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**Department of Energy**

**Ohio Field Office  
Fernald Closure Project  
175 Tri-County Parkway  
Springdale, Ohio 45246**



OCT 31 2006

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DOE-0040-07

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Dear Mr. Saric and Mr. Schneider:

**TRANSMITTAL OF THE CERTIFICATION REPORT FOR AREA 1, PHASE IV  
DECONTAMINATION FACILITY, REVISION A (20730-RP-0004)**

Enclosed for your review and approval is the draft Certification Report for Area 1, Phase IV  
Decontamination Facility.

If you have any questions or require additional information, please contact me at (513) 648-3139.

Sincerely,

A handwritten signature in cursive script that reads "Johnny W. Reising".

Johnny W. Reising  
Director

Enclosure: As Stated

Mr. James Saric  
Mr. Thomas Schneider

-2-

DOE-xxxx-07

If you have any questions or require any additional information, please contact me at (513) 648-3139.

Sincerely,

Johnny W. Reising  
Director

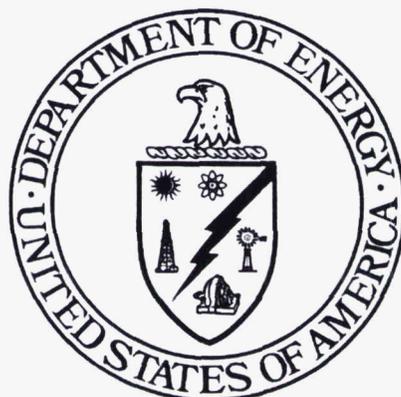
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006229

**CERTIFICATION REPORT FOR  
AREA 1, PHASE IV - DECONTAMINATION  
FACILITY AREA**

**FERNALD CLOSURE PROJECT  
FERNALD, OHIO**



**OCTOBER 2006**

**U.S. DEPARTMENT OF ENERGY**

**20730-RP-0004  
REVISION A  
DRAFT**

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## LIST OF ACRONYMS AND ABBREVIATIONS

ASCOC	area-specific constituent of concern
ASL	Analytical Support Level
BTV	benchmark toxicity value
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
CRDL	contract required detection limit
CU	certification unit
DOE	U.S. Department of Energy
ECOC	ecological constituent of concern
EPA	U.S. Environmental Protection Agency
FCP	Fernald Closure Project
FRL	final remediation level
HAMDC	highest allowable minimum detectable concentration
MDC	Main Drainage Corridor
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
MDL	minimum detectable level
mg/kg	milligrams per kilogram
OSDF	On-Site Disposal Facility
OU	Operable Unit
PCB	polychlorinated biphenyl
pCi/g	picoCuries per gram
PSP	Project Specific Plan
RAWP	Remedial Action Work Plan
ROD	Record of Decision
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SVOC	semi-volatile organic compound
TPU	Total Propagated Uncertainty
UCL	upper confidence limit
V&V	verification and validation process
V/FCN	Variance/Field Change Notice
VOC	volatile organic compound
VSL	Validation Support Level
WAC	waste acceptance criteria

**EXECUTIVE SUMMARY**

1  
2  
3 This certification report presents the information and data used by the U.S. Department of Energy (DOE)  
4 to determine that the soil in Area 1, Phase IV - Decontamination Facility Area meets the certification  
5 requirements at the Fernald Closure Project (FCP).

6  
7 This Certification Report includes details of the certification sampling, analysis, validation, and statistical  
8 analysis that took place in the area covered by this document. Consistent with the Sitewide Excavation  
9 Plan (DOE 1998), these areas underwent predesign, excavation, and precertification activities, including  
10 the use of real-time measurement systems as well as physical sampling and analysis. As a result of these  
11 activities, it was determined that no further remediation was necessary prior to certification.

12  
13 Area 1, Phase IV - Decontamination Facility Area is the last portion of Area 1, Phase IV to be certified.  
14 CU delineation for this area is described in the Certification Design Letter and Certification Project  
15 Specific Plan for Area 1, Phase IV - Decontamination Facility Area (DOE 2006). Certification sample  
16 results presented in this report demonstrate that the certification criteria were achieved in this CU. These  
17 criteria state that: 1) the mean concentration or activities of the primary area-specific constituents of  
18 concern (ASCOCs) within a CU must be less than the final remediation levels (FRLs) at the 95 percent  
19 upper confidence level (UCL) or the 90 percent UCL for the secondary ASCOCs; and 2) no certification  
20 result can exceed two times the FRL (i.e., the hotspot criterion). If either of these criteria is not met, then  
21 further investigation and possible excavation is required. If both of these criteria are met for a CU, then it  
22 can be released to restoration for development of the final land use.

23  
24 Area 1, Phase IV - Decontamination Facility Area underwent the certification process in October 2006. All  
25 samples related to this effort were collected in 2006 and analyzed at an off-site laboratory that is on the FCP  
26 Approved Laboratories List, per the Sitewide Comprehensive Environmental Response, Compensation and  
27 Liability Act (CERCLA) Quality Assurance Project Plan (SCQ, DOE 2003). The data were subjected to the  
28 required validation and verification process. All of the data passed certification criteria.

29  
30 On the basis of this reported information and supporting project files, DOE has determined that no  
31 additional remedial actions are required in this portion of the site. The area will be considered certified  
32 when the U.S. Environmental Protection Agency and Ohio Environmental Protection Agency concur that  
33 certification criteria have been met. At that time, DOE intends to proceed with final land use activities as  
34 outlined in the Natural Resource Restoration Plan (DOE 2002).

35  
36 DOE has restricted access to certified areas in order to maintain their integrity prior to final land use  
37 development. FCP procedure EP-0008 has been developed to implement the process that protects  
38 certified areas from becoming recontaminated.

## 1.0 INTRODUCTION

### 1.1 PURPOSE

This report presents the soil certification process and analytical data used by the U.S. Department of Energy (DOE) to demonstrate that the existing area-specific constituents of concern (ASCOCs) in Area 1, Phase IV - Decontamination Facility Area (Figure 1-1) meet the certification requirements of the Sitewide Excavation Plan (SEP, DOE 1998). Analytical results and statistical tests for the certification unit (CU) identified in the Certification Design Letter (CDL) and Certification Project Specific Plan (PSP) for Area 1, Phase IV - Decontamination Facility Area (DOE 2006) indicate that this area does not require any additional soil remediation. Based on the information presented in this document, the DOE considers remedial goals achieved in the portion of the site addressed by this document.

### 1.2 BACKGROUND

In the Operable Unit (OU) 5 Record of Decision (ROD, DOE 1996a), DOE committed to excavating contaminated soil that exceeds health-based final remediation levels (FRLs), with final disposition of the excavated material in the On-Site Disposal Facility (OSDF) or an off-site disposal facility if the OSDF waste acceptance criteria (WAC) are exceeded. The OU5 Remedial Investigation Report (DOE 1995a) defined the potential extent of soil contamination exceeding the FRLs and, in general, indicated widespread contamination in approximately 430 acres of the 1,050-acre Fernald Closure Project (FCP).

In the OU5 Remedial Action Work Plan (RAWP, DOE 1996b), DOE committed to preparing the SEP to define the overall approach to implementing the soil and at- and below-grade debris cleanup obligations identified in the OU2 (DOE 1995b), OU3 (DOE 1996c), and OU5 RODs. In the SEP, the FCP was divided into ten remedial areas. This document addresses Area 1, Phase IV - Decontamination Facility Area (Figure 1-1), which is identified as being within Remediation Area 5 in the SEP.

In the SEP, the FCP was divided into distinct remedial areas and phases for soil remediation, based on the operable units' remediation schedule. After all necessary remediation is completed within each area/phase, the soil is certified as having attained all clean up goals (i.e., FRLs). The general approach for the removal of contaminated soil and debris in the Area 1, Phase IV - Decontamination Facility Area followed "Excavation Approach A - Shallow Excavation of Impacted On-Property Area Outside the Former Production Area," as described in Section 4.1 of the SEP. The remediation of this area is discussed in the CDL and Certification PSP for the Area 1, Phase IV - Decontamination Facility Area.

### 1.3 AREA DESCRIPTION

The focus of this certification report is the 1.02 acre Area 1, Phase IV - Decontamination Facility Area. The boundary for this area is shown on Figure 1-1.

1 1.4 SCOPE

2 The scope of this Certification Report includes the details of certification sampling, analysis, validation  
3 and statistical evaluation for soil samples collected from Area 1, Phase IV - Decontamination Facility  
4 Area. This area is comprised of one Group 1 CU. The certification design for this CU follows the  
5 general approach outlined in Section 3.4 of the SEP.  
6

7 1.5 OBJECTIVES

8 The objectives of this Certification Report are:

- 9
- 10 ● Provide an overview of the precertification and remedial activities conducted in the Area 1,  
11 Phase IV - Decontamination Facility Area
- 12
- 13 ● Describe the analytical methods, data validation processes, data reduction and statistical  
14 processes used to support the certification process
- 15
- 16 ● Present the certification sampling results for the CU that makes up the Area 1, Phase IV -  
17 Decontamination Facility Area.
- 18
- 19 ● Present the statistical analysis showing the CU has passed the certification criteria (i.e., FRL  
20 attainment and hotspot criteria)  
21

22 1.6 REPORT FORMAT

23 This certification report is presented in five sections with supporting data and documentation in  
24 Appendices A and B. The sections of this report are as follows:

25 Section 1.0 Introduction: Purpose, background, area description, scope, and objectives of the  
26 report  
27

28 Section 2.0 Certification Approach: The CU design and approach to sampling and analysis used  
29 for certification  
30

31 Section 3.0 Overview of Field Activities: Area preparation/survey, sampling and changes to work  
32 scope  
33

34 Section 4.0 Analytical Methodologies, Data Validation Processes and Data Reduction  
35

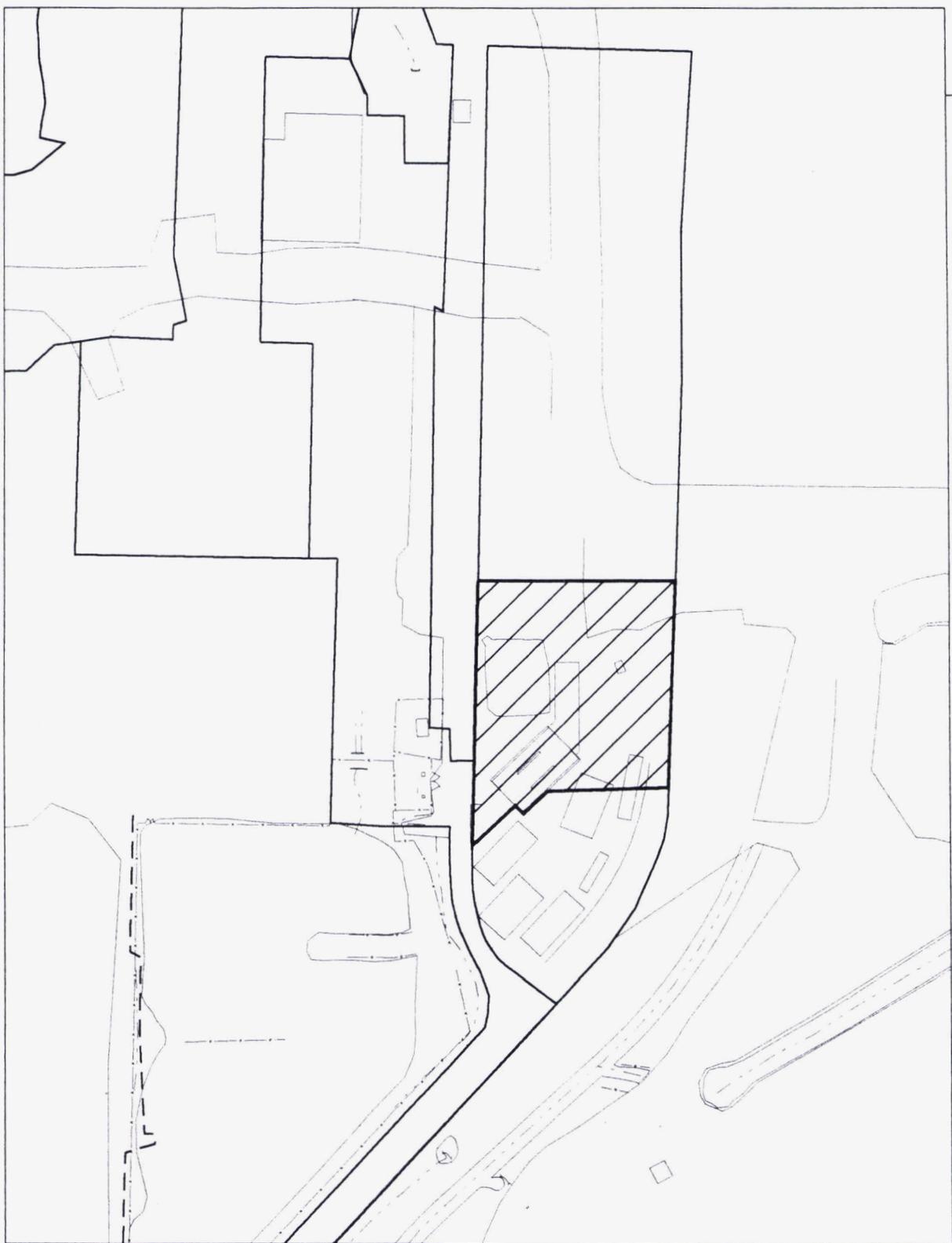
36 Section 5.0 Certification Evaluation and Conclusions  
37

38 Appendix A Statistical Analysis of Sample Data  
39

40 Appendix B Correction of 7-Day Radium-226 Results  
41  
42

43 1.7 FCP CONTROLLED CERTIFICATION MAP

44 In order to track the status of certification at the FCP, DOE includes a site map showing the status of the  
45 soil remediation areas with all Certification Reports. This map is included as Figure 1-2, and it has been  
46 updated to reflect the status of the areas included in this document.



LEGEND:



A1PIV DECONTAMINATION  
AREA BOUNDARY

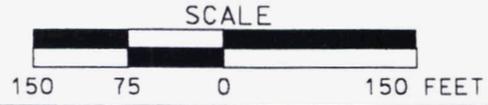


FIGURE 1-1. LOCATION MAP FOR A1PIV - DECONTAMINATION AREA



## 2.0 CERTIFICATION APPROACH

### 2.1 CERTIFICATION STRATEGY

This section summarizes the ASCOC selection process and the certification approach, including CU establishment, sampling design, and statistical analysis. The general purpose of certification sampling is to verify that the post-remediation mean concentration or activity of each ASCOC in the soil is less than its FRL at the 95 percent upper confidence level (UCL) (primary ASCOC) or the 90 percent UCL (secondary ASCOCs). This certification process also includes the hotspot criterion, which states that if any ASCOC concentration exceeds two times its FRL, additional soil remediation and sampling are necessary to remove the hotspot and verify that the COC is below the hotspot limit. Details on these actions are discussed in Section 3.4.5 of the SEP. If the mean residual concentration or activity of all ASCOCs are below the FRLs within the respective confidence bounds, and the hotspot criterion is met, then the remedial objectives have been achieved for the CU and it can then be released for regrading, reseeding and development of a final land use. Additional discussion of the certification strategy is described in Section 3.4 of the SEP and in the CDL and Certification PSP for Area 1, Phase IV - Decontamination Facility Area.

#### 2.1.1 Area-Specific Constituents of Concern

ASCOCs are selected based on screening criteria and requirements in the SEP.

#### 2.1.2 ASCOC Selection Criteria

The selection process for retaining secondary ASCOCs for a remediation area is driven by applying the following set of decision criteria:

- It was retained as an ASCOC in adjacent FCP soil remediation areas;
- It is listed as a soil constituent of concern (COC) in the OU5 ROD, and it is listed as an ASCOC in Table 2-7 of the SEP for the Remediation Area of interest;
- Analytical results show that a contaminant is present above its FRL, and the above-FRL concentrations are not attributable to false positives or elevated contract-required detection limits (CRDLs);
- It can be traced to site use, either through process knowledge or known release of the constituent to the environment; and
- Physical characteristics of the contaminant, such as degradation rate and volatility, indicate it is likely to persist in the soil between time of release and remediation.

1 2.1.3 ASCOC Selection Process

2 As committed to in the SEP, total uranium, radium-226, radium-228, thorium-228, and thorium-232 (the  
3 sitewide primary ASCOCs) must be retained as ASCOCs. Several COCs were retained as secondary  
4 ASCOCs, per the selection criteria noted above. Table 2-1 lists the ASCOCs retained for certification  
5 evaluation, the reason for their retention and the applicable FRL/BTV values.

6  
7 2.2 CERTIFICATION APPROACH

8 2.2.1 Certification Design

9 The intent of the certification effort is to certify that ASCOC concentrations in the Area 1, Phase IV -  
10 Decontamination Facility Area soil footprint meet the certification criteria in Section 3.4 of the SEP and  
11 the SEP Addendum (DOE 2001). One Group 1 CU was designed to cover Area 1, Phase IV -  
12 Decontamination Facility Area to increase the sample density because it was considered to be a  
13 potentially impacted area. The CU design and sample locations are depicted on Figure 2-1. Data from  
14 this sampling effort, along with a statistical evaluation (where necessary), are presented in Appendix A.

15  
16 2.2.2 Sample Selection Process

17 Certification sampling locations were selected according to Section 3.4.2 of the SEP. The CU was first  
18 divided into 16 approximately equal sub-CUs. Sample locations were then generated by randomly  
19 selecting an easting and northing coordinate within the boundaries of each sub-CU, then testing those  
20 locations against the minimum distance criteria for the CU. If the minimum distance criteria were not  
21 met, an alternative random location was selected for that sub-CU, and all the locations were retested.  
22 This process continued until all 16 random locations met the minimum distance criteria.

23  
24 The sub-CUs and planned certification sampling locations are shown on Figures 2-1. All 16 locations  
25 were sampled. One sample location in the CU was designated with a "D", indicating a field duplicate  
26 sample collection location.

27  
28 Prior to commencement of sampling activities, all locations were surveyed and field verified to make sure  
29 no surface obstacles would prevent sample collection at the planned location.

30  
31 2.2.3 Certification Sampling

32 Most samples were collected from the 0 to 6-inch surface soil interval at the designated and surveyed  
33 location, as described in Section 2.2.2 of this document. All collected samples were analyzed at an off-  
34 site laboratory for the five primary ASCOCs using the gamma spectrometry method. Additional  
35 information regarding the certification sampling and analysis, including the secondary ASCOCs for  
36 individual areas, may be obtained from the CDL/Certification PSP for Area 1, Phase IV -  
37 Decontamination Facility Area.

1   2.2.4 Statistical Analysis

2   After data are entered into the Sitewide Environmental Database (SED) and validated, a statistical  
3   analysis is performed to evaluate the pass/fail criteria for the CUs. The SEP (Section 3.4.3 and  
4   Appendix G) notes that two criteria must be met for a CU to pass certification. If the data distribution is  
5   normal or lognormal, the first criterion compares the 95 percent UCL on the mean of each primary COC  
6   to its FRL, or the 90 percent UCL on the mean of each secondary ASCOC. On an individual CU basis,  
7   any ASCOC with the 95 percent UCL above the FRL for primary ASCOCs (or 90 percent UCL above the  
8   FRL for secondary COCs) results in that CU failing certification. If the data distribution is not normal or  
9   lognormal, the appropriate nonparametric approach discussed in Appendix G of the SEP will be used to  
10   evaluate the first criterion. The *a posteriori* test will be performed to determine whether the sample size  
11   is sufficient for a meaningful conclusion of this comparison. The second criterion is the hotspot criterion,  
12   which states that primary or secondary ASCOC results must not exceed two times the FRL. When the  
13   given UCL on the mean for each COC is less than its FRL and the hotspot criterion is met, the CU will be  
14   considered certified.

15  
16   In the event that a CU passes the *a posteriori* test but fails certification, the following two scenarios will  
17   be evaluated: 1) localized contamination, and 2) widespread contamination. Details on the evaluation  
18   and responses to these possible outcomes are provided in Section 3.4.5 of the SEP.

**TABLE 2-1  
 AREA 1, PHASE IV – DECONTAMINATION FACILITY AREA FINAL ASCOC LIST**

ASCOC	FRL/(BTU) <sup>a</sup>
<b>Radionuclides</b>	
Total Uranium	82 mg/kg
Radium-226	1.7 pCi/g
Radium-228	1.8 pCi/g
Thorium-228	1.7 pCi/g
Thorium-232	1.5 pCi/g
Cesium-137	1.4 pCi/g
Lead-210	38 pCi/g
Technetium-99	30 pCi/g
Thorium-230	280 pCi/g
<b>Organic</b>	
1,1-dichloroethene	0.41 mg/kg
1,1,1-trichloroethane	4.3 mg/kg <sup>b</sup>
1,2-dichloroethene	0.16 mg/kg
2-Butanone <sup>c</sup>	23.5 mg/kg
4-Methyl-2-pentanone	2,500 mg/kg
Acetone	43,000 mg/kg
Aroclor-1254	0.13 mg/kg
Aroclor-1260	0.13 mg/kg
Benzene	850 mg/kg
Benzo(a)anthracene	20 mg/kg (1.0 mg/kg)
Benzo(a)pyrene	2.0 mg/kg (1.0 mg/kg)
Benzo(b)fluoranthene	20 mg/kg (1.0 mg/kg)
Benzo(g,h,i)perylene	1.0 mg/kg
Benzo(k)fluoranthene	200 mg/kg (1.0 mg/kg)
Bromodichloromethane	4.0 mg/kg
Chrysene	2,000 mg/kg (1.0 mg/kg)
Dieldrin	0.015 mg/kg
Dibenzo(a,h)anthracene	2.0 mg/kg (0.088 mg/kg)
Ethylbenzene	5,100 mg/kg
Fluoranthene	10 mg/kg
Indeno(1,2,3-cd)pyrene	20 mg/kg (1.0 mg/kg)
Methylene Chloride	37 mg/kg
Phenanthrene	5 mg/kg
Pyrene	10 mg/kg
Tetrachloroethene	3.6 mg/kg
Toluene	100,000 mg/kg
Trichloroethene	25 mg/kg
Xylenes, total	920,000 mg/kg

1

**TABLE 2-1**  
**(Continued)**

ASCOC	FRL/(BTV) <sup>a</sup>
<b>Metals</b>	
Arsenic	12.0 mg/kg
Barium	68,000 mg/kg
Beryllium	1.5 mg/kg
Cadmium	82 mg/kg
Chromium	300 mg/kg d
Lead	400 mg/kg
Mercury	7.5 mg/kg
Selenium	5400 mg/kg
Silver	29,000 mg/kg

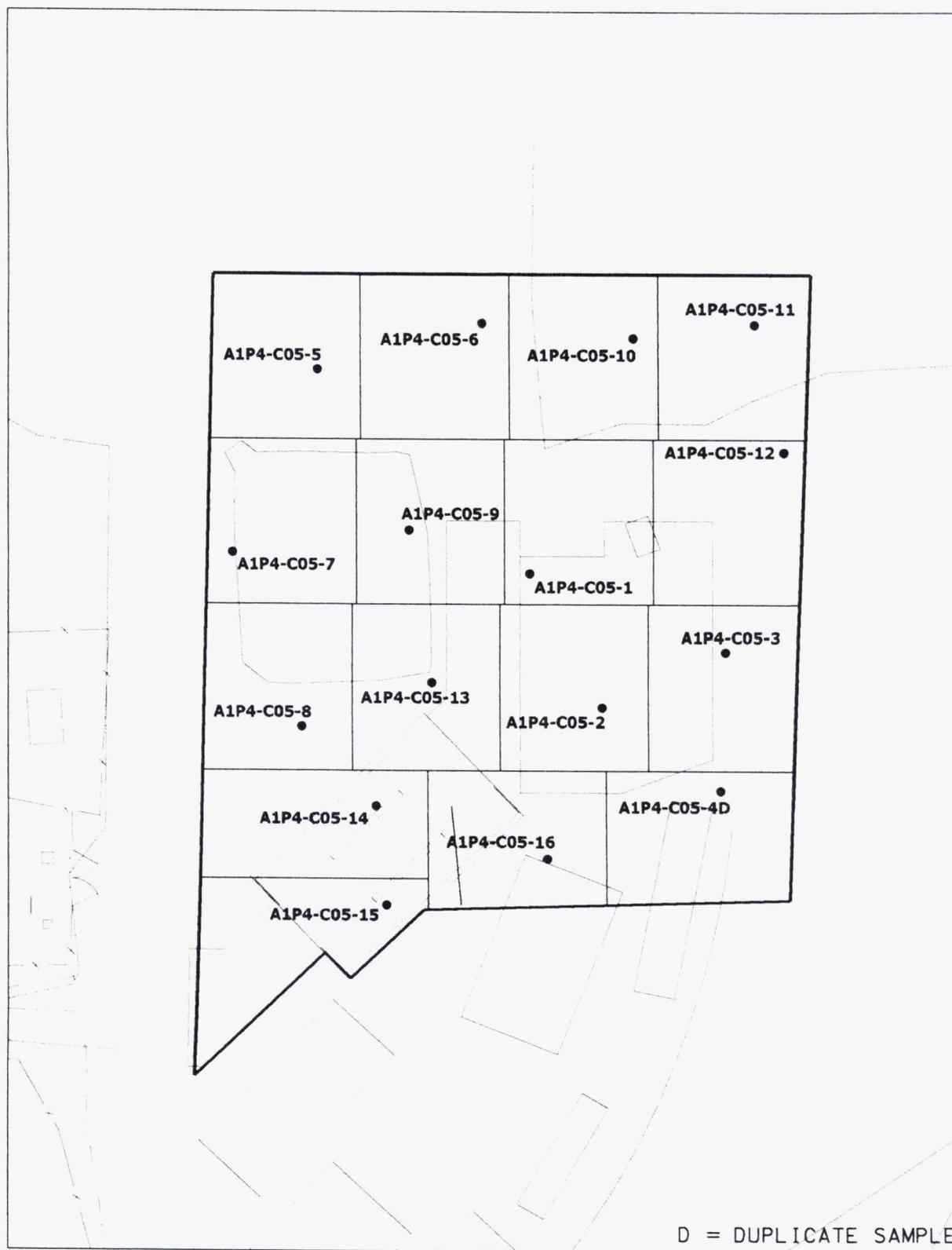
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13

<sup>a</sup>BTV applies to Ecological COCs.

<sup>b</sup>The FRL is actually for 1,1,2-trichloroethane because 1,1,1-trichloroethane does not have a FRL. This value will be used for statistical comparison for certification criteria.

<sup>c</sup>2-Butanone (Methyl Ethyl Ketone) does not have an associated soil FRL. The Closure Plan Review Guidance for RCRA Facilities (OEPA 2004) (Table 1) has set the cleanup goal at 23.5 mg/kg.

<sup>d</sup>The FRL is actually for hexavalent chromium because total chromium does not have a FRL.



LEGEND:

• SAMPLE LOCATION

D = DUPLICATE SAMPLE

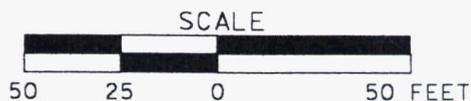


FIGURE 2-1. SOIL CERTIFICATION SAMPLING LOCATIONS FOR CU05

### 3.0 OVERVIEW OF FIELD ACTIVITIES

1  
2  
3 In accordance with the SEP, prior to conducting precertification and certification activities, all soil  
4 demonstrated to contain contamination above the associated FRLs is removed by excavation. Based on  
5 the initial remedial action and results from sampling and real-time scanning activities, summarized in  
6 Sections 3.1 and 3.2, it has been determined that no further remedial actions are necessary.  
7

#### 8 3.1 AREA PREPARATION AND PRECERTIFICATION

9 Precertification surveys were performed in October 2006 per the PSP Guidelines for General  
10 Characterization for Sitewide Soil Remediation, Sections 3.0 and 6.0 (DOE 2005). Real-time survey  
11 results are presented in Appendix B of the CDL and Certification PSP. Data used to support the  
12 conclusion that the area is ready for certification consisted of the real-time surveys, predesign sample  
13 results for areas requiring no remedial action and precertification sample results from the  
14 excavated/remediated footprint.  
15

16 Four precertification sample locations (A1P4-C05-1 through 4) were laid out and sampled in the footprint  
17 of the Decontamination Facility Expansion prior to its construction. These locations were included in the  
18 CU design and were sampled under variance 20730-PSP-0001-10 to the PSP for Area 1, Phase IV  
19 Excavation Characterization and Precertification (DOE 2004). Their results are included in the  
20 certification statistics in Appendix A.  
21

#### 22 3.2 CHANGES TO SCOPE OF WORK

23 There were no changes to the scope of work documented in the final CDL and Certification PSP.

## 4.0 ANALYTICAL METHODOLOGIES, DATA VALIDATION PROCESSES AND DATA REDUCTION

### 4.1 ANALYTICAL METHODOLOGIES

All samples collected for the certification effort were sent for off-site analysis. The laboratories complied with Sitewide Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ, DOE 2003) requirements. The SCQ is the source for analytical methodologies (Appendix G), data verification and validation, and analytical quality assurance/quality control requirements.

Laboratory analyses were conducted using approved analytical methods, as discussed in Appendix H of the SEP. Where possible, the minimum detection level (MDL) was set at 10 percent of the FRL and analyses were conducted to Analytical Support Level (ASL) D or E. ASL E is assigned when the MDL of 10 percent of the FRL is above the SCQ ASL detection level, but the analyses meet all other SCQ ASL D criteria. An ASL D data package was provided and all of the analytical results were validated and entered into the FCP SED. Final certification results are provided in Appendix A. A summary of the analytical methods follows.

#### 4.1.1 Chemical Methods

##### Polychlorinated Biphenyl (PCBs)/Pesticides

Samples submitted for PCB and pesticide analysis were analyzed by gas chromatography.

##### Metals

Samples submitted for metals analyses were either analyzed by inductively coupled plasma-atomic emission spectrometry or inductively coupled plasma-mass spectrometry.

##### Volatile Organic Compounds (VOCs)

Samples submitted for VOC analyses were analyzed by gas chromatography/mass spectrometry.

##### Semi-Volatile Organic Compounds (SVOCs)

Samples submitted for SVOC analyses were analyzed by gas chromatography/mass spectrometry.

#### 4.1.2 Radiochemical Methods

The radiochemical analytical methods use performance-based specification criteria, including highest allowable minimum detectable concentration (HAMDC), matrix spike, ASCOC concentrations in method blank, percent recovery of tracer, matrix spike and laboratory control sample, and percent recovery for duplicate samples were specified for each analyte. Laboratories were required to meet these specifications for the following radionuclides:

1 Uranium-238

2 Samples are analyzed for uranium-238 progeny using multiple gamma rays, and the error-weighted  
3 average of the emission lines is used to report uranium-238 activity. The uranium-238 activity is used to  
4 calculate the total uranium value as follows:

5  
6 
$$\text{Total Uranium (mg/kg)} = 2.998544 \text{ (mg/pCi * g/kg)} \times \text{Uranium-238 (pCi/g)}$$
  
7

8 The validation qualifier assigned to the total uranium value is the same as the uranium-238 qualifier.  
9

10 Radium-226

11 Following a 7-day in-growth for radon-222 (Appendix D), radium-226 progeny are measured using multiple  
12 gamma rays, and the error-weighted average of the emission lines is used to report radium-226 activity.  
13

14 Radium-228 and Thorium-232

15 Samples are analyzed for radium-228 and thorium-232 progeny using multiple gamma rays, and the  
16 error-weighted average of the emission lines is used to report radium-228 and thorium-232 activities.  
17 The identical activity is reported for radium-228 and thorium-232, as they are assumed to be in secular  
18 equilibrium with the measured daughter.  
19

20 Thorium-228

21 Thorium-228 is quantified by direct measurement of its gamma emission lines, and the error-weighted  
22 average of the emission lines is used to report the activity.  
23

24 Cesium-137

25 Cesium-137 is quantified by direct measurement of its gamma emission lines, and the error-weighted  
26 average of the emission lines is used to report the activity.  
27

28 Technetium-99

29 Following a chemical separation, technetium-99 is quantified using a liquid Scintillation counter.  
30

31 Thorium-230

32 Thorium-230 is quantified by measuring its characteristic alpha emission energies and correcting the  
33 activity based on the yield of a thorium-229 tracer.

34 Lead-210

35 Lead-210 progeny are measured using multiple gamma rays, and the error-weighted average of the  
36 emission lines is used to report lead-210 activity.  
37

## 4.2 DATA VERIFICATION AND VALIDATION

Data verification and validation (V&V) processes are used to examine the quality of field sampling and handling procedures, laboratory analysis and reporting, and non-conformance and discrepancy resolution. Analytical data are qualified to the appropriate data decision level by assessing the precision, accuracy, completeness, comparability, and representativeness of the measurements. The U.S. Environmental Protection Agency (EPA) National Functional Guidelines for Data Review (Inorganic Data) (EPA 1994), as adapted and approved by EPA Region V, as well as the Section 11.2 and Appendix D of the SCQ, are the appropriate V&V reference documents.

The V&V process evaluated the following parameters:

- Specific field forms for sample collection and handling
- Chain of Custody Forms
- Completeness of laboratory data package
- Holding times
- Instrument calibrations
- Calculation of results
- Laboratory/field duplicate precision
- Field/Laboratory Blank contamination
- Dry weight correction for solid samples
- Correct detection limits reported
- Recovery of laboratory control samples and compliance with established limits.

Parameters unique to the evaluation of radiochemical analyses include:

- Calibration data for specific gamma and alpha energies
- Background checks
- Relative error ratios
- Detector efficiencies
- Background count correction.

For this project, all sample data were reviewed and validated for the criteria noted above. Per project requirements specified in the SEP and Data Quality Objectives SL-052, a minimum 10 percent of the certification data were validated to Validation Support Level (VSL) D, and the remaining data were validated to VSL B. VSL D is a rigorous data review that includes the review process for VSL B plus a systematic review of the raw data and recalculation of all results.

1 Following V&V, qualifier codes are applied to the results to reflect the level of confidence assigned to a  
2 particular datum. These codes can include the following:

- 3
- 4 - No qualification; the positive result or detection limit is confident as reported
- 5
- 6 J Positive result is estimated or imprecise; data point is usable for decision-making purposes.  
7 Positive results less than the contract required reporting limit are also qualified in this manner
- 8
- 9 R Positive result or detection limit is considered unreliable; data point should not be used for  
10 decision-making purposes
- 11
- 12 U Undetected result at the stated limit of detection
- 13
- 14 UJ Undetected result; detection limit is considered estimated or imprecise; the data point is usable  
15 for decision-making purposes
- 16
- 17 N Positive result is tentatively identified - that is, there is some question regarding the actual  
18 identification and quantification of the result. Compound reported is best professional  
19 judgment of the interpretation of the supporting data, such as mass spectra. Caution must be  
20 exercised with the use of this data
- 21
- 22 NJ Positive result is tentatively estimated; detection limit is considered estimated or imprecise
- 23
- 24 NV Not validated. The results for this sample were not validated
- 25
- 26 Z This result, or detection limit in this analysis is not the best one to use; another analysis  
27 (e.g., the dilution or re-analysis) contains a more confident and usable result.
- 28

29 The V&V of the data set in this certification report did not identify any analytical problems. All the  
30 results are qualified as acceptable (-), estimated (J) and/or non-detects (U). No results were rejected.

31

### 32 4.3 DATA REDUCTION

33 Each sample used to support the certification decision was entered in the FCP SED with the following  
34 information:

#### 35 Field Information

- 36
- 37 • Sample Identification Number - A unique number assigned to each discrete sample point
  - 38 • Coordinate Information - Northing and Easting locations
  - 39 • Certification Unit - Each sample is assigned to a CU.
- 40

Laboratory Information

For each sample result the following information is entered:

- Laboratory Result - The laboratory reported analytical value.
- Laboratory Qualifier - The qualifier reported from the lab. (Note: radiological non-detect values are assigned a U qualifier by Fluor, because the lab does not).
- Total Propagated Uncertainty (TPU) - This value represents the uncertainty associated with the reported radiological result. TPU includes the counting error, as well as uncertainty from other laboratory measurements and data reduction.
- Units - The units for the reported laboratory result.

Validation Information

- Validation Result - The result based on the validation process. During the validation process, sample results may be adjusted. If the laboratory result is less than the requested minimum detectable concentration (MDC), the validation result becomes the MDC.
- Validation TPU - The TPU based on the validation process.
- Validation Qualifier - The qualifier assigned as a result of the data validation process.
- Validation Units - The units reported by the laboratory, unless corrected by the validation process.

Using the information above, the following actions are taken for data reduction of each CU data set.

1. All the data for each CU are queried from SED.
2. The data from the validation fields are used in the statistical calculations
3. Data with a qualifier of R or Z are not used in the statistical calculations
4. The higher of the two duplicate results is used in the statistical calculations
5. One half of the non-detect (U or UJ) value is used in the statistical calculations.

## 5.0 CERTIFICATION EVALUATION AND CONCLUSIONS

Certification success or failure is based on comparing sample data from the CU against criteria discussed in Section 2.2.4. Subsequent to the evaluation of preliminary data, full statistical analysis and evaluation are performed on all validated data that exceed the FRL. Final certification data are presented in Appendix A.

### 5.1 CERTIFICATION RESULTS AND EVALUATION

Below is a summary of the analytical results and statistical analyses of the data for each CU in Area 1, Phase IV - Decontamination Facility Area.

#### A1P4-C05

The above-listed CU passed the certification criteria as outlined in Section 2.2.4. Final certification data are presented in Appendix A.

### 5.2 CERTIFICATION CONCLUSIONS

Based on the sampling results and statistical analyses presented in this report, DOE has determined that the remedial objectives in the OU5 ROD have been achieved in the Area 1, Phase IV - Decontamination Facility Area. Therefore, upon EPA and Ohio Environmental Protection Agency concurrence, DOE has determined that no further soil remedial actions are required in these areas and that the certification activities are complete. The subject areas will be released for final land use.

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**APPENDIX A**  
**STATISTICAL ANALYSIS OF SAMPLE DATA**

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## APPENDIX A STATISTICAL ABBREVIATIONS AND SYMBOLS

The procedure used to determine if the data follow a normal or lognormal distribution is outlined in Section G.2.3 of Appendix G to the SEP. The second paragraph under "Step 3: Perform the Shapiro-Wilk Test to evaluate if the data are normally or lognormally distributed" states that "If the Shapiro-Wilk Test indicates both normal and lognormal distributions fit the data, the distribution with the highest p-value will be used in the Student's t-Test (Section G.2.2.2) to make the certification decision." Therefore, the distribution testing procedure is not a matter of transforming the data and then testing for lognormality only when the normality assumption fails as the comment seems to imply. The method is to test both normality and lognormality and select the distribution that "best" fits the data as defined by the test yielding the higher p-value above a minimum acceptable value. The minimum acceptable p-value for acceptance of a distribution was set at 0.05.

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If the maximum result for each analyte is below the FRL, no statistical result needs to be reported. For all statistical evaluations, the maximum value of the two duplicates was used.

### Abbreviations:

**Est. Mean\*** - Estimated measure of central tendency (Normal: Mean; Log Normal: Est Mean; Non-Parametric: Median)

**W-Statistic Probability** - Shapiro-Wilk probability of the "better" fit - either normal or lognormal (note: a value less than 0.05 indicates that neither normality nor lognormality could be accepted, but the highest p-value is still shown.) The test is performed on the raw untransformed data (N) and the log-transformed data (LN) to test for lognormality.

**t-Test (N)** - indicates that the normal distribution is best fit to data with a p-value greater than or equal to 0.05.

**t-Test (LN)** - indicates that the lognormal distribution is best fit to data with a p-value greater than or equal to 0.05.

**Sign Test** - the Sign test was used because one of the following situations occurred:

1. there were greater than 50 percent non-detects,
2. between 15 and 50 percent non-detects and data not symmetrically distributed,
3. less than 15 percent non-detects, but fails Shapiro-Wilk test for both normality and lognormality and data not symmetrically distributed.

**Wilcoxon SR** - the Wilcoxon Signed Rank procedure was used because of one of the following situations:

1. between 15 and 50 percent non-detects and data symmetrically distributed,
2. less than 15 percent non-detects, but fails Shapiro-Wilk test for both normality and lognormality and data symmetrically distributed.

**Note:** Data was considered to be "symmetrically distributed" if the Standardized Skewness had an Absolute Value of less than or equal to 2.00 (i.e., between -2.00 and 2.00).

**Number of NDs** - number of non-detects.

**Certification Unit 5**

SAMPLE ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Cesium-137	Lead-210 <sup>a</sup>	Technetium-99	Thorium-230	Arsenic	Barium <sup>a</sup>	Beryllium	Cadmium <sup>a</sup>
A1P4-C05-4-1	0.818 J	0.765 -	0.727 -	0.765 -	4.07 J	0.0752 U		1.67 U	1.21 -	6 J		0.51 -	
A1P4-C05-4-3	1.35 J	1.28 -	1.29 -	1.28 -	5.98 -	0.064 U		1.87 U	1.6 -	10.5 J		0.64 -	
A1P4-C05-3-1	0.815 J	0.99 -	1 -	0.99 -	5.21 -	0.0999 U		1.47 U	1.12 -	6.1 J		0.71 -	
A1P4-C05-3-3	1.05 J	1.12 -	1.14 -	1.12 -	6.93 -	0.064 U		1.78 U	0.965 -	6.1 J		0.61 -	
A1P4-C05-2-1	0.915 J	0.877 -	0.866 -	0.877 -	8.91 -	0.0592 U		1.77 U	1.48 -	7.9 J		0.58 -	
A1P4-C05-2-3	1.08 J	0.992 -	0.986 -	0.992 -	11.5 -	0.0685 U		1.71 U	1.08 -	5.9 J		0.42 -	
A1P4-C05-1-1	1.05 J	1.18 -	1.15 -	1.18 -	29.9 -	0.279 -		1.74 U	1.96 -	6.9 J		0.68 -	
A1P4-C05-1-3	1.01 J	1.01 -	1.01 -	1.01 -	10.9 -	0.0547 U		2.04 U	1.75 -	5.3 J		0.56 -	
A1P4-C05-5	0.996 -	1 -	1.03 -	1 -	4.7 -	0.051 U	0.675 U	0.793 U	0.988 -	5.61 -	62.5 J	0.439 -	0.137 J
A1P4-C05-6	0.848 -	0.733 -	0.761 -	0.733 -	6.8 -	0.029 U	5.81 U	0.835 U	1.35 -	7.3 -	118 J	0.792 -	0.193 J
A1P4-C05-7	0.852 -	0.741 -	0.747 -	0.741 -	11.8 -	0 U	0 U	4.04 J	1.29 -	8.23 -	120 J	0.43 -	0.176 J
A1P4-C05-8	1.04 -	1.05 -	1.05 -	1.05 -	19.3 -	0.162 -	4.73 U	1.92 U	1.01 -	5.3 J	87.4 J	0.59 -	0.31 J
A1P4-C05-9	1.03 -	1.31 -	1.31 -	1.31 -	5.14 -	0.0412 U	4.09 U	2.11 U	2.08 -	10.3 J	91.5 J	0.68 -	0.28 J
A1P4-C05-10	0.906 -	0.765 -	0.712 -	0.765 -	5.89 -	0 U	0 U	0.768 U	1.35 -	6.07 -	67.5 J	0.494 -	0.138 J
A1P4-C05-11	0.919 -	0.757 -	0.754 -	0.757 -	4.53 U	0.034 U	6.17 U	0.757 U	1.17 -	7.4 -	81.1 J	0.576 -	0.142 J
A1P4-C05-12	0.86 -	0.768 -	0.776 -	0.768 -	4.06 -	0.0337 U	3.26 U	2.04 U	0.961 -	7.7 J	90.1 J	0.64 -	0.32 J
A1P4-C05-13	2.06 -	0.658 -	0.652 -	0.658 -	17.1 -	0.0566 U	5.94 -	1.87 U	1.67 -	4 J	44.3 J	0.2 J	0.26 J
A1P4-C05-14	1.04 -	1.19 -	1.19 -	1.19 -	7.54 -	0.048 U	4.54 U	2.03 U	1.82 -	9.6 J	82.1 J	0.68 -	0.29 J
A1P4-C05-15	1.01 -	0.973 -	0.985 -	0.973 -	8.68 -	0.0573 J	1.73 U	1.99 U	1.29 -	5.6 J	78.2 J	0.51 -	1.7 J
A1P4-C05-16	0.772 -	0.829 -	0.83 -	0.829 -	6.76 J	0.04 U	3.03 U	1.85 U	1.8 J	6.5 J	89.9 J	0.68 -	0.26 J
Limit	1.7	1.8	1.7	1.5	82	1.4	38	30	280	12	68000	1.5	82
Units	pCi/g	pCi/g	pCi/g	pCi/g	mg/kg	pCi/g	pCi/g	pCi/g	pCi/g	mg/kg	mg/kg	mg/kg	mg/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%	90%	90%	90%	90%
Max. Result	2.06	1.31	1.31	1.31	29.9	0.279	5.94	4.04	2.08	10.5	120	0.792	1.7
Max. >= Limit	Yes	No	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--	--	--	--	--
Sample Size	16	16	16	16	16	16	12	16	16	16	12	16	12
Nondetects	0	0	0	0	1	14	11	15	0	0	0	0	0
% Nondetects	0%	0%	0%	0%	6%	88%	92%	94%	0%	0%	0%	0%	0%
Est. Mean*	--	--	--	--	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--	--	--	--	--
<i>a posteriori</i> Sample Size calculation	--	--	--	--	--	--	--	--	--	--	--	--	--

<sup>a</sup> Constituents were not analyzed for during precertification sampling. A sufficient number of samples (i.e. 12) were collected for these constituents during certification and there were no FRL exceedances.

Est. Mean = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)

The maximum value of the two duplicates was used in all statistical equations.

#: This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.

The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.

**Certification Unit 5**

SAMPLE ID	Chromium <sup>a</sup>	Lead <sup>a</sup>	Mercury <sup>a</sup>	Selenium <sup>a</sup>	Silver <sup>a</sup>	Benzo(a)anthracene <sup>a</sup>	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene <sup>a</sup>	Benzo(k)fluoranthene <sup>a</sup>	Chrysene <sup>a</sup>
A1P4-C05-4-1							93.9 J	144 -			
A1P4-C05-4-3							41.2 U	41.2 U			
A1P4-C05-3-1							40.4 J	39 U			
A1P4-C05-3-3							40.1 J	39.9 U			
A1P4-C05-2-1							44.3 J	38.2 U			
A1P4-C05-2-3							51.3 J	38.5 J			
A1P4-C05-1-1							62.4 J	53.4 J			
A1P4-C05-1-3							41.4 U	41.4 U			
A1P4-C05-5	10.5 J	10.4 J	0.0132 J	1.96 U	0.145 U	41.4 U	41.4 U	41.4 U	41.4 U	41.4 U	41.4 U
A1P4-C05-6	16.3 J	14.6 J	0.0293 J	2.1 U	0.155 U	39.1 U	39.1 U	39.1 U	39.1 U	39.1 U	39.1 U
A1P4-C05-7	10.2 J	18 J	0.0238 J	2.04 U	0.151 U	38.4 U	38.4 U	38.4 U	38.4 U	38.4 U	38.4 U
A1P4-C05-8	16.6 J	16.1 J	0.029 J	0.578 UJ	0.078 J	40.2 U	40.2 U	40.2 U	40.2 U	40.2 U	40.2 U
A1P4-C05-9	35.5 J	19.9 J	0.044 J	3.09 UJ	0.099 J	42.2 U	42.2 U	42.2 U	42.2 U	42.2 U	42.2 U
A1P4-C05-10	12 J	9.79 J	0.0164 J	1.91 U	0.141 U	37.1 U	37.1 U	37.1 U	37.1 U	37.1 U	37.1 U
A1P4-C05-11	14 J	12.1 J	0.0157 J	2.09 U	0.154 U	41.6 U	41.6 U	41.6 U	41.6 U	41.6 U	41.6 U
A1P4-C05-12	17.6 J	12.6 J	0.016 J	0.562 UJ	0.066 J	37.9 U	37.9 U	37.9 U	37.9 U	37.9 U	37.9 U
A1P4-C05-13	12.7 J	14.6 J	0.0027 U	0.555 U	0.0444 U	38.6 U	38.6 U	38.6 U	38.6 U	38.6 U	38.6 U
A1P4-C05-14	32.3 J	11.8 J	0.028 J	0.609 UJ	0.1 J	41.9 U	41.9 U	41.9 U	41.9 U	41.9 U	41.9 U
A1P4-C05-15	14.5 J	18.3 J	0.025 J	0.588 UJ	0.081 J	40.3 U	40.3 U	40.3 U	40.3 U	40.3 U	40.3 U
A1P4-C05-16	17.8 J	13.6 J	0.012 J	0.557 U	0.066 J	39 U	39 U	39 U	39 U	39 U	39 U
Limit	300	400	7.5	5400	29000	20000	2000	20000	1000	200000	2000000
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Conf. Level	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Max. Result	35.5	19.9	0.044	3.09 UJ	0.1	42.2 U	93.9	144	42.2 U	42.2 U	42.2 U
Max. >= Limit	No	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	16	16	12	12	12
Nondetects	0	0	1	12	6	0	10	13	0	0	0
% Nondetects	0%	0%	8%	100%	50%	0%	63%	81%	0%	0%	0%
Est. Mean*	--	--	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--	--	--
<i>a posteriori</i> Sample Size calculation	--	--	--	--	--	--	--	--	--	--	--

<sup>a</sup> Constituents were not analyzed for during precertification sampling. A sufficient number of samples (i.e. 12) were collected for these constituents during certification and there were no FRL exceedances.

Note: Est. Mean = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)

The maximum value of the two duplicates was used in all statistical equations.

#: This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.

The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.

Certification Unit 5

SAMPLE ID	Dibenzo(a,h)anthracene	Fluoranthene <sup>a</sup>	Indeno(1,2,3-cd)pyrene	Phenanthrene <sup>a</sup>	Pyrene <sup>a</sup>	Aroclor-1254	Aroclor-1260	Dieldrin	1,1,1-Trichloroethane <sup>a</sup>	1,1-Dichloroethene
A1P4-C05-4-1	37.7 U		64 J			3.8 U	3.8 U	1.4 U		0.8 U
A1P4-C05-4-3	41.2 U		41.2 U			4.1 U	4.1 U	1.6 U		1 U
A1P4-C05-3-1	39 U		39 U			3.9 U	3.9 U	1.5 U		0.9 U
A1P4-C05-3-3	39.9 U		39.9 U			3.9 U	3.9 U	1.6 U		0.9 U
A1P4-C05-2-1	38.2 U		38.2 U			3.8 U	3.8 U	1.5 U		0.8 U
A1P4-C05-2-3	38.3 U		38.3 U			3.9 U	3.9 U	1.5 U		0.9 U
A1P4-C05-1-1	40.5 U		40.5 U			4.1 U	4.1 U	1.6 U		1.1 U
A1P4-C05-1-3	41.4 U		41.4 U			4.1 U	4.1 U	1.6 U		1 U
A1P4-C05-5	41.4 U	41.4 U	41.4 U	41.4 U	41.4 U	4.1 U	4.1 U	1.7 U	1.1 U	1.1 U
A1P4-C05-6	39.1 U	39.1 U	39.1 U	39.1 U	39.1 U	3.9 U	3.9 U	1.6 U	1.1 U	1.9 J
A1P4-C05-7	38.4 U	38.4 U	38.4 U	38.4 U	38.4 U	3.8 U	3.8 U	1.5 U	1.2 U	1.2 U
A1P4-C05-8	40.2 U	40.2 U	40.2 U	40.2 U	40.2 U	4 U	4 U	1.6 U	1.2 U	1.2 U
A1P4-C05-9	42.2 U	42.2 U	42.2 U	42.2 U	42.2 U	4.2 U	4.2 U	1.7 U	1.2 U	1.2 U
A1P4-C05-10	37.1 U	37.1 U	37.1 U	37.1 U	37.1 U	3.7 U	3.7 U	1.5 U	1 U	1 U
A1P4-C05-11	41.6 U	41.6 U	41.6 U	41.6 U	41.6 U	4.2 U	4.2 U	1.7 U	1.1 U	1.4 J
A1P4-C05-12	37.9 U	37.9 U	37.9 U	37.9 U	37.9 U	3.8 U	3.8 U	1.5 U	0.9 U	0.9 U
A1P4-C05-13	38.6 U	38.6 U	38.6 U	125 J	38.6 U	3.9 U	3.9 U	4.6 U	1.2 U	1.2 UJ
A1P4-C05-14	41.9 U	41.9 U	41.9 U	41.9 U	41.9 U	4.2 U	4.2 U	1.7 U	1.1 U	1.1 U
A1P4-C05-15	40.3 U	40.3 U	40.3 U	40.3 U	40.3 U	4 U	4 U	1.6 U	1.3 U	1.3 U
A1P4-C05-16	39 U	39 U	39 U	39 U	39 U	3.9 U	3.9 U	1.6 U	1 U	1 UJ
Limit	2000	10000	20000	5000	10000	130	130	15	4300	410
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Conf. Level	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Max. Result	42.2 U	42.2 U	64	125	42.2 U	4.2 U	4.2 U	4.6 U	1.3 U	1.9
Max. >= Limit	No	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--	--
Sample Size	16	12	16	12	12	16	16	16	12	16
Nondetects	0	0	15	11	12	16	16	16	12	14
% Nondetects	0%	0%	94%	92%	100%	100%	100%	100%	100%	88%
Est. Mean*	--	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--	--
<i>a posteriori</i> Sample Size calculation	--	--	--	--	--	--	--	--	--	--

<sup>a</sup> Constituents were not analyzed for during precertification sampling. A sufficient number of samples (i.e. 12) were collected for these constituents during certification and there were no FRL exceedances.

Note: Est. Mean = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)

The maximum value of the two duplicates was used in all statistical equations.

#: This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.

The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.

**Certification Unit 5**

SAMPLE ID	1,2-Dichloroethene (Total)	2-Butanone <sup>a</sup>	4-Methyl-2-pentanone <sup>a</sup>	Acetone <sup>a</sup>	Benzene <sup>a</sup>	Bromodichloromethane	Ethylbenzene <sup>a</sup>	Methylene chloride <sup>a</sup>	Tetrachloroethene
A1P4-C05-4-1	0.8 U					0.8 U			0.8 U
A1P4-C05-4-3	1 U					1 U			1 U
A1P4-C05-3-1	0.9 U					0.9 U			0.9 U
A1P4-C05-3-3	0.9 U					0.9 U			0.9 U
A1P4-C05-2-1	0.8 U					0.8 U			0.8 U
A1P4-C05-2-3	0.9 U					0.9 U			0.9 U
A1P4-C05-1-1	1.1 U					1.1 U			1.1 U
A1P4-C05-1-3	1 U					1 U			1 U
A1P4-C05-5	1.1 U	5.7 U	5.7 U	52.5 J	1.1 U	1.1 U	1.1 U	5.7 U	1.1 U
A1P4-C05-6	1.1 U	5.6 U	5.6 U	5.6 U	1.1 U	1.1 U	1.1 U	5.6 U	1.1 U
A1P4-C05-7	1.2 U	6.1 U	6.1 U	6.1 U	1.2 U	1.2 U	1.2 U	6.1 U	1.2 U
A1P4-C05-8	1.2 U	18.3 J	6.2 U	69.4 J	1.2 U	1.2 U	1.2 U	6.2 U	1.2 U
A1P4-C05-9	1.2 U	5.8 U	5.8 U	6.3 U	1.2 U	1.2 U	1.2 U	5.8 U	1.2 U
A1P4-C05-10	1 U	5.1 U	5.1 U	5.1 U	1 U	1 U	1 U	5.1 U	1 U
A1P4-C05-11	1.1 U	5.7 U	5.7 U	5.7 U	1.1 U	1.1 U	1.1 U	5.7 U	1.1 U
A1P4-C05-12	0.9 U	4.5 U	4.5 U	10.8 U	0.9 U	0.9 U	0.9 U	4.5 U	0.9 U
A1P4-C05-13	1.2 UJ	5.8 U	5.8 U	5.8 U	1.2 UJ	1.2 UJ	1.2 UJ	5.8 U	1.2 UJ
A1P4-C05-14	1.1 U	5.8 J	5.3 U	27.9 U	1.1 U	1.1 U	1.1 U	5.3 U	1.1 U
A1P4-C05-15	1.3 U	6.2 U	6.2 U	11.8 U	1.3 U	1.3 U	1.3 U	6.2 U	1.3 U
A1P4-C05-16	1 UJ	4.9 U	4.9 U	20.7 J	1 UJ	1 UJ	1 UJ	4.9 U	1 UJ
Limit	160	11900	2500000	43000000	850000	4000	5100000	37000	3600
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Conf. Level	90%	90%	90%	90%	90%	90%	90%	90%	90%
Max. Result	1.3 U	18.3	6.2 U	69.4	1.3 U	1.3 U	1.3 U	6.2 U	1.3 U
Max. >= Limit	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--
Sample Size	16	12	12	12	12	16	12	12	16
Nondetects	16	10	12	9	12	16	12	12	16
% Nondetects	100%	83%	100%	75%	100%	100%	100%	100%	100%
Est. Mean*	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--
<i>a posteriori</i> Sample	--	--	--	--	--	--	--	--	--
Size calculation	--	--	--	--	--	--	--	--	--

<sup>a</sup> Constituents were not analyzed for during precertification sampling. A sufficient number of samples (i.e. 12) were collected for these constituents during certification and there were no FRL exceedances.

Note: Est. Mean = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)

The maximum value of the two duplicates was used in all statistical equations.

#: This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.

The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.

Certification Unit 5

SAMPLE ID	Toluene <sup>a</sup>	Trichloroethene	Xylenes, Total <sup>a</sup>
A1P4-C05-4-1		0.8 U	
A1P4-C05-4-3		1 U	
A1P4-C05-3-1		0.9 U	
A1P4-C05-3-3		0.9 U	
A1P4-C05-2-1		0.8 U	
A1P4-C05-2-3		0.9 U	
A1P4-C05-1-1		1.1 U	
A1P4-C05-1-3		1 U	
A1P4-C05-5	1.1 U	1.1 U	1.1 U
A1P4-C05-6	1.1 U	1.1 U	1.1 U
A1P4-C05-7	1.2 U	1.2 U	1.2 U
A1P4-C05-8	2.8 U	1.2 U	1.2 U
A1P4-C05-9	1.9 J	1.2 U	1.2 U
A1P4-C05-10	1 U	1 U	1 U
A1P4-C05-11	1.1 U	1.1 U	1.1 U
A1P4-C05-12	0.9 U	0.9 U	0.9 U
A1P4-C05-13	1.2 UJ	1.2 UJ	1.2 UJ
A1P4-C05-14	1.1 U	1.1 U	1.1 U
A1P4-C05-15	1.5 J	1.3 U	1.3 U
A1P4-C05-16	1 UJ	1 UJ	1 UJ
Limit	100000000	25000	920000000
Units	ug/kg	ug/kg	ug/kg
Conf. Level	90%	90%	90%
Max. Result	1.9	1.3 U	1.3 U
Max. >= Limit	No	No	No
W-statistic Prob. #	--	--	--
Test Procedure	--	--	--
Sample Size	12	16	12
Nondetects	10	16	12
% Nondetects	83%	100%	100%
Est. Mean*	--	--	--
UCL	--	--	--
Prob. > Limit	--	--	--
Pass / Fail	--	--	--
<i>a posteriori</i> Sample Size calculation	--	--	--

<sup>a</sup> Constituents were not analyzed for during precertification sampling. A sufficient number of samples (i.e. 12) were collected for these constituents during certification and there were no FRL exceedances.

Note: Est. Mean = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)

The maximum value of the two duplicates was used in all statistical equations.

#: This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.

The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.

**APPENDIX B**  
**CORRECTION OF 7-DAY RADIUM-226 RESULTS**

## APPENDIX B

## CORRECTION OF 7-DAY RADIUM-226 RESULTS

On July 10, 2006, OEPA approved DOE's July 6, 2006 request to reduce the in-growth period for radon, with the stipulation that additional soil samples would be collected from non-certified areas to verify initial assumptions and finalize the documentation of the process. This attachment to the certification report presents the analytical results for 7- and 21-day in-growth periods for samples collected from non-certified areas, as described in variance 20810-PSP-0004-36.

Figure 1 summarizes the results for 48 samples collected from non-certified areas. A regression of the data ( $R^2 = 0.9969$ ) yields the following equation for the estimate of the 21-day value:

$$21\text{-day value} = 1.053 \times 7\text{-day value} - 0.0156$$

This correction will be applied to 7-day analytical results to yield an estimate of the 21-day result. If statistical calculations are performed in the certification report, the estimate for 21-day results will be used to determine the pass/fail criteria for the certification units.

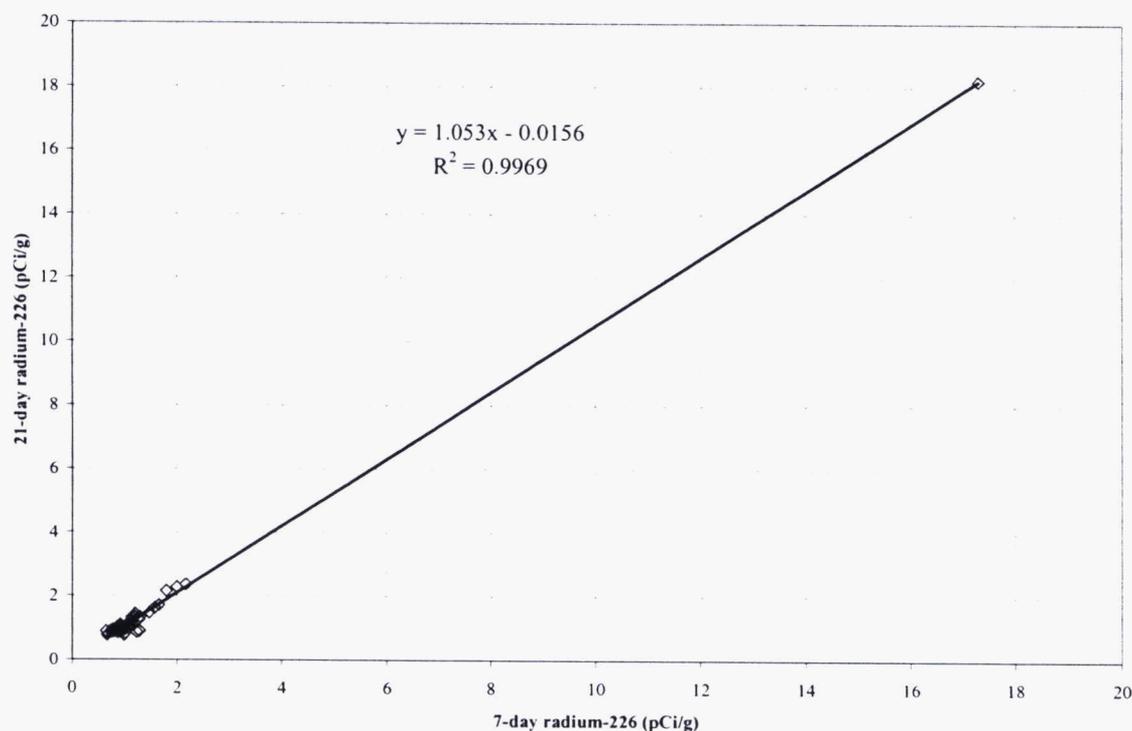


FIGURE 1. Regression analysis of radium-226 data based on 7- and 21-day ingrowth period for radon-222