. In 12 anemic, anephric patients undergoing dialysis, treatment with 0.18 mg cobalt/kg/day as cobalt chloride for 12 weeks resulted in a significant rise in hemoglobin (Duckham and Lee, 1976). Taylor et al. (1977) reported similar effects in 8 anephric patients treated with 0.16-0.32 mg cobalt/kg/day as cobalt chloride for 12-32 weeks. In both studies, hemoglobin levels returned to pre-treatment levels following the cessation of treatment. Similar effects were reported in nonanemic humans and animals (Davis and Fields, 1958; Krasovskii and Fridlyand, 1971). Reversible polycythemia was reported in 6 normal male subjects following treatment with 1 mg cobalt/kg/day as cobalt chloride for 25 days (Davis and Fields, 1958). In normal rats, treatment with 0.5 mg cobalt/kg/day, but not 0.05 mg/kg/day, as cobalt chloride resulted in polycythemia and an increase in hemoglobin (Krasovskii and Fridlyand, 1971). An increase in hematocrit and hemoglobin levels was not observed, however, in pregnant women treated with 0.5-0.6 mg cobalt/kg/day for 90 days in an attempt to alleviate the anemia often found during pregnancy (Holly, 1955).

Much of the oral data in humans deals with the cardiomyopathy seen in people who drank large quantities of beer containing cobalt chloride (used to stabilize the foam) (Alexander, 1969, 1972; Morin et al., 1971). The people ingested 0.04-0.14 mg cobalt/kg/day (approximately 8-30 pints of beer daily) over a period of years (Alexander, 1969, 1972; Morin et al., 1971). The cardiomyopathy in the beer-drinkers, termed "beer-cobalt cardiomyopathy," was fatal to 43% of the subjects within several years, with approximately 18% of these deaths occurring within the first several days. The beer-cobalt cardiomyopathy appeared to be similar to alcoholic cardiomyopathy and beriberi, but the onset of the beer-cobalt cardiomyopathy was much more abrupt. The practice of adding cobalt to beer to stabilize the foam has been discontinued. It should be noted, however, that the cardiomyopathy may have also been due to the fact that the beer-drinkers had protein-poor diets and may have had prior cardiac and hepatic damage from alcohol abuse. Treatment of both pregnant and nonpregnant anemic patients with comparable or much higher doses of cobalt (0.09-1 mg cobalt/kg/day) did not result in effects on the heart (Duckham and Lee, 1976; Davis and Fields, 1958; Holly, 1955; Taylor et al., 1977).

Cobalt has been found to be a sensitizer in humans. Individuals are sensitized following dermal or inhalation exposure, but flares of dermatitis may be triggered following cobalt ingestion. One study was located that orally challenged cobalt-exposed workers in order to assess sensitization (Veien et al., 1987). In this study, several patients with eczema of the hands were challenged orally with 1 mg cobalt (0.014 mg cobalt/kg/day as cobalt sulfate) in tablet form once per week for 3 weeks and 28/47 patients had a flare of dermatitis following the oral challenge (Veien et al., 1987). Forty-seven patients had positive patch tests to cobalt (13 to cobalt alone and 34 to nickel and cobalt) and 7 of the 13 patients that patch tested positive to cobalt reacted to the oral challenge. Using both the oral challenge and dermal patch tests, it was determined that the cobalt allergy was systemically induced. The exposure levels associated with sensitization to cobalt following inhalation or dermal exposure were not established.

Interrelationships have been found to exist between cobalt and nickel sensitization (Bencko et al., 1983; Rystedt and Fisher, 1983; Veien et al., 1987). In guinea pigs, nickel and cobalt sensitization appear to be interrelated and mutually enhancing (Lammintausta et al., 1985). Therefore, it is possible that in people sensitized by nickel, exposure to cobalt may result in an allergic reaction. The elicitation of an allergic response in cobalt-sensitized workers was considered for the derivation of an oral RfD. An oral RfD was not derived because a NOAEL for the elicitation of the allergic response in humans was not defined and, because interrelationships exist between cobalt and nickel sensitization, people sensitized by nickel may have an allergic reaction following cobalt exposure. Consequently, it is impossible to certify that an RfD based on this effect would provide sufficient protection for sensitive individuals.

Three studies were located examining the developmental effects of orally administered cobalt (given as cobalt chloride) in rodents (Domingo et al., 1985; Paternain et al., 1988; Seidenberg et al., 1986). Domingo et al. (1985) treated pregnant female rats to 5.4 to 21.8 mg cobalt/kg/day from gestation day 14 through lactation day 21. Fetal effects included stunted growth of the pups at 5.4 mg cobalt/kg/day and decreased survival at 21.8 mg cobalt/kg/day. These effects occurred at levels that were maternally toxic (authors did not specify the effects), therefore, the effects may be a result of maternal toxicity and not cobalt treatment. No teratogenic effects were reported.

No significant effects on fetal growth or survival were found in rats exposed to 6.2 to 24.8 mg cobalt/kg/day during gestation days 6-15 (Paternain et al., 1988), although a nonsignificant increase in the incidence of stunted fetuses was found in the animals treated with 12.4 or 24.8 mg cobalt/kg/day. Maternal effects, however, including reduced body weight and food consumption and altered hematological parameters, were reported. No fetal effects were reported in mice exposed to 81.7 mg cobalt/kg/day during gestation days 8-12 (Seidenberg et al., 1986), but a significant decrease in maternal weight was found.

Several studies reported testicular degeneration and atrophy in rats exposed to 5.7 to 30.2 mg cobalt/kg/day as cobalt chloride for 2-3 months in the diet or in the drinking water (Corrier et al., 1985; Domingo et al., 1984; Mollenhauer et al., 1985; Nation et al., 1983; Pedigo et al., 1988).

Given the database, the most sensitive indicators of cobalt toxicity following oral exposure are the increase in hemoglobin in both humans and animals, and the elicitation of dermatitis in sensitized individuals.

An alternative approach was likewise evaluated based on the hematological effects of cobalt treatment (increase in hemoglobin) in anemic dialysis patients (Duckham and Lee, 1976). The results of this study are supported by a similar study in anephric patients (Taylor et al., 1977). Hematological effects of cobalt were also found in studies in normal humans (Davis and Fields, 1958) and rats (Krasovskii and Fridlyand, 1971) indicating that the effect is not limited to anephric individuals. The data of Davis and Fields (1958) reported hemoglobin increase of 6-11 % over "normal" in "normal" volunteers given 0.96 mg cobalt/kg/day as cobaltous chloride. However, the data of Duckham and Lee (1976) describes a case of refractory anemia in patients with chronic renal failure that upon treatment with 0.18 mg cobalt/kg/day for 12 weeks responded favorably. The patients hemoglobin levels were increased to levels at or near low "normal" clinical levels from levels clinically described as anemic. The anemia recurred following cessation of treatment. Thus, this effect of cobalt administration in the Duckham and Lee (1976) study (and likewise that of Taylor et al., 1977) cannot be termed adverse, but are actually clinically beneficial to patients with renal disease. Consequently, these data cannot be used to derive an oral RfD.

Summary of Additonal Oral Studies on Cobalt to be Included in Master List Uptate

Male Sprague-Dawley rats (12 per group) were exposed to one of three diets: control diet, a diet containing 12% protein ("protein-restricted" control) or the protein-restricted diet containing cobalt sulfate at a concentration to achieve 8.4 mg Co/kg-day (40 mg $CoSO_4 \cdot 7H_2O$/kg-day) (Pehrsson et al., 1991). After eight weeks rats, were euthanized and hearts were isolated and perfused in a Langendorff perfusion circuit for assessment of left ventricular function. Body weights of rats exposed to 8.4 mg Co/kg-day were significantly lower (37%, $p<0.05$) than rats maintained on the protein-restricted control diet. No significant differences in left ventricular function were observed between the three diet groups. Myocardial Co concentrations were 1.5-4 mg Co/kg wet weight after eight weeks of exposure to 8.4 mg Co/kg-day compared to 0.05-0.18 after eight weeks on either of the two control diets. In a subsequent follow-up study (see below), cardiac function was assessed in rats after a 16 or 24 week exposure Co; the longer exposure duration resulted in higher myocardial Co concentrations and impairment of left ventricular function (Haga et al., 1996).

In the follow-up study, male Sprague-Dawley rats (12-16 per group) were exposed to a conventional control diet or a diet containing cobalt sulfate to achieve a daily intake of 8.4 mg Co/kg-day (40 mg $CoSO_4 \cdot 7H_2O$/kg-day) (Haga et al., 1996). The Co intake in the control group was not reported. After 16 or 24 weeks on the diets, rats were euthanized and hearts were isolated and perfused in a Langendorff perfusion circuit for assessment of left ventricular function. Body weights of rats exposed to 8.4 mg Co/kg-day were significantly lower than control rats after 16 weeks (26%, $p<0.0001$) and 24 weeks of exposure (31%, $p<0.001$). The ratio of left ventricular weight to body weight was significantly higher in rats exposed to 8.4 mg Co/kg-day for 24 weeks (30%, $p<0.001$). After 16 weeks of exposure, coronary flow index was significantly higher compared with controls ($p<0.01$) suggesting lower flow resistance in the coronary vascular bed. After 24 weeks of exposure, impairment of left ventricular function was more pronounced and characterized by decreased myocardial distensibility (reduced left ventricular pressure decay during diastole and pressure rise during systole, compared with control) in addition to reduced coronary flow resistance. Thus, the LOAEL was 40 mg/kg-day for left ventricular hypertrophy and impaired systolic and diastolic left ventricular function. Myocardial Co concentrations were 10-11 mg Co/kg wet weight after 16 and 24 weeks of exposure, compared with 0.12-0.13 mg Co/kg in the controls. The higher Co concentrations are 2-3 times greater than the Co concentrations achieved in the previous study of Pehrsson et al. (1991), and may explain why impaired ventricular function was evident after the longer exposure duration used in the Haga et al. (1996) study. [Hearts from human victims of "beer drinkers' myocardiopathy" were found to have a mean cobalt concentration of 0.48 mg Co/kg comapred to 0.04 mg Co/kg in controls (Sullivan et al., 1968).]

Male guinea pigs (20 per group) were exposed to one of six isocaloric diets for 5 weeks: standard Purina Guinea Chow (SGPC), SPGC plus 20 mg/kg-day Co as cobalt sulfate, SPGC (liquefied) plus 2 g/day ethanol with or without 20 mg/kg-day Co, SPGC (liquefied) plus sucrose with or without 20 mg/kg-day Co (Mohiuddin et al., 1970). Mortality at 5 weeks in the cobalt groups was 4-5 of 20; compared with 0-1/20 in the groups that did not receive the Co supplemented diets. Guinea pigs in the Co-supplemented groups had tachypnea, weakness and hindlimb paralysis (incidence not reported). Absolute and relative heart weights in all Co-supplemented groups were significantly greater than in the groups not supplemented with Co (28%, $p<0.01$). Gross examination of the heart after five weeks of exposure revealed pericardial effusion in 45-50% of all of the Co-supplemented guinea pigs and in none of the guinea pigs that did not receive Co. Microscopic examination revealed in all of the Co-supplemented groups, but not the other groups: pericardial thickening; myocardial degeneration without inflammation (e.g., absence of cellular infiltration) characterized by loss of myofribrillar material, vacuolization and increased intracellular lipid and glycogen content; endocardial edema and thickening; and thrombi in all heart chambers. Electron microscopic examination revealed in the Co-supplemented groups: loss of intracellular myofibrillar elements, changes in mitochondria shape, size and cristae morphology, dilated sarcoplasmic reticulum, intracellular lipid droplets. A greater incidence of abnormal electrocardiograms (ECG) including bradycardia, loss of QRS voltage and repolarization abnormalities were recorded in the Co-supplemented groups beginning in the 3rd and 4th weeks of exposure (65% abnormal ECG in SPGC group plus Co compared with 5% in the SPGC group). Specific ECG abnormalities consisted of a greater incidence in the Co-supplemented group (e.g., incidence in SPGC plus Co/incidence in SPGC) of bradycardia (80%/5%), decreased QRS voltage (75%/10%), A-V conduction delay (25%/5%) and S-T changes (65%/5%). The 20 mg Co/kg-day exposure used in this study defines a FEL for mortality and functional and histopathologic heart lesions in guinea pigs exposed to Co in food for five weeks.

In a subchronic reproductive study, adult male B6C3F1 mice were exposed to drinking water containing 400 mg Co/L as cobaltous chloride or given drinking water without Co supplementation (control); mice were fed Purina Rodent Chow (Pedigo and Vernon, 1993). The estimated dosage assuming an adult body weight of 0.04 kg and default drinking water intakes for male B6C3F1 mice (U.S. EPA, 1987) was 93 mg Co/kg-day. A dominant lethal assay was conducted after 10 weeks of exposure: Co-exposed and control males (10 per group) were mated with control females over a period of two weeks; pregnant females were euthanized on day 19 of pregnancy and fetuses were evaluated for gross abnormalities, response to tactile stimuli, and size (data not reported); resorptions and preimplantation losses were quantified. Males from both groups were euthanized after the dominant lethal assay was completed and epididymal sperm concentration and sperm motion characteristics. In a concurrent fertility study, males from the Co-exposed and control groups were mated overnight with control females (superovulated by injection of pregnant mare serum gonadotropin) after 7 and 10 weeks of exposure to Co and 2, 6 and 8 weeks after cessation of exposure to Co. Pregnant females were euthanized on day 2 of pregnancy and the number of ova/embryos and percentage of embryos that were 2-cell or greater (fertilized) were determined. The dominant lethal assay showed a significantly ($p \leq 0.001$) lower percentage of pregnant females (58% vs 91%) and average number of implantations per female (6.5 vs 8.3) in the cobalt-exposed groups compared controls and a significantly higher average number of preimplantation losses in the cobalt-exposed group (2.4 vs 0.43); post-implantation losses were not different in the two groups. Sperm concentration was significantly lower after 10 weeks of exposure to Co compared with control and remained significantly lower eight weeks after exposure to Co ceased. Sperm motion (motility, path velocity, progressive velocity, linearity, progressive motility and track speed) was significantly depressed after 10 weeks of exposure to Co compared with controls but recovered eight weeks after exposure to Co ceased. After 12 weeks of exposure, male fertility rate in the Co-exposed groups was significantly reduced compared with males in the control group (1.8% ova fertilized vs 82.4% fertilized) and recovered to control levels eight weeks after exposure to Co ceased. This study defines a LOAEL of 93 mg Co/kg-day for impairment of reproduction in mice.

The only known nutritional, but vital function of cobalt is as a cofactor of vitamin B_{12}. In humans, vitamin B_{12} is derived from bacterial synthesis and therefore, cobalt is essential for animal species, such as ruminants, that depend totally on their bacterial flora for vitamin B_{12}. There is no evidence that the intake of cobalt is ever limiting in the human diet, and therefore no RDA is deemed necessary for cobalt (NRC, 1989). It should be noted that the average daily intake of cobalt in humans ranges from approximately 0.002-0.008 mg cobalt/kg/day in adults (0.16-0.58 mg cobalt/day ÷ 70 kg; Tipton et al., 1966; Schroeder et al., 1967) and 0.01-0.06 mg cobalt/kg/day in children (0.3-1.77 mg cobalt/day ÷ 28 kg; NRC, 1989; Murthy et al., 1971). Murthy et al. (1971) indicated that the children in this study ranged in age from 9-12 years. Using the average weight of 28 kg for children aged 7-10 years (NRC, 1989), the average daily intake for the children in this study ranged from 0.01-0.06 mg/kg/day. If the default adult weight of 70 kg is used with the Murthy data, then the range of intake would be from 0.004-0.025 mg/kg/day.

The effects of chronic occupational exposure to cobalt on the respiratory system are well documented. Cobalt has been found to be the etiologic agent in hard metal disease. The observed effects include respiratory irritation, wheezing, asthma, pneumonia and fibrosis and have been found to occur at exposure levels ranging from 0.003 to 0.893 mg cobalt/m^3 over a period of 2-17 years (Davison et al., 1983; Demedts et al., 1984; Kusaka et al., 1986a,b; Raffn et al., 1988; Shirakawa et al., 1988; Sprince et al., 1988).

Studies have implicated cobalt as a sensitizer in humans. Although the minimum exposure level associated with cobalt sensitization has not been determined, work-related asthma was found in hard metal workers who were occupationally exposed (for greater than 3 years) to levels of cobalt ranging from 0.007 to 0.893 mg cobalt/m^3 (Shirakawa et al., 1988). Given the database, the most sensitive indicators of cobalt toxicity by inhalation exposure are the effects on the respiratory system in both humans and animals and allergic responses in cobalt-sensitized individuals.

The data described above does not identify a single study, animal or human, that could be used to properly derive an oral RfD. In unusual circumstances, i.e., excessive beer drinking or through occupational sensitization, cobalt has been shown to manifest toxicological symptomatology. However, these reports provide inadequate data on which to derive an RfD. Furthermore, use of inhalation data to derive an oral RfD is precluded due to portal of entry effects. It is apparent that the upper range of average intake for children (0.06 mg/kg/day) is below the levels of cobalt needed to induce polycythemia in both renally comprised patients (0.18 mg/kg/day) and normal patients (0.96 mg/kg/day).

Therefore, in lieu of an oral RfD for cobalt and given the ubiquitous nature of cobalt and the relatively well characterized intake of cobalt in food, it is recommended that the intake levels described above be used as guidance for oral exposure to cobalt.

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Risk Assessment Issue Paper for:
Feasibility of RfD Derivation for 2-Methylnaphthalene
(CASRN 91-57-6)

INTRODUCTION

The TOXLINE (1981-1998) and TSCATS data bases were examined in October 1998 to identify literature regarding health effects associated with exposure to 2-methylnaphthalene and 1-methylnaphthalene (as a possible surrogate). Update searches of TOXLINE (1991-1993, CAS number and chemical names strategy, all cites), CANCERLINE (1963-1993, CAS number and chemical names strategy, all cites), TSCATS, RTECS, and HSDB were performed and screened in April 1993.

In addition to the literature searches, IRIS (U.S. EPA, 1998), the RfD/RfC Monthly Status Report (U.S. EPA, 1995), the Drinking Water Regulations and Health Advisories list (U.S. EPA, 1994a), the HEAST (U.S. EPA, 1997), the NTP Chemical Status Reports (NTP, 1993a;b) and the OHEA CARA lists (U.S. EPA, 1991, 1994b), were used to identify sources of additional information. The ATSDR (1990) Toxicological Profile for Naphthalene and 2-Methylnaphthalene and a report by Buckpitt and Franklin (1989) were also reviewed for pertinent literature.

The U.S. EPA (1998) has not derived an RfD for 2-methylnaphthalene, nor is this chemical under consideration by the RfD/RfC Work Group (U.S. EPA, 1995) or listed on the HEAST (U.S. EPA, 1997). ATSDR (1990) has not derived MRL values.

REVIEW OF PERTINENT LITERATURE

Data were not located regarding effects in humans or animals following inhalation or oral exposure to 2-methylnaphthalene (or 1-methylnaphthalene). Information regarding the health effects of 2-methylnaphthalene is restricted to examinations of cell damage in the bronchiolar epithelium of mice (Griffin et al., 1981; Rasmussen et al., 1986; Buckpitt and Franklin, 1989; Honda et al., 1990) and rats (Dinsdale and Verschoyle, 1987) given intraperitoneal injections of 2-methylnaphthalene, and to studies of mononucleated giant cell formation and proteinosis in pulmonary alveoli of mice dermally exposed over a period of 30 weeks to a mixture of 1- and 2-methylnaphthalene (Murata et al., 1992).

Because no data on 2-methylnaphthalene that are suitable for derivation of the requested provisional oral RfD were located, use of the toxicity data for naphthalene as a surrogate for 2-methylnaphthalene have been considered. Intraperitoneal injections of either naphthalene, 1-

methylnaphthalene or 2-methylnaphthalene caused cell damage in the bronchiolar epithelium of mice (Rasmussen et al., 1986). Naphthalene and 2-methylnaphthalene were about equally toxic, but changes associated with 1-methylnaphthalene exposure were less severe. Other reports of similar results in similar mouse experiments comparing only naphthalene and 2-methylnaphthalene are available (Griffin et al., 1981; Buckpitt and Franklin, 1989; Honda et al., 1990). Although these comparisons suggest that naphthalene and its methylated derivatives may cause similar health effects in acutely exposed animals, it is uncertain if similarities in health effects would be observed in humans repeatedly exposed to any one of these compounds in the environment. It is possible that the observed effect in mice is a special case that may not apply to other species, since no bronchiolar cell damage was detected in rats following intraperitoneal doses of naphthalene, 1-methylnaphthalene or 2-methylnaphthalene (Dinsdale and Verschoyle, 1987). Furthermore, hemolytic anemia has been identified in case reports to be the primary effect in humans associated with acute exposure to naphthalene (ATSDR, 1990). Because no hemolytic effects were observed in mice orally exposed for 14 days to naphthalene doses as high as 267 mg/kg/day (Shopp et al., 1984), the use of rodents as an experimental model to assess health hazards for humans exposed to naphthalene or its methylated derivatives has been questioned (ATSDR, 1990).

Limited data are available concerning the relative acute lethality of naphthalene and 2-methylnaphthalene. Intraperitoneal doses of 2-methylnaphthalene as high as 800 mg/kg have been administered to mice without mortality (Griffin et al., 1981), but the intraperitoneal LD_{50} value for naphthalene is 380 mg/kg in mice (Warren et al., 1982), and intraperitoneal doses of naphthalene as low as 150 mg/kg have been reported to produce lethality in this species (Sandmeyer, 1981). Analysis by NCEA-Cin using the recently developed Quantitative-Structure-Activity model (rat, oral, chronic), predicts LOAEL values for 2-methylnaphthalene, naphthalene and 1-methylnaphthalene of 67.2, 42.0 and 34.5 mg/kg/day, respectively in order of increasing toxicity. The LD50s for the same compounds are 1.4, 1.8 and 0.872 g/kg, respectively. However, these predicted toxicities are based upon electrotopological (E-state) parameters and does not imply that the health endpoints are the same. Based on the metabolism, the health endpoints may be the same or different, depending on whether side chain or ring oxidation predominates with respect to health endpoint.

Comparison of the metabolism of 2-methylnaphthalene and naphthalene indicate that the addition of a methyl group can make a significant difference in metabolic fate (Buckpitt and Franklin, 1989). 2-Methylnaphthalene metabolism proceeds via two divergent pathways, methyl group oxidation and epoxidation of the aromatic ring. Naphthalene metabolism occurs via the aromatic ring epoxidation pathway only. The methyl group oxidation pathway is the major metabolic fate of 2-methylnaphthalene in guinea pigs (Teshima et al., 1983) and rats (Melancon et al., 1982). Further differences between the metabolism of naphthalene and that of its methylated derivatives can be inferred from reports that treatment of mice with inhibitors of cytochrome P-450 monooxygenase activity (i.e., SKF 525-A and piperonyl butoxide) did not inhibit the development of 2-methylnaphthalene-induced bronchiolar cellular damage, but markedly protected against naphthalene-induced damage (see Buckpitt and Franklin, 1989). The target organ for naphthalene, especially in animals and humans, appears to be different than for 2-methyl naphthalene. However, this conclusion is based on one dog experiment. Consequently, until additional studies are available, additivity for naphthalene and 2-methyl naphthalene can be assumed based on the fact that 1-methyl naphthalene appears to effect the same target organ as naphthalene; namely, the erythrocytes.

DERIVATION OF A CHRONIC ORAL RfD

Oral and inhalation toxicity data for 2-methylnaphthalene are lacking, precluding derivation of a provisional oral RfD for 2-methylnaphthalene. In general the methylation of aromatic rings modifies the metabolic pathway and reduces the toxicity of the chemical. This is observed with benzene and naphthalene when they are converted to methyl benzene (toluene) and 2-methyl naphthalene with respect to effects on the hematopoietic system. However, until additional studies are available to address unequivocally the health effects of 2-methyl naphthalene, it seems reasonable to use the RfD for naphthalene (2E-2 mg/kg/day; US EPA, 1998) as a surrogate for its methylated derivative; namely, 2-methyl naphthalene. The basis for this conservatism is that the ring oxidation reactions of 2-methyl naphthalene are similar (3,4-, 5,6- and 7,8-dihydrodiols), to those of naphthalene in that the same three dihydrodiols are produced by metabolism of both compounds via epoxide intermediates.

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**Risk Assessment Issue Paper for:
Deriving Toxicity Values for Acute Exposure
to PCBs (CASRN 1336-36-3): The Development of Provisional
RfDs and RfCs for Oral, Inhalation and Dermal Exposure**

A number of records on IRIS (U.S. EPA, 1998) provide quantitative benchmarks for the carcinogenicity or systemic toxicity of the polychlorinated biphenyls (PCBs). Thus, in the agency's reevaluation of the carcinogenicity of PCBs (CASRN 1336-36-3) as a class, separate upper, middle and lower tier pairs of slope factors (upper-bound and central tendency) are derived for different combinations of media, exposure scenarios, and mixtures of congeners (U.S. EPA, 1998). By contrast, for the compounds' non-carcinogenic effects, IRIS and HEAST (U.S. EPA, 1997) break out the quantitative evaluations into separate records for component Aroclors, with a verified chronic oral RfD of 7E-5 mg/kg-day for Aroclor 1016 (CASRN 12674-11-2), and a value of 2E-5 mg/kg-day for Aroclor 1254 (CASRN 11097-69-1). A chronic oral RfD for Aroclor 1248 (CASRN 12672-29-6) was considered "not verifiable." ATSDR has published Toxicological Profiles for the PCBs as a class, in which an overall MRL of 2E-5 mg/kg-day is proposed for chronic oral exposure (ATSDR, 1993; 1997). Occupational exposure limits and standards have been specified for some members of the class, including TWA-TLVs of 1mg/m^3 for the 42% chlorinated component (equivalent to Aroclor 1242) and 0.5 mg/m^3 for Aroclor 1254 (ACGIH, 1996). Each compound carries a "skin" notation, with Aroclor 1254 noted as an animal carcinogen. NIOSH (1994) records RELs for Aroclors 1242 and 1254 of 0.001 mg/m^3, OSHA PELs of 1.0 and 0.5 mg/m^3, respectively, and IDLHs of 5 mg/m^3 for either compound. With a "skin" designation, the compounds are also marked as carcinogens, eye irritants, and as inducers of liver damage and reproductive effects (NIOSH, 1994). The CARA list (U.S. EPA, 1994) specifies a number of documents on the PCBs, including a WQCD (U.S. EPA, 1980), DWCDs (U.S. EPA, 1984a; 1988), a HEA (U.S. EPA, 1984b), an RQ document for cancer effects (U.S. EPA, 1989), plus issue papers focusing on action levels (U.S. EPA, 1986) and toxicity equivalency factors (U.S. EPA, 1991).

Research papers pertinent to the absorption and toxicity of the PCBs via the dermal route were sought through computer searches of the HSDB, RTECS, MEDLINE, and TOXLINE (and its subfiles) databases, covering the time period of 1990-1998. The literature search was conducted in June 1998.

DERIVING ACUTE TOXICITY VALUES FOR THE PCBs

The *Chronic Health Hazard Assessments for Non-Carcinogenic Effects* (U.S. EPA, 1998) states that the governing concept for the oral RfD is the assumption that dose thresholds exist for certain toxic effects that do not lead to cancer. Thus, the chronic quantitative toxicity value for a compound represents an estimate of the dose level that is unlikely to lead to harmful effects in human beings, including sensitive sub-populations such as children and the elderly, as a result of continuous (and possibly lifetime) exposure. Deriving such values depends on the evaluation of data obtained from long-term toxicological studies in which dosing is carried out for at least half the normal life-span of the animal model being employed. Such an approach seeks to mimic in an experimental setting the hypothetical exposure to the chemical to which human beings would be subjected through daily exposure in the environment. Shorter term exposure studies (e.g., subchronic, 10 - 50% of the animal's normal life expectancy) can also be used in such derivations. This provides implicit endorsement of the concept of time-weighting and the existence of an inverse correlation between the duration of exposure and the dose in this paper of a compound that would be necessary to induce similar toxic effects. This relationship is used as the basis for estimating acute toxicity values for PCBs from chronic toxicity data and available benchmarks.

Key to the development of toxicity values for acute exposure to environmental contaminants may be the delineation of exposure scenarios that set the context in which the adjustment of chronic and subchronic to acute dosimetry may be targeted. For example, scenarios that are likely to be operative in the acute exposure to PCBs might include, (1) consumption of PCBs in food, (2) inhalation of PCBs in proximity to harmful emission, such as toxic waste incinerator emissions, electrical fires, and (3) dermal exposure during occupational exposure, for example, electricity company employees examining transformers, hazardous waste remediation, etc.

In the evaluations and extrapolations presented here, the verified toxicity values available on IRIS, HEAST, and/or from the agencies and organizations with statutory or professional oversight of occupational exposure standards, such as ACGIH, NIOSH, OSHA, and ATSDR, have been used as points-of-departure for developing provisional acute toxicity values for oral, inhalation and dermal exposure, with the choice of uncertainty factors employed to achieve such extrapolations rationalized by a survey of existing toxicity data. For dermal exposure, an acute toxicity value has been developed using the derived provisional acute oral RfD as a starting point, as impacted by the use of oral and dermal absorption factors, and by empirical considerations of the impact of "first-pass" metabolism on orally absorbed PCBs.

Oral Exposure

A considerable library of experimental studies attest to the widespread non-cancerous toxicological effects of the PCBs. Many of these studies have been summarized in the IRIS records for Aroclors 1016, 1248 and 1254 (U.S. EPA, 1998) and in the Toxicological Profiles for the PCBs as a class (ATSDR, 1993; 1997). For example, to derive the verified chronic oral RfD for Aroclor 1016, the IRIS compilers chose reduced birth weights in a reproductive bioassay in rhesus monkeys as the critical effect. By contrast, the appearance of clinical signs and immunological changes were considered to be the primary effects of Aroclor 1254 in the same animal model. Similarly, ATSDR used these same immunological responses to Aroclor 1254 as a basis for their chronic duration oral MRL for PCBs as a class (ATSDR, 1993). ATSDR (1993; 1997) has also provided a tabulated list of the entire spectrum of non-cancerous toxicological responses induced by PCBs in experimental studies. Depending on exposure duration and dosing levels, these effects include lethality, respiratory, cardiovascular and gastrointestinal lesions; liver necrosis and fatty changes, dermal and ocular effects, dose-dependent changes to serum clinical chemistry parameters and hormone levels, changes to hematological and neurological parameters, and reproductive/developmental perturbations.

However, despite the wide range of toxicological effects that have been induced by PCBs in experimental studies, the verified quantitative toxicological benchmarks that have been derived for the non-cancerous effects of the compound show a striking similarity, as summarized in Table 1.

Table 1. **Quantitative Toxicological Benchmarks for Non-Cancer Effects of PCBs**

Compound	**Principal Effect**	**RfD (mg/kg-day)**	**MRL (mg/kg-day)**	**Reference**
Aroclor 1016	Reduced birth weight in neonates	7E-5		U.S. EPA, 1998.
Aroclor 1254	Clinical signs; reduced immunological response to sheep red blood cells (SRBCs)	2E-5		U.S. EPA, 1998.
PCBs as a class	Reduced immunological response to SRBCs.		2E-5	ATSDR, 1993.

The potential for using time-weighting adjustments to chronic exposure rates to estimate acute dosimetry parameters for the PCBs may be explored through the use of ATSDR's tabulated list of toxicological effects of PCBs in experimental studies (ATSDR, 1993). Data on the NOAELs and LOAELs for broad categories of toxicological consequences of PCB challenge, via acute, intermediate and chronic exposure regimen, have here been used as a basis for deriving uncertainty factors by which the chronic RfD and/or MRL can be adjusted to estimate an acute oral RfD that would be realistic while remaining suitably conservative. A summary of these data are provided in Table 2.

Pooling the data for the toxic effects of PCB across animal models but within broadly-defined categories of toxicological response and exposure duration, has allowed the factors that link chronic to intermediate-duration exposures, and intermediate duration to acute exposures to be expressed, for both LOAELs and NOAELs. Of the 10 such factors that were derived in this analysis, values between 5.6-208.6 were obtained across all categories of response, though with an overall geometric mean of 20.28. Six of the 10 factors were between 5-15.

Table 2. **Range and Geometric Means of NOAELs and LOAELs According to Toxicological Response Category Establishing Time-Weighting Factors for Similar Toxicological Responses**

Response Category	NOAEL (mg/kg-day)		Factor	LOAEL (mg/kg-day)		Factor
	Range	Geometric Mean		Range	Geometric Mean	
Lethality Acute	N/D	-	-	130-4250	1160	-
Intermediate	N/D	-	-	1.9-840	17.2	67.5
Chronic	N/D	-	-	2.5*	-	-
Systemic Acute	0.5-6000	116.8	-	1-4000	27.2	-
Intermediate	0.05-100	4.7	24.85	0.09-100	3.6	7.6
Chronic	0.08-5	0 84	5.6	0 1-10	0 38	9.5
Neurological Acute	N/D	-	-	500-6000	1957	-

Intermediate	N/D	-	-	0 8*	-	-
Chronic	N/D	-	-	N/D		
Developmental Acute	2-100	12 6	-	4-244	34.8	-
Intermediate	0.13-12.5	1.46	8.63	0.1-35.4	3.34	10.4
Chronic	0.007-0.008	0 007	208.6	0.03-0.1	0.053	63.0
Reproductive Acute	8*	-	-	8-32	16	-
Intermediate	0.1-1.25	0.29	-	0.1-30	1.09	14.7
Chronic	N/D	-	-	0.1*	-	-
Immunological Acute	N/D	-	-	N/D	-	-
Intermediate	0.1-1	0.27	-	0.4-22	2.9	-
Chronic	N/D	-	-	0.005*#	-	-

* single value only, # used by the IRIS and ATSDR compilers as the LOAEL for RfD (1254) and MRL (PCB) derivation Data taken from ATSDR, 1993.

As stated earlier, when quantitative toxicity benchmarks for chronic non-cancer toxicological endpoints such as the RfD and RfC are derived from studies of less than half of the animals normal lifespan (i.e., sub-chronic studies) a factor is usually applied to the NOAEL or LOAEL to take into account the less than lifetime exposure duration. Unless overwhelming evidence is available for its inapplicability, the value of 10 is normally chosen for this transposition by default. In the above analysis of the relationship between threshold and sub-threshold dose levels for toxic response categories elicited by PCBs for different exposure durations, a factor of 10 has emerged as an applicable and reasonably conservative chemical-specific estimate for the chronic to intermediate (sub-chronic) and intermediate to acute transitions.

Accordingly, if the value for the chronic oral RfD of 2E-5 mg/kg-day, specific for Aroclor 1254, is considered applicable to the class of PCBs as a whole, correcting this value by two uncertainty factors of 10 each, to address the chronic to sub-chronic and sub-chronic to acute dosing regimen transitions, will result in the increase in the chronic oral RfD by two orders of magnitude.

Therefore, the provisional acute oral RfD may be calculated, thus:

Provisional Acute RfD = RfD x UF =

2E-5 mg/kg-day x 100 =

2E-3 mg/kg-day.

Therefore, this value would constitute a guideline for any "one-hit" exposure scenario involving PCBs (e.g., through the consumption of contaminated food).

Inhalation Exposure

Neither the IRIS records for PCBs as a class, nor those for the individual Aroclors 1016, 1248 or 1254, contain verified chronic inhalation RfCs (U.S. EPA, 1998). Therefore, in contrast to the provisional acute oral RfD, deriving an acute inhalation RfC for the PCBs cannot use such verified quantitative toxicity benchmarks as the point-of-departure. However, a range of recommended and/or permitted air concentration values has been established for the PCBs by agencies and professional organizations that establish guidelines and permitted levels of the compounds in the workplace (ACGIH, 1996; NIOSH, 1994). Since these are time-weighted average values, deriving an acute inhalation RfC might be dependent on proportioning the starting limit or guideline by factors expressing the differences between the assumed and chosen exposure scenario.

As listed in Table 3, a number of guidelines and standards are available for the concentration of PCBs in air.

Table 3. **Existing Guidelines and Limits for Levels of PCB in Air in the Workplace**

	C	Va
ACGIH (TWA-TLV)	A	
ACGIH (TWA-TLV)	A	
NIOSH (REL)	A	
NIOSH (REL)	A	
NIOSH (IDLH)	A	
NIOSH (IDLH)	A	
OSHA (PEL)	A	
OSHA (PEL)	A	

data taken from NIOSH. (1994) and ACGIH (1996).

As noted in NIOSH (1994), RELs are time-weighted average concentrations appropriate to a 10-hour work day during a 40-hour work week. By contrast, IDLHs have been established based on the effects that might occur as a result of a 30-minute exposure. These concentrations (i.e., IDLHs) are considered to represent the level of exposure that is likely to cause death or immediate or delayed permanent adverse health effects.

This analysis uses the NIOSH REL of 0.001 mg/m^3 as a conservative estimate of the concentration of PCBs in air that might be expected to be without significant health consequences during exposure throughout the work-week. Since the RELs are time-weighted average values, this concentration can be adjusted by factors that address the likely scenarios that would constitute "real-world" instances of acute exposure. For example, if it is assumed that a receptor is in the vicinity of a point-source emitter of PCBs, such as a low temperature thermal desorption unit treating contaminated soil, an acute toxicity value could be calculated from the REL by simple proportionality based on the different times of exposure. Thus, if the duration of exposure were assumed to be two hours, an acute toxicity value could be derived by time-weighting the NIOSH REL to model the appropriate time interval.

Therefore, using the NIOSH REL as a starting point:

A recommended air concentration limit for PCBs per hour is

$0.001 \times 40 = 0.04$ mg/m^3

For a two hour exposure, the TWA exposure limit for provisional acute toxicity would be

$0.04/2 =$ **0.02** mg/m^3.

Dermal Exposure

Estimating an acute dermal RfD uses the acute oral RfD derived in this issue paper, and transposes the *administered* dose to an *internalized* dose by the application of an oral absorption factor. This will constitute the sub-threshold *internalized* dose for toxic effects irrespective of the route of administration. Thereafter, if the dermal absorption factor arising from acute exposure is known or can be calculated, an acute dermal *administered* dose may be derived by simple proportionality. A potentially toxic amount (action level) of PCBs can be calculated using default or known values for the body weight of the receptor, if based on a discrete exposure scenario (e.g., exposure to electricity company workers inspecting leaking transformers).

ATSDR (1993; 1997) discusses a number of reports in which the toxicokinetics of PCBs have been investigated, and notes a number of values that have been calculated for the absorption of PCBs via the oral route. Depending on the experimental animal model and level of chlorination of the congeners that were employed in the studies, values from 75-95% have been derived for the percentage of the load that was internalized. In addition, Wester et al. (1990; 1993) have described a number of experiments in Rhesus monkeys in which the dermal absorption of a xenobiotic could be determined in experiments that compared the relative proportions of radiolabeled PCBs that could be collected from the urine compared with the amount resulting from intravenous injection. Depending on the vehicle employed to apply the compound to the skin (such as trichlorobenzene, mineral oil, or acetone), percentages of between 10-21% of the load were absorbed.

Therefore, in this provisional derivation, oral and dermal absorption factors of 0.95 and 0.15, respectively, have been assumed for PCBs.

Therefore, using the calculated acute oral RfD as the point-of-departure, the *internalized* acute oral RfD would approximate to:

$2\text{E-}3 \times 0.95 = 1.9\text{E-}3$ mg/kg-day.

This is assumed to be the *internalized* provisional acute oral RfD irrespective of the route of administration.

Assuming a dermal exposure factor for PCBs of 0.15 and back-calculating from the *internalized* RfD, the *applied* provisional acute dermal RfD would therefore be

1.9E-3/0.15 = **1.3E-2** mg/kg-day.

[It may be noted that, assuming an exposure scenario involving acute dermal exposure to an electric company employee (default body weight = 70 kg) in which the duration of exposure were sufficient for maximal skin penetration to be realized, a provisional acute **action level** of 1.3E-2 x 70 kg = **0.88 mg** would result.]

Uncertainty

The degree of uncertainty associated with estimating acute toxicity values for the PCBs from quantitative toxicity benchmarks for chronic toxicity is focused on the applicability of the uncertainty factors used in the time-weighting adjustments. In this derivation, the challenge has been to establish a balance between the range of potential uncertainty factors that might be available for the time-weighting transpositions and the need to remain reasonably conservative to "protect" potential receptors to the PCBs. Expressing the central tendency as a geometric mean has removed the expected dominance that would have been imposed by the extreme values in the range, and has generated an overall estimate of 20.28. Since 6 of the 10 values contributing to this estimate were between 5 and 15, these values, taken together, were considered to be sufficiently close to the default time-weighting uncertainty factor of 10 typically used in RfD/RfC derivations, thereby justifying its application to the derivations described in this issue paper. However, since the verified chronic oral RfD was calculated from one of the very few immunological studies in the data set, uncertainty remains as to whether the factor of 10-fold adjustment for that particular response would be the most applicable to the chronic-intermediate-acute toxicity extrapolation.

The primary contributor to the uncertainty bounding the acute inhalation RfC would be the arbitrary choice of the NIOSH REL as the guideline employed for the starting point in the calculation. This is because the REL is only one of the range of limits and guidelines that are available as potentially protective to human health, as listed in Table 3. Choosing the NIOSH REL of 0.001 mg/m^3 represents a deliberately conservative choice that has the potential to force an acute inhalation RfC that would be unrealistically low.

The limited suite of dermal and oral toxicokinetic data that attest to the absorption of the PCBs provide estimates of the factor of an administered load that can be absorbed. For oral exposure, these estimates range from 75 to 95%, suggesting that first pass metabolism of the compounds at the liver is minimal. This conflicts with data that is summarized in ATSDR

(1993; 1997) that point to the liver as one of the key target organs for the compounds. In seeking to provide an empirical assessment of the quantitative dermal toxicity of the PCBs, this anomaly has not been considered further. Similarly, data suggesting that the rates of dermal penetration of the different congeners may differ markedly have not been further considered in this analysis (Garner and Matthews, 1998). Perhaps the largest sources of uncertainty bounding the dermal toxicity estimate are (1) the uncertainty surrounding the question of whether the skin of a Rhesus monkey resembles human skin, and (2) the necessity of assuming an unlikely exposure scenario in which a receptor would allow the contaminant to remain on the skin surface for sufficient time for maximal penetration to occur. In the real-world, any such contact would probably be removed within a short space of time.

It may be noted that, as set forth in the preceding paragraphs, each of the acute toxicity estimates is beset with considerable uncertainty, constituting an amalgam of semi-realistic exposure assumptions and the all-pervasive requirement to remain conservative in assessments where human health may be impacted. Accordingly, for all three provisional acute toxicity estimates, low confidence is assigned.

RISK CHARACTERIZATION

Cancer Hazard Summary PCBs are *likely* to be human carcinogen (U.S. EPA, 1996) based on sufficient evidence of tumor formation in a number of authoritative studies in laboratory animals, that have been summarized on IRIS (U.S. EPA, 1998). Though a number of cohort studies involving potentially occupationally exposed persons have failed to provide conclusive evidence of human carcinogenicity, the observation of dose and time-dependent tumor formation in a number of target organs and sites in various strains of rats, provide sufficient justification for the conclusion of carcinogenicity, even in the absence of appropriate data in human beings.

Supporting Evidence

Human Data. The IRIS record for the PCBs documents a number of cohort studies in which employees of companies making capacitors and other electrical equipment were followed-up, in an effort to forge the link between exposure to PCBs and cancer mortality. In general, there was an absence of exposure-related trends, though, in many cases, small sample sizes and brief follow-up periods reduced confidence in any overall conclusions that could be derived (U.S. EPA, 1998).

Animal Data. A number of experimental studies point strongly to the carcinogenicity of the PCBs. As summarized on IRIS, though the studies have been confined to a number of strains of rat, a range of tumor sites were observed, with associated dose and time-dependent relationships being apparent (U.S. EPA, 1998).

Mutagenicity. As tabulated in ATSDR (1993; 1997), the overwhelming majority of studies of the mutagenicity and genotoxicity of the PCBs have provided negative data. For example, all available reports point to the compounds' inability to induce gene reversion in the Ames test.

Mode of Action

The mechanism of cancer induction by PCBs is not well-understood, although the subject has been extensively studied (ATSDR, 1993; 1997). Among the biochemical triggers that have been invoked to explain the tumorigenic responses are, (1) PCB binding to the Ah receptor, and (2) induction of cytochrome P-450-dependent monooxygenases. However, the etiological significance of these activities remains obscure.

Discussion

The marked incidence of positive carcinogenic effects of the PCBs in experimental animals allows the compound to be ascribed to the *likely* carcinogenic weight-of-evidence category with reasonably high confidence. This is because the authoritative nature of the available studies transcends the insufficient human exposure data that, to this point, have failed to bring adequate statistical power to their analyses. Occupational exposure studies are also confounded by the difficulty of unequivocally defining the source term. Few mechanistic data exist on the mechanism whereby PCBs bring about their toxic effects. The compound does not appear to be mutagenic (ATSDR, 1993).

BRIEFING SUMMARY

Route	Class	Designation or Rationale	Dose Response
Oral	Likely	High end	Linear extrapolation below LED_{10}s (U.S. EPA, 1996)

Basis for Classification/Dose Response

- **Human Data:** Most of the cohort/occupational exposure data on human exposure to PCBs are inconclusive.

- **Animal Data:** The PCBs have been shown to induce tumors in rats at a range of target organs and sites.

- **Structural Analog Data:** Structural analogies have been drawn between the PCBs and dioxins, which themselves are well-known carcinogens in experimental animals. As noted by ATSDR, polybrominated biphenyls (PBBs) have been shown to be carcinogenic in animal studies (ATSDR, 1993; 1997).

- **Other Key Information:** None.

- **Mode of Action:** No data.

- **Hazard Classification/Uncertainties:** High confidence is ascribed to the carcinogenic weight-of-evidence classification, despite the absence of evidence of cancer induction in human beings or in a second experimental animal model. Similarly, the lack of information on the tumorigenic mechanism of the PCBs constitutes a residual source of uncertainty.

- **Dose Response:** Linearity has been assumed below the LED_{10} (U.S. EPA, 1998).

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Risk Assessment Issue Paper for:
Carcinogenicity Information for
Tetrachloroethylene (perchloroethylene, PERC) (CASRN 127-18-4)

The carcinogenicity characterization has a long history. A July 1985 Health Assessment Document for Tetrachloroethylene (Perchloroethylene), EPA # 600/8-82/005F, classified the agent in Weight-of-Evidence Group "C - Possible Human Carcinogen" mentioning that this would be reevaluated because of new information. The 1985 document also provided upper bound inhalation and oral risk estimates. An April 1987 Addendum to the Health Assessment Document, EPA# 600/8-82/005FA, proposed that the Weight-of-Evidence be upgraded to "B2 - Probable Human Carcinogen" and provided a revised inhalation risk estimate. A February 1991 document titled Response to Issues and Data Submissions on the Carcinogenicity of Tetrachloroethylene, EPA# 600/6-91/002A discussed newer data relative to weight-of-evidence classification. The Agency's Science Advisory Board has reviewed these documents finding them to be technically adequate while offering an opinion that the weight-of-evidence is on C-B2 continuum (C=Possible Human Carcinogen, B2=Probable Human Carcinogen). At present time, the Agency has not adopted a final position on the weight-of-evidence classification.

The upper bound risk estimates from the 1985 Health Assessment Document as amended by updated inhalation values from the 1987 Addendum have not as yet been verified by the IRIS-CRAVE Workgroup. The estimates are viewed as useful information in the context of the information available in the 1985-1987 period.

ORAL: 1985 HAD; Unit risk = 1.5E-6 per ug/L

Slope Factor =5.2E-2 per mg/kg/day

INHALATION: 1987 Addendum; Unit risk = range form 2.9E-7 to 9.5E-7 with a geometric mean of 5.8E-7 per ug/cu.m

Slope factor = 2.0E-3 per mg/kg/day

Those needing to make a choice about carcinogenicity have found the 1985, 1987 and 1991 EPA documents and the 1988 and 1991 Science Advisory Board letters of advice useful background information. When the Agency makes a decision about weight-of-evidence, the CRAVE-IRIS verification will be completed and the information put on IRIS.

Attachment 8

(97-013b / 06-20-97)

Risk Assessment Issue Paper for:
Derivation of Provisional RfC for Tetrachloroethylene (CASRN 127-18-4)

INTRODUCTION

An RfC for tetrachloroethylene is not available on IRIS (U.S. EPA, 1997) or HEAST (U.S. EPA, 1995a), and has not been discussed by the RfD/RfC Work Group (U.S. EPA, 1995b). An RfD$_0$ of 1E-2 mg/kg-day for tetrachloroethylene is listed on IRIS (U.S. EPA, 1997). This RfD is based on NOAEL for hepatotoxicity in mice and weight gain in rats. ACGIH (1996) has established a TWA-TLV of 25 ppm and a STEL/Ceiling limit of 100 ppm for tetrachloroethylene; this chemical was classified as an animal carcinogen by ACGIH. OSHA (1989) determined that tetrachloroethylene is a potential human carcinogen and established a PEL of 25 ppm.

Documents listed in the CARA database (U.S. EPA, 1991, 1994a) include a HEA (U.S. EPA, 1988a) and HADs (U.S. EPA, 1982, 1983, 1985b, 1986). In addition, ATSDR has prepared a toxicological profile on tetrachloroethylene (ATSDR, 1995). In this document, ATSDR derived an acute inhalation MRL of 0.2 ppm and a chronic inhalation MRL of 0.04 ppm. The acute MRL was based on a NOAEL and LOAEL of 10 and 50 ppm, respectively, for increased latency of visual-evoked potentials in humans exposed to tetrachloroethylene 4 hours/day for 4 days (Altmann et al., 1990). The chronic MRL was based on a LOAEL of 15 ppm for increased reaction time in workers (Ferroni et al., 1992).

To identify research reports pertinent to the derivation of a provisional RfC for tetrachloroethylene, U.S. EPA and ATSDR documents (as cited above) were reviewed. In addition, a literature search was conducted in 1993 and updated in June 1997 and included TOXLINE (1985-June 1997), MEDLINE (1985-1993), DART (1985- June, 1997), RTECS, HSDB, ETIC (1985-1993), and TSCATS.

REVIEW OF PERTINENT LITERATURE

Human Studies

Tetrachloroethylene is widely used for dry cleaning fabrics and for metal-degreasing operations (ATSDR, 1995). Various symptoms have been reported by individuals exposed acutely to tetrachloroethylene vapors, including irritation of mucosa (eyes, upper respiratory tract), gastrointestinal distress, alteration of liver and kidney function parameters, and central nervous system (CNS) effects (fatigue, dizziness, weakness, headache, memory loss, behavioral changes, EEG disturbances) (Carpenter, 1937; Freed and Kandel, 1988; Hake and Stewart, 1977; Rowe et al., 1952; Coler and Rossmiller, 1953; Stewart et al., 1970). Acute exposures to high concentrations of tetrachloroethylene also resulted in anesthesia (ATSDR, 1995).

Following prolonged exposures, the brain, liver, and kidney have been reported as the major target organs in humans. This is based on the results of a number of occupational studies on workers in the dry cleaning industry. A common limitation of these studies is inadequate monitoring data; in particular, only current levels were measured. Decreases in occupational standards, as well as technological improvements in local exhaust ventilation and equipment have resulted in decreases in exposure concentrations.

Brodkin et al. (1995) investigated the hepatotoxicity of tetrachloroethylene in a group of 29 dry cleaning workers (17 males and 12 females). A group of 29 laundry workers (14 males and 15 females) served as controls; none of the laundry workers reported exposure to tetrachloroethylene or other solvents. Mean age (dry cleaning workers were 46 years of age versus 38 years of age for the laundry workers), and duration of employment (20 years versus 5 years) were the only two demographic characteristics that were significantly different between the two groups. Current tetrachloroethylene levels were assessed with personal monitoring devices worn by 19 dry cleaning workers during one full work shift within 8 weeks of the clinical chemistry and ultrasound determinations. The mean 8-hour TWA concentration of tetrachloroethylene was 15.8 ppm (107 mg/m^3; range of 0.4 to 83 ppm). Subjects with active hepatitis were excluded from some analyses of hepatotoxicity; the incidence of active hepatitis was similar for both groups. Although the prevalence of workers with abnormal serum alanine aminotransferase, aspartate aminotransferase, and γ-glutamyltransferase was higher in the dry cleaning workers, the difference was not statistically significant. Additionally, there were no differences in the mean levels of these serum enzymes, or total and direct bilirubin, alkaline phosphatase, or glucose levels. The prevalence of mild or moderate-to-severe hepatic alterations, as detected by ultrasonography, was significantly higher in the dry cleaning workers (18/27, 67%) than in the laundry workers (10/26, 38%). The largest difference between the two groups was in the number of workers with mild hepatic parenchymal changes (13/27 dry cleaning workers versus 4/26 laundry workers); the prevalence of moderate-to-severe changes was similar between the two groups (5/27 versus 6/26). The investigators suggested that the observed sonographic changes may be indicative of steatosis. Significant exposure-response trends were observed when the workers were dichotomized relative to measures of either subacute (low exposure: workers using dry-to-dry equipment installed in the last 3 years, high exposure: workers using wet transfer equipment or dry-to-dry equipment that was installed >3 years ago), current [low exposure: workers with current 8-hour TWA concentration of < 15 ppm (12 workers), high exposure: >15 ppm (5 workers)], or cumulative [estimated by multiplying duration of employment by the number of years spent in wet transfer (higher potential exposure to tetrachloroethylene, weighting factor of 1.0) or in dry operations (weighting factor of 0.5); low exposure: workers with <10 years employment, high exposure: ≥10 years] exposure. Overall exposure to tetrachloroethylene was associated with an increased risk of hepatic parenchymal changes (odds ratio of 3.2, 95% confidence interval of 1.04-9.8). Statistically significant odds ratios were also found in high exposure workers when subacute exposure (4.2, 95% confidence interval of 1.1-15.3), or cumulative exposure (4.0, 1.0-16.3) parameters were used to dichotomize the dry cleaning workers. When the odds ratios were adjusted for age, alcohol consumption, body mass index, sex, and serological evidence of active or previous hepatitis, they were no longer statistically significant. The results of this study suggest that exposure to relatively low concentrations of tetrachloroethylene is associated with mild parenchymal changes in the liver, without changes in serum biomarkers of liver function.

Lauwerys et al. (1983) studied workers (2 male, 24 females; average age of 32.9 years) employed in 6 dry cleaning shops in Belgium. The TWA exposure to tetrachloroethylene was 20.8 ppm (141 mg/m^3; range of 8.9–37.5 ppm) with a mean exposure duration of 6.4 years (0.1–25 years). Tetrachloroethylene levels were measured in exhaled breath and blood before work and 30 minutes after work; the levels were 1.9 ppm (0.1-5.5 ppm) and 5.1 ppm (0.2-10 ppm) in exhaled breath, respectively, and 0.4 mg/L (0.1-0.8 mg/L) and 1.2 mg/L (0.4-3.1 mg/L) for blood. A group of 33 individuals (2 males, 31 females) working in a chocolate factory or occupational health service without a history of occupational exposure to organic solvents represented the control group and was matched with the exposed group for gender, age, and educational level. Although no significant differences were found in subjective symptoms of nervous system disease, the exposed group had a higher prevalence of most symptoms, in particular memory loss (7/26 vs. 3/33 in controls) and difficulty in falling asleep (11/26 vs. 6/33 in controls). Psychomotor performance tests were conducted before work and after work. For the critical flicker fusion and simple reaction time tests, the performance of the exposed group was better ($p<0.05$) than that of the control group. No significant alterations in the 9-choice visual reaction time or sustained attention tests were observed. The levels of urine albumin, β_2-microglobulin, and retinol binding protein and serum β_2-microglobulin, aspartate aminotransferase, γ-glutamyltransferase, and creatine kinase were not statistically different. Thus, this study found no significant alterations in serum and urine biomarkers of liver and kidney disease, but did find alterations in some tests of neurobehavioral performance in dry cleaning workers with current exposure levels of approximately 21 ppm.

Mutti et al. (1992) assessed renal function in 9 men and 41 women (average age of 41 years) exposed to tetrachloroethylene in dry cleaning shops for an average of 10 years. The median concentration of tetrachloroethylene measured in 4-hour air samples was 14.8 ppm (100 mg/m^3; ranging from trace amounts to 85 ppm); the air samples were randomly collected via personal passive samplers over a working week. Blood tetrachloroethylene levels (blood samples were collected during the working day) ranged from 9-900 μg/L (median of 143 μg/L). The controls consisted of 50 blood donors matched by age, gender, tobacco, alcohol, and drug consumption with the exposed workers. A number of serum and urine biomarkers of renal toxicity were measured in both groups. Urinary albumin, transferrin, brush-border antigens

BBA, BB50, and HF5, tissue non-specific alkaline phosphatase, and fibronectin, as well as serum anti-glomerular basement membrane antibodies and laminin fragments, were significantly increased in the exposed group compared to controls. Furthermore, the frequencies of abnormal values for urinary albumin, retinol binding protein, β_2-microglobulin, transferrin, IgG, Tamm-Horsfall glycoprotein, glycosaminoglycans, and antigens BBA and HF5 and serum laminin fragments were significantly greater in the exposed group compared to controls. The investigators noted that these changes in renal biomarkers were suggestive of diffuse structural and functional changes resulting from generalized membrane disturbances within the kidney. In addition, 13/50 dry cleaning workers had 3 or more biomarker abnormalities compared to 3/50 controls. For the most part, tetrachloroethylene exposure duration or blood tetrachloroethylene levels did not correlate with biomarker concentrations. The significance of the changes in renal toxicity biomarkers cannot be readily assessed. Although the results indicate that there is a higher incidence of positive biomarkers for kidney disease in dry cleaning workers, the adversity of the changes and the relationship between the magnitude of changes and exposure to tetrachloroethylene is not known.

Vyskocil et al. (1990) examined the effect of tetrachloroethylene exposure on kidney function in 16 female workers (average age of 42 years) employed at one of five dry cleaning shops for an average of 9 years (1-18 years). Air tetrachloroethylene levels were measured 1 day/week (on third or fourth day of week) for 1 year using personal monitoring devices; the mean concentration was 157 mg/m^3 (23 ppm, range of 9–799 mg/m^3). In three of the dry cleaning shops, 20–80% of the individual values were greater than 250 mg/m^3 (37 ppm). A control group of 13 women with administrative jobs and no known exposure to organic solvent was used; the groups were matched for age, employment duration, smoking habit, and alcohol and analgesic consumption. Urinary biomarkers of kidney function were measured in urine samples collected at the end of the working day. Lysozyme levels in the urine were significantly increased ($p<0.05$) in the exposed workers compared to controls, but urinary excretion of albumin, β_2-microglobulin, lactate dehydrogenase, or total protein was not affected. The prevalences of abnormal values for the urinary parameters were not statistically different between the groups, and no significant correlations between tetrachloroethylene exposure concentration and the biomarker concentration were found. The investigators concluded that it was difficult to interpret the effect (lysozymuria) as a result of tetrachloroethylene-induced tubular damage because the other sensitive markers of tubular dysfunction were normal.

In a cross-sectional study by Franchini et al. (1983), 57 workers (mostly females; average age of 43 years) employed in dry cleaning shops for an average of 13.9 years were examined for possible kidney damage. Air sampling data were not available; however, the investigators estimated that the workers were exposed to a TWA concentration of 10 ppm tetrachloroethylene (68 mg/m^3) based on the mean concentration of trichloroacetic acid excreted in urine (7.8 mg/g creatinine). There were two control groups (80 and 81 unexposed individuals) that were not matched (by age or gender) to the exposed group. Significantly altered renal function parameters (increased β-glucuronidase and lysozymuria) were reported. The investigators noted that these alterations were suggestive of mild renal tubule damage. No alterations in the other kidney disease biomarkers (total protein or albumin excretion) were observed.

Cai et al. (1991) evaluated subjective symptoms, hematology, and serum biomarkers of liver and kidney effects in 56 tetrachloroethylene-exposed workers (29 men, 27 women; average age of 35 years) from 3 dry cleaning shops who were employed for an average of 36.3 months (1–120 months). The geometric mean exposure concentration was 19.9 ppm tetrachloroethylene (134 mg/m^3; range of 3.8–94.4 ppm). The control group consisted of 69 workers (32 men, 37 women) with no solvent exposures. The subjects were interviewed regarding symptoms that occurred during work and symptoms that occurred in the past 3-month period. The exposed workers reported significant increases in the prevalence of subjective symptoms at work, including nasal irritation (28.6 vs. 7.2%), dizziness (44.6 vs. 11.6%), floating sensation (23.2 vs. 5.8%), drunken feeling (17.9 vs. 0%), and heavy feeling in head (19.6 vs. 1.4%). Significant increases in a number of subjective symptoms occurring during the last 3 months were also observed; these included heavy feeling in head, drunken feeling, forgetfulness, fainting after rapidly standing up, rough skin, joint pain, and frequent cough. The subjects were also examined for alterations in hematology (hemoglobin, white cell count) and liver and kidney function indicators (alanine aminotransferase, aspartate aminotransferase, γ-glutamyltransferase, alkaline phosphatase, LAP, total bilirubin, BUN, and creatinine), but no differences were found between the control and exposed groups.

Ferroni et al. (1992) performed neurobehavioral tests on 60 female dry cleaning shop workers (average age of 39.7 years) exposed to tetrachloroethylene for 10.1 years. The median exposure concentration was 15 ppm (102 mg/m^3; range of 1–67 ppm); air samples were collected during various 4-hour periods over a working week, and tetrachloroethylene blood levels (blood samples evenly collected during the day) ranged from 12-86 mg/L (median of 145 mg/L). The control group of 30 women, recruited in an industrial cleaning plant where solvents were never used, was matched to the exposed group for age, gender, and vocabulary test score. The study demonstrated that the reaction times (assessed using simple reaction time, shape comparison, and finger tapping tests) were prolonged in the exposed group compared to the controls. Also, the exposed workers exhibited significantly higher basal levels of serum prolactin compared to their matched controls during the proliferative phase of the menstrual cycle, suggesting that tetrachloroethylene may cause neuroendocrine effects. The investigators reported that there was a lack of correlation between the neurobehavioral performance test scores and the exposure concentrations or the duration of exposure, and no correlation was seen between the increased prolactin levels and the exposure variables.

Echeverria et al. (1995) examined the effect of tetrachloroethylene on neurobehavioral performance in 65 workers employed at 23 dry cleaning shops. Based on job titles, the workers were divided into 3 groups: low, moderate, and high exposure. In 19 of the shops, tetrachloroethylene exposure concentrations were measured in single 15-minute air samples collected in the breathing zone of a clerk, pressor, and operator. Tetrachloroethylene was also measured in breath samples from each worker. In the shops which used a wet-transfer method, the mean tetrachloroethylene levels measured in the air samples were 0.61, 12.1, and 41.8 ppm (4.1, 82.1, 283.5 mg/m^3) for the low, moderate, and high exposure groups. Based on the low levels of tetrachloroethylene measured in the air samples of shops using a dry-to-dry transfer method, all of the workers at these shops were placed in the low-exposure group (actual mean concentrations were 0.0, 4.3, and 11.4 ppm). Cumulative exposure was estimated by multiplying the exposure concentration associated with each job title by the duration of employment. Breath sample collection, administration of neurobehavioral performance tests, and completion of a medical, symptom, work history, and hobby questionnaire were performed in the afternoon after work. Regression analysis of performance scores in the visual reproduction, pattern memory, and pattern recognition tests revealed significant concentration-response relationships. After adjustment for potential confounding influence of age, education, vocabulary, and alcohol consumption, statistically significant associations between cumulative exposure and performance on the visual reproduction, pattern memory, and pattern recognition tests were found. The differences between the test scores in the low-exposure group and those in the high-exposure group were 14.4, 6.7-10.0, and 3.9% for the visual reproductions, pattern memory, and pattern recognition tests, respectively. Performance on the trailmaking, symbol-digit matching, and digit span tests was not affected by tetrachloroethylene exposure. No association between current exposure levels and neurobehavioral performance was found. Dizziness from rapidly standing up and "solvent-related dizziness" were the only subjective symptoms that increased with tetrachloroethylene exposure. Although the incidence of dizziness increased with increasing exposure levels, the magnitude of the increase was small. The results of these studies suggest that chronic exposure to low levels of tetrachloroethylene can result in subclinical impairment in short-term memory for visually-mediated functions.

Seeber (1989) conducted a battery of psychological tests and questionnaires on 101 dry cleaning workers exposed to a TWA tetrachloroethylene concentration of 83.4 mg/m^3 (12.3 ppm; 7 males, 50 females; average exposure duration of 141.2 months) or 363.8 mg/m^3 (53.6 ppm; 5 males, 39 females; average exposure duration of 127.1 months). The control group consisted of 84 (20 males, 64 females) department store sales personnel and hotel receptionists presumably with no exposure to tetrachloroethylene. Differences in age, gender, intellectual level, and daily alcohol consumption between the groups were controlled during the statistical analyses. Significant alterations in tests of perceptual function, attention, and intellectual function were found in the two exposure groups as compared to controls. However, no significant differences were seen in the psychological tests between the two exposure groups, indicating a lack of a concentration-response trend. The study did not attempt to correlate the measured parameters with individual exposure concentrations.

Several investigators have attempted to evaluate the effects of tetrachloroethylene exposure on reproductive outcomes in humans. The results of these studies suggest potential reproductive effects; however, they were limited due to insufficient exposure data.

Eskenazi et al. (1991a) determined the effects of tetrachloroethylene exposure on semen quality. In a comparison of 34 dry cleaning workers with 48 laundry workers, the overall percentage of abnormal sperm was similar for the two groups and was, by standard clinical measurements, within normal limits. However, the sperm of dry cleaning workers was significantly more likely to be round and less likely to be narrow than the sperm of laundry workers; these effects correlated with expired air levels in the workers. Although the percentage of motile sperm did not differ between the groups, the sperm of dry cleaning workers tended to swim with greater amplitude of lateral head displacement ($p<0.09$); the level of tetrachloroethylene in expired air was a significant predictor of this effect.

In another study, Eskenazi et al. (1991b) examined reproductive outcomes of 17 wives of dry cleaning workers and 32 wives of laundry workers. A number of the wives (21.4% for dry cleaning group and 34.6% of the laundry group) also worked in the dry cleaning or laundry industry; the authors did not report whether these women were also exposed to tetrachloroethylene. The number of pregnancies and live births and the rates of spontaneous abortion were similar for the wives of dry cleaning workers as compared to the laundry workers' wives during a 2-year period. However, the wives of the dry cleaning workers were more than twice as likely to have a history of attempting to become pregnant for more than 12 months or to having sought care for an infertility problem (41.2% in the dry cleaning workers' wives versus 21.9% in laundry worker's wives); although the differences were not statistically significant (estimated rate ratio of 0.54, 95% confidence interval of 0.23-1.27). Hispanic ethnicity and smoking were the only variables that were significant predictors of increased length of time to conception. The dry cleaners had a lower percentage of Hispanic wives (64.3% versus 92.3%) and smokers (0% versus 23.1%) than in the laundry worker group. The authors noted that higher fertility rates are observed in Hispanic women, as compared to Black or Caucasian women, and that smoking may reduce fertility. Based on the study results, the lack of data for tetrachloroethylene exposure in the wives and the poor matching of the groups in terms of ethnicity and smoking preclude making definitive conclusions.

In a case control study, Kyyrönen et al. (1989) determined the effects of tetrachloroethylene exposure on the risk of spontaneous abortions and congenital malformations in female dry cleaning and laundry workers in Finland. Potential cases of women working in the dry cleaning and laundry industry during the first trimester of pregnancy were identified by linking several employment and medical registries. The 108 dry cleaning workers (39 cases of spontaneous abortion and 69 controls) were dichotomized based on exposure to tetrachloroethylene. High exposure was defined as work tasks which included dry cleaning for at least 1 hour/day on average, or handling tetrachloroethylene at least once per week (9 cases and 6 controls). Low exposure was defined as work tasks which included pressing, spot removing, or handling tetrachloroethylene less than once a week at a dry cleaning shop (8 cases and 23 controls). Apparently, the rest of the dry cleaning workers were not exposed to tetrachloroethylene or the exposure was not known. An increased odds ratio for spontaneous abortions was observed in workers with high exposure to tetrachloroethylene (odds ratio of 3.6, 95% confidence interval of 1.3-11.2, p<0.05). Use of multivariate analysis to adjust for frequency of alcohol consumption, heavy lifting and frequent use of solvents other than tetrachloroethylene, resulted in an adjusted odds ratio of 3.4 (95% confidence interval of 1.0-11.2, p<0.05) in the workers with high tetrachloroethylene exposure. Low exposure to tetrachloroethylene was not a significant risk factor for spontaneous abortion (odds ratio of 0.7). The occurrence of congenital malformations was examined in 26 women working in the dry cleaning industry (4 cases and 22 controls). No significant association between either high (0 cases and 1 control) or low (2 cases and 8 controls) exposure to tetrachloroethylene and increased risk of congenital malformations was found (odds ratio of 0.8, 95% confidence interval of 0.2-3.5). The authors did not discuss the comparison group used to calculate the odds ratios for spontaneous abortion or congenital malformations. Although there was a large number of cases and controls for the spontaneous abortion study, the number of cases and controls working in the dry cleaning industry with either high or low exposure to tetrachloroethylene was relatively small. Additionally, the number of cases and controls with tetrachloroethylene exposure for the congenital malformations study was inadequate. The small number of cases and controls limits the interpretation of these studies.

Sallmén et al. (1995) examined the relationship between time-to-pregnancy and exposure to tetrachloroethylene and other organic solvents. Time-to-pregnancy was assessed by asking the subject, via questionnaires, the number of menstrual cycles required to become pregnant. The workers were divided into two groups based on low (tetrachloroethylene handled less than once a week or 1-4 times per week with air concentration measurements to indicate low exposure) or high (handled tetrachloroethylene daily or 1-4 times per week with measurements to indicate high exposure) exposure to tetrachloroethylene. The incidence density ratio (0.44, 95% confidence interval of 0.22-0.86; adjusted for recent use of IUD/spermicides and age of menarche) was statistically lower in 11 female dry cleaning workers with low or high exposure to tetrachloroethylene as compared to non-exposed referents (sample size not reported). When the time-to-pregnancy in workers with high exposure (6 workers) was compared to the non-exposed referents, the adjusted incidence density ratio was not statistically significant (0.57, 0.24-1.34).

In a cohort study by Olsen et al. (1990), reproductive outcomes were evaluated in women employed in the dry cleaning industry in Sweden, Denmark, and Finland during the first trimester of pregnancy. Among Finnish workers with high exposure to tetrachloroethylene (women involved in dry cleaning or spot removal at least 1 hour/day), a significant increase in the risk of spontaneous abortions was found (relative risk of 4.53, 95% confidence interval of 1.11-18.5); the risk in women with low exposure to tetrachloroethylene was not significantly different from women with no exposure to tetrachloroethylene (relative risk of 1.18, 95% confidence interval of 0.71-1.97). The risk of spontaneous abortion was not increased in Swedish or Danish workers. The risk of congenital malformations was not significantly elevated in the workers exposed to tetrachloroethylene. Additionally, when all types of reproductive effects (i.e., spontaneous abortions, malformations, stillbirths, and low birth weights) were assessed, no significant increases in relative risk were observed in the Swedish, Danish, or Finnish cohorts.

Animal Studies

In a chronic study conducted by NTP (1986), groups of 50 male and 50 female Fischer 344 rats were exposed to 0, 200, or 400 ppm (0, 1357, and 2713 mg/m^3) tetrachloroethylene 6 hours/day, 5 days/week for 103 weeks. Daily observations, survival, body weight measurements, necropsy and histopathological examination of major tissues and organs (including the nasal cavity, trachea, bronchi, and lungs) were used to assess toxicity. No unusual behaviors or alterations in body weight gain were observed in the tetrachloroethylene-exposed rats. A significant decrease in survival was observed in the males exposed to 400 ppm (38 deaths versus 27 in the controls and 30 in the 200 ppm group); survival was not affected in the females. The authors concluded that the increased mortality observed in the male rats during the latter portion of the study was due to the increased incidence of mononuclear cell leukemia. Statistically significant increases ($P<0.05$) in the incidence of several types of neoplasms, including mononuclear cell leukemia, renal tubular adenoma or adenocarcinoma (incidence was not statistically higher than controls, but this type of tumor is rarely observed and was considered toxicologically significant), interstitial cell tumors in the testes, and adenomas and carcinomas of the preputial gland were observed in the tetrachloroethylene-exposed rats. Non-neoplastic alterations were observed in the nasal cavity, kidney, adrenal gland, and forestomach; the incidences of these lesions are presented in Table 1. A significant increase in thrombosis in the nasal cavity was observed in male rats exposed to 400 ppm and female rats exposed to 200 or 400 ppm (9/50, 11/50, 19/50 in the 0, 200, and 400 ppm males and 3/50, 10.50, and 7/50, respectively, for the females). However, the investigators noted that the increased incidence of thrombosis was probably secondary to the mononuclear cell leukemia. Thus, this study identifies a LOAEL of 200 ppm (6 hours/day, 5 days/week) for squamous metaplasia in the nasal cavity, renal tubule cell karyomegaly, and adrenal medullary hyperplasia in rats exposed to tetrachloroethylene for 2 years; a NOAEL was not identified in this study.

Table 1. Incidence of non-neoplastic lesions in rats exposed to 200 or 400 ppm tetrachloroethylene 6 hours/day, 5 days/week for 2 years (NTP, 1986).

Effect	Male rats			Female rats		
	control	200 ppm	400 ppm	controls	200 ppm	400 ppm
squamous metaplasia in nasal cavity	0/50	5/50*	5/50*	2/50	4/50	2/50
renal tubule cell karyomegaly	1/49	37/49*	47/50*	0/50	8/49*	20/50*
renal tubular cell hyperplasia	0/49	3/49	5/50*	0/50	0/49	1/50

adrenal medullary hyperplasia	9/50	11/50*	19/50*	7/50	3/49	4/47
adrenal cortical hyperplasia	11/49	5/49	7/49	4/50	6/49	11/47*
forestomach ulcers	0/48	1/49	5/49*	3/49	4/49	0/48
*incidence statistically different from controls ($p<0.05$)						

NTP (1986) also exposed groups of B6C3F1 mice (50/sex/group) to 0, 100, or 200 ppm (0, 678, and 1357 mg/m^3) tetrachloroethylene 6 hours/day, 5 days/week for 103 weeks. Statistically significant decreases in survival were observed in the male mice exposed to 100 (25/50) or 200 (32/50) ppm, as compared to controls (46/50), and in the female mice exposed to 200 ppm (36/50, 31/50, 17/50 in the 0, 100, and 200 ppm groups, respectively). The authors attributed the increased mortality to the high incidence of hepatocellular neoplasms. Body weights were comparable among the groups. Statistically significant increases in the incidence of hepatocellular adenomas in males and hepatocellular carcinomas in males and females were observed. Tetrachloroethylene exposure resulted in significant increases in the incidence of renal tubular karyomegaly, renal casts, hepatic degeneration (characterized by cytoplasmic vacuolation, hepatocellular necrosis, inflammatory cell infiltrates, increased pigmentation in cells, oval cell hyperplasia, and regenerative foci), hepatic necrosis, hepatic nuclear inclusion, and acute passive congestion in the lungs; the incidence data are presented in Table 2. This study identifies a LOAEL of 100 ppm (6 hours/day, 5 days/week) based on renal (karyomegaly and nephrosis), hepatic (degeneration, necrosis, and nuclear inclusions), and lung (congestion) effects in chronically exposed mice; a NOAEL was not identified.

Table 2. Incidence of non-neoplastic lesions in mice exposed to 100 or 200 ppm tetrachloroethylene 6 hours/day, 5 days/week for 2 years (NTP, 1986)

Effect	Male mice			Female mice		
	control	100 ppm	200 ppm	control	100 ppm	200 ppm
renal tubule cell karyomegaly	4/49	17/49*	46/50*	0/48	16/49*	38/50*
nephrosis	22/49	24/49	28/49	5/48	14/49*	25/50*
hepatic degeneration	2/49	8/49*	14/50*	1/49	2/50	13/50*
hepatic necrosis	1/49	6/49*	15/50*	3/48	5/50	9/50*

hepatic nuclear inclusions	2/49	5/49*	9/50*	incidence not reported		
acute passive congestion in lungs	1/49	8/49*	10/50*	1/48	5/50	6/50
*incidence significantly different from controls ($p<0.05$)						

In a subchronic study by NTP (1986), Fischer 344 rats (10/sex/group) inhaled 0, 100, 200, 400, 800, and 1600 ppm (0, 678, 1356, 2713, 5426, and 10851 mg/m^3) tetrachloroethylene 6 hours/day, 5 days/week for 13 weeks. Death occurred in 40% of the males and 70% of the females in the 1600 ppm group (no deaths were observed in the other groups). Final mean body weights were 20% lower in the 1600 ppm males than in controls and 11% lower for females. A concentration-related increase in the incidence of hepatic congestion was exhibited in the rats. This effect was observed in the control rats (males: 1/10, 2/10, 3/10, 5/10, 7/10; females: 0/9, 1/10, 5/10, 5/10, 8/9). It was also evident in the 200, 400, 800, and 1600 ppm tetrachloroethylene exposed male and female populations. The 100 ppm exposed male and female groups were not examined for this effect. The degree of severity was also reported to be concentrated-related. Lung congestion developed in 14 of the 20 male and female rats exposed to 1600 ppm, but was not observed in any of the rats in the 800 ppm exposed group or in the controls. A NOAEL of 200 ppm and a LOAEL of 400 ppm based on the hepatic effect was determined in rats exposed to tetrachloroethylene 6 hours/day, 5 days/week for 13 weeks.

NTP (1986) also exposed B6C3F1 mice (10/sex/group) to the same concentrations and subchronic duration as the rats. Two males and 4 females in the 1600 ppm group died during the study; deaths were not observed in the other groups. Clinical signs in the exposed mice included a hunched appearance and lack of movement at 400 ppm, panting and irritation at 800 ppm, and incoordination and unconsciousness at 1600 ppm. Liver lesions (leukocytic infiltration, centrilobular necrosis, and bile stasis) developed in mice exposed to ≥400 ppm (males: 0/10, 0/10, 8/10, 10/10, 10/10 in the 0, 200, 400, 800, and 1600 ppm exposed groups; females: 0/10, 3/10, 5/10, 5/10, 1/10, in similarly exposed groups; livers were not examined in animals exposed to 100 ppm). The severity of the lesions increased with exposure concentration reaching mild severity at 1600 ppm. Mitotic alterations were also observed in the liver of male mice, although the incidence did not appear to be concentration-related. Karyomegaly of renal tubular epithelial cells was seen in mice exposed to 200 ppm or higher (males: 0/10, 0/10, 6/10, 10/10, 10/10, 7/7 in the 0, 100, 200, 400, 800, and 1600 ppm exposed groups respectively; females: 0/10, 0/10, 8/10, 10/10, and 6/7, exposed in similar groups respectively). The NOAEL is 100 ppm and the LOAEL is 200 ppm based on increased incidences of renal tubular cell karyomegaly in mice exposed to tetrachloroethylene 6 hours/day, 5 days/week for 13 weeks.

Kylin et al. (1965) reported on female mice (strain not identified) (20/group) inhaling 200 ppm (1356 mg/m^3) tetrachloroethylene vapor 4 hours/day, 6 days/week for 1, 2, 4 or 8 weeks.

Only the liver and kidneys were examined. Compared to the controls, an increased incidence of fatty degeneration in the liver was observed in exposed animals, with greater severity at the longer exposure periods. A two-fold increase in liver fat was also reported in the exposed group. Kidney histopathology revealed no differences between the control and exposed groups. The LOAEL for the study was 200 ppm (4 hours/day, 6 days/week) based on hepatic effects in female mice exposed to 1-8 weeks.

Odum et al. (1988) exposed groups of Fischer 344 rats and B6C3F1 mice (5/sex/species/group) to 0, 200, or 400 ppm (1356 and 2713 mg/m^3) tetrachloroethylene 6 hours/day for 14, 21, or 28 consecutive days. Small, but statistically significant increases in relative liver weights were observed in the male and female mice exposed to 400 ppm; no effects on liver weights were observed in the mice exposed to 200 ppm or in exposed rats. Hepatic cyanide-insensitive palmitoyl CoA oxidase activity (marker for peroxisomal β-oxidation) was significantly increased in male and female rats and mice exposed to 200 ppm for 28 days and in male and female rats and mice exposed to 400 ppm for 14, 21, or 28 days (increase not significant in male rats exposed for 28 days). The magnitude of the increased activity was greater in the mice as compared to the rats. Palmitoyl CoA oxidase activity was also significantly increased in the kidneys of rats exposed to 200 ppm for 28 days and in female rats exposed to 400 ppm for 14-28 days. Hepatic peroxisomal catalase levels were significantly increased in male mice exposed to 400 ppm for 21 or 28 days although the increases was slight; no alterations were observed in the female mice or in the male or female rats. In the rats, centrilobular hepatocellular hypertrophy (consisting of proliferation of smooth endoplasmic reticulum) with a concomitant loss of glycogen was observed in the males of both exposed groups and the females of the 400 ppm group. In the mice, lipid accumulation in centrilobular hepatocytes was observed in the 200 and 400 ppm groups, as well as centrilobular eosinophilia and centrilobular fatty vacuolation in the 400 ppm group; the effects were similar in males and females. A significant increase in the volume of cytoplasm with peroxisomes was seen in the hepatocytes of both exposed groups of mice. The 200 ppm concentration is a LOAEL for rats and mice exposed to tetrachloroethylene 6 hours/day, 5 days/week for 14-28 days for hepatic effects.

In an older study by Carpenter (1937), male and female rats (24/group) (strain not specified) were exposed to 70, 230, or 470 ppm (475, 1560, or 3188 mg/m^3) tetrachloroethylene 8 hours/day, 5 days/week for 7 months. The control group consisted of 18 unexposed rats. Weight gain did not appear to be affected by tetrachloroethylene exposure, and no alterations in total or differential leukocyte levels, blood levels of glucose, calcium, bilirubin, or icteric index, or levels of total nitrogen, sulfate, bilirubin, or albumin in the urine were observed. Histopathological examinations of the liver, kidney, spleen, adrenal, heart, retina, and optic and sciatic nerves were performed immediately after exposure to 70 ppm, 20 days after termination of exposure to 230 ppm, and 46 days after termination of exposure to 470 ppm; it is unclear whether some animals in the 230 and 470 ppm groups were also examined immediately after exposure termination. Incidence data were not presented. Decreased glycogen storage was observed in the rats exposed to 230 ppm; at 470 ppm congestion and cloudy swelling of the liver were observed. The authors reported congested kidneys with granular swelling at 230 ppm. At 470 ppm, an increase in secretion, cloudy swelling, and desquamation in the kidneys were reported in rats. Splenic congestion and increased hemosiderin deposits were also exhibited in the rats exposed to 230 or 470 ppm. A NOAEL of 70 ppm and LOAEL of 230 ppm were determined for the study based on hepatic, renal, and splenic effects observed in rats exposed for 8 hours/day, 5 days/week for 7 months.

Several inhalation studies have found biochemical alterations in the brains of rodents. These alterations suggest that tetrachloroethylene exposure results in damage to the cerebral cortex, hippocampus, and cerebellum. In Mongolian gerbils continuously exposed to 320 ppm tetrachloroethylene for 3 months followed by a 4-month recovery period, significant increases in S-100 protein, indicative of astroglial hypertrophy and/or proliferation, were found in occipital cerebral cortex, hippocampus, anterior cerebellar hemispheres, and posterior cerebellar vermis (Rosengren et al., 1986). In contrast, significant decreases in S-100 protein levels, DNA concentration, and tissue weight were observed in the frontal cerebral cortex, suggesting atrophy and a loss of glial cells. A decrease in DNA content in the frontal cerebral cortex was also observed in gerbils similarly exposed to 60 ppm tetrachloroethylene (Rosengren et al., 1986; Karlsson et al., 1987). Wang et al. (1993) also found significant decreases in S-100 protein, glial fibrillary acid protein in the frontal cerebral cortex of Sprague-Dawley rats continuously exposed to 600 ppm for 4-12 weeks. These investigators also found decreased S-100 and glial fibrillary acid protein levels in the brain stem and hippocampus. Statistically significant alterations fatty acid composition of total ethanolamine phosphoglyceride were observed in the cerebral cortex and hippocampus of Mongolian gerbils continuously exposed to 120 ppm for 12 months (Kyrklund et al., 1984) or 320 ppm for 3 months (Kyrklund et al., 1987) and in Sprague Dawley rats continuously exposed to 320 ppm for 30 or 90 days (Kyrklund et al., 1988, 1990). Brain amino acid levels are also altered following inhalation exposure to tetrachloroethylene. Significant decreases in the levels of taurine in the hippocampus and the posterior part of the cerebellar vermis and increases in glutamine levels in the hippocampus were observed in Mongolian gerbils continuously exposed to 120 ppm for 12 months (Briving et al., 1986).

In a two-generation reproductive toxicity study (Tinston et al., 1995), groups of 24 male and 24 female Alpk:ApfSD rats were exposed to 0, 100, 300, or 1000 ppm tetrachloroethylene (0, 678, 2035, or 6780 mg/m^3) 6 hours/day, 5 days/week during a pre-mating period (≥11 weeks duration) and 6 hours/day, 7 days/week during mating, gestation, and on post-partum days 6-29 (The F_{2B} and F_{2C} were killed on post-partum day 5). The parental generation (F_0) was mated once to produce the F_{1A} generation and these rats were mated to produce the F_{2A} generation. The 0, 300, and 1000 ppm F_{1A} groups were mated to produce the F_{2B} litters, and F_{1A} males in the 0 or 1000 ppm groups were mated with unexposed females to produce the F_{2C} litters. CNS depression was observed in all generations during the first 2 weeks of exposure to 1000 ppm. Salivation, breathing irregularities, piloerection, and tip-toe gait were also observed in the 1000 ppm groups. In the 300 ppm group, there was an increased incidence of piloerection and increased breathing rates. In the F_0 group exposed to 1000 ppm, resumption of exposure on postpartum day 6 resulted in sedation and consequent neglect of litters (hypothermia, poor survival, and decreased growth were observed in the pups); thus, the 1000 ppm F_{2A} group was not exposed during lactation. Significant decreases in parental body weights were observed at 300 and 1000 ppm; in general, body weights were within 10% of controls. No adverse effects on gestation length or male or female fertility were observed. In the 1000 ppm F_{1A}, F_{2A}, and F_{2B} litters, there were significant decreases in the number of live pups and/or litters with live pups, decreases in pup survival at days 1-5 (not observed in F_{1A} litters) or days 5-22 (F_{2B} litters killed at day 5), decreases in litter size (F_{2A} and F_{2B} litters only), decreases in pup body weight, and decreases in litter weights. At 300 ppm, there was a significant decrease in pup body weight in the F_{1A} litters and sporadic decreases in litter weight in the F_{2A} and F_{2B} litters. The lack of effects in the F_{2C} pups suggests that the observed effects were maternally mediated. Significant decreases in absolute and relative liver and kidney weights were observed in the F_0 males exposed to 1000 ppm and decreases in relative liver and kidney weight were observed in F_{1A} males exposed to 1000 ppm. Absolute testes weights and testes weight adjusted for body weights were significantly decreased in F_1 males exposed to 300 or 1000 ppm. Histopathological alterations were limited to significant increases in the incidence of minimal chronic progressive glomerulonephropathy in F_0 males exposed to 1000 ppm (8/23, 8/24, 5/23, and 14/24 in the 0, 100, 300, and 1000 ppm exposed groups, respectively) and increased incidences of pleomorphism in proximal tubular nuclei in F_0 males and females exposed to 1000 ppm (not observed in males and females exposed to 0, 100, or 300 ppm and 24/24 males and 12/22 females exposed to 1000 ppm). This study identified a NOAEL of 100 ppm and LOAEL 300 ppm for reproductive/developmental effects in rats.

Schwetz et al. (1975) exposed groups of 18 pregnant Sprague-Dawley rats and 17 pregnant Swiss Webster mice to 300 ppm (2035 mg/m^3) tetrachloroethylene 7 hours/day on gestational days 6–15. Control groups of 30 rats and 30 mice were used. A slight, but significant, increase in the incidence of resorptions was seen in the rat. There were no increased incidences of gross or skeletal anomalies in the exposed rat fetuses compared to controls. In mice, fetal body weights were significantly decreased. Increases in soft tissue alteration (subcutaneous edema) and skeletal anomalies (delayed ossification of skull bones, unfused centers of ossification) were seen in litters of exposed mice. A LOAEL of 300 ppm was determined for development effects in mice (decreased fetal weight; delayed ossification) and rats (increased fetal resorptions).

In a behavioral developmental study by Nelson et al. (1980), pregnant Sprague-Dawley rats (19 or 21/group) were exposed to 100 ppm (678 mg/m^3) tetrachloroethylene on gestational days 14–20 or 900 ppm tetrachloroethylene (6104 mg/m^3) on gestational days 7–13 or 14–20. Three control groups were also included. Seven behavioral tests were performed on litters at ages 4–46 days to measure various CNS functions at different stages of development. No neurobehavioral effects were exhibited by the offspring exposed to 100 ppm *in utero*. A significant decrease in brain acetylcholine levels was found in 21-day-old offspring exposed to

900 ppm for either gestational period, as well as a decrease in dopamine levels in offspring exposed during gestational days 7–13. In this latter group, there was decreased performance on tests of neuromuscular ability (ascent on a wire mesh screen and rotorod balancing) on certain days. Offspring (before weaning) from dams exposed to 900 ppm on days 14–20 performed poorly on the ascent test on test day 14 only, but later in development, their performance in the rotorod balancing test was superior to controls, and they were more active in an open-field test. This study identifies a LOAEL for decreases in neurochemical levels and possibly alterations in neurobehavioral performance in the offspring of rats exposed to 900 ppm tetrachloroethylene on gestational days 7-13 or 14-20.

Carpenter (1937) reported that effects on fertility were apparent in rats exposed to 230 and 470 ppm (1560 and 3188 mg/m^3) tetrachloroethylene 8 hours/day, 5 days/week for 7 months (see the previous section for more information on this subchronic study). Therefore, a NOAEL of 470 ppm for reproductive effects was determined in rats subchronically exposed to tetrachloroethylene.

Hardin et al. (1981) found no evidence of maternal or fetal toxicity in rats or rabbits exposed to 500 ppm (3391 mg/m^3) tetrachloroethylene on gestational days 1–19 and 1–24, respectively. The authors provided very little information on the experimental design, it appears that groups of 30 Sprague-Dawley or Wistar rats and 15-20 New Zealand rabbits were exposed to two concentrations of tetrachloroethylene for 6 or 7 hours/day. The authors noted that for some studies (the paper describes developmental effects for a number of chemicals), the rats were exposed for 3 weeks prior to mating and during gestation.

DERIVATION OF PROVISIONAL CHRONIC RfC

The toxicity of tetrachloroethylene has been investigated in a number of studies of workers in the dry cleaning industry. In most of these studies, the current concentrations of tetrachloroethylene in the breathing zone were relatively low (TWA concentrations <25 ppm); these concentrations tended to range from very low levels to almost 100 ppm. The large variation in exposure levels may reflect differences in exposure levels associated with different jobs (pressers, machine operators) or differences in the type of equipment used (wet transfer or dry-to-dry transfer). The occupational exposure studies only measured current tetrachloroethylene concentrations; this may have resulted in an underestimation of actual exposure because exposure to tetrachloroethylene in the dry cleaning industry has generally declined with improved technology and reductions in occupational exposure regulations. The occupational exposure studies primarily focused on subclinical liver and kidney effects, neurological effects, and fertility. No alterations in liver function biomarkers (serum alanine aminotransferase, aspartate aminotransferase, γ-glutamyltransferase, and bilirubin) have been observed in several studies (Brodkin et al., 1995; Cai et al., 1991; Lauwerys et al., 1983). However, ultrasonographic alterations suggestive of steatosis were observed in dry cleaning workers in the Brodkin et al. (1995) study. Mutti et al. (1992) found significant alterations in some serum and urine biomarkers of kidney function which the investigators suggested may be the result of generalized membrane disturbances in the kidneys. Other studies found alterations in urine lysozyme levels (Vyskocil et al., 1990; Franchini et al., 1983), but levels of other biomarkers such as albumin and β_2-microglobulin were not altered. Positive evidence of subtle neurotoxicity (as evidenced by altered performance on neurobehavioral tests and increases in subjective symptoms of CNS toxicity) has been observed in a number of occupational studies (Lauwerys et al., 1983; Cai et al., 1991; Ferroni et al., 1992; Echeverria et al., 1995; Seeber, 1989). The results of several occupational exposure studies are suggestive of an association between tetrachloroethylene exposure and impaired fertility, in particular, increases in the risk of spontaneous abortions (Kyyrönen et al., 1989; Olsen et al., 1990) and increased time-to-pregnancy (Eskenazi et al., 1991b; Sallmén et al., 1995). In conclusion, the results of a number of occupational exposure studies suggest that exposure to current TWA concentrations of 15-25 ppm (102-170 mg/m^3) tetrachloroethylene can result in increases in the incidence of subclinical alterations in the liver and kidneys, small changes in neurobehavioral performance, increases in the incidence of some subjective CNS symptoms and possibly decreases in reproductive performance.

The identification of the liver, kidney, and brain as the primary targets of toxicity is supported by the results of a number of chronic and subchronic animal studies. In a chronic study conducted by NTP (1986) in rats and mice, exposure to the lowest tested concentration (200 and 100 ppm, respectively) resulted in increases in the incidence of nasal, kidney, and adrenal gland effects in the rats and liver, kidney, and lung effects in the mice. Subchronic studies in rats and gerbils have found several biochemical alterations which are suggestive of damage to the frontal cerebral cortex, hippocampus, and cerebellum; these effects generally occur at similar or higher concentrations as the chronic LOAELs. The available animal studies do not suggest that reproductive/developmental toxicity is a primary target of tetrachloroethylene toxicity.

The small number of subjects used in some studies, the uncertainty associated with the adversity of some of the observed effects, and the lack of adequate exposure information preclude deriving a provisional RfC from the available occupational exposure studies. Thus, the NTP (1986) animal study was selected as the basis of the provisional RfC. The chronic rat study identified a LOAEL of 200 ppm (1357 mg/m^3, 6 hours/day, 5 days/week) for squamous metaplasia in the nasal cavity, renal tubule cell karyomegaly, and adrenal medullary hyperplasia. The LOAEL identified in the chronic mouse study was 100 ppm (678 mg/m^3; 6 hours/day, 5 days/week) for renal tubule cell karyomegaly, nephrosis, hepatic degeneration and necrosis, and acute passive congestion in the lungs.

A provisional RfC for tetrachloroethylene can be derived by dividing the critical dose by an uncertainty factor. Using the traditional approach for calculating an RfC, the critical dose would be equal to the $LOAEL_{HEC}$ for the critical effect. Using the 1990 RfC methodology (U.S. EPA, 1990), $LOAEL_{HEC}$ values for extrarespiratory effects are calculated using the following equation:

$$LOAEL_{HEC} = LOAEL_{ADJ} \times P_{b/g_A} / P_{b/g_H}$$

Where: $LOAEL_{ADJ}$ is the duration-adjusted study LOAEL

$P_{b/g}$ is the blood/gas partition coefficient for animals and humans. Blood/gas partition coefficients of 10.3, 18.85, and 16.9 were identified for humans, rats, and mice, respectively (Reitz et al., 1996). Because the ratios of animal to human blood/gas partition coefficients were greater than 1, a default ratio of 1 was used.

The following equations (U.S. EPA, 1990) was used to calculate $LOAEL_{HEC}$ values for respiratory effects:

$$LOAEL_{HEC} = LOAEL_{ADJ} \times RGDR$$

$$RGDR = \frac{(Inhalation\ rate\ /\ Surface\ Area\ )_A}{(Inhalation\ rate\ /\ Surface\ Area\ )_H}$$

Where: $LOAEL_{ADJ}$ is the duration-adjusted study LOAEL.
RGDR is the regional gas dose ratio. The following default values were used to calculate the RGDRs: 20, 0.24, and 0.060 m^3/day inhalation rates for humans, Fischer 344 rats, and B6C3F1 mice, respectively (U.S. EPA, 1988b); 200 and 15.0 cm^2 surface areas for the extrathoracic region in humans and rats (U.S. EPA, 1994b); and 54.0 and 0.05 m^2 surface areas for the pulmonary region in humans and mice (U.S. EPA, 1994b).

The $LOAEL_{HEC}$ values for kidney, adrenal, and nasal lesions in rats exposed to 200 ppm (6 hours/day, 5 days/week) and liver, kidney, and lung effects in mice exposed to 100 ppm (6 hours/day, 5 days/week) are presented in Table 3.

Table 3. Human equivalent concentrations for the LOAELs identified in the rat and mouse chronic study (NTP, 1986).

Species	Effect	$LOAEL_{ADJ}$ (mg/m^3)	$LOAEL_{HEC}$[a] (mg/m^3)
rat	renal tubular cell karyomegaly adrenal hyperplasia	242	242
rat	squamous metaplasia in nasal cavity	242	39
mouse	renal tubular karyomegaly, nephrosis hepatic degeneration and necrosis	121	121
mouse	acute passive lung congestion	121	392

[a]Calculated using the equations presented in the text

Statistical models can also be used to estimate a benchmark concentration (BMC). With this approach, the critical dose would be the human equivalent concentration of the BMC. For each effect with a statistically significant increase in incidence in mice exposed to 100 ppm and the incidence of nasal lesions in rats, the concentrations associated with 1, 5, and 10% relative increases in the probability of response were estimated using a 1 degree polynomial model with "extra risk" (Global86 computer program, Clement Associates, 1986). To calculate RfCs, U.S. EPA (1997) has used the 95% lower limit on the concentration at extra risk level of 0.1 as the BMC. This approach is supported by the Faustman et al. (1994) and Allen et al. (1994) studies which found that, for quantal developmental effects, the 95% lower limit on dose at extra risk level of 0.1 correlated with the observed NOAELs. The BMC and BMC_{HEC} values for nasal lesions in male rats, hepatic degeneration in male mice, nephrosis in female mice, renal tubular cell karyomegaly in male and female mice (combined incidence), and lung congestion in male mice are presented in Table 4; additional details of the statistical models are presented in the Appendix.

Table 4. Benchmark concentrations and human equivalent benchmark concentrations for LOAELs identified in rats and mice (NTP, 1986)

Species	Effect	BMC[a]	BMC_{HEC}[b] (mg/m^3)
rat	squamous metaplasia in nasal cavity	186 ppm (1262 mg/m^3)	30
mouse	hepatic degeneration	49 ppm (332 mg/m^3)	60
mouse	nephrosis	28 ppm (190 mg/m^3)	34
mouse	renal tubular cell karyomegaly	14 ppm (95 mg/m^3)	17
mouse	acute passive lung congestion	59 ppm (400 mg/m^3)	230

[a]Details of the statistical models are presented in the Appendix
[b]Calculated using the equations presented in the text

A provisional RfC for tetrachloroethylene can be derived using either method NOAEL/LOAEL approach or benchmark approach. Using the NOAEL/LOAEL approach, the $LOAEL_{HEC}$ of 121 mg/m^3 for renal and hepatic effects observed in the chronic mouse study (NTP, 1986) is selected as the critical concentration. Although, the $LOAEL_{HEC}$ for squamous metaplasia in the nasal cavity in male rats is lower (39 mg/m^3), it was not selected as the critical concentration because the incidence was very low (5/50 versus 0/50 in controls) and was not concentration-related. Dividing the $LOAEL_{HEC}$ of 121 mg/m^3 for liver and kidney effects in mice by an uncertainty factor of 300 (10 for use of a LOAEL, 10 for human variability, and 3 for interspecies extrapolation using dosimetric adjustments) would result in a provisional RfC of 4E-1 mg/m^3.

Alternatively, the BMC_{HEC} of 17 mg/m^3 for renal tubular cell karyomegaly in chronically exposed male and female mice (NTP, 1986) could be used to derive a provisional RfC for tetrachloroethylene. This BMC_{HEC} was selected as the basis of the RfC because it was the lowest critical concentration for a relevant endpoint and it had the highest chi-square goodness of fit (see Appendix for details). A provisional chronic RfC of 6E-1 mg/m^3 tetrachloroethylene was determined based on this BMC_{HEC} of 17 mg/m^3 and an uncertainty factor of 30 (10 for human variability and 3 for interspecies extrapolation using dosimetric adjustments).

Confidence in the principal study (NTP, 1986) is medium-high. The NTP study was well-conducted using a sufficient number of animals and examining a number of relevant endpoints, although a NOAEL was not established for the study. Furthermore, the critical effects identified in the study were supported by several other inhalation studies (including occupational studies). Confidence in the database is medium. There is a large amount of data on inhalation exposure to tetrachloroethylene in humans and animals. Chronic human data come from studies conducted on exposed workers in dry cleaning shops (Brodkin et al., 1995; Cai et al., 1991; Ferroni et al., 1992; Franchini et al., 1983; Lauwerys et al., 1983; Mutti et al., 1992; Seeber, 1989; Vyskocil et al., 1990; Echeverria et al., 1995). However, these occupational studies have several limitations, in particular inadequate monitoring data. Therefore, there is a need for well-conducted chronic occupational studies to establish the thresholds for CNS, renal, liver, and reproductive effects in humans. There are numerous animal studies for chronic and subchronic durations which describe the effects of tetrachloroethylene exposure in rats, mice, and gerbils. The primary target organs found in these studies were the liver, kidney, and CNS. Hepatic and renal effects were assessed in rats and mice (Carpenter, 1937; NTP, 1986; Odum et al., 1988) and neurological changes were evaluated in rats and gerbils (Briving et al., 1986; Karlsson et al., 1987; Kyrklund et al., 1984, 1987, 1988, 1990; Rosengren et al., 1986; Wang et al., 1993). Also, several investigators (Eskenazi et al., 1991a, 1991b; Kyyrönen et al., 1989; Sallmén et al., 1995; Olsen et al., 1990) have assessed the effect of tetrachloroethylene on the reproductive outcomes of exposed dry cleaning workers and/or their wives; however, these studies lack adequate exposure information. The database contains information on the developmental and reproductive toxicity of tetrachloroethylene in animals (Carpenter, 1937; Hardin et al., 1981; Nelson et al., 1980; Schwetz et al., 1975; Tinston et al., 1995); some of these provide evidence that exposure to tetrachloroethylene can result in reproductive/developmental effects. The overall confidence in the RfC is medium based on the medium confidence for the database.

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APPENDIX

Polynomial model--Incidence of squamous metaplasia in male rats exposed to tetrachloroethylene for 6 hours/day, 5 days/week for 2 years (NTP, 1986)

Chi-square goodness of fit: 1.2418

MLE estimates of dose coefficients: q0= 0.0, q1= 0.00035

Model form: P(D) = 1-exp(-q0-q1*D)

Maximum value of log-likelihood function: -33.096

Extra Risk	MLE Concentration (ppm)	95% Lower Limit on Concentration (ppm)
0.1	299.97	185.80
0.05	146.04	90.453
0.01	28.614	17.723

Polynomial model--Incidence of nephrosis in female mice exposed to tetrachloroethylene for 6 hours/day, 5 days/week for 2 years (NTP, 1986)

Chi-square goodness of fit: 0.29543

MLE estimates of dose coefficients: q0= 0.1048, q1= 0.002731

Model form: P(D) = 1-exp(-q0-q1*D)

Maximum value of log-likelihood function: -80.161

Extra Risk	MLE Concentration (ppm)	95% Lower Limit on Concentration (ppm)
0.1	38.586	27.571
0.05	18.785	13.422

0.01	3.681	2.630

Polynomial model--Incidence of renal tubule cell karyomegaly in male and female mice (combined incidence) exposed to tetrachloroethylene for 6 hours/day, 5 days/week for 2 years (NTP, 1986)

Chi-square goodness of fit: 0.8739

MLE estimates of dose coefficients: q0= 0.03629, q1= 0.006345

Model form: P(D) = 1-exp(-q0-q1*D)

Maximum value of log-likelihood function: -131.388

Extra Risk	MLE Concentration (ppm)	95% Lower Limit on Concentration (ppm)
0.1	16.604	14.083
0.05	8.084	6.856
0.01	1.584	1.343

Polynomial model--Incidence of hepatic degeneration in male mice exposed to tetrachloroethylene for 6 hours/day, 5 days/week for 2 years (NTP, 1986)

Chi-square goodness of fit: 0.00753

MLE estimates of dose coefficients: q0= 0.04120, q1= 0.001415

Model form: P(D) = 1-exp(-q0-q1*D)

Maximum value of log-likelihood function: -59.8146

Extra Risk	MLE Concentration (ppm)	95% Lower Limit on Concentration (ppm)
0.1	74.439	49.426

0.05	36.239	24.062
0.01	7.101	4.715

Polynomial model--Incidence of acute passive lung congestion in male mice exposed to tetrachloroethylene for 6 hours/day, 5 days/week for 2 years (NTP, 1986)

Chi-square goodness of fit: 0.6704

MLE estimates of dose coefficients: q0= 0.02352, q1= 0.001171

Model form: P(D) = 1-exp(-q0-q1*D)

Maximum value of log-likelihood function: -52.0340

Extra Risk	MLE Concentration (ppm)	95% Lower Limit on Concentration (ppm)
0.1	89.964	58.568
0.05	43.798	28.513
0.01	8.582	5.587

Tetrachloroethylene RfC

Study	Species	Critical Effect(s)	Effect Level	
			NOAEL	LOAEL
CHRONIC ANIMAL STUDIES				
NTP 1986 103-week study	Fischer 344 rats	Kidney (karyomegaly) Adrenal gland (hyperplasia) Nasal cavity (squamous metaplasia)		200 ppm (1357 mg/m^3)
	B6C3F1 mice	Kidney (karyomegaly, nephrosis) Liver (degeneration and necrosis) Lung (congestion)		100 ppm (678 mg/m^3)
Briving et al. 1986 12-month study	Mongolian gerbils	CNS (decreased taurine in hippocampus and posterior part of cerebellar vermis; increased glutamine in hippocampus)		120 ppm (814 mg/m^3)
Kyrklund et al. 1984 12-month study	Mongolian gerbils (males)	CNS (altered fatty acid composition of phosphatidylethanolamine in cerebral cortex and hippocampus)		120 ppm (814 mg/m^3)
SUBCHRONIC ANIMAL STUDIES				
NTP 1986 13-week study	Fischer 344 rats	Liver (congestion)	200 ppm (1357 mg/m^3)	400 ppm (2713 mg/m^3)
	B6C3F1 mice	Kidney (karyomegaly)	200 ppm (1357 mg/m^3)	400 ppm (2713 mg/m^3)
Kylin et al. 1965 1–8-week study	female mice (strain not specified)	Liver (fatty degeneration)		200 ppm (1357 mg/m^3)
Odum et al. 1988 14–28-day study	Fischer 344 rats	Liver (centrilobular hypertrophy; increased palmitoyl CoA oxidase activity)		200 ppm (1357 mg/m^3)

Study	Species	Critical Effect(s)	Effect Level	
			NOAEL	LOAEL
	B6C3F1 mice	Liver (lipid accumulation; peroxisomal proliferation; increased relative organ weight)		200 ppm (1357 mg/m^3)
	B6C3F1 mice	Kidney (no effects)	NOAEL = 400 ppm = 2713 mg/m^3	NOAEL = 678 mg/m^3
Carpenter 1937 7-month study	rats (strain not specified)	Liver (decreased glycogen) Kidney (secretion; cloudy swelling; desquamation) Spleen (congestion; increased hemosiderin deposits)	70 ppm (475 mg/m^3)	230 ppm (1560 mg/m^3)
Karlsson et al. 1987 3-month study	Mongolian gerbils	CNS (decreased DNA in frontal cerebral cortex)		60 ppm (407 mg/m^3)
Rosengren et al. 1986 3-month study	Mongolian gerbils	CNS (decreased DNA in frontal cerebral cortex)		60 ppm (407 mg/m^3)
Kyrklund et al. 1987 3-month study	Mongolian gerbils (sex not reported)	CNS (altered fatty acid pattern in cerebral cortex and hippocampus)		320 ppm (2171 mg/m^3)
Kyrklund et al. 1990 90-day study	Sprague-Dawley rats (males)	CNS (altered fatty acid pattern in cerebral cortex)		320 ppm (2171 mg/m^3)
Kyrklund et al. 1988 30-day study	Sprague-Dawley rats (males)	CNS (altered fatty acid pattern in cerebral cortex)		320 ppm (2171 mg/m^3)
Wang et al. 1993 12-week study	Sprague-Dawley rats (males)	CNS (decreased brain weight, decreased DNA and protein in cerebral cortex and brain stem; decreased glial fibrillary acid protein and S-100 protein)		600 ppm (4070 mg/m^3)
REPRODUCTIVE/DEVELOPMENTAL STUDIES				

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Study	Species	Critical Effect(s)	Effect Level	
			NOAEL	LOAEL
Tinston et al. 1995	Alpk:ApfSD rats	Decreased pup body weight	100 ppm (678 mg/m^3)	300 ppm (2035 mg/m^3)
Schwetz et al. 1985	Sprague-Dawley rats	Increased fetal resorption		300 ppm (2035 mg/m^3)
	Swiss Webster mice	Decreased fetal body weight; delayed ossification		300 ppm (2035 mg/m^3)
Nelson et al. 1980	Sprague-Dawley rats	Behavioral and neurochemical changes	100 ppm (678 mg/m^3)	900 ppm (6105 mg/m^3)

Attachment 9

Risk Assessment Issue Paper for:
Carcinogenicity Information for
Trichloroethylene (TCE) (CASRN 79-01-6)

The current phase of the carcinogenicity characterization for trichloroethylene started with a July 1985 Health Assessment Document for Trichloroethylene, EPA# 600/8-82/006F which classified trichloroethylene in Weight-of-Evidence Group "B2 - Probable Human Carcinogen". Inhalation and oral upper bound risk estimates were provided. This information was verified on IRIS from 3/87 through 7/89. A June 1987 Addendum to the Health Assessment Document for Trichloroethylene, EPA# 600/8-82/006FA proposed that the Weight-of-Evidence finding of "B2" was further supported by newly available animal bioassay data and offered a minor revision to the inhalation upper bound risk estimate. In 1988 the Agency's Science Advisory Board offered an opinion that the weight-of-evidence was on C-B2 continuum (C=Possible Human Carcinogen, B2=Probable Human Carcinogen). The Agency withdrew the IRIS carcinogenicity file in 7/89 and has not adopted a current position on the weight-of-evidence classification.

The quantitative risk estimates provided in the 1985 Health Assessment Document and 1987 Addendum have been reviewed by the IRIS-Crave Workgroup but are not verified as such pending resolution of the weight-of-evidence classification. The upper bound risk values in these documents are as follows:

ORAL: 1985 HAD; Unit Risk = 3.2E-7 per ug/L
Slope Factor = 1.1E-2 per mg/kg/day

INHALATION: 1987 Addendum; Unit Risk = 1.7E-6 per ug/cu.m.
Slope Factor = 6.0E-3 per mg/kg/day

When the Agency adopts a current position on weight-of-evidence classification, the trichloroethylene file will be reentered on IRIS.

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Appendix K

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Appendix K

Site Photographs

APPENDIX K

Site Photographs

Photographs of the various FUs are included in this appendix.

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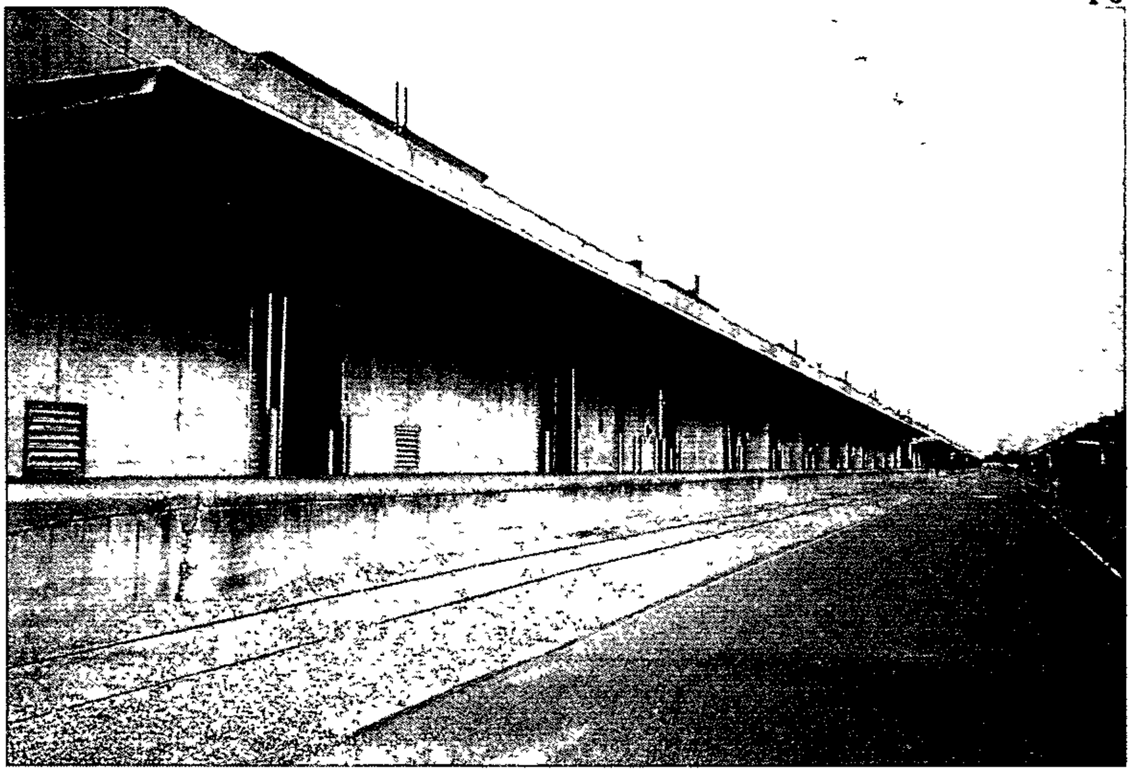
488 810



RI 57 Building 629. View of southwestern corner of Building 629 and the adjacent railroad tracks Samples were collected in the gravel area

SS 65 XXCC-3, Building 249. View of southeastern corner of Building 249 and the end of the adjacent railroad tracks Samples were collected in the gravel area

Figure K1a. Photos of Buildings 629 and 249.

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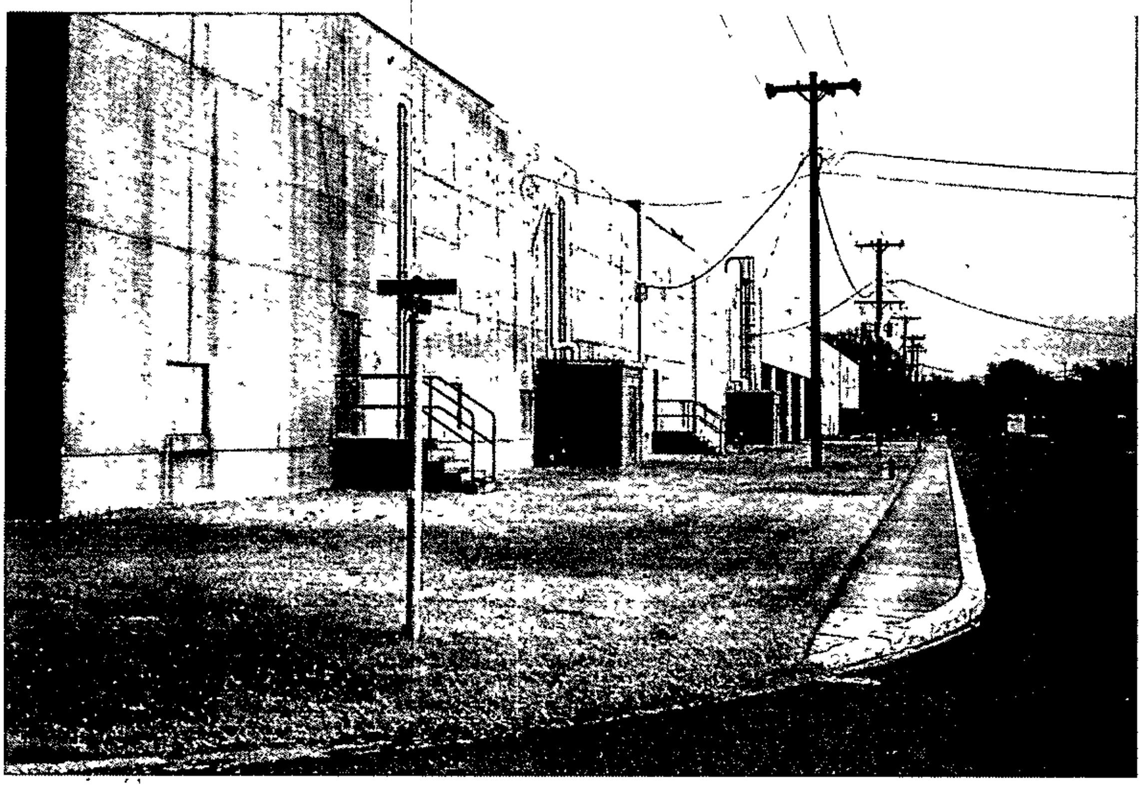

SS 66 Areas North of Building 253. View of southeastern corner of Building 250 and the grassy area north of "G" Street. Building 253 is located on the south side of "G" Street and is not shown here. Samples collected as part of FU1 were from grassy areas south of Building 250 shown here

Figure K1b. Photo of Building 250

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RI 25 Golf Course Pond (Subparcel 3.8). View of Golf Course Pond Samples were collected from within the pond

RI 26 Lake Danielson (Subparcel 3.6). View of southeastern side of Lake Danielson Samples were collected from within the lake

Figure K2a. Photos of Golf Course Pond and Lake Danielson.

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SS 51 Lake Danielson Outlet Drainage Ditch. View of north portion of concrete-lined drainage ditch, which discharges from Lake Danielson Samples were collected within ditch.

SS 52 Golf Course Pond Outlet Drainage Ditch. View of south portion of concrete-lined drainage ditch, which discharges from the Golf Course Pond Samples were collected within ditch.

Figure K2b. Photos of Lake Danielson Outlet Drainage Ditch and Golf Course Pond Outlet Drainage Ditch.

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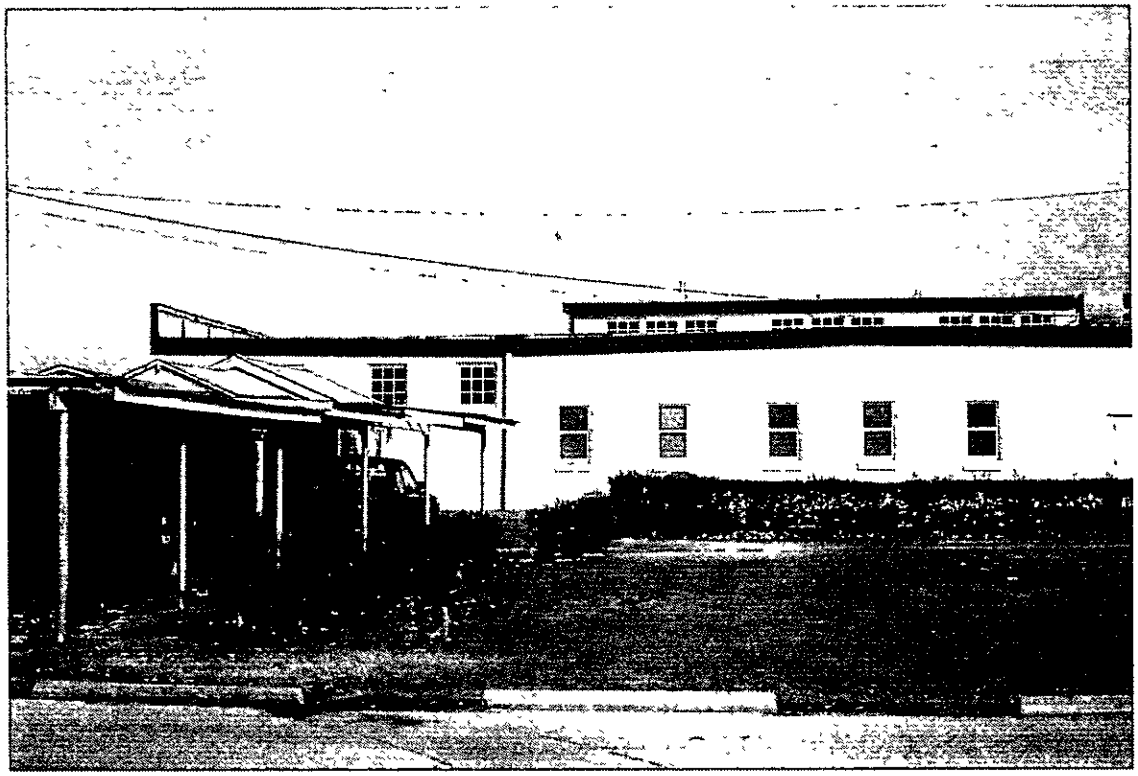
488 814



RI 59 Building T-273. View of southeastern side of Building T-273 Samples were collected in the grassy area to the right of the building

SS 69 Flamethrower Liquid Fuel Application. View of northern portion of golf course, south of Building T-273. Samples were collected in the grassy area

Figure K2c. Photos of Building T-273 and Flamethrower Liquid Fuel Application.

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TEC 92 View of park and road located on the western side of the golf course
Samples were collected in the grassy area

Figure K2d. Photo of TEC 92.

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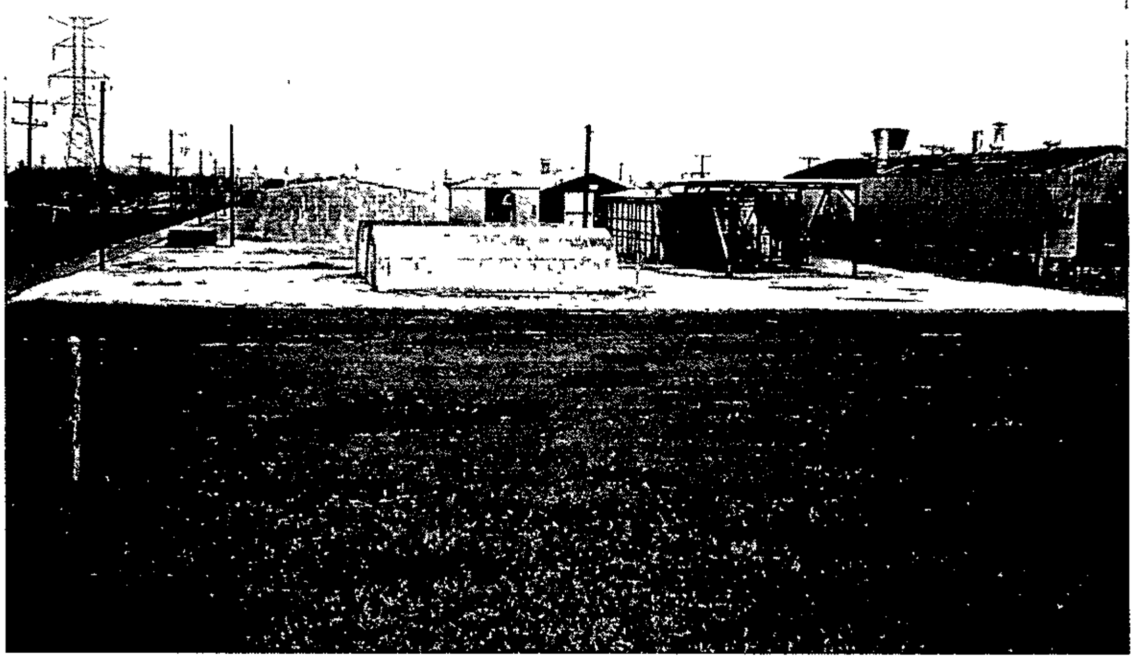
RI 27 Former Recoupment Area (Building S-873) View of southeastern side of Building 873 (to the right) Samples were collected in the gravel yard along the east side of the building, to the north of the building

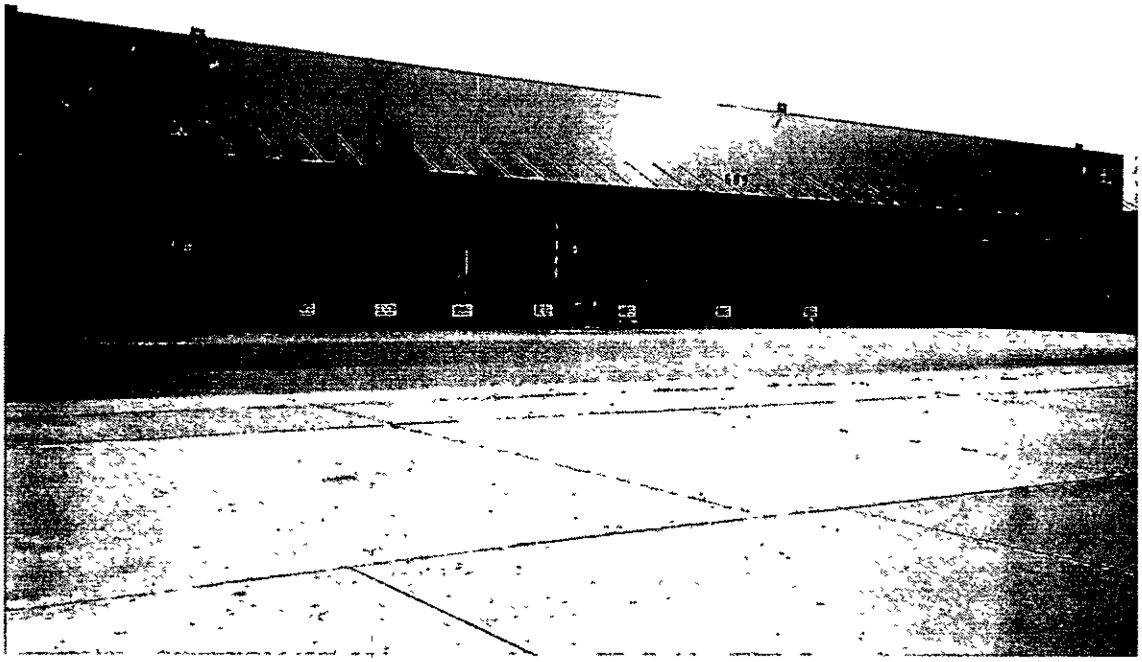


SS 31 Former Paint Spray Booth (Building 1087), RI 32 Sandblasting Waste Accumulation Area, SS 33 Sandblasting Waste Drum Storage Area (Metal Shed South of Building 1088). View of southern side of Buildings 1087, 1088, 1090, and 1091 Samples were collected in gravel yard surrounding all buildings

Figure K3a. Photos of Buildings S-873, 1087, 1088, 1090 and 1091

488 817

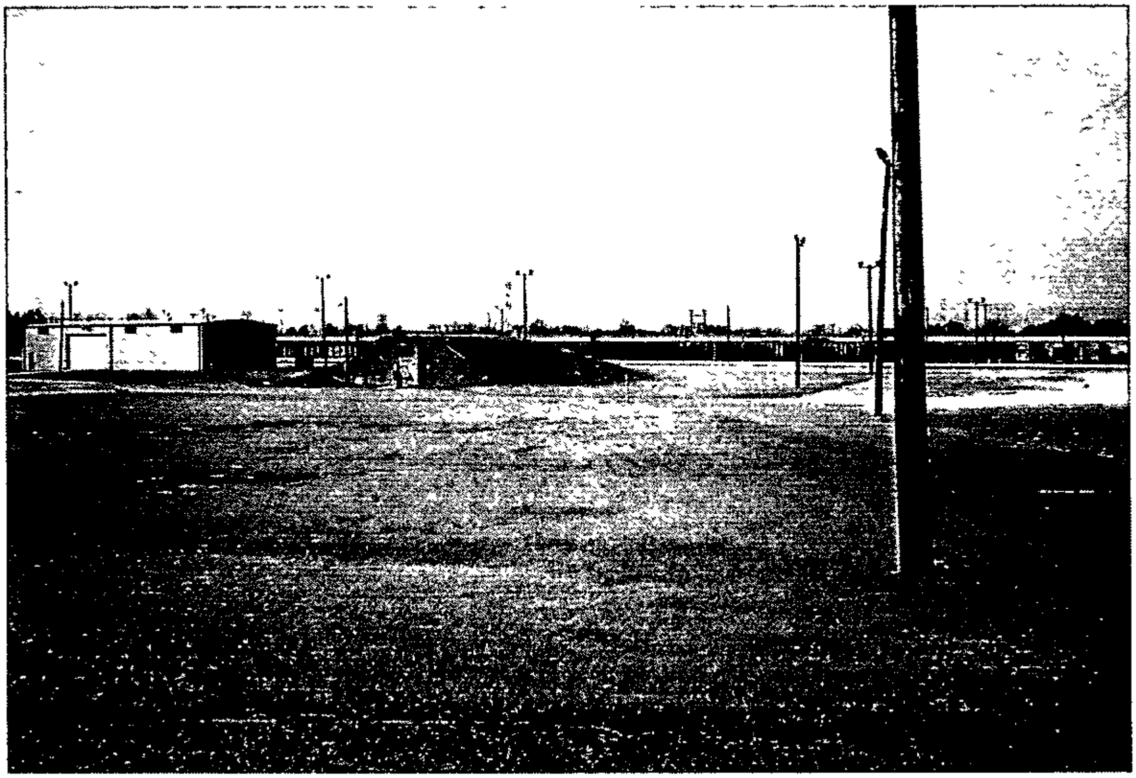
RI 34 Underground Oil Storage Tanks (Building 770). View of western side of Building 770 Samples were collected in gravel yard in center of photograph



SS 78 Building 689 (Alcohol, Acetone, Toluene, Naphthalene and Hydrofluoric Acid Area). View of western side of Building 689 Samples were collected below concrete slab where markings indicate and where soil boring can be seen in lower left corner of photograph

Figure K3b. Photos of Buildings 770 and 689.

488 818



SS 82 Buildings 783 and 793 (Flammables) View of northeastern side of Building 783 (Building 793 not shown) located within berm in distance Samples were collected in grassy area located in front of Building 783

SS 84 Building 972 (Flammables, Solvents, Waste Oil, etc) Northeastern view of north side of Building 972 (Building 972 is to the right of the area shown in the photo) Samples were collected in gravel area located in front and lower right of photograph

Figure K3c. Photos of Buildings 783, 793 and 972.

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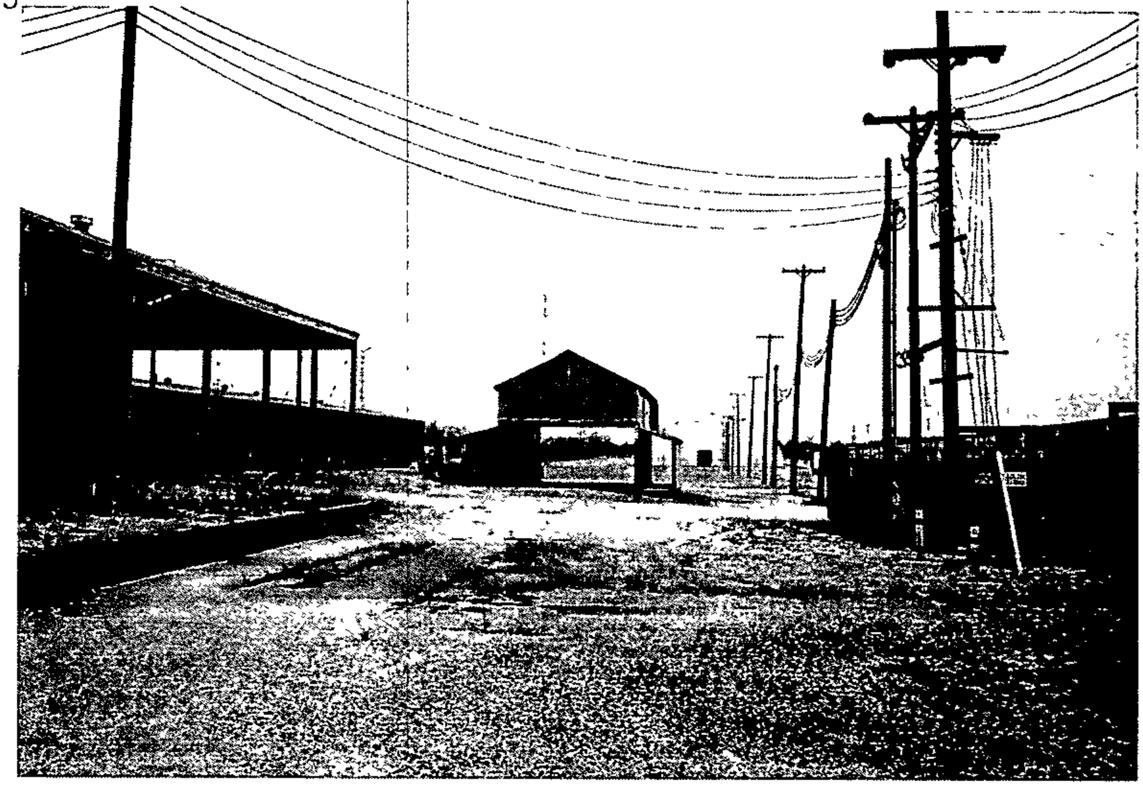
488 819



ER 87 Banned Pesticides (Building 1084) View of southern side of Building 1084, the open shed, in distance. Samples were collected in gravel yard surrounding Building 1084

SS 89 Building 1089 (Acids). View of western side of Building 1089 (left side of photograph), Perimeter Road, and southwestern boundary of site Samples were collected along west and south sides of Building 1089 and Perimeter Road

Figure K3d. Photos of Buildings 1084 and 1089

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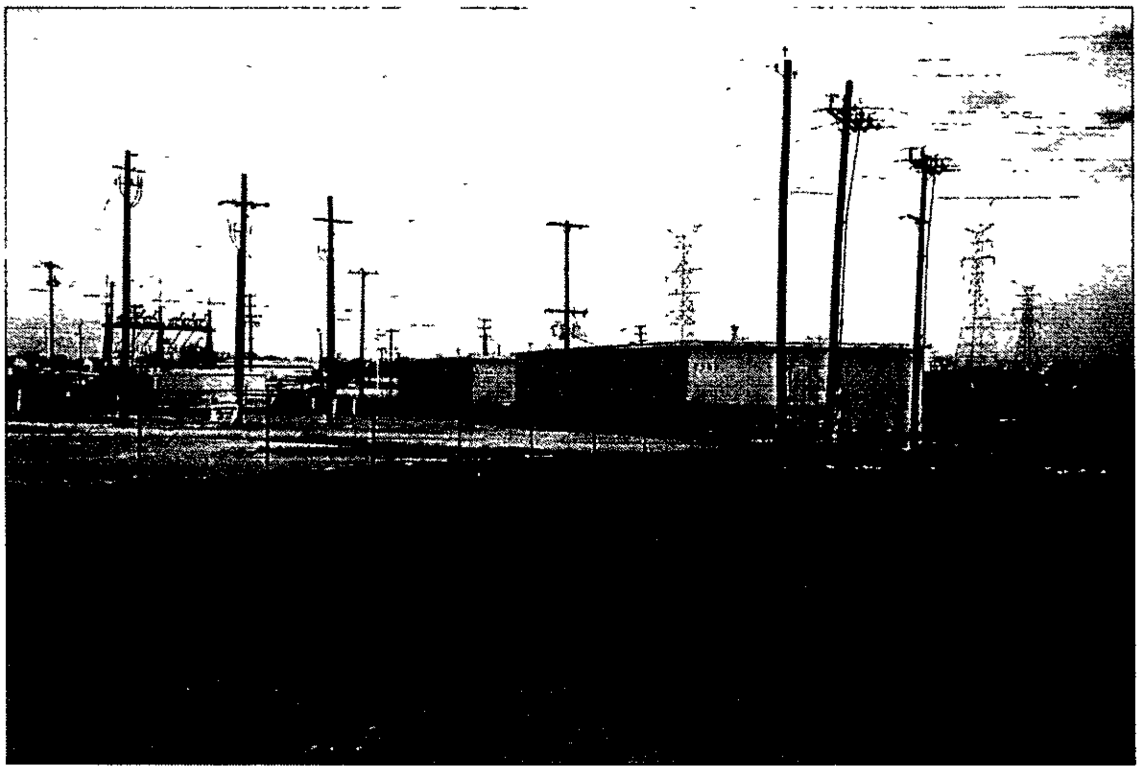
SS 35 Defense Reutilization Marketing Office (DRMO) Building T-308: Hazardous Waste Storage. View of the northeastern side of Building 308, the gravel yard and the historic docking area, where samples were collected



SS 36 DRMO Drum Storage. View of southwestern side of Building 309 Drainage culvert located to the right of the photo Samples were collected in grassy areas as well as near culvert

Figure K4a. Photos of Building T-308 and DRMO Drum Storage.

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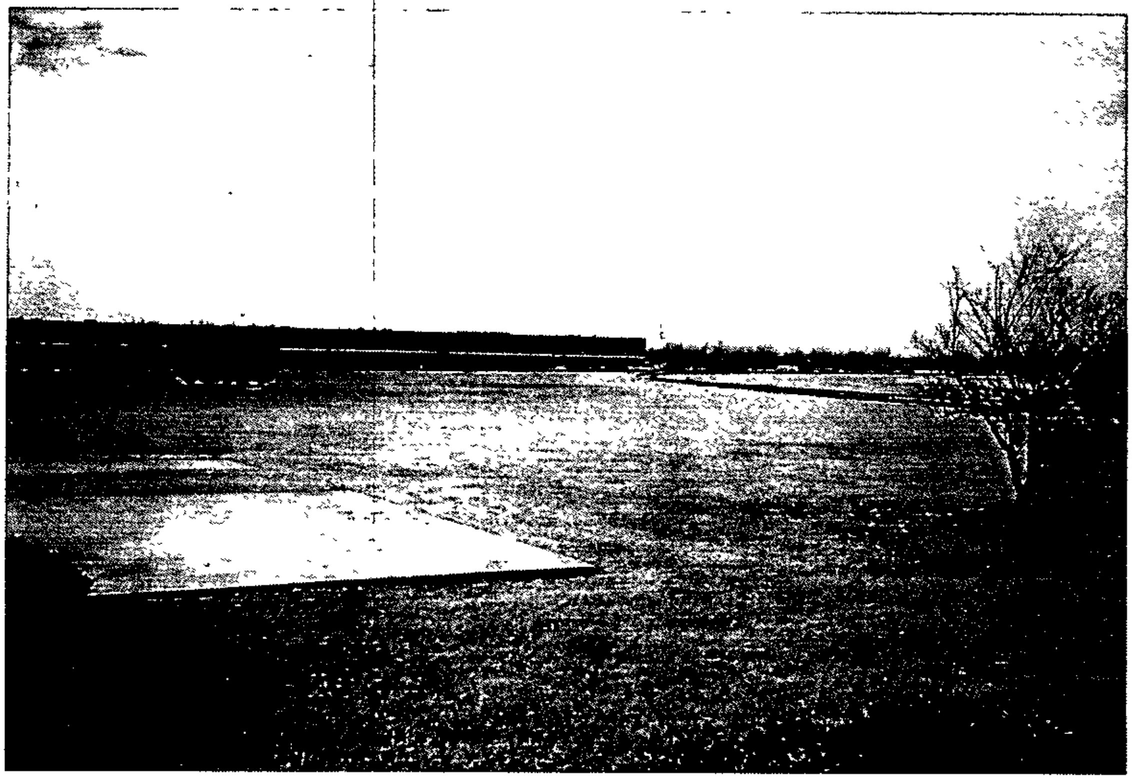

SS 42 Former PCP Dip Vat Area. View of grassy areas and railroad tracks located west of Building 650 (not shown) Building 835 is in distance Samples were collected in the grass

SS 43 Former Underground PCP Tank Area and SS 70 All Railroad Tracks. View of gravel areas and railroad tracks around SS 43, located west of Building 737 (not shown). Building 835 is in distance SS 70 represents the convergence of railroad tracks in the center of FU4, indicated by railroad tracks seen here Samples were collected in the gravel

Figure K4b. Photos of SS42, SS43 and SS70

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SS 54 DRMO East Storm Water Runoff Canal. View of the concrete-lined drainage ditch, located east of Buildings 308 and 309 Samples were collected within ditch

SS 55 DRMO North Storm Water Runoff Area and SS 72 Waste Oil (PDO Yard) Surface Application for Dust Control. SS 55 is a drainage ditch that is located along the northern fence line in this area View of gravel yard and end of railroad tracks located at SS 72, north of "B" Street (not shown), and south of Dunn Avenue, at the Depot's northern propoerty edge (shown in distance) Samples were collected within ditch and the gravel

Figure K4c. Photos of Storm Water Runoff Areas (East Canal and North Area) and Waste Oil (PDO Yard) Surface Application for Dust Control

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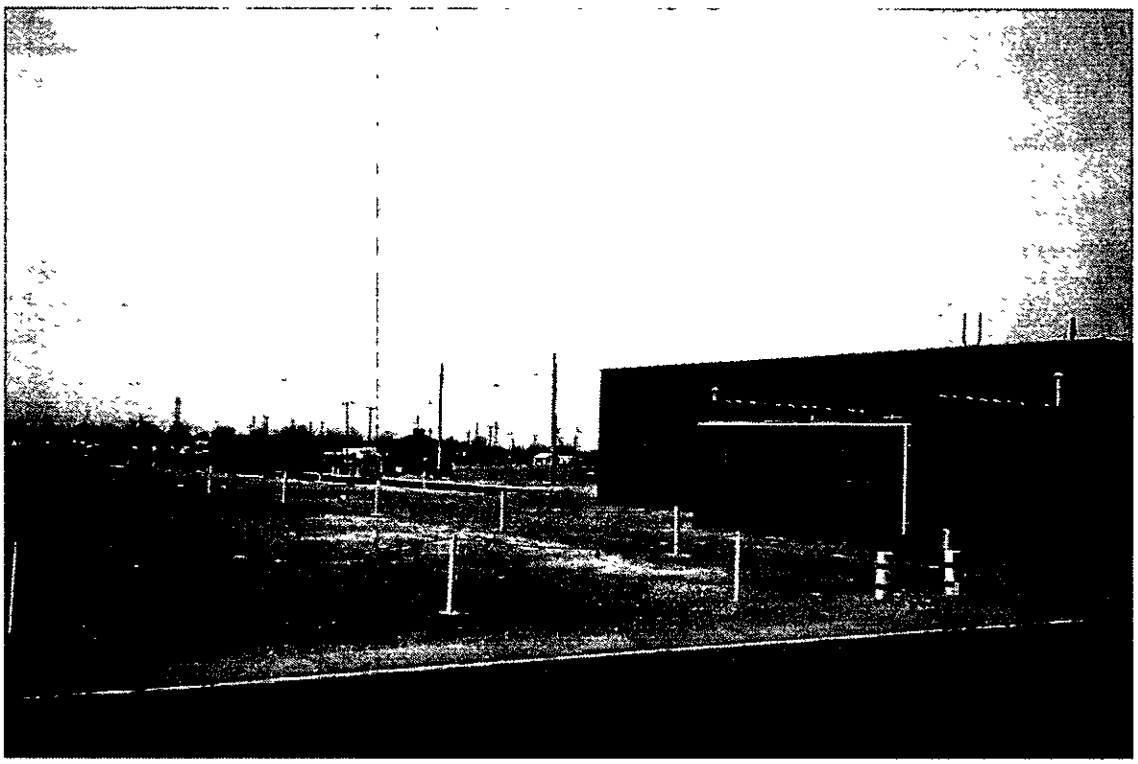
SS 79 Fuels, Miscellaneous Liquids, Wood, and Paper. View of the railroad tracks and the southern edge of the concrete pad where Building 702 once stood Samples were collected in the grassy area



SS 80 Fuel and Cleaner Dispensing, Building 720. View of the southeastern side of Building 720, and the railroad tracks and gravel yard behind it Samples were collected in the gravel area

Figure K4d. Photos of Former Building 702 and Building 720.

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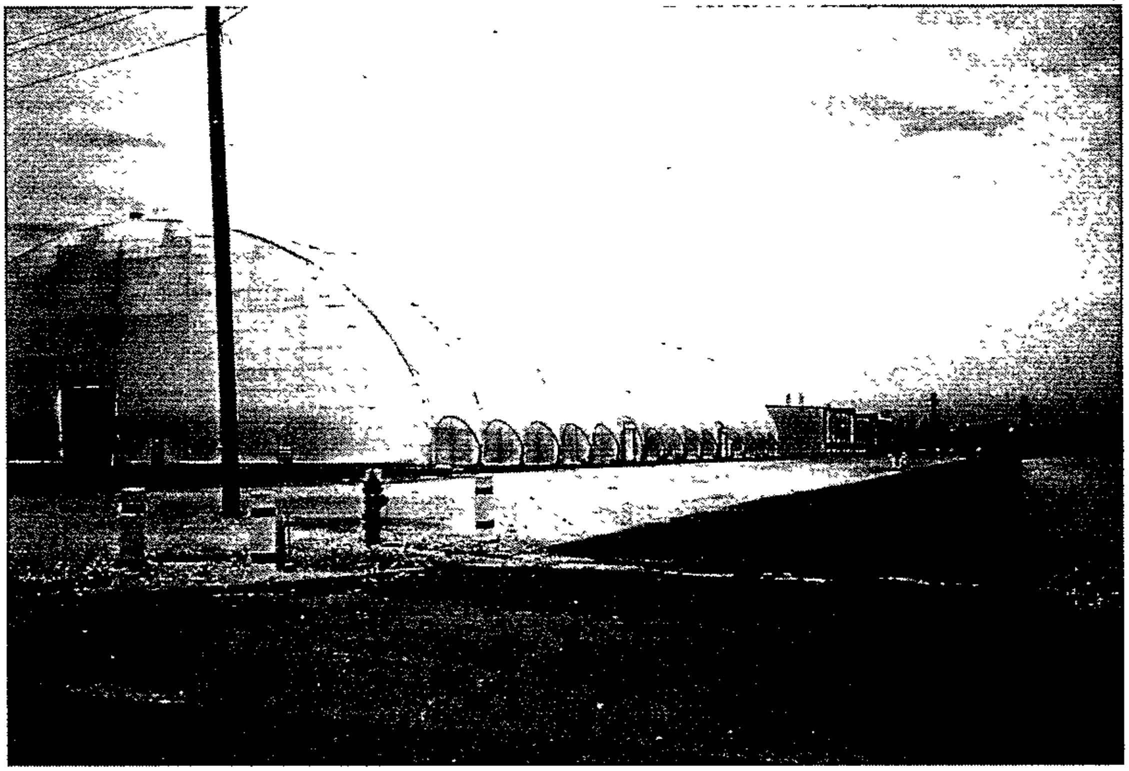

SS 83 Dried Paint Disposal Area. View of the southeastern side of the covered Building 949, concrete pads south of it, and adjacent railroad tracks Samples were collected in the gravel areas surrounding building, as well as from railroad tracks

Figure K4e. Photo of Building 949

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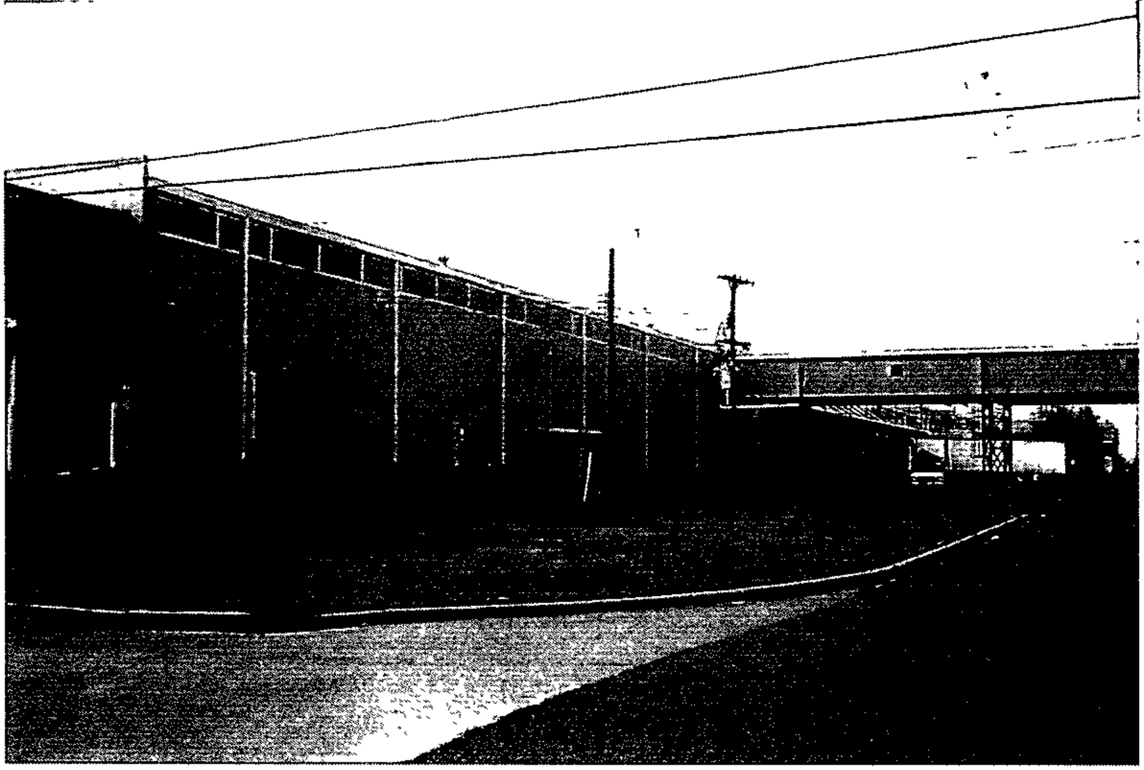

SS 75 Unknown Wastes near Building 689. View of grassy area located on northeastern side of Building 689 Samples were collected in the grassy area

SS 76 Unknown Wastes near Building 690. (No photo is available for this site)

Figure K5a. Photos of Buildings 689 and 690

488 827

SS 77 Unknown Wastes near Building 689 and 690. View of gravel and grassy areas located north of Building 690, south of Building 689, and east of Building 685 Samples were collected in the grass and gravel in this area.

SS 78 Alcohol, Acetone, Toluene, and Hydrofluoric Acid Area, Building 689. Note - this photo has also been included in FU3 layout. (Figure K3b).

Figure K5b. Photos of Buildings 689 and 690

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TEC 91A. View of northeastern side of Building 670 and the adjacent railroad tracks. Samples were collected in the gravel and along the railroad tracks.

Figure K5c. Photo of Building 670

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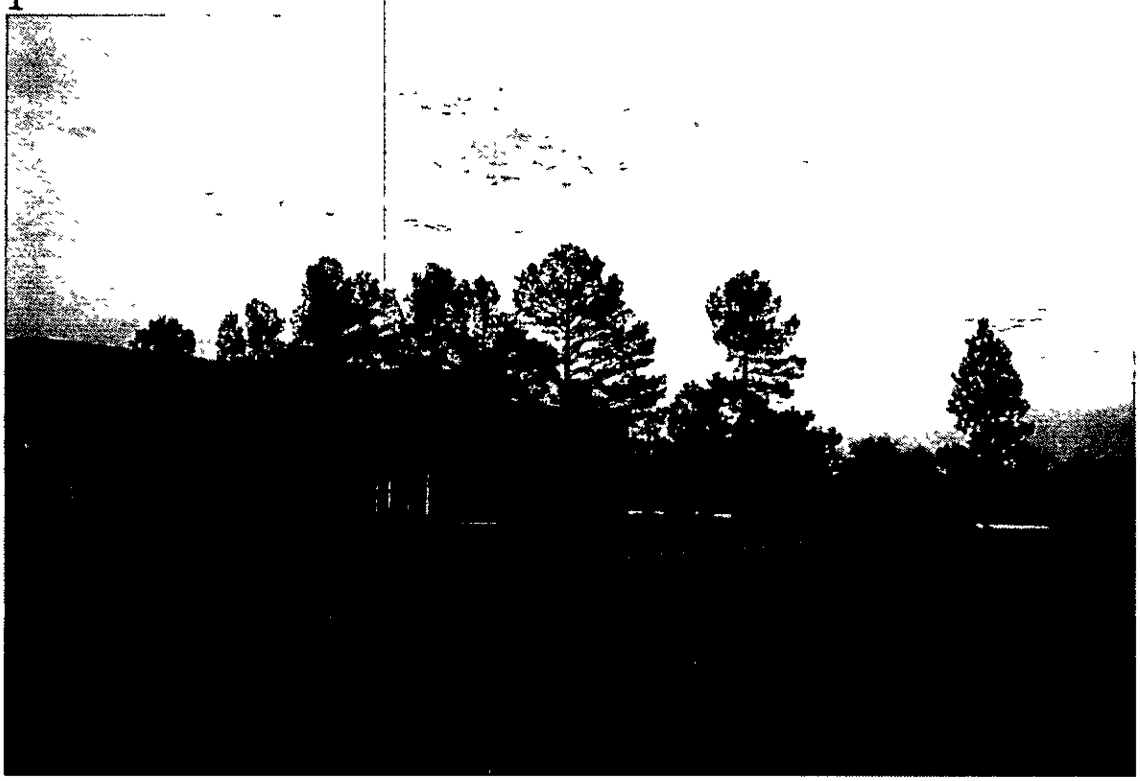
Administration Building (Parcel 1). View of grassy area located south of Building 144 and west of the southern parking lot near Gate No 1 Samples were collected in the grassy area

Housing Units (Parcel 2). View of Buildings 176, 179, 181, and 184 Samples were not collected due to excavation of entire area

Figure K6a. Photos of Administration Building (Parcel 1) and Housing Units (Parcel 2).

488 831

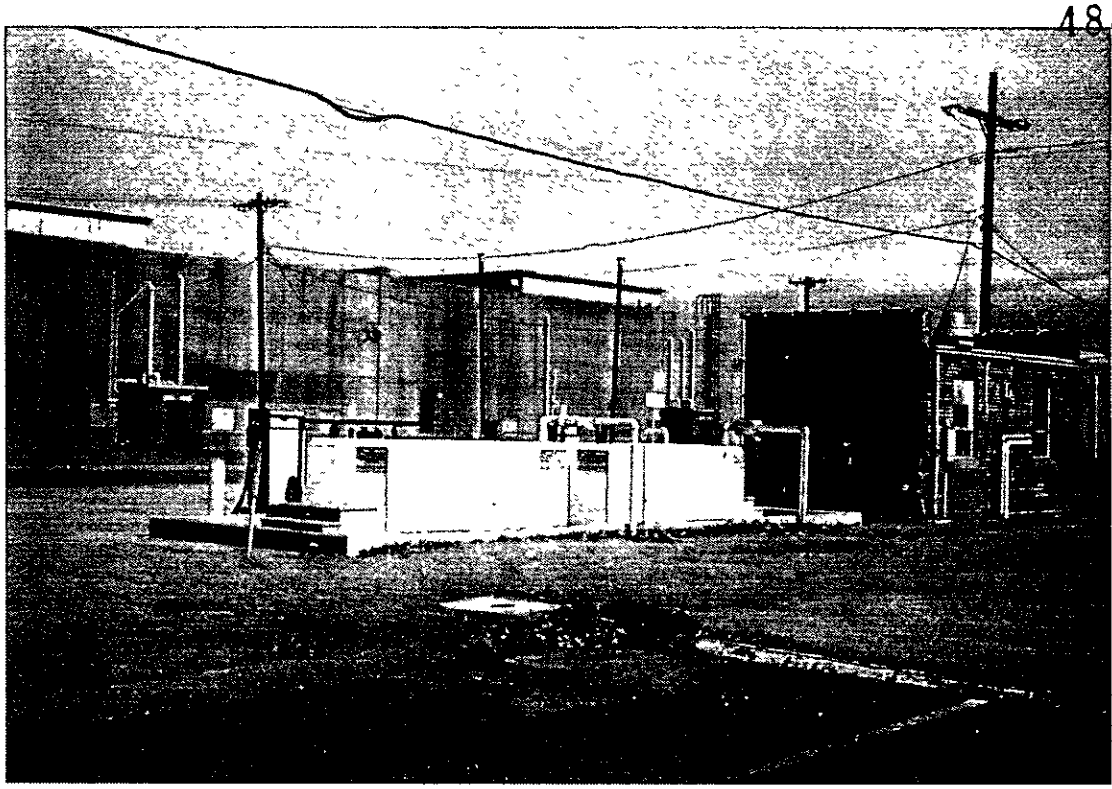


SS 48 & SS 58 at Cafeteria, Building 274. View of grassy area and northern side of Building 274. Samples were collected in the grassy areas surrounding the building

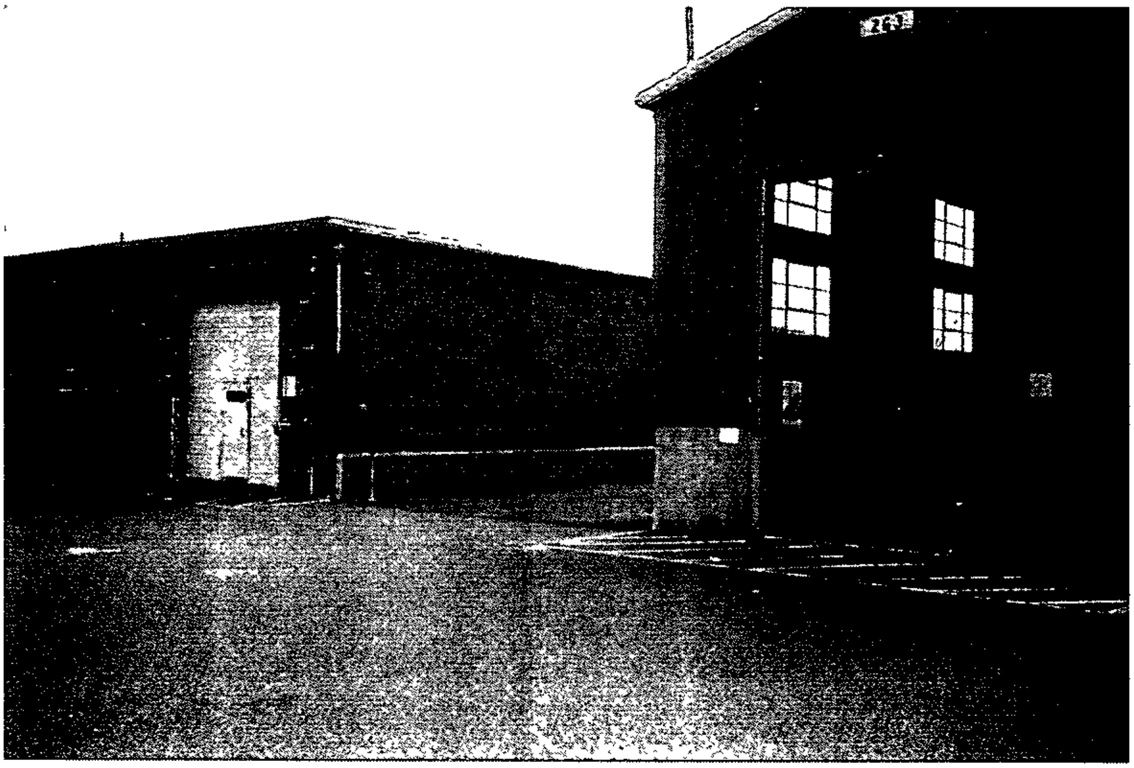
SS 66 Petroleum, Oil, and Lubricants (POL) Building 253. Building 253 is located on the south side of "G" Street, east of 2nd Street. (No photo is available for this site)

Figure K6b. Photos of Buildings 274 and 253

488 832



SS 67 Installation Gas Station, Building 257. View of grassy area surrounding gas station, located south of "G" Street Samples were collected in the grassy areas surrounding the station



SS 68 Petroleum, Oil, and Lubricants (POL) Building 263. View of paved area surrounding Building 263 Samples were collected from below the concrete located at the markers in the center of the photo

Figure K6c. Photos of Buildings 257 and 263

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Appendix L

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Appendix L

Detected Parameters in FU1

APPENDIX L

Detected Parameters in FU1

The following are included in this appendix:

- **Table L-1**–Detected Parameter Summary in Surface Soil
- **Table L-2**–Detected Parameter Summary in Subsurface Soil

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TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	SS11A	0 0 to 1 0	2-HEXANONE	0 002	J	MG/KG			310		1 4				N
BRAC	SS9A	0 0 to 1 0	2-HEXANONE	0 003	J	MG/KG			310		1 4				N
BRAC	SS11A	0 0 to 1 0	2 METHYLNAPHTHALENE	0 19	J	MG/KG			160		6 1		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	2 METHYLNAPHTHALENE	0 6	J	MG/KG			160		6 1		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	2 METHYLNAPHTHALENE	0 6	J	MG/KG			160		6 1		0 1	X	Y
57	SB57E	0 0 to 2 0	ACENAPHTHENE	1 4	=	MG/KG			470		570		20		N
65	SB65A	0 0 to 1 0	ACENAPHTHENE	1 1	J	MG/KG			470		570		20		N
65	SS65D	0 0 to 1 25	ACENAPHTHENE	1 1	J	MG/KG			470		570		20		N
65	SS65E	0 0 to 1 0	ACENAPHTHENE	5 7	=	MG/KG			470		570		20		N
BRAC	E(10 2)	0 0 to 1 0	ACENAPHTHENE	0 29	J	MG/KG			470		570		20		N
BRAC	F(10 2)	0 0 to 1 0	ACENAPHTHENE	0 093	J	MG/KG			470		570		20		N
BRAC	SS11A	0 0 to 1 0	ACENAPHTHENE	1 8	=	MG/KG			470		570		20		N
BRAC	SS6A	0 0 to 1 0	ACENAPHTHENE	0 1	J	MG/KG			470		570		20		N
BRAC	SS8A	0 0 to 1 0	ACENAPHTHENE	3	J	MG/KG			470		570		20		N
BRAC	SS8A	0 0 to 1 0	ACENAPHTHENE	3 2	J	MG/KG			470		570		20		N
65	SS65A	0 0 to 1 0	ACENAPHTHYLENE	9 5	J	MG/KG	0 19	X	470		27		0 1	X	Y
57	SB57C	0 0 to 2 0	ACETONE	0 007	J	MG/KG			780		16				N
57	SB57E	0 0 to 2 0	ACETONE	0 007	J	MG/KG			780		16				N
57	SB57G	0 0 to 2 0	ACETONE	0 017	=	MG/KG			780		16				N
65	FS65A	0 0 to 1 0	ALKALINITY, TOTAL (AS CaCO3)	658000	=	MG/KG									NA
65	FS65B	0 0 to 1 0	ALKALINITY TOTAL (AS CaCO3)	503000	=	MG/KG									NA
BRAC	A(16 1)	0 0 to 0 5	ALPHA-CHLORDANE	0 019	J	MG/KG	0 029		1 8				0 1		N
BRAC	SS8A	0 0 to 1 0	ALPHA-CHLORDANE	0 21	=	MG/KG	0 029	X	1 8				0 1	X	Y
BRAC	SS8A	0 0 to 1 0	ALPHA-CHLORDANE	0 17	J	MG/KG	0 029	X	1 8				0 1	X	Y
65	SS65E	0 0 to 1 0	ALUMINUM	3950	=	MG/KG	23810		7800				50	X	N
65	SS65H	0 0 to 1 0	ALUMINUM	3740	=	MG/KG	23810		7800				50	X	N
65	SS65H	0 0 to 1 0	ALUMINUM	4160	=	MG/KG	23810		7800				50	X	N
65	SS65I	0 0 to 1 0	ALUMINUM	13300	=	MG/KG	23810		7800	X			50	X	N
BRAC	E(10 2)	0 0 to 1 0	ALUMINUM	9020	=	MG/KG	23810		7800	X			50	X	N
BRAC	F(10 2)	0 0 to 1 0	ALUMINUM	8440	=	MG/KG	23810		7800	X			50	X	N
BRAC	SS11A	0 0 to 1 0	ALUMINUM	13200	=	MG/KG	23810		7800	X			50	X	N
BRAC	SS6A	0 0 to 1 0	ALUMINUM	10700	=	MG/KG	23810		7800	X			50	X	N
BRAC	SS8A	0 0 to 1 0	ALUMINUM	12600	=	MG/KG	23810		7800	X			50	X	N
BRAC	SS8A	0 0 to 1 0	ALUMINUM	10600	=	MG/KG	23810		7800	X			50	X	N
BRAC	SS9A	0 0 to 1 0	ALUMINUM	8620	=	MG/KG	23810		7800	X			50	X	N
57	FS57A	0 0 to 1 0	ANTHRACENE	0 265	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
57	FS57B	0 0 to 1 0	ANTHRACENE	0 255	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
57	FS57D	0 0 to 1 0	ANTHRACENE	1 55	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
57	SB57E	0 0 to 2 0	ANTHRACENE	2 2	=	MG/KG	0 096	X	2300		12000		0 1	X	Y
65	FS65A	0 0 to 1 0	ANTHRACENE	2 55	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
65	SB65A	0 0 to 1 0	ANTHRACENE	2 8	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
65	SB65B	0 0 to 1 0	ANTHRACENE	0 048	J	MG/KG	0 096		2300		12000		0 1		N
65	SS65A	0 0 to 1 0	ANTHRACENE	3 5	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
65	SS65C	0 0 to 1 0	ANTHRACENE	0 051	J	MG/KG	0 096		2300		12000		0 1		N
65	SS65D	0 0 to 1 25	ANTHRACENE	2 9	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
65	SS65E	0 0 to 1 0	ANTHRACENE	12	=	MG/KG	0 096	X	2300		12000		0 1	X	Y
65	SS65H	0 0 to 1 0	ANTHRACENE	4 5	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
65	SS65H	0 0 to 1 0	ANTHRACENE	5 6	=	MG/KG	0 096	X	2300		12000		0 1	X	Y
66	SS66E	0 0 to 1 0	ANTHRACENE	2 5	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	ANTHRACENE	0 54	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	ANTHRACENE	0 16	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
BRAC	SS11A	0 0 to 1 0	ANTHRACENE	2 4	=	MG/KG	0 096	X	2300		12000		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	ANTHRACENE	0 15	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	ANTHRACENE	5 3	=	MG/KG	0 096	X	2300		12000		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	ANTHRACENE	5 4	=	MG/KG	0 096	X	2300		12000		0 1	X	Y
BRAC	SS9A	0 0 to 1 0	ANTHRACENE	0 045	J	MG/KG	0 096		2300		12000		0 1		N
57	FS57C	0 0 to 1 0	ANTIMONY	7 65	J	MG/KG	7	X	3 1	X	5	X	3 5	X	Y
57	SB57G	0 0 to 2 0	ANTIMONY	0 92	=	MG/KG	7		3 1		5		3 5		N
65	SS65H	0 0 to 1 0	ANTIMONY	2 2	J	MG/KG	7		3 1		5		3 5		N

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TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
65	SS65H	0.0 to 1.0	ANTIMONY	2.5	J	MG/KG	7		3.1		5		3.5		N
65	SS65I	0.0 to 1.0	ANTIMONY	0.73	J	MG/KG	7		3.1		5		3.5		N
BRAC	E(10 2)	0.0 to 1.0	ANTIMONY	8	J	MG/KG	7	X	3.1	X	5	X	3.5	X	Y
BRAC	F(10 2)	0.0 to 1.0	ANTIMONY	7.4	J	MG/KG	7	X	3.1	X	5	X	3.5	X	Y
57	FS57A	0.0 to 1.0	ARSENIC	17.05	J	MG/KG	20		0.43	X	29		10	X	N
57	FS57C	0.0 to 1.0	ARSENIC	10.1	J	MG/KG	20		0.43	X	29		10	X	N
57	SB57C	0.0 to 2.0	ARSENIC	11.6	=	MG/KG	20		0.43	X	29		10	X	N
57	SB57D	0.0 to 2.0	ARSENIC	13.7	=	MG/KG	20		0.43	X	29		10	X	N
57	SB57E	0.0 to 2.0	ARSENIC	2.5	=	MG/KG	20		0.43	X	29		10		N
57	SB57F	0.0 to 2.0	ARSENIC	10.6	=	MG/KG	20		0.43	X	29		10	X	N
57	SB57G	0.0 to 2.0	ARSENIC	8.7	=	MG/KG	20		0.43	X	29		10		N
65	SS65E	0.0 to 1.0	ARSENIC	4	J	MG/KG	20		0.43	X	29		10		N
65	SS65H	0.0 to 1.0	ARSENIC	5.2	=	MG/KG	20		0.43	X	29		10		N
65	SS65H	0.0 to 1.0	ARSENIC	6	=	MG/KG	20		0.43	X	29		10		N
65	SS65I	0.0 to 1.0	ARSENIC	14.1	=	MG/KG	20		0.43	X	29		10	X	N
66	SS66B	0.0 to 1.0	ARSENIC	29.2	=	MG/KG	20	X	0.43	X	29	X	10	X	Y
66	SS66C	0.0 to 1.0	ARSENIC	34	=	MG/KG	20	X	0.43	X	29	X	10	X	Y
66	SS66D	0.0 to 1.0	ARSENIC	28.2	=	MG/KG	20	X	0.43	X	29		10	X	Y
66	SS66E	0.0 to 1.0	ARSENIC	34.8	=	MG/KG	20	X	0.43	X	29	X	10	X	Y
66	SS66E	0.0 to 1.0	ARSENIC	38.4	=	MG/KG	20	X	0.43	X	29	X	10	X	Y
BRAC	E(10 2)	0.0 to 1.0	ARSENIC	39.6	=	MG/KG	20	X	0.43	X	29	X	10	X	Y
BRAC	F(10 2)	0.0 to 1.0	ARSENIC	54.9	=	MG/KG	20	X	0.43	X	29	X	10	X	Y
BRAC	SS11A	0.0 to 1.0	ARSENIC	25.5	=	MG/KG	20	X	0.43	X	29		10	X	Y
BRAC	SS6A	0.0 to 1.0	ARSENIC	16.3	=	MG/KG	20		0.43	X	29		10	X	N
BRAC	SS8A	0.0 to 1.0	ARSENIC	29.5	=	MG/KG	20	X	0.43	X	29	X	10	X	Y
BRAC	SS8A	0.0 to 1.0	ARSENIC	46.1	=	MG/KG	20	X	0.43	X	29	X	10	X	Y
BRAC	SS9A	0.0 to 1.0	ARSENIC	7	=	MG/KG	20		0.43	X	29		10		N
65	SS65E	0.0 to 1.0	BARIUM	81.2	=	MG/KG	234		550		1600		165		N
65	SS65H	0.0 to 1.0	BARIUM	43.5	J	MG/KG	234		550		1600		165		N
65	SS65H	0.0 to 1.0	BARIUM	51	J	MG/KG	234		550		1600		165		N
65	SS65I	0.0 to 1.0	BARIUM	121	=	MG/KG	234		550		1600		165		N
BRAC	E(10 2)	0.0 to 1.0	BARIUM	97.2	=	MG/KG	234		550		1600		165		N
BRAC	F(10 2)	0.0 to 1.0	BARIUM	82.7	=	MG/KG	234		550		1600		165		N
BRAC	SS11A	0.0 to 1.0	BARIUM	135	=	MG/KG	234		550		1600		165		N
BRAC	SS6A	0.0 to 1.0	BARIUM	164	=	MG/KG	234		550		1600		165		N
BRAC	SS8A	0.0 to 1.0	BARIUM	119	=	MG/KG	234		550		1600		165		N
BRAC	SS8A	0.0 to 1.0	BARIUM	121	=	MG/KG	234		550		1600		165		N
BRAC	SS9A	0.0 to 1.0	BARIUM	107	=	MG/KG	234		550		1600		165		N
65	SS65H	0.0 to 1.0	BENZENE	0.004	J	MG/KG			22		0.03		0.05		N
65	SS65H	0.0 to 1.0	BENZENE	0.004	J	MG/KG			22		0.03		0.05		N
65	SS65I	0.0 to 1.0	BENZENE	0.001	J	MG/KG			22		0.03		0.05		N
BRAC	SS8A	0.0 to 1.0	BENZENE	0.006	J	MG/KG			22		0.03		0.05		N
BRAC	SS8A	0.0 to 1.0	BENZENE	0.003	J	MG/KG			22		0.03		0.05		N
BRAC	SS9A	0.0 to 1.0	BENZENE	0.002	J	MG/KG			22		0.03		0.05		N
57	FS57A	0.0 to 1.0	BENZO(a)ANTHRACENE	1.05	=	MG/KG	0.71	X	0.87	X	2		0.1	X	Y
57	FS57B	0.0 to 1.0	BENZO(a)ANTHRACENE	2.2	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
57	FS57C	0.0 to 1.0	BENZO(a)ANTHRACENE	25.5	J	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
57	FS57D	0.0 to 1.0	BENZO(a)ANTHRACENE	30	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
57	SB57E	0.0 to 2.0	BENZO(a)ANTHRACENE	9.9	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
65	FS65A	0.0 to 1.0	BENZO(a)ANTHRACENE	25	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
65	FS65B	0.0 to 1.0	BENZO(a)ANTHRACENE	7.05	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
65	SB65A	0.0 to 1.0	BENZO(a)ANTHRACENE	15	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
65	SB65B	0.0 to 1.0	BENZO(a)ANTHRACENE	0.19	J	MG/KG	0.71		0.87		2		0.1	X	N
65	SB65C	0.0 to 1.0	BENZO(a)ANTHRACENE	0.16	J	MG/KG	0.71		0.87		2		0.1	X	N
65	SS65A	0.0 to 1.0	BENZO(a)ANTHRACENE	37	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
65	SS65B	0.0 to 1.0	BENZO(a)ANTHRACENE	0.085	J	MG/KG	0.71		0.87		2		0.1		N
65	SS65C	0.0 to 1.0	BENZO(a)ANTHRACENE	0.16	J	MG/KG	0.71		0.87		2		0.1	X	N
65	SS65D	0.0 to 1.25	BENZO(a)ANTHRACENE	16	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y
65	SS65E	0.0 to 1.0	BENZO(a)ANTHRACENE	55	=	MG/KG	0.71	X	0.87	X	2	X	0.1	X	Y

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC: Direct Exposure Value	RBC: Direct Exposure Exceedance Flag	RBC: GWP Value	RBC: GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
65	SS65H	0 0 to 1 0	BENZO(a)ANTHRACENE	33	=	MG/KG	0 71	X	0 87	X	2	X	0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(a)ANTHRACENE	37	=	MG/KG	0 71	X	0 87	X	2	X	0 1	X	Y
65	SS65K	0 0 to 1 0	BENZO(a)ANTHRACENE	8	=	MG/KG	0 71	X	0 87	X	2	X	0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(a)ANTHRACENE	7 2	=	MG/KG	0 71	X	0 87	X	2	X	0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(a)ANTHRACENE	2	J	MG/KG	0 71	X	0 87	X	2		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	BENZO(a)ANTHRACENE	2	=	MG/KG	0 71	X	0 87	X	2		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	BENZO(a)ANTHRACENE	0 68	=	MG/KG	0 71		0 87		2		0 1	X	N
BRAC	SS11A	0 0 to 1 0	BENZO(a)ANTHRACENE	5 8	=	MG/KG	0 71	X	0 87	X	2	X	0 1	X	Y
BRAC	SS6A	0 0 to 1 0	BENZO(a)ANTHRACENE	0 45	=	MG/KG	0 71		0 87		2		0 1	X	N
BRAC	SS8A	0 0 to 1 0	BENZO(a)ANTHRACENE	12	=	MG/KG	0 71	X	0 87	X	2	X	0 1	X	Y
BRAC	SS8A	0 0 to 1 0	BENZO(a)ANTHRACENE	12	=	MG/KG	0 71	X	0 87	X	2	X	0 1	X	Y
BRAC	SS9A	0 0 to 1 0	BENZO(a)ANTHRACENE	0 15	J	MG/KG	0 71		0 87		2		0 1	X	N
57	FS57A	0 0 to 1 0	BENZO(a)PYRENE	1 05	=	MG/KG	0 96	X	0 087	X	8		0 1	X	Y
57	FS57B	0 0 to 1 0	BENZO(a)PYRENE	2 1	=	MG/KG	0 96	X	0 087	X	8		0 1	X	Y
57	FS57C	0 0 to 1 0	BENZO(a)PYRENE	26	J	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
57	FS57D	0 0 to 1 0	BENZO(a)PYRENE	29 5	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
57	SB57E	0 0 to 2 0	BENZO(a)PYRENE	8 9	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
65	FS65A	0 0 to 1 0	BENZO(a)PYRENE	23	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
65	FS65B	0 0 to 1 0	BENZO(a)PYRENE	7 75	=	MG/KG	0 96	X	0 087	X	8		0 1	X	Y
65	SB65A	0 0 to 1 0	BENZO(a)PYRENE	17	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
65	SB65B	0 0 to 1 0	BENZO(a)PYRENE	0 19	J	MG/KG	0 96		0 087	X	8		0 1	X	N
65	SB65C	0 0 to 1 0	BENZO(a)PYRENE	0 15	J	MG/KG	0 96		0 087	X	8		0 1	X	N
65	SS65A	0 0 to 1 0	BENZO(a)PYRENE	67	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
65	SS65B	0 0 to 1 0	BENZO(a)PYRENE	0 081	J	MG/KG	0 96		0 087		8		0 1		N
65	SS65C	0 0 to 1 0	BENZO(a)PYRENE	0 16	J	MG/KG	0 96		0 087	X	8		0 1	X	N
65	SS65D	0 0 to 1 25	BENZO(a)PYRENE	16	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
65	SS65E	0 0 to 1 0	BENZO(a)PYRENE	60	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(a)PYRENE	30	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(a)PYRENE	34	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
65	SS65K	0 0 to 1 0	BENZO(a)PYRENE	8	=	MG/KG	0 96	X	0 087	X	8		0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(a)PYRENE	6 1	=	MG/KG	0 96	X	0 087	X	8		0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(a)PYRENE	1 7	J	MG/KG	0 96	X	0 087	X	8		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	BENZO(a)PYRENE	1 8	=	MG/KG	0 96	X	0 087	X	8		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	BENZO(a)PYRENE	0 7	=	MG/KG	0 96		0 087	X	8		0 1	X	N
BRAC	SS11A	0 0 to 1 0	BENZO(a)PYRENE	4 8	=	MG/KG	0 96	X	0 087	X	8		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	BENZO(a)PYRENE	0 36	J	MG/KG	0 96		0 087	X	8		0 1	X	N
BRAC	SS8A	0 0 to 1 0	BENZO(a)PYRENE	12	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
BRAC	SS8A	0 0 to 1 0	BENZO(a)PYRENE	11	=	MG/KG	0 96	X	0 087	X	8	X	0 1	X	Y
BRAC	SS9A	0 0 to 1 0	BENZO(a)PYRENE	0 15	J	MG/KG	0 96		0 087	X	8		0 1	X	N
57	FS57A	0 0 to 1 0	BENZO(b)FLUORANTHENE	0 9	=	MG/KG	0 9		0 87	X	5		0 1	X	N
57	FS57B	0 0 to 1 0	BENZO(b)FLUORANTHENE	1 9	J	MG/KG	0 9	X	0 87	X	5		0 1	X	Y
57	FS57C	0 0 to 1 0	BENZO(b)FLUORANTHENE	25	J	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
57	FS57D	0 0 to 1 0	BENZO(b)FLUORANTHENE	27 5	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
57	SB57E	0 0 to 2 0	BENZO(b)FLUORANTHENE	10	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	FS65A	0 0 to 1 0	BENZO(b)FLUORANTHENE	25 5	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	FS65B	0 0 to 1 0	BENZO(b)FLUORANTHENE	8 6	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	SB65A	0 0 to 1 0	BENZO(b)FLUORANTHENE	21	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	SB65B	0 0 to 1 0	BENZO(b)FLUORANTHENE	0 21	J	MG/KG	0 9		0 87		5		0 1	X	N
65	SB65C	0 0 to 1 0	BENZO(b)FLUORANTHENE	0 16	J	MG/KG	0 9		0 87		5		0 1	X	N
65	SS65A	0 0 to 1 0	BENZO(b)FLUORANTHENE	65	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	SS65B	0 0 to 1 0	BENZO(b)FLUORANTHENE	0 098	J	MG/KG	0 9		0 87		5		0 1		N
65	SS65C	0 0 to 1 0	BENZO(b)FLUORANTHENE	0 14	J	MG/KG	0 9		0 87		5		0 1	X	N
65	SS65D	0 0 to 1 25	BENZO(b)FLUORANTHENE	15	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	SS65E	0 0 to 1 0	BENZO(b)FLUORANTHENE	62	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(b)FLUORANTHENE	32	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(b)FLUORANTHENE	37	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
65	SS65K	0 0 to 1 0	BENZO(b)FLUORANTHENE	8 9	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(b)FLUORANTHENE	6	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(b)FLUORANTHENE	1 7	J	MG/KG	0 9	X	0 87	X	5		0 1	X	Y

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	E(10 2)	0 0 to 1 0	BENZO(b)FLUORANTHENE	2	=	MG/KG	0 9	X	0 87	X	5		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	BENZO(b)FLUORANTHENE	0 7	=	MG/KG	0 9		0 87		5		0 1	X	N
BRAC	SS11A	0 0 to 1 0	BENZO(b)FLUORANTHENE	5	=	MG/KG	0 9	X	0 87	X	5		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	BENZO(b)FLUORANTHENE	0 42	=	MG/KG	0 9		0 87		5		0 1	X	N
BRAC	SS8A	0 0 to 1 0	BENZO(b)FLUORANTHENE	12	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
BRAC	SS8A	0 0 to 1 0	BENZO(b)FLUORANTHENE	12	=	MG/KG	0 9	X	0 87	X	5	X	0 1	X	Y
BRAC	SS9A	0 0 to 1 0	BENZO(b)FLUORANTHENE	0 15	J	MG/KG	0 9		0 87		5		0 1	X	N
57	FS57A	0 0 to 1 0	BENZO(g h i)PERYLENE	0 6	J	MG/KG	0 82		230		32000		0 1	X	N
57	FS57B	0 0 to 1 0	BENZO(g h i)PERYLENE	1	J	MG/KG	0 82	X	230		32000		0 1	X	Y
57	FS57C	0 0 to 1 0	BENZO(g h,i)PERYLENE	15	J	MG/KG	0 82	X	230		32000		0 1	X	Y
57	FS57D	0 0 to 1 0	BENZO(g h,i)PERYLENE	4 15	=	MG/KG	0 82	X	230		32000		0 1	X	Y
57	SB57E	0 0 to 2 0	BENZO(g h,i)PERYLENE	5	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	FS65A	0 0 to 1 0	BENZO(g h i)PERYLENE	15 05	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	FS65B	0 0 to 1 0	BENZO(g h i)PERYLENE	4 5	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	SB65A	0 0 to 1 0	BENZO(g h,i)PERYLENE	16	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	SB65B	0 0 to 1 0	BENZO(g h,i)PERYLENE	0 12	J	MG/KG	0 82		230		32000		0 1	X	N
65	SB65C	0 0 to 1 0	BENZO(g h i)PERYLENE	0 098	J	MG/KG	0 82		230		32000		0 1		N
65	SS65A	0 0 to 1 0	BENZO(g h i)PERYLENE	42	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	SS65B	0 0 to 1 0	BENZO(g h,i)PERYLENE	0 062	J	MG/KG	0 82		230		32000		0 1		N
65	SS65C	0 0 to 1 0	BENZO(g h i)PERYLENE	0 11	J	MG/KG	0 82		230		32000		0 1	X	N
65	SS65D	0 0 to 1 25	BENZO(g h i)PERYLENE	12	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	SS65E	0 0 to 1 0	BENZO(g h i)PERYLENE	48	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(g h,i)PERYLENE	20	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(g h,i)PERYLENE	23	=	MG/KG	0 82	X	230		32000		0 1	X	Y
65	SS65K	0 0 to 1 0	BENZO(g h i)PERYLENE	4 4	J	MG/KG	0 82	X	230		32000		0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(g h,i)PERYLENE	3 7	=	MG/KG	0 82	X	230		32000		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	BENZO(g h i)PERYLENE	1 3	=	MG/KG	0 82	X	230		32000		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	BENZO(g h i)PERYLENE	0 49	=	MG/KG	0 82		230		32000		0 1	X	N
BRAC	SS11A	0 0 to 1 0	BENZO(g h,i)PERYLENE	3 2	=	MG/KG	0 82	X	230		32000		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	BENZO(g h i)PERYLENE	0 23	J	MG/KG	0 82		230		32000		0 1	X	N
BRAC	SS8A	0 0 to 1 0	BENZO(g h i)PERYLENE	7 4	=	MG/KG	0 82	X	230		32000		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	BENZO(g h i)PERYLENE	7 1	=	MG/KG	0 82	X	230		32000		0 1	X	Y
BRAC	SS9A	0 0 to 1 0	BENZO(g,h,i)PERYLENE	0 11	J	MG/KG	0 82		230		32000		0 1	X	N
57	FS57A	0 0 to 1 0	BENZO(k)FLUORANTHENE	1 15	=	MG/KG	0 78	X	8 7		49		0 1	X	Y
57	FS57B	0 0 to 1 0	BENZO(k)FLUORANTHENE	2 3	=	MG/KG	0 78	X	8 7		49		0 1	X	Y
57	FS57C	0 0 to 1 0	BENZO(k)FLUORANTHENE	28 5	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
57	FS57D	0 0 to 1 0	BENZO(k)FLUORANTHENE	32	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
57	SB57E	0 0 to 2 0	BENZO(k)FLUORANTHENE	10	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
65	FS65A	0 0 to 1 0	BENZO(k)FLUORANTHENE	28	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
65	FS65B	0 0 to 1 0	BENZO(k)FLUORANTHENE	10	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
65	SB65A	0 0 to 1 0	BENZO(k)FLUORANTHENE	15	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
65	SB65B	0 0 to 1 0	BENZO(k)FLUORANTHENE	0 17	J	MG/KG	0 78		8 7		49		0 1	X	N
65	SB65C	0 0 to 1 0	BENZO(k)FLUORANTHENE	0 14	J	MG/KG	0 78		8 7		49		0 1	X	N
65	SS65A	0 0 to 1 0	BENZO(k)FLUORANTHENE	71	=	MG/KG	0 78	X	8 7	X	49	X	0 1	X	Y
65	SS65B	0 0 to 1 0	BENZO(k)FLUORANTHENE	0 073	J	MG/KG	0 78		8 7		49		0 1		N
65	SS65C	0 0 to 1 0	BENZO(k)FLUORANTHENE	0 16	J	MG/KG	0 78		8 7		49		0 1	X	N
65	SS65D	0 0 to 1 25	BENZO(k)FLUORANTHENE	16	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
65	SS65E	0 0 to 1 0	BENZO(k)FLUORANTHENE	51	=	MG/KG	0 78	X	8 7	X	49	X	0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(k)FLUORANTHENE	36	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
65	SS65H	0 0 to 1 0	BENZO(k)FLUORANTHENE	42	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
65	SS65K	0 0 to 1 0	BENZO(k)FLUORANTHENE	9 8	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(k)FLUORANTHENE	7	=	MG/KG	0 78	X	8 7		49		0 1	X	Y
66	SS66E	0 0 to 1 0	BENZO(k)FLUORANTHENE	1 9	J	MG/KG	0 78	X	8 7		49		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	BENZO(k)FLUORANTHENE	1 6	=	MG/KG	0 78	X	8 7		49		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	BENZO(k)FLUORANTHENE	0 64	=	MG/KG	0 78		8 7		49		0 1	X	N
BRAC	SS11A	0 0 to 1 0	BENZO(k)FLUORANTHENE	4 4	=	MG/KG	0 78	X	8 7		49		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	BENZO(k)FLUORANTHENE	0 35	J	MG/KG	0 78		8 7		49		0 1	X	N
BRAC	SS8A	0 0 to 1 0	BENZO(k)FLUORANTHENE	10	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	BENZO(k)FLUORANTHENE	9 4	=	MG/KG	0 78	X	8 7	X	49		0 1	X	Y

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	SS9A	0 0 to 1 0	BENZO(k)FLUORANTHENE	0 13	J	MG/KG	0 78		8 7		49		0 1	X	N
57	FS57A	0 0 to 1 0	BERYLLIUM	0 375	J	MG/KG	1 1		16		63		1 1		N
57	FS57C	0 0 to 1 0	BERYLLIUM	2 15	J	MG/KG	1 1	X	16		63		1 1	X	Y
65	SS65E	0 0 to 1 0	BERYLLIUM	0 27	J	MG/KG	1 1		16		63		1 1		N
65	SS65H	0 0 to 1 0	BERYLLIUM	0 31	J	MG/KG	1 1		16		63		1 1		N
65	SS65H	0 0 to 1 0	BERYLLIUM	0 39	J	MG/KG	1 1		16		63		1 1		N
65	SS65I	0 0 to 1 0	BERYLLIUM	0 47	J	MG/KG	1 1		16		63		1 1		N
66	SS66B	0 0 to 1 0	BERYLLIUM	0 47	J	MG/KG	1 1		16		63		1 1		N
66	SS66C	0 0 to 1 0	BERYLLIUM	0 49	J	MG/KG	1 1		16		63		1 1		N
66	SS66D	0 0 to 1 0	BERYLLIUM	0 51	J	MG/KG	1 1		16		63		1 1		N
66	SS66E	0 0 to 1 0	BERYLLIUM	0 48	J	MG/KG	1 1		16		63		1 1		N
66	SS66E	0 0 to 1 0	BERYLLIUM	0 49	J	MG/KG	1 1		16		63		1 1		N
BRAC	SS11A	0 0 to 1 0	BERYLLIUM	0 47	J	MG/KG	1 1		16		63		1 1		N
BRAC	SS6A	0 0 to 1 0	BERYLLIUM	0 5	J	MG/KG	1 1		16		63		1 1		N
BRAC	SS8A	0 0 to 1 0	BERYLLIUM	0 52	J	MG/KG	1 1		16		63		1 1		N
BRAC	SS8A	0 0 to 1 0	BERYLLIUM	0 48	J	MG/KG	1 1		16		63		1 1		N
BRAC	SS9A	0 0 to 1 0	BERYLLIUM	0 43	J	MG/KG	1 1		16		63		1 1		N
57	SB57C	0 0 to 2 0	bis(2-ETHYLHEXYL) PHTHALATE	0 064	J	MG/KG			46		3600		0 1		N
57	SB57G	0 0 to 2 0	bis(2 ETHYLHEXYL) PHTHALATE	0 096	J	MG/KG			46		3600		0 1		N
65	SB65B	0 0 to 1 0	bis(2-ETHYLHEXYL) PHTHALATE	0 31	J	MG/KG			46		3600		0 1	X	Y
65	SS65C	0 0 to 1 0	bis(2-ETHYLHEXYL) PHTHALATE	0 1	J	MG/KG			46		3600		0 1		N
65	SS65H	0 0 to 1 0	bis(2-ETHYLHEXYL) PHTHALATE	0 31	J	MG/KG			46		3600		0 1	X	Y
57	SB57C	0 0 to 2 0	BROMOMETHANE	0 002	J	MG/KG			11		0 2				N
65	SS65I	0 0 to 1 0	BROMOMETHANE	0 002	J	MG/KG			11		0 2				N
BRAC	SS11A	0 0 to 1 0	BROMOMETHANE	0 002	J	MG/KG			11		0 2				N
57	FS57A	0 0 to 1 0	CADMIUM	0 305	J	MG/KG	1 4		7 8		8		1 6		N
57	FS57C	0 0 to 1 0	CADMIUM	1 285	=	MG/KG	1 4		7 8		8		1 6		N
57	SB57D	0 0 to 2 0	CADMIUM	0 29	J	MG/KG	1 4		7 8		8		1 6		N
57	SB57E	0 0 to 2 0	CADMIUM	1 2	=	MG/KG	1 4		7 8		8		1 6		N
57	SB57F	0 0 to 2 0	CADMIUM	0 27	J	MG/KG	1 4		7 8		8		1 6		N
65	SS65E	0 0 to 1 0	CADMIUM	4 1	=	MG/KG	1 4	X	7 8		8		1 6	X	Y
65	SS65H	0 0 to 1 0	CADMIUM	0 95	=	MG/KG	1 4		7 8		8		1 6		N
65	SS65H	0 0 to 1 0	CADMIUM	0 93	=	MG/KG	1 4		7 8		8		1 6		N
65	SS65I	0 0 to 1 0	CADMIUM	0 12	J	MG/KG	1 4		7 8		8		1 6		N
66	SS66B	0 0 to 1 0	CADMIUM	0 28	J	MG/KG	1 4		7 8		8		1 6		N
66	SS66C	0 0 to 1 0	CADMIUM	0 31	J	MG/KG	1 4		7 8		8		1 6		N
66	SS66D	0 0 to 1 0	CADMIUM	0 35	J	MG/KG	1 4		7 8		8		1 6		N
66	SS66E	0 0 to 1 0	CADMIUM	0 4	J	MG/KG	1 4		7 8		8		1 6		N
66	SS66E	0 0 to 1 0	CADMIUM	0 43	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	E(10 2)	0 0 to 1 0	CADMIUM	0 22	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	F(10 2)	0 0 to 1 0	CADMIUM	0 23	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	SS11A	0 0 to 1 0	CADMIUM	0 36	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	SS6A	0 0 to 1 0	CADMIUM	0 05	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	SS8A	0 0 to 1 0	CADMIUM	0 05	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	SS8A	0 0 to 1 0	CADMIUM	0 07	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	SS9A	0 0 to 1 0	CADMIUM	0 04	J	MG/KG	1 4		7 8		8		1 6		N
65	SS65E	0 0 to 1 0	CALCIUM	134000	=	MG/KG	5840	X							NA
65	SS65H	0 0 to 1 0	CALCIUM	144000	=	MG/KG	5840	X							NA
65	SS65H	0 0 to 1 0	CALCIUM	121000	=	MG/KG	5840	X							NA
65	SS65I	0 0 to 1 0	CALCIUM	1620	=	MG/KG	5840								N
BRAC	E(10 2)	0 0 to 1 0	CALCIUM	2960	=	MG/KG	5840								N
BRAC	F(10 2)	0 0 to 1 0	CALCIUM	2360	=	MG/KG	5840								N
BRAC	SS11A	0 0 to 1 0	CALCIUM	1950	=	MG/KG	5840								N
BRAC	SS6A	0 0 to 1 0	CALCIUM	2310	=	MG/KG	5840								N
BRAC	SS8A	0 0 to 1 0	CALCIUM	1550	=	MG/KG	5840								N
BRAC	SS8A	0 0 to 1 0	CALCIUM	1640	=	MG/KG	5840								N
BRAC	SS9A	0 0 to 1 0	CALCIUM	1850	=	MG/KG	5840								N
57	SB57E	0 0 to 2 0	CARBAZOLE	13	J	MG/KG	0 067	X	32		0 6	X			Y
65	SB65A	0 0 to 1 0	CARBAZOLE	2 7	J	MG/KG	0 067	X	32		0 6	X			Y

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TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
65	SB65B	0.0 to 1.0	CARBAZOLE	0.053	J	MG/KG	0.067		32		0.6				N
65	SS65A	0.0 to 1.0	CARBAZOLE	1.6	J	MG/KG	0.067	X	32		0.6	X			Y
65	SS65C	0.0 to 1.0	CARBAZOLE	0.048	J	MG/KG	0.067		32		0.6				N
65	SS65D	0.0 to 1.25	CARBAZOLE	2.9	J	MG/KG	0.067	X	32		0.6	X			Y
65	SS65E	0.0 to 1.0	CARBAZOLE	12	=	MG/KG	0.067	X	32		0.6	X			Y
65	SS65H	0.0 to 1.0	CARBAZOLE	4.9	=	MG/KG	0.067	X	32		0.6	X			Y
BRAC	E(10.2)	0.0 to 1.0	CARBAZOLE	0.61	J	MG/KG	0.067	X	32		0.6	X			Y
BRAC	F(10.2)	0.0 to 1.0	CARBAZOLE	0.17	J	MG/KG	0.067	X	32		0.6				N
BRAC	SS11A	0.0 to 1.0	CARBAZOLE	2.5	=	MG/KG	0.067	X	32		0.6	X			Y
BRAC	SS6A	0.0 to 1.0	CARBAZOLE	0.21	J	MG/KG	0.067	X	32		0.6				N
BRAC	SS8A	0.0 to 1.0	CARBAZOLE	5.2	=	MG/KG	0.067	X	32		0.6	X			Y
BRAC	SS8A	0.0 to 1.0	CARBAZOLE	5.1	=	MG/KG	0.067	X	32		0.6	X			Y
BRAC	SS9A	0.0 to 1.0	CARBAZOLE	0.045	J	MG/KG	0.067		32		0.6				N
65	SS65H	0.0 to 1.0	CARBON DISULFIDE	0.001	J	MG/KG	0.002		780		32				N
65	SS65H	0.0 to 1.0	CARBON DISULFIDE	0.002	J	MG/KG	0.002		780		32				N
BRAC	SS8A	0.0 to 1.0	CARBON DISULFIDE	0.002	J	MG/KG	0.002		780		32				N
BRAC	SS8A	0.0 to 1.0	CARBON DISULFIDE	0.002	J	MG/KG	0.002		780		32				N
57	FS57A	0.0 to 1.0	CHROMIUM, TOTAL	12.15	J	MG/KG	24.8				38		0.4	X	N
57	FS57C	0.0 to 1.0	CHROMIUM, TOTAL	34.65	J	MG/KG	24.8	X			38		0.4	X	Y
57	SB57C	0.0 to 2.0	CHROMIUM TOTAL	11.2	=	MG/KG	24.8				38		0.4	X	N
57	SB57D	0.0 to 2.0	CHROMIUM, TOTAL	17.8	=	MG/KG	24.8				38		0.4	X	N
57	SB57E	0.0 to 2.0	CHROMIUM, TOTAL	9.9	=	MG/KG	24.8				38		0.4	X	N
57	SB57F	0.0 to 2.0	CHROMIUM, TOTAL	14.1	=	MG/KG	24.8				38		0.4	X	N
57	SB57G	0.0 to 2.0	CHROMIUM TOTAL	11.9	=	MG/KG	24.8				38		0.4	X	N
65	SS65E	0.0 to 1.0	CHROMIUM, TOTAL	29.9	J	MG/KG	24.8	X			38		0.4	X	Y
65	SS65H	0.0 to 1.0	CHROMIUM, TOTAL	9.8	=	MG/KG	24.8				38		0.4	X	N
65	SS65H	0.0 to 1.0	CHROMIUM, TOTAL	13.1	=	MG/KG	24.8				38		0.4	X	N
65	SS65I	0.0 to 1.0	CHROMIUM, TOTAL	12.6	=	MG/KG	24.8				38		0.4	X	N
66	SS66B	0.0 to 1.0	CHROMIUM, TOTAL	13.1	=	MG/KG	24.8				38		0.4	X	N
66	SS66C	0.0 to 1.0	CHROMIUM, TOTAL	11.9	=	MG/KG	24.8				38		0.4	X	N
66	SS66D	0.0 to 1.0	CHROMIUM, TOTAL	12.6	=	MG/KG	24.8				38		0.4	X	N
66	SS66E	0.0 to 1.0	CHROMIUM, TOTAL	15.3	=	MG/KG	24.8				38		0.4	X	N
66	SS66E	0.0 to 1.0	CHROMIUM TOTAL	15.1	=	MG/KG	24.8				38		0.4	X	N
BRAC	E(10.2)	0.0 to 1.0	CHROMIUM, TOTAL	12.7	=	MG/KG	24.8				38		0.4	X	N
BRAC	F(10.2)	0.0 to 1.0	CHROMIUM, TOTAL	11.9	=	MG/KG	24.8				38		0.4	X	N
BRAC	SS11A	0.0 to 1.0	CHROMIUM, TOTAL	14.3	=	MG/KG	24.8				38		0.4	X	N
BRAC	SS6A	0.0 to 1.0	CHROMIUM, TOTAL	13.1	J	MG/KG	24.8				38		0.4	X	N
BRAC	SS8A	0.0 to 1.0	CHROMIUM TOTAL	13.8	J	MG/KG	24.8				38		0.4	X	N
BRAC	SS8A	0.0 to 1.0	CHROMIUM TOTAL	13	J	MG/KG	24.8				38		0.4	X	N
BRAC	SS9A	0.0 to 1.0	CHROMIUM TOTAL	11.6	J	MG/KG	24.8				38		0.4	X	N
57	FS57A	0.0 to 1.0	CHRYSENE	1.1	=	MG/KG	0.94	X	87		160		0.1	X	Y
57	FS57B	0.0 to 1.0	CHRYSENE	2.25	=	MG/KG	0.94	X	87		160		0.1	X	Y
57	FS57C	0.0 to 1.0	CHRYSENE	31.5	=	MG/KG	0.94	X	87		160		0.1	X	Y
57	FS57D	0.0 to 1.0	CHRYSENE	35.5	=	MG/KG	0.94	X	87		160		0.1	X	Y
57	SB57E	0.0 to 2.0	CHRYSENE	11	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	FS65A	0.0 to 1.0	CHRYSENE	33	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	FS65B	0.0 to 1.0	CHRYSENE	8.25	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	SB65A	0.0 to 1.0	CHRYSENE	22	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	SB65B	0.0 to 1.0	CHRYSENE	0.24	J	MG/KG	0.94		87		160		0.1	X	N
65	SB65C	0.0 to 1.0	CHRYSENE	0.19	J	MG/KG	0.94		87		160		0.1	X	N
65	SS65A	0.0 to 1.0	CHRYSENE	47	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	SS65B	0.0 to 1.0	CHRYSENE	0.11	J	MG/KG	0.94		87		160		0.1	X	N
65	SS65C	0.0 to 1.0	CHRYSENE	0.21	J	MG/KG	0.94		87		160		0.1	X	N
65	SS65D	0.0 to 1.25	CHRYSENE	21	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	SS65E	0.0 to 1.0	CHRYSENE	68	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	SS65H	0.0 to 1.0	CHRYSENE	42	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	SS65H	0.0 to 1.0	CHRYSENE	48	=	MG/KG	0.94	X	87		160		0.1	X	Y
65	SS65K	0.0 to 1.0	CHRYSENE	10	=	MG/KG	0.94	X	87		160		0.1	X	Y
66	SS66E	0.0 to 1.0	CHRYSENE	8.7	=	MG/KG	0.94	X	87		160		0.1	X	Y

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
66	SS66E	0 0 to 1 0	CHRYSENE	2 1	J	MG/KG	0 94	X	87		160		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	CHRYSENE	2 2	=	MG/KG	0 94	X	87		160		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	CHRYSENE	0 78	=	MG/KG	0 94		87		160		0 1	X	N
BRAC	SS11A	0 0 to 1 0	CHRYSENE	5 8	=	MG/KG	0 94	X	87		160		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	CHRYSENE	0 56	=	MG/KG	0 94		87		160		0 1	X	N
BRAC	SS8A	0 0 to 1 0	CHRYSENE	13	=	MG/KG	0 94	X	87		160		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	CHRYSENE	14	=	MG/KG	0 94	X	87		160		0 1	X	Y
BRAC	SS9A	0 0 to 1 0	CHRYSENE	0 16	J	MG/KG	0 94		87		160		0 1	X	N
65	SS65E	0 0 to 1 0	COBALT	4 5	J	MG/KG	18 3		470				20		N
65	SS65H	0 0 to 1 0	COBALT	2 3	J	MG/KG	18 3		470				20		N
65	SS65H	0 0 to 1 0	COBALT	2 7	J	MG/KG	18 3		470				20		N
65	SS65I	0 0 to 1 0	COBALT	6 9	=	MG/KG	18 3		470				20		N
BRAC	E(10 2)	0 0 to 1 0	COBALT	5 8	J	MG/KG	18 3		470				20		N
BRAC	F(10 2)	0 0 to 1 0	COBALT	5 5	J	MG/KG	18 3		470				20		N
BRAC	SS11A	0 0 to 1 0	COBALT	7 3	=	MG/KG	18 3		470				20		N
BRAC	SS6A	0 0 to 1 0	COBALT	5 6	J	MG/KG	18 3		470				20		N
BRAC	SS8A	0 0 to 1 0	COBALT	7 6	J	MG/KG	18 3		470				20		N
BRAC	SS8A	0 0 to 1 0	COBALT	7 4	J	MG/KG	18 3		470				20		N
BRAC	SS9A	0 0 to 1 0	COBALT	6 2	J	MG/KG	18 3		470				20		N
57	FS57A	0 0 to 1 0	COPPER	15 6	=	MG/KG	33 5		310				40		N
57	FS57C	0 0 to 1 0	COPPER	23 45	=	MG/KG	33 5		310				40		N
57	SB57C	0 0 to 2 0	COPPER	20 5	=	MG/KG	33 5		310				40		N
57	SB57D	0 0 to 2 0	COPPER	21 4	=	MG/KG	33 5		310				40		N
57	SB57E	0 0 to 2 0	COPPER	7 8	=	MG/KG	33 5		310				40		N
57	SB57F	0 0 to 2 0	COPPER	17 7	=	MG/KG	33 5		310				40		N
57	SB57G	0 0 to 2 0	COPPER	15 7	=	MG/KG	33 5		310				40		N
65	SS65E	0 0 to 1 0	COPPER	20 5	=	MG/KG	33 5		310				40		N
65	SS65H	0 0 to 1 0	COPPER	9 7	J	MG/KG	33 5		310				40		N
65	SS65H	0 0 to 1 0	COPPER	11 1	J	MG/KG	33 5		310				40		N
65	SS65I	0 0 to 1 0	COPPER	17 7	J	MG/KG	33 5		310				40		N
66	SS66B	0 0 to 1 0	COPPER	25 5	J	MG/KG	33 5		310				40		N
66	SS66C	0 0 to 1 0	COPPER	27 2	J	MG/KG	33 5		310				40		N
66	SS66D	0 0 to 1 0	COPPER	25 2	J	MG/KG	33 5		310				40		N
66	SS66E	0 0 to 1 0	COPPER	18 1	J	MG/KG	33 5		310				40		N
66	SS66E	0 0 to 1 0	COPPER	19 5	J	MG/KG	33 5		310				40		N
BRAC	E(10 2)	0 0 to 1 0	COPPER	15 3	=	MG/KG	33 5		310				40		N
BRAC	F(10 2)	0 0 to 1 0	COPPER	15 5	=	MG/KG	33 5		310				40		N
BRAC	SS11A	0 0 to 1 0	COPPER	16 8	J	MG/KG	33 5		310				40		N
BRAC	SS6A	0 0 to 1 0	COPPER	19 3	J	MG/KG	33 5		310				40		N
BRAC	SS8A	0 0 to 1 0	COPPER	18 3	J	MG/KG	33 5		310				40		N
BRAC	SS8A	0 0 to 1 0	COPPER	18 4	J	MG/KG	33 5		310				40		N
BRAC	SS9A	0 0 to 1 0	COPPER	15 1	J	MG/KG	33 5		310				40		N
57	SB57D	0 0 to 2 0	DDD	0 0028	J	MG/KG	0 0067		2 7		16		0 0025	X	N
57	SB57C	0 0 to 2 0	DDE	0 0025	J	MG/KG	0 16		1 9		54		0 0025		N
57	SB57D	0 0 to 2 0	DDE	0 0063	=	MG/KG	0 16		1 9		54		0 0025	X	N
57	SB57E	0 0 to 2 0	DDE	2 3	=	MG/KG	0 16	X	1 9	X	54		0 0025	X	Y
57	SB57F	0 0 to 2 0	DDE	0 014	=	MG/KG	0 16		1 9		54		0 0025	X	N
57	SB57G	0 0 to 2 0	DDE	0 0075	=	MG/KG	0 16		1 9		54		0 0025	X	N
65	SS65E	0 0 to 1 0	DDE	2 8	=	MG/KG	0 16	X	1 9	X	54		0 0025	X	Y
65	SS65F	0 0 to 1 0	DDE	0 51	=	MG/KG	0 16	X	1 9		54		0 0025	X	Y
65	SS65G	0 0 to 1 0	DDE	7 3	=	MG/KG	0 16	X	1 9	X	54		0 0025	X	Y
65	SS65H	0 0 to 1 0	DDE	1 1	=	MG/KG	0 16	X	1 9		54		0 0025	X	Y
65	SS65H	0 0 to 1 0	DDE	1 1	=	MG/KG	0 16	X	1 9		54		0 0025	X	Y
65	SS65I	0 0 to 1 0	DDE	0 004	J	MG/KG	0 16		1 9		54		0 0025	X	N
65	SS65J	0 0 to 1 0	DDE	0 23	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
65	SS65K	0 0 to 1 0	DDE	0 97	=	MG/KG	0 16	X	1 9		54		0 0025	X	Y
66	SS66B	0 0 to 1 0	DDE	0 12	J	MG/KG	0 16		1 9		54		0 0025	X	N
66	SS66C	0 0 to 1 0	DDE	0 094	J	MG/KG	0 16		1 9		54		0 0025	X	N
66	SS66D	0 0 to 1 0	DDE	0 26	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
66	SS66E	0 0 to 1 0	DDE	1 2	=	MG/KG	0 16	X	1 9		54		0 0025	X	Y
66	SS66E	0 0 to 1 0	DDE	1 2	=	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	A(10 2)	0 0 to 0 5	DDE	1 4	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	A(10 2)	0 0 to 0 5	DDE	0 88	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	A(16 1)	0 0 to 0 5	DDE	0 067	=	MG/KG	0 16		1 9		54		0 0025	X	N
BRAC	A(17 2)	0 0 to 0 5	DDE	0 27	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	A(6 1)	0 0 to 0 5	DDE	0 82	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	A(6 1)	0 0 to 0 5	DDE	0 67	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	A(8 1)	0 0 to 0 5	DDE	0 06	J	MG/KG	0 16		1 9		54		0 0025	X	N
BRAC	B(10 2)	0 0 to 0 5	DDE	0 37	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	B(11 1)	0 0 to 0 5	DDE	0 44	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	B(16 1)	0 0 to 0 5	DDE	0 42	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	B(6 1)	0 0 to 0 5	DDE	0 18	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	B(9 1)	0 0 to 0 5	DDE	0 7	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	C(10 2)	0 0 to 0 5	DDE	0 62	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	C(11 1)	0 0 to 0 5	DDE	0 34	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	C(6 1)	0 0 to 0 5	DDE	0 24	J	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	D(10 2)	0 0 to 0 5	DDE	0 075	J	MG/KG	0 16		1 9		54		0 0025	X	N
BRAC	D(8 1)	0 0 to 0 5	DDE	0 045	=	MG/KG	0 16		1 9		54		0 0025	X	N
BRAC	E(10 2)	0 0 to 1 0	DDE	0 65	=	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	F(10 2)	0 0 to 1 0	DDE	0 2	=	MG/KG	0 16	X	1 9		54		0 0025	X	Y
BRAC	SS11A	0 0 to 1 0	DDE	0 098	=	MG/KG	0 16		1 9		54		0 0025	X	N
BRAC	SS6A	0 0 to 1 0	DDE	0 043	=	MG/KG	0 16		1 9		54		0 0025	X	N
BRAC	SS8A	0 0 to 1 0	DDE	0 12	J	MG/KG	0 16		1 9		54		0 0025	X	N
BRAC	SS8A	0 0 to 1 0	DDE	0 11	J	MG/KG	0 16		1 9		54		0 0025	X	N
BRAC	SS9A	0 0 to 1 0	DDE	0 0048	=	MG/KG	0 16		1 9		54		0 0025	X	N
57	SB57D	0 0 to 2 0	DDT	0 021	=	MG/KG	0 074		1 9		11		0 0025	X	N
57	SB57E	0 0 to 2 0	DDT	3	=	MG/KG	0 074	X	1 9	X	11		0 0025	X	Y
57	SB57F	0 0 to 2 0	DDT	0 022	=	MG/KG	0 074		1 9		11		0 0025	X	N
57	SB57G	0 0 to 2 0	DDT	0 022	=	MG/KG	0 074		1 9		11		0 0025	X	N
65	SS65E	0 0 to 1 0	DDT	5 1	=	MG/KG	0 074	X	1 9	X	11		0 0025	X	Y
65	SS65F	0 0 to 1 0	DDT	0 75	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
65	SS65G	0 0 to 1 0	DDT	10	=	MG/KG	0 074	X	1 9	X	11		0 0025	X	Y
65	SS65H	0 0 to 1 0	DDT	1 3	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
65	SS65H	0 0 to 1 0	DDT	1 2	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
65	SS65I	0 0 to 1 0	DDT	0 0057	J	MG/KG	0 074		1 9		11		0 0025	X	N
65	SS65J	0 0 to 1 0	DDT	0 22	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
65	SS65K	0 0 to 1 0	DDT	1 3	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
66	SS66B	0 0 to 1 0	DDT	0 1	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
66	SS66C	0 0 to 1 0	DDT	0 09	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
66	SS66D	0 0 to 1 0	DDT	0 2	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
66	SS66E	0 0 to 1 0	DDT	1 5	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
66	SS66E	0 0 to 1 0	DDT	1 4	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	A(10 2)	0 0 to 0 5	DDT	0 99	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	A(10 2)	0 0 to 0 5	DDT	0 69	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	A(16 1)	0 0 to 0 5	DDT	0 076	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	A(17 2)	0 0 to 0 5	DDT	0 33	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	A(6 1)	0 0 to 0 5	DDT	0 45	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	A(6 1)	0 0 to 0 5	DDT	0 44	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	A(8 1)	0 0 to 0 5	DDT	0 14	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	B(10 2)	0 0 to 0 5	DDT	0 24	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	B(11 1)	0 0 to 0 5	DDT	0 26	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	B(16 1)	0 0 to 0 5	DDT	0 41	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	B(6 1)	0 0 to 0 5	DDT	0 098	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	B(9 1)	0 0 to 0 5	DDT	0 37	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	C(10 2)	0 0 to 0 5	DDT	0 52	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	C(11 1)	0 0 to 0 5	DDT	0 24	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	C(6 1)	0 0 to 0 5	DDT	0 83	J	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	D(10 2)	0 0 to 0 5	DDT	0 062	J	MG/KG	0 074		1 9		11		0 0025	X	N

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TABLE L-1

Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	D(8 1)	0 0 to 0 5	DDT	0 046	=	MG/KG	0 074		1 9		11		0 0025	X	N
BRAC	E(10 2)	0 0 to 1 0	DDT	0 24	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	F(10 2)	0 0 to 1 0	DDT	0 084	=	MG/KG	0 074	X	1 9		11		0 0025	X	Y
BRAC	SS11A	0 0 to 1 0	DDT	0 064	=	MG/KG	0 074		1 9		11		0 0025	X	N
BRAC	SS6A	0 0 to 1 0	DDT	0 022	J	MG/KG	0 074		1 9		11		0 0025	X	N
BRAC	SS9A	0 0 to 1 0	DDT	0 004	=	MG/KG	0 074		1 9		11		0 0025	X	N
57	SB57E	0 0 to 2 0	DIBENZ(a,h)ANTHRACENE	2 1	=	MG/KG	0 26	X	0 087	X	2	X	0 1	X	Y
BRAC	SS6A	0 0 to 1 0	DIBENZ(a h)ANTHRACENE	0 078	J	MG/KG	0 26		0 087		2		0 1		N
65	SS65E	0 0 to 1 0	DIBENZOFURAN	1 9	J	MG/KG	0 647	X	31		15		0 1	X	Y
65	SS65H	0 0 to 1 0	DIBENZOFURAN	0 54	J	MG/KG	0 647		31		15		0 1	X	N
65	SS65H	0 0 to 1 0	DIBENZOFURAN	0 44	=	MG/KG	0 647		31		15		0 1	X	N
BRAC	E(10 2)	0 0 to 1 0	DIBENZOFURAN	0 12	J	MG/KG	0 647		31		15		0 1	X	N
BRAC	SS11A	0 0 to 1 0	DIBENZOFURAN	0 73	J	MG/KG	0 647	X	31		15		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	DIBENZOFURAN	0 065	J	MG/KG	0 647		31		15		0 1		N
BRAC	SS8A	0 0 to 1 0	DIBENZOFURAN	2	J	MG/KG	0 647	X	31		15		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	DIBENZOFURAN	2 2	J	MG/KG	0 647	X	31		15		0 1	X	Y
65	SS65F	0 0 to 1 0	DIELDRIN	0 22	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
65	SS65I	0 0 to 1 0	DIELDRIN	0 01	=	MG/KG	0 086		0 04		0 004	X	0 0005	X	N
65	SS65J	0 0 to 1 0	DIELDRIN	0 83	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
66	SS66B	0 0 to 1 0	DIELDRIN	0 44	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
66	SS66C	0 0 to 1 0	DIELDRIN	0 64	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
66	SS66D	0 0 to 1 0	DIELDRIN	0 73	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
66	SS66E	0 0 to 1 0	DIELDRIN	0 45	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
66	SS66E	0 0 to 1 0	DIELDRIN	0 45	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(10 2)	0 0 to 0 5	DIELDRIN	2 7	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(10 2)	0 0 to 0 5	DIELDRIN	1 6	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(16 1)	0 0 to 0 5	DIELDRIN	0 19	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(17 2)	0 0 to 0 5	DIELDRIN	3 3	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(6 1)	0 0 to 0 5	DIELDRIN	0 54	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(6 1)	0 0 to 0 5	DIELDRIN	0 59	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(8 1)	0 0 to 0 5	DIELDRIN	0 4	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(8 1)	0 0 to 0 5	DIELDRIN	0 9	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	B(10 2)	0 0 to 0 5	DIELDRIN	0 16	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	B(16 1)	0 0 to 0 5	DIELDRIN	1 3	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	B(6 1)	0 0 to 0 5	DIELDRIN	0 38	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	B(9 1)	0 0 to 0 5	DIELDRIN	0 47	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	C(10 2)	0 0 to 0 5	DIELDRIN	1 3	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	C(11 1)	0 0 to 0 5	DIELDRIN	0 98	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	C(6 1)	0 0 to 0 5	DIELDRIN	1 4	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	C(9 1)	0 0 to 0 5	DIELDRIN	4	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	D(10 2)	0 0 to 0 5	DIELDRIN	0 2	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	D(8 1)	0 0 to 0 5	DIELDRIN	0 052	=	MG/KG	0 086		0 04	X	0 004	X	0 0005	X	N
BRAC	E(10 2)	0 0 to 1 0	DIELDRIN	0 086	J	MG/KG	0 086		0 04	X	0 004	X	0 0005	X	N
BRAC	F(10 2)	0 0 to 1 0	DIELDRIN	0 11	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	SS11A	0 0 to 1 0	DIELDRIN	0 13	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	SS6A	0 0 to 1 0	DIELDRIN	0 16	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	SS8A	0 0 to 1 0	DIELDRIN	0 48	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	SS8A	0 0 to 1 0	DIELDRIN	0 41	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	SS9A	0 0 to 1 0	DIELDRIN	0 0049	=	MG/KG	0 086		0 04		0 004	X	0 0005	X	N
65	SS65C	0 0 to 1 0	DI-n-BUTYL PHTHALATE	0 056	J	MG/KG			780		2300		0 1		N
65	SS65H	0 0 to 1 0	ETHYLBENZENE	0 006	J	MG/KG			780		13		0 05		N
65	SS65H	0 0 to 1 0	ETHYLBENZENE	0 007	J	MG/KG			780		13		0 05		N
57	FS57A	0 0 to 1 0	FLUORANTHENE	2 3	=	MG/KG	1 6	X	310		4300		0 1	X	Y
57	FS57B	0 0 to 1 0	FLUORANTHENE	5 3	=	MG/KG	1 6	X	310		4300		0 1	X	Y
57	FS57C	0 0 to 1 0	FLUORANTHENE	55	=	MG/KG	1 6	X	310		4300		0 1	X	Y
57	FS57D	0 0 to 1 0	FLUORANTHENE	57 5	=	MG/KG	1 6	X	310		4300		0 1	X	Y
57	SB57E	0 0 to 2 0	FLUORANTHENE	23	=	MG/KG	1 6	X	310		4300		0 1	X	Y
65	FS65A	0 0 to 1 0	FLUORANTHENE	49 5	=	MG/KG	1 6	X	310		4300		0 1	X	Y
65	FS65B	0 0 to 1 0	FLUORANTHENE	16 05	=	MG/KG	1 6	X	310		4300		0 1	X	Y

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
65	SB65A	0 0 to 1 0	FLUORANTHENE	39	=	MG/KG	1 6	X	310		4300		0 1	X	Y
65	SB65B	0 0 to 1 0	FLUORANTHENE	0 48	=	MG/KG	1 6		310		4300		0 1	X	N
65	SB65C	0 0 to 1 0	FLUORANTHENE	0 38	J	MG/KG	1 6		310		4300		0 1	X	N
65	SS65A	0 0 to 1 0	FLUORANTHENE	44	=	MG/KG	1 6	X	310		4300		0 1	X	Y
65	SS65B	0 0 to 1 0	FLUORANTHENE	0 26	J	MG/KG	1 6		310		4300		0 1	X	N
65	SS65C	0 0 to 1 0	FLUORANTHENE	0 44	=	MG/KG	1 6		310		4300		0 1	X	N
65	SS65D	0 0 to 1 25	FLUORANTHENE	42	=	MG/KG	1 6	X	310		4300		0 1	X	Y
65	SS65E	0 0 to 1 0	FLUORANTHENE	130	=	MG/KG	1 6	X	310		4300		0 1	X	Y
65	SS65G	0 0 to 1 0	FLUORANTHENE	5	J	MG/KG	1 6	X	310		4300		0 1	X	Y
65	SS65H	0 0 to 1 0	FLUORANTHENE	70	=	MG/KG	1 6	X	310		4300		0 1	X	Y
65	SS65H	0 0 to 1 0	FLUORANTHENE	78	=	MG/KG	1 6	X	310		4300		0 1	X	Y
65	SS65K	0 0 to 1 0	FLUORANTHENE	18	=	MG/KG	1 6	X	310		4300		0 1	X	Y
66	SS66B	0 0 to 1 0	FLUORANTHENE	0 9	J	MG/KG	1 6		310		4300		0 1	X	N
66	SS66E	0 0 to 1 0	FLUORANTHENE	20	=	MG/KG	1 6	X	310		4300		0 1	X	Y
66	SS66E	0 0 to 1 0	FLUORANTHENE	4 5	=	MG/KG	1 6	X	310		4300		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	FLUORANTHENE	5	=	MG/KG	1 6	X	310		4300		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	FLUORANTHENE	1 5	=	MG/KG	1 6		310		4300		0 1	X	N
BRAC	SS11A	0 0 to 1 0	FLUORANTHENE	13	=	MG/KG	1 6	X	310		4300		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	FLUORANTHENE	1 2	=	MG/KG	1 6		310		4300		0 1	X	N
BRAC	SS8A	0 0 to 1 0	FLUORANTHENE	28	=	MG/KG	1 6	X	310		4300		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	FLUORANTHENE	25	=	MG/KG	1 6	X	310		4300		0 1	X	Y
BRAC	SS9A	0 0 to 1 0	FLUORANTHENE	0 37	J	MG/KG	1 6		310		4300		0 1	X	N
57	SB57E	0 0 to 2 0	FLUORENE	1 1	=	MG/KG			310		560		0 1	X	Y
65	SB65A	0 0 to 1 0	FLUORENE	1 1	J	MG/KG			310		560		0 1	X	Y
65	SS65D	0 0 to 1 25	FLUORENE	0 82	J	MG/KG			310		560		0 1	X	Y
65	SS65E	0 0 to 1 0	FLUORENE	5 2	=	MG/KG			310		560		0 1	X	Y
66	SS66E	0 0 to 1 0	FLUORENE	1 6	J	MG/KG			310		560		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	FLUORENE	0 23	J	MG/KG			310		560		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	FLUORENE	0 066	J	MG/KG			310		560		0 1		N
BRAC	SS11A	0 0 to 1 0	FLUORENE	1 3	J	MG/KG			310		560		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	FLUORENE	0 08	J	MG/KG			310		560		0 1		N
BRAC	SS8A	0 0 to 1 0	FLUORENE	3 1	J	MG/KG			310		560		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	FLUORENE	3 1	J	MG/KG			310		560		0 1	X	Y
57	SB57D	0 0 to 2 0	GAMMA BHC (LINDANE)	0 0029	=	MG/KG			0 49		0 009		0 00005	X	Y
BRAC	A(16 1)	0 0 to 0 5	GAMMA CHLORDANE	0 02	=	MG/KG	0 026		1 8				0 1		N
BRAC	SS8A	0 0 to 1 0	GAMMA CHLORDANE	0 15	J	MG/KG	0 026	X	1 8				0 1	X	Y
BRAC	SS8A	0 0 to 1 0	GAMMA CHLORDANE	0 12	J	MG/KG	0 026	X	1 8				0 1	X	Y
57	FS57A	0 0 to 1 0	INDENO(1,2,3-c d)PYRENE	0 65	=	MG/KG	0 7		0 87		14		0 1	X	N
57	FS57B	0 0 to 1 0	INDENO(1 2 3-c,d)PYRENE	1 1	J	MG/KG	0 7	X	0 87	X	14		0 1	X	Y
57	FS57C	0 0 to 1 0	INDENO(1 2 3-c d)PYRENE	19	J	MG/KG	0 7	X	0 87	X	14	X	0 1	X	Y
57	FS57D	0 0 to 1 0	INDENO(1,2,3-c,d)PYRENE	20 9	=	MG/KG	0 7	X	0 87	X	14	X	0 1	X	Y
57	SB57E	0 0 to 2 0	INDENO(1,2 3-c,d)PYRENE	4 4	=	MG/KG	0 7	X	0 87	X	14		0 1	X	Y
65	FS65A	0 0 to 1 0	INDENO(1 2 3-c d)PYRENE	19 2	=	MG/KG	0 7	X	0 87	X	14	X	0 1	X	Y
65	FS65B	0 0 to 1 0	INDENO(1,2,3-c,d)PYRENE	4 55	=	MG/KG	0 7	X	0 87	X	14		0 1	X	Y
65	SB65A	0 0 to 1 0	INDENO(1 2 3-c,d)PYRENE	15	=	MG/KG	0 7	X	0 87	X	14	X	0 1	X	Y
65	SB65B	0 0 to 1 0	INDENO(1 2 3-c,d)PYRENE	0 11	J	MG/KG	0 7		0 87		14		0 1	X	N
65	SB65C	0 0 to 1 0	INDENO(1,2,3-c,d)PYRENE	0 087	J	MG/KG	0 7		0 87		14		0 1		N
65	SS65A	0 0 to 1 0	INDENO(1 2 3-c,d)PYRENE	39	=	MG/KG	0 7	X	0 87	X	14	X	0 1	X	Y
65	SS65B	0 0 to 1 0	INDENO(1 2,3-c d)PYRENE	0 056	J	MG/KG	0 7		0 87		14		0 1		N
65	SS65C	0 0 to 1 0	INDENO(1 2 3-c d)PYRENE	0 096	J	MG/KG	0 7		0 87		14		0 1		N
65	SS65D	0 0 to 1 25	INDENO(1 2,3-c d)PYRENE	11	=	MG/KG	0 7	X	0 87	X	14		0 1	X	Y
65	SS65E	0 0 to 1 0	INDENO(1,2,3-c,d)PYRENE	44	=	MG/KG	0 7	X	0 87	X	14	X	0 1	X	Y
65	SS65H	0 0 to 1 0	INDENO(1,2,3-c d)PYRENE	27	=	MG/KG	0 7	X	0 87	X	14	X	0 1	X	Y
65	SS65H	0 0 to 1 0	INDENO(1,2,3-c,d)PYRENE	28	=	MG/KG	0 7	X	0 87	X	14	X	0 1	X	Y
65	SS65K	0 0 to 1 0	INDENO(1,2,3-c,d)PYRENE	6	=	MG/KG	0 7	X	0 87	X	14		0 1	X	Y
66	SS66E	0 0 to 1 0	INDENO(1 2,3-c,d)PYRENE	4	=	MG/KG	0 7	X	0 87	X	14		0 1	X	Y
BRAC	E(10 2)	0 0 to 1 0	INDENO(1 2 3-c d)PYRENE	1 2	=	MG/KG	0 7	X	0 87	X	14		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	INDENO(1 2 3-c d)PYRENE	0 48	=	MG/KG	0 7		0 87		14		0 1	X	N
BRAC	SS11A	0 0 to 1 0	INDENO(1,2 3-c d)PYRENE	3 2	=	MG/KG	0 7	X	0 87	X	14		0 1	X	Y

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	SS6A	0.0 to 1.0	INDENO(1,2,3-c,d)PYRENE	0.25	J	MG/KG	0.7		0.87		14		0.1	X	N
BRAC	SS8A	0.0 to 1.0	INDENO(1,2 3-c,d)PYRENE	7.7	=	MG/KG	0.7	X	0.87	X	14		0.1	X	Y
BRAC	SS8A	0.0 to 1.0	INDENO(1 2 3-c,d)PYRENE	7.1	=	MG/KG	0.7	X	0.87	X	14		0.1	X	Y
BRAC	SS9A	0.0 to 1.0	INDENO(1,2 3-c,d)PYRENE	0.11	J	MG/KG	0.7		0.87		14		0.1	X	N
65	SS65E	0.0 to 1.0	IRON	8280	=	MG/KG	37040		2300	X			200	X	N
65	SS65H	0.0 to 1.0	IRON	4410	=	MG/KG	37040		2300	X			200	X	N
65	SS65H	0.0 to 1.0	IRON	6500	=	MG/KG	37040		2300	X			200	X	N
65	SS65I	0.0 to 1.0	IRON	19900	=	MG/KG	37040		2300	X			200	X	N
BRAC	E(10 2)	0.0 to 1.0	IRON	15200	=	MG/KG	37040		2300	X			200	X	N
BRAC	F(10 2)	0.0 to 1.0	IRON	14100	=	MG/KG	37040		2300	X			200	X	N
BRAC	SS11A	0.0 to 1.0	IRON	19000	=	MG/KG	37040		2300	X			200	X	N
BRAC	SS6A	0.0 to 1.0	IRON	14500	=	MG/KG	37040		2300	X			200	X	N
BRAC	SS8A	0.0 to 1.0	IRON	20400	=	MG/KG	37040		2300	X			200	X	N
BRAC	SS8A	0.0 to 1.0	IRON	18500	=	MG/KG	37040		2300	X			200	X	N
BRAC	SS9A	0.0 to 1.0	IRON	15300	=	MG/KG	37040		2300	X			200	X	N
57	FS57A	0.0 to 1.0	LEAD	21.6	J	MG/KG	30		400				50		N
57	FS57C	0.0 to 1.0	LEAD	297	J	MG/KG	30	X	400				50	X	Y
57	SB57C	0.0 to 2.0	LEAD	13.7	=	MG/KG	30		400				50		N
57	SB57D	0.0 to 2.0	LEAD	16	=	MG/KG	30		400				50		N
57	SB57E	0.0 to 2.0	LEAD	33.2	=	MG/KG	30	X	400				50		N
57	SB57F	0.0 to 2.0	LEAD	11.7	=	MG/KG	30		400				50		N
57	SB57G	0.0 to 2.0	LEAD	14.2	=	MG/KG	30		400				50		N
65	SS65E	0.0 to 1.0	LEAD	97.7	=	MG/KG	30	X	400				50	X	Y
65	SS65H	0.0 to 1.0	LEAD	43.7	J	MG/KG	30	X	400				50		N
65	SS65H	0.0 to 1.0	LEAD	53.6	J	MG/KG	30	X	400				50	X	Y
65	SS65I	0.0 to 1.0	LEAD	15.4	J	MG/KG	30		400				50		N
66	SS66B	0.0 to 1.0	LEAD	38.4	J	MG/KG	30	X	400				50		N
66	SS66C	0.0 to 1.0	LEAD	41.6	J	MG/KG	30	X	400				50		N
66	SS66D	0.0 to 1.0	LEAD	34.3	J	MG/KG	30	X	400				50		N
66	SS66E	0.0 to 1.0	LEAD	49.9	J	MG/KG	30	X	400				50		N
66	SS66E	0.0 to 1.0	LEAD	56.5	J	MG/KG	30	X	400				50	X	Y
BRAC	E(10 2)	0.0 to 1.0	LEAD	37.9	J	MG/KG	30	X	400				50		N
BRAC	F(10 2)	0.0 to 1.0	LEAD	31.1	J	MG/KG	30	X	400				50		N
BRAC	SS11A	0.0 to 1.0	LEAD	29.2	J	MG/KG	30		400				50		N
BRAC	SS6A	0.0 to 1.0	LEAD	22.9	=	MG/KG	30		400				50		N
BRAC	SS8A	0.0 to 1.0	LEAD	65.4	=	MG/KG	30	X	400				50	X	Y
BRAC	SS8A	0.0 to 1.0	LEAD	76.8	=	MG/KG	30	X	400				50	X	Y
BRAC	SS9A	0.0 to 1.0	LEAD	13.4	=	MG/KG	30		400				50		N
65	SS65E	0.0 to 1.0	MAGNESIUM	9590	=	MG/KG	4600	X							NA
65	SS65H	0.0 to 1.0	MAGNESIUM	9700	=	MG/KG	4600	X							NA
65	SS65H	0.0 to 1.0	MAGNESIUM	8680	=	MG/KG	4600	X							NA
65	SS65I	0.0 to 1.0	MAGNESIUM	2180	=	MG/KG	4600								N
BRAC	E(10 2)	0.0 to 1.0	MAGNESIUM	1910	=	MG/KG	4600								N
BRAC	F(10 2)	0.0 to 1.0	MAGNESIUM	1670	=	MG/KG	4600								N
BRAC	SS11A	0.0 to 1.0	MAGNESIUM	2420	=	MG/KG	4600								N
BRAC	SS6A	0.0 to 1.0	MAGNESIUM	1740	=	MG/KG	4600								N
BRAC	SS8A	0.0 to 1.0	MAGNESIUM	2390	=	MG/KG	4600								N
BRAC	SS8A	0.0 to 1.0	MAGNESIUM	2110	=	MG/KG	4600								N
BRAC	SS9A	0.0 to 1.0	MAGNESIUM	1820	=	MG/KG	4600								N
65	SS65E	0.0 to 1.0	MANGANESE	162	=	MG/KG	1304		1100				100	X	N
65	SS65H	0.0 to 1.0	MANGANESE	93.9	=	MG/KG	1304		1100				100		N
65	SS65H	0.0 to 1.0	MANGANESE	112	=	MG/KG	1304		1100				100	X	N
65	SS65I	0.0 to 1.0	MANGANESE	541	=	MG/KG	1304		1100				100	X	N
BRAC	E(10 2)	0.0 to 1.0	MANGANESE	415	=	MG/KG	1304		1100				100	X	N
BRAC	F(10 2)	0.0 to 1.0	MANGANESE	379	=	MG/KG	1304		1100				100	X	N
BRAC	SS11A	0.0 to 1.0	MANGANESE	621	=	MG/KG	1304		1100				100	X	N
BRAC	SS6A	0.0 to 1.0	MANGANESE	335	=	MG/KG	1304		1100				100	X	N
BRAC	SS8A	0.0 to 1.0	MANGANESE	657	=	MG/KG	1304		1100				100	X	N
BRAC	SS8A	0.0 to 1.0	MANGANESE	650	=	MG/KG	1304		1100				100	X	N

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	SS9A	0.0 to 1.0	MANGANESE	432	=	MG/KG	1304		1100				100	X	N
57	FS57A	0.0 to 1.0	MERCURY	0.045	=	MG/KG	0.4		2.3		2		0.1		N
57	FS57C	0.0 to 1.0	MERCURY	2.13	=	MG/KG	0.4	X	2.3		2	X	0.1	X	Y
65	SS65H	0.0 to 1.0	MERCURY	0.03	J	MG/KG	0.4		2.3		2		0.1		N
65	SS65H	0.0 to 1.0	MERCURY	0.03	J	MG/KG	0.4		2.3		2		0.1		N
65	SS65I	0.0 to 1.0	MERCURY	0.05	=	MG/KG	0.4		2.3		2		0.1		N
66	SS66B	0.0 to 1.0	MERCURY	0.05	=	MG/KG	0.4		2.3		2		0.1		N
66	SS66C	0.0 to 1.0	MERCURY	0.05	=	MG/KG	0.4		2.3		2		0.1		N
66	SS66D	0.0 to 1.0	MERCURY	0.05	=	MG/KG	0.4		2.3		2		0.1		N
66	SS66E	0.0 to 1.0	MERCURY	0.12	=	MG/KG	0.4		2.3		2		0.1	X	N
66	SS66E	0.0 to 1.0	MERCURY	0.1	=	MG/KG	0.4		2.3		2		0.1		N
BRAC	E(10.2)	0.0 to 1.0	MERCURY	0.05	=	MG/KG	0.4		2.3		2		0.1		N
BRAC	SS11A	0.0 to 1.0	MERCURY	0.05	=	MG/KG	0.4		2.3		2		0.1		N
BRAC	SS8A	0.0 to 1.0	MERCURY	0.05	=	MG/KG	0.4		2.3		2		0.1		N
BRAC	SS8A	0.0 to 1.0	MERCURY	0.03	J	MG/KG	0.4		2.3		2		0.1		N
65	SS65H	0.0 to 1.0	METHYL ETHYL KETONE (2 BUTANONE)	0.006	J	MG/KG	0.002	X	4700		17				N
65	SS65I	0.0 to 1.0	METHYL ETHYL KETONE (2 BUTANONE)	0.024	=	MG/KG	0.002	X	4700		17				N
BRAC	SS11A	0.0 to 1.0	METHYL ETHYL KETONE (2 BUTANONE)	0.042	=	MG/KG	0.002	X	4700		17				N
BRAC	SS6A	0.0 to 1.0	METHYL ETHYL KETONE (2 BUTANONE)	0.034	=	MG/KG	0.002	X	4700		17				N
BRAC	SS8A	0.0 to 1.0	METHYL ETHYL KETONE (2-BUTANONE)	0.031	=	MG/KG	0.002	X	4700		17				N
BRAC	SS8A	0.0 to 1.0	METHYL ETHYL KETONE (2 BUTANONE)	0.081	=	MG/KG	0.002	X	4700		17				N
BRAC	SS9A	0.0 to 1.0	METHYL ETHYL KETONE (2-BUTANONE)	0.049	=	MG/KG	0.002	X	4700		17				N
65	SS65E	0.0 to 1.0	NAPHTHALENE	0.66	J	MG/KG			160		84		0.1	X	Y
BRAC	SS11A	0.0 to 1.0	NAPHTHALENE	0.36	J	MG/KG			160		84		0.1	X	Y
BRAC	SS8A	0.0 to 1.0	NAPHTHALENE	1.3	J	MG/KG			160		84		0.1	X	Y
BRAC	SS8A	0.0 to 1.0	NAPHTHALENE	1.2	J	MG/KG			160		84		0.1	X	Y
57	FS57A	0.0 to 1.0	NICKEL	14.6	J	MG/KG	30		160		130		30		N
57	FS57C	0.0 to 1.0	NICKEL	6.5	J	MG/KG	30		160		130		30		N
57	SB57C	0.0 to 2.0	NICKEL	19.5	=	MG/KG	30		160		130		30		N
57	SB57D	0.0 to 2.0	NICKEL	20.9	=	MG/KG	30		160		130		30		N
57	SB57E	0.0 to 2.0	NICKEL	4.4	=	MG/KG	30		160		130		30		N
57	SB57F	0.0 to 2.0	NICKEL	18	=	MG/KG	30		160		130		30		N
57	SB57G	0.0 to 2.0	NICKEL	17.2	=	MG/KG	30		160		130		30		N
65	SS65E	0.0 to 1.0	NICKEL	11.3	=	MG/KG	30		160		130		30		N
65	SS65H	0.0 to 1.0	NICKEL	5.5	=	MG/KG	30		160		130		30		N
65	SS65H	0.0 to 1.0	NICKEL	6.4	=	MG/KG	30		160		130		30		N
65	SS65I	0.0 to 1.0	NICKEL	15.7	=	MG/KG	30		160		130		30		N
66	SS66B	0.0 to 1.0	NICKEL	15.6	=	MG/KG	30		160		130		30		N
66	SS66C	0.0 to 1.0	NICKEL	16.3	=	MG/KG	30		160		130		30		N
66	SS66D	0.0 to 1.0	NICKEL	17.3	=	MG/KG	30		160		130		30		N
66	SS66E	0.0 to 1.0	NICKEL	15.5	=	MG/KG	30		160		130		30		N
66	SS66E	0.0 to 1.0	NICKEL	16.4	=	MG/KG	30		160		130		30		N
BRAC	E(10.2)	0.0 to 1.0	NICKEL	13.5	J	MG/KG	30		160		130		30		N
BRAC	F(10.2)	0.0 to 1.0	NICKEL	13.5	J	MG/KG	30		160		130		30		N
BRAC	SS11A	0.0 to 1.0	NICKEL	17.1	J	MG/KG	30		160		130		30		N
BRAC	SS6A	0.0 to 1.0	NICKEL	13.3	=	MG/KG	30		160		130		30		N
BRAC	SS8A	0.0 to 1.0	NICKEL	16.3	=	MG/KG	30		160		130		30		N
BRAC	SS8A	0.0 to 1.0	NICKEL	15.7	=	MG/KG	30		160		130		30		N
BRAC	SS9A	0.0 to 1.0	NICKEL	14.6	=	MG/KG	30		160		130		30		N
66	SS66E	0.0 to 1.0	PCB-1260 (AROCHLOR 1260)	6.3	=	MG/KG	0.11	X	0.32	X	17		0.02	X	Y
66	SS66E	0.0 to 1.0	PCB-1260 (AROCHLOR 1260)	6.6	=	MG/KG	0.11	X	0.32	X	17		0.02	X	Y
BRAC	A(6.1)	0.0 to 0.5	PCB-1260 (AROCHLOR 1260)	2.9	J	MG/KG	0.11	X	0.32	X	17		0.02	X	Y
BRAC	A(6.1)	0.0 to 0.5	PCB-1260 (AROCHLOR 1260)	2.3	J	MG/KG	0.11	X	0.32	X	17		0.02	X	Y
BRAC	E(10.2)	0.0 to 1.0	PETROLEUM HYDROCARBONS	33.8	=	MG/KG			34		340				N
BRAC	E(10.2)	0.0 to 1.0	PETROLEUM HYDROCARBONS	64.1	=	MG/KG			34	X	340				Y
BRAC	F(10.2)	0.0 to 1.0	PETROLEUM HYDROCARBONS	15.7	=	MG/KG			34		340				N
65	FS65A	0.0 to 1.0	pH	8.8	=	PH UNITS									NA
65	FS65B	0.0 to 1.0	pH	8.7	=	PH UNITS									NA
57	FS57A	0.0 to 1.0	PHENANTHRENE	1.4	=	MG/KG	0.61	X	230		250		0.1	X	Y

TABLE L-1

Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values

Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
57	FS57B	0.0 to 1.0	PHENANTHRENE	3.55	=	MG/KG	0.61	X	230		250		0.1	X	Y
57	FS57C	0.0 to 1.0	PHENANTHRENE	21	J	MG/KG	0.61	X	230		250		0.1	X	Y
57	FS57D	0.0 to 1.0	PHENANTHRENE	28	=	MG/KG	0.61	X	230		250		0.1	X	Y
57	SB57E	0.0 to 2.0	PHENANTHRENE	11	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	FS65A	0.0 to 1.0	PHENANTHRENE	20.3	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	FS65B	0.0 to 1.0	PHENANTHRENE	5	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	SB65A	0.0 to 1.0	PHENANTHRENE	20	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	SB65B	0.0 to 1.0	PHENANTHRENE	0.33	J	MG/KG	0.61		230		250		0.1	X	N
65	SB65C	0.0 to 1.0	PHENANTHRENE	0.26	J	MG/KG	0.61		230		250		0.1	X	N
65	SS65A	0.0 to 1.0	PHENANTHRENE	7.3	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	SS65B	0.0 to 1.0	PHENANTHRENE	0.18	J	MG/KG	0.61		230		250		0.1	X	N
65	SS65C	0.0 to 1.0	PHENANTHRENE	0.27	J	MG/KG	0.61		230		250		0.1	X	N
65	SS65D	0.0 to 1.25	PHENANTHRENE	16	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	SS65E	0.0 to 1.0	PHENANTHRENE	61	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	SS65H	0.0 to 1.0	PHENANTHRENE	30	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	SS65H	0.0 to 1.0	PHENANTHRENE	36	=	MG/KG	0.61	X	230		250		0.1	X	Y
65	SS65K	0.0 to 1.0	PHENANTHRENE	7.3	=	MG/KG	0.61	X	230		250		0.1	X	Y
66	SS66E	0.0 to 1.0	PHENANTHRENE	18	=	MG/KG	0.61	X	230		250		0.1	X	Y
66	SS66E	0.0 to 1.0	PHENANTHRENE	2.4	J	MG/KG	0.61	X	230		250		0.1	X	Y
BRAC	E(10.2)	0.0 to 1.0	PHENANTHRENE	3.1	=	MG/KG	0.61	X	230		250		0.1	X	Y
BRAC	F(10.2)	0.0 to 1.0	PHENANTHRENE	0.97	=	MG/KG	0.61	X	230		250		0.1	X	Y
BRAC	SS11A	0.0 to 1.0	PHENANTHRENE	11	=	MG/KG	0.61	X	230		250		0.1	X	Y
BRAC	SS6A	0.0 to 1.0	PHENANTHRENE	1	=	MG/KG	0.61	X	230		250		0.1	X	Y
BRAC	SS8A	0.0 to 1.0	PHENANTHRENE	25	=	MG/KG	0.61	X	230		250		0.1	X	Y
BRAC	SS8A	0.0 to 1.0	PHENANTHRENE	25	=	MG/KG	0.61	X	230		250		0.1	X	Y
BRAC	SS9A	0.0 to 1.0	PHENANTHRENE	0.25	J	MG/KG	0.61		230		250		0.1	X	N
65	SS65E	0.0 to 1.0	POTASSIUM	808	=	MG/KG	1820								N
65	SS65H	0.0 to 1.0	POTASSIUM	960	J	MG/KG	1820								N
65	SS65H	0.0 to 1.0	POTASSIUM	1420	J	MG/KG	1820								N
65	SS65I	0.0 to 1.0	POTASSIUM	2290	=	MG/KG	1820	X							NA
BRAC	E(10.2)	0.0 to 1.0	POTASSIUM	1940	=	MG/KG	1820	X							NA
BRAC	F(10.2)	0.0 to 1.0	POTASSIUM	2070	=	MG/KG	1820	X							NA
BRAC	SS11A	0.0 to 1.0	POTASSIUM	2630	=	MG/KG	1820	X							NA
BRAC	SS6A	0.0 to 1.0	POTASSIUM	2530	=	MG/KG	1820	X							NA
BRAC	SS8A	0.0 to 1.0	POTASSIUM	2590	=	MG/KG	1820	X							NA
BRAC	SS8A	0.0 to 1.0	POTASSIUM	2240	=	MG/KG	1820	X							NA
BRAC	SS9A	0.0 to 1.0	POTASSIUM	1950	=	MG/KG	1820	X							NA
57	FS57A	0.0 to 1.0	PYRENE	1.7	=	MG/KG	1.5	X	230		880		0.1	X	Y
57	FS57B	0.0 to 1.0	PYRENE	3.8	=	MG/KG	1.5	X	230		880		0.1	X	Y
57	FS57C	0.0 to 1.0	PYRENE	33.5	=	MG/KG	1.5	X	230		880		0.1	X	Y
57	FS57D	0.0 to 1.0	PYRENE	41.5	=	MG/KG	1.5	X	230		880		0.1	X	Y
57	SB57E	0.0 to 2.0	PYRENE	17	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	FS65A	0.0 to 1.0	PYRENE	38.5	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	FS65B	0.0 to 1.0	PYRENE	11.45	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	SB65A	0.0 to 1.0	PYRENE	26	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	SB65B	0.0 to 1.0	PYRENE	0.46	=	MG/KG	1.5		230		880		0.1	X	N
65	SB65C	0.0 to 1.0	PYRENE	0.39	J	MG/KG	1.5		230		880		0.1	X	N
65	SS65A	0.0 to 1.0	PYRENE	52	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	SS65B	0.0 to 1.0	PYRENE	0.2	J	MG/KG	1.5		230		880		0.1	X	N
65	SS65C	0.0 to 1.0	PYRENE	0.35	J	MG/KG	1.5		230		880		0.1	X	N
65	SS65D	0.0 to 1.25	PYRENE	35	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	SS65E	0.0 to 1.0	PYRENE	120	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	SS65G	0.0 to 1.0	PYRENE	3.4	J	MG/KG	1.5	X	230		880		0.1	X	Y
65	SS65H	0.0 to 1.0	PYRENE	55	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	SS65H	0.0 to 1.0	PYRENE	60	=	MG/KG	1.5	X	230		880		0.1	X	Y
65	SS65K	0.0 to 1.0	PYRENE	14	=	MG/KG	1.5	X	230		880		0.1	X	Y
66	SS66B	0.0 to 1.0	PYRENE	0.67	J	MG/KG	1.5		230		880		0.1	X	N
66	SS66E	0.0 to 1.0	PYRENE	14	=	MG/KG	1.5	X	230		880		0.1	X	Y
66	SS66E	0.0 to 1.0	PYRENE	2.6	J	MG/KG	1.5	X	230		880		0.1	X	Y

488 850

488 851

TABLE L-1
Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	E(10 2)	0 0 to 1 0	PYRENE	3 6	=	MG/KG	1 5	X	230		880		0 1	X	Y
BRAC	F(10 2)	0 0 to 1 0	PYRENE	1 4	=	MG/KG	1 5		230		880		0 1	X	N
BRAC	SS11A	0 0 to 1 0	PYRENE	10	=	MG/KG	1 5	X	230		880		0 1	X	Y
BRAC	SS6A	0 0 to 1 0	PYRENE	1	=	MG/KG	1 5		230		880		0 1	X	N
BRAC	SS8A	0 0 to 1 0	PYRENE	26	=	MG/KG	1 5	X	230		880		0 1	X	Y
BRAC	SS8A	0 0 to 1 0	PYRENE	29	=	MG/KG	1 5	X	230		880		0 1	X	Y
BRAC	SS9A	0 0 to 1 0	PYRENE	0 32	J	MG/KG	1 5		230		880		0 1	X	N
57	FS57C	0 0 to 1 0	SELENIUM	3 4	J	MG/KG	0 8	X	39		5		0 81	X	Y
65	SS65I	0 0 to 1 0	SELENIUM	1 2	=	MG/KG	0 8	X	39		5		0 81	X	Y
66	SS66B	0 0 to 1 0	SELENIUM	1 5	=	MG/KG	0 8	X	39		5		0 81	X	Y
66	SS66C	0 0 to 1 0	SELENIUM	1 8	=	MG/KG	0 8	X	39		5		0 81	X	Y
66	SS66D	0 0 to 1 0	SELENIUM	1 4	=	MG/KG	0 8	X	39		5		0 81	X	Y
57	FS57C	0 0 to 1 0	SILVER	0 67	=	MG/KG	2		39		34		2		N
65	SS65E	0 0 to 1 0	SODIUM	294	J	MG/KG									NA
65	SS65H	0 0 to 1 0	TOLUENE	0 012	=	MG/KG	0 002	X	1600		12		0 05		N
65	SS65H	0 0 to 1 0	TOLUENE	0 014	=	MG/KG	0 002	X	1600		12		0 05		N
BRAC	F(10 2)	0 0 to 1 0	TOLUENE	0 002	J	MG/KG	0 002		1600		12		0 05		N
BRAC	SS9A	0 0 to 1 0	TOLUENE	0 001	J	MG/KG	0 002		1600		12		0 05		N
57	FS57A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	12 165	=	MG/KG							1	X	Y
57	FS57B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	25 755	=	MG/KG							1	X	Y
57	FS57C	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	280	=	MG/KG							1	X	Y
57	FS57D	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	308 1	=	MG/KG							1	X	Y
57	SB57E	0 0 to 2 0	Total Polynuclear Aromatic Hydrocarbons	117	=	MG/KG							1	X	Y
65	FS65A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	279 6	=	MG/KG							1	X	Y
65	FS65B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	83 2	=	MG/KG							1	X	Y
65	SB65A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	211	=	MG/KG							1	X	Y
65	SB65B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	2 548	=	MG/KG							1	X	Y
65	SB65C	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	2 015	J	MG/KG							1	X	Y
65	SS65A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	484 3	=	MG/KG							1	X	Y
65	SS65B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 205	J	MG/KG							1	X	Y
65	SS65C	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	2 147	=	MG/KG							1	X	Y
65	SS65D	0 0 to 1 25	Total Polynuclear Aromatic Hydrocarbons	204 82	=	MG/KG							1	X	Y
65	SS65E	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	722 56	=	MG/KG							1	X	Y
65	SS65G	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	8 4	J	MG/KG							1	X	Y
65	SS65H	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	379 5	=	MG/KG							1	X	Y
65	SS65H	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	428 6	=	MG/KG							1	X	Y
65	SS65K	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	94 4	=	MG/KG							1	X	Y
66	SS66B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 57	J	MG/KG							1	X	Y
66	SS66E	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	98 8	=	MG/KG							1	X	Y
66	SS66E	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	18 9	=	MG/KG							1	X	Y
BRAC	E(10 2)	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	24 86	=	MG/KG							1	X	Y
BRAC	F(10 2)	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	8 659	=	MG/KG							1	X	Y
BRAC	SS11A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	72 25	=	MG/KG							1	X	Y
BRAC	SS6A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	6 228	=	MG/KG							1	X	Y
BRAC	SS8A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	166 4	=	MG/KG							1	X	Y
BRAC	SS8A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	165 1	=	MG/KG							1	X	Y
BRAC	SS9A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 945	J	MG/KG							1	X	Y
65	SS65H	0 0 to 1 0	Total Xylenes	0 009	J	MG/KG	0 009		16000		0 2				N
65	SS65H	0 0 to 1 0	Total Xylenes	0 009	J	MG/KG	0 009		16000		0 2				N
BRAC	SS9A	0 0 to 1 0	TRICHLOROETHYLENE (TCE)	0 002	J	MG/KG			58		0 06		0 001	X	Y
65	SS65E	0 0 to 1 0	VANADIUM	10 7	J	MG/KG	48 4		55		6000		2	X	N
65	SS65H	0 0 to 1 0	VANADIUM	8 4	=	MG/KG	48 4		55		6000		2	X	N
65	SS65H	0 0 to 1 0	VANADIUM	9 5	=	MG/KG	48 4		55		6000		2	X	N
65	SS65I	0 0 to 1 0	VANADIUM	25 8	=	MG/KG	48 4		55		6000		2	X	N
BRAC	E(10 2)	0 0 to 1 0	VANADIUM	22 2	=	MG/KG	48 4		55		6000		2	X	N
BRAC	F(10 2)	0 0 to 1 0	VANADIUM	21 5	=	MG/KG	48 4		55		6000		2	X	N
BRAC	SS11A	0 0 to 1 0	VANADIUM	28 6	=	MG/KG	48 4		55		6000		2	X	N
BRAC	SS6A	0 0 to 1 0	VANADIUM	22 1	J	MG/KG	48 4		55		6000		2	X	N
BRAC	SS8A	0 0 to 1 0	VANADIUM	27 4	J	MG/KG	48 4		55		6000		2	X	N

TABLE L-1

Summary of Detected Parameters in Surface Soil at FU1 Compared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	SS8A	0 0 to 1 0	VANADIUM	22 7	J	MG/KG	48 4		55		6000		2	X	N
BRAC	SS9A	0 0 to 1 0	VANADIUM	21 3	J	MG/KG	48 4		55		6000		2	X	N
57	FS57A	0 0 to 1 0	ZINC	50 25	J	MG/KG	126		2300		12000		50	X	N
57	FS57C	0 0 to 1 0	ZINC	152 5	J	MG/KG	126	X	2300		12000		50	X	Y
57	SB57C	0 0 to 2 0	ZINC	66 5	=	MG/KG	126		2300		12000		50	X	N
57	SB57D	0 0 to 2 0	ZINC	75 2	=	MG/KG	126		2300		12000		50	X	N
57	SB57E	0 0 to 2 0	ZINC	99 6	=	MG/KG	126		2300		12000		50	X	N
57	SB57F	0 0 to 2 0	ZINC	113	=	MG/KG	126		2300		12000		50	X	N
57	SB57G	0 0 to 2 0	ZINC	54	=	MG/KG	126		2300		12000		50	X	N
65	SB65A	0 0 to 1 0	ZINC	95	=	MG/KG	126		2300		12000		50	X	N
65	SB65B	0 0 to 1 0	ZINC	196	=	MG/KG	126	X	2300		12000		50	X	Y
65	SB65C	0 0 to 1 0	ZINC	134	=	MG/KG	126	X	2300		12000		50	X	Y
65	SS65A	0 0 to 1 0	ZINC	646	=	MG/KG	126	X	2300		12000		50	X	Y
65	SS65B	0 0 to 1 0	ZINC	64 9	=	MG/KG	126		2300		12000		50	X	N
65	SS65C	0 0 to 1 0	ZINC	131	=	MG/KG	126	X	2300		12000		50	X	Y
65	SS65D	0 0 to 1 25	ZINC	96 3	=	MG/KG	126		2300		12000		50	X	N
65	SS65E	0 0 to 1 0	ZINC	116	=	MG/KG	126		2300		12000		50	X	N
65	SS65H	0 0 to 1 0	ZINC	142	J	MG/KG	126	X	2300		12000		50	X	Y
65	SS65H	0 0 to 1 0	ZINC	74 8	J	MG/KG	126		2300		12000		50	X	N
65	SS65I	0 0 to 1 0	ZINC	53 7	J	MG/KG	126		2300		12000		50	X	N
66	SS66B	0 0 to 1 0	ZINC	59 4	J	MG/KG	126		2300		12000		50	X	N
66	SS66C	0 0 to 1 0	ZINC	76 6	J	MG/KG	126		2300		12000		50	X	N
66	SS66D	0 0 to 1 0	ZINC	65 2	J	MG/KG	126		2300		12000		50	X	N
66	SS66E	0 0 to 1 0	ZINC	80 6	J	MG/KG	126		2300		12000		50	X	N
66	SS66E	0 0 to 1 0	ZINC	82 3	J	MG/KG	126		2300		12000		50	X	N
BRAC	E(10 2)	0 0 to 1 0	ZINC	57	=	MG/KG	126		2300		12000		50	X	N
BRAC	F(10 2)	0 0 to 1 0	ZINC	51 9	=	MG/KG	126		2300		12000		50	X	N
BRAC	SS11A	0 0 to 1 0	ZINC	59 2	J	MG/KG	126		2300		12000		50	X	N
BRAC	SS6A	0 0 to 1 0	ZINC	48 8	J	MG/KG	126		2300		12000		50		N
BRAC	SS8A	0 0 to 1 0	ZINC	61 4	J	MG/KG	126		2300		12000		50	X	N
BRAC	SS8A	0 0 to 1 0	ZINC	61 5	J	MG/KG	126		2300		12000		50	X	N
BRAC	SS9A	0 0 to 1 0	ZINC	42	J	MG/KG	126		2300		12000		50		N

188 853

TABLE L-2
Summary of Detected Parameters in Subsurface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC		
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	GWP Value	GWP Exceedance Flag	Exceeded Criteria Flag
57	SB57C	3 0 to 5 0	ACETONE	0 008	J	MG/KG			16		N
57	SB57C	8 0 to 10 0	ACETONE	0 008	J	MG/KG			16		N
57	SB57D	3 0 to 5 0	ACETONE	0 008	J	MG/KG			16		N
57	SB57D	3 0 to 5 0	ACETONE	0 008	J	MG/KG			16		N
57	SB57D	8 0 to 10 0	ACETONE	0 009	J	MG/KG			16		N
57	SB57E	3 0 to 5 0	ACETONE	0 007	J	MG/KG			16		N
57	SB57E	8 0 to 10 0	ACETONE	0 006	J	MG/KG			16		N
57	SB57F	3 0 to 5 0	ACETONE	0 017	=	MG/KG			16		N
57	SB57F	8 0 to 10 0	ACETONE	0 018	=	MG/KG			16		N
57	SB57G	3 0 to 5 0	ACETONE	0 017	=	MG/KG			16		N
57	SB57G	8 0 to 10 0	ACETONE	0 018	=	MG/KG			16		N
57	SB57G	3 0 to 5 0	ACETONE	0 017	=	MG/KG			16		N
70	SB70F	3 0 to 5 0	ALUMINUM	13200	=	MG/KG	21829				N
70	SB70F	8 0 to 10 0	ALUMINUM	9180	=	MG/KG	21829				N
70	SB70H	3 0 to 5 0	ALUMINUM	9310	=	MG/KG	21829				N
70	SB70H	8 0 to 10 0	ALUMINUM	13200	=	MG/KG	21829				N
70	SB70I	3 0 to 5 0	ALUMINUM	12000	=	MG/KG	21829				N
70	SB70I	3 0 to 5 0	ALUMINUM	10500	=	MG/KG	21829				N
70	SB70I	8 0 to 10 0	ALUMINUM	18700	=	MG/KG	21829				N
70	SB70J	3 0 to 5 0	ALUMINUM	9440	=	MG/KG	21829				N
70	SB70J	8 0 to 10 0	ALUMINUM	9620	=	MG/KG	21829				N
57	SB57F	3 0 to 5 0	ANTIMONY	1 2	=	MG/KG			5		N
57	SB57F	8 0 to 10 0	ANTIMONY	1 1	=	MG/KG			5		N
57	SB57G	3 0 to 5 0	ANTIMONY	1	=	MG/KG			5		N
57	SB57G	8 0 to 10 0	ANTIMONY	1 3	=	MG/KG			5		N
57	SB57G	3 0 to 5 0	ANTIMONY	1 2	=	MG/KG			5		N
57	SB57C	3 0 to 5 0	ARSENIC	9 6	=	MG/KG	17		29		N
57	SB57C	8 0 to 10 0	ARSENIC	8 9	=	MG/KG	17		29		N
57	SB57D	3 0 to 5 0	ARSENIC	9 8	=	MG/KG	17		29		N
57	SB57D	3 0 to 5 0	ARSENIC	11	=	MG/KG	17		29		N
57	SB57D	8 0 to 10 0	ARSENIC	8	=	MG/KG	17		29		N
57	SB57E	3 0 to 5 0	ARSENIC	9 1	=	MG/KG	17		29		N
57	SB57E	8 0 to 10 0	ARSENIC	7 7	=	MG/KG	17		29		N
57	SB57F	3 0 to 5 0	ARSENIC	8 6	=	MG/KG	17		29		N
57	SB57F	8 0 to 10 0	ARSENIC	5 5	=	MG/KG	17		29		N
57	SB57G	3 0 to 5 0	ARSENIC	6 9	=	MG/KG	17		29		N
57	SB57G	8 0 to 10 0	ARSENIC	4 7	=	MG/KG	17		29		N
57	SB57G	3 0 to 5 0	ARSENIC	8 5	=	MG/KG	17		29		N
70	SB70F	3 0 to 5 0	ARSENIC	13 3	=	MG/KG	17		29		N
70	SB70F	8 0 to 10 0	ARSENIC	9 4	=	MG/KG	17		29		N
70	SB70H	3 0 to 5 0	ARSENIC	5 5	=	MG/KG	17		29		N
70	SB70H	8 0 to 10 0	ARSENIC	4 9	=	MG/KG	17		29		N
70	SB70I	3 0 to 5 0	ARSENIC	8	=	MG/KG	17		29		N
70	SB70I	3 0 to 5 0	ARSENIC	10	=	MG/KG	17		29		N
70	SB70I	8 0 to 10 0	ARSENIC	9 9	=	MG/KG	17		29		N
70	SB70J	3 0 to 5 0	ARSENIC	8 5	=	MG/KG	17		29		N
70	SB70J	8 0 to 10 0	ARSENIC	9	=	MG/KG	17		29		N
70	SB70F	3 0 to 5 0	BARIUM	132	=	MG/KG	300		1600		N
70	SB70F	8 0 to 10 0	BARIUM	121	=	MG/KG	300		1600		N
70	SB70H	3 0 to 5 0	BARIUM	76	=	MG/KG	300		1600		N
70	SB70H	8 0 to 10 0	BARIUM	87 2	=	MG/KG	300		1600		N
70	SB70I	3 0 to 5 0	BARIUM	161	=	MG/KG	300		1600		N
70	SB70I	3 0 to 5 0	BARIUM	181	=	MG/KG	300		1600		N
70	SB70I	8 0 to 10 0	BARIUM	154	=	MG/KG	300		1600		N
70	SB70J	3 0 to 5 0	BARIUM	119	=	MG/KG	300		1600		N
70	SB70J	8 0 to 10 0	BARIUM	121	=	MG/KG	300		1600		N
57	SB57C	3 0 to 5 0	bis(2 ETHYLHEXYL) PHTHALATE	0 047	J	MG/KG			3600		N
57	SB57C	8 0 to 10 0	bis(2 ETHYLHEXYL) PHTHALATE	0 35	J	MG/KG			3600		N
57	SB57D	3 0 to 5 0	bis(2 ETHYLHEXYL) PHTHALATE	0 072	J	MG/KG			3600		N
57	SB57D	8 0 to 10 0	bis(2-ETHYLHEXYL) PHTHALATE	0 33	J	MG/KG			3600		N
57	SB57E	3 0 to 5 0	bis(2-ETHYLHEXYL) PHTHALATE	0 08	J	MG/KG			3600		N
57	SB57E	8 0 to 10 0	bis(2-ETHYLHEXYL) PHTHALATE	0 098	J	MG/KG			3600		N
57	SB57F	3 0 to 5 0	bis(2-ETHYLHEXYL) PHTHALATE	1 2	=	MG/KG			3600		N
57	SB57F	8 0 to 10 0	bis(2-ETHYLHEXYL) PHTHALATE	0 076	J	MG/KG			3600		N
57	SB57G	3 0 to 5 0	bis(2-ETHYLHEXYL) PHTHALATE	0 065	J	MG/KG			3600		N
57	SB57G	8 0 to 10 0	bis(2 ETHYLHEXYL) PHTHALATE	0 16	J	MG/KG			3600		N
57	SB57G	3 0 to 5 0	bis(2-ETHYLHEXYL) PHTHALATE	0.22	J	MG/KG			3600		N
65	SB65A	8 0 to 10 0	bis(2 ETHYLHEXYL) PHTHALATE	0 11	J	MG/KG			3600		N
57	SB57C	3 0 to 5 0	BROMOMETHANE	0 002	J	MG/KG			0 2		N
70	SB70F	3 0 to 5 0	CALCIUM	1830	=	MG/KG	2432				N
70	SB70F	8 0 to 10 0	CALCIUM	2750	=	MG/KG	2432	X			NA
70	SB70H	3 0 to 5 0	CALCIUM	2320	=	MG/KG	2432				N
70	SB70H	8 0 to 10 0	CALCIUM	1730	=	MG/KG	2432				N
70	SB70I	3 0 to 5 0	CALCIUM	1370	=	MG/KG	2432				N
70	SB70I	3 0 to 5 0	CALCIUM	1170	=	MG/KG	2432				N

TABLE L-2
Summary of Detected Parameters in Subsurface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC		
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	GWP Value	GWP Exceedance Flag	Exceeded Criteria Flag
70	SB70I	8 0 to 10 0	CALCIUM	978	=	MG/KG	2432				N
70	SB70J	3 0 to 5 0	CALCIUM	1870	=	MG/KG	2432				N
70	SB70J	8 0 to 10 0	CALCIUM	2020	=	MG/KG	2432				N
57	SB57C	3 0 to 5 0	CHROMIUM TOTAL	12 1	=	MG/KG	26 4		38		N
57	SB57C	8 0 to 10 0	CHROMIUM TOTAL	13 2	=	MG/KG	26 4		38		N
57	SB57D	3 0 to 5 0	CHROMIUM TOTAL	10 2	=	MG/KG	26 4		38		N
57	SB57D	3 0 to 5 0	CHROMIUM TOTAL	11 9	=	MG/KG	26 4		38		N
57	SB57D	8 0 to 10 0	CHROMIUM TOTAL	10 6	=	MG/KG	26 4		38		N
57	SB57E	3 0 to 5 0	CHROMIUM TOTAL	12 8	=	MG/KG	26 4		38		N
57	SB57E	8 0 to 10 0	CHROMIUM TOTAL	10 8	=	MG/KG	26 4		38		N
57	SB57F	3 0 to 5 0	CHROMIUM TOTAL	11 8	=	MG/KG	26 4		38		N
57	SB57F	8 0 to 10 0	CHROMIUM TOTAL	11 3	=	MG/KG	26 4		38		N
57	SB57G	3 0 to 5 0	CHROMIUM, TOTAL	13	=	MG/KG	26 4		38		N
57	SB57G	8 0 to 10 0	CHROMIUM TOTAL	14	=	MG/KG	26 4		38		N
57	SB57G	3 0 to 5 0	CHROMIUM TOTAL	14	=	MG/KG	26 4		38		N
70	SB70F	3 0 to 5 0	CHROMIUM TOTAL	14 9	=	MG/KG	26 4		38		N
70	SB70F	8 0 to 10 0	CHROMIUM TOTAL	12 9	=	MG/KG	26 4		38		N
70	SB70H	3 0 to 5 0	CHROMIUM TOTAL	12	=	MG/KG	26 4		38		N
70	SB70H	8 0 to 10 0	CHROMIUM TOTAL	19 3	=	MG/KG	26 4		38		N
70	SB70I	3 0 to 5 0	CHROMIUM TOTAL	13 9	=	MG/KG	26 4		38		N
70	SB70I	3 0 to 5 0	CHROMIUM TOTAL	12 9	=	MG/KG	26 4		38		N
70	SB70I	8 0 to 10 0	CHROMIUM TOTAL	17 5	=	MG/KG	26 4		38		N
70	SB70J	3 0 to 5 0	CHROMIUM TOTAL	12	=	MG/KG	26 4		38		N
70	SB70J	8 0 to 10 0	CHROMIUM TOTAL	12 5	=	MG/KG	26 4		38		N
65	SB65A	8 0 to 10 0	CHRYSENE	0 05	J	MG/KG			160		N
70	SB70F	8 0 to 10 0	CHRYSENE	0 047	J	MG/KG			160		N
70	SB70F	3 0 to 5 0	COBALT	9 9	=	MG/KG	20 4				N
70	SB70F	8 0 to 10 0	COBALT	7 6	=	MG/KG	20 4				N
70	SB70H	3 0 to 5 0	COBALT	6 8	=	MG/KG	20 4				N
70	SB70H	8 0 to 10 0	COBALT	6 3	=	MG/KG	20 4				N
70	SB70I	3 0 to 5 0	COBALT	7 4	=	MG/KG	20 4				N
70	SB70I	3 0 to 5 0	COBALT	8 2	=	MG/KG	20 4				N
70	SB70I	8 0 to 10 0	COBALT	9 5	=	MG/KG	20 4				N
70	SB70J	3 0 to 5 0	COBALT	7 1	=	MG/KG	20 4				N
70	SB70J	8 0 to 10 0	COBALT	7 6	=	MG/KG	20 4				N
57	SB57C	3 0 to 5 0	COPPER	16 2	=	MG/KG	32 7				N
57	SB57C	8 0 to 10 0	COPPER	18 6	=	MG/KG	32 7				N
57	SB57D	3 0 to 5 0	COPPER	16 6	=	MG/KG	32 7				N
57	SB57D	3 0 to 5 0	COPPER	18 5	=	MG/KG	32 7				N
57	SB57D	8 0 to 10 0	COPPER	17 9	=	MG/KG	32 7				N
57	SB57E	3 0 to 5 0	COPPER	16 5	=	MG/KG	32 7				N
57	SB57E	8 0 to 10 0	COPPER	17 9	=	MG/KG	32 7				N
57	SB57F	3 0 to 5 0	COPPER	16 1	=	MG/KG	32 7				N
57	SB57F	8 0 to 10 0	COPPER	13 6	=	MG/KG	32 7				N
57	SB57G	3 0 to 5 0	COPPER	15 8	=	MG/KG	32 7				N
57	SB57G	8 0 to 10 0	COPPER	12 2	=	MG/KG	32 7				N
57	SB57G	3 0 to 5 0	COPPER	17 1	=	MG/KG	32 7				N
70	SB70F	3 0 to 5 0	COPPER	22	=	MG/KG	32 7				N
70	SB70F	8 0 to 10 0	COPPER	16 6	=	MG/KG	32 7				N
70	SB70H	3 0 to 5 0	COPPER	14	=	MG/KG	32 7				N
70	SB70H	8 0 to 10 0	COPPER	11 3	=	MG/KG	32 7				N
70	SB70I	3 0 to 5 0	COPPER	16 7	=	MG/KG	32 7				N
70	SB70I	3 0 to 5 0	COPPER	16 7	=	MG/KG	32 7				N
70	SB70I	8 0 to 10 0	COPPER	18 4	=	MG/KG	32 7				N
70	SB70J	3 0 to 5 0	COPPER	16 1	=	MG/KG	32 7				N
70	SB70J	8 0 to 10 0	COPPER	16 9	=	MG/KG	32 7				N
57	SB57E	8 0 to 10 0	DDE	0 0018	J	MG/KG	0 0015	X	54		N
57	SB57F	8 0 to 10 0	DDE	0 0016	J	MG/KG	0 0015	X	54		N
57	SB57G	3 0 to 5 0	DDE	0 0056	=	MG/KG	0 0015	X	54		N
57	SB57G	3 0 to 5 0	DDE	0 011	=	MG/KG	0 0015	X	54		N
70	SB70F	3 0 to 5 0	DDE	0 021	=	MG/KG	0 0015	X	54		N
70	SB70F	8 0 to 10 0	DDE	0 032	=	MG/KG	0 0015	X	54		N
70	SB70I	3 0 to 5 0	DDE	0 0035	J	MG/KG	0 0015	X	54		N
70	SB70I	8 0 to 10 0	DDE	0 0021	J	MG/KG	0 0015	X	54		N
57	SB57D	3 0 to 5 0	DDT	0 0021	J	MG/KG	0 0072		11		N
57	SB57E	8 0 to 10 0	DDT	0 0016	J	MG/KG	0 0072		11		N
57	SB57F	8 0 to 10 0	DDT	0 0026	J	MG/KG	0 0072		11		N
57	SB57G	3 0 to 5 0	DDT	0 015	=	MG/KG	0 0072	X	11		N
57	SB57G	8 0 to 10 0	DDT	0 0022	J	MG/KG	0 0072		11		N
57	SB57G	3 0 to 5 0	DDT	0 031	=	MG/KG	0 0072	X	11		N
70	SB70F	3 0 to 5 0	DDT	0 081	=	MG/KG	0 0072	X	11		N
70	SB70F	8 0 to 10 0	DDT	0 058	=	MG/KG	0 0072	X	11		N
70	SB70I	3 0 to 5 0	DDT	0 0081	=	MG/KG	0 0072	X	11		N
70	SB70I	8 0 to 10 0	DDT	0 0034	J	MG/KG	0 0072		11		N
65	SB65C	4 0 to 6 0	DI-n-BUTYL PHTHALATE	0 052	J	MG/KG			2300		N

TABLE L-2
Summary of Detected Parameters in Subsurface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC		
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	GWP Value	GWP Exceedance Flag	Exceeded Criteria Flag
70	SB70H	3 0 to 5 0	DI-n BUTYL PHTHALATE	0 058	J	MG/KG			2300		N
65	SB65A	8 0 to 10 0	FLUORANTHENE	0 066	J	MG/KG	0 045	X	4300		N
70	SB70F	8 0 to 10 0	FLUORANTHENE	0 072	J	MG/KG	0 045	X	4300		N
57	SB57D	3 0 to 5 0	GAMMA BHC (LINDANE)	0 0022	=	MG/KG			0 009		N
57	SB57D	3 0 to 5 0	GAMMA BHC (LINDANE)	0 0014	J	MG/KG			0 009		N
57	SB57D	8 0 to 10 0	GAMMA BHC (LINDANE)	0 0027	=	MG/KG			0 009		N
70	SB70F	3 0 to 5 0	IRON	23400	=	MG/KG	38480				N
70	SB70F	8 0 to 10 0	IRON	19600	=	MG/KG	38480				N
70	SB70H	3 0 to 5 0	IRON	16400	=	MG/KG	38480				N
70	SB70H	8 0 to 10 0	IRON	15900	=	MG/KG	38480				N
70	SB70I	3 0 to 5 0	IRON	18300	=	MG/KG	38480				N
70	SB70I	3 0 to 5 0	IRON	20300	=	MG/KG	38480				N
70	SB70I	8 0 to 10 0	IRON	21200	=	MG/KG	38480				N
70	SB70J	3 0 to 5 0	IRON	18500	=	MG/KG	38480				N
70	SB70J	8 0 to 10 0	IRON	19500	=	MG/KG	38480				N
57	SB57C	3 0 to 5 0	LEAD	10 8	=	MG/KG	23 9				N
57	SB57C	8 0 to 10 0	LEAD	10	=	MG/KG	23 9				N
57	SB57D	3 0 to 5 0	LEAD	11	=	MG/KG	23 9				N
57	SB57D	3 0 to 5 0	LEAD	13 1	=	MG/KG	23 9				N
57	SB57D	8 0 to 10 0	LEAD	8 8	=	MG/KG	23 9				N
57	SB57E	3 0 to 5 0	LEAD	10 5	=	MG/KG	23 9				N
57	SB57E	8 0 to 10 0	LEAD	8 4	=	MG/KG	23 9				N
57	SB57F	3 0 to 5 0	LEAD	9 8	=	MG/KG	23 9				N
57	SB57F	8 0 to 10 0	LEAD	7 5	=	MG/KG	23 9				N
57	SB57G	3 0 to 5 0	LEAD	8 5	=	MG/KG	23 9				N
57	SB57G	8 0 to 10 0	LEAD	8 3	=	MG/KG	23 9				N
57	SB57G	3 0 to 5 0	LEAD	9 4	=	MG/KG	23 9				N
70	SB70F	3 0 to 5 0	LEAD	13 2	=	MG/KG	23 9				N
70	SB70F	8 0 to 10 0	LEAD	10 1	=	MG/KG	23 9				N
70	SB70H	3 0 to 5 0	LEAD	7 3	=	MG/KG	23 9				N
70	SB70H	8 0 to 10 0	LEAD	8 2	=	MG/KG	23 9				N
70	SB70I	3 0 to 5 0	LEAD	11	=	MG/KG	23 9				N
70	SB70I	3 0 to 5 0	LEAD	10 6	=	MG/KG	23 9				N
70	SB70I	8 0 to 10 0	LEAD	14 4	=	MG/KG	23 9				N
70	SB70J	3 0 to 5 0	LEAD	9 1	=	MG/KG	23 9				N
70	SB70J	8 0 to 10 0	LEAD	9 5	=	MG/KG	23 9				N
70	SB70F	3 0 to 5 0	MAGNESIUM	2920	=	MG/KG	4900				N
70	SB70F	8 0 to 10 0	MAGNESIUM	2580	=	MG/KG	4900				N
70	SB70H	3 0 to 5 0	MAGNESIUM	2310	=	MG/KG	4900				N
70	SB70H	8 0 to 10 0	MAGNESIUM	2210	=	MG/KG	4900				N
70	SB70I	3 0 to 5 0	MAGNESIUM	2530	=	MG/KG	4900				N
70	SB70I	3 0 to 5 0	MAGNESIUM	2480	=	MG/KG	4900				N
70	SB70I	8 0 to 10 0	MAGNESIUM	2440	=	MG/KG	4900				N
70	SB70J	3 0 to 5 0	MAGNESIUM	2420	=	MG/KG	4900				N
70	SB70J	8 0 to 10 0	MAGNESIUM	2520	=	MG/KG	4900				N
70	SB70F	3 0 to 5 0	MANGANESE	1110	=	MG/KG	1540				N
70	SB70F	8 0 to 10 0	MANGANESE	541	=	MG/KG	1540				N
70	SB70H	3 0 to 5 0	MANGANESE	523	=	MG/KG	1540				N
70	SB70H	8 0 to 10 0	MANGANESE	405	=	MG/KG	1540				N
70	SB70I	3 0 to 5 0	MANGANESE	533	=	MG/KG	1540				N
70	SB70I	3 0 to 5 0	MANGANESE	684	=	MG/KG	1540				N
70	SB70I	8 0 to 10 0	MANGANESE	560	=	MG/KG	1540				N
70	SB70J	3 0 to 5 0	MANGANESE	487	=	MG/KG	1540				N
70	SB70J	8 0 to 10 0	MANGANESE	540	=	MG/KG	1540				N
57	SB57C	3 0 to 5 0	NICKEL	18	=	MG/KG	36 6		130		N
57	SB57C	8 0 to 10 0	NICKEL	19 4	=	MG/KG	36 6		130		N
57	SB57D	3 0 to 5 0	NICKEL	18	=	MG/KG	36 6		130		N
57	SB57D	3 0 to 5 0	NICKEL	19 8	=	MG/KG	36 6		130		N
57	SB57D	8 0 to 10 0	NICKEL	16 1	=	MG/KG	36 6		130		N
57	SB57E	3 0 to 5 0	NICKEL	18 5	=	MG/KG	36 6		130		N
57	SB57E	8 0 to 10 0	NICKEL	16 2	=	MG/KG	36 6		130		N
57	SB57F	3 0 to 5 0	NICKEL	17 6	=	MG/KG	36 6		130		N
57	SB57F	8 0 to 10 0	NICKEL	16 2	=	MG/KG	36 6		130		N
57	SB57G	3 0 to 5 0	NICKEL	18	=	MG/KG	36 6		130		N
57	SB57G	8 0 to 10 0	NICKEL	14 7	=	MG/KG	36 6		130		N
57	SB57G	3 0 to 5 0	NICKEL	18 6	=	MG/KG	36 6		130		N
70	SB70F	3 0 to 5 0	NICKEL	20 4	=	MG/KG	36 6		130		N
70	SB70F	8 0 to 10 0	NICKEL	18 4	=	MG/KG	36 6		130		N
70	SB70H	3 0 to 5 0	NICKEL	16 1	=	MG/KG	36 6		130		N
70	SB70H	8 0 to 10 0	NICKEL	13 9	=	MG/KG	36 6		130		N
70	SB70I	3 0 to 5 0	NICKEL	17 2	=	MG/KG	36 6		130		N
70	SB70I	3 0 to 5 0	NICKEL	17 9	=	MG/KG	36 6		130		N
70	SB70I	8 0 to 10 0	NICKEL	18 1	=	MG/KG	36 6		130		N
70	SB70J	3 0 to 5 0	NICKEL	16 9	=	MG/KG	36 6		130		N
70	SB70J	8 0 to 10 0	NICKEL	17 9	=	MG/KG	36 6		130		N

TABLE L-2
Summary of Detected Parameters in Subsurface Soil at FU1 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC		
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	GWP Value	GWP Exceedance Flag	Exceeded Criteria Flag
65	SB65A	8 0 to 10 0	PHENANTHRENE	0 089	J	MG/KG			250		N
70	SB70F	3 0 to 5 0	POTASSIUM	2780	=	MG/KG	1800	X			NA
70	SB70F	8 0 to 10 0	POTASSIUM	2410	=	MG/KG	1800	X			NA
70	SB70H	3 0 to 5 0	POTASSIUM	2180	=	MG/KG	1800	X			NA
70	SB70H	8 0 to 10 0	POTASSIUM	1880	=	MG/KG	1800	X			NA
70	SB70I	3 0 to 5 0	POTASSIUM	2460	=	MG/KG	1800	X			NA
70	SB70I	3 0 to 5 0	POTASSIUM	2280	=	MG/KG	1800	X			NA
70	SB70I	8 0 to 10 0	POTASSIUM	2750	=	MG/KG	1800	X			NA
70	SB70J	3 0 to 5 0	POTASSIUM	2340	=	MG/KG	1800	X			NA
70	SB70J	8 0 to 10 0	POTASSIUM	2420	=	MG/KG	1800	X			NA
65	SB65A	8 0 to 10 0	PYRENE	0 06	J	MG/KG	0 042	X	880		N
70	SB70F	8 0 to 10 0	PYRENE	0 058	J	MG/KG	0 042	X	880		N
70	SB70F	3 0 to 5 0	SILVER	0 17	J	MG/KG	1		34		N
70	SB70F	8 0 to 10 0	SILVER	0 16	J	MG/KG	1		34		N
70	SB70I	3 0 to 5 0	SILVER	0 12	J	MG/KG	1		34		N
70	SB70I	3 0 to 5 0	SILVER	0 15	J	MG/KG	1		34		N
70	SB70I	8 0 to 10 0	SILVER	0 1	J	MG/KG	1		34		N
70	SB70J	8 0 to 10 0	SILVER	0 11	J	MG/KG	1		34		N
57	SB57G	3 0 to 5 0	TETRACHLOROETHYLENE(PCE)	0 002	J	MG/KG			0 06		N
57	SB57G	8 0 to 10 0	TETRACHLOROETHYLENE(PCE)	0 007	J	MG/KG			0 06		N
57	SB57G	3 0 to 5 0	TETRACHLOROETHYLENE(PCE)	0 003	J	MG/KG			0 06		N
70	SB70F	3 0 to 5 0	VANADIUM	31 5	=	MG/KG	51 3		6000		N
70	SB70F	8 0 to 10 0	VANADIUM	24 9	=	MG/KG	51 3		6000		N
70	SB70H	3 0 to 5 0	VANADIUM	26 2	=	MG/KG	51 3		6000		N
70	SB70H	8 0 to 10 0	VANADIUM	31 8	=	MG/KG	51 3		6000		N
70	SB70I	3 0 to 5 0	VANADIUM	27 1	=	MG/KG	51 3		6000		N
70	SB70I	3 0 to 5 0	VANADIUM	24 6	=	MG/KG	51 3		6000		N
70	SB70I	8 0 to 10 0	VANADIUM	36 2	=	MG/KG	51 3		6000		N
70	SB70J	3 0 to 5 0	VANADIUM	24 9	=	MG/KG	51 3		6000		N
70	SB70J	8 0 to 10 0	VANADIUM	25 7	=	MG/KG	51 3		6000		N
57	SB57C	3 0 to 5 0	ZINC	57 3	=	MG/KG	114		12000		N
57	SB57C	8 0 to 10 0	ZINC	46 4	=	MG/KG	114		12000		N
57	SB57D	3 0 to 5 0	ZINC	55 2	=	MG/KG	114		12000		N
57	SB57D	3 0 to 5 0	ZINC	59 5	=	MG/KG	114		12000		N
57	SB57D	8 0 to 10 0	ZINC	46 9	=	MG/KG	114		12000		N
57	SB57E	3 0 to 5 0	ZINC	55 5	=	MG/KG	114		12000		N
57	SB57E	8 0 to 10 0	ZINC	46	=	MG/KG	114		12000		N
57	SB57F	3 0 to 5 0	ZINC	58 9	=	MG/KG	114		12000		N
57	SB57F	8 0 to 10 0	ZINC	36 8	=	MG/KG	114		12000		N
57	SB57G	3 0 to 5 0	ZINC	44 9	=	MG/KG	114		12000		N
57	SB57G	8 0 to 10 0	ZINC	37 5	=	MG/KG	114		12000		N
57	SB57G	3 0 to 5 0	ZINC	53 6	=	MG/KG	114		12000		N
65	SB65A	4 0 to 6 0	ZINC	155	=	MG/KG	114	X	12000		N
65	SB65A	8 0 to 10 0	ZINC	121	=	MG/KG	114	X	12000		N
65	SB65B	4 0 to 6 0	ZINC	127	=	MG/KG	114	X	12000		N
65	SB65B	9 5 to 11 0	ZINC	95 7	=	MG/KG	114		12000		N
65	SB65C	4 0 to 6 0	ZINC	112	=	MG/KG	114		12000		N
65	SB65C	9 0 to 11 0	ZINC	78 3	=	MG/KG	114		12000		N
70	SB70F	3 0 to 5 0	ZINC	72 1	=	MG/KG	114		12000		N
70	SB70F	8 0 to 10 0	ZINC	53 9	=	MG/KG	114		12000		N
70	SB70H	3 0 to 5 0	ZINC	35 8	=	MG/KG	114		12000		N
70	SB70H	8 0 to 10 0	ZINC	37 7	=	MG/KG	114		12000		N
70	SB70I	3 0 to 5 0	ZINC	56 1	=	MG/KG	114		12000		N
70	SB70I	3 0 to 5 0	ZINC	54 6	=	MG/KG	114		12000		N
70	SB70I	8 0 to 10 0	ZINC	61	=	MG/KG	114		12000		N
70	SB70J	3 0 to 5 0	ZINC	51 2	=	MG/KG	114		12000		N
70	SB70J	8 0 to 10 0	ZINC	53 2	=	MG/KG	114		12000		N

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TAB

Appendix M

TAB

Appendix M

Detected Parameters in FU2

APPENDIX M

Detected Parameters in FU2

The following are included in this appendix:

- **Table M-1**–Detected Parameters Summary in Surface Soil
- **Table M-2**–Detected Parameters Summary in Subsurface Soil
- **Table M-3**–Detected Parameters Summary in Surface Water
- **Table M-4**–Detected Parameters Summary in Sediment/Soil

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TABLE M-1

Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
92	TEC92B	0 0 to 1 0	2-HEXANONE	0 002	J	MG/KG			310		1 4				N
51	SB51B	0 0 to 1 0	ACENAPHTHENE	0 066	=	MG/KG			470		570		20		N
59	SS59I	0 0 to 1 0	ACENAPHTHENE	0 059	=	MG/KG			470		570		20		N
BRAC	M(3 5)	0 0 to 0 0	ACENAPHTHENE	0 13	J	MG/KG			470		570		20		N
51	SB51A	0 0 to 1 0	ACETONE	0 006	J	MG/KG			780		16				N
51	SB51C	0 0 to 1 0	ACETONE	0 007	J	MG/KG			780		16				N
51	SS51B	0 0 to 1 0	ACETONE	0 004	J	MG/KG			780		16				N
59	SS59J	0 0 to 1 0	ACETONE	0 095	=	MG/KG			780		16				N
59	SB59B	0 0 to 1 0	ALPHA-CHLORDANE	0 022	J	MG/KG	0 029		1 8				0 1		N
59	SS59E	0 0 to 1 0	ALPHA-CHLORDANE	0 08	J	MG/KG	0 029	X	1 8				0 1		N
59	SS59F	0 0 to 1 0	ALPHA-CHLORDANE	0 015	=	MG/KG	0 029		1 8				0 1		N
59	SS59F	0 0 to 1 0	ALPHA-CHLORDANE	0 0071	=	MG/KG	0 029		1 8				0 1		N
BRAC	A(3 5)	0 0 to 0 5	ALPHA-CHLORDANE	0 041	J	MG/KG	0 029	X	1 8				0 1		N
BRAC	O(3 5)	0 0 to 1 0	ALPHA-CHLORDANE	1 4	=	MG/KG	0 029	X	1 8				0 1	X	Y
51	SS51C	0 0 to 1 0	ALUMINUM	8940	=	MG/KG	23810		7800	X			50	X	N
52	SS52A	0 0 to 1 0	ALUMINUM	10900	=	MG/KG	23810		7800	X			50	X	N
59	SS59H	0 0 to 1 0	ALUMINUM	15600	=	MG/KG	23810		7800	X			50	X	N
69	SS69A	0 0 to 1 0	ALUMINUM	11500	=	MG/KG	23810		7800	X			50	X	N
92	TEC92A	0 0 to 1 0	ALUMINUM	8910	=	MG/KG	23810		7800	X			50	X	N
92	TEC92A	0 0 to 1 0	ALUMINUM	11700	=	MG/KG	23810		7800	X			50	X	N
92	TEC92B	0 0 to 1 0	ALUMINUM	6550	=	MG/KG	23810		7800				50	X	N
BRAC	A(3 10)	0 0 to 0 5	ALUMINUM	8550	J	MG/KG	23810		7800	X			50	X	N
BRAC	G(3 5)	0 0 to 0 0	ALUMINUM	11900	=	MG/KG	23810		7800	X			50	X	N
BRAC	H(3 5)	0 0 to 0 0	ALUMINUM	8310	=	MG/KG	23810		7800	X			50	X	N
BRAC	I(3 5)	0 0 to 0 0	ALUMINUM	12000	=	MG/KG	23810		7800	X			50	X	N
BRAC	J(3 5)	0 0 to 0 0	ALUMINUM	15900	=	MG/KG	23810		7800	X			50	X	N
BRAC	K(3 5)	0 0 to 0 0	ALUMINUM	13500	=	MG/KG	23810		7800	X			50	X	N
BRAC	K(3 5B)	0 0 to 0 0	ALUMINUM	12400	=	MG/KG	23810		7800	X			50	X	N
BRAC	L(3 5)	0 0 to 0 0	ALUMINUM	13800	=	MG/KG	23810		7800	X			50	X	N
BRAC	M(3 5)	0 0 to 0 0	ALUMINUM	9060	=	MG/KG	23810		7800	X			50	X	N
BRAC	N(3 5)	0 0 to 0 0	ALUMINUM	10800	=	MG/KG	23810		7800	X			50	X	N
51	SB51B	0 0 to 1 0	ANTHRACENE	0 066	=	MG/KG	0 096		2300		12000		0 1		N
BRAC	M(3 5)	0 0 to 0 0	ANTHRACENE	0 27	J	MG/KG	0 096	X	2300		12000		0 1	X	Y
51	SS51D	0 0 to 1 0	ANTIMONY	0 42	J	MG/KG	7		3 1		5		3 5		N
BRAC	H(3 5)	0 0 to 0 0	ANTIMONY	0 48	J	MG/KG	7		3 1		5		3 5		N
BRAC	I(3 5)	0 0 to 0 0	ANTIMONY	0 74	J	MG/KG	7		3 1		5		3 5		N
BRAC	J(3 5)	0 0 to 0 0	ANTIMONY	0 49	J	MG/KG	7		3 1		5		3 5		N
BRAC	K(3 5B)	0 0 to 0 0	ANTIMONY	0 69	J	MG/KG	7		3 1		5		3 5		N
BRAC	L(3 5)	0 0 to 0 0	ANTIMONY	0 57	J	MG/KG	7		3 1		5		3 5		N
BRAC	M(3 5)	0 0 to 0 0	ANTIMONY	0 87	J	MG/KG	7		3 1		5		3 5		N
BRAC	N(3 5)	0 0 to 0 0	ANTIMONY	1 7	J	MG/KG	7		3 1		5		3 5		N
51	SB51A	0 0 to 1 0	ARSENIC	20 1	=	MG/KG	20	X	0 43	X	29		10	X	Y
51	SB51B	0 0 to 1 0	ARSENIC	14 5	=	MG/KG	20		0 43	X	29		10	X	N
51	SB51C	0 0 to 1 0	ARSENIC	17 1	=	MG/KG	20		0 43	X	29		10	X	N
51	SS51A	0 0 to 1 0	ARSENIC	1 7	=	MG/KG	20		0 43	X	29		10		N
51	SS51B	0 0 to 1 0	ARSENIC	17 4	=	MG/KG	20		0 43	X	29		10	X	N
51	SS51C	0 0 to 1 0	ARSENIC	15 7	=	MG/KG	20		0 43	X	29		10	X	N
51	SS51D	0 0 to 1 0	ARSENIC	39	=	MG/KG	20	X	0 43	X	29	X	10	X	Y
51	SS51D	0 0 to 1 0	ARSENIC	21 3	=	MG/KG	20	X	0 43	X	29		10	X	Y
52	SB52A	0 0 to 1 0	ARSENIC	23 2	=	MG/KG	20	X	0 43	X	29		10	X	Y
52	SB52A	0 0 to 1 0	ARSENIC	9 4	=	MG/KG	20		0 43	X	29		10		N
52	SB52B	0 0 to 1 0	ARSENIC	11 9	=	MG/KG	20		0 43	X	29		10	X	N
52	SB52B	0 0 to 1 0	ARSENIC	8 6	=	MG/KG	20		0 43	X	29		10		N
52	SS52A	0 0 to 1 0	ARSENIC	12	=	MG/KG	20		0 43	X	29		10	X	N
52	SS52B	0 0 to 1 0	ARSENIC	45 1	=	MG/KG	20	X	0 43	X	29	X	10	X	Y
52	SS52C	0 0 to 1 0	ARSENIC	19 7	=	MG/KG	20		0 43	X	29		10	X	N
52	SS52D	0 0 to 1 0	ARSENIC	31 2	=	MG/KG	20	X	0 43	X	29	X	10	X	Y
52	SS52E	0 0 to 1 0	ARSENIC	14 8	=	MG/KG	20		0 43	X	29		10	X	N
59	SS59H	0 0 to 1 0	ARSENIC	11 6	=	MG/KG	20		0 43	X	29		10	X	N

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TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
69	SS69A	0.0 to 1.0	ARSENIC	13.5	J	MG/KG	20		0.43	X	29		10	X	N
92	TEC92A	0.0 to 1.0	ARSENIC	20	=	MG/KG	20		0.43	X	29		10	X	N
92	TEC92A	0.0 to 1.0	ARSENIC	25.8	=	MG/KG	20	X	0.43	X	29		10	X	Y
92	TEC92B	0.0 to 1.0	ARSENIC	14.6	=	MG/KG	20		0.43	X	29		10	X	N
BRAC	A(3 10)	0.0 to 0.5	ARSENIC	50.5	J	MG/KG	20	X	0.43	X	29	X	10	X	Y
BRAC	G(3 5)	0.0 to 0.0	ARSENIC	10.5	=	MG/KG	20		0.43	X	29		10	X	N
BRAC	H(3 5)	0.0 to 0.0	ARSENIC	16	=	MG/KG	20		0.43	X	29		10	X	N
BRAC	I(3 5)	0.0 to 0.0	ARSENIC	21.8	=	MG/KG	20	X	0.43	X	29		10	X	Y
BRAC	J(3 5)	0.0 to 0.0	ARSENIC	13	=	MG/KG	20		0.43	X	29		10	X	N
BRAC	K(3 5)	0.0 to 0.0	ARSENIC	12.4	=	MG/KG	20		0.43	X	29		10	X	N
BRAC	K(3 5B)	0.0 to 0.0	ARSENIC	14.2	=	MG/KG	20		0.43	X	29		10	X	N
BRAC	L(3 5)	0.0 to 0.0	ARSENIC	12.3	=	MG/KG	20		0.43	X	29		10	X	N
BRAC	M(3 5)	0.0 to 0.0	ARSENIC	9.6	=	MG/KG	20		0.43	X	29		10		N
BRAC	N(3 5)	0.0 to 0.0	ARSENIC	19.4	=	MG/KG	20		0.43	X	29		10	X	N
51	SS51C	0.0 to 1.0	BARIUM	106	=	MG/KG	234		550		1600		165		N
52	SS52A	0.0 to 1.0	BARIUM	152	=	MG/KG	234		550		1600		165		N
59	SS59H	0.0 to 1.0	BARIUM	103	=	MG/KG	234		550		1600		165		N
69	SS69A	0.0 to 1.0	BARIUM	114	=	MG/KG	234		550		1600		165		N
92	TEC92A	0.0 to 1.0	BARIUM	98	=	MG/KG	234		550		1600		165		N
92	TEC92A	0.0 to 1.0	BARIUM	111	=	MG/KG	234		550		1600		165		N
92	TEC92B	0.0 to 1.0	BARIUM	92.7	=	MG/KG	234		550		1600		165		N
BRAC	A(3 10)	0.0 to 0.5	BARIUM	101	J	MG/KG	234		550		1600		165		N
BRAC	G(3 5)	0.0 to 0.0	BARIUM	160	=	MG/KG	234		550		1600		165		N
BRAC	H(3 5)	0.0 to 0.0	BARIUM	112	=	MG/KG	234		550		1600		165		N
BRAC	I(3 5)	0.0 to 0.0	BARIUM	163	=	MG/KG	234		550		1600		165		N
BRAC	J(3 5)	0.0 to 0.0	BARIUM	183	=	MG/KG	234		550		1600		165	X	N
BRAC	K(3 5)	0.0 to 0.0	BARIUM	200	=	MG/KG	234		550		1600		165	X	N
BRAC	K(3 5B)	0.0 to 0.0	BARIUM	126	=	MG/KG	234		550		1600		165		N
BRAC	L(3 5)	0.0 to 0.0	BARIUM	112	=	MG/KG	234		550		1600		165		N
BRAC	M(3 5)	0.0 to 0.0	BARIUM	107	=	MG/KG	234		550		1600		165		N
BRAC	N(3 5)	0.0 to 0.0	BARIUM	137	=	MG/KG	234		550		1600		165		N
92	TEC92B	0.0 to 1.0	BENZENE	0.002	J	MG/KG			22		0.03		0.05		N
51	SB51A	0.0 to 1.0	BENZO(a)ANTHRACENE	0.25	=	MG/KG	0.71		0.87		2		0.1	X	N
51	SB51B	0.0 to 1.0	BENZO(a)ANTHRACENE	0.059	J	MG/KG	0.71		0.87		2		0.1		N
51	SS51C	0.0 to 1.0	BENZO(a)ANTHRACENE	0.054	J	MG/KG	0.71		0.87		2		0.1		N
51	SS51D	0.0 to 1.0	BENZO(a)ANTHRACENE	0.17	=	MG/KG	0.71		0.87		2		0.1	X	N
51	SS51D	0.0 to 1.0	BENZO(a)ANTHRACENE	0.17	=	MG/KG	0.71		0.87		2		0.1	X	N
52	SS52B	0.0 to 1.0	BENZO(a)ANTHRACENE	0.24	=	MG/KG	0.71		0.87		2		0.1	X	N
52	SS52C	0.0 to 1.0	BENZO(a)ANTHRACENE	0.09	=	MG/KG	0.71		0.87		2		0.1		N
52	SS52D	0.0 to 1.0	BENZO(a)ANTHRACENE	0.069	=	MG/KG	0.71		0.87		2		0.1		N
59	SB59B	0.0 to 1.0	BENZO(a)ANTHRACENE	0.14	=	MG/KG	0.71		0.87		2		0.1	X	N
59	SS59E	0.0 to 1.0	BENZO(a)ANTHRACENE	0.21	=	MG/KG	0.71		0.87		2		0.1	X	N
69	SB69B	0.0 to 1.0	BENZO(a)ANTHRACENE	0.14	=	MG/KG	0.71		0.87		2		0.1	X	N
69	SS69B	0.0 to 1.0	BENZO(a)ANTHRACENE	0.1	=	MG/KG	0.71		0.87		2		0.1		N
69	SS69D	0.0 to 1.0	BENZO(a)ANTHRACENE	0.081	=	MG/KG	0.71		0.87		2		0.1		N
BRAC	H(3 5)	0.0 to 0.0	BENZO(a)ANTHRACENE	0.076	J	MG/KG	0.71		0.87		2		0.1		N
BRAC	M(3 5)	0.0 to 0.0	BENZO(a)ANTHRACENE	0.57	=	MG/KG	0.71		0.87		2		0.1	X	N
51	SB51A	0.0 to 1.0	BENZO(a)PYRENE	0.24	=	MG/KG	0.96		0.087	X	8		0.1	X	N
51	SS51C	0.0 to 1.0	BENZO(a)PYRENE	0.057	J	MG/KG	0.96		0.087		8		0.1		N
51	SS51D	0.0 to 1.0	BENZO(a)PYRENE	0.17	=	MG/KG	0.96		0.087	X	8		0.1	X	N
51	SS51D	0.0 to 1.0	BENZO(a)PYRENE	0.16	=	MG/KG	0.96		0.087	X	8		0.1	X	N
52	SS52B	0.0 to 1.0	BENZO(a)PYRENE	0.26	=	MG/KG	0.96		0.087	X	8		0.1	X	N
52	SS52C	0.0 to 1.0	BENZO(a)PYRENE	0.058	J	MG/KG	0.96		0.087		8		0.1		N
59	SB59B	0.0 to 1.0	BENZO(a)PYRENE	0.14	=	MG/KG	0.96		0.087	X	8		0.1	X	N
59	SS59E	0.0 to 1.0	BENZO(a)PYRENE	0.2	=	MG/KG	0.96		0.087	X	8		0.1	X	N
69	SB69B	0.0 to 1.0	BENZO(a)PYRENE	0.12	=	MG/KG	0.96		0.087	X	8		0.1	X	N
69	SS69B	0.0 to 1.0	BENZO(a)PYRENE	0.086	=	MG/KG	0.96		0.087		8		0.1		N
69	SS69D	0.0 to 1.0	BENZO(a)PYRENE	0.054	J	MG/KG	0.96		0.087		8		0.1		N
BRAC	H(3 5)	0.0 to 0.0	BENZO(a)PYRENE	0.082	J	MG/KG	0.96		0.087		8		0.1		N

TABLE M-1

Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	M(3.5)	0.0 to 0.0	BENZO(a)PYRENE	0.44	=	MG/KG	0.96		0.087	X	8		0.1	X	N
51	SB51A	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.31	=	MG/KG	0.9		0.87		5		0.1	X	N
51	SS51C	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.052	J	MG/KG	0.9		0.87		5		0.1		N
51	SS51D	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.26	=	MG/KG	0.9		0.87		5		0.1	X	N
51	SS51D	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.24	=	MG/KG	0.9		0.87		5		0.1	X	N
52	SS52B	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.24	=	MG/KG	0.9		0.87		5		0.1	X	N
52	SS52C	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.078	=	MG/KG	0.9		0.87		5		0.1		N
59	SB59B	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.13	=	MG/KG	0.9		0.87		5		0.1	X	N
59	SS59E	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.2	=	MG/KG	0.9		0.87		5		0.1	X	N
69	SB69B	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.16	=	MG/KG	0.9		0.87		5		0.1	X	N
69	SS69B	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.12	=	MG/KG	0.9		0.87		5		0.1	X	N
69	SS69D	0.0 to 1.0	BENZO(b)FLUORANTHENE	0.059	=	MG/KG	0.9		0.87		5		0.1		N
BRAC	H(3.5)	0.0 to 0.0	BENZO(b)FLUORANTHENE	0.089	J	MG/KG	0.9		0.87		5		0.1		N
BRAC	M(3.5)	0.0 to 0.0	BENZO(b)FLUORANTHENE	0.46	=	MG/KG	0.9		0.87		5		0.1	X	N
51	SB51A	0.0 to 1.0	BENZO(g,h,i)PERYLENE	0.25	=	MG/KG	0.82		230		32000		0.1	X	N
51	SS51C	0.0 to 1.0	BENZO(g,h,i)PERYLENE	0.05	J	MG/KG	0.82		230		32000		0.1		N
52	SS52B	0.0 to 1.0	BENZO(g,h,i)PERYLENE	0.21	=	MG/KG	0.82		230		32000		0.1	X	N
59	SB59B	0.0 to 1.0	BENZO(g,h,i)PERYLENE	0.1	=	MG/KG	0.82		230		32000		0.1		N
69	SS69B	0.0 to 1.0	BENZO(g,h,i)PERYLENE	0.086	=	MG/KG	0.82		230		32000		0.1		N
BRAC	H(3.5)	0.0 to 0.0	BENZO(g,h,i)PERYLENE	0.045	J	MG/KG	0.82		230		32000		0.1		N
BRAC	M(3.5)	0.0 to 0.0	BENZO(g,h,i)PERYLENE	0.29	J	MG/KG	0.82		230		32000		0.1	X	N
51	SB51A	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.35	=	MG/KG	0.78		8.7		49		0.1	X	N
51	SS51C	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.048	J	MG/KG	0.78		8.7		49		0.1		N
51	SS51D	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.17	=	MG/KG	0.78		8.7		49		0.1	X	N
51	SS51D	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.17	=	MG/KG	0.78		8.7		49		0.1	X	N
52	SS52B	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.2	=	MG/KG	0.78		8.7		49		0.1	X	N
52	SS52C	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.064	=	MG/KG	0.78		8.7		49		0.1		N
59	SB59B	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.16	=	MG/KG	0.78		8.7		49		0.1	X	N
59	SS59E	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.14	=	MG/KG	0.78		8.7		49		0.1	X	N
69	SB69B	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.1	=	MG/KG	0.78		8.7		49		0.1		N
69	SS69B	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.071	=	MG/KG	0.78		8.7		49		0.1		N
69	SS69D	0.0 to 1.0	BENZO(k)FLUORANTHENE	0.05	J	MG/KG	0.78		8.7		49		0.1		N
BRAC	H(3.5)	0.0 to 0.0	BENZO(k)FLUORANTHENE	0.084	J	MG/KG	0.78		8.7		49		0.1		N
BRAC	M(3.5)	0.0 to 0.0	BENZO(k)FLUORANTHENE	0.4	J	MG/KG	0.78		8.7		49		0.1	X	N
51	SS51B	0.0 to 1.0	BERYLLIUM	1.1	=	MG/KG	1.1		16		63		1.1		N
51	SS51C	0.0 to 1.0	BERYLLIUM	0.27	J	MG/KG	1.1		16		63		1.1		N
51	SS51D	0.0 to 1.0	BERYLLIUM	0.67	J	MG/KG	1.1		16		63		1.1		N
51	SS51D	0.0 to 1.0	BERYLLIUM	0.43	J	MG/KG	1.1		16		63		1.1		N
52	SB52A	0.0 to 1.0	BERYLLIUM	0.29	J	MG/KG	1.1		16		63		1.1		N
52	SB52A	0.0 to 1.0	BERYLLIUM	0.39	J	MG/KG	1.1		16		63		1.1		N
52	SS52A	0.0 to 1.0	BERYLLIUM	0.39	J	MG/KG	1.1		16		63		1.1		N
69	SS69A	0.0 to 1.0	BERYLLIUM	0.45	J	MG/KG	1.1		16		63		1.1		N
92	TEC92A	0.0 to 1.0	BERYLLIUM	0.41	J	MG/KG	1.1		16		63		1.1		N
92	TEC92A	0.0 to 1.0	BERYLLIUM	0.46	J	MG/KG	1.1		16		63		1.1		N
92	TEC92B	0.0 to 1.0	BERYLLIUM	0.34	J	MG/KG	1.1		16		63		1.1		N
BRAC	A(3.10)	0.0 to 0.5	BERYLLIUM	0.39	J	MG/KG	1.1		16		63		1.1		N
BRAC	G(3.5)	0.0 to 0.0	BERYLLIUM	0.53	J	MG/KG	1.1		16		63		1.1		N
BRAC	H(3.5)	0.0 to 0.0	BERYLLIUM	0.39	J	MG/KG	1.1		16		63		1.1		N
BRAC	I(3.5)	0.0 to 0.0	BERYLLIUM	0.57	J	MG/KG	1.1		16		63		1.1		N
BRAC	J(3.5)	0.0 to 0.0	BERYLLIUM	0.66	=	MG/KG	1.1		16		63		1.1		N
BRAC	K(3.5)	0.0 to 0.0	BERYLLIUM	0.73	=	MG/KG	1.1		16		63		1.1		N
BRAC	K(3.5B)	0.0 to 0.0	BERYLLIUM	0.56	J	MG/KG	1.1		16		63		1.1		N
BRAC	L(3.5)	0.0 to 0.0	BERYLLIUM	0.56	J	MG/KG	1.1		16		63		1.1		N
BRAC	M(3.5)	0.0 to 0.0	BERYLLIUM	0.46	J	MG/KG	1.1		16		63		1.1		N
BRAC	N(3.5)	0.0 to 0.0	BERYLLIUM	0.58	J	MG/KG	1.1		16		63		1.1		N
51	SB51A	0.0 to 1.0	bis(2-ETHYLHEXYL) PHTHALATE	0.15	J	MG/KG			46		3600		0.1	X	Y
51	SB51C	0.0 to 1.0	bis(2-ETHYLHEXYL) PHTHALATE	0.23	J	MG/KG			46		3600		0.1	X	Y
51	SS51B	0.0 to 1.0	bis(2 ETHYLHEXYL) PHTHALATE	0.078	J	MG/KG			46		3600		0.1		N
51	SB51B	0.0 to 1.0	BROMOMETHANE	0.002	J	MG/KG			11		0.2				N

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TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
51	SB51A	0 0 to 1 0	CADMIUM	1 3	=	MG/KG	1 4		7 8		8		1 6		N
51	SS51C	0 0 to 1 0	CADMIUM	0 47	J	MG/KG	1 4		7 8		8		1 6		N
51	SS51D	0 0 to 1 0	CADMIUM	0 03	J	MG/KG	1 4		7 8		8		1 6		N
51	SS51D	0 0 to 1 0	CADMIUM	0 02	J	MG/KG	1 4		7 8		8		1 6		N
92	TEC92A	0 0 to 1 0	CADMIUM	0 25	J	MG/KG	1 4		7 8		8		1 6		N
92	TEC92A	0 0 to 1 0	CADMIUM	0 28	J	MG/KG	1 4		7 8		8		1 6		N
92	TEC92B	0 0 to 1 0	CADMIUM	0 32	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	A(3 10)	0 0 to 0 5	CADMIUM	0 38	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	G(3 5)	0 0 to 0 0	CADMIUM	0 39	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	H(3 5)	0 0 to 0 0	CADMIUM	0 39	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	I(3 5)	0 0 to 0 0	CADMIUM	0 44	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	J(3 5)	0 0 to 0 0	CADMIUM	0 49	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	K(3 5)	0 0 to 0 0	CADMIUM	0 41	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	K(3 5B)	0 0 to 0 0	CADMIUM	0 6	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	L(3 5)	0 0 to 0 0	CADMIUM	0 41	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	M(3 5)	0 0 to 0 0	CADMIUM	0 35	J	MG/KG	1 4		7 8		8		1 6		N
BRAC	N(3 5)	0 0 to 0 0	CADMIUM	0 54	J	MG/KG	1 4		7 8		8		1 6		N
51	SS51C	0 0 to 1 0	CALCIUM	1920	=	MG/KG	5840								N
52	SS52A	0 0 to 1 0	CALCIUM	3190	=	MG/KG	5840								N
59	SS59H	0 0 to 1 0	CALCIUM	886	=	MG/KG	5840								N
69	SS69A	0 0 to 1 0	CALCIUM	1700	=	MG/KG	5840								N
92	TEC92A	0 0 to 1 0	CALCIUM	1790	=	MG/KG	5840								N
92	TEC92A	0 0 to 1 0	CALCIUM	1960	=	MG/KG	5840								N
92	TEC92B	0 0 to 1 0	CALCIUM	3550	=	MG/KG	5840								N
BRAC	A(3 10)	0 0 to 0 5	CALCIUM	2130	=	MG/KG	5840								N
BRAC	G(3 5)	0 0 to 0 0	CALCIUM	2010	=	MG/KG	5840								N
BRAC	H(3 5)	0 0 to 0 0	CALCIUM	2130	=	MG/KG	5840								N
BRAC	I(3 5)	0 0 to 0 0	CALCIUM	2230	=	MG/KG	5840								N
BRAC	J(3 5)	0 0 to 0 0	CALCIUM	2140	=	MG/KG	5840								N
BRAC	K(3 5)	0 0 to 0 0	CALCIUM	1880	=	MG/KG	5840								N
BRAC	K(3 5B)	0 0 to 0 0	CALCIUM	2210	=	MG/KG	5840								N
BRAC	L(3 5)	0 0 to 0 0	CALCIUM	1830	=	MG/KG	5840								N
BRAC	M(3 5)	0 0 to 0 0	CALCIUM	1840	=	MG/KG	5840								N
BRAC	N(3 5)	0 0 to 0 0	CALCIUM	2340	=	MG/KG	5840								N
51	SB51A	0 0 to 1 0	CARBAZOLE	0 15	J	MG/KG	0 067	X	32		0 6				N
BRAC	M(3 5)	0 0 to 0 0	CARBAZOLE	0 18	J	MG/KG	0 067	X	32		0 6				N
59	SS59H	0 0 to 1 0	CARBON DISULFIDE	0 002	J	MG/KG	0 002		780		32				N
51	SB51A	0 0 to 1 0	CHROMIUM, TOTAL	25 8	=	MG/KG	24 8	X			38		0 4	X	Y
51	SB51B	0 0 to 1 0	CHROMIUM, TOTAL	21 8	=	MG/KG	24 8				38		0 4	X	N
51	SB51C	0 0 to 1 0	CHROMIUM, TOTAL	27 6	=	MG/KG	24 8	X			38		0 4	X	Y
51	SS51A	0 0 to 1 0	CHROMIUM, TOTAL	7 6	=	MG/KG	24 8				38		0 4	X	N
51	SS51B	0 0 to 1 0	CHROMIUM TOTAL	29 4	=	MG/KG	24 8	X			38		0 4	X	Y
51	SS51C	0 0 to 1 0	CHROMIUM, TOTAL	11 3	=	MG/KG	24 8				38		0 4	X	N
51	SS51D	0 0 to 1 0	CHROMIUM, TOTAL	13 2	J	MG/KG	24 8				38		0 4	X	N
51	SS51D	0 0 to 1 0	CHROMIUM TOTAL	9 5	J	MG/KG	24 8				38		0 4	X	N
52	SB52A	0 0 to 1 0	CHROMIUM, TOTAL	12 6	=	MG/KG	24 8				38		0 4	X	N
52	SB52A	0 0 to 1 0	CHROMIUM, TOTAL	13 8	=	MG/KG	24 8				38		0 4	X	N
52	SB52B	0 0 to 1 0	CHROMIUM, TOTAL	22 5	=	MG/KG	24 8				38		0 4	X	N
52	SB52B	0 0 to 1 0	CHROMIUM TOTAL	20	=	MG/KG	24 8				38		0 4	X	N
52	SS52A	0 0 to 1 0	CHROMIUM TOTAL	13 1	=	MG/KG	24 8				38		0 4	X	N
52	SS52B	0 0 to 1 0	CHROMIUM, TOTAL	40 3	=	MG/KG	24 8	X			38	X	0 4	X	Y
52	SS52C	0 0 to 1 0	CHROMIUM, TOTAL	20 3	=	MG/KG	24 8				38		0 4	X	N
52	SS52D	0 0 to 1 0	CHROMIUM, TOTAL	17 5	=	MG/KG	24 8				38		0 4	X	N
52	SS52E	0 0 to 1 0	CHROMIUM, TOTAL	21	=	MG/KG	24 8				38		0 4	X	N
59	SS59H	0 0 to 1 0	CHROMIUM, TOTAL	16 1	=	MG/KG	24 8				38		0 4	X	N
69	SS69A	0 0 to 1 0	CHROMIUM TOTAL	12 6	J	MG/KG	24 8				38		0 4	X	N
92	TEC92A	0 0 to 1 0	CHROMIUM, TOTAL	11 5	=	MG/KG	24 8				38		0 4	X	N
92	TEC92A	0 0 to 1 0	CHROMIUM, TOTAL	13 2	=	MG/KG	24 8				38		0 4	X	N
92	TEC92B	0 0 to 1 0	CHROMIUM, TOTAL	9 6	=	MG/KG	24 8				38		0 4	X	N

TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	A(3 10)	0 0 to 0 5	CHROMIUM TOTAL	19 7	J	MG/KG	24 8				38		0 4	X	N
BRAC	G(3 5)	0 0 to 0 0	CHROMIUM TOTAL	13 6	=	MG/KG	24 8				38		0 4	X	N
BRAC	H(3 5)	0 0 to 0 0	CHROMIUM, TOTAL	18 9	=	MG/KG	24 8				38		0 4	X	N
BRAC	I(3 5)	0 0 to 0 0	CHROMIUM, TOTAL	14 2	=	MG/KG	24 8				38		0 4	X	N
BRAC	J(3 5)	0 0 to 0 0	CHROMIUM TOTAL	16 3	=	MG/KG	24 8				38		0 4	X	N
BRAC	K(3 5)	0 0 to 0 0	CHROMIUM, TOTAL	15 3	=	MG/KG	24 8				38		0 4	X	N
BRAC	K(3 5B)	0 0 to 0 0	CHROMIUM, TOTAL	14	=	MG/KG	24 8				38		0 4	X	N
BRAC	L(3 5)	0 0 to 0 0	CHROMIUM TOTAL	16 3	=	MG/KG	24 8				38		0 4	X	N
BRAC	M(3 5)	0 0 to 0 0	CHROMIUM TOTAL	12	=	MG/KG	24 8				38		0 4	X	N
BRAC	N(3 5)	0 0 to 0 0	CHROMIUM, TOTAL	13 7	=	MG/KG	24 8				38		0 4	X	N
51	SB51A	0 0 to 1 0	CHRYSENE	0 26	=	MG/KG	0 94		87		160		0 1	X	N
51	SB51B	0 0 to 1 0	CHRYSENE	0 059	J	MG/KG	0 94		87		160		0 1		N
51	SS51C	0 0 to 1 0	CHRYSENE	0 074	J	MG/KG	0 94		87		160		0 1		N
51	SS51D	0 0 to 1 0	CHRYSENE	0 18	=	MG/KG	0 94		87		160		0 1	X	N
51	SS51D	0 0 to 1 0	CHRYSENE	0 18	=	MG/KG	0 94		87		160		0 1	X	N
52	SS52A	0 0 to 1 0	CHRYSENE	0 046	J	MG/KG	0 94		87		160		0 1		N
52	SS52B	0 0 to 1 0	CHRYSENE	0 26	=	MG/KG	0 94		87		160		0 1	X	N
52	SS52C	0 0 to 1 0	CHRYSENE	0 066	=	MG/KG	0 94		87		160		0 1		N
52	SS52D	0 0 to 1 0	CHRYSENE	0 057	J	MG/KG	0 94		87		160		0 1		N
59	SB59B	0 0 to 1 0	CHRYSENE	0 14	=	MG/KG	0 94		87		160		0 1	X	N
59	SS59E	0 0 to 1 0	CHRYSENE	0 2	=	MG/KG	0 94		87		160		0 1	X	N
69	SB69B	0 0 to 1 0	CHRYSENE	0 13	=	MG/KG	0 94		87		160		0 1	X	N
69	SS69D	0 0 to 1 0	CHRYSENE	0 069	=	MG/KG	0 94		87		160		0 1		N
BRAC	H(3 5)	0 0 to 0 0	CHRYSENE	0 094	J	MG/KG	0 94		87		160		0 1		N
BRAC	M(3 5)	0 0 to 0 0	CHRYSENE	0 62	=	MG/KG	0 94		87		160		0 1	X	N
BRAC	N(3 5)	0 0 to 0 0	CHRYSENE	0 049	J	MG/KG	0 94		87		160		0 1		N
51	SS51C	0 0 to 1 0	COBALT	8 2	=	MG/KG	18 3		470				20		N
52	SS52A	0 0 to 1 0	COBALT	12 6	=	MG/KG	18 3		470				20		N
59	SS59H	0 0 to 1 0	COBALT	6 4	=	MG/KG	18 3		470				20		N
69	SS69A	0 0 to 1 0	COBALT	7	=	MG/KG	18 3		470				20		N
92	TEC92A	0 0 to 1 0	COBALT	7 9	=	MG/KG	18 3		470				20		N
92	TEC92A	0 0 to 1 0	COBALT	8 2	=	MG/KG	18 3		470				20		N
92	TEC92B	0 0 to 1 0	COBALT	6 7	=	MG/KG	18 3		470				20		N
BRAC	A(3 10)	0 0 to 0 5	COBALT	7 2	J	MG/KG	18 3		470				20		N
BRAC	G(3 5)	0 0 to 0 0	COBALT	7 4	=	MG/KG	18 3		470				20		N
BRAC	H(3 5)	0 0 to 0 0	COBALT	8 5	=	MG/KG	18 3		470				20		N
BRAC	I(3 5)	0 0 to 0 0	COBALT	7 8	=	MG/KG	18 3		470				20		N
BRAC	J(3 5)	0 0 to 0 0	COBALT	10 7	=	MG/KG	18 3		470				20		N
BRAC	K(3 5)	0 0 to 0 0	COBALT	8 8	=	MG/KG	18 3		470				20		N
BRAC	K(3 5B)	0 0 to 0 0	COBALT	8 9	=	MG/KG	18 3		470				20		N
BRAC	L(3 5)	0 0 to 0 0	COBALT	7 5	=	MG/KG	18 3		470				20		N
BRAC	M(3 5)	0 0 to 0 0	COBALT	8 4	=	MG/KG	18 3		470				20		N
BRAC	N(3 5)	0 0 to 0 0	COBALT	7 6	=	MG/KG	18 3		470				20		N
51	SB51A	0 0 to 1 0	COPPER	28 9	=	MG/KG	33 5		310				40		N
51	SB51B	0 0 to 1 0	COPPER	28 2	=	MG/KG	33 5		310				40		N
51	SB51C	0 0 to 1 0	COPPER	32 6	=	MG/KG	33 5		310				40		N
51	SS51A	0 0 to 1 0	COPPER	3 3	J	MG/KG	33 5		310				40		N
51	SS51B	0 0 to 1 0	COPPER	37 2	=	MG/KG	33 5	X	310				40		N
51	SS51C	0 0 to 1 0	COPPER	16	J	MG/KG	33 5		310				40		N
51	SS51D	0 0 to 1 0	COPPER	10 5	=	MG/KG	33 5		310				40		N
51	SS51D	0 0 to 1 0	COPPER	9 9	=	MG/KG	33 5		310				40		N
52	SB52A	0 0 to 1 0	COPPER	12	J	MG/KG	33 5		310				40		N
52	SB52A	0 0 to 1 0	COPPER	15 4	J	MG/KG	33 5		310				40		N
52	SB52B	0 0 to 1 0	COPPER	19 4	=	MG/KG	33 5		310				40		N
52	SB52B	0 0 to 1 0	COPPER	16 6	=	MG/KG	33 5		310				40		N
52	SS52A	0 0 to 1 0	COPPER	13 8	J	MG/KG	33 5		310				40		N
52	SS52B	0 0 to 1 0	COPPER	30 5	=	MG/KG	33 5		310				40		N
52	SS52C	0 0 to 1 0	COPPER	21 3	=	MG/KG	33 5		310				40		N
52	SS52D	0 0 to 1 0	COPPER	19 3	=	MG/KG	33 5		310				40		N

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TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
52	SS52E	0.0 to 1.0	COPPER	28.3	=	MG/KG	33.5		310				40		N
59	SS59H	0.0 to 1.0	COPPER	18.5	J	MG/KG	33.5		310				40		N
69	SS69A	0.0 to 1.0	COPPER	16.8	=	MG/KG	33.5		310				40		N
92	TEC92A	0.0 to 1.0	COPPER	15.4	J	MG/KG	33.5		310				40		N
92	TEC92A	0.0 to 1.0	COPPER	16.5	J	MG/KG	33.5		310				40		N
92	TEC92B	0.0 to 1.0	COPPER	15.9	J	MG/KG	33.5		310				40		N
BRAC	A(3 10)	0.0 to 0.5	COPPER	25.9	J	MG/KG	33.5		310				40		N
BRAC	G(3 5)	0.0 to 0.0	COPPER	19	=	MG/KG	33.5		310				40		N
BRAC	H(3 5)	0.0 to 0.0	COPPER	25.4	=	MG/KG	33.5		310				40		N
BRAC	I(3 5)	0.0 to 0.0	COPPER	20	=	MG/KG	33.5		310				40		N
BRAC	J(3 5)	0.0 to 0.0	COPPER	23.5	=	MG/KG	33.5		310				40		N
BRAC	K(3 5)	0.0 to 0.0	COPPER	23.2	=	MG/KG	33.5		310				40		N
BRAC	K(3 5B)	0.0 to 0.0	COPPER	19	=	MG/KG	33.5		310				40		N
BRAC	L(3 5)	0.0 to 0.0	COPPER	21.7	=	MG/KG	33.5		310				40		N
BRAC	M(3 5)	0.0 to 0.0	COPPER	15.8	=	MG/KG	33.5		310				40		N
BRAC	N(3 5)	0.0 to 0.0	COPPER	55.4	=	MG/KG	33.5	X	310				40	X	Y
59	SS59C	0.0 to 1.0	DDD	0.017	=	MG/KG	0.0067	X	2.7		16		0.0025	X	Y
59	SS59D	0.0 to 1.0	DDD	0.0028	J	MG/KG	0.0067		2.7		16		0.0025	X	N
59	SS59F	0.0 to 1.0	DDD	0.012	J	MG/KG	0.0067	X	2.7		16		0.0025	X	Y
59	SS59F	0.0 to 1.0	DDD	0.0058	J	MG/KG	0.0067		2.7		16		0.0025	X	N
59	SS59H	0.0 to 1.0	DDD	0.016	=	MG/KG	0.0067	X	2.7		16		0.0025	X	Y
59	SS59I	0.0 to 1.0	DDD	0.0033	J	MG/KG	0.0067		2.7		16		0.0025	X	N
59	SS59J	0.0 to 1.0	DDD	0.003	J	MG/KG	0.0067		2.7		16		0.0025	X	N
51	SB51A	0.0 to 1.0	DDE	0.044	=	MG/KG	0.16		1.9		54		0.0025	X	N
51	SB51B	0.0 to 1.0	DDE	0.08	=	MG/KG	0.16		1.9		54		0.0025	X	N
51	SB51C	0.0 to 1.0	DDE	0.038	J	MG/KG	0.16		1.9		54		0.0025	X	N
51	SS51A	0.0 to 1.0	DDE	0.022	=	MG/KG	0.16		1.9		54		0.0025	X	N
51	SS51B	0.0 to 1.0	DDE	0.1	=	MG/KG	0.16		1.9		54		0.0025	X	N
51	SS51C	0.0 to 1.0	DDE	0.039	J	MG/KG	0.16		1.9		54		0.0025	X	N
52	SB52A	0.0 to 1.0	DDE	0.43	J	MG/KG	0.16	X	1.9		54		0.0025	X	Y
52	SB52A	0.0 to 1.0	DDE	0.0084	=	MG/KG	0.16		1.9		54		0.0025	X	N
52	SB52B	0.0 to 1.0	DDE	0.0043	J	MG/KG	0.16		1.9		54		0.0025	X	N
52	SS52A	0.0 to 1.0	DDE	0.025	J	MG/KG	0.16		1.9		54		0.0025	X	N
52	SS52C	0.0 to 1.0	DDE	0.03	=	MG/KG	0.16		1.9		54		0.0025	X	N
52	SS52D	0.0 to 1.0	DDE	0.0064	J	MG/KG	0.16		1.9		54		0.0025	X	N
52	SS52E	0.0 to 1.0	DDE	0.039	=	MG/KG	0.16		1.9		54		0.0025	X	N
59	SB59B	0.0 to 1.0	DDE	0.44	=	MG/KG	0.16	X	1.9		54		0.0025	X	Y
59	SS59C	0.0 to 1.0	DDE	0.015	=	MG/KG	0.16		1.9		54		0.0025	X	N
59	SS59D	0.0 to 1.0	DDE	0.002	J	MG/KG	0.16		1.9		54		0.0025		N
59	SS59E	0.0 to 1.0	DDE	0.69	=	MG/KG	0.16	X	1.9		54		0.0025	X	Y
59	SS59F	0.0 to 1.0	DDE	0.036	=	MG/KG	0.16		1.9		54		0.0025	X	N
59	SS59F	0.0 to 1.0	DDE	0.024	=	MG/KG	0.16		1.9		54		0.0025	X	N
59	SS59G	0.0 to 1.0	DDE	0.0082	=	MG/KG	0.16		1.9		54		0.0025	X	N
59	SS59H	0.0 to 1.0	DDE	0.011	=	MG/KG	0.16		1.9		54		0.0025	X	N
59	SS59I	0.0 to 1.0	DDE	0.0028	J	MG/KG	0.16		1.9		54		0.0025	X	N
59	SS59J	0.0 to 1.0	DDE	0.0051	=	MG/KG	0.16		1.9		54		0.0025	X	N
92	TEC92A	0.0 to 1.0	DDE	0.084	=	MG/KG	0.16		1.9		54		0.0025	X	N
92	TEC92A	0.0 to 1.0	DDE	0.074	=	MG/KG	0.16		1.9		54		0.0025	X	N
92	TEC92B	0.0 to 1.0	DDE	0.016	J	MG/KG	0.16		1.9		54		0.0025	X	N
BRAC	A(3 10)	0.0 to 0.5	DDE	0.019	J	MG/KG	0.16		1.9		54		0.0025	X	N
BRAC	A(3 5)	0.0 to 0.5	DDE	0.26	J	MG/KG	0.16	X	1.9		54		0.0025	X	Y
BRAC	E(3 5)	0.0 to 0.5	DDE	0.53	J	MG/KG	0.16	X	1.9		54		0.0025	X	Y
BRAC	F(3 5)	0.0 to 0.5	DDE	0.17	J	MG/KG	0.16	X	1.9		54		0.0025	X	Y
BRAC	H(3 5)	0.0 to 1.0	DDE	0.086	J	MG/KG	0.16		1.9		54		0.0025	X	N
BRAC	K(3 5)	0.0 to 1.0	DDE	0.14	=	MG/KG	0.16		1.9		54		0.0025	X	N
BRAC	L(3 5)	0.0 to 1.0	DDE	0.43	=	MG/KG	0.16	X	1.9		54		0.0025	X	Y
BRAC	M(3 5)	0.0 to 1.0	DDE	0.14	J	MG/KG	0.16		1.9		54		0.0025	X	N
BRAC	O(3 5)	0.0 to 1.0	DDE	0.47	J	MG/KG	0.16	X	1.9		54		0.0025	X	Y
BRAC	P(3 5)	0.0 to 1.0	DDE	0.38	J	MG/KG	0.16	X	1.9		54		0.0025	X	Y

TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC: Direct Exposure Value	RBC: Direct Exposure Exceedance Flag	RBC: GWP Value	RBC: GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	R(3 5)	0.0 to 1.0	DDE	0.47	=	MG/KG	0.16	X	1.9		54		0.0025	X	Y
BRAC	S(3 5)	0.0 to 1.0	DDE	1	=	MG/KG	0.16	X	1.9		54		0.0025	X	Y
51	SB51A	0.0 to 1.0	DDT	0.044	=	MG/KG	0.074		1.9		11		0.0025	X	N
51	SB51B	0.0 to 1.0	DDT	0.09	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
51	SB51C	0.0 to 1.0	DDT	0.56	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
51	SS51A	0.0 to 1.0	DDT	0.043	=	MG/KG	0.074		1.9		11		0.0025	X	N
51	SS51B	0.0 to 1.0	DDT	0.077	J	MG/KG	0.074	X	1.9		11		0.0025	X	Y
52	SB52A	0.0 to 1.0	DDT	0.24	J	MG/KG	0.074	X	1.9		11		0.0025	X	Y
52	SB52A	0.0 to 1.0	DDT	0.024	=	MG/KG	0.074		1.9		11		0.0025	X	N
52	SB52B	0.0 to 1.0	DDT	0.0052	J	MG/KG	0.074		1.9		11		0.0025	X	N
52	SB52B	0.0 to 1.0	DDT	0.021	=	MG/KG	0.074		1.9		11		0.0025	X	N
52	SS52A	0.0 to 1.0	DDT	0.21	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
52	SS52B	0.0 to 1.0	DDT	6.7	=	MG/KG	0.074	X	1.9	X	11		0.0025	X	Y
52	SS52C	0.0 to 1.0	DDT	0.073	=	MG/KG	0.074		1.9		11		0.0025	X	N
52	SS52D	0.0 to 1.0	DDT	0.0069	J	MG/KG	0.074		1.9		11		0.0025	X	N
52	SS52E	0.0 to 1.0	DDT	0.042	=	MG/KG	0.074		1.9		11		0.0025	X	N
59	SB59B	0.0 to 1.0	DDT	0.77	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
59	SS59C	0.0 to 1.0	DDT	0.0028	J	MG/KG	0.074		1.9		11		0.0025	X	N
59	SS59D	0.0 to 1.0	DDT	0.0017	J	MG/KG	0.074		1.9		11		0.0025		N
59	SS59E	0.0 to 1.0	DDT	0.38	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
59	SS59F	0.0 to 1.0	DDT	0.085	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
59	SS59F	0.0 to 1.0	DDT	0.042	=	MG/KG	0.074		1.9		11		0.0025	X	N
59	SS59G	0.0 to 1.0	DDT	0.01	=	MG/KG	0.074		1.9		11		0.0025	X	N
59	SS59H	0.0 to 1.0	DDT	0.0084	=	MG/KG	0.074		1.9		11		0.0025	X	N
59	SS59J	0.0 to 1.0	DDT	0.017	=	MG/KG	0.074		1.9		11		0.0025	X	N
92	TEC92A	0.0 to 1.0	DDT	0.14	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
92	TEC92A	0.0 to 1.0	DDT	0.086	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
92	TEC92B	0.0 to 1.0	DDT	0.04	=	MG/KG	0.074		1.9		11		0.0025	X	N
BRAC	A(3 10)	0.0 to 0.5	DDT	0.023	=	MG/KG	0.074		1.9		11		0.0025	X	N
BRAC	A(3 5)	0.0 to 0.5	DDT	0.13	J	MG/KG	0.074	X	1.9		11		0.0025	X	Y
BRAC	F(3 5)	0.0 to 0.5	DDT	0.14	J	MG/KG	0.074	X	1.9		11		0.0025	X	Y
BRAC	H(3 5)	0.0 to 1.0	DDT	0.071	J	MG/KG	0.074		1.9		11		0.0025	X	N
BRAC	K(3 5)	0.0 to 1.0	DDT	0.044	J	MG/KG	0.074		1.9		11		0.0025	X	N
BRAC	L(3 5)	0.0 to 1.0	DDT	0.2	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
BRAC	O(3 5)	0.0 to 1.0	DDT	2.4	=	MG/KG	0.074	X	1.9	X	11		0.0025	X	Y
BRAC	P(3 5)	0.0 to 1.0	DDT	0.33	J	MG/KG	0.074	X	1.9		11		0.0025	X	Y
BRAC	R(3 5)	0.0 to 1.0	DDT	0.36	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
BRAC	S(3 5)	0.0 to 1.0	DDT	0.72	=	MG/KG	0.074	X	1.9		11		0.0025	X	Y
BRAC	M(3 5)	0.0 to 0.0	DIBENZ(a h)ANTHRACENE	0.083	J	MG/KG	0.26		0.087		2		0.1		N
BRAC	M(3 5)	0.0 to 0.0	DIBENZOFURAN	0.056	J	MG/KG	0.647		31		15		0.1		N
51	SB51A	0.0 to 1.0	DIELDRIN	0.025	J	MG/KG	0.086		0.04		0.004	X	0.0005	X	N
51	SB51B	0.0 to 1.0	DIELDRIN	0.048	=	MG/KG	0.086		0.04	X	0.004	X	0.0005	X	N
51	SB51C	0.0 to 1.0	DIELDRIN	0.063	J	MG/KG	0.086		0.04	X	0.004	X	0.0005	X	N
51	SS51A	0.0 to 1.0	DIELDRIN	0.021	=	MG/KG	0.086		0.04		0.004	X	0.0005	X	N
51	SS51B	0.0 to 1.0	DIELDRIN	0.32	=	MG/KG	0.086	X	0.04	X	0.004	X	0.0005	X	Y
51	SS51C	0.0 to 1.0	DIELDRIN	0.14	=	MG/KG	0.086	X	0.04	X	0.004	X	0.0005	X	Y
52	SB52A	0.0 to 1.0	DIELDRIN	0.29	J	MG/KG	0.086	X	0.04	X	0.004	X	0.0005	X	Y
52	SB52A	0.0 to 1.0	DIELDRIN	0.022	=	MG/KG	0.086		0.04		0.004	X	0.0005	X	N
52	SB52B	0.0 to 1.0	DIELDRIN	0.0013	J	MG/KG	0.086		0.04		0.004		0.0005	X	N
52	SS52A	0.0 to 1.0	DIELDRIN	0.038	J	MG/KG	0.086		0.04		0.004	X	0.0005	X	N
52	SS52B	0.0 to 1.0	DIELDRIN	0.75	J	MG/KG	0.086	X	0.04	X	0.004	X	0.0005	X	Y
52	SS52C	0.0 to 1.0	DIELDRIN	0.033	=	MG/KG	0.086		0.04		0.004	X	0.0005	X	N
52	SS52D	0.0 to 1.0	DIELDRIN	0.021	=	MG/KG	0.086		0.04		0.004	X	0.0005	X	N
59	SB59B	0.0 to 1.0	DIELDRIN	0.13	=	MG/KG	0.086	X	0.04	X	0.004	X	0.0005	X	Y
59	SS59E	0.0 to 1.0	DIELDRIN	0.58	=	MG/KG	0.086	X	0.04	X	0.004	X	0.0005	X	Y
59	SS59F	0.0 to 1.0	DIELDRIN	0.016	J	MG/KG	0.086		0.04		0.004	X	0.0005	X	N
59	SS59F	0.0 to 1.0	DIELDRIN	0.01	=	MG/KG	0.086		0.04		0.004	X	0.0005	X	N
69	SS69A	0.0 to 1.0	DIELDRIN	0.042	=	MG/KG	0.086		0.04	X	0.004	X	0.0005	X	N
92	TEC92A	0.0 to 1.0	DIELDRIN	0.14	=	MG/KG	0.086	X	0.04	X	0.004	X	0.0005	X	Y

TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC				Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
									Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag			
92	TEC92A	0 0 to 1 0	DIELDRIN	0 17	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
92	TEC92B	0 0 to 1 0	DIELDRIN	0 1	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	A(3 10)	0 0 to 0 5	DIELDRIN	0 06	=	MG/KG	0 086		0 04	X	0 004	X	0 0005	X	N
BRAC	A(3 5)	0 0 to 0 5	DIELDRIN	0 5	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	B(3 5)	0 0 to 0 5	DIELDRIN	10	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	C(3 5)	0 0 to 0 5	DIELDRIN	0 068	=	MG/KG	0 086		0 04	X	0 004	X	0 0005	X	N
BRAC	D(3 5)	0 0 to 0 5	DIELDRIN	1 4	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	E(3 5)	0 0 to 0 5	DIELDRIN	0 57	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	F(3 5)	0 0 to 0 5	DIELDRIN	0 44	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	G(3 5)	0 0 to 1 0	DIELDRIN	0 74	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	H(3 5)	0 0 to 1 0	DIELDRIN	0 23	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	I(3 5)	0 0 to 1 0	DIELDRIN	0 16	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	J(3 5)	0 0 to 1 0	DIELDRIN	1 1	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	K(3 5)	0 0 to 1 0	DIELDRIN	0 2	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	L(3 5)	0 0 to 1 0	DIELDRIN	0 28	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	M(3 5)	0 0 to 1 0	DIELDRIN	0 57	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	N(3 5)	0 0 to 1 0	DIELDRIN	0 71	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	O(3 5)	0 0 to 1 0	DIELDRIN	0 6	J	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	P(3 5)	0 0 to 1 0	DIELDRIN	2 6	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	Q(3 5)	0 0 to 1 0	DIELDRIN	0 96	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	R(3 5)	0 0 to 1 0	DIELDRIN	0 44	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	S(3 5)	0 0 to 1 0	DIELDRIN	0 72	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	T(3 5)	0 0 to 1 0	DIELDRIN	0 54	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	U(3 5)	0 0 to 1 0	DIELDRIN	0 33	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	V(3 5)	0 0 to 1 0	DIELDRIN	0 34	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	V(3 5)	0 0 to 1 0	DIELDRIN	0 29	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
BRAC	W(3 5)	0 0 to 1 0	DIELDRIN	0 0085	=	MG/KG	0 086		0 04		0 004	X	0 0005	X	N
BRAC	X(3 5)	0 0 to 1 0	DIELDRIN	0 21	=	MG/KG	0 086	X	0 04	X	0 004	X	0 0005	X	Y
51	SB51A	0 0 to 1 0	FLUORANTHENE	0 45	=	MG/KG	1 6		310		4300		0 1	X	N
51	SB51B	0 0 to 1 0	FLUORANTHENE	0 1	=	MG/KG	1 6		310		4300		0 1		N
51	SS51B	0 0 to 1 0	FLUORANTHENE	0 077	=	MG/KG	1 6		310		4300		0 1		N
51	SS51C	0 0 to 1 0	FLUORANTHENE	0 14	J	MG/KG	1 6		310		4300		0 1	X	N
51	SS51D	0 0 to 1 0	FLUORANTHENE	0 3	=	MG/KG	1 6		310		4300		0 1	X	N
51	SS51D	0 0 to 1 0	FLUORANTHENE	0 23	=	MG/KG	1 6		310		4300		0 1	X	N
52	SS52B	0 0 to 1 0	FLUORANTHENE	0 42	=	MG/KG	1 6		310		4300		0 1	X	N
52	SS52C	0 0 to 1 0	FLUORANTHENE	0 094	=	MG/KG	1 6		310		4300		0 1		N
52	SS52D	0 0 to 1 0	FLUORANTHENE	0 08	=	MG/KG	1 6		310		4300		0 1		N
59	SB59B	0 0 to 1 0	FLUORANTHENE	0 28	=	MG/KG	1 6		310		4300		0 1	X	N
59	SS59E	0 0 to 1 0	FLUORANTHENE	0 37	=	MG/KG	1 6		310		4300		0 1	X	N
59	SS59F	0 0 to 1 0	FLUORANTHENE	0 08	=	MG/KG	1 6		310		4300		0 1		N
59	SS59F	0 0 to 1 0	FLUORANTHENE	0 081	=	MG/KG	1 6		310		4300		0 1		N
69	SB69A	0 0 to 1 0	FLUORANTHENE	0 073	=	MG/KG	1 6		310		4300		0 1		N
69	SB69B	0 0 to 1 0	FLUORANTHENE	0 19	=	MG/KG	1 6		310		4300		0 1	X	N
69	SS69B	0 0 to 1 0	FLUORANTHENE	0 21	=	MG/KG	1 6		310		4300		0 1	X	N
69	SS69D	0 0 to 1 0	FLUORANTHENE	0 14	=	MG/KG	1 6		310		4300		0 1	X	N
92	TEC92A	0 0 to 1 0	FLUORANTHENE	0 04	J	MG/KG	1 6		310		4300		0 1		N
92	TEC92A	0 0 to 1 0	FLUORANTHENE	0 05	J	MG/KG	1 6		310		4300		0 1		N
BRAC	H(3 5)	0 0 to 0 0	FLUORANTHENE	0 16	J	MG/KG	1 6		310		4300		0 1	X	N
BRAC	I(3 5)	0 0 to 0 0	FLUORANTHENE	0 054	J	MG/KG	1 6		310		4300		0 1		N
BRAC	L(3 5)	0 0 to 0 0	FLUORANTHENE	0 046	J	MG/KG	1 6		310		4300		0 1		N
BRAC	M(3 5)	0 0 to 0 0	FLUORANTHENE	1 2	=	MG/KG	1 6		310		4300		0 1	X	N
BRAC	N(3 5)	0 0 to 0 0	FLUORANTHENE	0 061	J	MG/KG	1 6		310		4300		0 1		N
51	SB51B	0 0 to 1 0	FLUORENE	0 078	=	MG/KG			310		560		0 1		N
BRAC	M(3 5)	0 0 to 0 0	FLUORENE	0 14	J	MG/KG			310		560		0 1	X	Y
59	SB59B	0 0 to 1 0	GAMMA CHLORDANE	0 016	J	MG/KG	0 026		1 8				0 1		N
59	SS59E	0 0 to 1 0	GAMMA CHLORDANE	0 061	J	MG/KG	0 026	X	1 8				0 1		N
59	SS59F	0 0 to 1 0	GAMMA CHLORDANE	0 015	=	MG/KG	0 026		1 8				0 1		N
59	SS59F	0 0 to 1 0	GAMMA-CHLORDANE	0 0074	=	MG/KG	0 026		1 8				0 1		N
BRAC	A(3 5)	0 0 to 0 5	GAMMA-CHLORDANE	0 023	J	MG/KG	0 026		1 8				0 1		N

TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	O(3 5)	0 0 to 1 0	GAMMA CHLORDANE	1.4	=	MG/KG	0.026	X	1.8				0.1	X	Y
51	SB51A	0 0 to 1 0	INDENO(1,2,3-c d)PYRENE	0.19	=	MG/KG	0.7		0.87		14		0.1	X	N
51	SS51D	0 0 to 1 0	INDENO(1,2,3-c,d)PYRENE	0.12	=	MG/KG	0.7		0.87		14		0.1	X	N
51	SS51D	0 0 to 1 0	INDENO(1,2,3-c d)PYRENE	0.13	=	MG/KG	0.7		0.87		14		0.1	X	N
59	SB59B	0 0 to 1 0	INDENO(1 2 3-c d)PYRENE	0.12	=	MG/KG	0.7		0.87		14		0.1	X	N
69	SS69B	0 0 to 1 0	INDENO(1 2 3-c,d)PYRENE	0.092	=	MG/KG	0.7		0.87		14		0.1		N
BRAC	H(3 5)	0 0 to 0 0	INDENO(1,2,3-c d)PYRENE	0.066	J	MG/KG	0.7		0.87		14		0.1		N
BRAC	M(3 5)	0 0 to 0 0	INDENO(1,2,3-c d)PYRENE	0.26	J	MG/KG	0.7		0.87		14		0.1	X	N
51	SS51C	0 0 to 1 0	IRON	16000	J	MG/KG	37040		2300	X			200	X	N
52	SS52A	0 0 to 1 0	IRON	15400	J	MG/KG	37040		2300	X			200	X	N
59	SS59H	0 0 to 1 0	IRON	21300	=	MG/KG	37040		2300	X			200	X	N
69	SS69A	0 0 to 1 0	IRON	19700	=	MG/KG	37040		2300	X			200	X	N
92	TEC92A	0 0 to 1 0	IRON	16700	=	MG/KG	37040		2300	X			200	X	N
92	TEC92A	0 0 to 1 0	IRON	18800	=	MG/KG	37040		2300	X			200	X	N
92	TEC92B	0 0 to 1 0	IRON	15600	=	MG/KG	37040		2300	X			200	X	N
BRAC	A(3 10)	0 0 to 0 5	IRON	14200	J	MG/KG	37040		2300	X			200	X	N
BRAC	G(3 5)	0 0 to 0 0	IRON	20000	=	MG/KG	37040		2300	X			200	X	N
BRAC	H(3 5)	0 0 to 0 0	IRON	13800	=	MG/KG	37040		2300	X			200	X	N
BRAC	I(3 5)	0 0 to 0 0	IRON	20700	=	MG/KG	37040		2300	X			200	X	N
BRAC	J(3 5)	0 0 to 0 0	IRON	23000	=	MG/KG	37040		2300	X			200	X	N
BRAC	K(3 5)	0 0 to 0 0	IRON	22000	=	MG/KG	37040		2300	X			200	X	N
BRAC	K(3 5B)	0 0 to 0 0	IRON	19700	=	MG/KG	37040		2300	X			200	X	N
BRAC	L(3 5)	0 0 to 0 0	IRON	21600	=	MG/KG	37040		2300	X			200	X	N
BRAC	M(3 5)	0 0 to 0 0	IRON	15300	=	MG/KG	37040		2300	X			200	X	N
BRAC	N(3 5)	0 0 to 0 0	IRON	19300	=	MG/KG	37040		2300	X			200	X	N
51	SB51A	0 0 to 1 0	LEAD	63.2	=	MG/KG	30	X	400				50	X	Y
51	SB51B	0 0 to 1 0	LEAD	62.2	=	MG/KG	30	X	400				50	X	Y
51	SB51C	0 0 to 1 0	LEAD	41.5	=	MG/KG	30	X	400				50		N
51	SS51A	0 0 to 1 0	LEAD	2.8	=	MG/KG	30		400				50		N
51	SS51B	0 0 to 1 0	LEAD	138	=	MG/KG	30	X	400				50	X	Y
51	SS51C	0 0 to 1 0	LEAD	22.1	=	MG/KG	30		400				50		N
51	SS51D	0 0 to 1 0	LEAD	318	=	MG/KG	30	X	400				50	X	Y
51	SS51D	0 0 to 1 0	LEAD	34.6	=	MG/KG	30	X	400				50		N
52	SB52A	0 0 to 1 0	LEAD	24.4	=	MG/KG	30		400				50		N
52	SB52A	0 0 to 1 0	LEAD	16.8	=	MG/KG	30		400				50		N
52	SB52B	0 0 to 1 0	LEAD	17.9	=	MG/KG	30		400				50		N
52	SB52B	0 0 to 1 0	LEAD	23.8	=	MG/KG	30		400				50		N
52	SS52A	0 0 to 1 0	LEAD	18.5	=	MG/KG	30		400				50		N
52	SS52B	0 0 to 1 0	LEAD	150	=	MG/KG	30	X	400				50	X	Y
52	SS52C	0 0 to 1 0	LEAD	32.2	=	MG/KG	30	X	400				50		N
52	SS52D	0 0 to 1 0	LEAD	33.8	=	MG/KG	30	X	400				50		N
52	SS52E	0 0 to 1 0	LEAD	29.9	=	MG/KG	30		400				50		N
59	SS59H	0 0 to 1 0	LEAD	14.9	=	MG/KG	30		400				50		N
69	SS69A	0 0 to 1 0	LEAD	11.4	=	MG/KG	30		400				50		N
92	TEC92A	0 0 to 1 0	LEAD	36.3	J	MG/KG	30	X	400				50		N
92	TEC92A	0 0 to 1 0	LEAD	35.4	J	MG/KG	30	X	400				50		N
92	TEC92B	0 0 to 1 0	LEAD	11.4	J	MG/KG	30		400				50		N
BRAC	A(3 10)	0 0 to 0 5	LEAD	83.4	J	MG/KG	30	X	400				50	X	Y
BRAC	G(3 5)	0 0 to 0 0	LEAD	12.2	=	MG/KG	30		400				50		N
BRAC	H(3 5)	0 0 to 0 0	LEAD	48.6	=	MG/KG	30	X	400				50		N
BRAC	I(3 5)	0 0 to 0 0	LEAD	16.8	=	MG/KG	30		400				50		N
BRAC	J(3 5)	0 0 to 0 0	LEAD	14.6	=	MG/KG	30		400				50		N
BRAC	K(3 5)	0 0 to 0 0	LEAD	15.6	=	MG/KG	30		400				50		N
BRAC	K(3 5B)	0 0 to 0 0	LEAD	18.6	=	MG/KG	30		400				50		N
BRAC	L(3 5)	0 0 to 0 0	LEAD	20	=	MG/KG	30		400				50		N
BRAC	M(3 5)	0 0 to 0 0	LEAD	38.1	=	MG/KG	30	X	400				50		N
BRAC	N(3 5)	0 0 to 0 0	LEAD	68.8	=	MG/KG	30	X	400				50	X	Y
51	SS51C	0 0 to 1 0	MAGNESIUM	1710	=	MG/KG	4600								N
52	SS52A	0 0 to 1 0	MAGNESIUM	1650	=	MG/KG	4600								N

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TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
59	SS59H	0 0 to 1 0	MAGNESIUM	2590	=	MG/KG	4600								N
69	SS69A	0 0 to 1 0	MAGNESIUM	2140	=	MG/KG	4600								N
92	TEC92A	0 0 to 1 0	MAGNESIUM	1730	=	MG/KG	4600								N
92	TEC92A	0 0 to 1 0	MAGNESIUM	2020	=	MG/KG	4600								N
92	TEC92B	0 0 to 1 0	MAGNESIUM	2590	=	MG/KG	4600								N
BRAC	A(3 10)	0 0 to 0 5	MAGNESIUM	1680	=	MG/KG	4600								N
BRAC	G(3 5)	0 0 to 0 0	MAGNESIUM	2530	=	MG/KG	4600								N
BRAC	H(3 5)	0 0 to 0 0	MAGNESIUM	1570	=	MG/KG	4600								N
BRAC	I(3 5)	0 0 to 0 0	MAGNESIUM	2490	=	MG/KG	4600								N
BRAC	J(3 5)	0 0 to 0 0	MAGNESIUM	3000	=	MG/KG	4600								N
BRAC	K(3 5)	0 0 to 0 0	MAGNESIUM	2810	=	MG/KG	4600								N
BRAC	K(3 5B)	0 0 to 0 0	MAGNESIUM	2200	=	MG/KG	4600								N
BRAC	L(3 5)	0 0 to 0 0	MAGNESIUM	2410	=	MG/KG	4600								N
BRAC	M(3 5)	0 0 to 0 0	MAGNESIUM	1610	=	MG/KG	4600								N
BRAC	N(3 5)	0 0 to 0 0	MAGNESIUM	2070	=	MG/KG	4600								N
51	SS51C	0 0 to 1 0	MANGANESE	604	=	MG/KG	1304		1100				100	X	N
52	SS52A	0 0 to 1 0	MANGANESE	1860	=	MG/KG	1304	X	1100	X			100	X	Y
59	SS59H	0 0 to 1 0	MANGANESE	499	=	MG/KG	1304		1100				100	X	N
69	SS69A	0 0 to 1 0	MANGANESE	371	=	MG/KG	1304		1100				100	X	N
92	TEC92A	0 0 to 1 0	MANGANESE	560	=	MG/KG	1304		1100				100	X	N
92	TEC92A	0 0 to 1 0	MANGANESE	658	=	MG/KG	1304		1100				100	X	N
92	TEC92B	0 0 to 1 0	MANGANESE	533	=	MG/KG	1304		1100				100	X	N
BRAC	A(3 10)	0 0 to 0 5	MANGANESE	533	J	MG/KG	1304		1100				100	X	N
BRAC	G(3 5)	0 0 to 0 0	MANGANESE	520	=	MG/KG	1304		1100				100	X	N
BRAC	H(3 5)	0 0 to 0 0	MANGANESE	666	=	MG/KG	1304		1100				100	X	N
BRAC	I(3 5)	0 0 to 0 0	MANGANESE	689	=	MG/KG	1304		1100				100	X	N
BRAC	J(3 5)	0 0 to 0 0	MANGANESE	970	=	MG/KG	1304		1100				100	X	N
BRAC	K(3 5)	0 0 to 0 0	MANGANESE	899	=	MG/KG	1304		1100				100	X	N
BRAC	K(3 5B)	0 0 to 0 0	MANGANESE	752	=	MG/KG	1304		1100				100	X	N
BRAC	L(3 5)	0 0 to 0 0	MANGANESE	432	=	MG/KG	1304		1100				100	X	N
BRAC	M(3 5)	0 0 to 0 0	MANGANESE	612	=	MG/KG	1304		1100				100	X	N
BRAC	N(3 5)	0 0 to 0 0	MANGANESE	561	=	MG/KG	1304		1100				100	X	N
51	SS51D	0 0 to 1 0	MERCURY	0 04	J	MG/KG	0 4		2 3		2		0 1		N
51	SS51D	0 0 to 1 0	MERCURY	0 03	J	MG/KG	0 4		2 3		2		0 1		N
92	TEC92A	0 0 to 1 0	MERCURY	0 07	=	MG/KG	0 4		2 3		2		0 1		N
92	TEC92A	0 0 to 1 0	MERCURY	0 06	=	MG/KG	0 4		2 3		2		0 1		N
92	TEC92B	0 0 to 1 0	MERCURY	0 03	J	MG/KG	0 4		2 3		2		0 1		N
BRAC	A(3 10)	0 0 to 0 5	MERCURY	0 03	J	MG/KG	0 4		2 3		2		0 1		N
BRAC	G(3 5)	0 0 to 0 0	MERCURY	0 05	J	MG/KG	0 4		2 3		2		0 1		N
BRAC	H(3 5)	0 0 to 0 0	MERCURY	0 06	J	MG/KG	0 4		2 3		2		0 1		N
BRAC	J(3 5)	0 0 to 0 0	MERCURY	0 06	J	MG/KG	0 4		2 3		2		0 1		N
BRAC	K(3 5)	0 0 to 0 0	MERCURY	0 05	J	MG/KG	0 4		2 3		2		0 1		N
BRAC	L(3 5)	0 0 to 0 0	MERCURY	0 07	J	MG/KG	0 4		2 3		2		0 1		N
BRAC	M(3 5)	0 0 to 0 0	MERCURY	0 06	J	MG/KG	0 4		2 3		2		0 1		N
BRAC	N(3 5)	0 0 to 0 0	MERCURY	0 08	J	MG/KG	0 4		2 3		2		0 1		N
59	SS59J	0 0 to 1 0	METHYL ETHYL KETONE (2 BUTANONE)	0 009	J	MG/KG	0 002	X	4700		17				N
92	TEC92A	0 0 to 1 0	METHYL ETHYL KETONE (2 BUTANONE)	0 016	=	MG/KG	0 002	X	4700		17				N
92	TEC92A	0 0 to 1 0	METHYL ETHYL KETONE (2 BUTANONE)	0 038	=	MG/KG	0 002	X	4700		17				N
92	TEC92B	0 0 to 1 0	METHYL ETHYL KETONE (2-BUTANONE)	0 028	=	MG/KG	0 002	X	4700		17				N
51	SB51A	0 0 to 1 0	METHYLENE CHLORIDE	0 002	J	MG/KG			85		0 02		0 1		N
51	SS51B	0 0 to 1 0	METHYLENE CHLORIDE	0 003	J	MG/KG			85		0 02		0 1		N
59	SS59J	0 0 to 1 0	METHYLENE CHLORIDE	0 002	J	MG/KG			85		0 02		0 1		N
51	SB51A	0 0 to 1 0	NICKEL	29 9	=	MG/KG	30		160		130		30		N
51	SB51B	0 0 to 1 0	NICKEL	27 8	=	MG/KG	30		160		130		30		N
51	SB51C	0 0 to 1 0	NICKEL	57 6	=	MG/KG	30	X	160		130		30	X	Y
51	SS51A	0 0 to 1 0	NICKEL	3 9	J	MG/KG	30		160		130		30		N
51	SS51B	0 0 to 1 0	NICKEL	34 9	=	MG/KG	30	X	160		130		30	X	Y
51	SS51C	0 0 to 1 0	NICKEL	13 9	J	MG/KG	30		160		130		30		N
51	SS51D	0 0 to 1 0	NICKEL	11 8	=	MG/KG	30		160		130		30		N

TABLE M-1

Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC: Direct Exposure Value	RBC: Direct Exposure Exceedance Flag	RBC: GWP Value	RBC: GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
51	SS51D	0 0 to 1 0	NICKEL	10 2	=	MG/KG	30		160		130		30		N
52	SB52A	0 0 to 1 0	NICKEL	12 9	J	MG/KG	30		160		130		30		N
52	SB52A	0 0 to 1 0	NICKEL	19	J	MG/KG	30		160		130		30		N
52	SB52B	0 0 to 1 0	NICKEL	24 1	=	MG/KG	30		160		130		30		N
52	SB52B	0 0 to 1 0	NICKEL	26 5	=	MG/KG	30		160		130		30		N
52	SS52A	0 0 to 1 0	NICKEL	14 8	J	MG/KG	30		160		130		30		N
52	SS52B	0 0 to 1 0	NICKEL	31 8	=	MG/KG	30	X	160		130		30	X	Y
52	SS52C	0 0 to 1 0	NICKEL	25 3	=	MG/KG	30		160		130		30		N
52	SS52D	0 0 to 1 0	NICKEL	26 3	=	MG/KG	30		160		130		30		N
52	SS52E	0 0 to 1 0	NICKEL	24 9	=	MG/KG	30		160		130		30		N
59	SS59H	0 0 to 1 0	NICKEL	17	=	MG/KG	30		160		130		30		N
69	SS69A	0 0 to 1 0	NICKEL	15 6	=	MG/KG	30		160		130		30		N
92	TEC92A	0 0 to 1 0	NICKEL	13 7	J	MG/KG	30		160		130		30		N
92	TEC92A	0 0 to 1 0	NICKEL	15 7	J	MG/KG	30		160		130		30		N
92	TEC92B	0 0 to 1 0	NICKEL	16 8	J	MG/KG	30		160		130		30		N
BRAC	A(3 10)	0 0 to 0 5	NICKEL	13 5	=	MG/KG	30		160		130		30		N
BRAC	G(3 5)	0 0 to 0 0	NICKEL	18 9	=	MG/KG	30		160		130		30		N
BRAC	H(3 5)	0 0 to 0 0	NICKEL	13 7	=	MG/KG	30		160		130		30		N
BRAC	I(3 5)	0 0 to 0 0	NICKEL	20	=	MG/KG	30		160		130		30		N
BRAC	J(3 5)	0 0 to 0 0	NICKEL	20 6	=	MG/KG	30		160		130		30		N
BRAC	K(3 5)	0 0 to 0 0	NICKEL	21 1	=	MG/KG	30		160		130		30		N
BRAC	K(3 5B)	0 0 to 0 0	NICKEL	17 9	=	MG/KG	30		160		130		30		N
BRAC	L(3 5)	0 0 to 0 0	NICKEL	18 2	=	MG/KG	30		160		130		30		N
BRAC	M(3 5)	0 0 to 0 0	NICKEL	13 8	=	MG/KG	30		160		130		30		N
BRAC	N(3 5)	0 0 to 0 0	NICKEL	18 9	=	MG/KG	30		160		130		30		N
51	SS51B	0 0 to 1 0	PENTACHLOROPHENOL	0 054	J	MG/KG			5 3		0 03	X	0 002	X	Y
51	SB51A	0 0 to 1 0	PHENANTHRENE	0 23	=	MG/KG	0 61		230		250		0 1	X	N
51	SB51B	0 0 to 1 0	PHENANTHRENE	0 12	=	MG/KG	0 61		230		250		0 1	X	N
51	SS51C	0 0 to 1 0	PHENANTHRENE	0 066	J	MG/KG	0 61		230		250		0 1		N
51	SS51D	0 0 to 1 0	PHENANTHRENE	0 24	=	MG/KG	0 61		230		250		0 1	X	N
51	SS51D	0 0 to 1 0	PHENANTHRENE	0 22	=	MG/KG	0 61		230		250		0 1	X	N
52	SS52B	0 0 to 1 0	PHENANTHRENE	0 22	=	MG/KG	0 61		230		250		0 1	X	N
52	SS52C	0 0 to 1 0	PHENANTHRENE	0 075	=	MG/KG	0 61		230		250		0 1		N
52	SS52D	0 0 to 1 0	PHENANTHRENE	0 065	=	MG/KG	0 61		230		250		0 1		N
59	SB59B	0 0 to 1 0	PHENANTHRENE	0 22	=	MG/KG	0 61		230		250		0 1	X	N
59	SS59E	0 0 to 1 0	PHENANTHRENE	0 24	=	MG/KG	0 61		230		250		0 1	X	N
59	SS59F	0 0 to 1 0	PHENANTHRENE	0 076	=	MG/KG	0 61		230		250		0 1		N
59	SS59F	0 0 to 1 0	PHENANTHRENE	0 079	=	MG/KG	0 61		230		250		0 1		N
69	SB69B	0 0 to 1 0	PHENANTHRENE	0 1	=	MG/KG	0 61		230		250		0 1		N
69	SS69B	0 0 to 1 0	PHENANTHRENE	0 16	=	MG/KG	0 61		230		250		0 1	X	N
69	SS69D	0 0 to 1 0	PHENANTHRENE	0 098	=	MG/KG	0 61		230		250		0 1		N
BRAC	H(3 5)	0 0 to 0 0	PHENANTHRENE	0 072	J	MG/KG	0 61		230		250		0 1		N
BRAC	M(3 5)	0 0 to 0 0	PHENANTHRENE	1	=	MG/KG	0 61	X	230		250		0 1	X	Y
BRAC	N(3 5)	0 0 to 0 0	PHENANTHRENE	0 072	J	MG/KG	0 61		230		250		0 1		N
51	SS51C	0 0 to 1 0	POTASSIUM	1090	=	MG/KG	1820								N
52	SS52A	0 0 to 1 0	POTASSIUM	901	=	MG/KG	1820								N
59	SS59H	0 0 to 1 0	POTASSIUM	2060	=	MG/KG	1820	X							NA
69	SS69A	0 0 to 1 0	POTASSIUM	1190	=	MG/KG	1820								N
92	TEC92A	0 0 to 1 0	POTASSIUM	1790	=	MG/KG	1820								N
92	TEC92A	0 0 to 1 0	POTASSIUM	2330	=	MG/KG	1820	X							NA
92	TEC92B	0 0 to 1 0	POTASSIUM	1600	=	MG/KG	1820								N
BRAC	A(3 10)	0 0 to 0 5	POTASSIUM	1380	J	MG/KG	1820								N
BRAC	G(3 5)	0 0 to 0 0	POTASSIUM	2620	=	MG/KG	1820	X							NA
BRAC	H(3 5)	0 0 to 0 0	POTASSIUM	2160	=	MG/KG	1820	X							NA
BRAC	I(3 5)	0 0 to 0 0	POTASSIUM	3060	=	MG/KG	1820	X							NA
BRAC	J(3 5)	0 0 to 0 0	POTASSIUM	3360	=	MG/KG	1820	X							NA
BRAC	K(3 5)	0 0 to 0 0	POTASSIUM	3300	=	MG/KG	1820	X							NA
BRAC	K(3 5B)	0 0 to 0 0	POTASSIUM	2810	=	MG/KG	1820	X							NA
BRAC	L(3 5)	0 0 to 0 0	POTASSIUM	2870	=	MG/KG	1820	X							NA

TABLE M-1
Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
BRAC	M(3 5)	0 0 to 0 0	POTASSIUM	2080	=	MG/KG	1820	X							NA
BRAC	N(3 5)	0 0 to 0 0	POTASSIUM	2570	=	MG/KG	1820	X							NA
51	SB51A	0 0 to 1 0	PYRENE	0 21	=	MG/KG	1 5		230		880		0 1	X	N
51	SB51B	0 0 to 1 0	PYRENE	0 08	=	MG/KG	1 5		230		880		0 1		N
51	SS51C	0 0 to 1 0	PYRENE	0 12	J	MG/KG	1 5		230		880		0 1	X	N
51	SS51D	0 0 to 1 0	PYRENE	0 32	=	MG/KG	1 5		230		880		0 1	X	N
51	SS51D	0 0 to 1 0	PYRENE	0 3	=	MG/KG	1 5		230		880		0 1	X	N
52	SS52A	0 0 to 1 0	PYRENE	0 055	J	MG/KG	1 5		230		880		0 1		N
52	SS52B	0 0 to 1 0	PYRENE	0 33	=	MG/KG	1 5		230		880		0 1	X	N
52	SS52C	0 0 to 1 0	PYRENE	0 084	=	MG/KG	1 5		230		880		0 1		N
52	SS52D	0 0 to 1 0	PYRENE	0 061	=	MG/KG	1 5		230		880		0 1		N
59	SB59B	0 0 to 1 0	PYRENE	0 2	=	MG/KG	1 5		230		880		0 1	X	N
59	SS59E	0 0 to 1 0	PYRENE	0 27	=	MG/KG	1 5		230		880		0 1	X	N
59	SS59F	0 0 to 1 0	PYRENE	0 064	=	MG/KG	1 5		230		880		0 1		N
59	SS59F	0 0 to 1 0	PYRENE	0 072	=	MG/KG	1 5		230		880		0 1		N
69	SB69B	0 0 to 1 0	PYRENE	0 16	=	MG/KG	1 5		230		880		0 1	X	N
69	SS69B	0 0 to 1 0	PYRENE	0 16	=	MG/KG	1 5		230		880		0 1	X	N
69	SS69D	0 0 to 1 0	PYRENE	0 12	=	MG/KG	1 5		230		880		0 1	X	N
92	TEC92A	0 0 to 1 0	PYRENE	0 045	J	MG/KG	1 5		230		880		0 1		N
BRAC	H(3 5)	0 0 to 0 0	PYRENE	0 17	J	MG/KG	1 5		230		880		0 1	X	N
BRAC	I(3 5)	0 0 to 0 0	PYRENE	0 046	J	MG/KG	1 5		230		880		0 1		N
BRAC	M(3 5)	0 0 to 0 0	PYRENE	1 1	=	MG/KG	1 5		230		880		0 1	X	N
BRAC	N(3 5)	0 0 to 0 0	PYRENE	0 067	J	MG/KG	1 5		230		880		0 1		N
51	SS51B	0 0 to 1 0	SELENIUM	2 1	=	MG/KG	0 8	X	39		5		0 81	X	Y
51	SS51D	0 0 to 1 0	SELENIUM	1	=	MG/KG	0 8	X	39		5		0 81	X	Y
51	SS51D	0 0 to 1 0	SELENIUM	1 7	=	MG/KG	0 8	X	39		5		0 81	X	Y
52	SS52A	0 0 to 1 0	SELENIUM	0 58	J	MG/KG	0 8		39		5		0 81		N
92	TEC92A	0 0 to 1 0	SELENIUM	0 44	J	MG/KG	0 8		39		5		0 81		N
BRAC	H(3 5)	0 0 to 0 0	SELENIUM	0 56	J	MG/KG	0 8		39		5		0 81		N
BRAC	I(3 5)	0 0 to 0 0	SELENIUM	0 82	=	MG/KG	0 8	X	39		5		0 81	X	Y
BRAC	K(3 5)	0 0 to 0 0	SELENIUM	0 43	J	MG/KG	0 8		39		5		0 81		N
BRAC	K(3 5B)	0 0 to 0 0	SELENIUM	0 64	=	MG/KG	0 8		39		5		0 81		N
BRAC	M(3 5)	0 0 to 0 0	SELENIUM	0 42	J	MG/KG	0 8		39		5		0 81		N
BRAC	N(3 5)	0 0 to 0 0	SELENIUM	0 56	J	MG/KG	0 8		39		5		0 81		N
51	SS51C	0 0 to 1 0	SODIUM	218	J	MG/KG									NA
51	SS51B	0 0 to 1 0	TETRACHLOROETHYLENE(PCE)	0 003	J	MG/KG			12		0 06		0 01		N
59	SS59H	0 0 to 1 0	TETRACHLOROETHYLENE(PCE)	0 073	J	MG/KG			12		0 06	X	0 01	X	Y
59	SS59J	0 0 to 1 0	TETRACHLOROETHYLENE(PCE)	0 004	J	MG/KG			12		0 06		0 01		N
92	TEC92B	0 0 to 1 0	TOLUENE	0 003	J	MG/KG	0 002	X	1600		12		0 05		N
59	SS59H	0 0 to 1 0	TOTAL 1,2-DICHLOROETHENE	0 004	J	MG/KG			70				0 1		N
51	SB51A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	2 74	=	MG/KG							1	X	Y
51	SB51B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 628	=	MG/KG							1		N
51	SS51B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 077	=	MG/KG							1		N
51	SS51C	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 661	J	MG/KG							1		N
51	SS51D	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 93	=	MG/KG							1	X	Y
51	SS51D	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 8	=	MG/KG							1	X	Y
52	SS52A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 101	J	MG/KG							1		N
52	SS52B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	2 38	=	MG/KG							1	X	Y
52	SS52C	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 609	=	MG/KG							1		N
52	SS52D	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 332	=	MG/KG							1		N
59	SB59B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 63	=	MG/KG							1	X	Y
59	SS59E	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 83	=	MG/KG							1	X	Y
59	SS59F	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 22	=	MG/KG							1		N
59	SS59F	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 232	=	MG/KG							1		N
59	SS59I	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 059	=	MG/KG							1		N
69	SB69A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 073	=	MG/KG							1		N
69	SB69B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 1	=	MG/KG							1	X	Y
69	SS69B	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	1 085	=	MG/KG							1	X	Y
69	SS69D	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 671	=	MG/KG							1		N

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TABLE M-1

Summary of Detected Parameters in Surface Soil at FU2 Compared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
92	TEC92A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 04	J	MG/KG							1		N
92	TEC92A	0 0 to 1 0	Total Polynuclear Aromatic Hydrocarbons	0 095	J	MG/KG							1		N
BRAC	H(3 5)	0 0 to 0 0	Total Polynuclear Aromatic Hydrocarbons	0 938	J	MG/KG							1		N
BRAC	I(3 5)	0 0 to 0 0	Total Polynuclear Aromatic Hydrocarbons	0 1	J	MG/KG							1		N
BRAC	L(3 5)	0 0 to 0 0	Total Polynuclear Aromatic Hydrocarbons	0 046	J	MG/KG							1		N
BRAC	M(3 5)	0 0 to 0 0	Total Polynuclear Aromatic Hydrocarbons	6 963	=	MG/KG							1	X	Y
BRAC	N(3 5)	0 0 to 0 0	Total Polynuclear Aromatic Hydrocarbons	0 249	J	MG/KG							1		N
92	TEC92B	0 0 to 1 0	Total Xylenes	0 001	J	MG/KG	0 009		16000		0 2				N
59	SS59J	0 0 to 1 0	TRICHLOROETHYLENE (TCE)	0 003	J	MG/KG			58		0 06		0 001	X	Y
51	SS51C	0 0 to 1 0	VANADIUM	21 1	=	MG/KG	48 4		55		6000		2	X	N
52	SS52A	0 0 to 1 0	VANADIUM	24 8	=	MG/KG	48 4		55		6000		2	X	N
59	SS59H	0 0 to 1 0	VANADIUM	30 9	=	MG/KG	48 4		55		6000		2	X	N
69	SS69A	0 0 to 1 0	VANADIUM	26 1	J	MG/KG	48 4		55		6000		2	X	N
92	TEC92A	0 0 to 1 0	VANADIUM	20 1	=	MG/KG	48 4		55		6000		2	X	N
92	TEC92A	0 0 to 1 0	VANADIUM	25 2	=	MG/KG	48 4		55		6000		2	X	N
92	TEC92B	0 0 to 1 0	VANADIUM	17	=	MG/KG	48 4		55		6000		2	X	N
BRAC	A(3 10)	0 0 to 0 5	VANADIUM	21 6	J	MG/KG	48 4		55		6000		2	X	N
BRAC	G(3 5)	0 0 to 0 0	VANADIUM	28 2	=	MG/KG	48 4		55		6000		2	X	N
BRAC	H(3 5)	0 0 to 0 0	VANADIUM	21	=	MG/KG	48 4		55		6000		2	X	N
BRAC	I(3 5)	0 0 to 0 0	VANADIUM	29 4	=	MG/KG	48 4		55		6000		2	X	N
BRAC	J(3 5)	0 0 to 0 0	VANADIUM	37 2	=	MG/KG	48 4		55		6000		2	X	N
BRAC	K(3 5)	0 0 to 0 0	VANADIUM	32 9	=	MG/KG	48 4		55		6000		2	X	N
BRAC	K(3 5B)	0 0 to 0 0	VANADIUM	29 8	=	MG/KG	48 4		55		6000		2	X	N
BRAC	L(3 5)	0 0 to 0 0	VANADIUM	32 5	=	MG/KG	48 4		55		6000		2	X	N
BRAC	M(3 5)	0 0 to 0 0	VANADIUM	23 5	=	MG/KG	48 4		55		6000		2	X	N
BRAC	N(3 5)	0 0 to 0 0	VANADIUM	28 3	=	MG/KG	48 4		55		6000		2	X	N
51	SB51A	0 0 to 1 0	ZINC	146	=	MG/KG	126	X	2300		12000		50	X	Y
51	SB51B	0 0 to 1 0	ZINC	95 8	=	MG/KG	126		2300		12000		50	X	N
51	SB51C	0 0 to 1 0	ZINC	127	=	MG/KG	126	X	2300		12000		50	X	Y
51	SS51A	0 0 to 1 0	ZINC	10 8	J	MG/KG	126		2300		12000		50		N
51	SS51B	0 0 to 1 0	ZINC	142	=	MG/KG	126	X	2300		12000		50	X	Y
51	SS51C	0 0 to 1 0	ZINC	58 1	J	MG/KG	126		2300		12000		50	X	N
51	SS51D	0 0 to 1 0	ZINC	44	J	MG/KG	126		2300		12000		50		N
51	SS51D	0 0 to 1 0	ZINC	37 4	J	MG/KG	126		2300		12000		50		N
52	SB52A	0 0 to 1 0	ZINC	58	J	MG/KG	126		2300		12000		50	X	N
52	SB52A	0 0 to 1 0	ZINC	65 6	J	MG/KG	126		2300		12000		50	X	N
52	SB52B	0 0 to 1 0	ZINC	75 7	=	MG/KG	126		2300		12000		50	X	N
52	SB52B	0 0 to 1 0	ZINC	66 2	=	MG/KG	126		2300		12000		50	X	N
52	SS52A	0 0 to 1 0	ZINC	75	J	MG/KG	126		2300		12000		50	X	N
52	SS52B	0 0 to 1 0	ZINC	426	=	MG/KG	126	X	2300		12000		50	X	Y
52	SS52C	0 0 to 1 0	ZINC	85 3	=	MG/KG	126		2300		12000		50	X	N
52	SS52D	0 0 to 1 0	ZINC	71 1	=	MG/KG	126		2300		12000		50	X	N
52	SS52E	0 0 to 1 0	ZINC	91 3	=	MG/KG	126		2300		12000		50	X	N
59	SS59H	0 0 to 1 0	ZINC	63 3	=	MG/KG	126		2300		12000		50	X	N
69	SS69A	0 0 to 1 0	ZINC	57 8	=	MG/KG	126		2300		12000		50	X	N
92	TEC92A	0 0 to 1 0	ZINC	72 8	J	MG/KG	126		2300		12000		50	X	N
92	TEC92A	0 0 to 1 0	ZINC	75 2	J	MG/KG	126		2300		12000		50	X	N
92	TEC92B	0 0 to 1 0	ZINC	46 9	J	MG/KG	126		2300		12000		50		N
BRAC	A(3 10)	0 0 to 0 5	ZINC	84 9	J	MG/KG	126		2300		12000		50	X	N
BRAC	G(3 5)	0 0 to 0 0	ZINC	58 6	=	MG/KG	126		2300		12000		50	X	N
BRAC	H(3 5)	0 0 to 0 0	ZINC	65 4	=	MG/KG	126		2300		12000		50	X	N
BRAC	I(3 5)	0 0 to 0 0	ZINC	62 2	=	MG/KG	126		2300		12000		50	X	N
BRAC	J(3 5)	0 0 to 0 0	ZINC	68 1	=	MG/KG	126		2300		12000		50	X	N
BRAC	K(3 5)	0 0 to 0 0	ZINC	73 9	=	MG/KG	126		2300		12000		50	X	N
BRAC	K(3 5B)	0 0 to 0 0	ZINC	64 2	=	MG/KG	126		2300		12000		50	X	N
BRAC	L(3 5)	0 0 to 0 0	ZINC	63 7	=	MG/KG	126		2300		12000		50	X	N
BRAC	M(3 5)	0 0 to 0 0	ZINC	49 7	=	MG/KG	126		2300		12000		50		N
BRAC	N(3 5)	0 0 to 0 0	ZINC	83 5	=	MG/KG	126		2300		12000		50	X	N

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TABLE M-2
Summary of Detected Parameters in Subsurface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Exceeded Criteria Flag
51	SB51A	9 0 to 11 0	ACETONE	0 03	=	MG/KG			16		N
51	SB51B	9 0 to 12 0	ACETONE	0 074	=	MG/KG			16		N
51	SB51C	8 0 to 10 0	ACETONE	0 006	J	MG/KG			16		N
	GT27	8 0 to 10 0	ALKALINITY, TOTAL (AS CaCO3)	234	=	MG/KG					NA
	GT59	8 0 to 10 0	ALKALINITY, TOTAL (AS CaCO3)	193	=	MG/KG					NA
59	SB59C	8 0 to 10 0	ALUMINUM	9650	=	MG/KG	21829				N
59	SB59C	8 0 to 10 0	ANTIMONY	0 58	J	MG/KG			5		N
51	SB51A	9 0 to 11 0	ARSENIC	24 7	=	MG/KG	17	X	29		N
51	SB51A	5 0 to 7 0	ARSENIC	4 8	=	MG/KG	17		29		N
51	SB51B	6 0 to 8 0	ARSENIC	7 7	=	MG/KG	17		29		N
51	SB51B	9 0 to 12 0	ARSENIC	9	=	MG/KG	17		29		N
51	SB51C	5 0 to 6 0	ARSENIC	15 4	=	MG/KG	17		29		N
51	SB51C	8 0 to 10 0	ARSENIC	19 5	=	MG/KG	17	X	29		N
52	SB52A	4 0 to 6 0	ARSENIC	17 2	=	MG/KG	17	X	29		N
52	SB52A	8 0 to 10 0	ARSENIC	19	=	MG/KG	17	X	29		N
52	SB52B	4 0 to 6 0	ARSENIC	17 9	=	MG/KG	17	X	29		N
52	SB52B	8 0 to 10 0	ARSENIC	7 7	=	MG/KG	17		29		N
59	SB59C	8 0 to 10 0	ARSENIC	7 8	=	MG/KG	17		29		N
59	SB59C	8 0 to 10 0	BARIUM	97	=	MG/KG	300		1600		N
51	SB51A	9 0 to 11 0	BERYLLIUM	1 4	=	MG/KG	1 2	X	63		N
51	SB51A	5 0 to 7 0	BERYLLIUM	0 27	J	MG/KG	1 2		63		N
51	SB51C	5 0 to 6 0	BERYLLIUM	1	=	MG/KG	1 2		63		N
51	SB51C	8 0 to 10 0	BERYLLIUM	1 4	=	MG/KG	1 2	X	63		N
52	SB52A	8 0 to 10 0	BERYLLIUM	1 3	=	MG/KG	1 2	X	63		N
59	SB59C	8 0 to 10 0	BERYLLIUM	0 41	J	MG/KG	1 2		63		N
51	SB51A	9 0 to 11 0	bis(2-ETHYLHEXYL) PHTHALATE	0 23	J	MG/KG			3600		N
51	SB51B	6 0 to 8 0	bis(2-ETHYLHEXYL) PHTHALATE	0 079	J	MG/KG			3600		N
51	SB51C	5 0 to 6 0	bis(2-ETHYLHEXYL) PHTHALATE	1 6	=	MG/KG			3600		N
51	SB51C	8 0 to 10 0	bis(2-ETHYLHEXYL) PHTHALATE	0 19	J	MG/KG			3600		N
59	SB59C	8 0 to 10 0	bis(2-ETHYLHEXYL) PHTHALATE	0 13	J	MG/KG			3600		N
51	SB51B	6 0 to 8 0	BROMOMETHANE	0 002	J	MG/KG			0 2		N
51	SB51B	9 0 to 12 0	BROMOMETHANE	0 001	J	MG/KG			0 2		N
52	SB52B	4 0 to 6 0	CADMIUM	1 5	=	MG/KG	1 4	X	8		N
59	SB59C	8 0 to 10 0	CADMIUM	0 15	J	MG/KG	1 4		8		N
59	SB59C	8 0 to 10 0	CALCIUM	1980	=	MG/KG	2432				N
51	SB51A	9 0 to 11 0	CHROMIUM, TOTAL	32 7	=	MG/KG	26 4	X	38		N
51	SB51A	5 0 to 7 0	CHROMIUM, TOTAL	10 5	=	MG/KG	26 4		38		N
51	SB51B	6 0 to 8 0	CHROMIUM, TOTAL	17 1	=	MG/KG	26 4		38		N
51	SB51B	9 0 to 12 0	CHROMIUM, TOTAL	17 2	=	MG/KG	26 4		38		N
51	SB51C	5 0 to 6 0	CHROMIUM, TOTAL	25 6	=	MG/KG	26 4		38		N
51	SB51C	8 0 to 10 0	CHROMIUM, TOTAL	49 1	=	MG/KG	26 4	X	38	X	Y
52	SB52A	4 0 to 6 0	CHROMIUM TOTAL	37 6	=	MG/KG	26 4	X	38		N
52	SB52A	8 0 to 10 0	CHROMIUM TOTAL	53 2	=	MG/KG	26 4	X	38	X	Y
52	SB52B	4 0 to 6 0	CHROMIUM TOTAL	31	=	MG/KG	26 4	X	38		N
52	SB52B	8 0 to 10 0	CHROMIUM, TOTAL	32 9	=	MG/KG	26 4	X	38		N
59	SB59C	8 0 to 10 0	CHROMIUM, TOTAL	12 9	=	MG/KG	26 4		38		N
59	SB59C	8 0 to 10 0	COBALT	4 7	J	MG/KG	20 4				N
51	SB51A	9 0 to 11 0	COPPER	28	=	MG/KG	32 7				N
51	SB51A	5 0 to 7 0	COPPER	11 2	J	MG/KG	32 7				N
51	SB51B	6 0 to 8 0	COPPER	18 9	=	MG/KG	32 7				N
51	SB51B	9 0 to 12 0	COPPER	18	=	MG/KG	32 7				N
51	SB51C	5 0 to 6 0	COPPER	23 4	=	MG/KG	32 7				N
51	SB51C	8 0 to 10 0	COPPER	30 1	=	MG/KG	32 7				N
52	SB52A	4 0 to 6 0	COPPER	36 1	=	MG/KG	32 7	X			NA
52	SB52A	8 0 to 10 0	COPPER	31	=	MG/KG	32 7				N
52	SB52B	4 0 to 6 0	COPPER	22 8	=	MG/KG	32 7				N
52	SB52B	8 0 to 10 0	COPPER	18 8	=	MG/KG	32 7				N
59	SB59C	8 0 to 10 0	COPPER	14	=	MG/KG	32 7				N
BRAC	B(3 5)	0 0 to 4 0	DDE	0 0057	J	MG/KG	0 0015	X	54		N
52	SB52B	8 0 to 10 0	DDT	0 0018	J	MG/KG	0 0072		11		N
52	SB52A	8 0 to 10 0	DIELDRIN	0 0017	J	MG/KG	0 37		0 004		N
52	SB52B	4 0 to 6 0	DIELDRIN	0 0053	J	MG/KG	0 37		0 004	X	N
52	SB52B	8 0 to 10 0	DIELDRIN	0 0018	J	MG/KG	0 37		0 004		N
BRAC	B(3 5)	0 0 to 4 0	DIELDRIN	0 042	=	MG/KG	0 37		0 004	X	N
BRAC	D(3 5)	0 0 to 4 0	DIELDRIN	0 047	=	MG/KG	0 37		0 004	X	N
BRAC	D(3 5)	7 0 to 10 0	DIELDRIN	0 016	=	MG/KG	0 37		0 004	X	N
59	SB59C	8 0 to 10 0	IRON	16500	=	MG/KG	38480				N
51	SB51A	9 0 to 11 0	LEAD	32 9	=	MG/KG	23 9	X			NA
51	SB51A	5 0 to 7 0	LEAD	9 6	=	MG/KG	23 9				N
51	SB51B	6 0 to 8 0	LEAD	17 5	=	MG/KG	23 9				N
51	SB51B	9 0 to 12 0	LEAD	15 9	=	MG/KG	23 9				N

TABLE M-2
Summary of Detected Parameters in Subsurface Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Exceeded Criteria Flag
51	SB51C	5 0 to 6 0	LEAD	19 8	=	MG/KG	23 9				N
51	SB51C	8 0 to 10 0	LEAD	24 7	=	MG/KG	23 9	X			NA
52	SB52A	4 0 to 6 0	LEAD	31 7	=	MG/KG	23 9	X			NA
52	SB52A	8 0 to 10 0	LEAD	27 4	=	MG/KG	23 9	X			NA
52	SB52B	4 0 to 6 0	LEAD	22 9	=	MG/KG	23 9				N
52	SB52B	8 0 to 10 0	LEAD	24 2	=	MG/KG	23 9	X			NA
59	SB59C	8 0 to 10 0	LEAD	8	=	MG/KG	23 9				N
59	SB59C	8 0 to 10 0	MAGNESIUM	2380	=	MG/KG	4900				N
59	SB59C	8 0 to 10 0	MANGANESE	334	=	MG/KG	1540				N
51	SB51A	9 0 to 11 0	METHYL ETHYL KETONE (2-BUTANONE)	0 003	J	MG/KG			17		N
51	SB51A	9 0 to 11 0	NICKEL	32 2	=	MG/KG	36 6		130		N
51	SB51A	5 0 to 7 0	NICKEL	11 9	J	MG/KG	36 6		130		N
51	SB51B	6 0 to 8 0	NICKEL	24 4	=	MG/KG	36 6		130		N
51	SB51B	9 0 to 12 0	NICKEL	20 4	=	MG/KG	36 6		130		N
51	SB51C	5 0 to 6 0	NICKEL	23 4	=	MG/KG	36 6		130		N
51	SB51C	8 0 to 10 0	NICKEL	31 2	=	MG/KG	36 6		130		N
52	SB52A	4 0 to 6 0	NICKEL	40 2	=	MG/KG	36 6	X	130		N
52	SB52A	8 0 to 10 0	NICKEL	35 2	=	MG/KG	36 6		130		N
52	SB52B	4 0 to 6 0	NICKEL	25 1	=	MG/KG	36 6		130		N
52	SB52B	8 0 to 10 0	NICKEL	23 4	=	MG/KG	36 6		130		N
59	SB59C	8 0 to 10 0	NICKEL	14 3	=	MG/KG	36 6		130		N
	GT27	8 0 to 10 0	pH	6 1	=	PH UNITS					NA
	GT59	8 0 to 10 0	pH	6 4	=	PH UNITS					NA
59	SB59C	8 0 to 10 0	POTASSIUM	2900	=	MG/KG	1800	X			NA
51	SB51A	9 0 to 11 0	SELENIUM	1 6	=	MG/KG	0 6	X	5		N
59	SB59C	8 0 to 10 0	SELENIUM	1 3	=	MG/KG	0 6	X	5		N
59	SB59C	8 0 to 10 0	Total Xylenes	0 001	J	MG/KG	0 002		0 2		N
59	SB59C	8 0 to 10 0	VANADIUM	25 5	=	MG/KG	51 3		6000		N
51	SB51A	9 0 to 11 0	ZINC	109	=	MG/KG	114		12000		N
51	SB51A	5 0 to 7 0	ZINC	36 9	J	MG/KG	114		12000		N
51	SB51B	6 0 to 8 0	ZINC	66 6	=	MG/KG	114		12000		N
51	SB51B	9 0 to 12 0	ZINC	59 3	=	MG/KG	114		12000		N
51	SB51C	5 0 to 6 0	ZINC	80	=	MG/KG	114		12000		N
51	SB51C	8 0 to 10 0	ZINC	99 5	=	MG/KG	114		12000		N
52	SB52A	4 0 to 6 0	ZINC	133	=	MG/KG	114	X	12000		N
52	SB52A	8 0 to 10 0	ZINC	110	=	MG/KG	114		12000		N
52	SB52B	4 0 to 6 0	ZINC	82 5	=	MG/KG	114		12000		N
52	SB52B	8 0 to 10 0	ZINC	60 8	=	MG/KG	114		12000		N
59	SB59C	8 0 to 10 0	ZINC	39 3	=	MG/KG	114		12000		N

TABLE M-3
Summary of Detected Parameters in Surface Water at FU2 Compared to Backgound and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Regulatory Criterion Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
25	SW25B2	ALUMINUM	0 064	J	MG/L	5 077			0 087		N
25	SW25B2	ALUMINUM	0 0498	J	MG/L	5 077			0 087		N
25	SW25E	ALUMINUM	0 351	=	MG/L	5 077			0 087	X	N
25	SW25F	ALUMINUM	0 25	=	MG/L	5 077			0 087	X	N
25	SW25G	ALUMINUM	0 262	=	MG/L	5 077			0 087	X	N
26	SW26C1	ALUMINUM	0 576	=	MG/L	5 077			0 087	X	N
26	SW26C2	ALUMINUM	0 118	J	MG/L	5 077			0 087	X	N
26	SW26E	ALUMINUM	0 0892	J	MG/L	5 077			0 087	X	N
26	SW26F	ALUMINUM	0 0843	J	MG/L	5 077			0 087		N
26	SW26H	ALUMINUM	0 052	J	MG/L	5 077			0 087		N
25	SW25B2	Aluminum, Dissolved	0 014	J	MG/L	0 471			0 087		N
25	SW25B2	Aluminum, Dissolved	0 0147	J	MG/L	0 471			0 087		N
26	SW26C2	Aluminum, Dissolved	0 0814	J	MG/L	0 471			0 087		N
25	SW25A1	ARSENIC	0 013	=	MG/L	0 018		X	0 19		N
25	SW25C1	ARSENIC	0 0026	J	MG/L	0 018		X	0 19		N
25	SW25C2	ARSENIC	0 0038	J	MG/L	0 018		X	0 19		N
25	SW25D1	ARSENIC	0 008	J	MG/L	0 018		X	0 19		N
25	SW25D2	ARSENIC	0 0153	=	MG/L	0 018		X	0 19		N
25	SW25F	ARSENIC	0 017	=	MG/L	0 018		X	0 19		N
26	SW26A1	ARSENIC	0 0123	=	MG/L	0 018		X	0 19		N
26	SW26A2	ARSENIC	0 0123	=	MG/L	0 018		X	0 19		N
26	SW26B1	ARSENIC	0 0364	=	MG/L	0 018	X	X	0 19		Y
26	SW26B2	ARSENIC	0 0223	=	MG/L	0 018	X	X	0 19		Y
26	SW26D1	ARSENIC	0 0629	=	MG/L	0 018	X	X	0 19		Y
26	SW26D2	ARSENIC	0 0774	=	MG/L	0 018	X	X	0 19		Y
51	SW51C	ARSENIC	0 006	J	MG/L	0 018		X	0 19		N
52	SW52A	ARSENIC	0 0027	J	MG/L	0 018		X	0 19		N
52	SW52B	ARSENIC	0 0041	J	MG/L	0 018		X	0 19		N
25	SW25A1	Arsenic, Dissolved	0 0084	J	MG/L	0 012			0 19		N
25	SW25B1	Arsenic, Dissolved	0 0025	J	MG/L	0 012			0 19		N
25	SW25B2	Arsenic, Dissolved	0 0018	J	MG/L	0 012			0 19		N
25	SW25C2	Arsenic, Dissolved	0 0034	J	MG/L	0 012			0 19		N
25	SW25D1	Arsenic, Dissolved	0 0073	J	MG/L	0 012			0 19		N
25	SW25D2	Arsenic, Dissolved	0 0084	J	MG/L	0 012			0 19		N
26	SW26A1	Arsenic, Dissolved	0 0078	J	MG/L	0 012			0 19		N

TABLE M-3
Summary of Detected Parameters in Surface Water at FU2 Compared to Backgound and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Regulatory Criterion Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	SW26A2	Arsenic, Dissolved	0 0099	J	MG/L	0 012			0 19		N
26	SW26B1	Arsenic, Dissolved	0 0096	J	MG/L	0 012			0 19		N
26	SW26B2	Arsenic, Dissolved	0 0193	=	MG/L	0 012	X		0 19		N
26	SW26C1	Arsenic, Dissolved	0 0024	J	MG/L	0 012			0 19		N
26	SW26D1	Arsenic, Dissolved	0 0216	=	MG/L	0 012	X		0 19		N
26	SW26D2	Arsenic, Dissolved	0 0405	=	MG/L	0 012	X		0 19		N
51	SW51C	Arsenic, Dissolved	0 0036	J	MG/L	0 012			0 19		N
52	SW52A	Arsenic, Dissolved	0 0043	J	MG/L	0 012			0 19		N
52	SW52B	Arsenic, Dissolved	0 0033	J	MG/L	0 012			0 19		N
25	SW25E	BARIUM	0 0177	J	MG/L	0 1253					N
25	SW25F	BARIUM	0 0172	J	MG/L	0 1253					N
25	SW25G	BARIUM	0 0167	J	MG/L	0 1253					N
26	SW26E	BARIUM	0 0131	J	MG/L	0 1253					N
26	SW26F	BARIUM	0 013	J	MG/L	0 1253					N
26	SW26G	BARIUM	0 0127	J	MG/L	0 1253					N
26	SW26G	BARIUM	0 0127	J	MG/L	0 1253					N
26	SW26H	BARIUM	0 0132	J	MG/L	0 1253					N
26	SW26I	BARIUM	0 0128	J	MG/L	0 1253					N
26	SW26I	bis(2-ETHYLHEXYL) PHTHALATE	0 001	J	MG/L				0 0003	X	Y
25	SW25B1	CALCIUM	2 49	J	MG/L	31 8					N
25	SW25B1	CALCIUM	2 44	J	MG/L	31 8					N
25	SW25B2	CALCIUM	8 37	=	MG/L	31 8					N
25	SW25B2	CALCIUM	8 15	=	MG/L	31 8					N
25	SW25E	CALCIUM	8 92	=	MG/L	31 8					N
25	SW25F	CALCIUM	9 34	=	MG/L	31 8					N
25	SW25G	CALCIUM	9 13	=	MG/L	31 8					N
26	SW26C1	CALCIUM	4 2	J	MG/L	31 8					N
26	SW26C2	CALCIUM	9 08	=	MG/L	31 8					N
26	SW26E	CALCIUM	6 64	=	MG/L	31 8					N
26	SW26F	CALCIUM	6 78	=	MG/L	31 8					N
26	SW26G	CALCIUM	6 66	=	MG/L	31 8					N
26	SW26G	CALCIUM	6 69	=	MG/L	31 8					N
26	SW26H	CALCIUM	6 78	=	MG/L	31 8					N
26	SW26I	CALCIUM	6 71	=	MG/L	31 8					N
25	SW25B1	Calcium, Dissolved	2 29	J	MG/L	30 2					N

TABLE M-3

Summary of Detected Parameters in Surface Water at FU2 Compared to Backgound and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Regulatory Criterion Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
25	SW25B1	Calcium, Dissolved	2 68	J	MG/L	30 2					N
25	SW25B2	Calcium, Dissolved	7 49	=	MG/L	30 2					N
25	SW25B2	Calcium, Dissolved	8 05	=	MG/L	30 2					N
26	SW26C1	Calcium, Dissolved	3 34	J	MG/L	30 2					N
26	SW26C2	Calcium, Dissolved	9 62	=	MG/L	30 2					N
25	SW25E	CHROMIUM, TOTAL	0 0011	J	MG/L	0 0361			0 011		N
26	SW26A2	CHROMIUM, TOTAL	0 014	=	MG/L	0 0361			0 011	X	N
26	SW26B1	CHROMIUM, TOTAL	0 0101	=	MG/L	0 0361			0 011		N
26	SW26D1	CHROMIUM, TOTAL	0 0128	=	MG/L	0 0361			0 011	X	N
26	SW26D2	CHROMIUM, TOTAL	0 0186	=	MG/L	0 0361			0 011	X	N
26	SW26D1	COPPER	0 0213	J	MG/L	0 0746			0 00654	X	N
26	SW26D2	COPPER	0 0216	J	MG/L	0 0746			0 00654	X	N
52	SW52A	COPPER	0 0046	J	MG/L	0 0746			0 00654		N
25	SW25B1	DDE	0 000032	J	MG/L			X	0 0105		Y
26	SW26A1	DDE	0 000031	J	MG/L			X	0 0105		Y
26	SW26B1	DDE	0 000029	J	MG/L			X	0 0105		Y
26	SW26C1	DDE	0 000058	J	MG/L			X	0 0105		Y
26	SW26D1	DDE	0 000026	J	MG/L			X	0 0105		Y
26	SW26A1	DDT	0 000047	J	MG/L			X	0 000001	X	Y
26	SW26C1	DDT	0 00015	=	MG/L			X	0 000001	X	Y
26	SW26D1	DDT	0 000054	J	MG/L			X	0 000001	X	Y
25	SW25A1	DIELDRIN	0 00043	=	MG/L			X	0 0000019	X	Y
25	SW25B1	DIELDRIN	0 00016	=	MG/L			X	0 0000019	X	Y
25	SW25C2	DIELDRIN	0 000044	J	MG/L			X	0 0000019	X	Y
25	SW25D1	DIELDRIN	0 000053	J	MG/L			X	0 0000019	X	Y
25	SW25D2	DIELDRIN	0 000045	J	MG/L			X	0 0000019	X	Y
26	SW26A1	DIELDRIN	0 000093	J	MG/L			X	0 0000019	X	Y
26	SW26A2	DIELDRIN	0 0001	=	MG/L			X	0 0000019	X	Y
26	SW26B1	DIELDRIN	0 000035	J	MG/L			X	0 0000019	X	Y
26	SW26D2	DIELDRIN	0 00028	=	MG/L			X	0 0000019	X	Y
51	SW51A	DIELDRIN	0 00022	=	MG/L			X	0 0000019	X	Y
51	SW51C	DIELDRIN	0 0001	=	MG/L			X	0 0000019	X	Y
52	SW52A	DIELDRIN	0 000066	J	MG/L			X	0 0000019	X	Y
25	SW25B1	IRON	0 306	=	MG/L	6 1035		X	1		N
25	SW25B1	IRON	0 245	=	MG/L	6 1035			1		N

TABLE M-3

Summary of Detected Parameters in Surface Water at FU2 Compared to Backgound and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Regulatory Criterion Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
25	SW25B2	IRON	0 417	=	MG/L	6 1035		X	1		N
25	SW25B2	IRON	0 432	=	MG/L	6 1035		X	1		N
25	SW25E	IRON	0 797	=	MG/L	6 1035		X	1		N
25	SW25F	IRON	0 604	=	MG/L	6 1035		X	1		N
25	SW25G	IRON	0 587	=	MG/L	6 1035		X	1		N
26	SW26C1	IRON	0 835	=	MG/L	6 1035		X	1		N
26	SW26E	IRON	0 269	=	MG/L	6 1035			1		N
26	SW26F	IRON	0 219	=	MG/L	6 1035			1		N
26	SW26G	IRON	0 149	=	MG/L	6 1035			1		N
26	SW26G	IRON	0 156	=	MG/L	6 1035			1		N
26	SW26H	IRON	0 189	=	MG/L	6 1035			1		N
26	SW26I	IRON	0 166	=	MG/L	6 1035			1		N
25	SW25B2	Iron, Dissolved	0 253	=	MG/L	0 1201	X		1		N
25	SW25B2	Iron, Dissolved	0 215	=	MG/L	0 1201	X		1		N
25	SW25A1	LEAD	0 0169	J	MG/L	0 0186			0 00132	X	N
25	SW25B1	LEAD	0 0052	J	MG/L	0 0186			0 00132	X	N
25	SW25B1	LEAD	0 0026	J	MG/L	0 0186			0 00132	X	N
25	SW25C1	LEAD	0 0023	J	MG/L	0 0186			0 00132	X	N
25	SW25D1	LEAD	0 005	J	MG/L	0 0186			0 00132	X	N
25	SW25D2	LEAD	0 0162	J	MG/L	0 0186			0 00132	X	N
26	SW26A1	LEAD	0 0089	J	MG/L	0 0186			0 00132	X	N
26	SW26A2	LEAD	0 0081	J	MG/L	0 0186			0 00132	X	N
26	SW26B1	LEAD	0 0188	J	MG/L	0 0186	X		0 00132	X	Y
26	SW26B2	LEAD	0 0037	J	MG/L	0 0186			0 00132	X	N
26	SW26C1	LEAD	0 011	J	MG/L	0 0186			0 00132	X	N
26	SW26D1	LEAD	0 0262	J	MG/L	0 0186	X		0 00132	X	Y
26	SW26D2	LEAD	0 0224	J	MG/L	0 0186	X		0 00132	X	Y
51	SW51A	LEAD	0 0022	J	MG/L	0 0186			0 00132	X	N
51	SW51B	LEAD	0 0168	=	MG/L	0 0186			0 00132	X	N
51	SW51C	LEAD	0 0594	=	MG/L	0 0186	X	X	0 00132	X	Y
52	SW52A	LEAD	0 003	J	MG/L	0 0186			0 00132	X	N
52	SW52B	LEAD	0 0023	J	MG/L	0 0186			0 00132	X	N
25	SW25D1	Lead, Dissolved	0 0023	J	MG/L	0 0226			0 00132	X	N
26	SW26D1	Lead, Dissolved	0 0031	J	MG/L	0 0226			0 00132	X	N
51	SW51B	Lead, Dissolved	0 0064	=	MG/L	0 0226			0 00132	X	N

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TABLE M-3

Summary of Detected Parameters in Surface Water at FU2 Compared to Backgound and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Regulatory Criterion Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
51	SW51C	Lead, Dissolved	0 0313	=	MG/L	0 0226	X		0 00132	X	Y
25	SW25B1	MAGNESIUM	0 286	J	MG/L	7 7018					N
25	SW25B1	MAGNESIUM	0 271	J	MG/L	7 7018					N
25	SW25B2	MAGNESIUM	1 58	J	MG/L	7 7018					N
25	SW25B2	MAGNESIUM	1 57	J	MG/L	7 7018					N
25	SW25E	MAGNESIUM	2 3	J	MG/L	7 7018					N
25	SW25F	MAGNESIUM	2 37	J	MG/L	7 7018					N
25	SW25G	MAGNESIUM	2 33	J	MG/L	7 7018					N
26	SW26C1	MAGNESIUM	0 388	J	MG/L	7 7018					N
26	SW26C2	MAGNESIUM	1 28	J	MG/L	7 7018					N
26	SW26E	MAGNESIUM	0 737	J	MG/L	7 7018					N
26	SW26F	MAGNESIUM	0 752	J	MG/L	7 7018					N
26	SW26G	MAGNESIUM	0 714	J	MG/L	7 7018					N
26	SW26G	MAGNESIUM	0 719	J	MG/L	7 7018					N
26	SW26H	MAGNESIUM	0 73	J	MG/L	7 7018					N
26	SW26I	MAGNESIUM	0 71	J	MG/L	7 7018					N
25	SW25B1	Magnesium, Dissolved	0 263	J	MG/L	6 8645					N
25	SW25B1	Magnesium, Dissolved	0 418	J	MG/L	6 8645					N
25	SW25B2	Magnesium, Dissolved	1 62	J	MG/L	6 8645					N
25	SW25B2	Magnesium, Dissolved	1 57	J	MG/L	6 8645					N
26	SW26C1	Magnesium, Dissolved	0 213	J	MG/L	6 8645					N
26	SW26C2	Magnesium, Dissolved	1 4	J	MG/L	6 8645					N
25	SW25B1	MANGANESE	0 0167	=	MG/L	0 6562					N
25	SW25B1	MANGANESE	0 0146	J	MG/L	0 6562					N
25	SW25B2	MANGANESE	0 0684	=	MG/L	0 6562		X			N
25	SW25B2	MANGANESE	0 0698	=	MG/L	0 6562		X			N
25	SW25E	MANGANESE	0 0659	=	MG/L	0 6562		X			N
25	SW25F	MANGANESE	0 0562	=	MG/L	0 6562		X			N
25	SW25G	MANGANESE	0 0547	=	MG/L	0 6562		X			N
26	SW26C1	MANGANESE	0 0461	=	MG/L	0 6562					N
26	SW26C2	MANGANESE	0 0084	J	MG/L	0 6562					N
26	SW26E	MANGANESE	0 0203	=	MG/L	0 6562					N
26	SW26F	MANGANESE	0 0267	=	MG/L	0 6562					N
26	SW26G	MANGANESE	0 0178	=	MG/L	0 6562					N
26	SW26G	MANGANESE	0 0179	=	MG/L	0 6562					N

TABLE M-3
Summary of Detected Parameters in Surface Water at FU2 Compared to Backgound and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Regulatory Criterion Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	SW26H	MANGANESE	0 0205	=	MG/L	0 6562					N
26	SW26I	MANGANESE	0 0197	=	MG/L	0 6562					N
25	SW25B1	Manganese, Dissolved	0 0103	J	MG/L	0 352					N
25	SW25B1	Manganese, Dissolved	0 0097	J	MG/L	0 352					N
26	SW26C1	Manganese, Dissolved	0 0207	=	MG/L	0 352					N
26	SW26C2	Manganese, Dissolved	0 0074	J	MG/L	0 352					N
26	SW26G	MERCURY	0 00009	J	MG/L				0 000012	X	Y
26	SW26B1	NICKEL	0 0117	J	MG/L	0 228			0 08771		N
26	SW26D1	NICKEL	0 016	J	MG/L	0 228			0 08771		N
26	SW26D2	NICKEL	0 0175	J	MG/L	0 228			0 08771		N
26	SW26G	NICKEL	0 00049	J	MG/L	0 228			0 08771		N
51	SW51A	NICKEL	0 0061	J	MG/L	0 228			0 08771		N
51	SW51C	NICKEL	0 007	J	MG/L	0 228			0 08771		N
25	SW25B2	POTASSIUM	2 73	J	MG/L	7 28					N
25	SW25B2	POTASSIUM	2 54	J	MG/L	7 28					N
25	SW25E	POTASSIUM	3 95	J	MG/L	7 28					N
25	SW25F	POTASSIUM	3 11	J	MG/L	7 28					N
25	SW25G	POTASSIUM	3 76	J	MG/L	7 28					N
26	SW26C2	POTASSIUM	1 91	J	MG/L	7 28					N
26	SW26E	POTASSIUM	1 25	J	MG/L	7 28					N
26	SW26F	POTASSIUM	1 01	J	MG/L	7 28					N
26	SW26G	POTASSIUM	1 51	J	MG/L	7 28					N
26	SW26G	POTASSIUM	1 4	J	MG/L	7 28					N
26	SW26H	POTASSIUM	1 19	J	MG/L	7 28					N
26	SW26I	POTASSIUM	1 03	J	MG/L	7 28					N
25	SW25B2	Potassium, Dissolved	2 55	J	MG/L	6 72					N
25	SW25B2	Potassium, Dissolved	2 58	J	MG/L	6 72					N
26	SW26C1	Potassium, Dissolved	0 751	J	MG/L	6 72					N
26	SW26C2	Potassium, Dissolved	1 43	J	MG/L	6 72					N
26	SW26I	SELENIUM	0 0058	=	MG/L				0 005	X	Y
25	SW25B2	SODIUM	1 08	J	MG/L	21 4					N
25	SW25B2	SODIUM	0 993	J	MG/L	21 4					N
26	SW26C1	SODIUM	0 975	J	MG/L	21 4					N
26	SW26C2	SODIUM	0 963	J	MG/L	21 4					N
26	SW26C2	Sodium, Dissolved	0 907	J	MG/L	21 6					N

TABLE M-3

Summary of Detected Parameters in Surface Water at FU2 Compared to Backgound and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Regulatory Criterion Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
25	SW25A1	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	94	=	MG/L						NA
25	SW25B1	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	15	=	MG/L						NA
25	SW25B1	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	10	=	MG/L						NA
25	SW25D1	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	21	=	MG/L						NA
25	SW25D2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	557	=	MG/L						NA
26	SW26A1	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	106	=	MG/L						NA
26	SW26A2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	282	=	MG/L						NA
26	SW26B1	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	364	=	MG/L						NA
26	SW26B2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	14	=	MG/L						NA
26	SW26C1	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	9	=	MG/L						NA
26	SW26C2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	6	=	MG/L						NA
26	SW26D1	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	1180	=	MG/L						NA
26	SW26D2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	603	=	MG/L						NA
25	SW25E	VANADIUM	0 0043	J	MG/L	0 039					N
25	SW25F	VANADIUM	0 0041	J	MG/L	0 039					N
25	SW25B2	ZINC	0 0613	J	MG/L	0 2873			0 05891	X	N
25	SW25B2	ZINC	0 0702	J	MG/L	0 2873			0 05891	X	N
25	SW25C2	ZINC	0 0862	J	MG/L	0 2873			0 05891	X	N
25	SW25D2	ZINC	0 0734	J	MG/L	0 2873			0 05891	X	N
25	SW25G	ZINC	0 0152	J	MG/L	0 2873			0 05891		N
26	SW26B1	ZINC	0 0857	J	MG/L	0 2873			0 05891	X	N
26	SW26B2	ZINC	0 0658	J	MG/L	0 2873			0 05891	X	N
26	SW26C1	ZINC	0 184	J	MG/L	0 2873			0 05891	X	N
26	SW26C2	ZINC	0 467	J	MG/L	0 2873	X		0 05891	X	Y
26	SW26D1	ZINC	0 124	J	MG/L	0 2873			0 05891	X	N
26	SW26D2	ZINC	0 199	J	MG/L	0 2873			0 05891	X	N
26	SW26E	ZINC	0 0098	J	MG/L	0 2873			0 05891		N
26	SW26F	ZINC	0 0168	J	MG/L	0 2873			0 05891		N
26	SW26H	ZINC	0 011	J	MG/L	0 2873			0 05891		N
26	SW26I	ZINC	0 0099	J	MG/L	0 2873			0 05891		N
51	SW51A	ZINC	0 0648	J	MG/L	0 2873			0 05891	X	N
51	SW51B	ZINC	0 063	J	MG/L	0 2873			0 05891	X	N
51	SW51C	ZINC	0 0908	J	MG/L	0 2873			0 05891	X	N
52	SW52A	ZINC	0 0196	J	MG/L	0 2873			0 05891		N
52	SW52B	ZINC	0 0305	J	MG/L	0 2873			0 05891		N

TABLE M-3

Summary of Detected Parameters in Surface Water at FU2 Compared to Backgound and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Regulatory Criterion Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
25	SW25C1	Zinc, Dissolved	0 136	J	MG/L	0 41			0 05891	X	N
26	SW26C1	Zinc, Dissolved	0 145	J	MG/L	0 41			0 05891	X	N
26	SW26C2	Zinc, Dissolved	0 406	J	MG/L	0 41			0 05891	X	N
51	SW51A	Zinc, Dissolved	0 0432	=	MG/L	0 41			0 05891		N
51	SW51B	Zinc, Dissolved	0 045	=	MG/L	0 41			0 05891		N
51	SW51C	Zinc, Dissolved	0 0763	=	MG/L	0 41			0 05891	X	N
52	SW52A	Zinc, Dissolved	0 0271	=	MG/L	0 41			0 05891		N

TABLE M-4
Summary of Detected Parameters in Sediment Soil at FU2 Compared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
25	M-SD04	to	1,2,3,4,6,7,8 HEPTACHLORODIBENZOFURAN	0 0000596	J	MG/KG			0 000000043	X	0 00005	X			Y
25	M-SD05	to	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0 00045	=	MG/KG			0 000000043	X	0 00005	X			Y
26	M-SD01	to	1 2,3 4 6 7,8-HEPTACHLORODIBENZOFURAN	0 000556	=	MG/KG			0 000000043	X	0 00005	X			Y
26	M-SD01	to	1 2 3 4 6 7,8-HEPTACHLORODIBENZOFURAN	0 000427	=	MG/KG			0 000000043	X	0 00005	X			Y
26	M-SD02	to	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0 000307	=	MG/KG			0 000000043	X	0 00005	X			Y
26	M-SD03	to	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	0 000226	J	MG/KG			0 000000043	X	0 00005	X			Y
25	M-SD04	to	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	0 000385	J	MG/KG	0 000583		0 000000043	X	0 00005	X			N
25	M-SD05	to	1,2,3,4,6,7,8 HEPTACHLORODIBENZO-p-DIOXIN	0 0021	J	MG/KG	0 000583	X	0 000000043	X	0 00005	X			Y
26	M-SD01	to	1,2 3 4,6,7 8-HEPTACHLORODIBENZO-p DIOXIN	0 00644	=	MG/KG	0 000583	X	0 000000043	X	0 00005	X			Y
26	M-SD01	to	1 2 3 4 6 7 8-HEPTACHLORODIBENZO-p-DIOXIN	0 00608	=	MG/KG	0 000583	X	0 000000043	X	0 00005	X			Y
26	M-SD02	to	1 2 3 4 6 7 8-HEPTACHLORODIBENZO-p DIOXIN	0 00131	J	MG/KG	0 000583	X	0 000000043	X	0 00005	X			Y
26	M-SD03	to	1,2,3 4,6,7,8-HEPTACHLORODIBENZO p DIOXIN	0 00063	J	MG/KG	0 000583	X	0 000000043	X	0 00005	X			Y
25	M-SD04	to	1,2,3,6,7,8 HEXACHLORODIBENZO-P DIOXIN	0 0000116	J	MG/KG			0 00000043	X	0 0005				Y
26	M-SD01	to	1,2,3 6,7,8 HEXACHLORODIBENZO-P DIOXIN	0 0000929	J	MG/KG			0 00000043	X	0 0005				Y
26	M-SD01	to	1 2 3 6,7 8 HEXACHLORODIBENZO-P DIOXIN	0 0000767	=	MG/KG			0 00000043	X	0 0005				Y
26	M-SD03	to	1 2 3 6 7,8-HEXACHLORODIBENZO P DIOXIN	0 0000175	=	MG/KG			0 00000043	X	0 0005				Y
25	M-SD04	to	1,2,3,7,8,9 HEXACHLORODIBENZO-P DIOXIN	0 0000043	J	MG/KG			0 00000043	X	0 0005				Y
26	M-SD01	to	1 2 3 7 8 9 HEXACHLORODIBENZO P DIOXIN	0 000146	J	MG/KG			0 00000043	X	0 0005				Y
26	M-SD01	to	1,2,3 7,8,9 HEXACHLORODIBENZO P DIOXIN	0 0000782	=	MG/KG			0 00000043	X	0 0005				Y
26	M-SD03	to	1,2,3 7,8 9 HEXACHLORODIBENZO P DIOXIN	0 0000236	J	MG/KG			0 00000043	X	0 0005				Y
26	M-SD01	to	2-METHYLNAPHTHALENE	0 018	J	MG/KG			160		6 1		0 33		N
26	SD26E	0 0 to 0 4	2-METHYLNAPHTHALENE	0 086	J	MG/KG			160		6 1		0 33		N
25	M-SD05	to	ACENAPHTHENE	0 26	J	MG/KG	0 77		470		570		0 33		N
25	SD25B	0 0 to 0 5	ACENAPHTHENE	0 05	J	MG/KG	0 77		470		570		0 33		N
25	SD25C	0 0 to 1 0	ACENAPHTHENE	0 25	J	MG/KG	0 77		470		570		0 33		N
26	M SD01	to	ACENAPHTHENE	0 059	J	MG/KG	0 77		470		570		0 33		N
26	M SD01	to	ACENAPHTHENE	0 052	J	MG/KG	0 77		470		570		0 33		N
26	M SD02	to	ACENAPHTHENE	0 027	J	MG/KG	0 77		470		570		0 33		N
26	M SD03	to	ACENAPHTHENE	0 096	J	MG/KG	0 77		470		570		0 33		N
26	SD26A	0 0 to 1 0	ACENAPHTHENE	0 13	J	MG/KG	0 77		470		570		0 33		N
26	SD26E	0 0 to 0 4	ACENAPHTHENE	0 25	J	MG/KG	0 77		470		570		0 33		N
26	M SD01	to	ACENAPHTHYLENE	0 058	J	MG/KG			470		27		0 33		N
26	M SD01	to	ACENAPHTHYLENE	0 062	J	MG/KG			470		27		0 33		N
26	M SD02	to	ACENAPHTHYLENE	0 066	J	MG/KG			470		27		0 33		N
26	M SD03	to	ACENAPHTHYLENE	0 029	J	MG/KG			470		27		0 33		N
25	M-SD05	to	ACETONE	0 023	=	MG/KG			780		16				N
26	M-SD01	to	ACETONE	0 007	J	MG/KG			780		16				N
51	M-SD18	to	ACETONE	0 013	J	MG/KG			780		16				N
51	M SD17	to	ALDRIN	0 0092	J	MG/KG			0 038		0 5				N
52	M-SD15	to	ALDRIN	0 014	J	MG/KG			0 038		0 5				N
52	SE52A	0 0 to 4 0	ALDRIN	0 01	J	MG/KG			0 038		0 5				N
26	M-SD01	to	ALPHA ENDOSULFAN	0 0055	J	MG/KG			47		18				N
26	M-SD02	to	ALPHA ENDOSULFAN	0 0076	J	MG/KG			47		18				N
26	M-SD03	to	ALPHA ENDOSULFAN	0 0045	J	MG/KG			47		18				N
52	M SD16	to	ALPHA ENDOSULFAN	0 0081	J	MG/KG			47		18				N
25	M-SD05	to	ALPHA-CHLORDANE	0 0054	J	MG/KG	0 0052	X	1 8				0 0017	X	Y
25	SD25B	0 0 to 0 5	ALPHA-CHLORDANE	0 0097	J	MG/KG	0 0052	X	1 8				0 0017	X	Y
25	SD25C	0 0 to 1 0	ALPHA-CHLORDANE	0 034	=	MG/KG	0 0052	X	1 8				0 0017	X	Y
26	M SD01	to	ALPHA-CHLORDANE	0 014	J	MG/KG	0 0052	X	1 8				0 0017	X	Y
26	M SD01	to	ALPHA-CHLORDANE	0 026	J	MG/KG	0 0052	X	1 8				0 0017	X	Y
26	M SD02	to	ALPHA-CHLORDANE	0 0095	J	MG/KG	0 0052	X	1 8				0 0017	X	Y
26	M SD03	to	ALPHA-CHLORDANE	0 0043	J	MG/KG	0 0052		1 8				0 0017	X	N
26	SD26C	0 0 to 0 6	ALPHA CHLORDANE	0 0087	J	MG/KG	0 0052	X	1 8				0 0017	X	Y
51	M SD17	to	ALPHA CHLORDANE	0 0099	J	MG/KG	0 0052	X	1 8				0 0017	X	Y
52	M SD15	to	ALPHA CHLORDANE	0 021	J	MG/KG	0 0052	X	1 8				0 0017	X	Y

TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
52	M SD16	to	ALPHA CHLORDANE	0 02	J	MG/KG	0 0052	X	1 8				0 0017	X	Y
25	M SD04	to	ALUMINUM	3500	=	mg/kg	10085		7800						N
25	M SD05	to	ALUMINUM	6320	=	mg/kg	10085		7800						N
25	SD25A	0 0 to 0 5	ALUMINUM	3860	=	MG/KG	10085		7800						N
25	SD25B	0 0 to 0 5	ALUMINUM	9030	=	MG/KG	10085		7800	X					N
25	SD25C	0 0 to 1 0	ALUMINUM	12800	=	MG/KG	10085	X	7800	X					Y
26	M SD01	to	ALUMINUM	2170	=	mg/kg	10085		7800						N
26	M SD01	to	ALUMINUM	2810	=	mg/kg	10085		7800						N
26	M SD02	to	ALUMINUM	6580	=	mg/kg	10085		7800						N
26	M SD03	to	ALUMINUM	2420	=	mg/kg	10085		7800						N
26	SD26A	0 0 to 1 0	ALUMINUM	8640	=	MG/KG	10085		7800	X					N
26	SD26B	0 0 to 0 5	ALUMINUM	7160	=	MG/KG	10085		7800						N
26	SD26C	0 0 to 0 6	ALUMINUM	10300	=	MG/KG	10085	X	7800	X					Y
26	SD26C	0 0 to 0 6	ALUMINUM	12100	=	MG/KG	10085	X	7800	X					Y
26	SD26D	0 0 to 0 7	ALUMINUM	9900	=	MG/KG	10085		7800	X					N
26	SD26E	0 0 to 0 4	ALUMINUM	17100	=	MG/KG	10085	X	7800	X					Y
51	M-SD17	to	ALUMINUM	4270	=	mg/kg	10085		7800						N
51	M-SD18	to	ALUMINUM	5340	=	mg/kg	10085		7800						N
52	M-SD15	to	ALUMINUM	1130	=	mg/kg	10085		7800						N
52	M-SD16	to	ALUMINUM	662	=	mg/kg	10085		7800						N
25	M-SD05	to	ANTHRACENE	0 62	J	MG/KG	1 6		2300		12000		0 33	X	N
25	SD25B	0 0 to 0 5	ANTHRACENE	0 11	J	MG/KG	1 6		2300		12000		0 33		N
25	SD25C	0 0 to 1 0	ANTHRACENE	0 46	J	MG/KG	1 6		2300		12000		0 33	X	N
26	M SD01	to	ANTHRACENE	0 2	J	MG/KG	1 6		2300		12000		0 33		N
26	M SD01	to	ANTHRACENE	0 2	J	MG/KG	1 6		2300		12000		0 33		N
26	M SD02	to	ANTHRACENE	0 057	J	MG/KG	1 6		2300		12000		0 33		N
26	M SD03	to	ANTHRACENE	0 16	J	MG/KG	1 6		2300		12000		0 33		N
26	SD26A	0 0 to 1 0	ANTHRACENE	0 2	J	MG/KG	1 6		2300		12000		0 33		N
26	SD26B	0 0 to 0 5	ANTHRACENE	0 046	J	MG/KG	1 6		2300		12000		0 33		N
26	SD26E	0 0 to 0 4	ANTHRACENE	0 35	J	MG/KG	1 6		2300		12000		0 33	X	N
51	M SD18	to	ANTHRACENE	0 025	J	MG/KG	1 6		2300		12000		0 33		N
52	M SD16	to	ANTHRACENE	0 019	J	MG/KG	1 6		2300		12000		0 33		N
25	SD25A	0 0 to 0 5	ANTIMONY	6 4	J	MG/KG	7 6		3 1	X	5	X	12		N
26	M SD03	to	ANTIMONY	0 44	J	mg/kg	7 6		3 1		5		12		N
26	SD26E	0 0 to 0 4	ANTIMONY	2 3	J	MG/KG	7 6		3 1		5		12		N
25	M SD04	to	ARSENIC	2 5	=	mg/kg	12		0 43	X	29		7 24		N
25	M-SD05	to	ARSENIC	3 1	=	mg/kg	12		0 43	X	29		7 24		N
25	SD25A	0 0 to 0 5	ARSENIC	14	=	MG/KG	12	X	0 43	X	29		7 24	X	Y
25	SD25B	0 0 to 0 5	ARSENIC	4 9	=	MG/KG	12		0 43	X	29		7 24		N
25	SD25C	0 0 to 1 0	ARSENIC	13 4	=	MG/KG	12	X	0 43	X	29		7 24	X	Y
26	M-SD01	to	ARSENIC	2	J	mg/kg	12		0 43	X	29		7 24		N
26	M-SD01	to	ARSENIC	1 8	J	mg/kg	12		0 43	X	29		7 24		N
26	M-SD02	to	ARSENIC	1 7	J	mg/kg	12		0 43	X	29		7 24		N
26	M SD03	to	ARSENIC	1 8	J	mg/kg	12		0 43	X	29		7 24		N
26	SD26A	0 0 to 1 0	ARSENIC	5 6	=	MG/KG	12		0 43	X	29		7 24		N
26	SD26B	0 0 to 0 5	ARSENIC	5 8	=	MG/KG	12		0 43	X	29		7 24		N
26	SD26C	0 0 to 0 6	ARSENIC	7 2	=	MG/KG	12		0 43	X	29		7 24		N
26	SD26C	0 0 to 0 6	ARSENIC	8 4	=	MG/KG	12		0 43	X	29		7 24	X	N
26	SD26D	0 0 to 0 7	ARSENIC	7 1	=	MG/KG	12		0 43	X	29		7 24		N
26	SD26E	0 0 to 0 4	ARSENIC	9 1	=	MG/KG	12		0 43	X	29		7 24	X	N
51	M-SD17	to	ARSENIC	6	=	mg/kg	12		0 43	X	29		7 24		N
51	M-SD18	to	ARSENIC	3	=	mg/kg	12		0 43	X	29		7 24		N
51	SE51A	0 0 to 3 0	ARSENIC	6 7	=	MG/KG	12		0 43	X	29		7 24		N
51	SE51B	0 0 to 3 0	ARSENIC	6 7	=	MG/KG	12		0 43	X	29		7 24		N
51	SE51C	0 0 to 2 0	ARSENIC	13 8	=	MG/KG	12	X	0 43	X	29		7 24	X	Y

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488 887

TABLE M-4
Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
52	M SD15	to	ARSENIC	1 4	J	mg/kg	12		0 43	X	29		7 24		N
52	M SD16	to	ARSENIC	2 1	=	mg/kg	12		0 43	X	29		7 24		N
52	SE52A	0 0 to 4 0	ARSENIC	10 1	=	MG/KG	12		0 43	X	29		7 24	X	N
52	SE52B	0 0 to 1 0	ARSENIC	9 8	=	MG/KG	12		0 43	X	29		7 24	X	N
25	M SD04	to	BARIUM	74 9	=	mg/kg	118		550		1600				N
25	M SD05	to	BARIUM	47 6	=	mg/kg	118		550		1600				N
25	SD25A	0 0 to 0 5	BARIUM	112	J	MG/KG	118		550		1600				N
25	SD25B	0 0 to 0 5	BARIUM	91 4	=	MG/KG	118		550		1600				N
25	SD25C	0 0 to 1 0	BARIUM	91 3	=	MG/KG	118		550		1600				N
26	M SD01	to	BARIUM	24 1	J	mg/kg	118		550		1600				N
26	M SD01	to	BARIUM	45 2	=	mg/kg	118		550		1600				N
26	M SD02	to	BARIUM	142	=	mg/kg	118	X	550		1600				N
26	M-SD03	to	BARIUM	53	=	mg/kg	118		550		1600				N
26	SD26A	0 0 to 1 0	BARIUM	107	=	MG/KG	118		550		1600				N
26	SD26B	0 0 to 0 5	BARIUM	99 9	=	MG/KG	118		550		1600				N
26	SD26C	0 0 to 0 6	BARIUM	75 6	=	MG/KG	118		550		1600				N
26	SD26C	0 0 to 0 6	BARIUM	88 1	=	MG/KG	118		550		1600				N
26	SD26D	0 0 to 0 7	BARIUM	106	=	MG/KG	118		550		1600				N
26	SD26E	0 0 to 0 4	BARIUM	130	=	MG/KG	118	X	550		1600				N
51	M-SD17	to	BARIUM	62 8	=	mg/kg	118		550		1600				N
51	M SD18	to	BARIUM	145	=	mg/kg	118	X	550		1600				N
52	M-SD15	to	BARIUM	15 7	J	mg/kg	118		550		1600				N
52	M-SD16	to	BARIUM	16 7	J	mg/kg	118		550		1600				N
26	SD26E	0 0 to 0 4	BENZENE	0 004	J	MG/KG			22		0 03				N
25	M-SD04	to	BENZO(a)ANTHRACENE	0 072	J	MG/KG	2 9		0 87		2		0 33		N
25	M-SD05	to	BENZO(a)ANTHRACENE	3 8	=	MG/KG	2 9	X	0 87	X	2	X	0 33	X	Y
25	SD25B	0 0 to 0 5	BENZO(a)ANTHRACENE	0 28	J	MG/KG	2 9		0 87		2		0 33		N
25	SD25C	0 0 to 1 0	BENZO(a)ANTHRACENE	1 8	=	MG/KG	2 9		0 87	X	2		0 33	X	N
26	M-SD01	to	BENZO(a)ANTHRACENE	0 89	=	MG/KG	2 9		0 87	X	2		0 33	X	N
26	M-SD01	to	BENZO(a)ANTHRACENE	0 84	=	MG/KG	2 9		0 87		2		0 33	X	N
26	M-SD02	to	BENZO(a)ANTHRACENE	0 67	=	MG/KG	2 9		0 87		2		0 33	X	N
26	M SD03	to	BENZO(a)ANTHRACENE	0 82	=	MG/KG	2 9		0 87		2		0 33	X	N
26	SD26A	0 0 to 1 0	BENZO(a)ANTHRACENE	1 1	=	MG/KG	2 9		0 87	X	2		0 33	X	N
26	SD26B	0 0 to 0 5	BENZO(a)ANTHRACENE	0 22	J	MG/KG	2 9		0 87		2		0 33		N
26	SD26C	0 0 to 0 6	BENZO(a)ANTHRACENE	0 052	J	MG/KG	2 9		0 87		2		0 33		N
26	SD26C	0 0 to 0 6	BENZO(a)ANTHRACENE	0 052	J	MG/KG	2 9		0 87		2		0 33		N
26	SD26D	0 0 to 0 7	BENZO(a)ANTHRACENE	0 046	J	MG/KG	2 9		0 87		2		0 33		N
26	SD26E	0 0 to 0 4	BENZO(a)ANTHRACENE	1 5	=	MG/KG	2 9		0 87	X	2		0 33	X	N
51	M SD18	to	BENZO(a)ANTHRACENE	0 063	J	MG/KG	2 9		0 87		2		0 33		N
52	M SD15	to	BENZO(a)ANTHRACENE	0 12	J	MG/KG	2 9		0 87		2		0 33		N
52	M SD16	to	BENZO(a)ANTHRACENE	0 15	J	MG/KG	2 9		0 87		2		0 33		N
25	M SD04	to	BENZO(a)PYRENE	0 086	J	MG/KG	2 5		0 087		8		0 33		N
25	M-SD05	to	BENZO(a)PYRENE	4 1	=	MG/KG	2 5	X	0 087	X	8		0 33	X	Y
25	SD25A	0 0 to 0 5	BENZO(a)PYRENE	0 28	J	MG/KG	2 5		0 087	X	8		0 33		N
25	SD25B	0 0 to 0 5	BENZO(a)PYRENE	0 24	J	MG/KG	2 5		0 087	X	8		0 33		N
25	SD25C	0 0 to 1 0	BENZO(a)PYRENE	2	=	MG/KG	2 5		0 087	X	8		0 33	X	N
26	M SD01	to	BENZO(a)PYRENE	0 96	=	MG/KG	2 5		0 087	X	8		0 33	X	N
26	M-SD01	to	BENZO(a)PYRENE	0 81	=	MG/KG	2 5		0 087	X	8		0 33	X	N
26	M-SD02	to	BENZO(a)PYRENE	0 55	=	MG/KG	2 5		0 087	X	8		0 33	X	N
26	M-SD03	to	BENZO(a)PYRENE	0 71	=	MG/KG	2 5		0 087	X	8		0 33	X	N
26	SD26A	0 0 to 1 0	BENZO(a)PYRENE	1 1	=	MG/KG	2 5		0 087	X	8		0 33	X	N
26	SD26B	0 0 to 0 5	BENZO(a)PYRENE	0 23	J	MG/KG	2 5		0 087	X	8		0 33		N
26	SD26C	0 0 to 0 6	BENZO(a)PYRENE	0 071	J	MG/KG	2 5		0 087		8		0 33		N
26	SD26C	0 0 to 0 6	BENZO(a)PYRENE	0 066	J	MG/KG	2 5		0 087		8		0 33		N
26	SD26D	0 0 to 0 7	BENZO(a)PYRENE	0 058	J	MG/KG	2 5		0 087		8		0 33		N

TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC				Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
									Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag			
26	SD26E	0.0 to 0.4	BENZO(a)PYRENE	1.9	=	MG/KG	2.5		0.087	X	8		0.33	X	N
51	M-SD17	to	BENZO(a)PYRENE	0.084	J	MG/KG	2.5		0.087		8		0.33		N
51	M-SD18	to	BENZO(a)PYRENE	0.041	J	MG/KG	2.5		0.087		8		0.33		N
52	M SD15	to	BENZO(a)PYRENE	0.089	J	MG/KG	2.5		0.087	X	8		0.33		N
52	M SD16	to	BENZO(a)PYRENE	0.17	J	MG/KG	2.5		0.087	X	8		0.33		N
25	M-SD04	to	BENZO(b)FLUORANTHENE	0.15	J	MG/KG	2.21605		0.87		5		0.33		N
25	M-SD05	to	BENZO(b)FLUORANTHENE	4.9	=	MG/KG	2.21605	X	0.87	X	5		0.33	X	Y
25	SD25A	0.0 to 0.5	BENZO(b)FLUORANTHENE	0.35	J	MG/KG	2.21605		0.87		5		0.33	X	N
25	SD25B	0.0 to 0.5	BENZO(b)FLUORANTHENE	0.3	J	MG/KG	2.21605		0.87		5		0.33		N
25	SD25C	0.0 to 1.0	BENZO(b)FLUORANTHENE	2.1	=	MG/KG	2.21605		0.87	X	5		0.33	X	N
26	M-SD01	to	BENZO(b)FLUORANTHENE	1.3	=	MG/KG	2.21605		0.87	X	5		0.33	X	N
26	M SD01	to	BENZO(b)FLUORANTHENE	1.3	=	MG/KG	2.21605		0.87	X	5		0.33	X	N
26	M SD02	to	BENZO(b)FLUORANTHENE	1.2	=	MG/KG	2.21605		0.87	X	5		0.33	X	N
26	M-SD03	to	BENZO(b)FLUORANTHENE	1.4	=	MG/KG	2.21605		0.87	X	5		0.33	X	N
26	SD26A	0.0 to 1.0	BENZO(b)FLUORANTHENE	1.3	=	MG/KG	2.21605		0.87	X	5		0.33	X	N
26	SD26B	0.0 to 0.5	BENZO(b)FLUORANTHENE	0.25	J	MG/KG	2.21605		0.87		5		0.33		N
26	SD26C	0.0 to 0.6	BENZO(b)FLUORANTHENE	0.091	J	MG/KG	2.21605		0.87		5		0.33		N
26	SD26C	0.0 to 0.6	BENZO(b)FLUORANTHENE	0.079	J	MG/KG	2.21605		0.87		5		0.33		N
26	SD26D	0.0 to 0.7	BENZO(b)FLUORANTHENE	0.053	J	MG/KG	2.21605		0.87		5		0.33		N
26	SD26E	0.0 to 0.4	BENZO(b)FLUORANTHENE	2.3	=	MG/KG	2.21605	X	0.87	X	5		0.33	X	Y
51	M-SD17	to	BENZO(b)FLUORANTHENE	0.12	J	MG/KG	2.21605		0.87		5		0.33		N
51	M SD18	to	BENZO(b)FLUORANTHENE	0.056	J	MG/KG	2.21605		0.87		5		0.33		N
52	M SD15	to	BENZO(b)FLUORANTHENE	0.15	J	MG/KG	2.21605		0.87		5		0.33		N
52	M SD16	to	BENZO(b)FLUORANTHENE	0.26	J	MG/KG	2.21605		0.87		5		0.33		N
25	M SD04	to	BENZO(g,h,i)PERYLENE	0.054	J	MG/KG	1.8		230		32000		0.33		N
25	M-SD05	to	BENZO(g h i)PERYLENE	3	=	MG/KG	1.8	X	230		32000		0.33	X	Y
25	SD25A	0.0 to 0.5	BENZO(g,h,i)PERYLENE	0.25	J	MG/KG	1.8		230		32000		0.33		N
25	SD25B	0.0 to 0.5	BENZO(g h,i)PERYLENE	0.18	J	MG/KG	1.8		230		32000		0.33		N
25	SD25C	0.0 to 1.0	BENZO(g h i)PERYLENE	1.5	=	MG/KG	1.8		230		32000		0.33	X	N
26	M-SD01	to	BENZO(g,h,i)PERYLENE	0.77	=	MG/KG	1.8		230		32000		0.33	X	N
26	M-SD01	to	BENZO(g,h,i)PERYLENE	0.54	=	MG/KG	1.8		230		32000		0.33	X	N
26	M-SD02	to	BENZO(g h i)PERYLENE	0.44	=	MG/KG	1.8		230		32000		0.33	X	N
26	M-SD03	to	BENZO(g h,i)PERYLENE	0.46	=	MG/KG	1.8		230		32000		0.33	X	N
26	SD26A	0.0 to 1.0	BENZO(g h,i)PERYLENE	0.93	=	MG/KG	1.8		230		32000		0.33	X	N
26	SD26B	0.0 to 0.5	BENZO(g h,i)PERYLENE	0.17	J	MG/KG	1.8		230		32000		0.33		N
26	SD26C	0.0 to 0.6	BENZO(g h i)PERYLENE	0.056	J	MG/KG	1.8		230		32000		0.33		N
26	SD26C	0.0 to 0.6	BENZO(g h i)PERYLENE	0.051	J	MG/KG	1.8		230		32000		0.33		N
26	SD26D	0.0 to 0.7	BENZO(g h i)PERYLENE	0.043	J	MG/KG	1.8		230		32000		0.33		N
26	SD26E	0.0 to 0.4	BENZO(g h i)PERYLENE	1.6	=	MG/KG	1.8		230		32000		0.33	X	N
51	M-SD18	to	BENZO(g,h,i)PERYLENE	0.034	J	MG/KG	1.8		230		32000		0.33		N
52	M-SD16	to	BENZO(g,h,i)PERYLENE	0.091	J	MG/KG	1.8		230		32000		0.33		N
25	M-SD05	to	BENZO(k)FLUORANTHENE	4.6	=	MG/KG	2.3	X	8.7		49		0.33	X	Y
25	SD25A	0.0 to 0.5	BENZO(k)FLUORANTHENE	0.31	J	MG/KG	2.3		8.7		49		0.33		N
25	SD25B	0.0 to 0.5	BENZO(k)FLUORANTHENE	0.24	J	MG/KG	2.3		8.7		49		0.33		N
25	SD25C	0.0 to 1.0	BENZO(k)FLUORANTHENE	2.2	=	MG/KG	2.3		8.7		49		0.33	X	N
26	M-SD01	to	BENZO(k)FLUORANTHENE	0.72	=	MG/KG	2.3		8.7		49		0.33	X	N
26	M SD01	to	BENZO(k)FLUORANTHENE	0.68	=	MG/KG	2.3		8.7		49		0.33	X	N
26	SD26A	0.0 to 1.0	BENZO(k)FLUORANTHENE	1.1	=	MG/KG	2.3		8.7		49		0.33	X	N
26	SD26B	0.0 to 0.5	BENZO(k)FLUORANTHENE	0.21	J	MG/KG	2.3		8.7		49		0.33		N
26	SD26C	0.0 to 0.6	BENZO(k)FLUORANTHENE	0.074	J	MG/KG	2.3		8.7		49		0.33		N
26	SD26C	0.0 to 0.6	BENZO(k)FLUORANTHENE	0.07	J	MG/KG	2.3		8.7		49		0.33		N
26	SD26D	0.0 to 0.7	BENZO(k)FLUORANTHENE	0.06	J	MG/KG	2.3		8.7		49		0.33		N
26	SD26E	0.0 to 0.4	BENZO(k)FLUORANTHENE	2.1	=	MG/KG	2.3		8.7		49		0.33	X	N
51	M-SD18	to	BENZO(k)FLUORANTHENE	0.041	J	MG/KG	2.3		8.7		49		0.33		N
52	M-SD16	to	BENZYL BUTYL PHTHALATE	0.084	J	MG/KG			1600		930				N

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TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
25	M-SD05	to	BERYLLIUM	0 27	J	mg/kg	1 3		16		63				N
25	SD25A	0 0 to 0 5	BERYLLIUM	0 1	J	MG/KG	1 3		16		63				N
25	SD25B	0 0 to 0 5	BERYLLIUM	0 52	J	MG/KG	1 3		16		63				N
25	SD25C	0 0 to 1 0	BERYLLIUM	0 54	J	MG/KG	1 3		16		63				N
26	M SD01	to	BERYLLIUM	0 23	J	mg/kg	1 3		16		63				N
26	M SD01	to	BERYLLIUM	0 29	J	mg/kg	1 3		16		63				N
26	M SD02	to	BERYLLIUM	1 2	J	mg/kg	1 3		16		63				N
26	M SD03	to	BERYLLIUM	0 22	J	mg/kg	1 3		16		63				N
26	SD26A	0 0 to 1 0	BERYLLIUM	0 55	J	MG/KG	1 3		16		63				N
26	SD26B	0 0 to 0 5	BERYLLIUM	0 42	J	MG/KG	1 3		16		63				N
26	SD26C	0 0 to 0 6	BERYLLIUM	0 45	J	MG/KG	1 3		16		63				N
26	SD26C	0 0 to 0 6	BERYLLIUM	0 52	J	MG/KG	1 3		16		63				N
26	SD26D	0 0 to 0 7	BERYLLIUM	0 49	J	MG/KG	1 3		16		63				N
26	SD26E	0 0 to 0 4	BERYLLIUM	0 75	J	MG/KG	1 3		16		63				N
51	M SD17	to	BERYLLIUM	0 4	J	mg/kg	1 3		16		63				N
51	M SD18	to	BERYLLIUM	0 62	J	mg/kg	1 3		16		63				N
51	SE51A	0 0 to 3 0	BERYLLIUM	0 32	J	MG/KG	1 3		16		63				N
51	SE51B	0 0 to 3 0	BERYLLIUM	0 41	J	MG/KG	1 3		16		63				N
51	SE51C	0 0 to 2 0	BERYLLIUM	0 25	J	MG/KG	1 3		16		63				N
52	SE52A	0 0 to 4 0	BERYLLIUM	0 29	J	MG/KG	1 3		16		63				N
52	SE52B	0 0 to 1 0	BERYLLIUM	0 57	J	MG/KG	1 3		16		63				N
25	M SD04	to	bis(2-ETHYLHEXYL) PHTHALATE	0 051	J	MG/KG	0 48		46		3600		0 182		N
25	SD25A	0 0 to 0 5	bis(2-ETHYLHEXYL) PHTHALATE	0 22	J	MG/KG	0 48		46		3600		0 182	X	N
25	SD25C	0 0 to 1 0	bis(2-ETHYLHEXYL) PHTHALATE	1 5	=	MG/KG	0 48	X	46		3600		0 182	X	Y
26	M SD01	to	bis(2-ETHYLHEXYL) PHTHALATE	0 082	J	MG/KG	0 48		46		3600		0 182		N
26	M SD01	to	bis(2-ETHYLHEXYL) PHTHALATE	0 12	J	MG/KG	0 48		46		3600		0 182		N
26	M-SD02	to	bis(2-ETHYLHEXYL) PHTHALATE	0 29	J	MG/KG	0 48		46		3600		0 182	X	N
26	M-SD03	to	bis(2-ETHYLHEXYL) PHTHALATE	0 3	J	MG/KG	0 48		46		3600		0 182	X	N
26	SD26A	0 0 to 1 0	bis(2-ETHYLHEXYL) PHTHALATE	0 095	J	MG/KG	0 48		46		3600		0 182		N
26	SD26B	0 0 to 0 5	bis(2-ETHYLHEXYL) PHTHALATE	0 066	J	MG/KG	0 48		46		3600		0 182		N
26	SD26C	0 0 to 0 6	bis(2-ETHYLHEXYL) PHTHALATE	0 11	J	MG/KG	0 48		46		3600		0 182		N
26	SD26E	0 0 to 0 4	bis(2-ETHYLHEXYL) PHTHALATE	0 26	J	MG/KG	0 48		46		3600		0 182	X	N
51	M-SD17	to	bis(2-ETHYLHEXYL) PHTHALATE	0 21	J	MG/KG	0 48		46		3600		0 182	X	N
51	M SD18	to	bis(2-ETHYLHEXYL) PHTHALATE	0 13	J	MG/KG	0 48		46		3600		0 182		N
52	M-SD15	to	bis(2-ETHYLHEXYL) PHTHALATE	1 2	J	MG/KG	0 48	X	46		3600		0 182	X	Y
52	M SD16	to	bis(2-ETHYLHEXYL) PHTHALATE	0 19	J	MG/KG	0 48		46		3600		0 182	X	N
25	M-SD05	to	CADMIUM	0 4	J	mg/kg	28 9		7 8		8		1		N
25	SD25A	0 0 to 0 5	CADMIUM	1 8	J	MG/KG	28 9		7 8		8		1	X	N
25	SD25C	0 0 to 1 0	CADMIUM	0 78	J	MG/KG	28 9		7 8		8		1		N
26	M-SD01	to	CADMIUM	0 38	J	mg/kg	28 9		7 8		8		1		N
26	M-SD01	to	CADMIUM	0 44	J	mg/kg	28 9		7 8		8		1		N
26	M-SD02	to	CADMIUM	1 2	=	mg/kg	28 9		7 8		8		1	X	N
26	M-SD03	to	CADMIUM	2 4	=	mg/kg	28 9		7 8		8		1	X	N
26	SD26C	0 0 to 0 6	CADMIUM	0 15	J	MG/KG	28 9		7 8		8		1		N
26	SD26C	0 0 to 0 6	CADMIUM	0 11	J	MG/KG	28 9		7 8		8		1		N
26	SD26D	0 0 to 0 7	CADMIUM	0 72	=	MG/KG	28 9		7 8		8		1		N
26	SD26E	0 0 to 0 4	CADMIUM	0 97	=	MG/KG	28 9		7 8		8		1		N
51	M SD17	to	CADMIUM	0 46	J	mg/kg	28 9		7 8		8		1		N
52	M-SD16	to	CADMIUM	0.26	J	mg/kg	28 9		7 8		8		1		N
52	SE52B	0 0 to 1 0	CADMIUM	0 52	J	MG/KG	28 9		7 8		8		1		N
25	M-SD04	to	CALCIUM	13300	=	mg/kg	14860								N
25	M-SD05	to	CALCIUM	43100	=	mg/kg	14860	X							NA
25	SD25A	0 0 to 0 5	CALCIUM	20200	=	MG/KG	14860	X							NA
25	SD25B	0 0 to 0 5	CALCIUM	2000	=	MG/KG	14860								N
25	SD25C	0 0 to 1 0	CALCIUM	2420	=	MG/KG	14860								N

TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	M SD01	to	CALCIUM	19200	=	mg/kg	14860	X							NA
26	M SD01	to	CALCIUM	19200	=	mg/kg	14860	X							NA
26	M-SD02	to	CALCIUM	37900	=	mg/kg	14860	X							NA
26	M SD03	to	CALCIUM	148000	=	mg/kg	14860	X							NA
26	SD26A	0 0 to 1 0	CALCIUM	1190	=	MG/KG	14860								N
26	SD26B	0 0 to 0 5	CALCIUM	958	=	MG/KG	14860								N
26	SD26C	0 0 to 0 6	CALCIUM	4030	=	MG/KG	14860								N
26	SD26C	0 0 to 0 6	CALCIUM	3040	=	MG/KG	14860								N
26	SD26D	0 0 to 0 7	CALCIUM	4080	=	MG/KG	14860								N
26	SD26E	0 0 to 0 4	CALCIUM	1610	=	MG/KG	14860								N
51	M SD17	to	CALCIUM	1820	=	mg/kg	14860								N
51	M SD18	to	CALCIUM	1620	=	mg/kg	14860								N
52	M SD15	to	CALCIUM	4470	=	mg/kg	14860								N
52	M SD16	to	CALCIUM	158000	=	mg/kg	14860	X							NA
25	M SD05	to	CARBAZOLE	0 66	J	MG/KG	1 1		32		0 6	X			N
25	SD25B	0 0 to 0 5	CARBAZOLE	0 11	J	MG/KG	1 1		32		0 6				N
25	SD25C	0 0 to 1 0	CARBAZOLE	0 52	J	MG/KG	1 1		32		0 6				N
26	M SD01	to	CARBAZOLE	0 17	J	MG/KG	1 1		32		0 6				N
26	M SD01	to	CARBAZOLE	0 16	J	MG/KG	1 1		32		0 6				N
26	M SD02	to	CARBAZOLE	0 072	J	MG/KG	1 1		32		0 6				N
26	M SD03	to	CARBAZOLE	0 19	J	MG/KG	1 1		32		0 6				N
26	SD26A	0 0 to 1 0	CARBAZOLE	0 24	J	MG/KG	1 1		32		0 6				N
26	SD26B	0 0 to 0 5	CARBAZOLE	0 048	J	MG/KG	1 1		32		0 6				N
26	SD26E	0 0 to 0 4	CARBAZOLE	0 45	J	MG/KG	1 1		32		0 6				N
51	M SD18	to	CARBAZOLE	0 023	J	MG/KG	1 1		32		0 6				N
25	SD25A	0 0 to 0 5	CARBON DISULFIDE	0 032	J	MG/KG			780		32				N
25	SD25B	0 0 to 0 5	CARBON DISULFIDE	0 002	J	MG/KG			780		32				N
25	SD25C	0 0 to 1 0	CARBON DISULFIDE	0 008	J	MG/KG			780		32				N
26	SD26A	0 0 to 1 0	CARBON DISULFIDE	0 002	J	MG/KG			780		32				N
26	SD26E	0 0 to 0 4	CARBON DISULFIDE	0 003	J	MG/KG			780		32				N
26	M SD01	to	CARBON TETRACHLORIDE	0 007	J	MG/KG			4 9		0 07				N
26	M SD02	to	CARBON TETRACHLORIDE	0 11	=	MG/KG			4 9		0 07	X			Y
26	M-SD03	to	CARBON TETRACHLORIDE	0 005	J	MG/KG			4 9		0 07				N
51	M-SD18	to	CARBON TETRACHLORIDE	0 044	=	MG/KG			4 9		0 07				N
25	M-SD04	to	CHROMIUM, TOTAL	14 6	=	mg/kg	20				38		52 3		N
25	M-SD05	to	CHROMIUM, TOTAL	16 7	=	mg/kg	20				38		52 3		N
25	SD25A	0 0 to 0 5	CHROMIUM TOTAL	7 3	=	MG/KG	20				38		52 3		N
25	SD25B	0 0 to 0 5	CHROMIUM, TOTAL	14 2	=	MG/KG	20				38		52 3		N
25	SD25C	0 0 to 1 0	CHROMIUM, TOTAL	18 8	=	MG/KG	20				38		52 3		N
26	M SD01	to	CHROMIUM, TOTAL	8 4	=	mg/kg	20				38		52 3		N
26	M SD01	to	CHROMIUM, TOTAL	6 9	=	mg/kg	20				38		52 3		N
26	M-SD02	to	CHROMIUM, TOTAL	5 1	=	mg/kg	20				38		52 3		N
26	M-SD03	to	CHROMIUM TOTAL	10 7	=	mg/kg	20				38		52 3		N
26	SD26A	0 0 to 1 0	CHROMIUM, TOTAL	11	=	MG/KG	20				38		52 3		N
26	SD26B	0 0 to 0 5	CHROMIUM TOTAL	10 9	=	MG/KG	20				38		52 3		N
26	SD26C	0 0 to 0 6	CHROMIUM, TOTAL	13 5	=	MG/KG	20				38		52 3		N
26	SD26C	0 0 to 0 6	CHROMIUM, TOTAL	14 9	=	MG/KG	20				38		52 3		N
26	SD26D	0 0 to 0 7	CHROMIUM TOTAL	12 7	=	MG/KG	20				38		52 3		N
26	SD26E	0 0 to 0 4	CHROMIUM TOTAL	36 5	=	MG/KG	20	X			38		52 3		N
51	M SD17	to	CHROMIUM, TOTAL	7 8	=	mg/kg	20				38		52 3		N
51	M SD18	to	CHROMIUM TOTAL	10 7	=	mg/kg	20				38		52 3		N
51	SE51A	0 0 to 3 0	CHROMIUM, TOTAL	9 8	=	MG/KG	20				38		52 3		N
51	SE51B	0 0 to 3 0	CHROMIUM, TOTAL	17 6	=	MG/KG	20				38		52 3		N
51	SE51C	0 0 to 2 0	CHROMIUM, TOTAL	11 4	=	MG/KG	20				38		52 3		N
52	M-SD15	to	CHROMIUM TOTAL	3 1	=	mg/kg	20				38		52 3		N

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TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
52	M SD16	to	CHROMIUM, TOTAL	5 6	=	mg/kg	20				38		52 3		N
52	SE52A	0 0 to 4 0	CHROMIUM TOTAL	11 2	=	MG/KG	20				38		52 3		N
52	SE52B	0 0 to 1 0	CHROMIUM, TOTAL	14 7	=	MG/KG	20				38		52 3		N
25	M SD04	to	CHRYSENE	0 059	J	MG/KG	3 2		87		160		0 33		N
25	M SD05	to	CHRYSENE	4 6	=	MG/KG	3 2	X	87		160		0 33	X	Y
25	SD25A	0 0 to 0 5	CHRYSENE	0 34	J	MG/KG	3 2		87		160		0 33	X	N
25	SD25B	0 0 to 0 5	CHRYSENE	0 36	J	MG/KG	3 2		87		160		0 33	X	N
25	SD25C	0 0 to 1 0	CHRYSENE	2 5	=	MG/KG	3 2		87		160		0 33	X	N
26	M-SD01	to	CHRYSENE	1	=	MG/KG	3 2		87		160		0 33	X	N
26	M-SD01	to	CHRYSENE	0 87	=	MG/KG	3 2		87		160		0 33	X	N
26	M-SD02	to	CHRYSENE	0 51	=	MG/KG	3 2		87		160		0 33	X	N
26	M SD03	to	CHRYSENE	0 88	=	MG/KG	3 2		87		160		0 33	X	N
26	SD26A	0 0 to 1 0	CHRYSENE	1 4	=	MG/KG	3 2		87		160		0 33	X	N
26	SD26B	0 0 to 0 5	CHRYSENE	0 27	J	MG/KG	3 2		87		160		0 33		N
26	SD26C	0 0 to 0 6	CHRYSENE	0 078	J	MG/KG	3 2		87		160		0 33		N
26	SD26C	0 0 to 0 6	CHRYSENE	0 083	J	MG/KG	3 2		87		160		0 33		N
26	SD26D	0 0 to 0 7	CHRYSENE	0 062	J	MG/KG	3 2		87		160		0 33		N
26	SD26E	0 0 to 0 4	CHRYSENE	2 6	=	MG/KG	3 2		87		160		0 33	X	N
51	M-SD17	to	CHRYSENE	0 064	J	MG/KG	3 2		87		160		0 33		N
51	M-SD18	to	CHRYSENE	0 065	J	MG/KG	3 2		87		160		0 33		N
52	M-SD15	to	CHRYSENE	0 14	J	MG/KG	3 2		87		160		0 33		N
52	M-SD16	to	CHRYSENE	0 17	J	MG/KG	3 2		87		160		0 33		N
25	M-SD04	to	COBALT	219	=	mg/kg	13 6	X	470						N
25	M-SD05	to	COBALT	2 6	J	mg/kg	13 6		470						N
25	SD25A	0 0 to 0 5	COBALT	3 5	J	MG/KG	13 6		470						N
25	SD25B	0 0 to 0 5	COBALT	5 8	J	MG/KG	13 6		470						N
25	SD25C	0 0 to 1 0	COBALT	6 3	J	MG/KG	13 6		470						N
26	M-SD01	to	COBALT	0 76	J	mg/kg	13 6		470						N
26	M-SD01	to	COBALT	1	J	mg/kg	13 6		470						N
26	M-SD02	to	COBALT	0 8	J	mg/kg	13 6		470						N
26	M-SD03	to	COBALT	1 5	J	mg/kg	13 6		470						N
26	SD26A	0 0 to 1 0	COBALT	5 5	J	MG/KG	13 6		470						N
26	SD26B	0 0 to 0 5	COBALT	5 4	J	MG/KG	13 6		470						N
26	SD26C	0 0 to 0 6	COBALT	5 4	J	MG/KG	13 6		470						N
26	SD26C	0 0 to 0 6	COBALT	5 8	J	MG/KG	13 6		470						N
26	SD26D	0 0 to 0 7	COBALT	6 1	J	MG/KG	13 6		470						N
26	SD26E	0 0 to 0 4	COBALT	6 9	J	MG/KG	13 6		470						N
51	M-SD17	to	COBALT	6 8	J	mg/kg	13 6		470						N
51	M-SD18	to	COBALT	6 3	J	mg/kg	13 6		470						N
52	M-SD15	to	COBALT	2 5	J	mg/kg	13 6		470						N
52	M-SD16	to	COBALT	1 6	J	mg/kg	13 6		470						N
25	M-SD04	to	COPPER	34 7	=	mg/kg	58		310				18 7	X	N
25	M-SD05	to	COPPER	7 4	=	mg/kg	58		310				18 7		N
25	SD25A	0 0 to 0 5	COPPER	49 4	=	MG/KG	58		310				18 7	X	N
25	SD25B	0 0 to 0 5	COPPER	15	=	MG/KG	58		310				18 7		N
25	SD25C	0 0 to 1 0	COPPER	31 4	=	MG/KG	58		310				18 7	X	N
26	M SD01	to	COPPER	11 9	=	mg/kg	58		310				18 7		N
26	M SD01	to	COPPER	4 3	J	mg/kg	58		310				18 7		N
26	M SD02	to	COPPER	6 9	=	mg/kg	58		310				18 7		N
26	M SD03	to	COPPER	15 4	=	mg/kg	58		310				18 7		N
26	SD26A	0 0 to 1 0	COPPER	14	=	MG/KG	58		310				18 7		N
26	SD26B	0 0 to 0 5	COPPER	11	=	MG/KG	58		310				18 7		N
26	SD26C	0 0 to 0 6	COPPER	15 3	=	MG/KG	58		310				18 7		N
26	SD26C	0 0 to 0 6	COPPER	17 6	=	MG/KG	58		310				18 7		N
26	SD26D	0 0 to 0 7	COPPER	13 9	=	MG/KG	58		310				18 7		N

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TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	SD26E	0 0 to 0 4	COPPER	41 2	=	MG/KG	58		310				18 7	X	N
51	M-SD17	to	COPPER	15 3	=	mg/kg	58		310				18 7		N
51	M SD18	to	COPPER	11 2	=	mg/kg	58		310				18 7		N
51	SE51A	0 0 to 3 0	COPPER	8 8	J	MG/KG	58		310				18 7		N
51	SE51B	0 0 to 3 0	COPPER	16 5	J	MG/KG	58		310				18 7		N
51	SE51C	0 0 to 2 0	COPPER	13 6	J	MG/KG	58		310				18 7		N
52	M SD15	to	COPPER	9 6	=	mg/kg	58		310				18 7		N
52	M SD16	to	COPPER	7 1	=	mg/kg	58		310				18 7		N
52	SE52A	0 0 to 4 0	COPPER	12 8	J	MG/KG	58		310				18 7		N
52	SE52B	0 0 to 1 0	COPPER	11 6	J	MG/KG	58		310				18 7		N
25	M-SD05	to	CYANIDE	0 34	J	mg/kg			160		40				N
26	M SD01	to	CYANIDE	0 23	J	mg/kg			160		40				N
25	M-SD05	to	DDD	0 006	J	MG/KG	0 0061		2 7		16		0 0033	X	N
25	SD25A	0 0 to 0 5	DDD	0 12	=	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
25	SD25B	0 0 to 0 5	DDD	0 07	=	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
25	SD25C	0 0 to 1 0	DDD	0 091	=	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
26	M-SD01	to	DDD	0 011	J	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
26	M-SD01	to	DDD	0 016	J	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
26	M-SD02	to	DDD	0 0058	J	MG/KG	0 0061		2 7		16		0 0033	X	N
26	SD26B	0 0 to 0 5	DDD	0 0077	J	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
26	SD26C	0 0 to 0 6	DDD	0 031	J	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
26	SD26C	0 0 to 0 6	DDD	0 033	J	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
26	SD26D	0 0 to 0 7	DDD	0 0092	=	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
26	SD26E	0 0 to 0 4	DDD	0 4	J	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
51	M-SD17	to	DDD	0 23	=	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
51	M SD18	to	DDD	0 0061	J	MG/KG	0 0061		2 7		16		0 0033	X	N
51	SE51B	0 0 to 3 0	DDD	0 0044	=	MG/KG	0 0061		2 7		16		0 0033	X	N
52	M SD15	to	DDD	0 066	J	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
52	M-SD16	to	DDD	0 13	=	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
52	SE52A	0 0 to 4 0	DDD	0 077	=	MG/KG	0 0061	X	2 7		16		0 0033	X	Y
52	SE52B	0 0 to 1 0	DDD	0 0046	=	MG/KG	0 0061		2 7		16		0 0033	X	N
25	M-SD04	to	DDE	0 018	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
25	M-SD05	to	DDE	0 015	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
25	SD25A	0 0 to 0 5	DDE	0 13	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
25	SD25B	0 0 to 0 5	DDE	0 077	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
25	SD25C	0 0 to 1 0	DDE	0 3	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	M SD01	to	DDE	0 029	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	M SD01	to	DDE	0 026	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	M SD02	to	DDE	0 0081	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	SD26A	0 0 to 1 0	DDE	0 019	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	SD26B	0 0 to 0 5	DDE	0 0091	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	SD26C	0 0 to 0 6	DDE	0 055	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	SD26C	0 0 to 0 6	DDE	0 07	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	SD26D	0 0 to 0 7	DDE	0 0092	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
26	SD26E	0 0 to 0 4	DDE	0 79	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
51	M SD17	to	DDE	0 029	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
51	M SD18	to	DDE	0 0055	J	MG/KG	0 0072		1 9		54		0 0033	X	N
52	M-SD15	to	DDE	0 13	=	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
52	M-SD16	to	DDE	0 026	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
52	SE52A	0 0 to 4 0	DDE	0 016	J	MG/KG	0 0072	X	1 9		54		0 0033	X	Y
52	SE52B	0 0 to 1 0	DDE	0 0021	J	MG/KG	0 0072		1 9		54		0 0033		N
25	M SD05	to	DDT	0 044	J	MG/KG			1 9		11		0 0033	X	Y
25	SD25B	0 0 to 0 5	DDT	0 027	=	MG/KG			1 9		11		0 0033	X	Y
26	M SD01	to	DDT	0 093	J	MG/KG			1 9		11		0 0033	X	Y
26	M-SD03	to	DDT	0 0053	J	MG/KG			1 9		11		0 0033	X	Y

TABLE M-4
Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
51	M SD17	to	DDT	0.0047	J	MG/KG			1.9		11		0.0033	X	Y
52	M SD15	to	DDT	0.036	J	MG/KG			1.9		11		0.0033	X	Y
52	M SD16	to	DDT	0.042	J	MG/KG			1.9		11		0.0033	X	Y
52	SE52A	0.0 to 4.0	DDT	0.025	=	MG/KG			1.9		11		0.0033	X	Y
52	SE52B	0.0 to 1.0	DDT	0.0037	J	MG/KG			1.9		11		0.0033	X	Y
25	M SD04	to	DIBENZ(a,h)ANTHRACENE	0.032	J	MG/KG	0.7		0.087		2		0.33		N
25	M-SD05	to	DIBENZ(a,h)ANTHRACENE	0.48	J	MG/KG	0.7		0.087	X	2		0.33	X	N
26	M SD01	to	DIBENZ(a h)ANTHRACENE	0.25	J	MG/KG	0.7		0.087	X	2		0.33		N
26	M SD01	to	DIBENZ(a h)ANTHRACENE	0.24	J	MG/KG	0.7		0.087	X	2		0.33		N
26	M SD02	to	DIBENZ(a h)ANTHRACENE	0.12	J	MG/KG	0.7		0.087	X	2		0.33		N
26	M-SD03	to	DIBENZ(a,h)ANTHRACENE	0.18	J	MG/KG	0.7		0.087	X	2		0.33		N
52	M-SD16	to	DIBENZ(a,h)ANTHRACENE	0.028	J	MG/KG	0.7		0.087		2		0.33		N
25	SD25C	0.0 to 1.0	DIBENZOFURAN	0.11	J	MG/KG	0.38		31		15				N
26	M-SD01	to	DIBENZOFURAN	0.073	J	MG/KG	0.38		31		15				N
26	M-SD01	to	DIBENZOFURAN	0.056	J	MG/KG	0.38		31		15				N
26	M-SD03	to	DIBENZOFURAN	0.022	J	MG/KG	0.38		31		15				N
26	SD26E	0.0 to 0.4	DIBENZOFURAN	0.14	J	MG/KG	0.38		31		15				N
25	M SD05	to	DIELDRIN	0.038	J	MG/KG	0.011	X	0.04		0.004	X	0.0033	X	Y
25	SD25A	0.0 to 0.5	DIELDRIN	0.049	J	MG/KG	0.011	X	0.04	X	0.004	X	0.0033	X	Y
26	M SD01	to	DIELDRIN	0.012	J	MG/KG	0.011	X	0.04		0.004	X	0.0033	X	Y
26	M SD01	to	DIELDRIN	0.0081	J	MG/KG	0.011		0.04		0.004	X	0.0033	X	N
26	M SD02	to	DIELDRIN	0.0063	J	MG/KG	0.011		0.04		0.004	X	0.0033	X	N
26	M SD03	to	DIELDRIN	0.014	J	MG/KG	0.011	X	0.04		0.004	X	0.0033	X	Y
51	M SD17	to	DIELDRIN	0.038	J	MG/KG	0.011	X	0.04		0.004	X	0.0033	X	Y
51	M-SD18	to	DIELDRIN	0.0046	J	MG/KG	0.011		0.04		0.004	X	0.0033	X	N
52	M SD15	to	DIELDRIN	0.16	=	MG/KG	0.011	X	0.04	X	0.004	X	0.0033	X	Y
52	M-SD16	to	DIELDRIN	0.031	J	MG/KG	0.011	X	0.04		0.004	X	0.0033	X	Y
52	SE52A	0.0 to 4.0	DIELDRIN	0.024	=	MG/KG	0.011	X	0.04		0.004	X	0.0033	X	Y
52	SE52B	0.0 to 1.0	DIELDRIN	0.0028	J	MG/KG	0.011		0.04		0.004		0.0033		N
26	M-SD02	to	DIETHYL PHTHALATE	0.027	J	MG/KG			6300		470				N
51	M-SD17	to	DIETHYL PHTHALATE	0.076	J	MG/KG			6300		470				N
51	M SD18	to	DIETHYL PHTHALATE	0.38	J	MG/KG			6300		470				N
52	M SD15	to	DIETHYL PHTHALATE	0.52	J	MG/KG			6300		470				N
52	M SD16	to	DIETHYL PHTHALATE	0.026	J	MG/KG			6300		470				N
51	M SD18	to	DIMETHYL PHTHALATE	0.11	J	MG/KG			78000		380				N
25	M-SD04	to	DI n-BUTYL PHTHALATE	0.022	J	MG/KG			780		2300				N
26	M-SD01	to	DI n-BUTYL PHTHALATE	0.023	J	MG/KG			780		2300				N
26	M-SD01	to	DI-n BUTYL PHTHALATE	0.019	J	MG/KG			780		2300				N
26	M-SD02	to	DI-n BUTYL PHTHALATE	0.044	J	MG/KG			780		2300				N
26	M-SD03	to	DI-n BUTYL PHTHALATE	0.022	J	MG/KG			780		2300				N
51	M-SD17	to	DI-n BUTYL PHTHALATE	0.045	J	MG/KG			780		2300				N
51	M SD18	to	DI-n-BUTYL PHTHALATE	0.034	J	MG/KG			780		2300				N
52	M-SD15	to	DI-n-BUTYL PHTHALATE	0.026	J	MG/KG			780		2300				N
52	M-SD16	to	DI-n-BUTYL PHTHALATE	0.02	J	MG/KG			780		2300				N
51	M-SD17	to	DI n-OCTYLPHTHALATE	0.09	J	MG/KG	0.047	X	160		10000				N
52	M-SD16	to	DI-n-OCTYLPHTHALATE	0.021	J	MG/KG	0.047		160		10000				N
25	M-SD05	to	ENDRIN	0.018	J	MG/KG			2.3		1		0.0033	X	Y
26	M-SD01	to	ENDRIN	0.014	J	MG/KG			2.3		1		0.0033	X	Y
26	M-SD01	to	ENDRIN	0.026	J	MG/KG			2.3		1		0.0033	X	Y
26	M-SD02	to	ENDRIN	0.015	J	MG/KG			2.3		1		0.0033	X	Y
26	M SD03	to	ENDRIN	0.01	J	MG/KG			2.3		1		0.0033	X	Y
52	M SD15	to	ENDRIN	0.011	J	MG/KG			2.3		1		0.0033	X	Y
52	M SD16	to	ENDRIN	0.014	J	MG/KG			2.3		1		0.0033	X	Y
26	M-SD01	to	ENDRIN ALDEHYDE	0.0046	J	MG/KG			2.3		1				N
26	M-SD02	to	ENDRIN ALDEHYDE	0.019	J	MG/KG			2.3		1				N

TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	M-SD03	to	ENDRIN ALDEHYDE	0.0097	J	MG/KG			2.3		1				N
52	M-SD15	to	ENDRIN ALDEHYDE	0.0082	J	MG/KG			2.3		1				N
52	M-SD16	to	ENDRIN ALDEHYDE	0.004	J	MG/KG			2.3		1				N
25	M-SD04	to	FLUORANTHENE	0.037	J	MG/KG	7.1		310		4300		0.33		N
25	M-SD05	to	FLUORANTHENE	9.9	=	MG/KG	7.1	X	310		4300		0.33	X	Y
25	SD25A	0.0 to 0.5	FLUORANTHENE	0.58	J	MG/KG	7.1		310		4300		0.33	X	N
25	SD25B	0.0 to 0.5	FLUORANTHENE	0.82	=	MG/KG	7.1		310		4300		0.33	X	N
26	M SD01	to	FLUORANTHENE	1.8	=	MG/KG	7.1		310		4300		0.33	X	N
26	M SD01	to	FLUORANTHENE	1.6	=	MG/KG	7.1		310		4300		0.33	X	N
26	M-SD02	to	FLUORANTHENE	0.83	=	MG/KG	7.1		310		4300		0.33	X	N
26	M-SD03	to	FLUORANTHENE	1.2	=	MG/KG	7.1		310		4300		0.33	X	N
26	SD26A	0.0 to 1.0	FLUORANTHENE	2.8	=	MG/KG	7.1		310		4300		0.33	X	N
26	SD26B	0.0 to 0.5	FLUORANTHENE	0.55	=	MG/KG	7.1		310		4300		0.33	X	N
26	SD26C	0.0 to 0.6	FLUORANTHENE	0.14	J	MG/KG	7.1		310		4300		0.33		N
26	SD26C	0.0 to 0.6	FLUORANTHENE	0.17	J	MG/KG	7.1		310		4300		0.33		N
26	SD26D	0.0 to 0.7	FLUORANTHENE	0.1	J	MG/KG	7.1		310		4300		0.33		N
51	M-SD18	to	FLUORANTHENE	0.15	J	MG/KG	7.1		310		4300		0.33		N
52	M SD15	to	FLUORANTHENE	0.28	J	MG/KG	7.1		310		4300		0.33		N
52	M SD16	to	FLUORANTHENE	0.18	J	MG/KG	7.1		310		4300		0.33		N
25	M-SD05	to	FLUORENE	0.22	J	MG/KG	0.87		310		560		0.33		N
25	SD25B	0.0 to 0.5	FLUORENE	0.066	J	MG/KG	0.87		310		560		0.33		N
25	SD25C	0.0 to 1.0	FLUORENE	0.29	J	MG/KG	0.87		310		560		0.33		N
26	M-SD01	to	FLUORENE	0.1	J	MG/KG	0.87		310		560		0.33		N
26	M-SD01	to	FLUORENE	0.098	J	MG/KG	0.87		310		560		0.33		N
26	M-SD02	to	FLUORENE	0.039	J	MG/KG	0.87		310		560		0.33		N
26	M-SD03	to	FLUORENE	0.084	J	MG/KG	0.87		310		560		0.33		N
26	SD26A	0.0 to 1.0	FLUORENE	0.073	J	MG/KG	0.87		310		560		0.33		N
26	SD26E	0.0 to 0.4	FLUORENE	0.33	J	MG/KG	0.87		310		560		0.33		N
51	M-SD18	to	FLUORENE	0.029	J	MG/KG	0.87		310		560		0.33		N
25	M-SD05	to	GAMMA CHLORDANE	0.0048	J	MG/KG	2		1.8				0.0017	X	N
25	SD25B	0.0 to 0.5	GAMMA CHLORDANE	0.025	=	MG/KG	2		1.8				0.0017	X	N
25	SD25C	0.0 to 1.0	GAMMA-CHLORDANE	0.054	=	MG/KG	2		1.8				0.0017	X	N
26	M-SD01	to	GAMMA CHLORDANE	0.018	J	MG/KG	2		1.8				0.0017	X	N
26	M-SD01	to	GAMMA CHLORDANE	0.027	J	MG/KG	2		1.8				0.0017	X	N
26	M-SD02	to	GAMMA CHLORDANE	0.011	J	MG/KG	2		1.8				0.0017	X	N
26	M SD03	to	GAMMA CHLORDANE	0.0051	J	MG/KG	2		1.8				0.0017	X	N
26	SD26C	0.0 to 0.6	GAMMA CHLORDANE	0.011	J	MG/KG	2		1.8				0.0017	X	N
51	M-SD17	to	GAMMA CHLORDANE	0.0075	J	MG/KG	2		1.8				0.0017	X	N
52	M-SD15	to	GAMMA CHLORDANE	0.017	J	MG/KG	2		1.8				0.0017	X	N
52	M-SD16	to	GAMMA CHLORDANE	0.023	J	MG/KG	2		1.8				0.0017	X	N
26	M-SD01	to	HEPTACHLOR	0.0018	J	MG/KG	0.23		0.14		23				N
26	M-SD01	to	HEPTACHLOR	0.002	J	MG/KG	0.23		0.14		23				N
26	M-SD01	to	HEPTACHLOR EPOXIDE	0.0037	J	MG/KG	0.23								N
25	M-SD04	to	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	0.000166	=	MG/KG									NA
25	M-SD05	to	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	0.0013	J	MG/KG									NA
26	M-SD01	to	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	0.00198	=	MG/KG									NA
26	M-SD01	to	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	0.00167	=	MG/KG									NA
26	M-SD02	to	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	0.000883	=	MG/KG									NA
26	M-SD03	to	HEPTACHLORINATED DIBENZOFURANS (TOTAL)	0.00078	=	MG/KG									NA
25	M SD04	to	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	0.00078	=	MG/KG									NA
25	M-SD05	to	HEPTACHLORINATED DIBENZO p-DIOXINS, (TOTAL)	0.0043	=	MG/KG									NA
26	M-SD01	to	HEPTACHLORINATED DIBENZO p-DIOXINS, (TOTAL)	0.0123	=	MG/KG									NA
26	M-SD01	to	HEPTACHLORINATED DIBENZO p-DIOXINS, (TOTAL)	0.0126	=	MG/KG									NA
26	M-SD02	to	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	0.00262	=	MG/KG									NA
26	M-SD03	to	HEPTACHLORINATED DIBENZO-p-DIOXINS (TOTAL)	0.00145	=	MG/KG									NA

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TABLE M-4
Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC: Direct Exposure Value	RBC: Direct Exposure Exceedance Flag	RBC: GWP Value	RBC: GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	M SD01	to	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	0 000495	=	MG/KG									NA
26	M SD01	to	HEXACHLORINATED DIBENZOFURANS (TOTAL)	0 000598	=	MG/KG									NA
26	M SD02	to	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	0 000345	=	MG/KG									NA
26	M SD03	to	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	0 000289	=	MG/KG									NA
25	M-SD04	to	HEXACHLORINATED DIBENZO-p DIOXINS, (TOTAL)	0 0000559	=	MG/KG									NA
26	M-SD01	to	HEXACHLORINATED DIBENZO-p DIOXINS, (TOTAL)	0 00103	=	MG/KG									NA
26	M-SD01	to	HEXACHLORINATED DIBENZO p-DIOXINS (TOTAL)	0 000649	=	MG/KG									NA
26	M-SD02	to	HEXACHLORINATED DIBENZO p-DIOXINS, (TOTAL)	0 00017	=	MG/KG									NA
26	M-SD03	to	HEXACHLORINATED DIBENZO p-DIOXINS, (TOTAL)	0 000178	=	MG/KG									NA
25	M-SD04	to	INDENO(1 2 3-c,d)PYRENE	0 041	J	MG/KG	1 7		0 87		14		0 33		N
25	M-SD05	to	INDENO(1,2,3 c,d)PYRENE	3 2	=	MG/KG	1 7	X	0 87	X	14		0 33	X	Y
25	SD25A	0 0 to 0 5	INDENO(1,2,3 c,d)PYRENE	0 24	J	MG/KG	1 7		0 87		14		0 33		N
25	SD25B	0 0 to 0 5	INDENO(1,2,3 c,d)PYRENE	0 18	J	MG/KG	1 7		0 87		14		0 33		N
25	SD25C	0 0 to 1 0	INDENO(1,2,3 c,d)PYRENE	1 4	=	MG/KG	1 7		0 87	X	14		0 33	X	N
26	M-SD01	to	INDENO(1,2 3-c,d)PYRENE	0 77	=	MG/KG	1 7		0 87		14		0 33	X	N
26	M SD01	to	INDENO(1 2 3-c d)PYRENE	0 62	=	MG/KG	1 7		0 87		14		0 33	X	N
26	M-SD02	to	INDENO(1 2 3-c d)PYRENE	0 62	=	MG/KG	1 7		0 87		14		0 33	X	N
26	M SD03	to	INDENO(1 2 3-c d)PYRENE	0 47	=	MG/KG	1 7		0 87		14		0 33	X	N
26	SD26A	0 0 to 1 0	INDENO(1,2,3-c,d)PYRENE	0 86	=	MG/KG	1 7		0 87		14		0 33	X	N
26	SD26B	0 0 to 0 5	INDENO(1,2,3-c,d)PYRENE	0 17	J	MG/KG	1 7		0 87		14		0 33		N
26	SD26C	0 0 to 0 6	INDENO(1,2,3-c,d)PYRENE	0 051	J	MG/KG	1 7		0 87		14		0 33		N
26	SD26E	0 0 to 0 4	INDENO(1 2 3-c d)PYRENE	1 5	=	MG/KG	1 7		0 87	X	14		0 33	X	N
51	M-SD17	to	INDENO(1 2,3-c,d)PYRENE	0 028	J	MG/KG	1 7		0 87		14		0 33		N
51	M-SD18	to	INDENO(1,2,3-c,d)PYRENE	0 033	J	MG/KG	1 7		0 87		14		0 33		N
52	M-SD16	to	INDENO(1,2,3-c,d)PYRENE	0 092	J	MG/KG	1 7		0 87		14		0 33		N
25	M SD04	to	IRON	6870	=	mg/kg	23080		2300	X					N
25	M SD05	to	IRON	4700	=	mg/kg	23080		2300	X					N
25	SD25A	0 0 to 0 5	IRON	12900	=	MG/KG	23080		2300	X					N
25	SD25B	0 0 to 0 5	IRON	17000	=	MG/KG	23080		2300	X					N
25	SD25C	0 0 to 1 0	IRON	16500	=	MG/KG	23080		2300	X					N
26	M SD01	to	IRON	3470	=	mg/kg	23080		2300	X					N
26	M-SD01	to	IRON	2810	=	mg/kg	23080		2300	X					N
26	M SD02	to	IRON	2470	=	mg/kg	23080		2300	X					N
26	M SD03	to	IRON	4500	=	mg/kg	23080		2300	X					N
26	SD26A	0 0 to 1 0	IRON	18000	=	MG/KG	23080		2300	X					N
26	SD26B	0 0 to 0 5	IRON	14500	=	MG/KG	23080		2300	X					N
26	SD26C	0 0 to 0 6	IRON	15100	=	MG/KG	23080		2300	X					N
26	SD26C	0 0 to 0 6	IRON	17200	=	MG/KG	23080		2300	X					N
26	SD26D	0 0 to 0 7	IRON	17900	=	MG/KG	23080		2300	X					N
26	SD26E	0 0 to 0 4	IRON	19200	=	MG/KG	23080		2300	X					N
51	M-SD17	to	IRON	9090	=	mg/kg	23080		2300	X					N
51	M-SD18	to	IRON	9840	=	mg/kg	23080		2300	X					N
52	M SD15	to	IRON	3100	=	mg/kg	23080		2300	X					N
52	M SD16	to	IRON	3340	=	mg/kg	23080		2300	X					N
25	M-SD04	to	LEAD	44	=	mg/kg	35 2	X	400				30 2	X	Y
25	M-SD05	to	LEAD	42 6	=	mg/kg	35 2	X	400				30 2	X	Y
25	SD25A	0 0 to 0 5	LEAD	30 8	=	MG/KG	35 2		400				30 2	X	N
25	SD25B	0 0 to 0 5	LEAD	14 8	=	MG/KG	35 2		400				30 2		N
25	SD25C	0 0 to 1 0	LEAD	169	=	MG/KG	35 2	X	400				30 2	X	Y
26	M SD01	to	LEAD	17 7	=	mg/kg	35 2		400				30 2		N
26	M SD01	to	LEAD	22 4	=	mg/kg	35 2		400				30 2		N
26	M SD02	to	LEAD	19 9	=	mg/kg	35 2		400				30 2		N
26	M-SD03	to	LEAD	28 2	=	mg/kg	35 2		400				30 2		N
26	SD26A	0 0 to 1 0	LEAD	9 3	=	MG/KG	35 2		400				30 2		N
26	SD26B	0 0 to 0 5	LEAD	8 1	=	MG/KG	35 2		400				30 2		N

TABLE M-4
Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values
Memphis Depot Main Installation RI

									RBC						
Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	Direct Exposure Value	Direct Exposure Exceedance Flag	GWP Value	GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	SD26C	0 0 to 0 6	LEAD	15	=	MG/KG	35 2		400				30 2		N
26	SD26C	0 0 to 0 6	LEAD	16 2	=	MG/KG	35 2		400				30 2		N
26	SD26D	0 0 to 0 7	LEAD	9 8	=	MG/KG	35 2		400				30 2		N
26	SD26E	0 0 to 0 4	LEAD	121	=	MG/KG	35 2	X	400				30 2	X	Y
51	M SD17	to	LEAD	75	=	mg/kg	35 2	X	400				30 2	X	Y
51	M SD18	to	LEAD	38 4	=	mg/kg	35 2	X	400				30 2	X	Y
51	SE51A	0 0 to 3 0	LEAD	9 9	=	MG/KG	35 2		400				30 2		N
51	SE51B	0 0 to 3 0	LEAD	10 8	=	MG/KG	35 2		400				30 2		N
51	SE51C	0 0 to 2 0	LEAD	10 3	=	MG/KG	35 2		400				30 2		N
52	M SD15	to	LEAD	7 7	=	mg/kg	35 2		400				30 2		N
52	M SD16	to	LEAD	9 3	=	mg/kg	35 2		400				30 2		N
52	SE52A	0 0 to 4 0	LEAD	10 4	=	MG/KG	35 2		400				30 2		N
52	SE52B	0 0 to 1 0	LEAD	15 5	=	MG/KG	35 2		400				30 2		N
25	M SD04	to	MAGNESIUM	786	J	mg/kg	2440								N
25	M SD05	to	MAGNESIUM	9390	=	mg/kg	2440	X							NA
25	SD25A	0 0 to 0 5	MAGNESIUM	2980	J	MG/KG	2440	X							NA
25	SD25B	0 0 to 0 5	MAGNESIUM	1870	=	MG/KG	2440								N
25	SD25C	0 0 to 1 0	MAGNESIUM	2590	=	MG/KG	2440	X							NA
26	M-SD01	to	MAGNESIUM	884	J	mg/kg	2440								N
26	M SD01	to	MAGNESIUM	1210	=	mg/kg	2440								N
26	M SD02	to	MAGNESIUM	5830	=	mg/kg	2440	X							NA
26	M SD03	to	MAGNESIUM	19100	=	mg/kg	2440	X							NA
26	SD26A	0 0 to 1 0	MAGNESIUM	1820	=	MG/KG	2440								N
26	SD26B	0 0 to 0 5	MAGNESIUM	1620	=	MG/KG	2440								N
26	SD26C	0 0 to 0 6	MAGNESIUM	2800	=	MG/KG	2440	X							NA
26	SD26C	0 0 to 0 6	MAGNESIUM	2640	=	MG/KG	2440	X							NA
26	SD26D	0 0 to 0 7	MAGNESIUM	2880	=	MG/KG	2440	X							NA
26	SD26E	0 0 to 0 4	MAGNESIUM	2490	=	MG/KG	2440	X							NA
51	M-SD17	to	MAGNESIUM	1030	J	mg/kg	2440								N
51	M-SD18	to	MAGNESIUM	1130	J	mg/kg	2440								N
52	M SD15	to	MAGNESIUM	714	J	mg/kg	2440								N
52	M-SD16	to	MAGNESIUM	3930	=	mg/kg	2440	X							NA
25	M SD04	to	MANGANESE	160	J	mg/kg	871		1100						N
25	M SD05	to	MANGANESE	697	J	mg/kg	871		1100						N
25	SD25A	0 0 to 0 5	MANGANESE	327	=	MG/KG	871		1100						N
25	SD25B	0 0 to 0 5	MANGANESE	188	=	MG/KG	871		1100						N
25	SD25C	0 0 to 1 0	MANGANESE	208	=	MG/KG	871		1100						N
26	M SD01	to	MANGANESE	74	J	mg/kg	871		1100						N
26	M SD01	to	MANGANESE	115	J	mg/kg	871		1100						N
26	M SD02	to	MANGANESE	232	J	mg/kg	871		1100						N
26	M SD03	to	MANGANESE	77	J	mg/kg	871		1100						N
26	SD26A	0 0 to 1 0	MANGANESE	162	=	MG/KG	871		1100						N
26	SD26B	0 0 to 0 5	MANGANESE	230	=	MG/KG	871		1100						N
26	SD26C	0 0 to 0 6	MANGANESE	271	=	MG/KG	871		1100						N
26	SD26C	0 0 to 0 6	MANGANESE	295	=	MG/KG	871		1100						N
26	SD26D	0 0 to 0 7	MANGANESE	328	=	MG/KG	871		1100						N
26	SD26E	0 0 to 0 4	MANGANESE	183	=	MG/KG	871		1100						N
51	M SD17	to	MANGANESE	218	J	mg/kg	871		1100						N
51	M SD18	to	MANGANESE	191	J	mg/kg	871		1100						N
52	M SD15	to	MANGANESE	23 6	J	mg/kg	871		1100						N
52	M SD16	to	MANGANESE	112	J	mg/kg	871		1100						N
25	SD25A	0 0 to 0 5	MERCURY	0 12	J	MG/KG	4		2 3		2		0 13		N
25	SD25B	0 0 to 0 5	MERCURY	0 1	=	MG/KG	4		2 3		2		0 13		N
25	SD25C	0 0 to 1 0	MERCURY	0 53	=	MG/KG	4		2 3		2		0 13	X	N
26	SD26E	0 0 to 0 4	MERCURY	0 16	=	MG/KG	4		2 3		2		0 13	X	N

TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
25	SD25A	0 0 to 0 5	METHYL ETHYL KETONE (2 BUTANONE)	0 12	J	MG/KG	0 01	X	4700		17				N
25	SD25B	0 0 to 0 5	METHYL ETHYL KETONE (2 BUTANONE)	0 006	J	MG/KG	0 01		4700		17				N
25	SD25C	0 0 to 1 0	METHYL ETHYL KETONE (2 BUTANONE)	0 02	J	MG/KG	0 01	X	4700		17				N
26	SD26B	0 0 to 0 5	METHYL ETHYL KETONE (2 BUTANONE)	0 004	J	MG/KG	0 01		4700		17				N
26	SD26C	0 0 to 0 6	METHYL ETHYL KETONE (2 BUTANONE)	0 005	J	MG/KG	0 01		4700		17				N
26	SD26C	0 0 to 0 6	METHYL ETHYL KETONE (2 BUTANONE)	0 008	J	MG/KG	0 01		4700		17				N
26	SD26D	0 0 to 0 7	METHYL ETHYL KETONE (2 BUTANONE)	0 003	J	MG/KG	0 01		4700		17				N
26	SD26E	0 0 to 0 4	METHYL ETHYL KETONE (2-BUTANONE)	0 04	J	MG/KG	0 01	X	4700		17				N
51	SE51C	0 0 to 2 0	METHYL ETHYL KETONE (2-BUTANONE)	0 006	J	MG/KG	0 01		4700		17				N
25	M SD04	to	METHYLENE CHLORIDE	0 004	J	MG/KG			85		0 02				N
25	M SD05	to	METHYLENE CHLORIDE	0 015	=	MG/KG			85		0 02				N
26	M SD02	to	METHYLENE CHLORIDE	0 001	J	MG/KG			85		0 02				N
26	M SD03	to	METHYLENE CHLORIDE	0 006	J	MG/KG			85		0 02				N
52	M SD16	to	METHYLENE CHLORIDE	0 008	J	MG/KG			85		0 02				N
26	M SD01	to	NAPHTHALENE	0 072	J	MG/KG	0 13		160		84		0 33		N
26	M-SD01	to	NAPHTHALENE	0 052	J	MG/KG	0 13		160		84		0 33		N
26	SD26E	0 0 to 0 4	NAPHTHALENE	0 081	J	MG/KG	0 13		160		84		0 33		N
25	M SD04	to	NICKEL	26 2	=	mg/kg	30 5		160		130		15 9	X	N
25	M SD05	to	NICKEL	4 8	J	mg/kg	30 5		160		130		15 9		N
25	SD25A	0 0 to 0 5	NICKEL	13 1	J	MG/KG	30 5		160		130		15 9		N
25	SD25B	0 0 to 0 5	NICKEL	15 7	=	MG/KG	30 5		160		130		15 9		N
25	SD25C	0 0 to 1 0	NICKEL	17	=	MG/KG	30 5		160		130		15 9	X	N
26	M-SD01	to	NICKEL	2 3	J	mg/kg	30 5		160		130		15 9		N
26	M-SD01	to	NICKEL	2 1	J	mg/kg	30 5		160		130		15 9		N
26	M-SD02	to	NICKEL	2 2	J	mg/kg	30 5		160		130		15 9		N
26	M-SD03	to	NICKEL	4 3	J	mg/kg	30 5		160		130		15 9		N
26	SD26A	0 0 to 1 0	NICKEL	14 2	=	MG/KG	30 5		160		130		15 9		N
26	SD26B	0 0 to 0 5	NICKEL	12 4	=	MG/KG	30 5		160		130		15 9		N
26	SD26C	0 0 to 0 6	NICKEL	12 8	=	MG/KG	30 5		160		130		15 9		N
26	SD26C	0 0 to 0 6	NICKEL	14 7	=	MG/KG	30 5		160		130		15 9		N
26	SD26D	0 0 to 0 7	NICKEL	14 3	=	MG/KG	30 5		160		130		15 9		N
26	SD26E	0 0 to 0 4	NICKEL	21 2	=	MG/KG	30 5		160		130		15 9	X	N
51	M SD17	to	NICKEL	9 9	J	mg/kg	30 5		160		130		15 9		N
51	M SD18	to	NICKEL	9 5	J	mg/kg	30 5		160		130		15 9		N
51	SE51A	0 0 to 3 0	NICKEL	11 7	J	MG/KG	30 5		160		130		15 9		N
51	SE51B	0 0 to 3 0	NICKEL	14 5	J	MG/KG	30 5		160		130		15 9		N
51	SE51C	0 0 to 2 0	NICKEL	12 6	J	MG/KG	30 5		160		130		15 9		N
52	M SD15	to	NICKEL	3 4	J	mg/kg	30 5		160		130		15 9		N
52	M SD16	to	NICKEL	3 7	J	mg/kg	30 5		160		130		15 9		N
52	SE52A	0 0 to 4 0	NICKEL	11 9	J	MG/KG	30 5		160		130		15 9		N
52	SE52B	0 0 to 1 0	NICKEL	11 1	J	MG/KG	30 5		160		130		15 9		N
25	M SD04	to	OCTACHLORODIBENZOFURAN	0 000117	J	MG/KG			4 3E-09	X	0 000005	X			Y
25	M SD05	to	OCTACHLORODIBENZOFURAN	0 0024	J	MG/KG			4 3E-09	X	0 000005	X			Y
26	M SD01	to	OCTACHLORODIBENZOFURAN	0 00236	J	MG/KG			4 3E-09	X	0 000005	X			Y
26	M SD01	to	OCTACHLORODIBENZOFURAN	0 0019	J	MG/KG			4 3E-09	X	0 000005	X			Y
26	M SD02	to	OCTACHLORODIBENZOFURAN	0 00106	J	MG/KG			4 3E-09	X	0 000005	X			Y
26	M SD03	to	OCTACHLORODIBENZOFURAN	0 000831	J	MG/KG			4 3E-09	X	0 000005	X			Y
25	M SD04	to	OCTACHLORODIBENZO-p DIOXIN	0 0043	J	MG/KG	0 00856		4 3E-09	X	0 000005	X			N
25	M SD05	to	OCTACHLORODIBENZO-p DIOXIN	0 02	=	MG/KG	0 00856	X	4 3E-09	X	0 000005	X			Y
26	M-SD01	to	OCTACHLORODIBENZO-p-DIOXIN	0 051	=	MG/KG	0 00856	X	4 3E-09	X	0 000005	X			Y
26	M-SD01	to	OCTACHLORODIBENZO-p-DIOXIN	0 0616	=	MG/KG	0 00856	X	4 3E-09	X	0 000005	X			Y
26	M-SD02	to	OCTACHLORODIBENZO-p DIOXIN	0 0154	=	MG/KG	0 00856	X	4 3E-09	X	0 000005	X			Y
26	M-SD03	to	OCTACHLORODIBENZO-p DIOXIN	0 00844	=	MG/KG	0 00856		4 3E-09	X	0 000005	X			N
25	SD25B	0 0 to 0 5	PCB 1260 (AROCHLOR 1260)	0 33	=	MG/KG			0 32	X	17		0 033	X	Y
26	M-SD01	to	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	0 000106	=	MG/KG									NA

TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	M SD01	to	PENTACHLORINATED DIBENZOFURANS (TOTAL)	0 0000829	=	MG/KG									NA
26	M SD02	to	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	0 0000342	=	MG/KG									NA
26	M SD03	to	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	0 0000434	=	MG/KG									NA
26	M SD01	to	PENTACHLORINATED DIBENZO p-DIOXINS (TOTAL)	0 0000128	=	MG/KG									NA
26	SD26A	0 0 to 1 0	PENTACHLOROPHENOL	0 14	J	MG/KG			5 3		0 03	X			Y
26	SD26E	0 0 to 0 4	PENTACHLOROPHENOL	0 12	J	MG/KG			5 3		0 03	X			Y
25	M SD05	to	PHENANTHRENE	4 7	=	MG/KG	6 9		230		250		0 33	X	N
25	SD25A	0 0 to 0 5	PHENANTHRENE	0 22	J	MG/KG	6 9		230		250		0 33		N
25	SD25B	0 0 to 0 5	PHENANTHRENE	0 69	=	MG/KG	6 9		230		250		0 33	X	N
25	SD25C	0 0 to 1 0	PHENANTHRENE	3 2	=	MG/KG	6 9		230		250		0 33	X	N
26	M SD01	to	PHENANTHRENE	1 5	=	MG/KG	6 9		230		250		0 33	X	N
26	M SD01	to	PHENANTHRENE	1 3	=	MG/KG	6 9		230		250		0 33	X	N
26	M SD02	to	PHENANTHRENE	0 46	=	MG/KG	6 9		230		250		0 33	X	N
26	M SD03	to	PHENANTHRENE	0 61	=	MG/KG	6 9		230		250		0 33	X	N
26	SD26A	0 0 to 1 0	PHENANTHRENE	1 4	=	MG/KG	6 9		230		250		0 33	X	N
26	SD26B	0 0 to 0 5	PHENANTHRENE	0 28	J	MG/KG	6 9		230		250		0 33		N
26	SD26C	0 0 to 0 6	PHENANTHRENE	0 078	J	MG/KG	6 9		230		250		0 33		N
26	SD26C	0 0 to 0 6	PHENANTHRENE	0 083	J	MG/KG	6 9		230		250		0 33		N
26	SD26D	0 0 to 0 7	PHENANTHRENE	0 044	J	MG/KG	6 9		230		250		0 33		N
26	SD26E	0 0 to 0 4	PHENANTHRENE	2 5	=	MG/KG	6 9		230		250		0 33	X	N
51	M SD17	to	PHENANTHRENE	0 029	J	MG/KG	6 9		230		250		0 33		N
51	M SD18	to	PHENANTHRENE	0 13	J	MG/KG	6 9		230		250		0 33		N
52	M SD15	to	PHENANTHRENE	0 14	J	MG/KG	6 9		230		250		0 33		N
52	M-SD16	to	PHENANTHRENE	0 063	J	MG/KG	6 9		230		250		0 33		N
25	M-SD04	to	POTASSIUM	271	J	mg/kg	1560								N
25	M-SD05	to	POTASSIUM	375	J	mg/kg	1560								N
25	SD25A	0 0 to 0 5	POTASSIUM	1170	J	MG/KG	1560								N
25	SD25B	0 0 to 0 5	POTASSIUM	1950	=	MG/KG	1560	X							NA
25	SD25C	0 0 to 1 0	POTASSIUM	2630	=	MG/KG	1560	X							NA
26	M SD01	to	POTASSIUM	180	J	mg/kg	1560								N
26	M-SD01	to	POTASSIUM	253	J	mg/kg	1560								N
26	M-SD02	to	POTASSIUM	1150	J	mg/kg	1560								N
26	M-SD03	to	POTASSIUM	409	J	mg/kg	1560								N
26	SD26A	0 0 to 1 0	POTASSIUM	2060	=	MG/KG	1560	X							NA
26	SD26B	0 0 to 0 5	POTASSIUM	1860	=	MG/KG	1560	X							NA
26	SD26C	0 0 to 0 6	POTASSIUM	2050	=	MG/KG	1560	X							NA
26	SD26C	0 0 to 0 6	POTASSIUM	2310	=	MG/KG	1560	X							NA
26	SD26D	0 0 to 0 7	POTASSIUM	1950	=	MG/KG	1560	X							NA
26	SD26E	0 0 to 0 4	POTASSIUM	3240	=	MG/KG	1560	X							NA
51	M SD17	to	POTASSIUM	498	J	mg/kg	1560								N
51	M SD18	to	POTASSIUM	408	J	mg/kg	1560								N
52	M SD15	to	POTASSIUM	106	J	mg/kg	1560								N
52	M SD16	to	POTASSIUM	126	J	mg/kg	1560								N
25	M SD04	to	PYRENE	0 056	J	MG/KG	2 882		230		880		0 33		N
25	M SD05	to	PYRENE	9 3	=	MG/KG	2 882	X	230		880		0 33	X	Y
25	SD25A	0 0 to 0 5	PYRENE	0 61	J	MG/KG	2 882		230		880		0 33	X	N
25	SD25B	0 0 to 0 5	PYRENE	0 75	=	MG/KG	2 882		230		880		0 33	X	N
25	SD25C	0 0 to 1 0	PYRENE	5	=	MG/KG	2 882	X	230		880		0 33	X	Y
26	M SD01	to	PYRENE	2 5	=	MG/KG	2 882		230		880		0 33	X	N
26	M-SD01	to	PYRENE	2	=	MG/KG	2 882		230		880		0 33	X	N
26	M-SD02	to	PYRENE	0 9	=	MG/KG	2 882		230		880		0 33	X	N
26	M SD03	to	PYRENE	1 2	=	MG/KG	2 882		230		880		0 33	X	N
26	SD26A	0 0 to 1 0	PYRENE	2 4	=	MG/KG	2 882		230		880		0 33	X	N
26	SD26B	0 0 to 0 5	PYRENE	0 47	=	MG/KG	2 882		230		880		0 33	X	N
26	SD26C	0 0 to 0 6	PYRENE	0 12	J	MG/KG	2 882		230		880		0 33		N

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TABLE M-4
Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values
Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC: Direct Exposure Value	RBC: Direct Exposure Exceedance Flag	RBC: GWP Value	RBC: GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
26	SD26C	0 0 to 0 6	PYRENE	0 14	J	MG/KG	2 882		230		880		0 33		N
26	SD26D	0 0 to 0 7	PYRENE	0 095	J	MG/KG	2 882		230		880		0 33		N
26	SD26E	0 0 to 0 4	PYRENE	4 9	=	MG/KG	2 882	X	230		880		0 33	X	Y
51	M-SD17	to	PYRENE	0 039	J	MG/KG	2 882		230		880		0 33		N
51	M-SD18	to	PYRENE	0 23	J	MG/KG	2 882		230		880		0 33		N
52	M-SD15	to	PYRENE	0 42	J	MG/KG	2 882		230		880		0 33	X	N
52	M-SD16	to	PYRENE	0 15	J	MG/KG	2 882		230		880		0 33		N
25	SD25A	0 0 to 0 5	SELENIUM	3 6	=	MG/KG	1 7	X	39		5				N
25	SD25B	0 0 to 0 5	SELENIUM	1 5	=	MG/KG	1 7		39		5				N
25	SD25C	0 0 to 1 0	SELENIUM	2 8	=	MG/KG	1 7	X	39		5				N
26	M-SD01	to	SELENIUM	0 71	J	mg/kg	1 7		39		5				N
26	M-SD01	to	SELENIUM	0 73	J	mg/kg	1 7		39		5				N
26	M-SD02	to	SELENIUM	0 79	J	mg/kg	1 7		39		5				N
26	SD26B	0 0 to 0 5	SELENIUM	1 6	=	MG/KG	1 7		39		5				N
26	SD26C	0 0 to 0 6	SELENIUM	1 2	=	MG/KG	1 7		39		5				N
26	SD26C	0 0 to 0 6	SELENIUM	1 3	=	MG/KG	1 7		39		5				N
26	SD26E	0 0 to 0 4	SELENIUM	1 9	=	MG/KG	1 7	X	39		5				N
51	M-SD18	to	SELENIUM	0 77	J	mg/kg	1 7		39		5				N
52	SE52B	0 0 to 1 0	SELENIUM	0 98	=	MG/KG	1 7		39		5				N
25	M-SD04	to	SILVER	9 1	=	mg/kg	1 8	X	39		34		2	X	Y
52	SE52B	0 0 to 1 0	SILVER	0 28	J	MG/KG	1 8		39		34		2		N
25	M-SD04	to	SODIUM	45 7	J	mg/kg	240								N
25	M-SD05	to	SODIUM	68 8	J	mg/kg	240								N
25	SD25A	0 0 to 0 5	SODIUM	201	J	MG/KG	240								N
26	M-SD01	to	SODIUM	57 5	J	mg/kg	240								N
26	M SD01	to	SODIUM	87 7	J	mg/kg	240								N
26	M SD02	to	SODIUM	282	J	mg/kg	240	X							NA
26	M-SD03	to	SODIUM	134	J	mg/kg	240								N
51	M-SD17	to	SODIUM	74	J	mg/kg	240								N
51	M-SD18	to	SODIUM	42 4	J	mg/kg	240								N
52	M-SD15	to	SODIUM	40 6	J	mg/kg	240								N
52	M-SD16	to	SODIUM	149	J	mg/kg	240								N
25	M-SD04	to	TCDD Equivalent	0 000004417	=	MG/KG	0 000009		0 0000043	X	0 005				N
25	M-SD05	to	TCDD Equivalent	0 0000224	=	MG/KG	0 000009	X	0 0000043	X	0 005				Y
26	M-SD01	to	TCDD Equivalent	0 00005336	=	MG/KG	0 000009	X	0 0000043	X	0 005				Y
26	M-SD01	to	TCDD Equivalent	0 0000635	=	MG/KG	0 000009	X	0 0000043	X	0 005				Y
26	M-SD02	to	TCDD Equivalent	0 00001646	=	MG/KG	0 000009	X	0 0000043	X	0 005				Y
26	M-SD03	to	TCDD Equivalent	0 000009271	=	MG/KG	0 000009	X	0 0000043	X	0 005				Y
26	M-SD01	to	TETRACHLORINATED DIBENZOFURANS (TOTAL)	0 0000123	=	MG/KG									NA
26	M-SD01	to	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	0 0000087	=	MG/KG									NA
25	M-SD04	to	VANADIUM	6 7	J	mg/kg	30		55		6000				N
25	M-SD05	to	VANADIUM	12 9	=	mg/kg	30		55		6000				N
25	SD25A	0 0 to 0 5	VANADIUM	25 4	J	MG/KG	30		55		6000				N
25	SD25B	0 0 to 0 5	VANADIUM	26 5	=	MG/KG	30		55		6000				N
25	SD25C	0 0 to 1 0	VANADIUM	27 9	=	MG/KG	30		55		6000				N
26	M-SD01	to	VANADIUM	6 9	J	mg/kg	30		55		6000				N
26	M-SD01	to	VANADIUM	6 7	J	mg/kg	30		55		6000				N
26	M-SD02	to	VANADIUM	4 7	J	mg/kg	30		55		6000				N
26	M-SD03	to	VANADIUM	7 1	J	mg/kg	30		55		6000				N
26	SD26A	0 0 to 1 0	VANADIUM	22 3	=	MG/KG	30		55		6000				N
26	SD26B	0 0 to 0 5	VANADIUM	20 9	=	MG/KG	30		55		6000				N
26	SD26C	0 0 to 0 6	VANADIUM	25 1	=	MG/KG	30		55		6000				N
26	SD26C	0 0 to 0 6	VANADIUM	28 8	=	MG/KG	30		55		6000				N
26	SD26D	0 0 to 0 7	VANADIUM	24	=	MG/KG	30		55		6000				N
26	SD26E	0 0 to 0 4	VANADIUM	38 9	=	MG/KG	30	X	55		6000				N

TABLE M-4

Summary of Detected Parameters in Sediment Soil at FU2 Campared to Background and Screening Level Values

Memphis Depot Main Installation RI

Site	Station	Depth Range	Parameter	Concentration	Qualifier	Units	Background Value	Background Exceedance Flag	RBC Direct Exposure Value	RBC Direct Exposure Exceedance Flag	RBC GWP Value	RBC GWP Exceedance Flag	Ecological Criterion Value	Ecological Criterion Exceedance Flag	Exceeded Criteria Flag
51	M-SD17	to	VANADIUM	13 1	=	mg/kg	30		55		6000				N
51	M-SD18	to	VANADIUM	22 1	=	mg/kg	30		55		6000				N
52	M SD15	to	VANADIUM	5 8	J	mg/kg	30		55		6000				N
52	M-SD16	to	VANADIUM	4 6	J	mg/kg	30		55		6000				N
25	M SD04	to	ZINC	1170	=	mg/kg	797	X	2300		12000		124	X	Y
25	M SD05	to	ZINC	69 6	=	mg/kg	797		2300		12000		124		N
25	SD25A	0 0 to 0 5	ZINC	190	=	MG/KG	797		2300		12000		124	X	N
25	SD25B	0 0 to 0 5	ZINC	46 4	=	MG/KG	797		2300		12000		124		N
25	SD25C	0 0 to 1 0	ZINC	175	=	MG/KG	797		2300		12000		124	X	N
26	M SD01	to	ZINC	33	=	mg/kg	797		2300		12000		124		N
26	M SD01	to	ZINC	40 6	=	mg/kg	797		2300		12000		124		N
26	M SD02	to	ZINC	66 9	=	mg/kg	797		2300		12000		124		N
26	M SD03	to	ZINC	120	=	mg/kg	797		2300		12000		124		N
26	SD26A	0 0 to 1 0	ZINC	50 3	=	MG/KG	797		2300		12000		124		N
26	SD26B	0 0 to 0 5	ZINC	44 5	=	MG/KG	797		2300		12000		124		N
26	SD26C	0 0 to 0 6	ZINC	573	=	MG/KG	797		2300		12000		124	X	N
26	SD26C	0 0 to 0 6	ZINC	128	=	MG/KG	797		2300		12000		124	X	N
26	SD26D	0 0 to 0 7	ZINC	142	=	MG/KG	797		2300		12000		124	X	N
26	SD26E	0 0 to 0 4	ZINC	233	=	MG/KG	797		2300		12000		124	X	N
51	M SD17	to	ZINC	135	=	mg/kg	797		2300		12000		124	X	N
51	M SD18	to	ZINC	40 3	=	mg/kg	797		2300		12000		124		N
51	SE51A	0 0 to 3 0	ZINC	39	J	MG/KG	797		2300		12000		124		N
51	SE51B	0 0 to 3 0	ZINC	42 7	J	MG/KG	797		2300		12000		124		N
51	SE51C	0 0 to 2 0	ZINC	46 2	J	MG/KG	797		2300		12000		124		N
52	M SD15	to	ZINC	42 5	=	mg/kg	797		2300		12000		124		N
52	M SD16	to	ZINC	66 9	=	mg/kg	797		2300		12000		124		N
52	SE52A	0 0 to 4 0	ZINC	40 1	J	MG/KG	797		2300		12000		124		N
52	SE52B	0 0 to 1 0	ZINC	38 1	J	MG/KG	797		2300		12000		124		N

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ADMINISTRATIVE RECORD

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