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OCT 22 2010

PPPO-02-1015929-11

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Federal Facilities Branch
61 Forsyth Street
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Mr. Edward Winner, FFA Manager
Kentucky Department for Environmental Protection
Division of Waste Management
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Dear Ms. Tufts and Mr. Winner:

REMOVAL ACTION REPORT FOR SOILS OPERABLE UNIT INACTIVE FACILITIES (SOLID WASTE MANAGEMENT UNITS 19 AND 181) AT PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY (DOE/LX/07-0356&D2)

Please find enclosed the *Removal Action Report for the Soils Operable Unit Inactive Facilities Solid Waste Management Units (SWMU) 19 and 181 at the Paducah Gaseous Diffusion Plant, Paducah Kentucky* (RAR). This secondary document satisfies the requirement for a Removal Action Completion Report, as identified in the *Removal Action Work Plan for Contaminated Soils Operable Unit Inactive Facilities SWMU 19 and SWMU 181 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0220&D2/R1. As discussed during the April 14, 2010, Federal Facility Agreement (FFA) Managers' meeting, the contents of this report are consistent with Section X.A of the FFA. For this project, mobilization occurred on November 30, 2009, and final demobilization occurred on March 22, 2010.

This revision incorporates comments received from the U.S. Environmental Protection Agency and the Kentucky Department for Environmental Protection on September 9 and 10, 2010, respectively. Enclosed is a red-lined version of the document and a comment response summary to assist with your review.

If you have any questions or require additional information, please contact David Dollins at (270) 441-6825.

Sincerely,

Reinhard Knerr
Paducah Site Lead
Portsmouth/Paducah Project Office

Enclosures:

1. RAR for Soils Operable Unit Inactive Facilities SWMUs 19 and 181
2. Red-line of RAR for Soils Operable Unit Inactive Facilities SWMU 19 and 181
3. Comment Response Summary

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REMOVAL ACTION REPORT FOR SOILS OPERABLE UNIT INACTIVE FACILITIES SOLID WASTE MANAGEMENT UNITS 19 AND 181 AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY

Description of the Removal Action Implemented

As documented in the approved *Removal Notification for the Soils Operable Unit Inactive Facilities*, DOE/LX/07-0014&D1, a removal action for the C-218 Firing Range [Solid Waste Management Unit (SWMU) 181] and C-410-B Hydrogen Fluoride (HF) Neutralization Lagoon (SWMU 19) was warranted due to the contaminants of concern identified, their associated concentration levels, and relevant process knowledge. See Appendix A for SWMU locations.

As documented in the Removal Action Work Plan (RAWP), soil, sediment, and accumulated rainwater were the exposure pathways of concern. The inactive facilities were not suspected sources of surface water or groundwater contamination at the site, and, as a result, direct contact with soil, sediment, and accumulated rainwater was the primary focus of the removal action. Work was performed in accordance with the RAWP.

The Removal Action Objectives (RAOs) for this removal action are consistent with the overall Remedial Action Objectives for the Soils Operable Unit referenced in Appendix 3 of the Site Management Plan for fiscal year 2010, and meet the intent of the Paducah Site Federal Facility Agreement Section X (Removal Actions). The RAOs for this removal action are the following:

- Control current industrial worker exposure to soils, sediment, and accumulated rainwater containing hazardous substances, pollutants, or contaminants.

- Identify and control, as needed, off-site migration into multimedia exposure pathways such as surface water and groundwater.

Completion of this removal action reduces the risk to current and future workers and excavation workers from direct contact by removing known sources of contamination.

Summaries of Results

C-218 Firing Range (SWMU 181)

Excavation of lead-contaminated soils began on November 30, 2009, and was completed on December 23, 2009, including demobilization. A total of 1,478 yd^3 of soil was removed and dispositioned. Confirmation sampling was performed as described in the RAWP. A data compact disk (CD) containing the analytical results is included as Appendix B.

During a pre-work walkover, bullet fragments were observed in three remediation units (RUs) (RUs 4, 13, and 14). As a result, two ft of soil was excavated from these three RUs.

Following excavation of these three RUs, a metal detector was used to identify other locations that might contain bullet fragments. As a result of this survey, an additional one ft of soil was excavated from RUs 4, 13, and 14. No additional bullet fragments were identified at these RUs after the excavation. Bullet fragments were not identified at any other RUs.

All RUs then were field-screened using X-ray fluorescence (XRF). This XRF screening identified two additional RUs (RUs 10 and 20) that had the potential to contain lead concentrations greater than one-fifth of 400 mg/kg (i.e., 80 mg/kg). As a result, two ft of soil was excavated from these RUs.

One ft of soil was excavated from all other RUs at the site. A second round of XRF screening was performed after the additional excavation. The results of this second round of sampling and analysis are included in Appendix B (initial results are not included on the CD, but are available if requested).

Sample results indicate the following:

- One hundred five composite samples were analyzed for lead by XRF [one five-point composite from each survey unit (SU) and five duplicate samples]. Five-point composite samples were collected from five discreet points within the SU: one in the approximate center of the SU and four points surrounding the center. These points were documented in field logbooks using a global positioning system (GPS). Results ranged from below the detection limit of 8 mg/kg to a maximum of 88.41 mg/kg. Ninety-nine of the samples contained lead at concentrations less than 38 mg/kg. The error associated with the one sample that was reported to contain lead at 88.41 mg/kg was +/- 11.34 mg/kg, and the average of the four SUs within this RU (RU 25) was 35.12 mg/kg. For these reasons, it was decided to proceed with Activity 2 sampling without further excavation at this location.

- Using the detection limit as the value, the average lead concentration of the 100 samples is 17.02 mg/kg. The XRF detection limit for lead was 8 mg/kg.

- Following XRF sampling, postexcavation sampling (i.e., Activity II) was undertaken. This included collection of 17 samples, which were analyzed for lead by SW-846 Method 6020, including 10 samples that were collected as laboratory confirmation of field analysis (see Appendix A for locations). Results ranged from below the detection limit in 10 samples (at detection limits of 17.4 mg/kg to 19.6 mg/kg) to a maximum of 22.4 mg/kg. Using the detection limit as the value, the average concentration of these samples is 18.78 mg/kg.

- Postexcavation samples were verified, assessed, and validated. Detection limits for samples analyzed by SW-846 Method 6020 were higher than indicated in the RAWP (1 mg/kg); however, this variance did not affect the decision making process and, therefore, it is considered insignificant.

- A comparison of the results for those ten samples that were analyzed by both XRF and SW-846 Method 6020 indicates that XRF results are consistently higher. The variance ranged from 0.9 mg/kg (+5%) to 11 mg/kg (+65%), with the average variance being 6 mg/kg (33%). These variances are considered insignificant because the fact that the field screening method over-estimated actual concentrations did not impact the efficacy of the cleanup.

The action limit and cleanup level of 800 ppm total lead, based on the industrial scenario was achieved in all excavated areas. Based on the sampling results, the RAOs for this removal action were achieved. The removal action also successfully achieved cleanup to below 400 ppm total lead, the value for a residential scenario. No further action is recommended for lead at this SWMU. Any other chemicals associated with SWMU 181 will be addressed as part of the Soils Operable Unit.

The excavation site floor was backfilled with approximately 752 yd^3 clean backfill originating from the stockpile of soil from construction of the Northwest Storm Water Collection Basin. Soil excavated from the berm was not replaced. The backfill was verified using the *Paducah Gaseous Diffusion Plant (PGDP) Fill and Cover Material Verification Guidance*, PRS-ENR-0036. This guidance initially was submitted as Appendix H of the RAWP, "Fill and Cover Material Verification Protocol." The title was changed and put into document format in order to incorporate it into the existing contractor document structure. *Fill and Cover Material Verification for Stockpile of Soil from Construction of the Northwest Storm Water Collection Basin*, PRS-ENR-0037/R4, provides the analyses verifying consistency with the guidance. These documents are included in Appendix C.

<u>C-410-B HF Neutralization Lagoon (SWMU 19)</u>

Excavation began on March 3, 2010, and was completed by March 22, 2010, including demobilization. A total of 1,245 yd^3 of soil and other material (i.e., metal railing, concrete rubble, and riprap used for stabilization during excavation) was removed and dispositioned. In order to capture rainwater during the excavation, a low-point/sump was created in the northwest corner of the lagoon and the standing water was pumped into poly tanks. The water was disposed of at Energy*Solutions* in Clive, Utah. Once water was too low to pump, it was mixed with the sludge in the lagoon and solidified with an absorbent.

Approximate dimensions of the excavated area were 44 ft x 57 ft x 10 ft, which is three ft beyond the facility boundary, in accordance with the RAWP (see excerpt below).

> Under this action, C-410-B HF Neutralization Lagoon (SWMU 19) will be removed to up to 3 ft beyond its SWMU boundary; therefore, cleanup levels for this inactive facility are not applicable. With regard to C-410-B Hydrogen Fluoride Neutralization Lagoon, the boundary definition was discussed in previous scoping meetings with agreement to remove up to 3 ft beyond the SWMU boundary, which was determined likely to include the majority of any soil contamination. Any contamination left in place would be [evaluated in future investigations].[1]

Confirmation sampling was performed as described in the RAWP. No evidence of contamination required biasing of sampling locations. A data CD containing the analytical results is included as Appendix B.

Eight composite samples and one duplicate were collected. Sample results indicate the following:

- Total uranium concentrations ranged from less than the detection limit (of 0.896 mg/kg) to 164 mg/kg. Seven of the eight samples contained total uranium at concentrations less than 27.1 mg/kg.

- Uranium-238 levels ranged between 0.536 pCi/g and 30.6 pCi/g. All other radioactive analytes, including americium-241, cesium-237, neptium-237, plutonium-238, plutonium-239/240, technetium-99, thorium-228, thorium-230, thorium-232, uranium-234, and uranium-235 were present in amounts less than background or less than a 1E-5 risk-based soil screening levels for direct contact for the industrial worker (*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).

- None of the samples contained polychlorinated biphenyls at a detection limit of 100 ug/kg.

[1] The original text from the RAWP stated that contamination left in place would be addressed in a subsequent response action.

- Detected lead and arsenic concentrations were below background.

- Polyaromatic hydrocarbons, including benzo(b)fluoranthene, fluoranthene, phenanthrene, and pyrene, were detected in both floor samples and two of the six wall samples at concentrations ranging from less than the detection limit to 1,400 ug/kg. These detections were less than a 1E-5 risk-based soil screening levels for direct contact for the industrial worker.

Based on the sampling results, the RAOs for this removal action were achieved by reducing the risk to current and future workers and excavation workers from direct contact by removing known sources of contamination.

The excavation site was backfilled with approximately 2,527 tons of uncontaminated gravel and fines overlaid by dense gravel aggregate to bring the site back to grade. The backfill was verified clean by the vendor (Appendix D).

Summaries of Problems Encountered

No problems were encountered during implementation of the RAWP. Deviations from the RAWP were minor field changes as discussed above.

Summaries of Accomplishments and/or Effectiveness of the Removal Action

The following table shows the volume of soil that was dispositioned.

Location	Waste Disposition (yd^3)	
	C-746-U Landfill	Waste Control Specialists, Andrews, Texas
C-218 Firing Range	1,136	342
C-410-B HF Neutralization Lagoon	1,245	0
Total	2,381	342

Photographs showing the condition of the areas before, during, and after the removal action are included as Appendix E.

Summary of Project Costs

The following table shows the summary of the project costs.[2]

Location	Cost
C-218 Firing Range	$1,105,405
C-410-B HF Neutralization Lagoon	$684,577
Total	**$1,789,982**

Copies of Relevant Laboratory/Monitoring Data

Relevant laboratory/monitoring data are included as Appendix B.

[2] The accounting of expenditures is based on an estimate governed by figures known at the time the report was written.

APPENDIX A

LOCATION OF C-218 AND C-410-B

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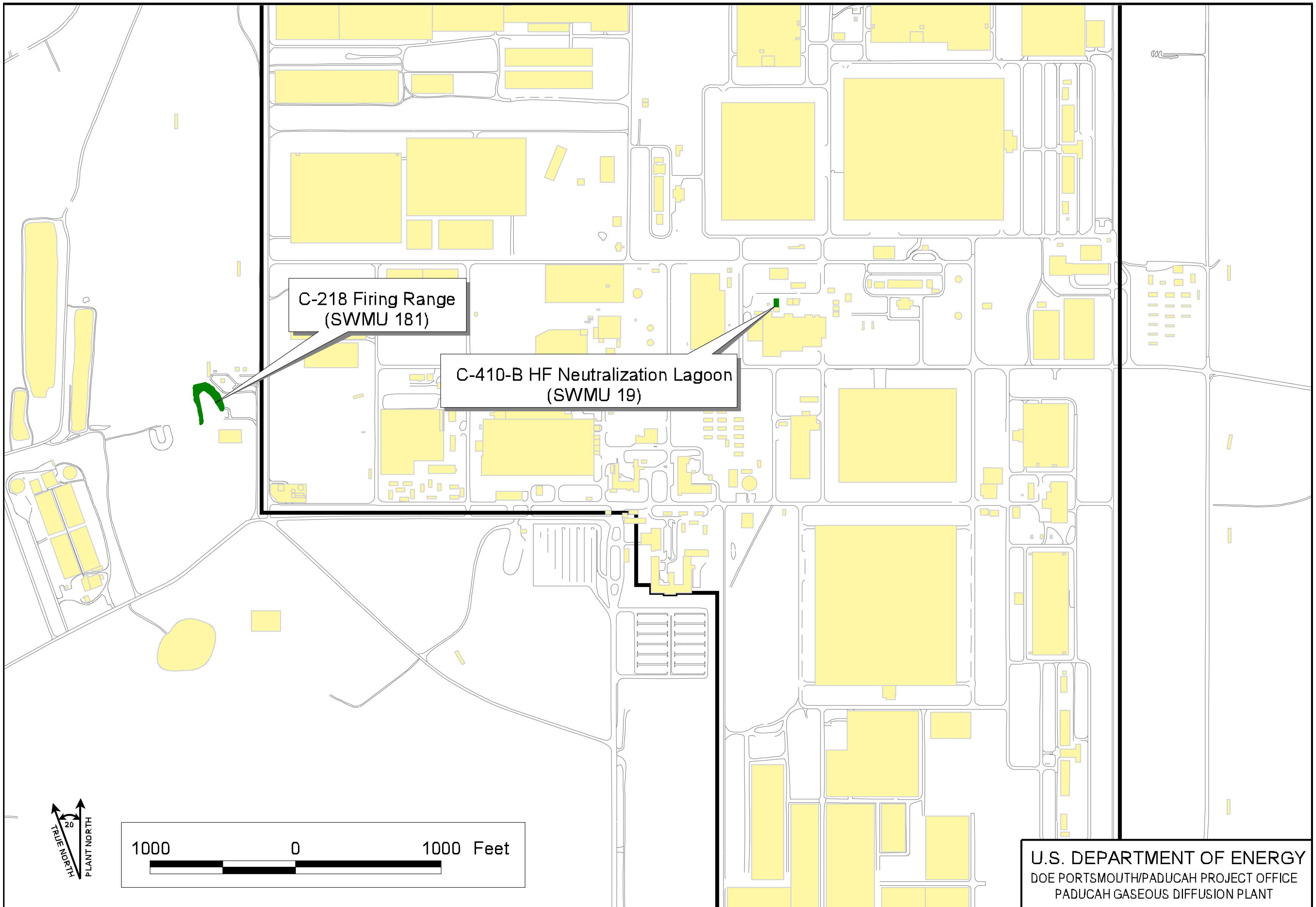
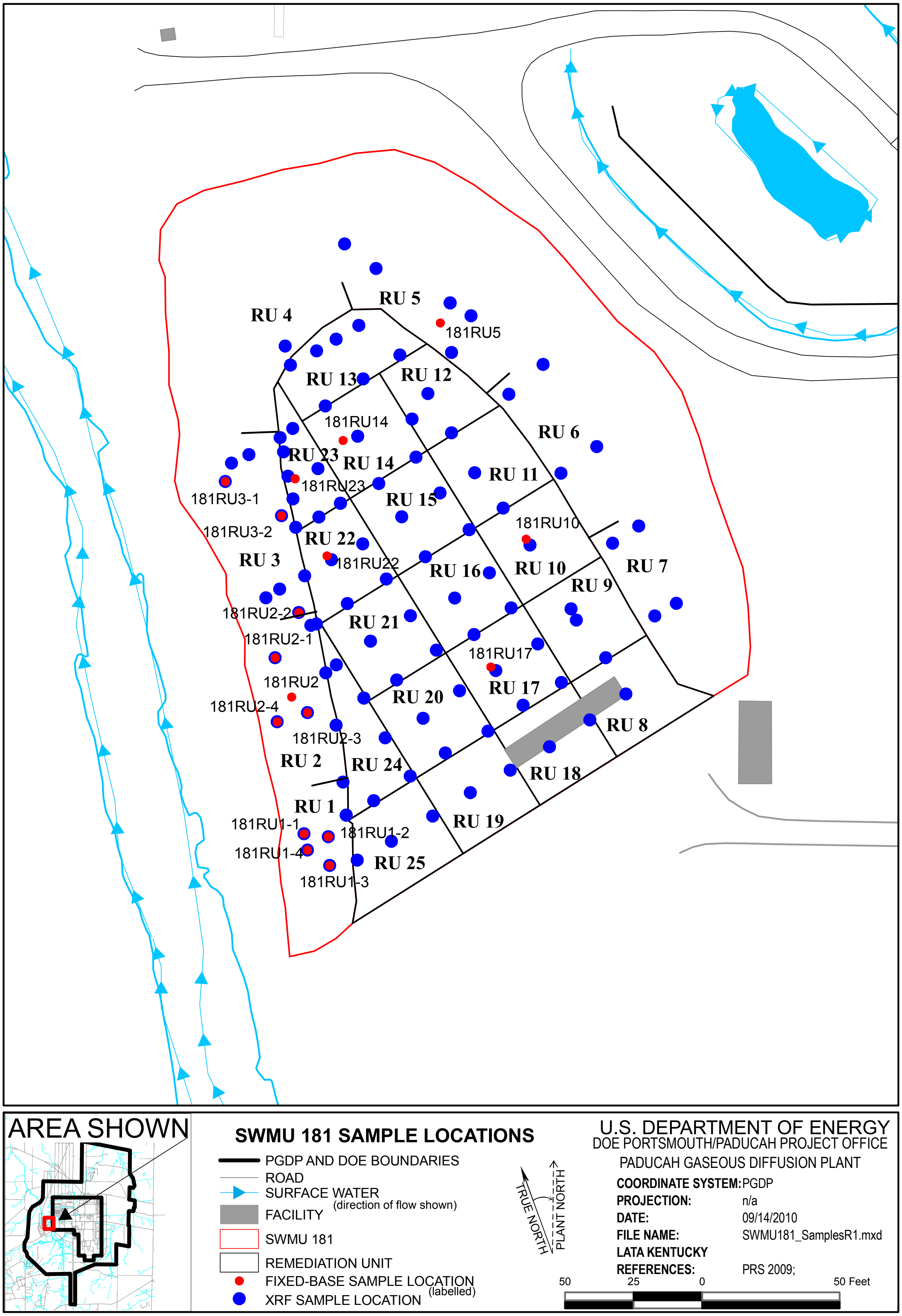


U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

Location of C-218 and C-410-B

LATA Environmental Services of Kentucky, LLC

Figure No. c5ac90005sk014r1_base_r3.apr
DATE 04-08-2010



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181RU3-2
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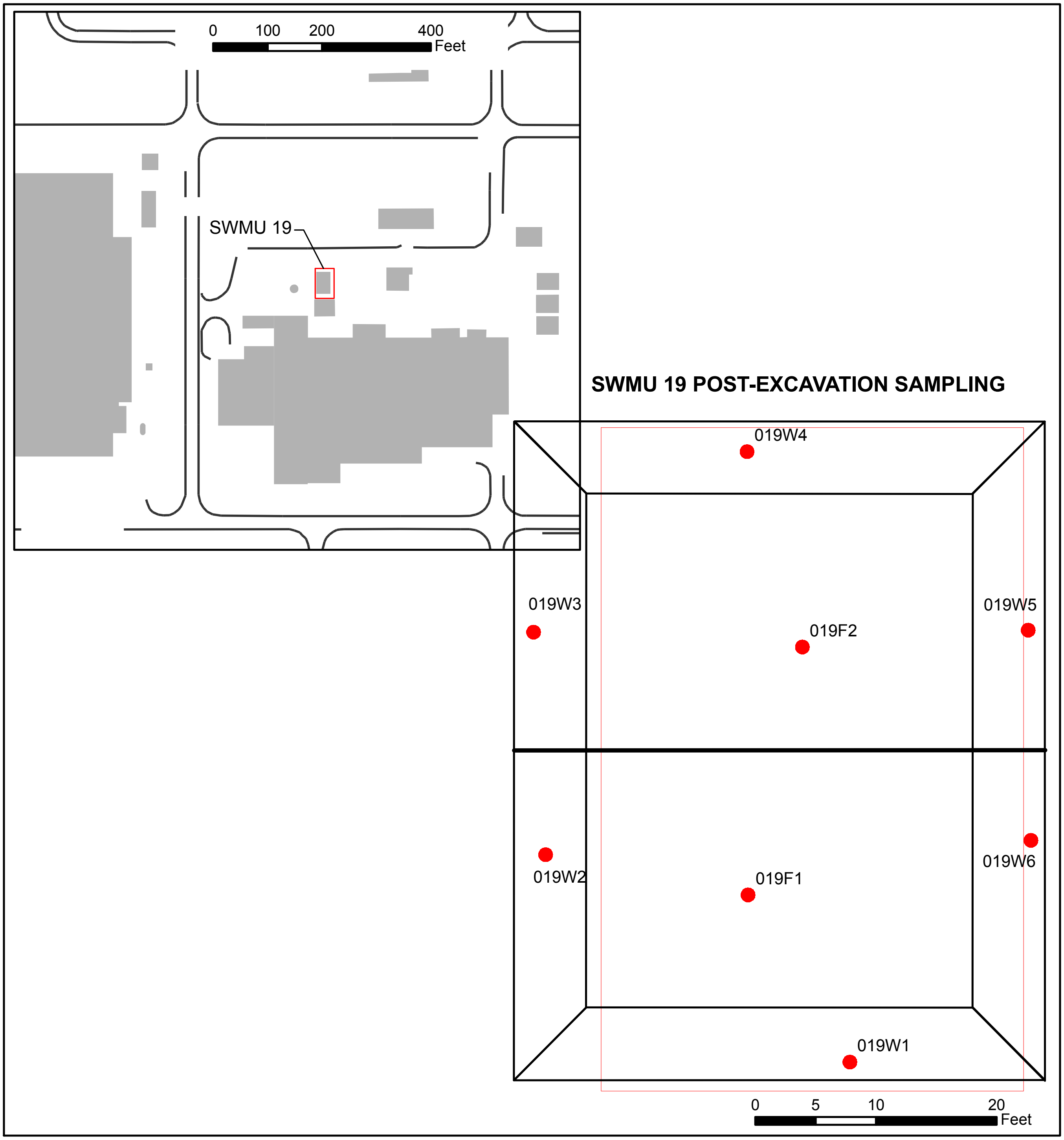
181RU22
181RU2-2
181RU2-1
181RU17
181RU2
181RU2-4
181RU2-3
181RU1-1
181RU1-2
181RU1-4
181RU1-3
AREA SHOWN
SWMU 181 SAMPLE LOCATIONS
PGDP AND DOE BOUNDARIES
ROAD
SURFACE WATER
(direction of flow shown)
FACILITY
SWMU 181
REMEDIATION UNIT
FIXED-BASE SAMPLE LOCATION
(labelled)
XRF SAMPLE LOCATION
TRUE NORTH
PLANT NORTH
U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT
COORDINATE SYSTEM: PGDP
PROJECTION: n/a
DATE: 09/14/2010
FILE NAME: SWMU181_SamplesR1.mxd
LATA KENTUCKY
REFERENCES: PRS 2009;
50 25 0 50 Feet



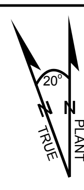
SWMU 19 SAMPLE LOCATIONS

SWMU BOUNDARY

FACILITY

APPROXIMATE LIMITS OF EXCAVATION

LOCATION OF CENTER-POINT OF COMPOSITE SAMPLE
(Each sample was a 4-point composite. Coordinates for the composite were designated as the center of the 4 points.)



U.S. DEPARTMENT OF ENERGY

DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

COORDINATE SYSTEM:	PGDP
PROJECTION:	n/a
DATE:	10/15/2010
FILE NAME:	C5AC90005SK041_410R2.mxd
LATA KENTUCKY	
REFERENCES:	PRS 2008

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APPENDIX B

ANALYTICAL DATA CD

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ANALYTICAL DATA (CD)

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APPENDIX C

FILL AND COVER MATERIALS VERIFICATION

(The document contained in Appendix C was previously published by the former contractor as PRS-ENR-0037/R3. The document was updated to incorporate regulator comments. The title page of the document has been updated to reflect a revision date of October 2010.)

FILL AND COVER MATERIAL VERIFICATION FOR STOCKPILE OF SOIL FROM CONSTRUCTION OF THE NORTHWEST STORM WATER COLLECTION BASIN

CLEARED FOR PUBLIC RELEASE

Fill and Cover Material Verification for Stockpile of Soil From Construction of the Northwest Storm Water Collection Basin

Date Issued—June 2010

Date Revised—October 2010

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

Prepared by
PADUCAH REMEDIATION SERVICES, LLC

Revised by
LATA ENVIRONMENTAL SERVICES OF KENTUCKY, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE- DE-AC30-10CC40020

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ACRONYMS

COPC	chemicals of potential concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
KEEC	Kentucky Energy and Environment Cabinet
MDA	minimum detectable activity
NAL	no action level
PAHs	polycylic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PGDP	Paducah Gaseous Diffusion Plant
RA	removal action
RMD	Risk Methods Document
SQL	sample quantitation limit
UCL	upper confidence limit

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Fill material is needed to replace excavated soils for several planned removal actions (RAs) for the Soils Operable Unit and the Surface Water Operable Unit. The proposed source of this fill material is the stockpile of 22,500 yds^3 excavated soil removed as part of the construction of the Northwest Storm Water Collection Basin in 2001. This evaluation determines whether this soil stockpile is acceptable for use as fill material for these RAs based on analysis of the historical soil samples collected when the stockpile was created. Construction of the storm water basin took place outside the plant boundary and was not within an area of known contamination (i.e., the area has not been designated as a solid waste management unit or area of concern). Historical soil sampling was conducted on the soil to be excavated as a precaution to ensure the soil did not require disposition as a waste.

The "Paducah Gaseous Diffusion Plant (PGDP) Fill and Cover Material Verification Guidance" serves as a standard method or protocol for determining if fill and cover material is acceptable for RAs at PGDP (PRS 2010). While this Guidance presents a standard method for sampling fill and cover material and evaluating the sampling results, guidelines within the Guidance can be applied to the use of historical sampling results with certain deviations. Deviations from the established protocol [e.g., deviations from the analyte list and analyte sample quantitation limits (SQLs)] are presented within this evaluation.

Guidance protocol and their applicability for use of the stockpile of soil from the Northwest Storm Water Collection Basin are presented below.

C.1. SAMPLE COLLECTION

Guidance protocol for sample collection are the following:

> 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 yds^3 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, [U.S. the Department of Energy (DOE)] will provide information showing that the historical sampling was performed in a manner consistent with this guidance. Once an area is approved through this guidance 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.

Prior to construction of the Northwest Storm Water Collection Basin, the soils were characterized *in situ* by collecting five-part composite samples from 17 established grids approximately 100 ft x 100 ft (BJC 2001). All of the soil samples were collected using hand augers at a depth of approximately 1 ft. Analyses for the initial sampling included metals, volatile and semivolatile organics, polychlorinated biphenyls, and radionuclides. Additional sampling for metals took place in October 2001 within two of the grids in order to resample the area around which beryllium was detected. During this resample event, ten individual samples were collected from the top 1 ft of soil. Beryllium was not detected in soil from the resampled locations, and as such, the detections were considered anomalous, and the soil was not further differentiated. Figure 1 shows the locations of these characterization samples (all figures follow text of this Fill and Cover Material Verification).

A total of 17 composite samples (plus 2 field replicate composites) and 10 grab samples (plus 1 field replicate) was collected for the excavated soils. Thirty total samples are available for evaluation in the historical dataset.

C.2. ANALYTICAL PARAMETERS

Guidance protocol for analytical parameters are the following:

> 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 [C.1.1]. Historical results will be evaluated, and the absence of any analytes in the historical results will be discussed.

The historical dataset is summarized in Table C.1. The historical samples were analyzed for the list of analytes presented in Table C.1.1 of the Guidance (see Appendix) with the following exceptions as noted in Table C.2.

Table C.1. Summary of Historical Dataset

Analysis	Units	Detected Results			FOD[a]	SQL/Radionuclide Equivalent Range
		Min	Max	Avg		
Inorganic Chemicals						
Aluminum	mg/kg	3.88E+03	1.13E+04	7.75E+03	30/30	20 - 20
Antimony	mg/kg	n/a	n/a	n/a	0/30	20 - 20
Arsenic	mg/kg	5.27E+00	1.18E+01	7.93E+00	9/30	5 - 5
Barium	mg/kg	3.69E+01	1.04E+02	6.92E+01	30/30	5 - 5
Beryllium	mg/kg	9.91E-01	5.64E+00	3.32E+00	2/30	0.5 - 0.5
Cadmium	mg/kg	2.87E+00	2.87E+00	2.87E+00	1/30	2 - 2
Calcium	mg/kg	1.60E+03	2.21E+05	5.27E+04	30/30	200 - 2000
Chromium	mg/kg	5.02E+00	1.88E+01	1.07E+01	30/30	2.5 - 2.5
Cobalt	mg/kg	2.57E+00	1.64E+01	4.64E+00	26/30	2.5 - 2.5
Copper	mg/kg	3.67E+00	1.45E+01	7.21E+00	30/30	2.5 - 2.5
Iron	mg/kg	5.19E+03	1.68E+04	1.04E+04	30/30	20 - 20
Lead	mg/kg	2.04E+01	1.03E+02	6.17E+01	2/30	20 - 200
Lithium	mg/kg	1.19E+01	1.19E+01	1.19E+01	1/30	10 - 10
Magnesium	mg/kg	8.36E+02	1.39E+04	2.62E+03	30/30	15 - 15
Manganese	mg/kg	1.61E+02	7.62E+02	3.12E+02	30/30	10 - 10
Mercury	mg/kg	n/a	n/a	n/a	0/30	0.2 - 0.2
Nickel	mg/kg	7.09E+00	1.76E+01	1.14E+01	28/30	5 - 5
Selenium	mg/kg	1.06E+00	1.58E+00	1.25E+00	9/30	1 - 1
Silver	mg/kg	n/a	n/a	n/a	0/30	4 - 4
Thallium	mg/kg	n/a	n/a	n/a	0/30	20 - 20
Tin	mg/kg	n/a	n/a	n/a	0/30	100 - 1000
Uranium	mg/kg	n/a	n/a	n/a	0/30	200 - 2000
Vanadium	mg/kg	7.34E+00	3.16E+01	1.84E+01	30/30	2.5 - 2.5
Zinc	mg/kg	2.02E+01	5.23E+01	3.15E+01	21/30	20 - 200
Organic Compounds (PCBs)						
PCB-1016	mg/kg	n/a	n/a	n/a	0/19	0.06 - 0.06
PCB-1221	mg/kg	n/a	n/a	n/a	0/19	0.1 - 0.1
PCB-1232	mg/kg	n/a	n/a	n/a	0/19	0.09 - 0.09
PCB-1242	mg/kg	n/a	n/a	n/a	0/19	0.07 - 0.07
PCB-1248	mg/kg	n/a	n/a	n/a	0/19	0.08 - 0.08
PCB-1254	mg/kg	n/a	n/a	n/a	0/19	0.06 - 0.06
PCB-1260	mg/kg	n/a	n/a	n/a	0/19	0.09 - 0.09

Table C.1. Summary of Historical Dataset (Continued)

Analysis	Units	Detected Results			FOD[a]	SQL/Radionuclide Equivalent Range
		Min	Max	Avg		
PCB-1268	mg/kg	n/a	n/a	n/a	0/19	0.1 - 0.1
Polychlorinated biphenyl	mg/kg	n/a	n/a	n/a	0/19	0.1 - 0.1
Radionuclides						
Americium-241	pCi/g	n/a	n/a	n/a	0/19	0.0588 - 0.187
Cesium-134	pCi/g	n/a	n/a	n/a	0/19	0.0141 - 0.0274
Cesium-137	pCi/g	4.79E-02	2.55E-01	1.09E-01	19/19	0.0197 - 0.0376
Cobalt-60	pCi/g	n/a	n/a	n/a	0/19	0.0177 - 0.0374
Neptunium-237	pCi/g	n/a	n/a	n/a	0/19	0.0304 - 0.0542
Plutonium-238	pCi/g	n/a	n/a	n/a	0/19	0.191 - 0.192
Plutonium-239/240	pCi/g	n/a	n/a	n/a	0/19	0.0416 - 0.0437
Technetium-99	pCi/g	n/a	n/a	n/a	0/19	3.62 - 3.62
Thorium-228	pCi/g	2.31E-01	4.72E-01	3.74E-01	19/19	0.0314 - 0.047
Thorium-230	pCi/g	3.29E-01	5.10E-01	4.09E-01	19/19	0.138 - 0.146
Thorium-232	pCi/g	2.79E-01	5.51E-01	4.00E-01	19/19	0.0408 - 0.0516
Uranium	pCi/g	n/a	n/a	n/a	0/19	0.254 - 1.32
Uranium-234	pCi/g	n/a	n/a	n/a	0/19	0.0768 - 0.668
Uranium-235	pCi/g	2.76E-02	6.69E-02	4.52E-02	16/19	0.0211 - 0.0373
Uranium-238	pCi/g	8.46E-01	1.77E+00	1.30E+00	16/19	0.144 - 0.888
Organic Compounds (Semivolatile)						
1,2,4-Trichlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
1,2-Dichlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
1,3-Dichlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
1,4-Dichlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4,5-Trichlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4,6-Trichlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4-Dichlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4-Dimethylphenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4-Dinitrophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4-Dinitrotoluene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,6-Dinitrotoluene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Chloronaphthalene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Chlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Methyl-4,6-dinitrophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Methylnaphthalene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Methylphenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Nitrobenzenamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Nitrophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
3,3'-Dichlorobenzidine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
3-Nitrobenzenamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Bromophenyl phenyl ether	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Chloro-3-methylphenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Chlorobenzenamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Chlorophenyl phenyl ether	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Methylphenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Nitrobenzenamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Nitrophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Acenaphthene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Acenaphthylene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Anthracene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49

Table C.1. Summary of Historical Dataset (Continued)

Analysis	Units	Detected Results			FOD[a]	SQL/Radionuclide Equivalent Range
		Min	Max	Avg		
Benz(a)anthracene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Benzo(a)pyrene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Benzo(b)fluoranthene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Benzo(ghi)perylene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Bis(2-chloroethoxy)methane	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Bis(2-chloroethyl) ether	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Bis(2-chloroisopropyl) ether	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Bis(2-ethylhexyl)phthalate	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Butyl benzyl phthalate	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Carbazole	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Chrysene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Di-n-octylphthalate	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Fluorene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Hexachlorocyclopentadiene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Hexachloroethane	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Indeno(1,2,3-cd)pyrene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Isophorone	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Naphthalene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Nitrobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
N-Nitroso-di-n-propylamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
N-Nitrosodiphenylamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Pentachlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Phenanthrene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Phenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Pyrene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Pyridine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Organic Compounds (Volatile)						
1,1,1-Trichloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,1,2,2-Tetrachloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,1,2-Trichloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,1-Dichloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,1-Dichloroethene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,2-Dichloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,2-Dichloropropane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,2-Dimethylbenzene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
2-Butanone	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
2-Hexanone	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
4-Methyl-2-pentanone	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Acetone	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Benzene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Bromodichloromethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Bromoform	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Bromomethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Carbon disulfide	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Carbon tetrachloride	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Chlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Ethylbenzene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
m,p-Xylene	mg/kg	n/a	n/a	n/a	0/19	0.02 - 0.02
Methylene chloride	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01

Table C.1. Summary of Historical Dataset (Continued)

Analysis	Units	Detected Results			FOD[a]	SQL/Radionuclide Equivalent Range
		Min	Max	Avg		
Styrene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Tetrachloroethene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Toluene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
trans-1,2-Dichloroethene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
trans-1,3-Dichloropropene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Trichloroethene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01

[a] FOD = frequency of detection. FOD was determined from the number of detected samples over the entire number of samples. Field replicates were counted in the total.

Table C.2. Exceptions to the List of Analytes in the Protocol

Analytes not Included in Historical Analysis	Rationale for Acceptability
Inorganic Chemicals	
Boron Molybdenum	Although these metals are listed in the Guidance, they are not necessary for characterizing soil to be used for fill and cover material, since these metals typically are not detected at PGDP. They were not evaluated for background at PGDP (DOE 1997). Additionally, these metals have never been detected greater than the risk-based value established for this Protocol (see Section 4.2) (DOE 2009a).
Organic Compounds	
Benzo(k)fluoranthene Dibenz(a,h)anthracene Fluoranthene	These polycylic aromatic hydrocarbons (PAHs) were not requested for analysis in the historical set; however, the other PAHs [benz(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; chrysene; and indeno(1,2,3-cd)pyrene] used in calculating Total PAHs by toxicity equivalence were analyzed and not detected. It can be reasonably assumed that these PAHs also would not have been detected.
1,2-Dichloroethene (mixed) Acrylonitrile Chloroform *cis*-1,2-Dichloroethene Vinyl chloride	These volatile organics were not requested for analysis in the historical set; however, all other volatile organics were not detected. It can be reasonably assumed that these volatile organics also would not have been detected.
Dieldrin Hexachlorobenzene	These semivolatile organics represent pesticides. They were not requested for analysis in the historical set. Since no other semivolatile organics were detected, it is unlikely these pesticides would be present.
m-Xylene	Though m-xylene was not analyzed, m,p-xylene was; therefore, m-xylene is not required.
Total Dioxins/Furans	As stated in the Guidance, "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 [due to] the absence of polychlorinated biphenyls (PCBs) based upon PGDP process information." Consistent with this line of reasoning, dioxins/furans are not suspected in the proposed fill material because PCBs were not detected.

Based upon this evaluation of the analyte list for historical samples, the existing dataset is considered comprehensive and adequate to characterize the soil stockpile since it includes COPCs of interest at PGDP.

C.3. SAMPLING AND ANALYTICAL METHODS

Guidance protocol for sampling and analytical methods are the following:

> Sampling and laboratory analytical methods will be consistent with EPA methods, DOE requirements, and contractor-approved procedures.

Sampling and laboratory analytical methods for the historical data were consistent with U.S. Environmental Protection Agency (EPA) methods, U.S. Department of Energy (DOE) requirements, and contractor-approved procedures.

SAMPLE QUANTITATION LIMITS/RADIONUCLIDE EQUIVALENTS

Guidance protocol for SQLs and their radionuclide equivalents are the following:

> SQLs and their radionuclide equivalents for analytes are shown in Table [C.1.1]. Historical data with SQLs or their radionuclide equivalents that exceed the values shown in Table [A.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 [A.1] may be acceptable, once the impacts on the evaluation are understood.

SQLs and their radionuclide equivalents for analytes shown in Table C.1.1 of the Guidance (see Appendix) were met in the historical dataset with the exceptions detailed in Table C.3.

Table C.3. Exceptions to SQL and Their Radionuclide Equivalents in the Guidance

Analysis	Units	Historical Dataset Detection Limit[a]		Guidance SQL[b]
		Minimum	Maximum	
Metals				
Antimony	mg/kg	20	20	0.105
Beryllium	mg/kg	0.5	0.5	0.45
Cadmium	mg/kg	2	2	0.105
Lead	mg/kg	20	200	17.5
Mercury	mg/kg	0.2	0.2	0.1
Selenium	mg/kg	1	1	0.3
Silver	mg/kg	4	4	1.5
Thallium	mg/kg	20	20	0.105
Uranium	mg/kg	200	2000	3.8
Zinc	mg/kg	20	200	41
Radionuclides				
Neptunium-237	pCi/g	0.0304	0.0542	0.014
Plutonium-238	pCi/g	0.191	0.192	0.002
Plutonium-239/240	pCi/g	0.0416	0.0437	0.009
Technetium-99	pCi/g	3.62	3.62	0.15
Semivolatile Organics				
Benzo(a)pyrene	mg/kg	0.47	0.49	0.197
N-Nitroso-di-n-propylamine	mg/kg	0.47	0.49	0.2

Table C.3. Exceptions to SQL and Their Radionuclide Equivalents in the Guidance (Continued)

[a] Historical Detection Limit refers to the lowest reliably reported value for an inorganic or an organic analyte. For purposes of this table, the radionuclide equivalent or the minimum detectable activity (MDA) is presented.
[b] 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.

Metals - Antimony and thallium historical detection limits are commonly higher than risk-based levels at PGDP. These metals were all nondetect values within the historical dataset and their presence is not expected in this location. Although the beryllium and mercury historical detection limits are only slightly higher than the required SQLs, their historical detection limits are still lower than the site-specific background values. The historical detection limits for cadmium, lead, selenium, and silver are higher than that required in the Guidance, but they are not higher than the risk-based value established in the Guidance. The higher historical detection limits for these metals do not have any impact on this evaluation.

Zinc historical detection limits range from 20 to 200 mg/kg. The majority of the samples have detection limits for zinc of 20 mg/kg; these detection limits are within the requirements of the Guidance. Four of the 30 samples have a detection limit for zinc of 200 mg/kg, which is greater than the requirements of the Guidance. One of these samples is a field replicate, two samples were part of the resampling effort for beryllium. Only one of the initial grid samples has the higher detection limit. All four samples with the higher detection limit were nondetects. The higher detection limit for zinc does not have a negative impact on this evaluation.

The historical detection limit for uranium metal is much higher than can be expected to produce reliable results with respect to this evaluation; however, radioisotopic uranium data is available for this dataset with appropriate minimum detectable activities (MDAs). This data was collected prior to the implementation of the use of nitric acid for alpha spectroscopy analysis; these analyses were performed using gamma spectroscopy. The high uranium metal detection limit is not anticipated to negatively impact this evaluation.

Radionuclides - Although the MDAs for four radionuclides were greater than the SQL/radionuclide equivalent required by the Guidance, there is no significant impact because the MDA for these radionuclides are below the risk-based values presented in the Guidance.

Semivolatiles - Two semivolatiles had historical detection limits greater than that required by the Guidance: benzo(a)pyrene and n-nitroso-di-n-propylamine. Both historical detection limits were approximately 2.5 times the risk-based value and all results were nondetect. Since there is no reason to suspect these chemicals are present, it is not anticipated that these higher detection limits have a negative impact on this evaluation.

C.4. DATA SCREENING

Guidance protocol for screening of laboratory analytical data are as follows in the subsequent sections. A summary of the detected chemicals in the dataset is presented in Table C.4 of this evaluation.

Table C.4. Data Summary of Detected Chemicals in Historical Soil Samples

Analysis	Units	Detected Results			Frequency of Detection [a]	2001 Background[b]		2009 Background[c]		Risk-Based Value[d]		Detection Limit Range
		Minimum	Maximum	Average		Value	FOE[e]	Value	FOE[e]	Value	FOE[e]	
Metals												
Aluminum	mg/kg	3.88E+03	1.13E+04	7.75E+03	30/30	1.30E+04	0/30	1.60E+04	0/30	4.41E+04	0/30	20 - 20
Arsenic	mg/kg	5.27E+00	1.18E+01	7.93E+00	9/30	1.20E+01	0/30	1.10E+01	2/30	2.38E+00	9/30	5 - 5
Barium	mg/kg	3.69E+01	1.04E+02	6.92E+01	30/30	2.00E+02	0/30	1.82E+02	0/30	1.40E+03	0/30	5 - 5
Beryllium	mg/kg	9.91E-01	5.64E+00	3.32E+00	2/30	6.70E-01	2/30	9.00E-01	2/30	8.29E-03	2/30	0.5 - 0.5
Cadmium	mg/kg	2.87E+00	2.87E+00	2.87E+00	1/30	2.10E-01	1/30	2.10E-01	1/30	2.00E+01	0/30	2 - 2
Chromium	mg/kg	5.02E+00	1.88E+01	1.07E+01	30/30	1.60E+01	2/30	2.50E+01	0/30	1.09E+03	0/30	2.5 - 2.5
Cobalt	mg/kg	2.57E+00	1.64E+01	4.64E+00	26/30	1.40E+01	1/30	1.30E+01	1/30	7.53E+02	0/30	2.5 - 2.5
Copper	mg/kg	3.67E+00	1.45E+01	7.21E+00	30/30	1.90E+01	0/30	2.40E+01	0/30	1.84E+03	0/30	2.5 - 2.5
Iron	mg/kg	5.19E+03	1.68E+04	1.04E+04	30/30	2.80E+04	0/30	2.87E+04	0/30	1.38E+04	4/30	20 - 20
Lead	mg/kg	2.04E+01	1.03E+02	6.17E+01	2/30	3.60E+01	1/30	3.50E+01	1/30	4.00E+02	0/30	20 - 200
Manganese	mg/kg	1.61E+02	7.62E+02	3.12E+02	30/30	1.50E+03	0/30	7.01E+02	1/30	3.98E+03	0/30	10 - 10
Nickel	mg/kg	7.09E+00	1.76E+01	1.14E+01	28/30	2.10E+01	0/30	2.80E+01	0/30	8.46E+01	0/30	5 - 5
Selenium	mg/kg	1.06E+00	1.58E+00	1.25E+00	9/30	8.00E-01	9/30	6.00E-01	9/30	2.30E+02	0/30	1 - 1
Vanadium	mg/kg	7.34E+00	3.16E+01	1.84E+01	30/30	3.80E+01	0/30	4.40E+01	0/30	1.96E+01	9/30	2.5 - 2.5
Zinc	mg/kg	2.02E+01	5.23E+01	3.15E+01	21/30	6.50E+01	0/30	8.20E+01	0/30	1.38E+04	0/30	20 - 200
Radionuclides												
Cesium-137	pCi/g	4.79E-02	2.55E-01	1.09E-01	19/19	4.90E-01	0/19	5.00E-01	0/19	2.66E-01	0/19	0.0197 - 0.0376
Thorium-230	pCi/g	3.29E-01	5.10E-01	4.09E-01	19/19	1.50E+00	0/19	2.20E+00	0/19	4.09E+01	0/19	0.138 - 0.146
Uranium-235	pCi/g	2.76E-02	6.69E-02	4.52E-02	16/19	1.40E-01	0/19	1.10E-01	0/19	1.22E+00	0/19	0.0211 - 0.0373
Uranium-238	pCi/g	8.46E-01	1.77E+00	1.30E+00	16/19	1.20E+00	10/19	1.90E+00	0/19	5.17E+00	0/19	0.144 - 0.888

[a] Frequency of Detection was determined from the number of detected samples over the entire number of samples. Field replicates were counted in the total.
[b] Background Values from DOE 2001. All samples were screened against surface values. Only detected values were screened.
[c] Background Values from DOE 2009b. All samples were screened against surface values. Only detected values were screened.
[d] Risk-based values are derived from the Risk Methods Document (DOE 2009b) using a level of ELCR=1E-5/HI=1 for the child resident scenario. These values are proposed in the Guidance (PRS 2010). Only detected values were screened.
[e] Frequency of Exceedance.
n/a = not applicable or not available.

The text in these sections describe and illustrate the spatial distribution of the soil samples having background and/or risk-based exceedances, with accompanying charts of results compared to background. The 2001 Risk Methods Document (DOE 2001) and the 2009 Risk Methods Document were the primary sources used for comparing soil sampling results with background and the 2009 Risk Methods Document was the source used for derivation of the risk-based comparison value. In order to better focus on chemicals presenting potential concern for the soil samples, additional information sources were consulted. Both ambient background values published by Kentucky Natural Resources and Environmental Protection Cabinet [now called the Kentucky Energy and Environment Cabinet (KEEC)] (KEEC 2004) and global fallout values (ANL 2007) were used to inform ambient background.

The background screen is not meant necessarily to screen against the most conservative of the background values available, but to screen results that are below values that reasonably could be expected to occur naturally. The documents and values cited in this verification define values that reasonably could be expected to occur.

To apply the guidance established by the KEEC, the criteria used are listed below:

(1) The mean site concentration for inorganic constituents must be below the 95% upper confidence limit (UCL) of the mean concentrations of background for inorganic constituents.

(2) At least half of the data points should be less than the 60th percentile.

(3) No data points should be above the upper bound value (95th percentile).

The risk-based comparison values were derived from the no action levels presented in Appendix A of the 2009 Risk Methods Document (DOE 2009b). Consistent with the Guidance, the risk-based values used in the comparison are the lesser of values based upon a cancer risk target of 1E-05 and a hazard index target of 1. Values for the resident scenario (lifetime for cancer risk-based and child for hazard-based values) were used to ensure that areas in which fill was placed would be available for unrestricted future use.

C.4.1 SITE-SPECIFIC BACKGROUND COMPARISON

> 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 the PGDP. This evaluation will begin with a simple comparison against background concentrations presented in Table [A.2], but additional analyses will be used to determine if exceedances of these background concentrations represent potential contamination or natural variation.

The following analytes listed in the Guidance were detected exceeding both 2001 and 2009 background screening criteria: beryllium, cadmium, cobalt, lead, and selenium.

Beryllium was detected in two composite samples within the established grids at 0.991 and 5.64 mg/kg. These results appeared anomalous and the locations from which the composites were collected were resampled as grab samples. None of the resampled locations showed a detection of beryllium. Since the detection of beryllium could not be verified, these results are not reliable and should not be considered real or present as a COPC. Figure 2 graphically shows the results with the background values and other comparison values.

Cadmium was detected above the primary background screening criteria; however, it was detected in only one of 30 samples (Figure 3). The criteria for applying ambient background values established by KEEC (see listing above) were met since only one sample was detected. The detected value was 2.87 mg/kg, which is below the 95th percentile of the generic statewide ambient background value (3.9 mg/kg) (KEEC 2004); therefore, cadmium is not present in the soil samples as a COPC.

Cobalt was detected in 26 of 30 soil samples ranging from 2.57 mg/kg to 16.4 mg/kg (Figure 4). Although the maximum detected result is greater than the primary background screening values of 13 mg/kg and 14 mg/kg (DOE 2009b; DOE 2001), it is still below the generic statewide ambient background value of 25.1 mg/kg (KEEC 2004). The mean concentration for cobalt in this dataset is 4.64 mg/kg, which is below Kentucky's 95% UCL of the mean concentrations of background of 12.4 mg/kg, and more than half were not detected or less than the 60th percentile of 13.1 mg/kg, which meets the criteria for applying ambient background values established by KEEC. Since cobalt is below the range of background, it is not considered a COPC.

Lead was detected in two of 30 soil samples at values of 20.4 and 103 mg/kg. The maximum detected value is greater than all background screening values (35, 36, and 84.6 mg/kg) (DOE 2009b; DOE 2001; KEEC 2004). Although the maximum lead value is greater than background, it does not exceed the risk-based comparison value (see Section 4.2) and should not be considered a COPC. Figure 5 graphically shows the results with the background values and other comparison values.

Selenium detections in the historical soil samples ranged from 1.06 to 1.58 mg/kg in nine of 30 samples. Although these detections exceeded the primary background screening values of 0.6 mg/kg and 0.9 mg/kg (DOE 2009b; DOE 2001), they are still below the generic statewide ambient background value of 2.1 mg/kg (KEEC 2004). The high laboratory detection limit prevents the dataset from meeting the criteria for applying ambient background values established by KEEC; however, the maximum value detected is still much lower than the derived risk-based value of 230 mg/kg (see Section 4.2). Figure 6 graphically shows the results with the background values and other comparison values. Since selenium is below the derived risk-based value, it should not be considered a COPC.

C.4.2 RISK-BASED VALUE COMPARISON

> 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[b]). 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.

Within this dataset, there were no analytes without background concentrations for comparison that were detected at levels greater than their risk-based values. As stated within this section, values for the resident scenario (lifetime for cancer risk-based and child for hazard-based values) were used to ensure that areas in which fill was placed would be available for unrestricted future use.

The following analytes listed in the Guidance were detected exceeding the full range of background screening criteria: lead and selenium. Additional evaluation was performed for these analytes including comparison to risk-based values. The concentrations of these analytes are below the risk-based values, (i.e., 400 mg/kg and 230 mg/kg, respectively) they should not be considered COPCs.

C.4.3 UNCERTAINTY ANALYSIS

> 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.

Although cadmium and cobalt exceed both the 2001 and the 2009 background screening criteria, they do not exceed the full range of background as described within this report. Cadmium and cobalt values for this sampling fall within the natural range of background and are not considered COPCs.

Values for lead and selenium exceed the background screening criteria; however, their values do not exceed risk-based value selected for screening fill and cover material. Since lead and selenium are below the risk-based values, they should not be considered COPCs.

Beryllium detections exceed comparison values, but these results should not be considered reliable because these results are anomalous and the detection of beryllium could not be verified. The beryllium detections should not be considered real or present as a COPC, as shown in Section 4.1.

C.5. CONCLUSION

Though historical soil sampling deviates from the Fill and Cover Material Verification Guidance, the stockpile of 22,500 yds^3 excavated soil removed as part of the construction of the Northwest Storm Water Collection Basin in 2001 does not contain COPCs and is acceptable for use as fill material to replace excavated soils for several planned RAs for the Soils Operable Unit and the Surface Water Operable Unit.

C.6. REFERENCES

ANL 2007. *Radiological and Chemical Fact Sheets to Support Health Risk Analyses for Contaminated Areas*, Argonne National Laboratory, Environmental Science Division, March.

BJC 2001. *SY01-BSN*, October.

DOE 1997. *Background Levels of Selected Radionuclides and Metals in Soil and Geologic Media at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1586&D2, June.

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 2009a. Paducah GIS Environmental Data Warehouse Web Site, December 14, 2009, http://prsdw01/padgis/default.jsp.

DOE 2009b. *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.

KEEC 2004. *Kentucky Guidance for Ambient Background Assessment*, Natural Resources and Environmental Protection Cabinet, January.

PRS 2010. *Paducah Gaseous Diffusion Plant Fill and Cover Material Verification Guidance,* PRS-ENR-0036, January.

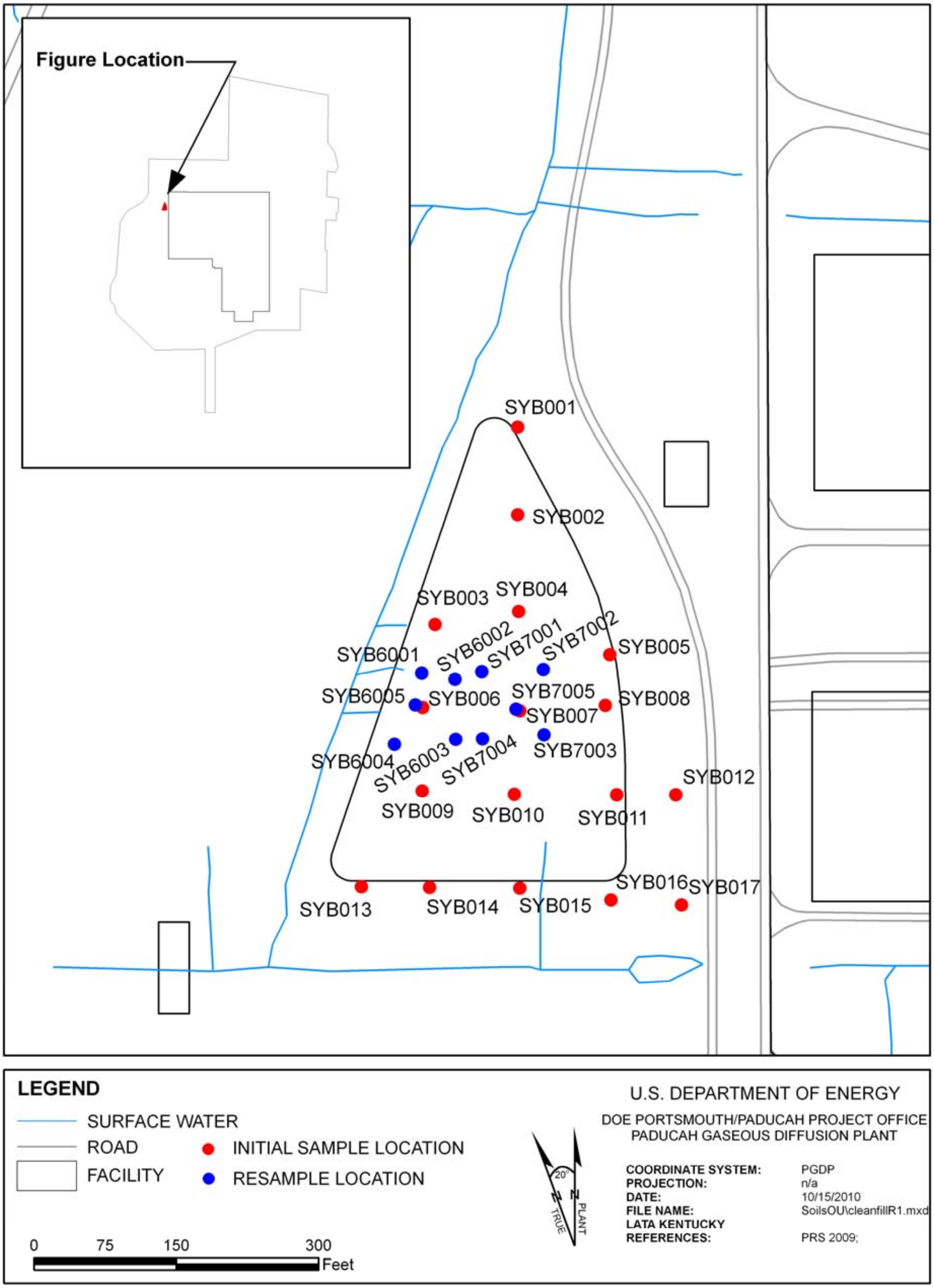

Figure C.1. Characterization of Northwest Storm Water Control Basin Prior to Excavation

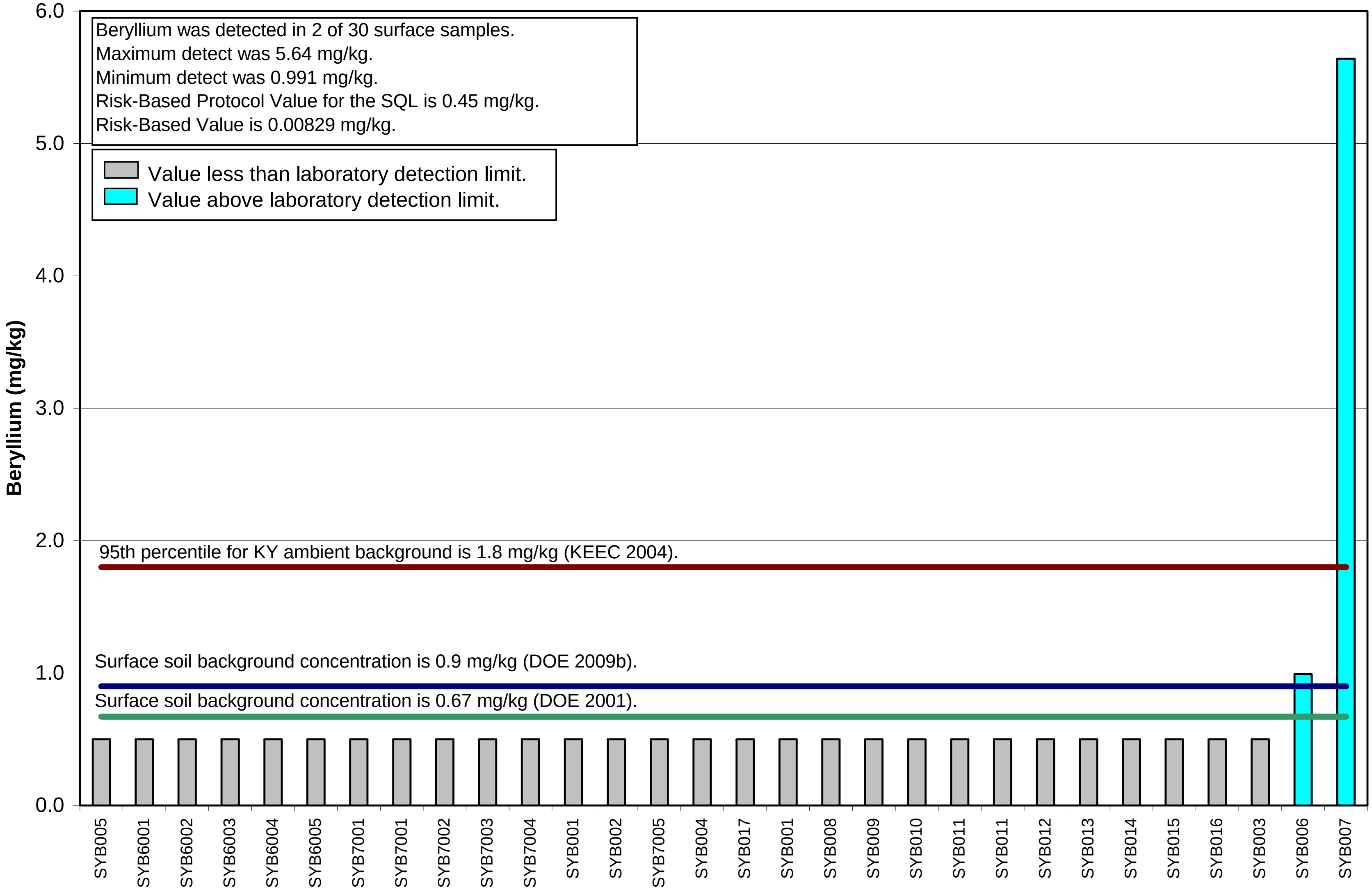

Figure C.2. Comparison between Beryllium Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

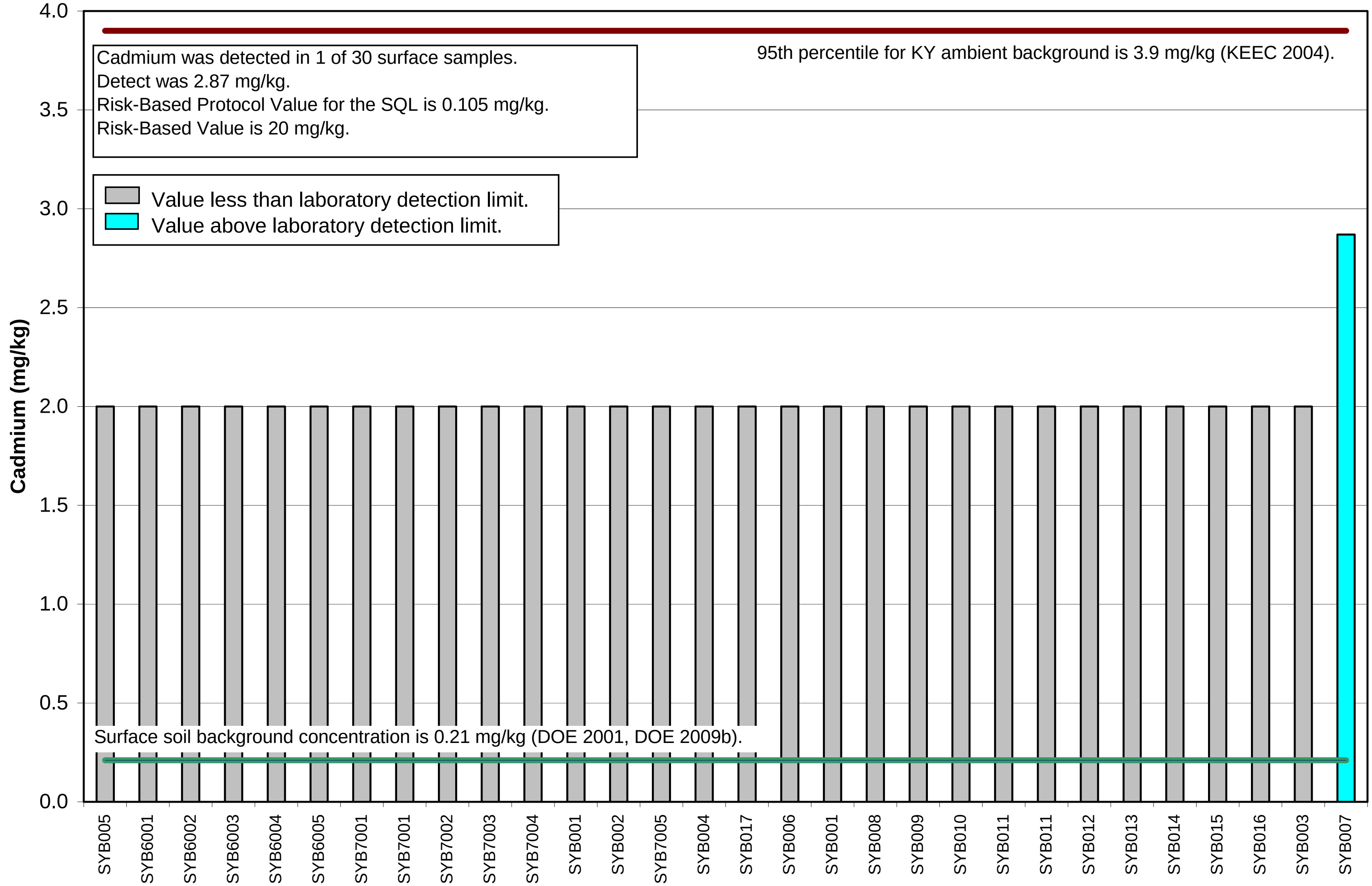

Figure C.3. Comparison between Cadmium Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

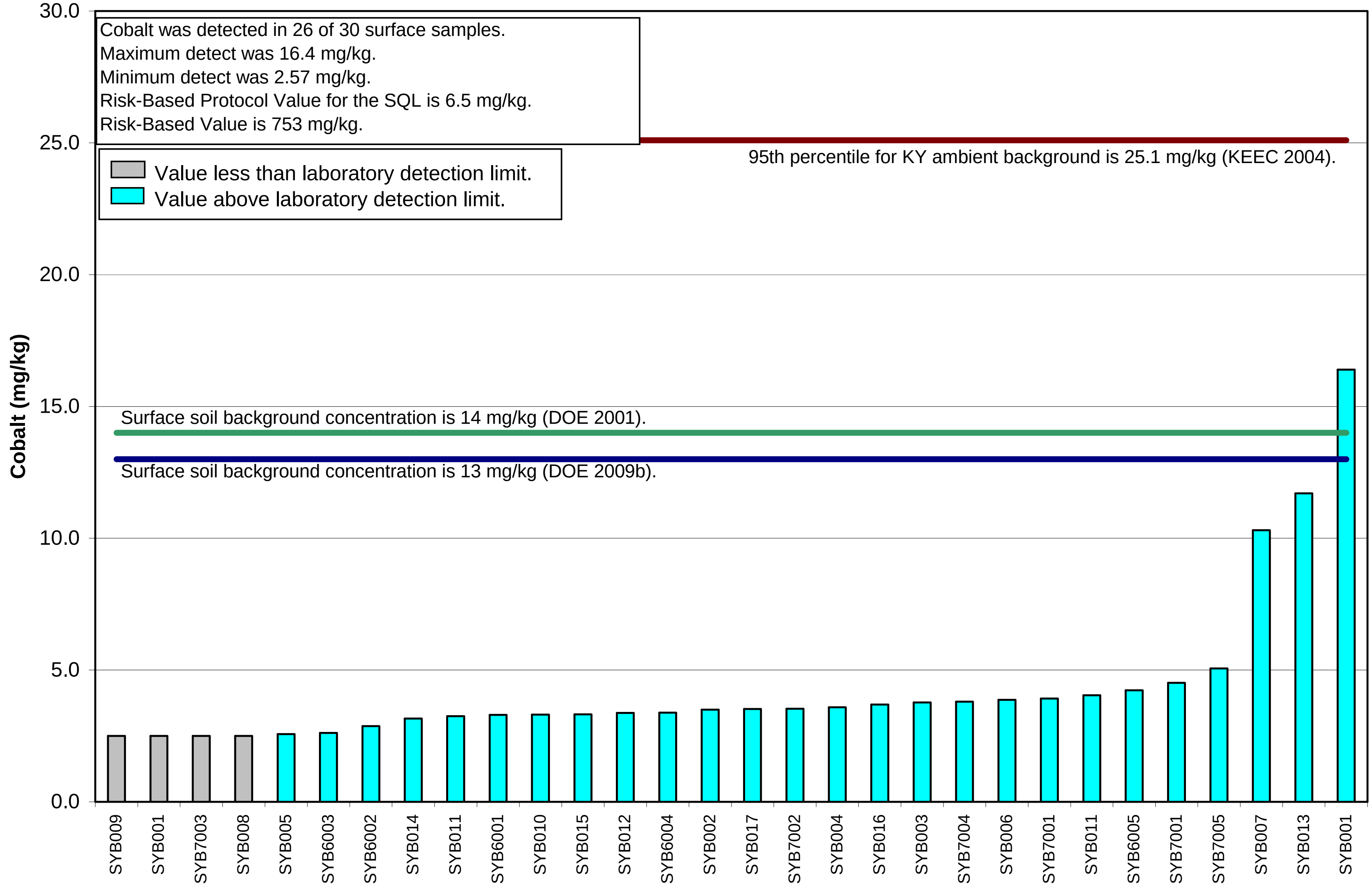

Figure C.4. Comparison between Cobalt Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

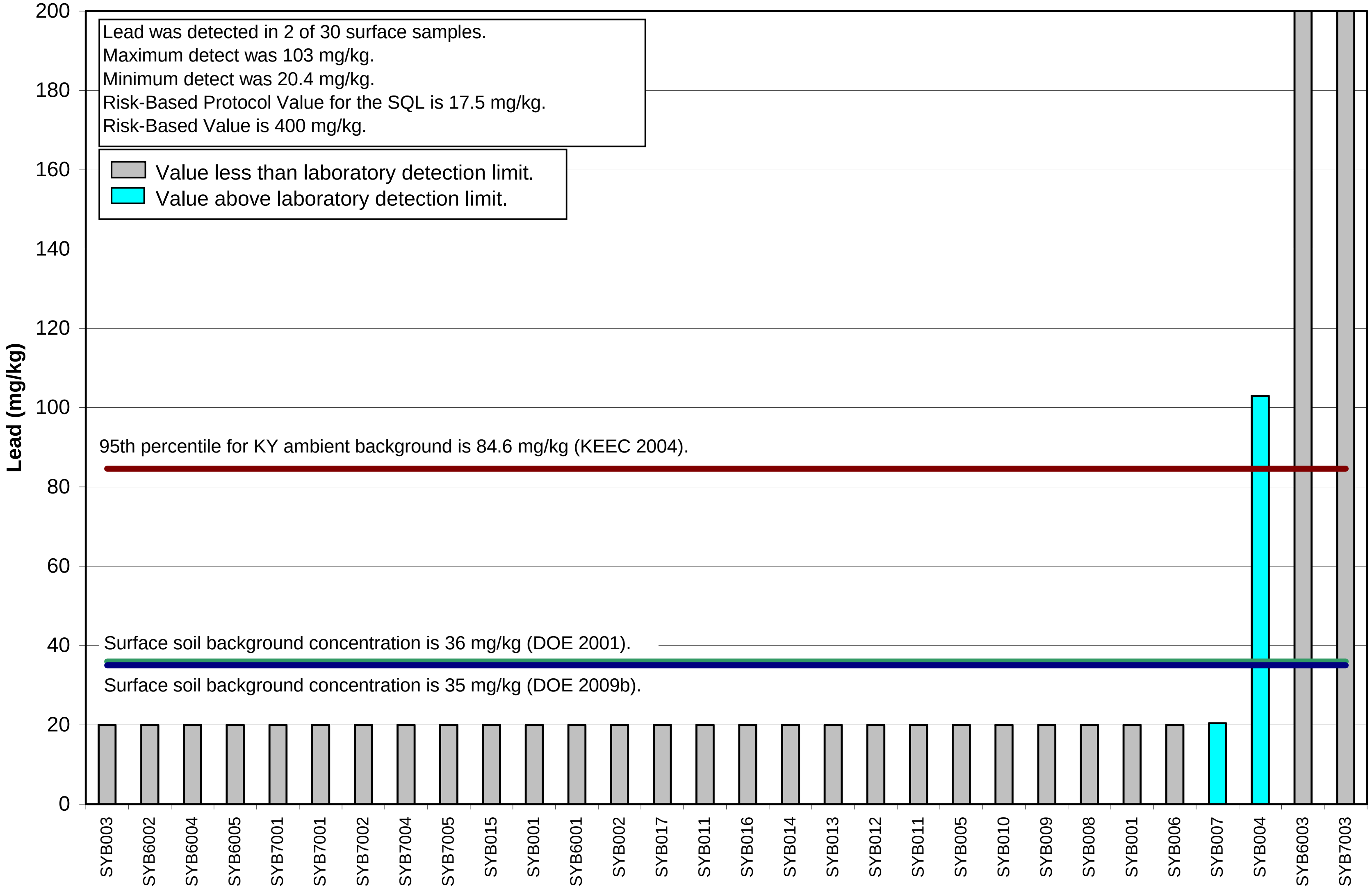

Figure C.5. Comparison between Lead Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

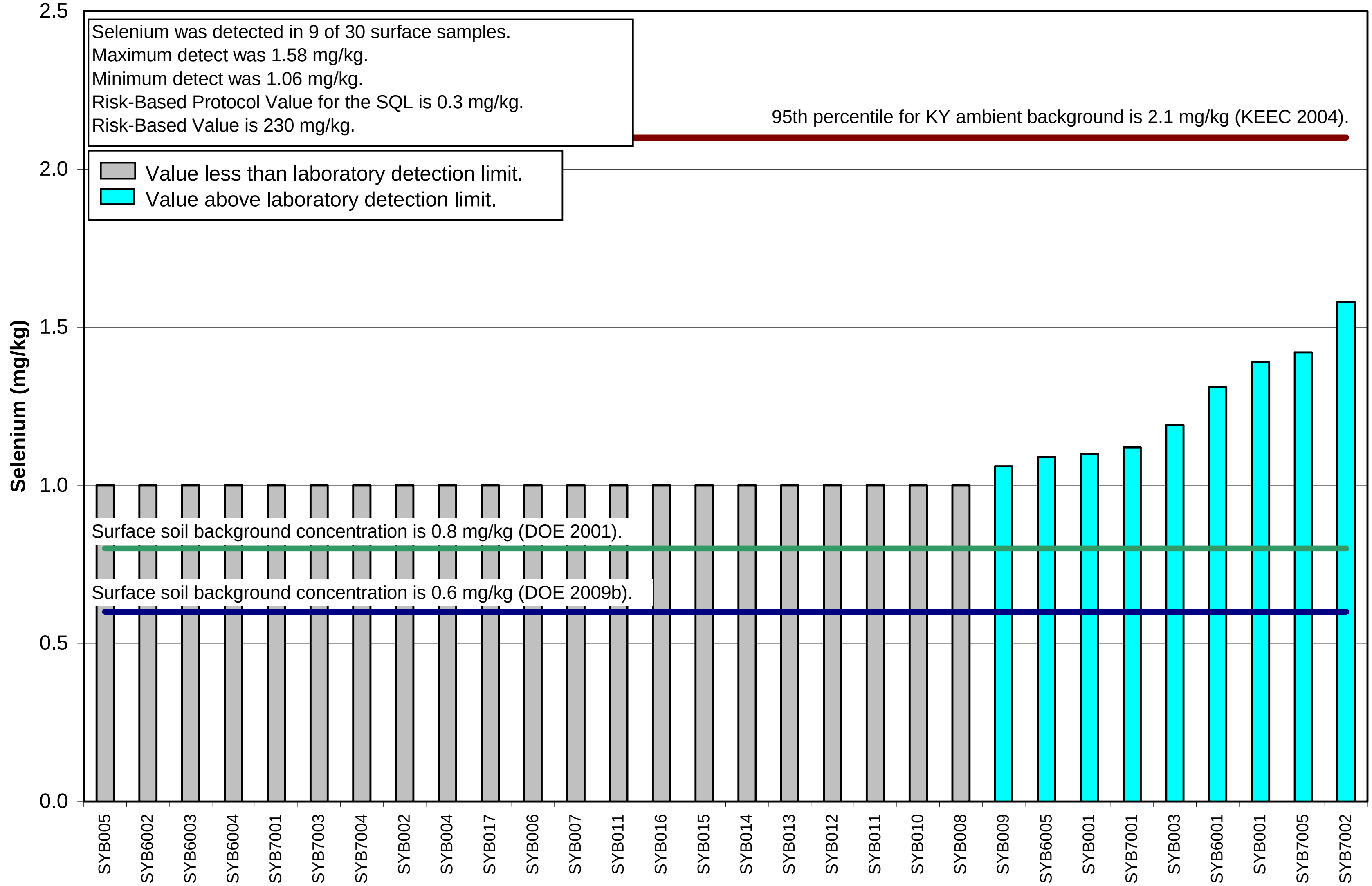

Figure C.6. Comparison between Selenium Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

ATTACHMENT

FILL AND COVER MATERIAL VERIFICATION GUIDANCE

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Paducah Gaseous Diffusion Plant
Fill and Cover Material Verification Guidance

PRS-ENR-0036

Paducah Gaseous Diffusion Plant
Fill and Cover Material Verification Guidance

Date Issued—February 2010

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

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

CONTENTS

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C1.1. OBJECTIVE

The guidance 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 guidance presents a standard method for sampling fill and cover material and evaluating the sampling results, deviations from this guidance 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.

C1.2. BASIS

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

C1.3. VERIFICATION GUIDANCE

This guidance 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.

Guidance 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 yds^3 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 guidance. Once an area is approved through this guidance 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), with some deviations. This list of analytes and deviations are in Table C.1.1. 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 C.1.1. Historical data with SQLs or their radionuclide equivalents that exceed the values shown in Table C.1.1 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 C.1.1 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 C.1.2, 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 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.

C1.4. 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 C.1.1. Sitewide Chemicals of Potential Concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky[1]

Analyte	CAS Number	Sample Quantitation Limit or Radionuclide Equivalent[2]	
Inorganic Chemicals			
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
Organic Compounds			
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
trans-1,2-Dichloroethene	156605	20	mg/kg
cis-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 C.1.1. Sitewide Chemicals of Potential Concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky[1] (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 C.1.2. 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

APPENDIX D

CLEAN FILL VENDOR CERTIFICATION FOR SWMU 19

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Martin Marietta Materials

3565 Lone Oak Road, Suite 4
Paducah, Kentucky 42003

Johnny L. Boyd
Sales Representative

Tuesday, March 30, 2010

Dear Valued Customer:

We would like to thank you for the recent purchase of the DGA and 8" minus being produced at our three Rivers Quarry located in Smithland KY. The Three Rivers Quarry is approved by several different states as well as the Corps of Engineers. The material is produced form state approved formations and is a well graded material free from any chemical contamination. If you have any other questions please feel free to contact me.

Sincerely,

Johnny L. Boyd
Martin Marietta Materials

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APPENDIX E

PHOTOGRAPHS OF SWMUS 19 AND 181

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C-218 – 2/4/08 (Before)

C-218 – 12/11/09 (Implementation)

C-218 – 1/4/10 (After)

C-218 – 5/17/10 (After)

C-410-B – 6/26/06 (Before)

C-410-B – 3/8/10 (Implementation)

C-410-B – 3/26/10 (After)

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REMOVAL ACTION REPORT FOR SOILS OPERABLE UNIT INACTIVE FACILITIES SOLID WASTE MANAGEMENT UNITS 19 AND 181 AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY

Description of the Removal Action Implemented

As documented in the approved *Removal Notification for the Soils Operable Unit Inactive Facilities*, DOE/LX/07-0014&D1, a removal action for the C-218 Firing Range [Solid Waste Management Unit (SWMU) 181] and C-410-B Hydrogen Fluoride (HF) Neutralization Lagoon (SWMU 19) was warranted due to the contaminants of concern identified, their associated concentration levels, and relevant process knowledge. See Appendix A for SWMU locations.

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As documented in the Removal Action Work Plan (RAWP), soil, sediment, and accumulated rainwater were the exposure pathways of concern. The inactive facilities were not suspected sources of surface water or groundwater contamination at the site, and, as a result, direct contact with soil, sediment, and accumulated rainwater was the primary focus of the removal action. Work was performed in accordance with the RAWP.

The Removal Action Objectives (RAOs) for this removal action are consistent with the overall Remedial Action Objectives for the Soils Operable Unit referenced in Appendix 3 of the Site Management Plan for fiscal year 2010, and meet the intent of the Paducah Site Federal Facility Agreement Section X (Removal Actions). The RAOs for this removal action are the following:

- Control current industrial worker exposure to soils, sediment, and accumulated rainwater containing hazardous substances, pollutants, or contaminants.

- Identify and control, as needed, off-site migration into multimedia exposure pathways such as surface water and groundwater.

Completion of this removal action reduces the risk to current and future workers and excavation workers from direct contact by removing known sources of contamination.

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Summaries of Results

C-218 Firing Range (SWMU 181)

Excavation of lead-contaminated soils began on November 30, 2009, and was completed on December 23, 2009, including demobilization. A total of 1,478 yd^3 of soil was removed and dispositioned. Confirmation sampling was performed as described in the RAWP. A data compact disk (CD) containing the analytical results is included as Appendix B.

During a pre-work walkover, bullet fragments were observed in three remediation units (RUs) (RUs 4, 13, and 14). As a result, two ft of soil was excavated from these three RUs.

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Following excavation of these three RUs, a metal detector was used to identify other locations that might contain bullet fragments. As a result of this survey, an additional one ft of soil was excavated from RUs 4, 13, and 14. No additional bullet fragments were identified at these RUs after the excavation. Bullet fragments were not identified at any other RUs.

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All RUs then were field-screened using X-ray fluorescence (XRF). This XRF screening identified two additional RUs (RUs 10 and 20) that had the potential to contain lead concentrations greater than one-fifth of 400 mg/kg (i.e., 80 mg/kg). As a result, two ft of soil was excavated from these RUs.

One ft of soil was excavated from all other RUs at the site. A second round of XRF screening was performed after the additional excavation. The results of this second round of sampling and analysis are included in Appendix B (initial results are not included on the CD, but are available if requested).

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Sample results indicate the following:

- One hundred five composite samples were analyzed for lead by XRF [one five-point composite from each survey unit (SU) and five duplicate samples]. Five-point composite samples were collected from five discreet points within the SU: one in the approximate center of the SU and four points surrounding the center. These points were documented in field logbooks using a global positioning system (GPS). Results ranged from below the detection limit of 8 mg/kg to a maximum of 88.41 mg/kg. Ninety-nine of the samples contained lead at concentrations less than 38 mg/kg. The error associated with the one sample that was reported to contain lead at 88.41 mg/kg was +/- 11.34 mg/kg, and the average of the four SUs within this RU (RU 25) was 35.12 mg/kg. For these reasons, it was decided to proceed with Activity 2 sampling without further excavation at this location.

- Using the detection limit as the value, the average lead concentration of the 100 samples is 17.02 mg/kg. The XRF detection limit for lead was 8 mg/kg.

- Following XRF sampling, postexcavation sampling (i.e., Activity II) was undertaken. This included collection of 17 samples, which were analyzed for lead by SW-846 Method 6020, including 10 samples that were collected as laboratory confirmation of field analysis (see Appendix A for locations). Results ranged from below the detection limit in 10 samples (at detection limits of 17.4 mg/kg to 19.6 mg/kg) to a maximum of 22.4 mg/kg. Using the detection limit as the value, the average concentration of these samples is 18.78 mg/kg.

- Postexcavation samples were verified, assessed, and validated. Detection limits for samples analyzed by SW-846 Method 6020 were higher than indicated in the RAWP (1 mg/kg); however, this variance did not affect the decision making process and, therefore, it is considered insignificant.

- A comparison of the results for those ten samples that were analyzed by both XRF and SW-846 Method 6020 indicates that XRF results are consistently higher. The variance ranged from 0.9 mg/kg (+5%) to 11 mg/kg (+65%), with the average variance being 6 mg/kg (33%). These variances are considered insignificant because the fact that the field screening method over-estimated actual concentrations did not impact the efficacy of the cleanup.

The action limit and cleanup level of 800 ppm total lead, based on the industrial scenario was achieved in all excavated areas. Based on the sampling results, the RAOs for this removal action were achieved. The removal action also successfully achieved cleanup to below 400 ppm total lead, the value for a residential

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scenario. No further action is recommended for lead at this SWMU. Any other chemicals associated with SWMU 181 will be addressed as part of the Soils Operable Unit.

The excavation site floor was backfilled with approximately 752 yd^3 clean backfill originating from the stockpile of soil from construction of the Northwest Storm Water Collection Basin. Soil excavated from the berm was not replaced. The backfill was verified using the *Paducah Gaseous Diffusion Plant (PGDP) Fill and Cover Material Verification Guidance*, PRS-ENR-0036. This guidance initially was submitted as Appendix H of the RAWP, "Fill and Cover Material Verification Protocol." The title was changed and put into document format in order to incorporate it into the existing contractor document structure. *Fill and Cover Material Verification for Stockpile of Soil from Construction of the Northwest Storm Water Collection Basin*, PRS-ENR-0037/R4, provides the analyses verifying consistency with the guidance. These documents are included in Appendix C.

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C-410-B HF Neutralization Lagoon (SWMU 19)

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Excavation began on March 3, 2010, and was completed by March 22, 2010, including demobilization. A total of 1,245 yd^3 of soil and other material (i.e., metal railing, concrete rubble, and riprap used for stabilization during excavation) was removed and dispositioned. In order to capture rainwater during the excavation, a low-point/sump was created in the northwest corner of the lagoon and the standing water was pumped into poly tanks. The water was disposed of at Energy*Solutions* in Clive, Utah. Once water was too low to pump, it was mixed with the sludge in the lagoon and solidified with an absorbent.

Approximate dimensions of the excavated area were 44 ft x 57 ft x 10 ft, which is three ft beyond the facility boundary, in accordance with the RAWP (see excerpt below).

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> Under this action, C-410-B HF Neutralization Lagoon (SWMU 19) will be removed to up to 3 ft beyond its SWMU boundary; therefore, cleanup levels for this inactive facility are not applicable. With regard to C-410-B Hydrogen Fluoride Neutralization Lagoon, the boundary definition was discussed in previous scoping meetings with agreement to remove up to 3 ft beyond the SWMU boundary, which was determined likely to include the majority of any soil contamination. Any contamination left in place would be [evaluated in future investigations].[1]

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Confirmation sampling was performed as described in the RAWP. No evidence of contamination required biasing of sampling locations. A data CD containing the analytical results is included as Appendix B.

Eight composite samples and one duplicate were collected. Sample results indicate the following:

- Total uranium concentrations ranged from less than the detection limit (of 0.896 mg/kg) to 164 mg/kg. Seven of the eight samples contained total uranium at concentrations less than 27.1 mg/kg.

- Uranium-238 levels ranged between 0.536 pCi/g and 30.6 pCi/g. All other radioactive analytes, including americium-241, cesium-237, neptium-237, plutonium-238, plutonium-239/240, technetium-99, thorium-228, thorium-230, thorium-232, uranium-234, and uranium-235 were present in amounts less than background or less than a 1E-5 risk-based soil screening levels for direct contact for the industrial worker (*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).

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- None of the samples contained polychlorinated biphenyls at a detection limit of 100 ug/kg.

[1] The original text from the RAWP stated that contamination left in place would be addressed in a subsequent response action.

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- Detected lead and arsenic concentrations were below background.

- Polyaromatic hydrocarbons, including benzo(b)fluoranthene, fluoranthene, phenanthrene, and pyrene, were detected in both floor samples and two of the six wall samples at concentrations ranging from less than the detection limit to 1,400 ug/kg. These detections were less than a 1E-5 risk-based soil screening levels for direct contact for the industrial worker.

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Based on the sampling results, the RAOs for this removal action were achieved by reducing the risk to current and future workers and excavation workers from direct contact by removing known sources of contamination.

The excavation site was backfilled with approximately 2,527 tons of uncontaminated gravel and fines overlaid by dense gravel aggregate to bring the site back to grade. The backfill was verified clean by the vendor (Appendix D).

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Summaries of Problems Encountered

No problems were encountered during implementation of the RAWP. Deviations from the RAWP were minor field changes as discussed above.

Summaries of Accomplishments and/or Effectiveness of the Removal Action

The following table shows the volume of soil that was dispositioned.

Location	Waste Disposition (yd^3)	
	C-746-U Landfill	Waste Control Specialists, Andrews, Texas
C-218 Firing Range	1,136	342
C-410-B HF Neutralization Lagoon	1,245	0
Total	2,381	342

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Photographs showing the condition of the areas before, during, and after the removal action are included as Appendix E.

Summary of Project Costs

The following table shows the summary of the project costs.[2]

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Location	Cost
C-218 Firing Range	$1,105,405
C-410-B HF Neutralization Lagoon	$684,577
Total	**$1,789,982**

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Copies of Relevant Laboratory/Monitoring Data

Relevant laboratory/monitoring data are included as Appendix B.

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[2] The accounting of expenditures is based on an estimate governed by figures known at the time the report was written.

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APPENDIX A

LOCATION OF C-218 AND C-410-B

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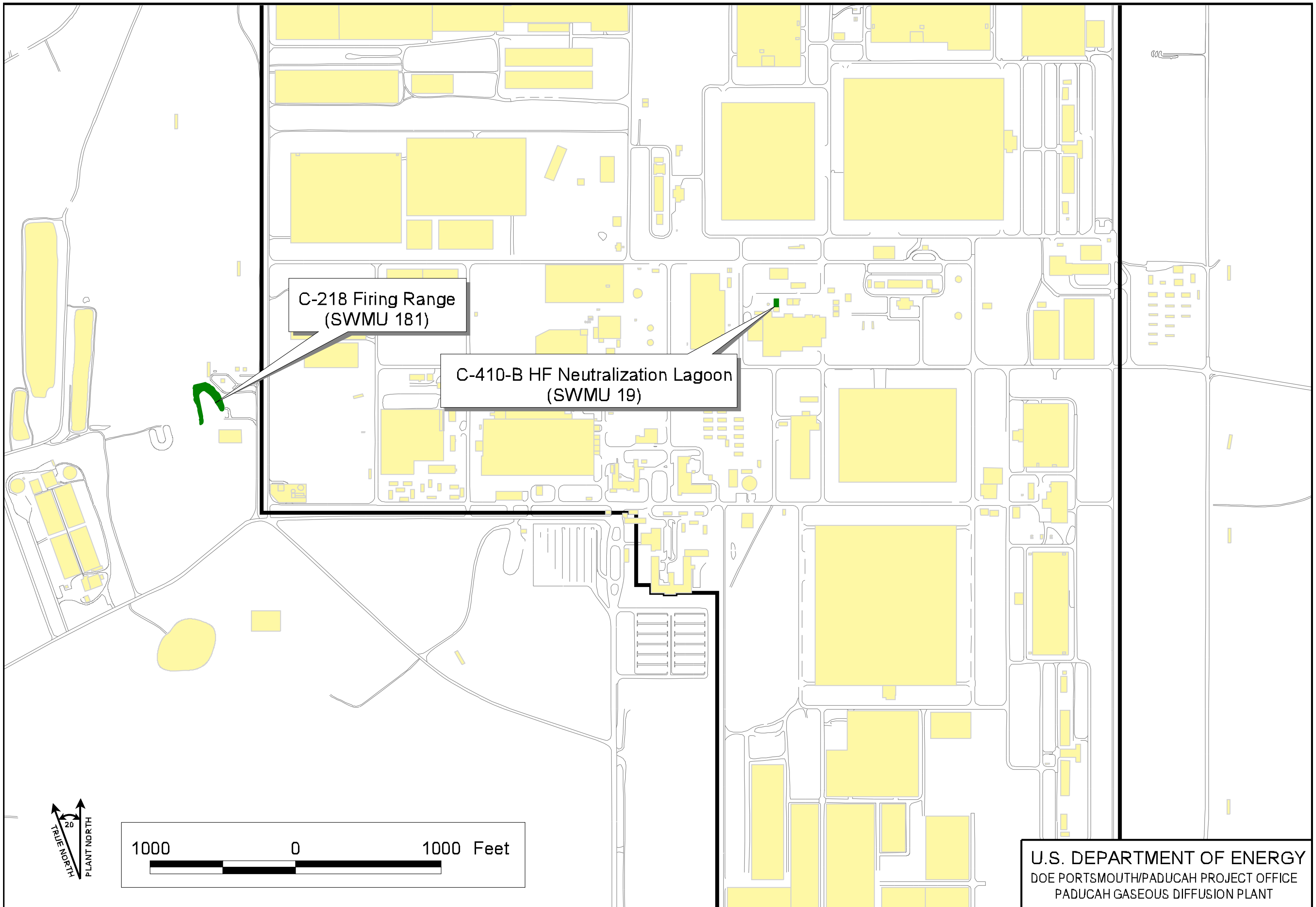

Location of C-218 and C-410-B

LATA Environmental Services of Kentucky, LLC

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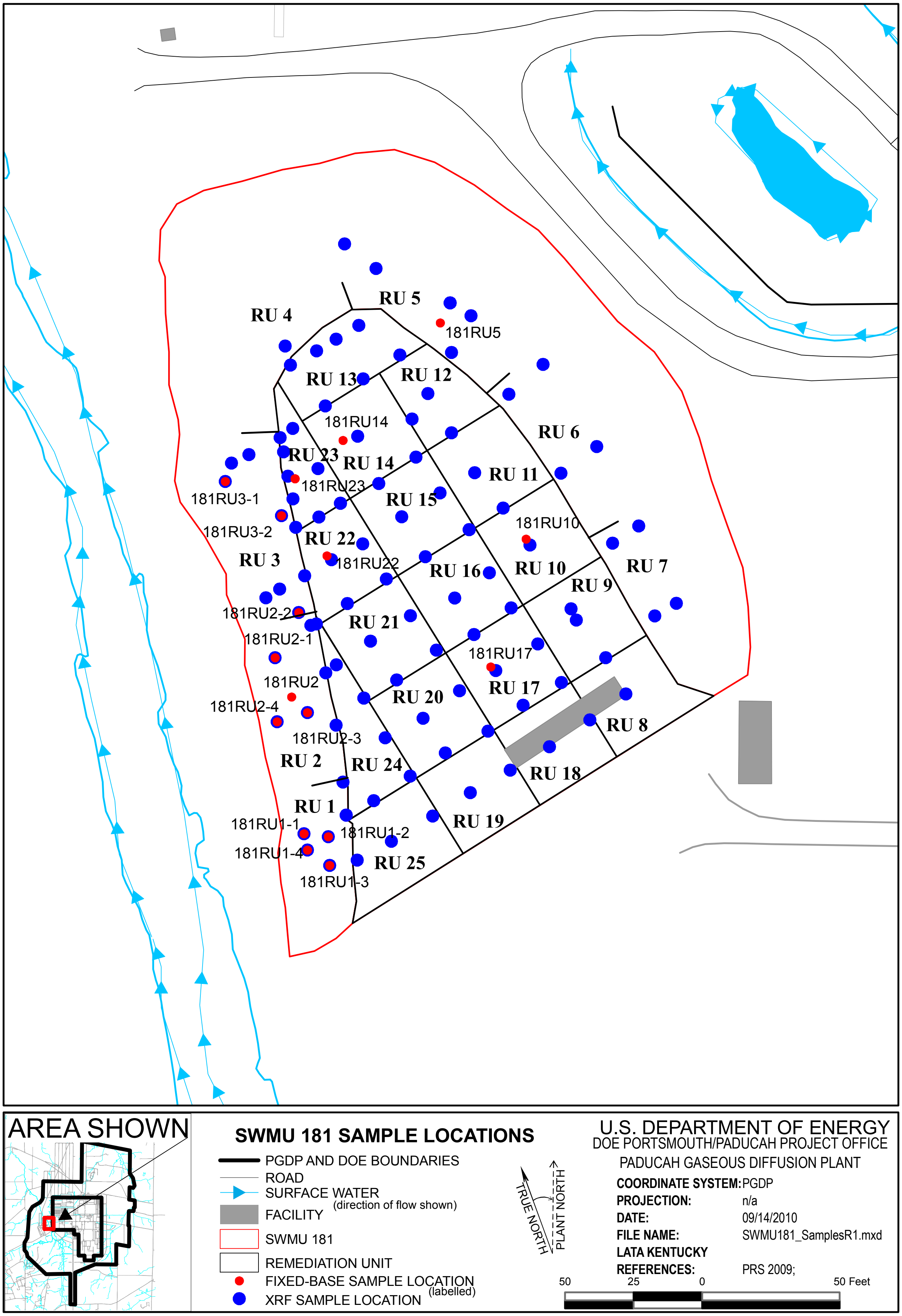
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AREA SHOWN
SWMU 181 SAMPLE LOCATIONS
PGDP AND DOE BOUNDARIES
ROAD
SURFACE WATER
(direction of flow shown)
FACILITY
SWMU 181
REMEDIATION UNIT
FIXED-BASE SAMPLE LOCATION
(labelled)
XRF SAMPLE LOCATION
TRUE NORTH
PLANT NORTH
U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT
COORDINATE SYSTEM: PGDP
PROJECTION: n/a
DATE: 09/14/2010
FILE NAME: SWMU181_SamplesR1.mxd
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REFERENCES: PRS 2009;
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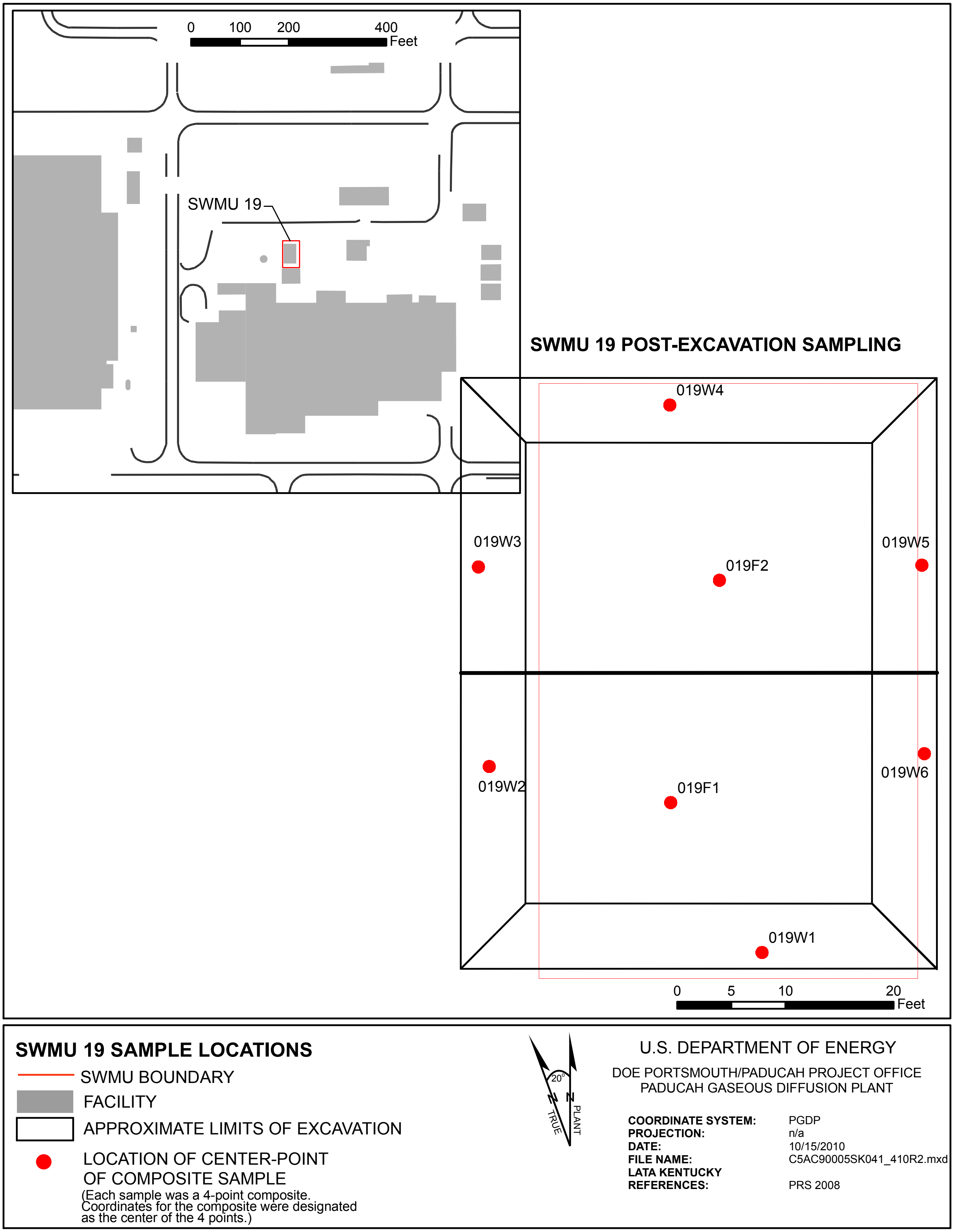
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SWMU 19
SWMU 19 POST-EXCAVATION SAMPLING
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SWMU 19 SAMPLE LOCATIONS
SWMU BOUNDARY
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APPROXIMATE LIMITS OF EXCAVATION
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OF COMPOSITE SAMPLE
(Each sample was a 4-point composite.
Coordinates for the composite were designated
as the center of the 4 points.)
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DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT
COORDINATE SYSTEM: PGDP
PROJECTION: n/a
DATE: 10/15/2010
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REFERENCES: PRS 2008

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APPENDIX B

ANALYTICAL DATA CD

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ANALYTICAL DATA (CD)

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APPENDIX C

FILL AND COVER MATERIALS VERIFICATION

(The document contained in Appendix C was previously published by the former contractor as PRS-ENR-0037/R3. The document was updated to incorporate regulator comments. The title page of the document has been updated to reflect a revision date of October 2010.)

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FILL AND COVER MATERIAL VERIFICATION FOR STOCKPILE OF SOIL FROM CONSTRUCTION OF THE NORTHWEST STORM WATER COLLECTION BASIN

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Date Issued—June 2010

Date Revised—October 2010

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

Prepared by
PADUCAH REMEDIATION SERVICES, LLC

Revised by
LATA ENVIRONMENTAL SERVICES OF KENTUCKY, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE- DE-AC30-10CC40020

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- C.4.2 Risk-Based Value Comparison C-22
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ATTACHMENT: FILL AND COVER MATERIAL VERIFICATION GUIDANCE C1-1

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6. REFERENCES 11¶

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FIGURES

C-1. Characterization of Northwest Storm Water Control Basin Prior to Excavation C-25
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3. Comparison between Cadmium Concentrations in Historical Soil Samples and Surface Soil Background ... [1]
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ACRONYMS

COPC	chemicals of potential concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
KEEC	Kentucky Energy and Environment Cabinet
MDA	minimum detectable activity
NAL	no action level
PAHs	polycylic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PGDP	Paducah Gaseous Diffusion Plant
RA	removal action
RMD	Risk Methods Document
SQL	sample quantitation limit
UCL	upper confidence limit

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Fill material is needed to replace excavated soils for several planned removal actions (RAs) for the Soils Operable Unit and the Surface Water Operable Unit. The proposed source of this fill material is the stockpile of 22,500 yds^3 excavated soil removed as part of the construction of the Northwest Storm Water Collection Basin in 2001. This evaluation determines whether this soil stockpile is acceptable for use as fill material for these RAs based on analysis of the historical soil samples collected when the stockpile was created. Construction of the storm water basin took place outside the plant boundary and was not within an area of known contamination (i.e., the area has not been designated as a solid waste management unit or area of concern). Historical soil sampling was conducted on the soil to be excavated as a precaution to ensure the soil did not require disposition as a waste.

The "Paducah Gaseous Diffusion Plant (PGDP) Fill and Cover Material Verification Guidance" serves as a standard method or protocol for determining if fill and cover material is acceptable for RAs at PGDP (PRS 2010). While this Guidance presents a standard method for sampling fill and cover material and evaluating the sampling results, guidelines within the Guidance can be applied to the use of historical sampling results with certain deviations. Deviations from the established protocol [e.g., deviations from the analyte list and analyte sample quantitation limits (SQLs)] are presented within this evaluation.

Guidance protocol and their applicability for use of the stockpile of soil from the Northwest Storm Water Collection Basin are presented below.

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C.1. SAMPLE COLLECTION

Guidance protocol for sample collection are the following:

> 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 yds^3 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, [U.S. the Department of Energy (DOE)] will provide information showing that the historical sampling was performed in a manner consistent with this guidance. Once an area is approved through this guidance 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.

Prior to construction of the Northwest Storm Water Collection Basin, the soils were characterized *in situ* by collecting five-part composite samples from 17 established grids approximately 100 ft x 100 ft (BJC 2001). All of the soil samples were collected using hand augers at a depth of approximately 1 ft. Analyses for the initial sampling included metals, volatile and semivolatile organics, polychlorinated biphenyls, and radionuclides. Additional sampling for metals took place in October 2001 within two of the grids in order to resample the area around which beryllium was detected. During this resample event, ten individual samples were collected from the top 1 ft of soil. Beryllium was not detected in soil from the resampled locations, and as such, the detections were considered anomalous, and the soil was not further differentiated. Figure 1 shows the locations of these characterization samples (all figures follow text of this Fill and Cover Material Verification).

A total of 17 composite samples (plus 2 field replicate composites) and 10 grab samples (plus 1 field replicate) was collected for the excavated soils. Thirty total samples are available for evaluation in the historical dataset.

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C.2. ANALYTICAL PARAMETERS

Guidance protocol for analytical parameters are the following:

> 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 [C.1.1]. Historical results will be evaluated, and the absence of any analytes in the historical results will be discussed.

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The historical dataset is summarized in Table C.1. The historical samples were analyzed for the list of analytes presented in Table C.1.1 of the Guidance (see Appendix) with the following exceptions as noted in Table C.2.

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Table C.1. Summary of Historical Dataset

Analysis	Units	Detected Results			FOD[a]	SQL/Radionuclide Equivalent Range
		Min	Max	Avg		
Inorganic Chemicals						
Aluminum	mg/kg	3.88E+03	1.13E+04	7.75E+03	30/30	20 - 20
Antimony	mg/kg	n/a	n/a	n/a	0/30	20 - 20
Arsenic	mg/kg	5.27E+00	1.18E+01	7.93E+00	9/30	5 - 5
Barium	mg/kg	3.69E+01	1.04E+02	6.92E+01	30/30	5 - 5
Beryllium	mg/kg	9.91E-01	5.64E+00	3.32E+00	2/30	0.5 - 0.5
Cadmium	mg/kg	2.87E+00	2.87E+00	2.87E+00	1/30	2 - 2
Calcium	mg/kg	1.60E+03	2.21E+05	5.27E+04	30/30	200 - 2000
Chromium	mg/kg	5.02E+00	1.88E+01	1.07E+01	30/30	2.5 - 2.5
Cobalt	mg/kg	2.57E+00	1.64E+01	4.64E+00	26/30	2.5 - 2.5
Copper	mg/kg	3.67E+00	1.45E+01	7.21E+00	30/30	2.5 - 2.5
Iron	mg/kg	5.19E+03	1.68E+04	1.04E+04	30/30	20 - 20
Lead	mg/kg	2.04E+01	1.03E+02	6.17E+01	2/30	20 - 200
Lithium	mg/kg	1.19E+01	1.19E+01	1.19E+01	1/30	10 - 10
Magnesium	mg/kg	8.36E+02	1.39E+04	2.62E+03	30/30	15 - 15
Manganese	mg/kg	1.61E+02	7.62E+02	3.12E+02	30/30	10 - 10
Mercury	mg/kg	n/a	n/a	n/a	0/30	0.2 - 0.2
Nickel	mg/kg	7.09E+00	1.76E+01	1.14E+01	28/30	5 - 5
Selenium	mg/kg	1.06E+00	1.58E+00	1.25E+00	9/30	1 - 1
Silver	mg/kg	n/a	n/a	n/a	0/30	4 - 4
Thallium	mg/kg	n/a	n/a	n/a	0/30	20 - 20
Tin	mg/kg	n/a	n/a	n/a	0/30	100 - 1000
Uranium	mg/kg	n/a	n/a	n/a	0/30	200 - 2000
Vanadium	mg/kg	7.34E+00	3.16E+01	1.84E+01	30/30	2.5 - 2.5
Zinc	mg/kg	2.02E+01	5.23E+01	3.15E+01	21/30	20 - 200
Organic Compounds (PCBs)						
PCB-1016	mg/kg	n/a	n/a	n/a	0/19	0.06 - 0.06
PCB-1221	mg/kg	n/a	n/a	n/a	0/19	0.1 - 0.1
PCB-1232	mg/kg	n/a	n/a	n/a	0/19	0.09 - 0.09
PCB-1242	mg/kg	n/a	n/a	n/a	0/19	0.07 - 0.07
PCB-1248	mg/kg	n/a	n/a	n/a	0/19	0.08 - 0.08
PCB-1254	mg/kg	n/a	n/a	n/a	0/19	0.06 - 0.06
PCB-1260	mg/kg	n/a	n/a	n/a	0/19	0.09 - 0.09

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Table C.1. Summary of Historical Dataset (Continued)

Analysis	Units	Detected Results			FOD[a]	SQL/Radionuclide Equivalent Range
		Min	Max	Avg		
PCB-1268	mg/kg	n/a	n/a	n/a	0/19	0.1 - 0.1
Polychlorinated biphenyl	mg/kg	n/a	n/a	n/a	0/19	0.1 - 0.1
Radionuclides						
Americium-241	pCi/g	n/a	n/a	n/a	0/19	0.0588 - 0.187
Cesium-134	pCi/g	n/a	n/a	n/a	0/19	0.0141 - 0.0274
Cesium-137	pCi/g	4.79E-02	2.55E-01	1.09E-01	19/19	0.0197 - 0.0376
Cobalt-60	pCi/g	n/a	n/a	n/a	0/19	0.0177 - 0.0374
Neptunium-237	pCi/g	n/a	n/a	n/a	0/19	0.0304 - 0.0542
Plutonium-238	pCi/g	n/a	n/a	n/a	0/19	0.191 - 0.192
Plutonium-239/240	pCi/g	n/a	n/a	n/a	0/19	0.0416 - 0.0437
Technetium-99	pCi/g	n/a	n/a	n/a	0/19	3.62 - 3.62
Thorium-228	pCi/g	2.31E-01	4.72E-01	3.74E-01	19/19	0.0314 - 0.047
Thorium-230	pCi/g	3.29E-01	5.10E-01	4.09E-01	19/19	0.138 - 0.146
Thorium-232	pCi/g	2.79E-01	5.51E-01	4.00E-01	19/19	0.0408 - 0.0516
Uranium	pCi/g	n/a	n/a	n/a	0/19	0.254 - 1.32
Uranium-234	pCi/g	n/a	n/a	n/a	0/19	0.0768 - 0.668
Uranium-235	pCi/g	2.76E-02	6.69E-02	4.52E-02	16/19	0.0211 - 0.0373
Uranium-238	pCi/g	8.46E-01	1.77E+00	1.30E+00	16/19	0.144 - 0.888
Organic Compounds (Semivolatile)						
1,2,4-Trichlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
1,2-Dichlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
1,3-Dichlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
1,4-Dichlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4,5-Trichlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4,6-Trichlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4-Dichlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4-Dimethylphenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4-Dinitrophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,4-Dinitrotoluene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2,6-Dinitrotoluene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Chloronaphthalene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Chlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Methyl-4,6-dinitrophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Methylnaphthalene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Methylphenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Nitrobenzenamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
2-Nitrophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
3,3'-Dichlorobenzidine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
3-Nitrobenzenamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Bromophenyl phenyl ether	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Chloro-3-methylphenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Chlorobenzenamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Chlorophenyl phenyl ether	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Methylphenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Nitrobenzenamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
4-Nitrophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Acenaphthene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Acenaphthylene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Anthracene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49

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Table C.1. Summary of Historical Dataset (Continued)

Analysis	Units	Detected Results			FOD[a]	SQL/Radionuclide Equivalent Range
		Min	Max	Avg		
Benz(a)anthracene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Benzo(a)pyrene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Benzo(b)fluoranthene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Benzo(ghi)perylene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Bis(2-chloroethoxy)methane	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Bis(2-chloroethyl) ether	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Bis(2-chloroisopropyl) ether	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Bis(2-ethylhexyl)phthalate	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Butyl benzyl phthalate	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Carbazole	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Chrysene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Di-n-octylphthalate	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Fluorene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Hexachlorocyclopentadiene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Hexachloroethane	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Indeno(1,2,3-cd)pyrene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Isophorone	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Naphthalene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Nitrobenzene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
N-Nitroso-di-n-propylamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
N-Nitrosodiphenylamine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Pentachlorophenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Phenanthrene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Phenol	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Pyrene	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Pyridine	mg/kg	n/a	n/a	n/a	0/19	0.47 - 0.49
Organic Compounds (Volatile)						
1,1,1-Trichloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,1,2,2-Tetrachloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,1,2-Trichloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,1-Dichloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,1-Dichloroethene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,2-Dichloroethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,2-Dichloropropane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
1,2-Dimethylbenzene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
2-Butanone	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
2-Hexanone	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
4-Methyl-2-pentanone	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Acetone	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Benzene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Bromodichloromethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Bromoform	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Bromomethane	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Carbon disulfide	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Carbon tetrachloride	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Chlorobenzene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Ethylbenzene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
m,p-Xylene	mg/kg	n/a	n/a	n/a	0/19	0.02 - 0.02
Methylene chloride	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01

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Table C.1. Summary of Historical Dataset (Continued)

Analysis	Units	Detected Results			FOD[a]	SQL/Radionuclide Equivalent Range
		Min	Max	Avg		
Styrene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Tetrachloroethene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Toluene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
trans-1,2-Dichloroethene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
trans-1,3-Dichloropropene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01
Trichloroethene	mg/kg	n/a	n/a	n/a	0/19	0.01 - 0.01

[a] FOD = frequency of detection. FOD was determined from the number of detected samples over the entire number of samples. Field replicates were counted in the total.

Table C.2. Exceptions to the List of Analytes in the Protocol

Analytes not Included in Historical Analysis	Rationale for Acceptability
Inorganic Chemicals	
Boron Molybdenum	Although these metals are listed in the Guidance, they are not necessary for characterizing soil to be used for fill and cover material, since these metals typically are not detected at PGDP. They were not evaluated for background at PGDP (DOE 1997). Additionally, these metals have never been detected greater than the risk-based value established for this Protocol (see Section 4.2) (DOE 2009a).
Organic Compounds	
Benzo(k)fluoranthene Dibenz(a,h)anthracene Fluoranthene	These polycylic aromatic hydrocarbons (PAHs) were not requested for analysis in the historical set; however, the other PAHs [benz(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; chrysene; and indeno(1,2,3-cd)pyrene] used in calculating Total PAHs by toxicity equivalence were analyzed and not detected. It can be reasonably assumed that these PAHs also would not have been detected.
1,2-Dichloroethene (mixed) Acrylonitrile Chloroform *cis*-1,2-Dichloroethene Vinyl chloride	These volatile organics were not requested for analysis in the historical set; however, all other volatile organics were not detected. It can be reasonably assumed that these volatile organics also would not have been detected.
Dieldrin Hexachlorobenzene	These semivolatile organics represent pesticides. They were not requested for analysis in the historical set. Since no other semivolatile organics were detected, it is unlikely these pesticides would be present.
m-Xylene	Though m-xylene was not analyzed, m,p-xylene was; therefore, m-xylene is not required.
Total Dioxins/Furans	As stated in the Guidance, "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 [due to] the absence of polychlorinated biphenyls (PCBs) based upon PGDP process information." Consistent with this line of reasoning, dioxins/furans are not suspected in the proposed fill material because PCBs were not detected.

Based upon this evaluation of the analyte list for historical samples, the existing dataset is considered comprehensive and adequate to characterize the soil stockpile since it includes COPCs of interest at PGDP.

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C.3. SAMPLING AND ANALYTICAL METHODS

Guidance protocol for sampling and analytical methods are the following:

> Sampling and laboratory analytical methods will be consistent with EPA methods, DOE requirements, and contractor-approved procedures.

Sampling and laboratory analytical methods for the historical data were consistent with U.S. Environmental Protection Agency (EPA) methods, U.S. Department of Energy (DOE) requirements, and contractor-approved procedures.

SAMPLE QUANTITATION LIMITS/RADIONUCLIDE EQUIVALENTS

Guidance protocol for SQLs and their radionuclide equivalents are the following:

> SQLs and their radionuclide equivalents for analytes are shown in Table [C.1.1]. Historical data with SQLs or their radionuclide equivalents that exceed the values shown in Table [A.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 [A.1] may be acceptable, once the impacts on the evaluation are understood.

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SQLs and their radionuclide equivalents for analytes shown in Table C.1.1 of the Guidance (see Appendix) were met in the historical dataset with the exceptions detailed in Table C.3.

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Table C.3. Exceptions to SQL and Their Radionuclide Equivalents in the Guidance

Analysis	Units	Historical Dataset Detection Limit[a]		Guidance SQL[b]
		Minimum	Maximum	
Metals				
Antimony	mg/kg	20	20	0.105
Beryllium	mg/kg	0.5	0.5	0.45
Cadmium	mg/kg	2	2	0.105
Lead	mg/kg	20	200	17.5
Mercury	mg/kg	0.2	0.2	0.1
Selenium	mg/kg	1	1	0.3
Silver	mg/kg	4	4	1.5
Thallium	mg/kg	20	20	0.105
Uranium	mg/kg	200	2000	3.8
Zinc	mg/kg	20	200	41
Radionuclides				
Neptunium-237	pCi/g	0.0304	0.0542	0.014
Plutonium-238	pCi/g	0.191	0.192	0.002
Plutonium-239/240	pCi/g	0.0416	0.0437	0.009
Technetium-99	pCi/g	3.62	3.62	0.15
Semivolatile Organics				
Benzo(a)pyrene	mg/kg	0.47	0.49	0.197
N-Nitroso-di-n-propylamine	mg/kg	0.47	0.49	0.2

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Table C.3. Exceptions to SQL and Their Radionuclide Equivalents in the Guidance (Continued)

[a] Historical Detection Limit refers to the lowest reliably reported value for an inorganic or an organic analyte. For purposes of this table, the radionuclide equivalent or the minimum detectable activity (MDA) is presented.
[b] 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.

Metals - Antimony and thallium historical detection limits are commonly higher than risk-based levels at PGDP. These metals were all nondetect values within the historical dataset and their presence is not expected in this location. Although the beryllium and mercury historical detection limits are only slightly higher than the required SQLs, their historical detection limits are still lower than the site-specific background values. The historical detection limits for cadmium, lead, selenium, and silver are higher than that required in the Guidance, but they are not higher than the risk-based value established in the Guidance. The higher historical detection limits for these metals do not have any impact on this evaluation.

Zinc historical detection limits range from 20 to 200 mg/kg. The majority of the samples have detection limits for zinc of 20 mg/kg; these detection limits are within the requirements of the Guidance. Four of the 30 samples have a detection limit for zinc of 200 mg/kg, which is greater than the requirements of the Guidance. One of these samples is a field replicate, two samples were part of the resampling effort for beryllium. Only one of the initial grid samples has the higher detection limit. All four samples with the higher detection limit were nondetects. The higher detection limit for zinc does not have a negative impact on this evaluation.

The historical detection limit for uranium metal is much higher than can be expected to produce reliable results with respect to this evaluation; however, radioisotopic uranium data is available for this dataset with appropriate minimum detectable activities (MDAs). This data was collected prior to the implementation of the use of nitric acid for alpha spectroscopy analysis; these analyses were performed using gamma spectroscopy. The high uranium metal detection limit is not anticipated to negatively impact this evaluation.

Radionuclides - Although the MDAs for four radionuclides were greater than the SQL/radionuclide equivalent required by the Guidance, there is no significant impact because the MDA for these radionuclides are below the risk-based values presented in the Guidance.

Semivolatiles - Two semivolatiles had historical detection limits greater than that required by the Guidance: benzo(a)pyrene and n-nitroso-di-n-propylamine. Both historical detection limits were approximately 2.5 times the risk-based value and all results were nondetect. Since there is no reason to suspect these chemicals are present, it is not anticipated that these higher detection limits have a negative impact on this evaluation.

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C.4. DATA SCREENING

Guidance protocol for screening of laboratory analytical data are as follows in the subsequent sections. A summary of the detected chemicals in the dataset is presented in Table C.4 of this evaluation.

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Table C.4. Data Summary of Detected Chemicals in Historical Soil Samples

Analysis	Units	Detected Results			Frequency of Detection [a]	2001 Background [b]		2009 Background [c]		Risk-Based Value [d]		Detection Limit Range
		Minimum	Maximum	Average		Value	FOE [e]	Value	FOE [e]	Value	FOE [e]	
Metals												
Aluminum	mg/kg	3.88E+03	1.13E+04	7.75E+03	30/30	1.30E+04	0/30	1.60E+04	0/30	4.41E+04	0/30	20 - 20
Arsenic	mg/kg	5.27E+00	1.18E+01	7.93E+00	9/30	1.20E+01	0/30	1.10E+01	2/30	2.38E+00	9/30	5 - 5
Barium	mg/kg	3.69E+01	1.04E+02	6.92E+01	30/30	2.00E+02	0/30	1.82E+02	0/30	1.40E+03	0/30	5 - 5
Beryllium	mg/kg	9.91E-01	5.64E+00	3.32E+00	2/30	6.70E-01	2/30	9.00E-01	2/30	8.29E-03	2/30	0.5 - 0.5
Cadmium	mg/kg	2.87E+00	2.87E+00	2.87E+00	1/30	2.10E-01	1/30	2.10E-01	1/30	2.00E+01	0/30	2 - 2
Chromium	mg/kg	5.02E+00	1.88E+01	1.07E+01	30/30	1.60E+01	2/30	2.50E+01	0/30	1.09E+03	0/30	2.5 - 2.5
Cobalt	mg/kg	2.57E+00	1.64E+01	4.64E+00	26/30	1.40E+01	1/30	1.30E+01	1/30	7.53E+02	0/30	2.5 - 2.5
Copper	mg/kg	3.67E+00	1.45E+01	7.21E+00	30/30	1.90E+01	0/30	2.40E+01	0/30	1.84E+03	0/30	2.5 - 2.5
Iron	mg/kg	5.19E+03	1.68E+04	1.04E+04	30/30	2.80E+04	0/30	2.87E+04	0/30	1.38E+04	4/30	20 - 20
Lead	mg/kg	2.04E+01	1.03E+02	6.17E+01	2/30	3.60E+01	1/30	3.50E+01	1/30	4.00E+02	0/30	20 - 200
Manganese	mg/kg	1.61E+02	7.62E+02	3.12E+02	30/30	1.50E+03	0/30	7.01E+02	1/30	3.98E+03	0/30	10 - 10
Nickel	mg/kg	7.09E+00	1.76E+01	1.14E+01	28/30	2.10E+01	0/30	2.80E+01	0/30	8.46E+01	0/30	5 - 5
Selenium	mg/kg	1.06E+00	1.58E+00	1.25E+00	9/30	8.00E-01	9/30	6.00E-01	9/30	2.30E+02	0/30	1 - 1
Vanadium	mg/kg	7.34E+00	3.16E+01	1.84E+01	30/30	3.80E+01	0/30	4.40E+01	0/30	1.96E+01	9/30	2.5 - 2.5
Zinc	mg/kg	2.02E+01	5.23E+01	3.15E+01	21/30	6.50E+01	0/30	8.20E+01	0/30	1.38E+04	0/30	20 - 200
Radionuclides												
Cesium-137	pCi/g	4.79E-02	2.55E-01	1.09E-01	19/19	4.90E-01	0/19	5.00E-01	0/19	2.66E-01	0/19	0.0197 - 0.0376
Thorium-230	pCi/g	3.29E-01	5.10E-01	4.09E-01	19/19	1.50E+00	0/19	2.20E+00	0/19	4.09E+01	0/19	0.138 - 0.146
Uranium-235	pCi/g	2.76E-02	6.69E-02	4.52E-02	16/19	1.40E-01	0/19	1.10E-01	0/19	1.22E+00	0/19	0.0211 - 0.0373
Uranium-238	pCi/g	8.46E-01	1.77E+00	1.30E+00	16/19	1.20E+00	10/19	1.90E+00	0/19	5.17E+00	0/19	0.144 - 0.888

[a] Frequency of Detection was determined from the number of detected samples over the entire number of samples. Field replicates were counted in the total.
[b] Background Values from DOE 2001. All samples were screened against surface values. Only detected values were screened.
[c] Background Values from DOE 2009b. All samples were screened against surface values. Only detected values were screened.
[d] Risk-based values are derived from the Risk Methods Document (DOE 2009b) using a level of ELCR=1E-5/HI=1 for the child resident scenario. These values are proposed in the Guidance (PRS 2010). Only detected values were screened.
[e] Frequency of Exceedance.
n/a = not applicable or not available.

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The text in these sections describe and illustrate the spatial distribution of the soil samples having background and/or risk-based exceedances, with accompanying charts of results compared to background. The 2001 Risk Methods Document (DOE 2001) and the 2009 Risk Methods Document were the primary sources used for comparing soil sampling results with background and the 2009 Risk Methods Document was the source used for derivation of the risk-based comparison value. In order to better focus on chemicals presenting potential concern for the soil samples, additional information sources were consulted. Both ambient background values published by Kentucky Natural Resources and Environmental Protection Cabinet [now called the Kentucky Energy and Environment Cabinet (KEEC)] (KEEC 2004) and global fallout values (ANL 2007) were used to inform ambient background.

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The background screen is not meant necessarily to screen against the most conservative of the background values available, but to screen results that are below values that reasonably could be expected to occur naturally. The documents and values cited in this verification define values that reasonably could be expected to occur.

To apply the guidance established by the KEEC, the criteria used are listed below:

(1) The mean site concentration for inorganic constituents must be below the 95% upper confidence limit (UCL) of the mean concentrations of background for inorganic constituents.

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(2) At least half of the data points should be less than the 60th percentile.

(3) No data points should be above the upper bound value (95th percentile).

The risk-based comparison values were derived from the no action levels presented in Appendix A of the 2009 Risk Methods Document (DOE 2009b). Consistent with the Guidance, the risk-based values used in the comparison are the lesser of values based upon a cancer risk target of 1E-05 and a hazard index target of 1. Values for the resident scenario (lifetime for cancer risk-based and child for hazard-based values) were used to ensure that areas in which fill was placed would be available for unrestricted future use.

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C.4.1 SITE-SPECIFIC BACKGROUND COMPARISON

> 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 the PGDP. This evaluation will begin with a simple comparison against background concentrations presented in Table [A.2], but additional analyses will be used to determine if exceedances of these background concentrations represent potential contamination or natural variation.

The following analytes listed in the Guidance were detected exceeding both 2001 and 2009 background screening criteria: beryllium, cadmium, cobalt, lead, and selenium.

Beryllium was detected in two composite samples within the established grids at 0.991 and 5.64 mg/kg. These results appeared anomalous and the locations from which the composites were collected were resampled as grab samples. None of the resampled locations showed a detection of beryllium. Since the detection of beryllium could not be verified, these results are not reliable and should not be considered real or present as a COPC. Figure 2 graphically shows the results with the background values and other comparison values.

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Cadmium was detected above the primary background screening criteria; however, it was detected in only one of 30 samples (Figure 3). The criteria for applying ambient background values established by KEEC (see listing above) were met since only one sample was detected. The detected value was 2.87 mg/kg, which is below the 95th percentile of the generic statewide ambient background value (3.9 mg/kg) (KEEC 2004); therefore, cadmium is not present in the soil samples as a COPC.

Cobalt was detected in 26 of 30 soil samples ranging from 2.57 mg/kg to 16.4 mg/kg (Figure 4). Although the maximum detected result is greater than the primary background screening values of 13 mg/kg and 14 mg/kg (DOE 2009b; DOE 2001), it is still below the generic statewide ambient background value of 25.1 mg/kg (KEEC 2004). The mean concentration for cobalt in this dataset is 4.64 mg/kg, which is below Kentucky's 95% UCL of the mean concentrations of background of 12.4 mg/kg, and more than half were not detected or less than the 60th percentile of 13.1 mg/kg, which meets the criteria for applying ambient background values established by KEEC. Since cobalt is below the range of background, it is not considered a COPC.

Lead was detected in two of 30 soil samples at values of 20.4 and 103 mg/kg. The maximum detected value is greater than all background screening values (35, 36, and 84.6 mg/kg) (DOE 2009b; DOE 2001; KEEC 2004). Although the maximum lead value is greater than background, it does not exceed the risk-based comparison value (see Section 4.2) and should not be considered a COPC. Figure 5 graphically shows the results with the background values and other comparison values.

Selenium detections in the historical soil samples ranged from 1.06 to 1.58 mg/kg in nine of 30 samples. Although these detections exceeded the primary background screening values of 0.6 mg/kg and 0.9 mg/kg (DOE 2009b; DOE 2001), they are still below the generic statewide ambient background value of 2.1 mg/kg (KEEC 2004). The high laboratory detection limit prevents the dataset from meeting the criteria for applying ambient background values established by KEEC; however, the maximum value detected is still much lower than the derived risk-based value of 230 mg/kg (see Section 4.2). Figure 6 graphically shows the results with the background values and other comparison values. Since selenium is below the derived risk-based value, it should not be considered a COPC.

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C.4.2 RISK-BASED VALUE COMPARISON

> 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[b]). 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.

Within this dataset, there were no analytes without background concentrations for comparison that were detected at levels greater than their risk-based values. As stated within this section, values for the resident scenario (lifetime for cancer risk-based and child for hazard-based values) were used to ensure that areas in which fill was placed would be available for unrestricted future use.

The following analytes listed in the Guidance were detected exceeding the full range of background screening criteria: lead and selenium. Additional evaluation was performed for these analytes including comparison to risk-based values. The concentrations of these analytes are below the risk-based values, (i.e., 400 mg/kg and 230 mg/kg, respectively) they should not be considered COPCs.

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C.4.3 UNCERTAINTY ANALYSIS

> 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.

Although cadmium and cobalt exceed both the 2001 and the 2009 background screening criteria, they do not exceed the full range of background as described within this report. Cadmium and cobalt values for this sampling fall within the natural range of background and are not considered COPCs.

Values for lead and selenium exceed the background screening criteria; however, their values do not exceed risk-based value selected for screening fill and cover material. Since lead and selenium are below the risk-based values, they should not be considered COPCs.

Beryllium detections exceed comparison values, but these results should not be considered reliable because these results are anomalous and the detection of beryllium could not be verified. The beryllium detections should not be considered real or present as a COPC, as shown in Section 4.1.

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C.5. CONCLUSION

Though historical soil sampling deviates from the Fill and Cover Material Verification Guidance, the stockpile of 22,500 yds^3 excavated soil removed as part of the construction of the Northwest Storm Water Collection Basin in 2001 does not contain COPCs and is acceptable for use as fill material to replace excavated soils for several planned RAs for the Soils Operable Unit and the Surface Water Operable Unit.

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C.6. REFERENCES

ANL 2007. *Radiological and Chemical Fact Sheets to Support Health Risk Analyses for Contaminated Areas,* Argonne National Laboratory, Environmental Science Division, March.

BJC 2001. *SY01-BSN*, October.

DOE 1997. *Background Levels of Selected Radionuclides and Metals in Soil and Geologic Media at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1586&D2, June.

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 2009a. Paducah GIS Environmental Data Warehouse Web Site, December 14, 2009, http://prsdw01/padgis/default.jsp.

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DOE 2009b. *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.

KEEC 2004. *Kentucky Guidance for Ambient Background Assessment*, Natural Resources and Environmental Protection Cabinet, January.

PRS 2010. *Paducah Gaseous Diffusion Plant Fill and Cover Material Verification Guidance*, PRS-ENR-0036, January.

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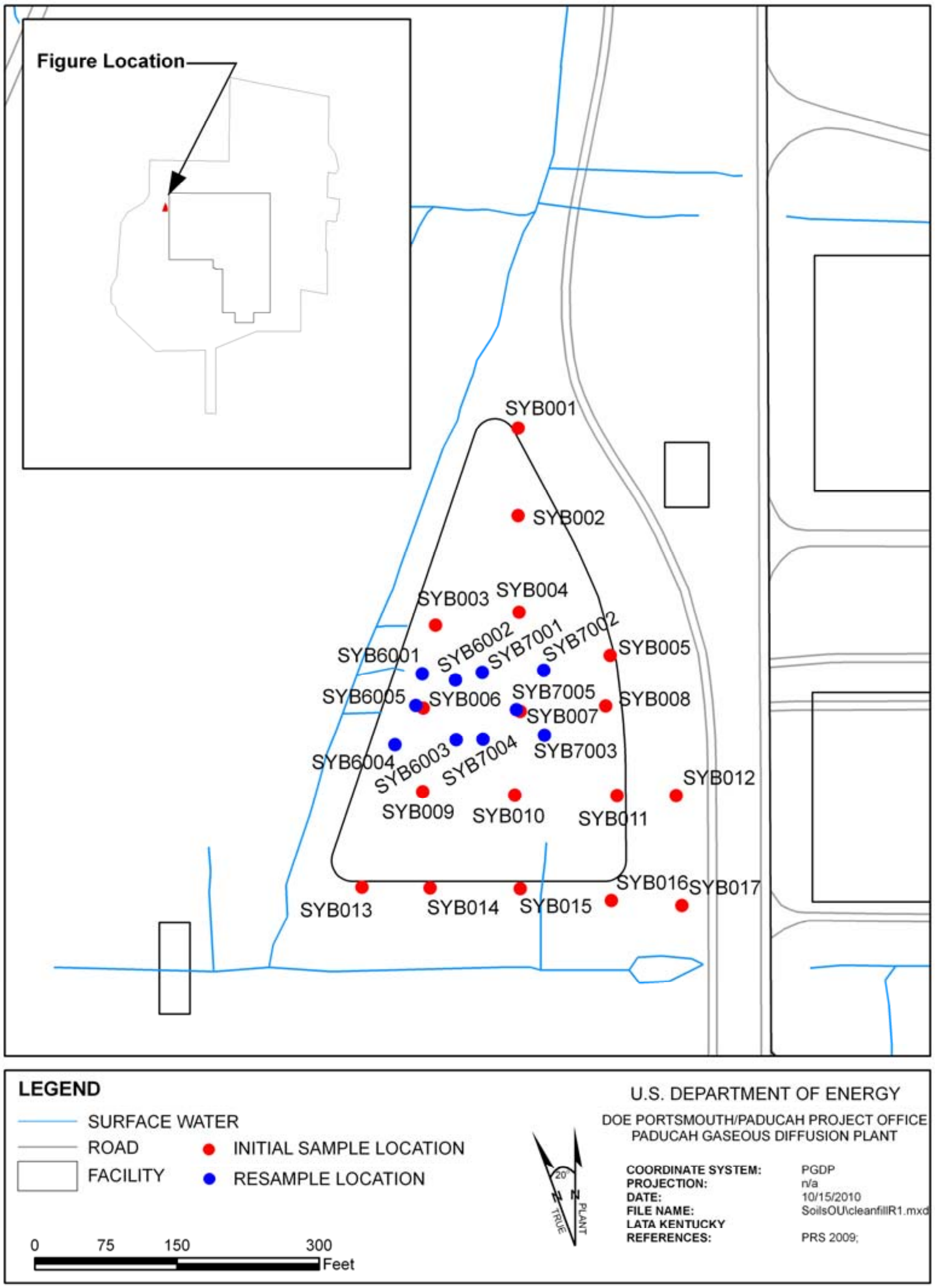
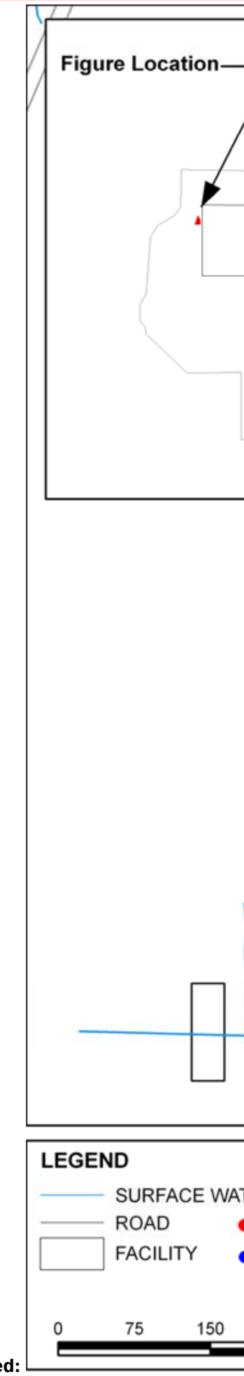


Figure C.1. Characterization of Northwest Storm Water Control Basin Prior to Excavation



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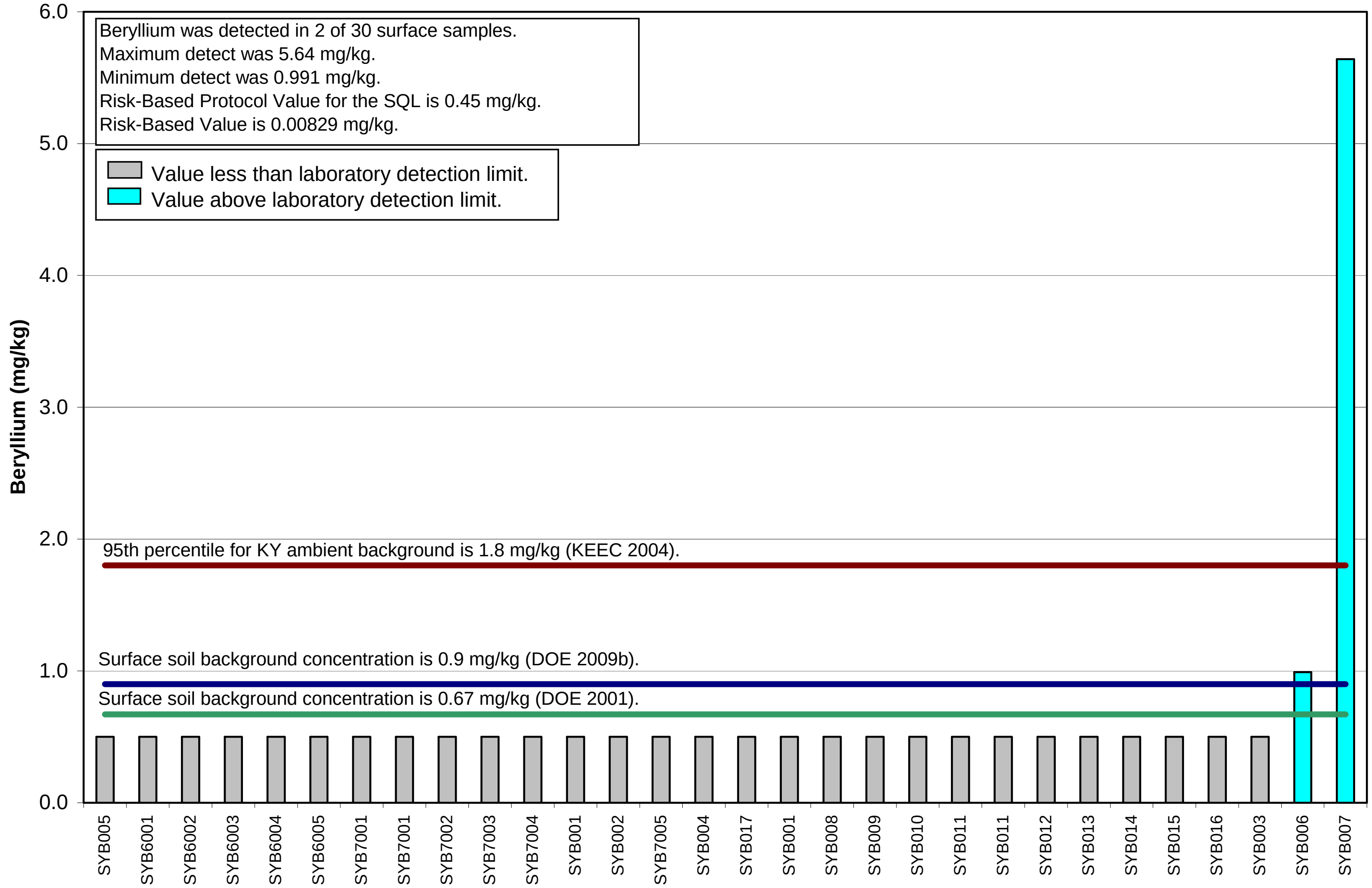

Figure C.2. Comparison between Beryllium Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

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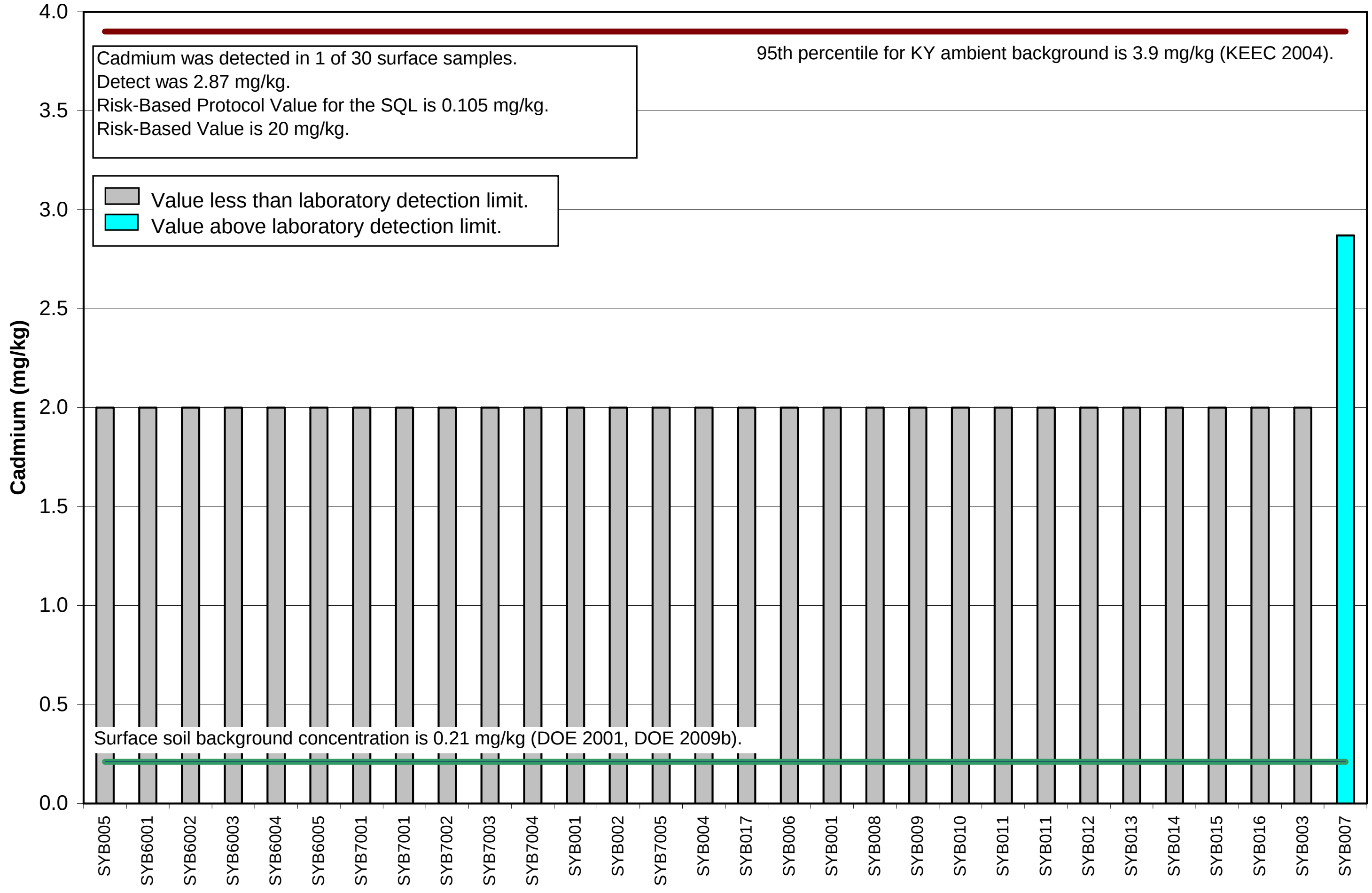

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Figure C.3. Comparison between Cadmium Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

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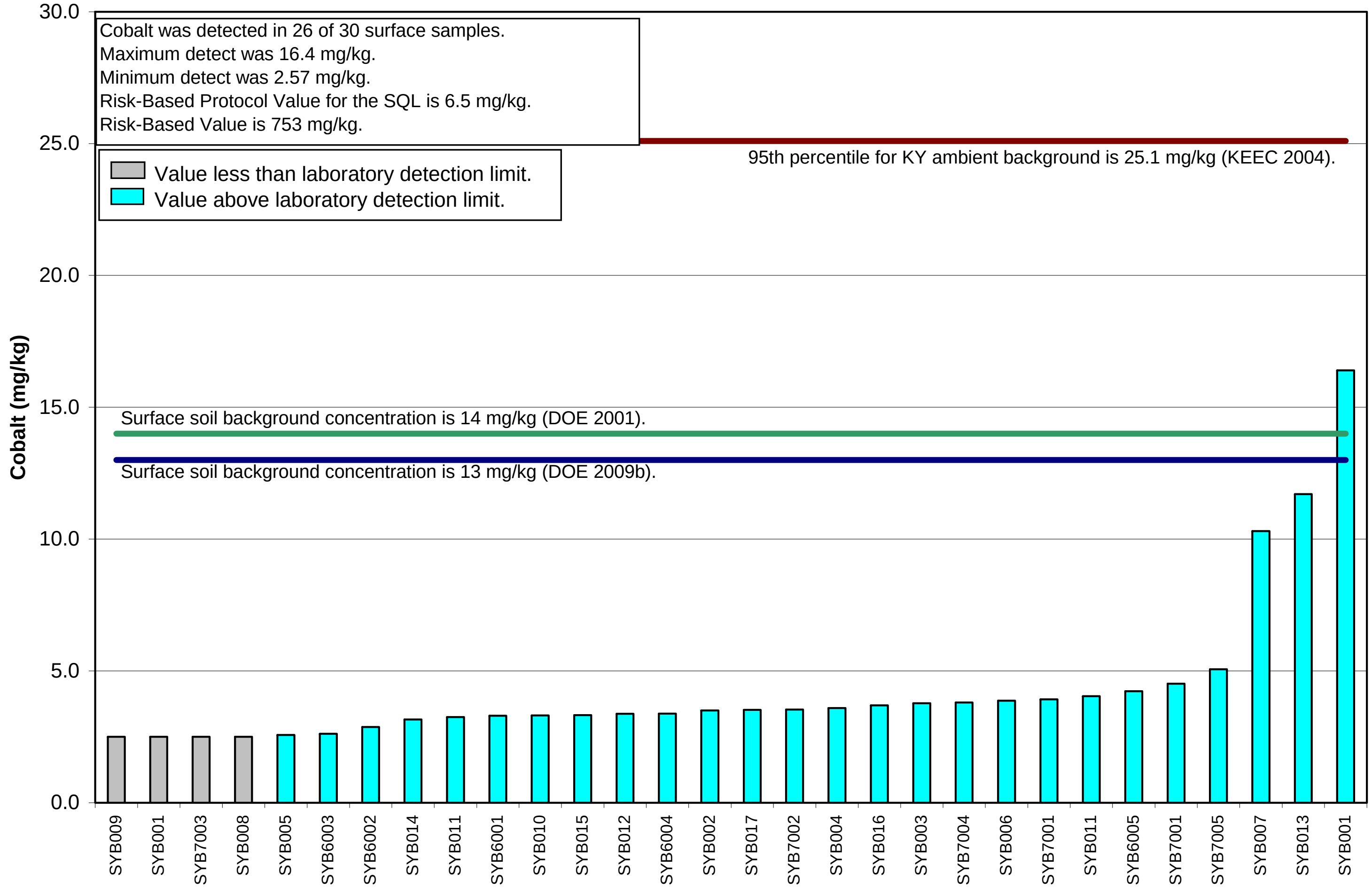

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Figure C.4. Comparison between Cobalt Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

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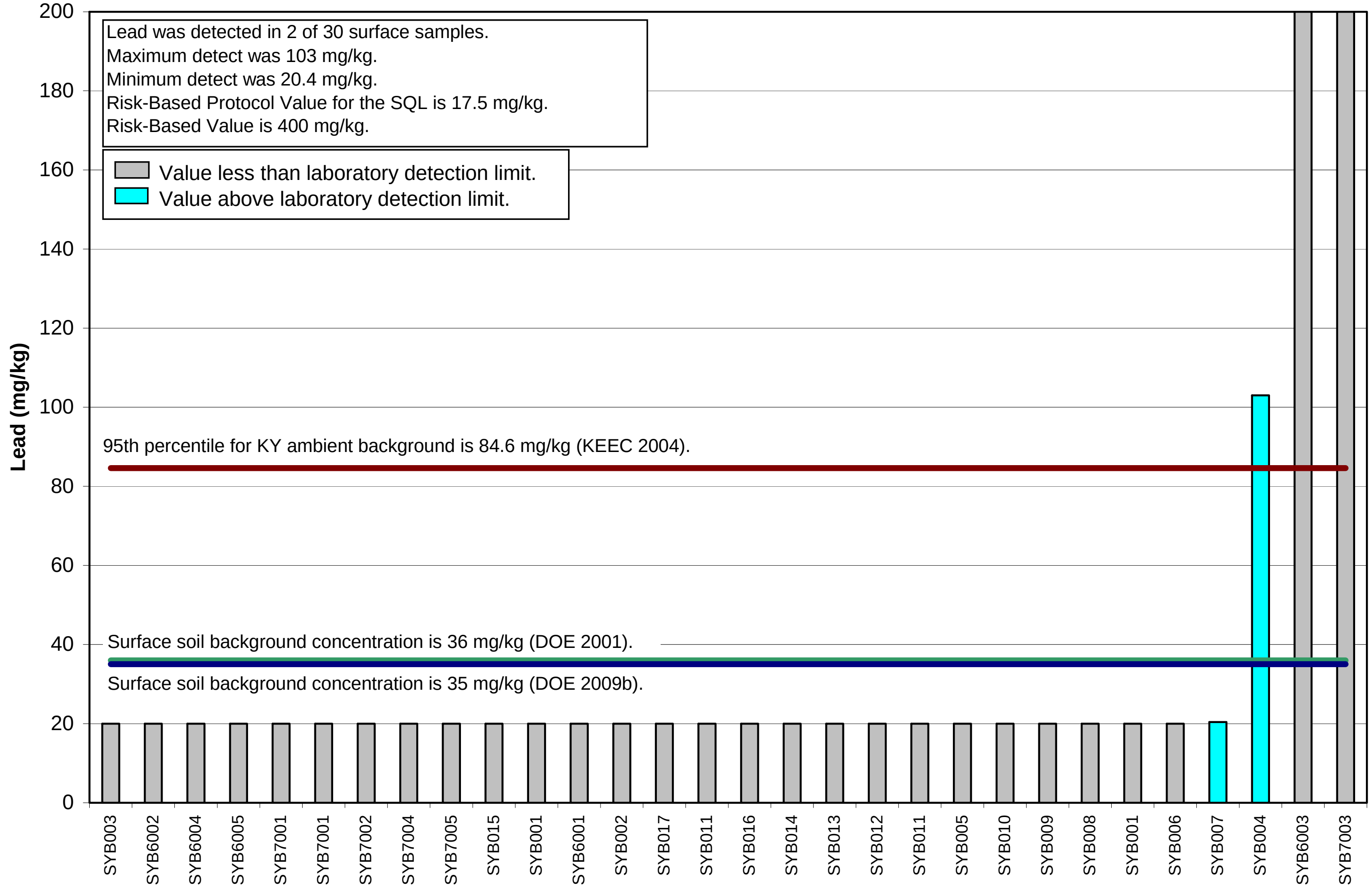

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Figure C.5. Comparison between Lead Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

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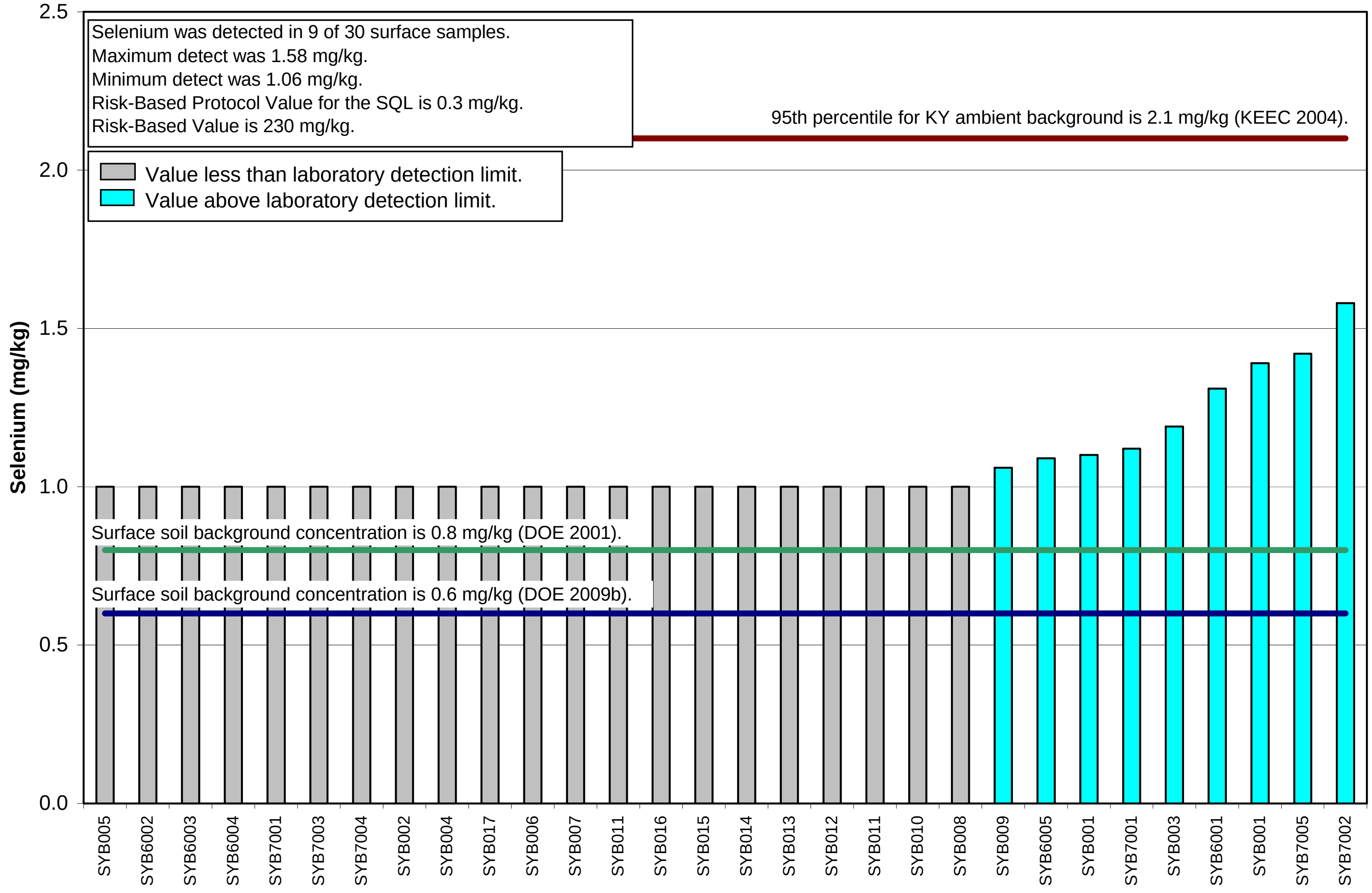

Figure C.6. Comparison between Selenium Concentrations in Historical Soil Samples and Surface Soil Background Concentrations

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ATTACHMENT

FILL AND COVER MATERIAL VERIFICATION GUIDANCE

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Paducah Gaseous Diffusion Plant
Fill and Cover Material Verification Guidance

PRS-ENR-0036

Paducah Gaseous Diffusion Plant
Fill and Cover Material Verification Guidance

Date Issued—February 2010

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

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

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CONTENTS

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C1.1. OBJECTIVE C1-6

C1.2. BASIS C1-6

C1.3. VERIFICATION GUIDANCE C1-6

C1.4. REFERENCES C1-7

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C1.1. OBJECTIVE

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The guidance 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 guidance presents a standard method for sampling fill and cover material and evaluating the sampling results, deviations from this guidance 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.

C1.2. BASIS

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

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C1.3. VERIFICATION GUIDANCE

This guidance 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.

Guidance 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 yds^3 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 guidance. Once an area is approved through this guidance 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), with some deviations. This list of analytes and deviations are in Table C.1.1. 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 C.1.1. Historical data with SQLs or their radionuclide equivalents that exceed the values shown in Table C.1.1 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 C.1.1 may be acceptable, once the impacts on the evaluation are understood.

Results of laboratory analysis will be screened as follows:

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- 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 C.1.2, 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 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.

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C1.4. 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.

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Table C.1.1. Sitewide Chemicals of Potential Concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky[1]

Analyte	CAS Number	Sample Quantitation Limit or Radionuclide Equivalent[2]	
Inorganic Chemicals			
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
Organic Compounds			
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
trans-1,2-Dichloroethene	156605	20	mg/kg
cis-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

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Table C.1.1. Sitewide Chemicals of Potential Concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky[1] (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 x 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

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Table C.1.2. 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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APPENDIX D

CLEAN FILL VENDOR CERTIFICATION FOR SWMU 19

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Martin Marietta Materials

3565 Lone Oak Road, Suite 4
Paducah, Kentucky 42003

Johnny L. Boyd
Sales Representative

Tuesday, March 30, 2010

Dear Valued Customer:

We would like to thank you for the recent purchase of the DGA and 8” minus being produced at our three Rivers Quarry located in Smithland KY. The Three Rivers Quarry is approved by several different states as well as the Corps of Engineers. The material is produced form state approved formations and is a well graded material free from any chemical contamination. If you have any other questions please feel free to contact me.

Sincerely,

Johnny L. Boyd
Martin Marietta Materials

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APPENDIX E

PHOTOGRAPHS OF SWMUS 19 AND 181

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C-218 – 2/4/08 (Before)

C-218 – 12/11/09 (Implementation)

C-218 – 1/4/10 (After)

C-218 – 5/17/10 (After)

C-410-B – 6/26/06 (Before)

C-410-B – 3/8/10 (Implementation)

C-410-B – 3/26/10 (After)

Responses to EPA, KDWM, and KY Radiation Health Branch Comments Pertaining to the *Removal Action Report for Soils Operable Unit Inactive Facilities Solid Waste Management Units 19 and 181 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* DOE/LX/07-0356&D2 Dated August 2010

The comments provided by EPA and KY have been considered and the provided responses are presented. The individual agency comments are listed followed by the responses.

EPA Comments:

Comment 1: *Summary of Results, Page 2 and 3: Figures should be provided that illustrate confirmatory sampling locations for the Firing Range (SWMU 181) and the Neutralization Lagoon (SWMU 19).*

Response: Additional figures have been included in Appendix A.

Comment 2: *C-410-B HF Neutralization Lagoon (SWMU 19), Page 3: Discussion from the RAWP should be provided that gives the rationale for excavating a finite area at the Neutralization Lagoon, i.e. 3 ft beyond the site boundary, rather than meeting cleanup goals. Also, the statement should be made that the residual contamination remaining at the C-410-B HF Neutralization Lagoon (SWMU 19) will be evaluated and addressed as part of ongoing and future remedial investigation activities (e.g., Groundwater OU, Soils OU, etc.).*

Response: The following excerpt from the RAWP, as updated, has been added to the section:

"Under this action, C-410-B HF Neutralization Lagoon (SWMU 19) will be removed to up to 3 ft beyond its SWMU boundary; therefore, cleanup levels for this inactive facility are not applicable. With regard to C-410-B Hydrogen Fluoride Neutralization Lagoon, the boundary definition was discussed in previous scoping meetings with agreement to remove up to 3 ft beyond the SWMU boundary, which was determined likely to include the majority of any soil contamination. Any contamination left in place would be [evaluated in future investigations]."

Comment 3: *Appendix C, Pages 2, 6: The Fill and Cover Material Verification Guidance does not have an Appendix letter assigned, which makes finding the guidance cumbersome. Add the Appendix letter and reference to the appropriate Appendix and Table on pages 2, 6 and 9.*

Response: The appendix within Appendix C did not have a letter designation because Appendix C was, in its entirety, a previously published document. Appendix C has been reformatted to avoid this confusion.

Comment 4: *Appendix E: Photos provided of SWMUs 19 and 181 are much appreciated.*

Response: Thank you.

KDWM General Comments:

Comment 1: *The document, even one as short as this one, should have section and sub-section (as appropriate) designations for reference purposes.*

Response: This RAR is a letter report containing specified information. Although sections and subsections are appropriate within documents, formatting is not recommended to be utilized in this specific letter report.

Comment 2: *The document must discuss maintenance and future actions, if future actions are warranted. When an action does not attain clean-up values that allow for unlimited use and exposure, residential PRGs in Kentucky, a future action is always in order even if that action is only LUCs, environmental covenant, etc.*

Response: Cleanup values for lead were attained for SWMU 181. No further action is recommended for lead. Additionally, the following text has been added to the paragraph: "No further action is recommended for lead at this SWMU. Any other chemicals associated with SWMU 181 will be addressed as part of the Soils Operable Unit."

An excerpt from the RAWP, as updated, has been included for SWMU 19 on page 3 as follows:

"Under this action, C-410-B HF Neutralization Lagoon (SWMU 19) will be removed to up to 3 ft beyond its SWMU boundary; therefore, cleanup levels for this inactive facility are not applicable. With regard to C-410-B Hydrogen Fluoride Neutralization Lagoon, the boundary definition was discussed in previous scoping meetings with agreement to remove up to 3 ft beyond the SWMU boundary, which was determined likely to include the majority of any soil contamination. Any contamination left in place would be [evaluated in future investigations]."

Comment 3: *The report should provide a summary of project costs. See Appendix D pg II-17 of the FFA. It would be instructive for the report to provide the projected cost for a project and the actual costs for the project.*

Response: A summary of project cost has been included on page 4. A footnote has been added to the project cost indicating that the accounting of expenditures is based on an estimate governed by figures known at the time the report was written.. This summary of project costs is not a precedence for future reports.

KDWM Specific Comments:

Comment 1: *Summaries of Results—C-218 Firing Range (SWMU 181), Page 1: Please include a site map in Appendix A (such as Figures F.3 and F.4 from the Sampling Plan in the RAWP) that includes the Remedial Unit (RU) boundaries. Please denote the areas where the bullet fragments were observed, the RUs that were sampled, the three RUs where an additional foot of soil was removed and the two RUs where an additional two ft were removed.*

Response: An additional figure has been included in Appendix A.

Comment 2: *Summaries of Results—C-218 Firing Range (SWMU 181), Page 2, Third Bullet: Please include in this discussion the locations of the samples, i.e. which RUs were sampled.*

Response: A reference to Appendix A for locations has been added to the text.

Comment 3: *Summaries of Results—C-218 Firing Range (SMWU 181), first paragraph, Page 3: Briefly describe where from where the backfill soil originated (or reference Appendix D).*

Response: The text, "…originating from the stockpile of soil from construction of the Northwest Storm Water Collection Basin." has been added to the referenced paragraph.

Comment 4: *Summaries of Results—C-410-B Neutralization Lagoon (SMWU 19), Page 3: Please include a site map in Appendix A (such as Figure F.2 from the RAWP) that includes the Remedial Unit (RU) boundaries to inform the discussion of sampling and sampling results.*

Response: An additional figure has been included in Appendix A.

Comment 5: *Summaries of Results—C-410-B Neutralization Lagoon (SMWU 19), Page 3:*

a) Please include a discussion of how the accumulated rainwater was handled, how much water was generated and its final disposition. b) Please include a discussion of why there are no clean-up levels for this SWMU, consistent with the discussion on page 10 of the RAWP. c) In the discussion of sampling, please address whether any sample locations were biased because of indications of contamination.

Response: (a) The following text has been added to page 3 or the report: "In order to capture rainwater during the excavation, a low-point/sump was created in the northwest corner of the lagoon and the standing water was pumped into poly tanks. The water was disposed of at Energy*Solutions* in Clive, Utah. Once water was too low to pump, it was mixed with the sludge in the lagoon and solidified with an absorbent."

(b) The following excerpt from the RAWP, as updated, has been added to the text: "Under this action, C-410-B HF Neutralization Lagoon (SWMU 19) will be removed to up to 3 ft beyond its SWMU boundary; therefore, cleanup levels for this inactive facility are not applicable. With regard to C-410-B Hydrogen Fluoride Neutralization Lagoon, the boundary definition was discussed in previous scoping meetings with agreement to remove up to 3 ft beyond the SWMU boundary, which was determined likely to include the majority of any soil contamination. Any contamination left in place would be [evaluated in future investigations]."

(c) The following has been added to the text on page 3: "No evidence of contamination required biasing of sampling locations."

KY Radiation Health Branch General Comments:

Comment 1: *Throughout the document the citations for background values list the 2009 Risk Methods Document. Some listings include values for both the 2001 and 2009 Risk Methods Documents. This is not appropriate for isotopic uranium values, since the values in the 2001, the 2009 (draft) and the 2010 are all different. This may not only be limited to isotopic uranium. Please utilize only approved values for all contaminants.*

Response: Within the main text of the report, only the 2001 Risk Methods Document background values are referenced. For isotopic uranium, text on page 3 of the report states the following, "All other radioactive analytes, including … uranium-234, and uranium-235 were present in amounts less than background or less than a 1E-5 risk-based soil screening levels for direct contact for the industrial worker (*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)." Uranium-234 and uranium-235 were present below a 1E-5 risk-based soil screening level for direct contact for the industrial worker, but were above background.

Reference to background within Appendix C of the report follows guidelines established with the "Fill and Cover Material Verification Protocol." The protocol will be considered for updating, as necessary, as the Risk Methods Document is revised.

KY Radiation Health Branch Specific Comments:

Comment 1: ***Page 1:*** *"Description of the Removal Action Implemented", Last Paragraph: The sentence states "direct contract" instead of "direct contact". Please correct.*

Response: Text has been corrected as requested.

Comment 2: *Appendix B CD Data "Codes List".*

The "Codes List" file includes the following Data Assessment Codes:

(a) KYRHTAB-OK: Kentucky Radiation Health and Toxic Agents Branch (KYRHTAB) performed an independent data evaluation (not to be confused with data verification and validation) and the data is acceptable for use.

(b) KYRHTAB-NE: Kentucky Radiation Health and Toxic Agents Branch (KYRHTAB) performed an independent data evaluation (not to be confused with data verification and validation) and the rad error exhibits a negative value, which is a statistical outlier.

(c) KYRHTAB-LT: Kentucky Radiation Health and Toxic Agents Branch(KYRHTAB) performed an independent data evaluation (not to be confused with data verification and validation) and the results are less than (LT) the maximum detectable activity (MDA) or detection limit

(d) KYRHTAB-ER: Kentucky Radiation Health and Toxic Agents Branch(KYRHTAB) performed an independent data evaluation (not to be confused with data verification and validation) and the data presents error problems (ie., no counting uncertainty or zero counting uncertainty (emission of wording made by "Codes List")

Pages 3-18 and 3-19 of the Risk Methods Document (2010) states:

Evaluation of radionuclide data will follow rules agreed upon by the Commonwealth of Kentucky Radiation Health Branch and DOE (RAWG 2000a through 2000f). The data assessment qualifiers that will appear and their description are as follows:

(a) KYRHB-LT: Kentucky Radiation Health and Branch (KYRHTAB) performed an independent data assessment and the results are less than the MDC or detection limit and should not be plotted.

(b) KYRHB-50: KYRHTAB performed an independent data assessment and the radiation counting uncertainty is greater than 50% of the analytical results.

(c) KYRHB-ER: KYRHTAB performed an independent data assessment and the data present error problems (i.e., no counting uncertainty or zero counting uncertainty).

(d) KYRHB-OK: KYRHTAB performed an independent data assessment and the data are acceptable for use.

Please explain the following:

(a) The addition of KYRHTAB-NE

(b) The additional language added to all data assessment codes—"not to be confused with data verification and validation"

Response: Both (a) the addition of KYRHTAB-NE and (b) the additional language added to all data assessment codes were suggested by Kentucky Radiation Health and Toxic Agents Branch. See attached e-mail. The data assessment code "KYRHTAB-NE" will be considered for addition to the Risk Methods Document.

Comment 3: *<u>Appendix B CD Data "Codes List"</u>: The definition of KYRHTAB-ER was not completed in the Codes List table. Please provide the rest of the definition.*

Response: The remainder of the text has been added to the end of the definition of KYRHTAB-ER in the Codes List table so that the entire code description reads "Kentucky Radiation Health and Toxic Agents Branch (KYRHTAB) has performed an independent data evaluation (not to be confused with data verification and validation) and the data presents error problems (i.e., no counting uncertainty or zero counting uncertainty)."

In addition, the definitions for "DIS-EDDF1," "KYRHTAB-LT," and "USECNITRIC-CF" were updated.

Comment 4: *<u>Appendix C, "Fill and Cover Material", Page 3, Table 1</u>: (a) The Uranium (pCi/g) and Uranium-234 (pCi/g) detected results are listed as n/a, but the "SQL/Radionuclide Equivalent Range" column has data for these analytes. Please explain.*

(b) The origin of the "Uranium" analyte with units of pCi/g is unclear. Please explain.

(c) The Risk Methods Documents (2001 and 2010), do not include action levels for "Uranium" with pCi/g. Please explain the relevance of this analytes' inclusion in this table and provide the proper screening process for this analyte.

Response: (a) For the historical dataset, results for uranium (pCi/g) and uranium-234 (pCi/g) were qualified by the laboratory as "U." Although clarification to this qualifier is being prepared, at the time of this report, those results were considered not detected. Minimum detected activities for these analyses were reported with the range as listed.

(b) The "uranium" analyte with units of pCi/g is total radioactive uranium. It is a calculated value provided by the laboratory indicating the sum of the activities of the isotopes uranium-234, uranium-235, and uranium-238.

(c) Table 1 presents a "Summary of Historical Data." All reported data is included. There are no screening values for total radioactive uranium, since typically individual isotopes are screened. All total radioactive uranium results for this dataset, however, are qualified by the laboratory with "U" because they are less than their total propagated uncertainty.

Comment 5: *<u>Appendix C, "Fill and Cover Material", "Data Screening", Page 9, 1st Paragraph, Last Sentence & Appendix C, "Fill and Cover Material", "References", Page 11, "ANL 2007"</u>: The reference to support fallout value statements is not sufficient. This fact sheet is does not contain enough information to make any decisions about background fallout values in a given area. Please refer to the original ANL study or remove the reference and the statements it supports.*

Response: The Argonne National Laboratory fact sheets provide information that helps us to understand detection of fission products in site samples and help us to determine if those fission products are above background concentrations. Although the fact sheets are not used in screening this dataset, it is still a key aspect in establishing a range of background for the site. Any additional information used to develop individual fact sheets is available in the reference section of the compilation of fact sheets. It is common practice to reference summary reports within reports and decision documents.

The text has been revised to the following: "In order to better focus on chemicals presenting potential concern for the soil samples, additional information sources were consulted. Both ambient background values published by Kentucky Natural Resources and Environmental Protection Cabinet [now called the Kentucky Energy and Environment Cabinet (KEEC)] (KEEC 2004) and global fallout values (ANL 2007) were used to inform ambient background."Appendix C now indicates a new document revision and date.

From: John.Volpe@mail.state.ky.us
Sent: Friday, August 10, 2001 8:44 AM
To: crabtreels@bechteljacobs.org
Cc: Eric.Scott@mail.state.ky.us
Subject: RE: New Assessment Qualifier

Jana/Lisa,

This is ok with me. I think we should make it clear that RHTAB review of the data is not verification and validation since we don't have data packages. It is an independent evaluation of the radiation database by the Commonwealth's Radiation Control Agency.

-----Original Message-----
From: Crabtree, Lisa Sue (TVG) [mailto:tvg@bechteljacobs.org <mailto:tvg@bechteljacobs.org>]
Sent: Wednesday, August 08, 2001 12:57 PM
To: 'John.Volpe@mail.state.ky.us'; Eric.Scott@mail.state.ky.us
Cc: Jana L. White
Subject: New Assessment Qualifier

John/Eric,

Jana and I have taken a stab at coming up with a description for the KYRHTAB-NE assessment qualifier to add to OREIS:

Kentucky Radiation Health and Toxic Agents Branch (KYRHTAB) has performed an independent data assessment (not to be confused with data verification and validation) and the rad error is [exhibits] a negative value, which is a statistical outlier.

Please let us know if you agree with this description or if you have another description you would like for us to use. Once we have come up with a final description, we will add it to OREIS and flag the data appropriately.

Thanks,
Lisa

Paducah Data Manager
Bechtel Jacobs Company LLC
(270)441-5135