



Department of Energy

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DEC 14 2009

Ms. Jennifer Tufts
U.S. Environmental Protection Agency, Region 4
Federal Facilities Branch
61 Forsyth Street
Atlanta, Georgia 30303

PPPO-02-220-10

Mr. Edward Winner, FFA Manager
Kentucky Department for Environmental Protection
Division of Waste Management
200 Fair Oaks Lane, 2nd Floor
Frankfort, Kentucky 40601

Dear Ms. Tufts and Mr. Winner:

**TRANSMITTAL OF THE ERRATA PAGES AND REPLACEMENT PAGES FOR THE
REMOVAL ACTION WORK PLAN FOR SOILS OPERABLE UNIT INACTIVE
FACILITIES SWMU 19 AND SWMU 181 AT THE PADUCAH GASEOUS DIFFUSION
PLANT, PADUCAH, KENTUCKY (DOE/LX/07-0220&D2/R1)**

Reference: Letter from J. Tufts to R. Knerr, "Approval of the D2 Removal Action
Work Plan for Soils Operable Unit Inactive Facilities SWMU 19 and
SWMU 181 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/LX/07-0220&D2/R1)," dated November 12, 2009

Please find enclosed the errata pages and replacement pages for the D2/R1 *Removal Action Work Plan for Soils Operable Unit Inactive Facilities SWMU 19 and SWMU 181 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0220&D2/R1)*. The enclosed replacement pages and errata pages satisfy the condition for approval from the Environmental Protection Agency (EPA) (reference) and include the additional agreed upon changes that are detailed in the letter from EPA dated November 12, 2009 (reference).

If you have any questions or require additional information, please contact David Dollins at (270) 441-6819.

Sincerely,

A handwritten signature in black ink, appearing to read "Reinhard Knerr", is written over a horizontal line.

Reinhard Knerr
Paducah Site Lead
Portsmouth/Paducah Project Office

Enclosures:

1. Certification Page
2. List of Changes Made to the D2/R1 Soils Inactive Facilities RAWP
3. Clean Replacement Pages & Errata Pages
4. Red-lined Replacement Pages

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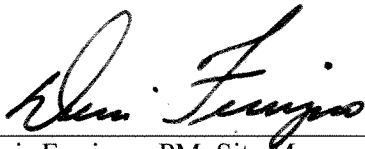
CERTIFICATION

Document Identification:

Errata for the Removal Action Work Plan for Soils Operable Unit Inactive Facilities SWMU 19 and SWMU 181 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-0220&D2/R1

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Paducah Remediation Services, LLC
Operator



Dennis Ferrigno, PM, Site Manager

12-11-09

Date Signed

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

U.S. Department of Energy (DOE)
Owner



Reinhard Knerr, Paducah Site Lead
Portsmouth/Paducah Project Office

12/14/09

Date Signed

CHANGES MADE:

**Removal Action Work Plan
for Soils Operable Unit Inactive Facilities
SWMU 19 and SWMU 181
at the Paducah Gaseous Diffusion Plant,
Paducah, Kentucky
DOE/LX/07-0220&D2/R1, issued October 2009**

The enclosed replacement pages and errata pages document the following 5 changes.

1. Title Page – added revised date, corrected document number
2. Table of Contents, page vi – added Appendix H
3. Appendix A, page A-9, 5th paragraph, 8th row – deleted text "and/or"³ and inserted text "and/or other appropriate DOT performance orientated packaging"
4. Appendix A, page A-12, Section A.3.3 C-410 B HF Neutralization Lagoon (SWMU 19), letter "N" – added text "(Appendix H)"
5. Inserted Appendix H (errata pages)

**Removal Action Work Plan
for Soils Operable Unit Inactive Facilities
SWMU 19 and SWMU 181
at the Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**

Date Issued—October 2009

Revised Date—December 2009

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the

Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

CLEARED FOR PUBLIC RELEASE

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- Continue inspection and site maintenance during and after excavation/removal and restoration to ensure that no additional erosion occurs and until the excavated/restored area is stable.

The impact to vulnerable or sensitive populations, habitats, or natural resources (i.e., critical or aquatic habitat, migratory birds, wetlands, streams, and floodplains) has been identified. These impacts have been evaluated and the necessary mitigation measures required to meet applicable or relevant and appropriate requirements (ARARs) will be implemented during the construction and operation phases of this removal action.

Mobilization will include, but is not limited to, participation in the Readiness Assessment process, delivery of all necessary construction and environmental, safety, and health (ES&H) equipment, setup of any temporary facilities, establishment of a trained and qualified workforce on the job site, and delivery of construction materials required for starting work. All work shall be performed in strict compliance with U.S. Occupational Safety and Health Administration (OSHA) 29 *CFR* 1910 and 1926. An experienced worker with excavation competent person training in accordance with OSHA 29 *CFR* 1926 subpart P shall supervise excavation and backfill activities. Erosion control measures will be established.

Storm water control will be implemented as described in the BMP Plan, PRS/PROG/0017. The BMP plan will be implemented to minimize and/or eliminate the potential that contaminants associated with the inactive facilities might migrate beyond their current boundaries. These BMPs may include use of dust mitigation/suppression, diversion of run-on/run-off around the project area, and/or installation of small storm water retention areas, silt fencing, or rock check dams as localized engineering controls, as required. Any containers of oil or oil products will be inventoried in accordance with PRS/ENM/0037, *Spill Prevention, Control, and Countermeasure Plan*, for the DOE Paducah Site. If volumes equal or exceed 55 gal, plans for controls will be set in place.

Excavation and removal activities will be conducted in a manner that will limit fugitive dust emissions and will provide sedimentation controls, thereby limiting potential impacts due to airborne particulates and suspended solid loading.

The removal action will generate approximately 59,500 ft³ of soil/sediment and approximately 25,000 gal of accumulated rainwater requiring on-site or off-site disposal. Soil and other waste materials will be characterized, managed, transported, and disposed of in accordance with the ARARs/to be considered (TBCs) for low-level radioactive, Resource Conservation and Recovery Act (RCRA), Toxic Substances and Control Act (TSCA), or industrial waste. DOE will manage/store polychlorinated biphenyl (PCB) remediation wastes in risk-based storage instead of storage meeting 40 *CFR* 761.61(b)(1) requirements pursuant to 40 *CFR* 761.65(b)(2)(vi) and 761.65(c)(9)(iv). Such wastes may be stored up to 180 days in drums, B-12 boxes, B-25 boxes, intermodal containers, Sealand containers and/or other appropriate DOT performance orientated packaging, provided that the containers are sealed when not adding/removing materials. Storing PCB remediation wastes in this manner provides a level of protectiveness that is similar to storing PCB remediation wastes in piles under 40 *CFR* 761.65(c)(9). DOE will perform disposal [in accordance with 40 *CFR* § 761.61(a)(5)(v)] of soil containing less than or equal to 49 ppm PCBs at the C-746-U Solid Waste Landfill. The Environmental Performance Standard in 401 *KAR* 47:030, Section 8, and Condition Number ACTV0006, "Standard Requirement 1" of Solid Waste Permit No. 073-00014/073-00015/073-00045, currently allow such disposal. PCB remediation waste requiring off-site disposal (i.e., greater than 49 ppm) will be disposed of in accordance with 40 *CFR* § 761.61(a), (b), or (c) in a RCRA permitted landfill, in a landfill with a coordinated approval, in a chemical waste landfill, or in a facility with approval from EPA. The contractor will follow permit conditions and as low as reasonably achievable as required by DOE orders.

Health-based standards of 39.2 ppm TCE and 2,080 ppm 1,1,1-trichloroethane (TCA) in solids will be used as the criteria for making contained-in/contaminated-with determinations for environmental media and debris managed on-site and/or designated for disposal at the C-746-U Landfill. The Commonwealth of Kentucky has agreed to consult with DOE and the state where the off-site facility is located to reach agreement on the appropriate health-based standard for making such determinations for waste that is to be shipped to such a facility. Wastewater collected or generated as part of the Removal Action will be sent to an existing Kentucky Pollutant Discharge Elimination System (KPDES)-permitted Waste Water Treatment Facility located at PGDP for treatment prior to discharge into surface water. Water may be treated and disposed of on- or off-site; however it will meet facility WAC and as low as reasonably achievable as required by DOE orders.

Off-site transfer of any hazardous substance, pollutant, or contaminant generated during this action will be sent to a facility that complies with applicable federal and state laws and has been approved by U.S. Environmental Protection Agency (EPA) for acceptance of CERCLA waste. Accordingly, DOE will verify with the appropriate EPA regional contact that any needed off-site facility is acceptable for receipt of CERCLA wastes prior to transfer in accordance with the requirements of the Off-Site Rule in 40 *CFR* § 300.440(a)(4).

Post-excavation soil sampling activities will be conducted following excavations. At the C-218 Firing Range (SWMU 181), verification soil sampling for lead will be performed. Limited additional excavation of lead ‘hot spots’ may be required depending upon sampling results. At the C-410-B HF Neutralization Lagoon, soil characterization samples will be collected prior to restoration for use in future CERCLA actions (e.g., Groundwater OU, Soils OU, Comprehensive Site OU, etc.). All post-excavation sampling will be conducted in accordance with the Sampling and Analysis Plan (SAP) found in Appendix F. Sampling locations will be surveyed upon completion of sampling activities and the four corner boundaries of the C-410-B HF Neutralization Lagoon will be surveyed and used to update as-built engineering drawings.

Upon completion of fieldwork, demobilization will occur. Demobilization includes decontamination and removal of all construction and health and safety equipment, dismantlement and removal of temporary structures and storm water controls, removal of excess construction materials, removal of all personnel, and preparation of a post construction completion report.

All work shall be performed in accordance with this RAWP, the SOW (Appendix A); the design drawings (Appendix B); ES&H Plan (Appendix C); Waste Management Plan (WMP) (Appendix D); Quality Assurance Project Plan (Appendix E); SAP (Appendix F); and the Data Management Implementation Plan (Appendix G).

A.2.1 C-218 OUTDOOR FIRING RANGE (SWMU 181)

The following is the specific scope for the C-218 Outdoor firing range.

Soil: The length of the face of SWMU 181 [approximately 130 m (425 ft)] will be excavated to a depth of up to two ft and the ground surface in front of the berm [approximately 1,730 m² (18,600 ft²)] will be excavated to reduce the lead concentration within the facility “hot spot” to below 800 mg/kg. This will result in the “hot spot” excavation of approximately 3,398 m³ (51,000 ft³) of contaminated soil. Any residual lead-contaminated soil remaining at the C-218 Firing Range (SWMU 181) after excavation is complete that exhibits concentrations greater than those established for unrestricted use/unlimited exposure will be addressed as part of future remedial investigation activities associated with the Soils OU.

A.2.2 C-410-B HF NEUTRALIZATION LAGOON (SWMU 19)

The following are specific scopes for the C-410-B HF Neutralization lagoon.

Soil/Sediment and Debris: SWMU 19 will be excavated within its defined boundaries. Defined boundaries of SWMU 19 extend no further than 3 ft on each side of or 3 ft from the bottom of the lagoon. This will result in the removal of approximately 241 m³ (8,512 ft³) of sediment, concrete, and soil, which includes the lagoon structure and its defined area, as well as approximately 94,635 L (25,000 gal) of water. Any residual contamination from historical releases remaining after excavation is complete will be addressed as part of future remedial investigation activities (e.g., Groundwater OU, Soils OU, Comprehensive Site OU, etc.).

Accumulated Rainwater: Accumulated rainwater, estimated at approximately 94,633 L (25,000 gal), will be pumped from the lagoon and properly stored and disposed of prior to excavation of the lagoon and surrounding soil. The rainwater/sludge mixture will be pumped from the lagoon by a pump designed to pump solids and liquids (i.e., trash pump). The sludge either will be placed in an approved filtering container to allow for solid/liquid separation or the mixture will be passed through a filter press unit at C-752-C or another approved unit at the site. The liquids and solids then will be properly stored and dispositioned. Impermeable containments will be constructed at hose connections to ensure all liquids are contained.

A.3 WORK INCLUDED

A.3.1 MOBILIZATION

- A. Mobilization shall include, but is not limited to, participation in the Readiness Review process; delivery of all necessary construction and health & safety equipment; setup of any temporary facilities; maintenance of temporary facilities; establishment of the total required workforce on the job site; completion of site specific training; delivery of all construction materials required to start work; and establishment of construction site access controls. It also includes the submittal of all documentation required prior to the start of fieldwork.

A.3.2 SEDIMENT CONTROL MEASURES

- A. Construct and maintain, at a minimum, storm water management controls, including but not limited to diversion ditches, diversion dams, silt fence, straw bale barriers, silt socks, erosion control blankets or mats, and rock check dams. Storm water control will be implemented as described in the BMP Plan, PRS/PROG/0017.
- B. Install erosion and sediment control measures. All erosion and sediment control measures shall be maintained throughout the construction period. Erosion and sediment control measures (i.e., hay bales and/or silt fencing) for the C-218 firing range will be placed at the sides and bottom of the excavation since excavation activities will be at the vertical face and floor of the berm. Weekly checks will be made to ensure erosion controls are in place during project downtime. Erosion and sediment controls will be put in place at the end of each days activities.
- C. If feasible, disturbed areas shall be securely covered with an impermeable liner during extended periods of time where no excavation/sampling work is required or when inclement weather is forecast. Transfer water collected in the work area into liquid storage containers. A pump (i.e. trash pump) would be used to transfer rainwater. A low point would be created when placing the

liner over the excavation to allow for the water to collect. The water would be pumped into a mobile poly tank and disposed of in an appropriate manner.

- D. Best management practices shall be implemented as outlined in the “Best Management Practices Plan,” PRS/PROG/0017.

A.3.3 C-410-B HF NEUTRALIZATION LAGOON (SWMU 19)

- A. Obtain excavation/penetration permits prior to excavation work.
- B. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).
- C. Construct or install all erosion control structures per BMP Plan, PRS/PROG/0017.
- D. Pump the accumulated storm water and manage per the WMP (Appendix D).
- E. Locate utilities by hand excavation methods.
- F. Field verify the location of all utilities by hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.
- G. Underground utilities shall be emptied and cut at the edge of the excavation and relocated, capped, or plugged.
- H. Use the sheet pile, shoring, or other appropriate methods to stabilize excavation during removal. The specific method(s) to be used for stabilization, if needed, will be developed during construction planning. Contractor construction work control documents will include appropriate details such as plans, drawings or schematics showing how the sheet pile, shoring, or other appropriate methods will be used to stabilize excavations during the removal process.
- I. Excavate soil, sediment, and debris (concrete) to the lines and grades as shown on Drawing C7DC410B0A001 in Appendix B.
- J. Take special care during excavation around pipe supports and building foundations.
- K. The excavated soil, sediments, and concrete debris shall be managed in accordance with the WMP (Appendix D).
- L. Characterize the waste, as necessary, and dispose of according to WMP (Appendix D).
- M. Collect soil characterization samples prior to restoration for use in future CERCLA actions per the SAP (Appendix F).
- N. Backfill the excavated area with clean fill (Appendix H) and compact.
- O. Cover with 6 inch dense graded aggregate and crown to drain.

A.3.4 C-218 OUTDOOR FIRING RANGE (SWMU 181)

- A. Obtain excavation/penetration permits prior to excavation work.

- B. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).
- C. Locate utilities by hand excavation methods.
- D. Coordinate with the RA contractor to determine the status of all utilities.
- E. Field verify the location of all utilities by hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.
- F. Underground utilities shall be emptied and cut at the edge of the excavation and relocated, capped, or plugged.
- G. Excavate soil up to two ft around the inside of the berm and from the existing ground surface if required, as shown in cross sections of Drawing C7DC21800A001 (Appendix B).
- H. The excavated soil shall be managed in accordance with the WMP (Appendix D).
- I. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).
- J. Verification samples will be collected in accordance with the SAP (Appendix F). If cleanup goals have not been met, additional excavation will be performed per the SAP and verification sampling will be repeated.
- K. The excavated area shall be restored and seeded/revegetated.
- L. Apply erosion control blanket to berm slopes.

A.3.5 WASTE MANAGEMENT AND DISPOSAL

- A. Manage waste generated under the WMP (Appendix D). Waste will be evaluated for disposal options and will be disposed of in the most appropriate and economical way. Waste includes, but is not limited to, accumulated stormwater, miscellaneous concrete/brick/metal debris, and soil/sediments.
- B. Provide weekly inspections and maintenance of the waste staging areas and temporarily staged excavated materials until they are shipped off-site.

A.3.6 DEMOBILIZATION

Demobilization shall include, but not be limited to, backfill and restoration in accordance with design drawings; decontamination of equipment; removal of all construction and health & safety equipment; dismantlement and removal of all temporary structure; and removal of all excess construction materials.

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APPENDIX H
FILL AND COVER MATERIAL VERIFICATION PROTOCOL

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Paducah Gaseous Diffusion Plant Fill and Cover Material Verification Protocol

Objective

The protocol will serve as a standard method for determining if fill and cover material is acceptable for response actions at the Paducah Gaseous Diffusion Plant (PGDP). While this protocol presents a standard method for sampling fill and cover material and evaluating the sampling results, deviations from this protocol are likely, and these deviations will be discussed on a case-by-case basis. Examples of likely deviations are the use of historical sampling results instead of results from new sampling in the evaluation and, in the case of historical data, some deviations from the analyte list and analyte sample quantitation limits (SQLs) presented below.

Basis

This protocol is based upon a similar protocol used at the U.S. Department of Energy's (DOE) Savannah River Site (SRS) (Westinghouse Savannah River Company 2003). This protocol was modeled after the SRS protocol in order to respond to preference expressed by U. S. Environmental Protection Agency (EPA) personnel. This protocol was discussed at Federal Facility Manager Meetings held in September 2009, as well as during teleconferences held in September and October 2009.

Verification Protocol

This protocol applies to fill taken from areas owned by DOE at the PGDP. Commercial suppliers of soil for fill or cover will be asked for assurances that soil is uncontaminated as part of contracting.

Protocol requirements are:

- Samples will be collected from soil designated for use in response actions either prior to excavation or from loads at a rate of approximately one five-part composite for every 1,000 yds³ of soil. If *in situ* historical data from an area is available, then results from that sampling may be evaluated instead of results from new sampling; however, DOE will provide information showing that the historical sampling was performed in a manner consistent with this protocol. Once an area is approved through this protocol for a project, then the area sampled will remain as an approved source of fill or cover for that project or similar projects, and additional sampling from that area will not be required.
- Newly collected soil samples will be analyzed for the sitewide list of chemicals of potential concern in Table 2.1 of *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1, Human Health, DOE/LX/07-0107&D1/V1*, (Risk Methods Document) (RMD), with some deviations. This list of analytes and deviations are in Table H.1. Historical results will be evaluated, and the absence of any analytes in the historical results will be discussed.
- Sampling and laboratory analytical methods will be consistent with EPA methods, DOE requirements, and contractor-approved procedures.
- SQLs and their radionuclide equivalents for analytes are shown in Table H.1. Historical data with SQLs or their radionuclide equivalents that exceed the values shown in Table H.1 will be evaluated to determine the impact of SQLs on the acceptability of soil proposed as fill or cover. Results with SQLs exceeding the values shown in Table H.1 may be acceptable, once the impacts on the evaluation are understood.

- Results of laboratory analysis will be screened as follows:
 - For those analytes with site-specific background concentrations (i.e., most metals and radionuclides), results will be compared to the full range of background expected or likely at PGDP. This evaluation will begin with a simple comparison against background concentrations presented in Table H.2, but additional analyses will be used to determine if exceedances of these background concentrations represent potential contamination or natural variation.
 - For analytes without site-specific background concentrations (i.e., some metals, some radionuclides, and organic compounds), results will be compared to the appropriate risk-based value derived from no action levels (NAL) presented in Appendix A of the Risk Methods Document (DOE 2009). Justification for the risk-based values used in the comparison will be provided. The risk-based values used will be the lesser of values based upon a cancer risk target of 1E-05 and a hazard index target of 1.
 - If exceedances of either the full range of background or appropriate risk-based value are identified, then an uncertainty analysis will be performed to determine the possible reasons and importance of exceedances. The identification of analyte concentrations exceeding the background and risk-based value benchmarks will not be the sole basis for discounting use of soil from a particular area as fill or cover.

References

- DOE 2001. *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1, Human Health*, DOE/OR/07-1506&D2, December.
- DOE 2009. Draft *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1, Human Health*, DOE/LX/07-0107&D1/V1, August.
- Westinghouse Savannah River Company 2003. *SRS Fill and Cover Material Verification Protocol*, ERTEC-2003-00012, December.

Table H.1. Sitewide Chemicals of Potential Concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky¹

Analyte	CAS Number	Sample Quantitation	Limit or Radionuclide Equivalent ²
<i>Inorganic Chemicals</i>			
Aluminum	7429905	8,022.5	mg/kg
Antimony	7440360	0.105	mg/kg
Arsenic	7440382	5.5	mg/kg
Barium	7440393	91	mg/kg
Beryllium	7440417	0.45	mg/kg
Boron	7440428	9,180	mg/kg
Cadmium	7440439	0.105	mg/kg
Chromium ³	7440473	12.5	mg/kg
Cobalt	7440484	6.5	mg/kg
Copper	7440508	12	mg/kg
Iron	7439896	14,328.5	mg/kg
Lead	7439921	17.5	mg/kg
Manganese	7439965	350.5	mg/kg
Mercury	7439976	0.1	mg/kg
Molybdenum	7439987	230	mg/kg
Nickel	7440020	14	mg/kg
Selenium	7782492	0.3	mg/kg
Silver	7440224	1.5	mg/kg
Thallium	7440280	0.105	mg/kg
Uranium	7440611	3.8	mg/kg
Vanadium	7440622	22	mg/kg
Zinc	7440666	41	mg/kg
<i>Organic Compounds</i>			
Acenaphthene	83329	1,230	mg/kg
Acenaphthylene	208968	NA	mg/kg
Acrylonitrile	107131	0.729	mg/kg
Anthracene	120127	7,610	mg/kg
Benzene	71432	3.46	mg/kg
Carbazole	86748	87.2	mg/kg
Carbon tetrachloride	56235	0.574	mg/kg
Chloroform	67663	0.123	mg/kg
1,1-Dichloroethene	75354	0.235	mg/kg
1,2-Dichloroethene (mixed)	540590	156	mg/kg
<i>trans</i> -1,2-Dichloroethene	156605	20	mg/kg
<i>cis</i> -1,2-Dichloroethene	156592	15.4	mg/kg
Dieldrin	60571	0.105	mg/kg
Ethylbenzene	100414	46.4	mg/kg
Fluoranthene	206440	1,090	mg/kg
Fluorene	86737	945	mg/kg
Hexachlorobenzene	118741	0.414	mg/kg
Naphthalene	91203	19.4	mg/kg
2-Nitroaniline	88744	4.56	mg/kg
N-Nitroso-di-n-propylamine	621647	0.2	mg/kg
Phenanthrene	85018	NA	mg/kg
Pyrene	129000	814	mg/kg
Tetrachloroethene	127184	1.08	mg/kg
Trichloroethene	79016	0.22	mg/kg
Total Dioxins/Furans ⁴	1746016	1.14E-05	mg/kg

Table H.1. Site-wide Chemicals of Potential Concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky¹ (Continued)

Analyte	CAS Number	Sample Quantitation Limit	or Radionuclide Equivalent ²
Total PAHs	50328	0.197	mg/kg
Benz(a)anthracene	56553	1.96	mg/kg
Benzo(a)pyrene	50328	0.197	mg/kg
Benzo(b)fluoranthene	205992	1.97	mg/kg
Benzo(k)fluoranthene	207089	19.7	mg/kg
Chrysene	218019	197	mg/kg
Dibenz(a,h)anthracene	53703	0.197	mg/kg
Indeno(1,2,3-cd)pyrene	193395	1.97	mg/kg
Total PCBs ⁵	1336363	0.624	mg/kg
Aroclor 1016	12674112	0.618	mg/kg
Aroclor 1221	11104282	0.682	mg/kg
Aroclor 1232	11141165	0.682	mg/kg
Aroclor 1242	53469219	0.619	mg/kg
Aroclor 1248	12672296	0.682	mg/kg
Aroclor 1254	11097691	0.493	mg/kg
Aroclor 1260	11096825	0.657	mg/kg
Vinyl chloride	75014	0.402	mg/kg
Xylenes (Mixture)	1330207	82.1	mg/kg
p-Xylene	106423	NA	mg/kg
m-Xylene	108383	3,940	mg/kg
o-Xylene	95476	4,140	mg/kg
Radionuclides			
Americium-241	14596102	15	pCi/g
Cesium-137+D	10045973	0.25	pCi/g
Cobalt-60	10198400	0.0547	pCi/g
Neptunium-237+D	13994202	0.014	pCi/g
Plutonium-238	13981163	0.002	pCi/g
Plutonium-239	15117483	0.009	pCi/g
Plutonium-240	14119336	31.6	pCi/g
Technetium-99	14133767	0.15	pCi/g
Thorium-230	14269637	1.1	pCi/g
Uranium-234	13966295	0.95	pCi/g
Uranium-235+D	15117961	0.055	pCi/g
Uranium-238+D	7440611	0.95	pCi/g

¹ Taken from Table 2.1 in *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1, Human Health, DOE/LX/07-0107&D1/V1*.

² Sample Quantitation Limit refers to the lowest reliably detected value for an inorganic or an organic analyte. For purposes of this table, the radionuclide equivalent or the minimum detectable activity (MDA) is presented. Values presented for most metals and radionuclides are the "average" site-specific background concentrations at the PGDP. Values presented for boron, molybdenum, americium-241, cobalt-60, and organic compounds are derived from no action levels for the child resident taken from the RMD by revising the target cancer risk and hazard index to 1×10^{-5} and 1, respectively.

³ Table 2.1 in the RMD includes Cr III, Cr Total, and Cr VI. Only Cr Total is included here because it is type of chromium expected in soil samples at the PGDP. The cancer-based screening value presented in the RMD for Cr Total was derived using the cancer slope factor for Cr VI. Background values for Cr III are used here.

⁴ Table 2.1 in the RMD presents several dioxins and furans. Analyses for these organic compounds will not be required for samples from fill and cover material because they are unlikely to be present in soil from DOE-owned areas at the PGDP the absence of polychlorinated biphenyls (PCBs) based upon PGDP process information.

⁵ The list of PCBs may be smaller than that shown here. The list will include Aroclor 1248, 1254, and 1260, which are the most commonly detected PCBs at the PGDP.

NA = not applicable

**Table H.2. Site Specific Background Values Used for Soil Evaluation
at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky**

Analysis	CAS Number	Site-Specific Background Values	
		2001 ¹	2009 ²
Metals (mg/kg)			
Aluminum	7429905	13,000	16,045
Antimony	7440360	0.21	0.21
Arsenic	7440382	12	11
Barium	7440393	200	182
Beryllium	7440417	0.67	0.9
Cadmium	7440439	0.21	0.21
Calcium	7440702	200,000	8,376
Chromium ³	7440473	16	25
Cobalt	7440484	14	13
Copper	7440508	19	24
Iron	7439896	28,000	28,657
Lead	7439921	36	35
Magnesium	7439954	7,700	2,652
Manganese	7439965	1,500	701
Mercury	7439976	0.2	0.2
Nickel	7440020	21	28
Potassium	7440097	1,300	1,005
Selenium	7782492	0.8	0.6
Silver	7440224	2.3	3
Sodium	7440235	320	142
Thallium	7440280	0.21	0.21
Uranium	7440611	4.9	7.6
Vanadium	7440622	38	44
Zinc	7440666	65	82
Radionuclides (pCi/g)			
Cesium-137	10045973	0.49	0.5
Neptunium-237	13994202	0.1	0.028
Plutonium-238	13981163	0.073	0.004
Plutonium-239	15117483	0.025	0.018
Potassium-40	13966002	16	27
Radium-226	13982633	1.5	2.2
Strontium-90	10098972	4.7	0
Technetium-99	14133767	2.5	0.3
Thorium-228	14274829	1.6	2.3
Thorium-230	14269637	1.5	2.2
Thorium-232	NA	1.5	2.2
Uranium-234	13966295	2.5	1.9
Uranium-235	15117961	0.14	0.11
Uranium-238	7440611	1.2	1.9

¹ Background taken from surface soil values found in Table A.12 of DOE 2001.

² Background taken from surface soil values found in Table A.12 of DOE 2009.

³ Background values for Chromium III are presented.

NA = not available

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**Removal Action Work Plan
for Soils Operable Unit Inactive Facilities
SWMU 19 and SWMU 181
at the Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**

Date Issued—October 2009

Revised Date—December 2009

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the

Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

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- Continue inspection and site maintenance during and after excavation/removal and restoration to ensure that no additional erosion occurs and until the excavated/restored area is stable.

The impact to vulnerable or sensitive populations, habitats, or natural resources (i.e., critical or aquatic habitat, migratory birds, wetlands, streams, and floodplains) has been identified. These impacts have been evaluated and the necessary mitigation measures required to meet applicable or relevant and appropriate requirements (ARARs) will be implemented during the construction and operation phases of this removal action.

Mobilization will include, but is not limited to, participation in the Readiness Assessment process, delivery of all necessary construction and environmental, safety, and health (ES&H) equipment, setup of any temporary facilities, establishment of a trained and qualified workforce on the job site, and delivery of construction materials required for starting work. All work shall be performed in strict compliance with U.S. Occupational Safety and Health Administration (OSHA) 29 *CFR* 1910 and 1926. An experienced worker with excavation competent person training in accordance with OSHA 29 *CFR* 1926 subpart P shall supervise excavation and backfill activities. Erosion control measures will be established.

Storm water control will be implemented as described in the BMP Plan, PRS/PROG/0017. The BMP plan will be implemented to minimize and/or eliminate the potential that contaminants associated with the inactive facilities might migrate beyond their current boundaries. These BMPs may include use of dust mitigation/suppression, diversion of run-on/run-off around the project area, and/or installation of small storm water retention areas, silt fencing, or rock check dams as localized engineering controls, as required. Any containers of oil or oil products will be inventoried in accordance with PRS/ENM/0037, *Spill Prevention, Control, and Countermeasure Plan*, for the DOE Paducah Site. If volumes equal or exceed 55 gal, plans for controls will be set in place.

Excavation and removal activities will be conducted in a manner that will limit fugitive dust emissions and will provide sedimentation controls, thereby limiting potential impacts due to airborne particulates and suspended solid loading.

The removal action will generate approximately 59,500 ft³ of soil/sediment and approximately 25,000 gal of accumulated rainwater requiring on-site or off-site disposal. Soil and other waste materials will be characterized, managed, transported, and disposed of in accordance with the ARARs/to be considered (TBCs) for low-level radioactive, Resource Conservation and Recovery Act (RCRA), Toxic Substances and Control Act (TSCA), or industrial waste. DOE will manage/store polychlorinated biphenyl (PCB) remediation wastes in risk-based storage instead of storage meeting 40 *CFR* 761.61(b)(1) requirements pursuant to 40 *CFR* 761.65(b)(2)(vi) and 761.65(c)(9)(iv). Such wastes may be stored up to 180 days in drums, B-12 boxes, B-25 boxes, intermodal containers, Sealand containers and/or other appropriate DOT performance orientated packaging, provided that the containers are sealed when not adding/removing materials. Storing PCB remediation wastes in this manner provides a level of protectiveness that is similar to storing PCB remediation wastes in piles under 40 *CFR* 761.65(c)(9). DOE will perform disposal [in accordance with 40 *CFR* § 761.61(a)(5)(v)] of soil containing less than or equal to 49 ppm PCBs at the C-746-U Solid Waste Landfill. The Environmental Performance Standard in 401 *KAR* 47:030, Section 8, and Condition Number ACTV0006, "Standard Requirement 1" of Solid Waste Permit No. 073-00014/073-00015/073-00045, currently allow such disposal. PCB remediation waste requiring off-site disposal (i.e., greater than 49 ppm) will be disposed of in accordance with 40 *CFR* § 761.61(a), (b), or (c) in a RCRA permitted landfill, in a landfill with a coordinated approval, in a chemical waste landfill, or in a facility with approval from EPA. The contractor will follow permit conditions and as low as reasonably achievable as required by DOE orders.

Deleted: and/or

Health-based standards of 39.2 ppm TCE and 2,080 ppm 1,1,1-trichloroethane (TCA) in solids will be used as the criteria for making contained-in/contaminated-with determinations for environmental media and debris managed on-site and/or designated for disposal at the C-746-U Landfill. The Commonwealth of Kentucky has agreed to consult with DOE and the state where the off-site facility is located to reach agreement on the appropriate health-based standard for making such determinations for waste that is to be shipped to such a facility. Wastewater collected or generated as part of the Removal Action will be sent to an existing Kentucky Pollutant Discharge Elimination System (KPDES)-permitted Waste Water Treatment Facility located at PGDP for treatment prior to discharge into surface water. Water may be treated and disposed of on- or off-site; however it will meet facility WAC and as low as reasonably achievable as required by DOE orders.

Off-site transfer of any hazardous substance, pollutant, or contaminant generated during this action will be sent to a facility that complies with applicable federal and state laws and has been approved by U.S. Environmental Protection Agency (EPA) for acceptance of CERCLA waste. Accordingly, DOE will verify with the appropriate EPA regional contact that any needed off-site facility is acceptable for receipt of CERCLA wastes prior to transfer in accordance with the requirements of the Off-Site Rule in 40 *CFR* § 300.440(a)(4).

Post-excavation soil sampling activities will be conducted following excavations. At the C-218 Firing Range (SWMU 181), verification soil sampling for lead will be performed. Limited additional excavation of lead 'hot spots' may be required depending upon sampling results. At the C-410-B HF Neutralization Lagoon, soil characterization samples will be collected prior to restoration for use in future CERCLA actions (e.g., Groundwater OU, Soils OU, Comprehensive Site OU, etc.). All post-excavation sampling will be conducted in accordance with the Sampling and Analysis Plan (SAP) found in Appendix F. Sampling locations will be surveyed upon completion of sampling activities and the four corner boundaries of the C-410-B HF Neutralization Lagoon will be surveyed and used to update as-built engineering drawings.

Upon completion of fieldwork, demobilization will occur. Demobilization includes decontamination and removal of all construction and health and safety equipment, dismantlement and removal of temporary structures and storm water controls, removal of excess construction materials, removal of all personnel, and preparation of a post construction completion report.

All work shall be performed in accordance with this RAWP, the SOW (Appendix A); the design drawings (Appendix B); ES&H Plan (Appendix C); Waste Management Plan (WMP) (Appendix D); Quality Assurance Project Plan (Appendix E); SAP (Appendix F); and the Data Management Implementation Plan (Appendix G).

A.2.1 C-218 OUTDOOR FIRING RANGE (SWMU 181)

The following is the specific scope for the C-218 Outdoor firing range.

Soil: The length of the face of SWMU 181 [approximately 130 m (425 ft)] will be excavated to a depth of up to two ft and the ground surface in front of the berm [approximately 1,730 m² (18,600 ft²)] will be excavated to reduce the lead concentration within the facility "hot spot" to below 800 mg/kg. This will result in the "hot spot" excavation of approximately 3,398 m³ (51,000 ft³) of contaminated soil. Any residual lead-contaminated soil remaining at the C-218 Firing Range (SWMU 181) after excavation is complete that exhibits concentrations greater than those established for unrestricted use/unlimited exposure will be addressed as part of future remedial investigation activities associated with the Soils OU.

A.2.2 C-410-B HF NEUTRALIZATION LAGOON (SWMU 19)

The following are specific scopes for the C-410-B HF Neutralization lagoon.

Soil/Sediment and Debris: SWMU 19 will be excavated within its defined boundaries. Defined boundaries of SWMU 19 extend no further than 3 ft on each side of or 3 ft from the bottom of the lagoon. This will result in the removal of approximately 241 m³ (8,512 ft³) of sediment, concrete, and soil, which includes the lagoon structure and its defined area, as well as approximately 94,635 L (25,000 gal) of water. Any residual contamination from historical releases remaining after excavation is complete will be addressed as part of future remedial investigation activities (e.g., Groundwater OU, Soils OU, Comprehensive Site OU, etc.).

Accumulated Rainwater: Accumulated rainwater, estimated at approximately 94,633 L (25,000 gal), will be pumped from the lagoon and properly stored and disposed of prior to excavation of the lagoon and surrounding soil. The rainwater/sludge mixture will be pumped from the lagoon by a pump designed to pump solids and liquids (i.e., trash pump). The sludge either will be placed in an approved filtering container to allow for solid/liquid separation or the mixture will be passed through a filter press unit at C-752-C or another approved unit at the site. The liquids and solids then will be properly stored and dispositioned. Impermeable containments will be constructed at hose connections to ensure all liquids are contained.

A.3 WORK INCLUDED

A.3.1 MOBILIZATION

- A. Mobilization shall include, but is not limited to, participation in the Readiness Review process; delivery of all necessary construction and health & safety equipment; setup of any temporary facilities; maintenance of temporary facilities; establishment of the total required workforce on the job site; completion of site specific training; delivery of all construction materials required to start work; and establishment of construction site access controls. It also includes the submittal of all documentation required prior to the start of fieldwork.

A.3.2 SEDIMENT CONTROL MEASURES

- A. Construct and maintain, at a minimum, storm water management controls, including but not limited to diversion ditches, diversion dams, silt fence, straw bale barriers, silt socks, erosion control blankets or mats, and rock check dams. Storm water control will be implemented as described in the BMP Plan, PRS/PROG/0017.
- B. Install erosion and sediment control measures. All erosion and sediment control measures shall be maintained throughout the construction period. Erosion and sediment control measures (i.e., hay bales and/or silt fencing) for the C-218 firing range will be placed at the sides and bottom of the excavation since excavation activities will be at the vertical face and floor of the berm. Weekly checks will be made to ensure erosion controls are in place during project downtime. Erosion and sediment controls will be put in place at the end of each days activities.
- C. If feasible, disturbed areas shall be securely covered with an impermeable liner during extended periods of time where no excavation/sampling work is required or when inclement weather is forecast. Transfer water collected in the work area into liquid storage containers. A pump (i.e. trash pump) would be used to transfer rainwater. A low point would be created when placing the

liner over the excavation to allow for the water to collect. The water would be pumped into a mobile poly tank and disposed of in an appropriate manner.

- D. Best management practices shall be implemented as outlined in the “Best Management Practices Plan,” PRS/PROG/0017.

A.3.3 C-410-B HF NEUTRALIZATION LAGOON (SWMU 19)

- A. Obtain excavation/penetration permits prior to excavation work.
- B. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).
- C. Construct or install all erosion control structures per BMP Plan, PRS/PROG/0017.
- D. Pump the accumulated storm water and manage per the WMP (Appendix D).
- E. Locate utilities by hand excavation methods.
- F. Field verify the location of all utilities by hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.
- G. Underground utilities shall be emptied and cut at the edge of the excavation and relocated, capped, or plugged.
- H. Use the sheet pile, shoring, or other appropriate methods to stabilize excavation during removal. The specific method(s) to be used for stabilization, if needed, will be developed during construction planning. Contractor construction work control documents will include appropriate details such as plans, drawings or schematics showing how the sheet pile, shoring, or other appropriate methods will be used to stabilize excavations during the removal process.
- I. Excavate soil, sediment, and debris (concrete) to the lines and grades as shown on Drawing C7DC410B0A001 in Appendix B.
- J. Take special care during excavation around pipe supports and building foundations.
- K. The excavated soil, sediments, and concrete debris shall be managed in accordance with the WMP (Appendix D).
- L. Characterize the waste, as necessary, and dispose of according to WMP (Appendix D).
- M. Collect soil characterization samples prior to restoration for use in future CERCLA actions per the SAP (Appendix F).
- N. Backfill the excavated area with clean fill ([Appendix H](#)) and compact.
- O. Cover with 6 inch dense graded aggregate and crown to drain.

A.3.4 C-218 OUTDOOR FIRING RANGE (SWMU 181)

- A. Obtain excavation/penetration permits prior to excavation work.

- B. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).
- C. Locate utilities by hand excavation methods.
- D. Coordinate with the RA contractor to determine the status of all utilities.
- E. Field verify the location of all utilities by hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.
- F. Underground utilities shall be emptied and cut at the edge of the excavation and relocated, capped, or plugged.
- G. Excavate soil up to two ft around the inside of the berm and from the existing ground surface if required, as shown in cross sections of Drawing C7DC21800A001 (Appendix B).
- H. The excavated soil shall be managed in accordance with the WMP (Appendix D).
- I. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).
- J. Verification samples will be collected in accordance with the SAP (Appendix F). If cleanup goals have not been met, additional excavation will be performed per the SAP and verification sampling will be repeated.
- K. The excavated area shall be restored and seeded/revegetated.
- L. Apply erosion control blanket to berm slopes.

A.3.5 WASTE MANAGEMENT AND DISPOSAL

- A. Manage waste generated under the WMP (Appendix D). Waste will be evaluated for disposal options and will be disposed of in the most appropriate and economical way. Waste includes, but is not limited to, accumulated stormwater, miscellaneous concrete/brick/metal debris, and soil/sediments.
- B. Provide weekly inspections and maintenance of the waste staging areas and temporarily staged excavated materials until they are shipped off-site.

A.3.6 DEMOBILIZATION

Demobilization shall include, but not be limited to, backfill and restoration in accordance with design drawings; decontamination of equipment; removal of all construction and health & safety equipment; dismantlement and removal of all temporary structure; and removal of all excess construction materials.

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APPENDIX H
FILL AND COVER MATERIAL VERIFICATION PROTOCOL

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Paducah Gaseous Diffusion Plant Fill and Cover Material Verification Protocol

Objective

The protocol will serve as a standard method for determining if fill and cover material is acceptable for response actions at the Paducah Gaseous Diffusion Plant (PGDP). While this protocol presents a standard method for sampling fill and cover material and evaluating the sampling results, deviations from this protocol are likely, and these deviations will be discussed on a case-by-case basis. Examples of likely deviations are the use of historical sampling results instead of results from new sampling in the evaluation and, in the case of historical data, some deviations from the analyte list and analyte sample quantitation limits (SQLs) presented below.

Basis

This protocol is based upon a similar protocol used at the U.S. Department of Energy's (DOE) Savannah River Site (SRS) (Westinghouse Savannah River Company 2003). This protocol was modeled after the SRS protocol in order to respond to preference expressed by U. S. Environmental Protection Agency (EPA) personnel. This protocol was discussed at Federal Facility Manager Meetings held in September 2009, as well as during teleconferences held in September and October 2009.

Verification Protocol

This protocol applies to fill taken from areas owned by DOE at the PGDP. Commercial suppliers of soil for fill or cover will be asked for assurances that soil is uncontaminated as part of contracting.

Protocol requirements are:

- Samples will be collected from soil designated for use in response actions either prior to excavation or from loads at a rate of approximately one five-part composite for every 1,000 yds³ of soil. If *in situ* historical data from an area is available, then results from that sampling may be evaluated instead of results from new sampling; however, DOE will provide information showing that the historical sampling was performed in a manner consistent with this protocol. Once an area is approved through this protocol for a project, then the area sampled will remain as an approved source of fill or cover for that project or similar projects, and additional sampling from that area will not be required.
- Newly collected soil samples will be analyzed for the sitewide list of chemicals of potential concern in Table 2.1 of *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1, Human Health, DOE/LX/07-0107&D1/V1*, (Risk Methods Document) (RMD), with some deviations. This list of analytes and deviations are in Table H.1. Historical results will be evaluated, and the absence of any analytes in the historical results will be discussed.
- Sampling and laboratory analytical methods will be consistent with EPA methods, DOE requirements, and contractor-approved procedures.
- SQLs and their radionuclide equivalents for analytes are shown in Table H.1. Historical data with SQLs or their radionuclide equivalents that exceed the values shown in Table H.1 will be evaluated to determine the impact of SQLs on the acceptability of soil proposed as fill or cover. Results with SQLs exceeding the values shown in Table H.1 may be acceptable, once the impacts on the evaluation are understood.

- Results of laboratory analysis will be screened as follows:
 - For those analytes with site-specific background concentrations (i.e., most metals and radionuclides), results will be compared to the full range of background expected or likely at PGDP. This evaluation will begin with a simple comparison against background concentrations presented in Table H.2, but additional analyses will be used to determine if exceedances of these background concentrations represent potential contamination or natural variation.
 - For analytes without site-specific background concentrations (i.e., some metals, some radionuclides, and organic compounds), results will be compared to the appropriate risk-based value derived from no action levels (NAL) presented in Appendix A of the Risk Methods Document (DOE 2009). Justification for the risk-based values used in the comparison will be provided. The risk-based values used will be the lesser of values based upon a cancer risk target of 1E-05 and a hazard index target of 1.
 - If exceedances of either the full range of background or appropriate risk-based value are identified, then an uncertainty analysis will be performed to determine the possible reasons and importance of exceedances. The identification of analyte concentrations exceeding the background and risk-based value benchmarks will not be the sole basis for discounting use of soil from a particular area as fill or cover.

References

- DOE 2001. *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1, Human Health*, DOE/OR/07-1506&D2, December.
- DOE 2009. Draft *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1, Human Health*, DOE/LX/07-0107&D1/V1, August.
- Westinghouse Savannah River Company 2003. *SRS Fill and Cover Material Verification Protocol*, ERTEC-2003-00012, December.

Table H.1. Sitewide Chemicals of Potential Concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky¹

Analyte	CAS Number	Sample Quantitation	Limit or Radionuclide Equivalent ²
<i>Inorganic Chemicals</i>			
Aluminum	7429905	8,022.5	mg/kg
Antimony	7440360	0.105	mg/kg
Arsenic	7440382	5.5	mg/kg
Barium	7440393	91	mg/kg
Beryllium	7440417	0.45	mg/kg
Boron	7440428	9,180	mg/kg
Cadmium	7440439	0.105	mg/kg
Chromium ³	7440473	12.5	mg/kg
Cobalt	7440484	6.5	mg/kg
Copper	7440508	12	mg/kg
Iron	7439896	14,328.5	mg/kg
Lead	7439921	17.5	mg/kg
Manganese	7439965	350.5	mg/kg
Mercury	7439976	0.1	mg/kg
Molybdenum	7439987	230	mg/kg
Nickel	7440020	14	mg/kg
Selenium	7782492	0.3	mg/kg
Silver	7440224	1.5	mg/kg
Thallium	7440280	0.105	mg/kg
Uranium	7440611	3.8	mg/kg
Vanadium	7440622	22	mg/kg
Zinc	7440666	41	mg/kg
<i>Organic Compounds</i>			
Acenaphthene	83329	1,230	mg/kg
Acenaphthylene	208968	NA	mg/kg
Acrylonitrile	107131	0.729	mg/kg
Anthracene	120127	7,610	mg/kg
Benzene	71432	3.46	mg/kg
Carbazole	86748	87.2	mg/kg
Carbon tetrachloride	56235	0.574	mg/kg
Chloroform	67663	0.123	mg/kg
1,1-Dichloroethene	75354	0.235	mg/kg
1,2-Dichloroethene (mixed)	540590	156	mg/kg
<i>trans</i> -1,2-Dichloroethene	156605	20	mg/kg
<i>cis</i> -1,2-Dichloroethene	156592	15.4	mg/kg
Dieldrin	60571	0.105	mg/kg
Ethylbenzene	100414	46.4	mg/kg
Fluoranthene	206440	1,090	mg/kg
Fluorene	86737	945	mg/kg
Hexachlorobenzene	118741	0.414	mg/kg
Naphthalene	91203	19.4	mg/kg
2-Nitroaniline	88744	4.56	mg/kg
N-Nitroso-di-n-propylamine	621647	0.2	mg/kg
Phenanthrene	85018	NA	mg/kg
Pyrene	129000	814	mg/kg
Tetrachloroethene	127184	1.08	mg/kg
Trichloroethene	79016	0.22	mg/kg
Total Dioxins/Furans ⁴	1746016	1.14E-05	mg/kg

Table H.1. Site-wide Chemicals of Potential Concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky¹ (Continued)

Analyte	CAS Number	Sample Quantitation Limit	or Radionuclide Equivalent ²
Total PAHs	50328	0.197	mg/kg
Benz(a)anthracene	56553	1.96	mg/kg
Benzo(a)pyrene	50328	0.197	mg/kg
Benzo(b)fluoranthene	205992	1.97	mg/kg
Benzo(k)fluoranthene	207089	19.7	mg/kg
Chrysene	218019	197	mg/kg
Dibenz(a,h)anthracene	53703	0.197	mg/kg
Indeno(1,2,3-cd)pyrene	193395	1.97	mg/kg
Total PCBs ⁵	1336363	0.624	mg/kg
Aroclor 1016	12674112	0.618	mg/kg
Aroclor 1221	11104282	0.682	mg/kg
Aroclor 1232	11141165	0.682	mg/kg
Aroclor 1242	53469219	0.619	mg/kg
Aroclor 1248	12672296	0.682	mg/kg
Aroclor 1254	11097691	0.493	mg/kg
Aroclor 1260	11096825	0.657	mg/kg
Vinyl chloride	75014	0.402	mg/kg
Xylenes (Mixture)	1330207	82.1	mg/kg
p-Xylene	106423	NA	mg/kg
m-Xylene	108383	3,940	mg/kg
o-Xylene	95476	4,140	mg/kg
Radionuclides			
Americium-241	14596102	15	pCi/g
Cesium-137+D	10045973	0.25	pCi/g
Cobalt-60	10198400	0.0547	pCi/g
Neptunium-237+D	13994202	0.014	pCi/g
Plutonium-238	13981163	0.002	pCi/g
Plutonium-239	15117483	0.009	pCi/g
Plutonium-240	14119336	31.6	pCi/g
Technetium-99	14133767	0.15	pCi/g
Thorium-230	14269637	1.1	pCi/g
Uranium-234	13966295	0.95	pCi/g
Uranium-235+D	15117961	0.055	pCi/g
Uranium-238+D	7440611	0.95	pCi/g

¹ Taken from Table 2.1 in *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1, Human Health, DOE/LX/07-0107&D1/V1*.

² Sample Quantitation Limit refers to the lowest reliably detected value for an inorganic or an organic analyte. For purposes of this table, the radionuclide equivalent or the minimum detectable activity (MDA) is presented. Values presented for most metals and radionuclides are the "average" site-specific background concentrations at the PGDP. Values presented for boron, molybdenum, americium-241, cobalt-60, and organic compounds are derived from no action levels for the child resident taken from the RMD by revising the target cancer risk and hazard index to 1×10^{-5} and 1, respectively.

³ Table 2.1 in the RMD includes Cr III, Cr Total, and Cr VI. Only Cr Total is included here because it is type of chromium expected in soil samples at the PGDP. The cancer-based screening value presented in the RMD for Cr Total was derived using the cancer slope factor for Cr VI. Background values for Cr III are used here.

⁴ Table 2.1 in the RMD presents several dioxins and furans. Analyses for these organic compounds will not be required for samples from fill and cover material because they are unlikely to be present in soil from DOE-owned areas at the PGDP the absence of polychlorinated biphenyls (PCBs) based upon PGDP process information.

⁵ The list of PCBs may be smaller than that shown here. The list will include Aroclor 1248, 1254, and 1260, which are the most commonly detected PCBs at the PGDP.

NA = not applicable

**Table H.2. Site Specific Background Values Used for Soil Evaluation
at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky**

Analysis	CAS Number	Site-Specific Background Values	
		2001 ¹	2009 ²
<i>Metals (mg/kg)</i>			
Aluminum	7429905	13,000	16,045
Antimony	7440360	0.21	0.21
Arsenic	7440382	12	11
Barium	7440393	200	182
Beryllium	7440417	0.67	0.9
Cadmium	7440439	0.21	0.21
Calcium	7440702	200,000	8,376
Chromium ³	7440473	16	25
Cobalt	7440484	14	13
Copper	7440508	19	24
Iron	7439896	28,000	28,657
Lead	7439921	36	35
Magnesium	7439954	7,700	2,652
Manganese	7439965	1,500	701
Mercury	7439976	0.2	0.2
Nickel	7440020	21	28
Potassium	7440097	1,300	1,005
Selenium	7782492	0.8	0.6
Silver	7440224	2.3	3
Sodium	7440235	320	142
Thallium	7440280	0.21	0.21
Uranium	7440611	4.9	7.6
Vanadium	7440622	38	44
Zinc	7440666	65	82
<i>Radionuclides (pCi/g)</i>			
Cesium-137	10045973	0.49	0.5
Neptunium-237	13994202	0.1	0.028
Plutonium-238	13981163	0.073	0.004
Plutonium-239	15117483	0.025	0.018
Potassium-40	13966002	16	27
Radium-226	13982633	1.5	2.2
Strontium-90	10098972	4.7	0
Technetium-99	14133767	2.5	0.3
Thorium-228	14274829	1.6	2.3
Thorium-230	14269637	1.5	2.2
Thorium-232	NA	1.5	2.2
Uranium-234	13966295	2.5	1.9
Uranium-235	15117961	0.14	0.11
Uranium-238	7440611	1.2	1.9

¹ Background taken from surface soil values found in Table A.12 of DOE 2001.

² Background taken from surface soil values found in Table A.12 of DOE 2009.

³ Background values for Chromium III are presented.

NA = not available

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