Department of Energy

Ohio Field Office
Fernald Closure Project
175 Tri-County Parkway
Springdale, Ohio 45246
(513) 648-3155

NOV 15 2005

Mr. James A. Saric, Remedial Project Manager
United States Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

DOE-0020-06

Mr. Thomas Schneider, Project Manager
Ohio Environmental Protection Agency
Southwest District Office
401 East Fifth Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF THE DRAFT CERTIFICATION REPORT FOR THE STREAM CORRIDORS STORM SEWER OUTFALL DITCH

Enclosed for your review is the draft Certification Report for the Stream Corridors Storm Sewer Outfall Ditch.

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

Sincerely,

Johnny Reising

Johnny W. Reising
Director

Enclosure:

cc w/enclosure:
J. Desormeau, OH/FCP
J. Reising, OH/FCP
T. Schneider, OEPA-Dayton (three copies of enclosure)
G. Jablonowski, USEPA-V, SR-6J
C. Connell, ATSDR
M. Cullerton, Tetra Tech
M. Shupe, HSI GeoTrans
R. Vandegrift, ODH
AR Coordinator, Fluor Fernald, Inc./MS78

cc w/o enclosure:
J. Chiou, Fluor Fernald, Inc./MS88
F. Johnston, Fluor Fernald, Inc./MS12
C. Murphy, Fluor Fernald, Inc./MS1

6054

CERTIFICATION REPORT FOR THE STREAM CORRIDORS STORM SEWER OUTFALL DITCH

FERNALD CLOSURE PROJECT
FERNALD, OHIO

NOVEMBER 2005

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

20820-RP-0002
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 level
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Constituent of Concern
CRDL	contract-required detection limits
CU	Certification Unit
DOE	Department of Energy
EPA	Environmental Protection Agency
FCP	Fernald Closure Project
FRL	Final Remediation Level
GC	gas chromatography
HAMDC	highest allowable minimum detectable concentration
ICP-AES	inductively coupled plasma-atomic emission spectrometry
MDC	minimum detectable concentration
MDL	minimum detectable level
mg/kg	milligrams per kilogram
OEPA	Ohio Environmental Protection Agency
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 Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan.
SSOD	Storm Sewer Outfall Ditch
SWRB	Storm Water Retention Basin
TPU	Total Propagated Uncertainty
UCL	Upper Confidence Level
V&V	verification and validation process
VSL	Validation Support Level
WAC	waste acceptance criteria

EXECUTIVE SUMMARY

This certification report presents the information and data used by the U.S. Department of Energy (DOE) to determine that the soils in the Stream Corridors Storm Sewer Outfall Ditch (SSOD) meet the certification requirements at the Fernald Closure Project (FCP). On the basis of this reported information and supporting project files, DOE has determined that no further remedial actions are required in this area of the site and, therefore, they can be considered "certified." Stream Corridors SSOD will be considered certified when the U.S. Environmental Protection Agency and Ohio Environmental Protection Agency agree that the certification criteria have been achieved within each certification unit (CU) that makes up the SSOD. Upon approval from the regulatory agencies, DOE will proceed with planning the natural resource restoration activities for the SSOD.

Nine areas were remediated prior to certification of the SSOD. Consistent with the SEP, all of the SSOD underwent precertification including the use of real-time instruments as well as physical sampling and analysis.

The SSOD was made up of six (6) CUs. CU delineation is described in the Certification Design Letter and Certification Project Specific Plan for the Stream Corridors Storm Sewer Outfall Ditch (DOE 2005a). Certification sampling was conducted to verify that the certification criteria were achieved. These criteria state that: 1) the mean concentration or activities of the primary area-specific constituents of concern (ASCOCs) within a CU are less than the final remediation level (FRLs) at the 95 percent Upper Confidence Level (UCL) or the 90 percent UCL for the secondary ASCOCs; and 2) no certification result can exceed two times the FRL (i.e., the hotspot criterion). If either of these criteria is not met, then further investigation and possible excavation is required.

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

The SSOD underwent the certification process in late spring of 2005. The results of this process indicated that all of the CUs meet the certification criteria. Certification sampling was conducted in each CU to verify that the certification criteria set forth in the SEP were achieved. All samples related to this effort were analyzed at an off-site laboratory that is on the FCP Approved Laboratories List per the Sitewide Comprehensive Environmental Response, Compensation and Liability Act Quality Assurance Project Plan (DOE 2003). The data were subjected to the required validation and verification process.

1.0 INTRODUCTION

1.1 PURPOSE

This Certification Report presents the process and data used by the U.S. Department of Energy (DOE) to determine that the existing area-specific constituents of concern (ASCOCs) in the Storm Sewer Outfall Ditch (SSOD) meet certification requirements, and therefore do not require soil remediation. This report presents final certification results for the certification units (CUs) identified in the Certification Design Letter (CDL) and Certification Project Specific Plan (PSP) for the Stream Corridors SSOD (DOE 2005a). Based on the information presented in this document, the DOE considers remedial goals achieved in this portion of the site.

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 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 a Sitewide Excavation Plan (SEP, DOE 1998), defining 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. However, the Stream Corridors were not specifically addressed in the SEP. Because the SEP does not identify ASCOCs for the Stream Corridors as it does for other remediation areas and due to the fact that the Stream Corridors have received storm water run-off from the entire FCP, the entire list of ASCOCs was retained for predesign.

After all necessary remediation is completed within each area/phase, the soil will be certified as attaining all clean-up goals (i.e., FRLs). The SEP describes the general soil remediation and certification process at the FCP. According to Section 4.1 of the SEP, Excavation Approach A was followed in the SSOD. The remediation of this area is discussed in the CDL and Certification PSP for the SSOD.

1.3 AREA DESCRIPTION

The focus of this certification report is the SSOD. Stream Corridors SSOD is an area of approximately 7.6 acres that includes the SSOD and it's major tributaries. It is bordered on the north by the Storm Water Retention Basin (SWRB), on the east and south by the Area 2, Phase III certified area, and on the west by Area 2, Phase II - Subarea 3. The boundary for the SSOD is shown on Figure 1-1. Other Stream

Corridors areas (i.e., Paddys Run and Pilot Plant Drainage Ditch) will be discussed within separate documentation.

1.4 SCOPE

The scope of this Certification Report includes details of certification sampling, analysis and validation that took place in the SSOD. Other areas in the Stream Corridors (i.e., Paddys Run Creek and the Pilot Plant Drainage Ditch) are not included herein, but are covered under separate documentation.

1.5 OBJECTIVES

The objectives of this Certification Report are:

- Provide an overview of activities conducted in the SSOD.
- Describe the analytical methods, data validation processes, data reduction and statistical processes used to support the certification process
- Present the results for the CUs that make up the SSOD.
- Present the statistical analysis showing that both surface and subsurface soil in the CU has passed the certification criteria
- Describe access controls implemented to prevent recontamination.

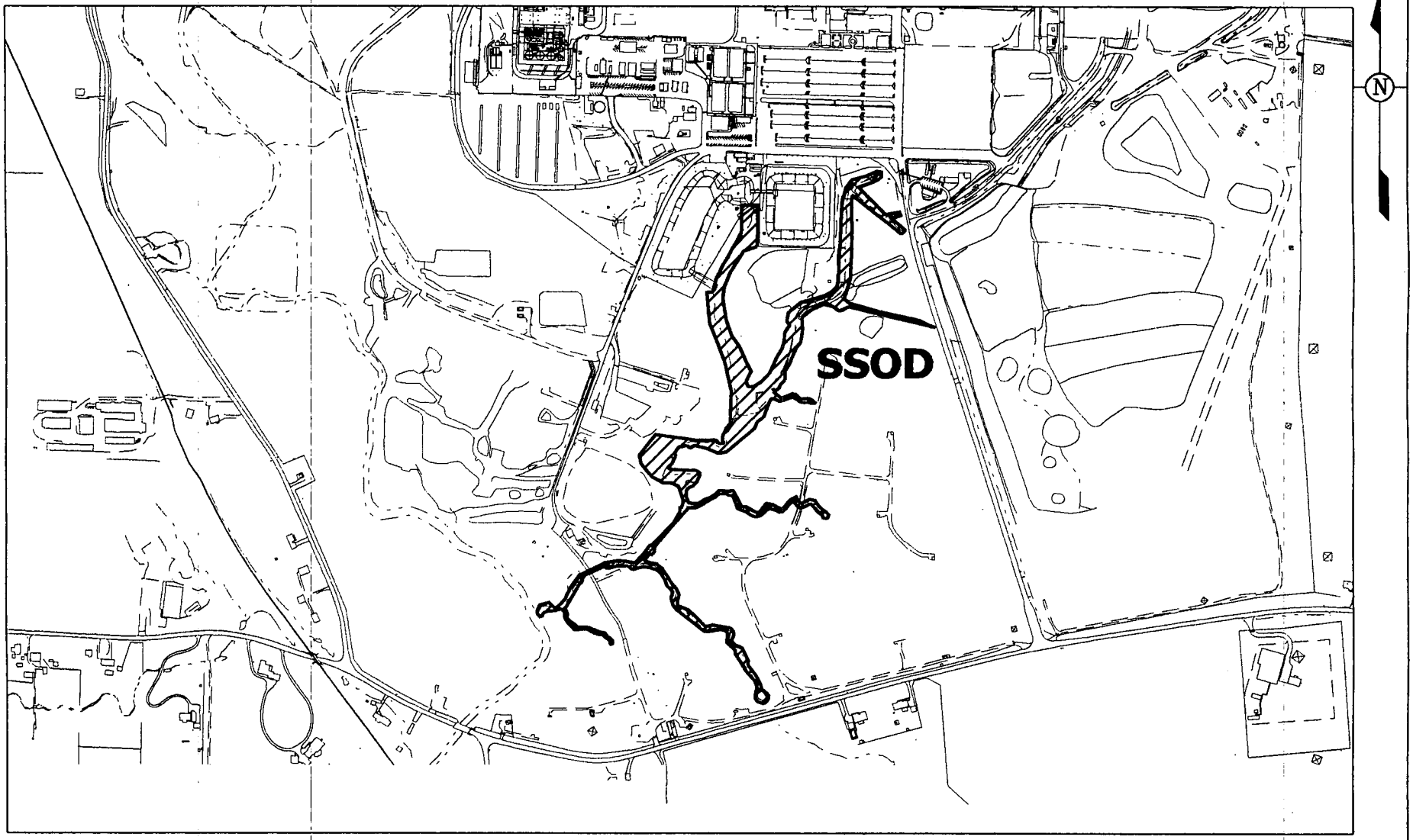
1.6 REPORT FORMAT

This certification report is presented in six sections with supporting documentation and data in Appendices A and B. The sections of this report area as follows:

Section 1.0	Introduction: Purpose, background, area description, scope, and objectives of the report
Section 2.0	Certification Approach: The CU design and approach to sampling and analysis used for certification
Section 3.0	Overview of Field Activities: Area preparation/survey, sampling and changes to work scope
Section 4.0	Analytical Methodologies, Data Validation Processes and Data Reduction
Section 5.0	Certification Evaluation and Conclusions
Section 6.0	Protection of Certified Areas
Appendix A	Statistical Analysis of Sample Data within the Storm Sewer Outfall Ditch

1.7 FCP CONTROLLED CERTIFICATION MAP

In order to track the status of certification at the FCP, DOE will include a site map showing the status of the soil remediation areas and phased areas with all Certification Reports. This map is included in this Certification Report as Figure 1-2, and has been updated to reflect the status of the SSOD.



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STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 1-1. STREAM CORRIDORS STORM SEWER OUTFALL DITCH LOCATION MAP

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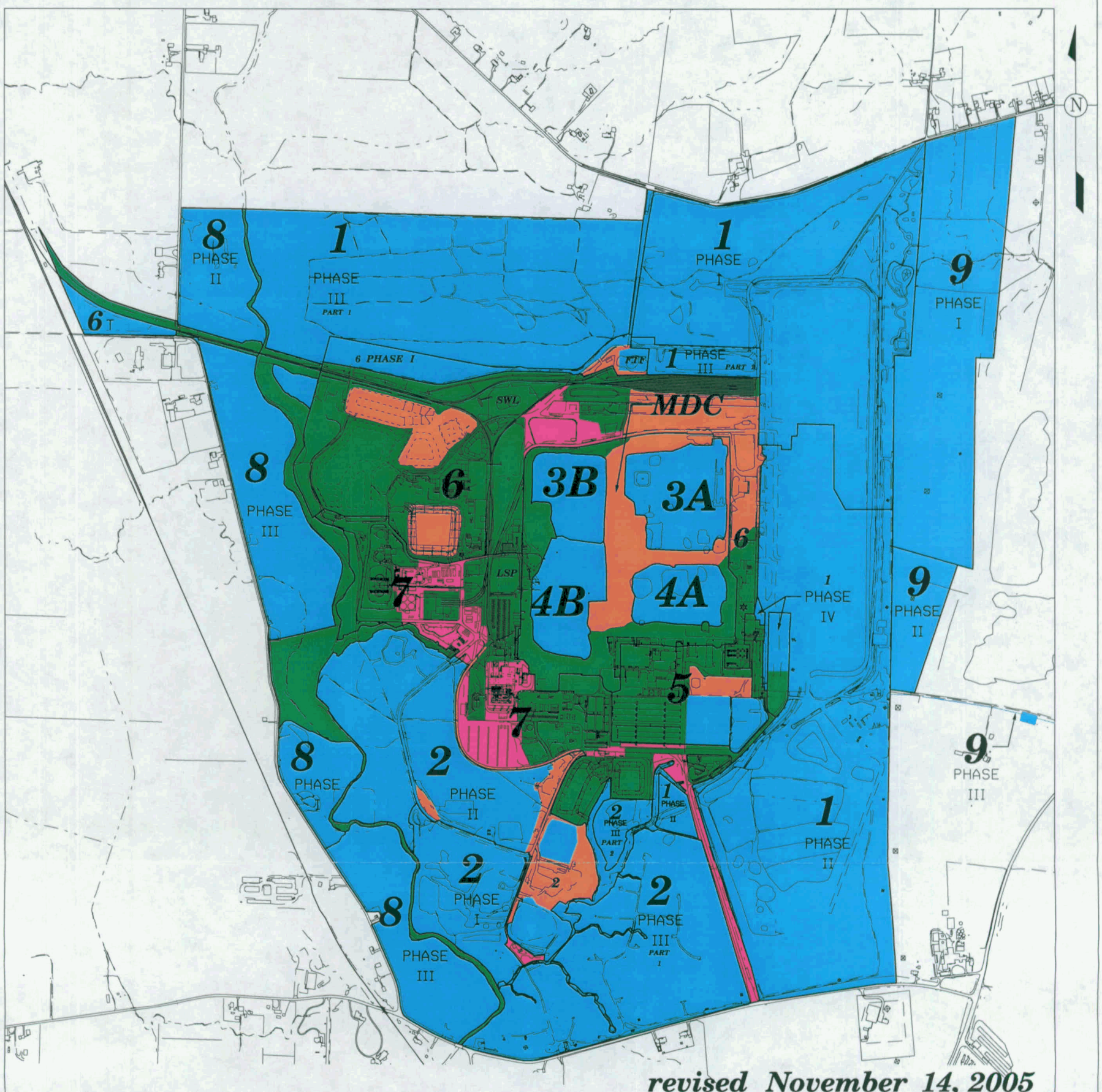

revised November 14, 2005

AREAS	TOTAL ACRES	APPROVED CERT. ACRES	CERT. ACRES IN PROGRESS	REMEDIATION ACRES IN PROGRESS	PREDESIGN ACRES IN PROGRESS	REMAINING ACRES
AREA 1	395.8	394.0	0	1.7	0	0
AREA 2	174.7	162.1	11.8	0	0.8	0
AREA 3A/4A	29.3	29.3	0	0	0	0
AREA 3B/4B	26.2	26.2	0	0	0	0
AREA 5	26.9	7.6	2.7	16.7	0	0
AREA 6	140.8	18.8	33.2	82.1	6.8	0
AREA 7	85.1	0	1.2	55.8	28.2	0
AREA 8	98.9	98.9	0	0	0	0
MDC	39.0	0	13.4	25.6	0	0
PR/SSOD/PPDD	32.7	7.0	0	25.8	0	0
TOTAL ON SITE	1049.4	743.8	62.2	207.6	35.7	0
AREA 9	85.6	85.6	0	0	0	0
TOTAL OFF SITE	85.6	85.6	0	0	0	0

* ONSITE AREA9 REMAINING ACRES INCLUDE THE DISSOLVED OXYGEN FACILITY AREA. THE INTERIM LEACHATE LINE CORRIDOR IS INCLUDED IN AREA 6.

AREA 10 INCLUDES PIPELINES RELATED TO GROUNDWATER REMEDIATION AND OTHER UTILITIES NOT SPECIFICALLY LISTED.

SCALE

1100 550 0 1100 FEET

STATE PLANAR COORDINATE SYSTEM 1983

14-NOV-2005

FIGURE 1-2. FCP CONTROLLED CERTIFICATION MAP

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 mean concentrations or activities of primary ASCOCs remaining in the soil of a CU following remedial activities are less than the FRLs at the 95 percent Upper Confidence Level (UCL), and at the 90 percent UCL for secondary ASCOCs. This certification process also includes the hotspot criterion, which states that if any of the certification results exceed two times the FRL, further action is required, as discussed in Section 3.4.5 of the SEP. If the mean residual ASCOC concentrations or activities 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. It can then be released for regrading, reseeding and development of a final land use. The general certification strategy is described in Section 3.4 of the SEP, and more specifically in the CDL and Certification PSP for the SSOD.

2.1.1 Area-Specific Constituents of Concern

Because the SEP does not identify ASCOCs for Stream Corridors as it does for other remediation areas and due to the fact that storm water run-off from the entire FCP has flowed through the Stream Corridors, the full list of primary and secondary ASCOCs for the site was initially retained. Total uranium, radium-226, radium-228, thorium-228, and thorium-232 (the sitewide primary ASCOCs) were retained as ASCOCs. As a result of the predesign investigation, aroclor-1254, arsenic, beryllium, and thorium-230 were retained as secondary ASCOCs due to FRL exceedances. Table 2-1 lists the ASCOCs retained for sampling based on the above outlined criteria. The reason for constituent retention as well as their applicable FRLs are also listed in the table.

2.1.2 ASCOC Selection Criteria

The selection process for retaining secondary ASCOCs for a remediation area is driven by applying a set of decision criteria. A soil contaminant will be retained as an ASCOC if the following apply:

- 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.

2.1.3 ASCOC Selection Process

The PSP for Predesign Characterization of Sediments in Paddys Run and Associated Drainage Features (DOE 2004) identified five primary COCs and 34 secondary COCs for this area. Table 2-1 lists the ASCOCs that will be retained for sampling based on the above-listed criteria along with the reason for constituent retention.

2.2 CERTIFICATION APPROACH

2.2.1 Certification Design

The intent of this effort was to certify the soil along the SSOD and it's major tributaries. The certification design for the SSOD followed the general approach outlined in Section 3.4 of the SEP and the SEP Addendum (DOE 2001) and is described in the CDL and Certification PSP for the SSOD. Factors such as historical land use, proximity to other areas of the site, and layout of the area were used to determine the boundaries for the CUs. Six CUs were designed to cover the length of the SSOD and it's major tributaries. The CU design and sample locations are depicted in Figures 2-1 through 2-3.

2.2.2 Sample Selection Process

Prior to beginning the certification process, several issues arose which impacted the certification sampling of the SSOD. These are described in Variance/Field Change Notices 20340-PSP-0001-03 through -06 for the PSP for Excavation Control and Precertification of Stream Corridors SSOD (DOE 2005b) and Section 4.1.2 of the CDL and Certification PSP for the SSOD. However, the selection of certification sampling locations was conducted according to Section 3.4.2 of the SEP. Sample locations were tested against the minimum distance criteria for each CU. Each CU was first divided into 16 approximately equal sub-CUs. Sample locations were then generated by randomly selecting an easting and northing coordinate within the boundaries of each sub-CU, then testing those locations against the minimum distance criteria for the CU. If the minimum distance criteria were not met, an alternative random location was selected for that sub-CU, and all the locations were re-tested. This process continued until all 16 random locations met the minimum distance criteria. All sub-CUs and proposed certification sampling locations are shown on Figures 2-1 through 2-3.

2.2.3 Certification Sampling

Each sample was collected at the designated and surveyed location as described in Section 2.2.2 of this document. The certification locations that were designated as archive locations were identified in the field but not collected, and the other identified locations were submitted for analysis.

2.2.4 Statistical Analysis

Once data are entered into the Sitewide Environmental Database (SED), a statistical analysis was performed to evaluate the pass/fail criteria for the CUs. The statistical approach is discussed in Section 3.4.3, Appendix G of the SEP, and Section 3.4.8 of the SEP Addendum.

Two criteria must be met for a CU to pass certification. If the data distribution is normal or lognormal, the first criterion compares the 95 percent UCL on the mean of each primary COC to its FRL, or the 90 percent UCL on the mean of each secondary ASCOC. On an individual CU basis, any ASCOC with the 95 percent UCL for primary ASCOCs (or 90 percent UCL above the FRL for secondary COCs) results in that CU failing certification. If the data distribution is not normal or lognormal, the appropriate nonparametric approach discussed in Appendix G of the SEP will be used to evaluate the second criterion; the *a posteriori* test will be performed to determine whether the sample size is sufficient for a meaningful conclusion of this comparison. The second criterion is the hotspot criterion, which states that primary or secondary ASCOC results must not exceed two times the FRL. When the given UCL on the mean for each COC is less than its FRL and the hotspot criterion is met, the CU will be considered certified.

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

TABLE 2-1
ASCOC LIST FOR SSOD CERTIFICATION UNITS

ASCOC	FRL/*BTV*	Reason Retained
Total Uranium	82 mg/kg	Retained as a primary ASCOC sitewide
Radium-226	1.7 pCi/g	Retained as a primary ASCOC sitewide
Radium-228	1.8 pCi/g	Retained as a primary ASCOC sitewide
Thorium-228	1.7 pCi/g	Retained as a primary ASCOC sitewide
Thorium-232	1.5 pCi/g	Retained as a primary ASCOC sitewide
Aroclor-1254	0.13 mg/kg	ASCOC for SSOD - above-FRL results
Arsenic	12 mg/kg	ASCOC for SSOD - above-FRL results
Beryllium	1.5 mg/kg	ASCOC for SSOD - above-FRL results
Thorium-230	280 pCi/g	ASCOC for SSOD - above-FRL results

BTV - benchmark toxicity level
mg/kg - milligrams per kilogram
pCi/g - picoCuries per gram

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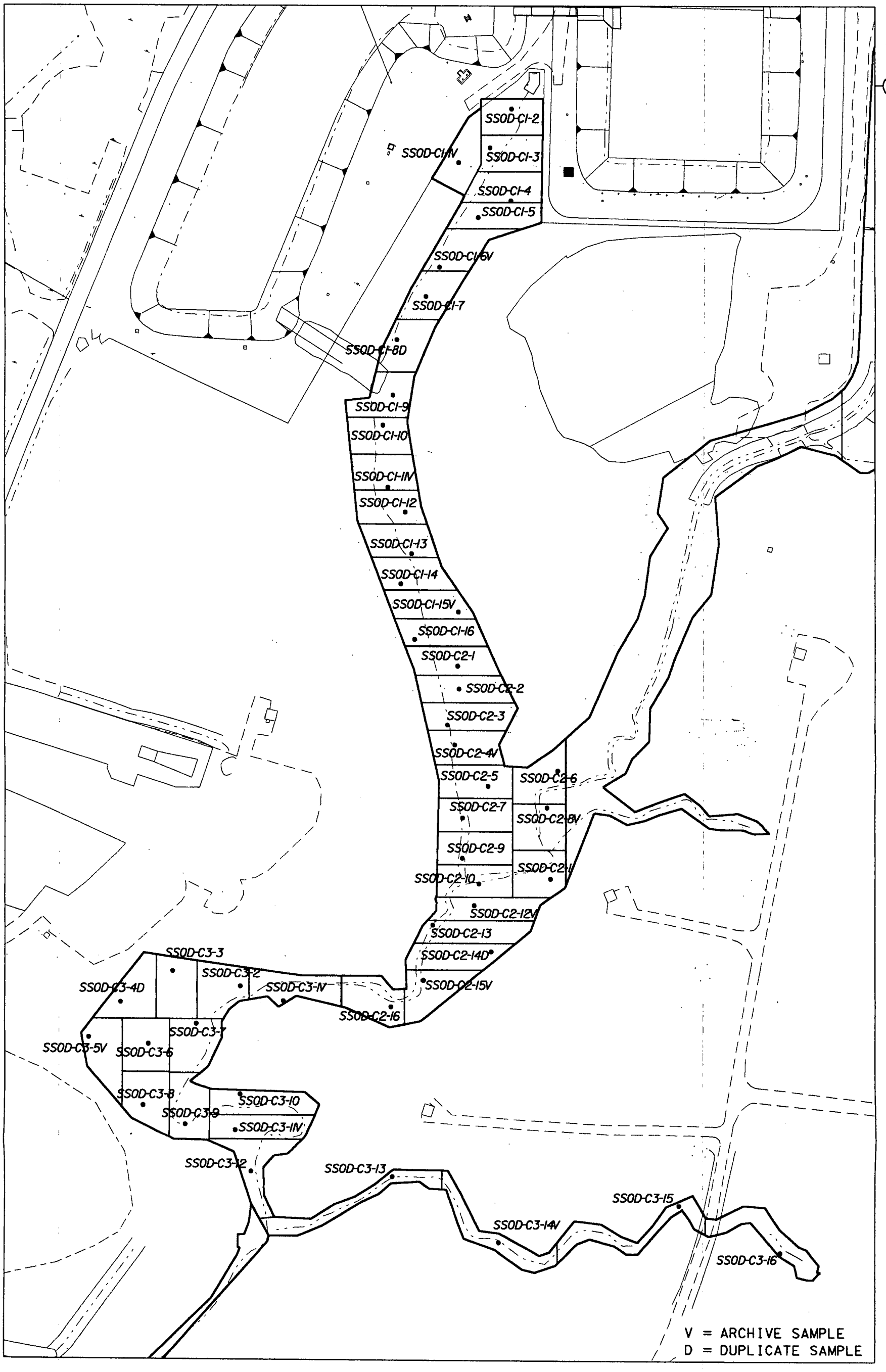
STATE PLANAR COORDINATE SYSTEM 1983

09-NOV-2005



LEGEND:

• SAMPLE LOCATION

SCALE

120 60 0 120 FEET

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FIGURE 2-1. STREAM CORRIDORS STORM SEWER OUTFALL DITCH SUB CU AND SAMPLE LOCATION MAP FOR CUs 1, 2 & 3 CERTIFICATION

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STATE PLANAR COORDINATE SYSTEM 1983

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SSOD-C4-1
SSOD-C4-2
SSOD-C4-3V
SSOD-C4-4
SSOD-C4-7
SSOD-C4-5V
SSOD-C4-8
SSOD-C4-6
SSOD-C4-9
SSOD-C4-10
SSOD-C4-11V
SSOD-C4-12
SSOD-C4-13D
SSOD-C5-1
SSOD-C4-14
SSOD-C5-3
SSOD-C5-2V
SSOD-C4-15V
SSOD-C5-4D
SSOD-C4-16
SSOD-C5-5
SSOD-C5-6
SSOD-C5-7V
SSOD-C5-8
SSOD-C5-9V
SSOD-C5-10
SSOD-C5-11
SSOD-C5-12
SSOD-C5-13V
SSOD-C5-14
SSOD-C5-15
SSOD-C5-16

V = ARCHIVE SAMPLE
D = DUPLICATE SAMPLE

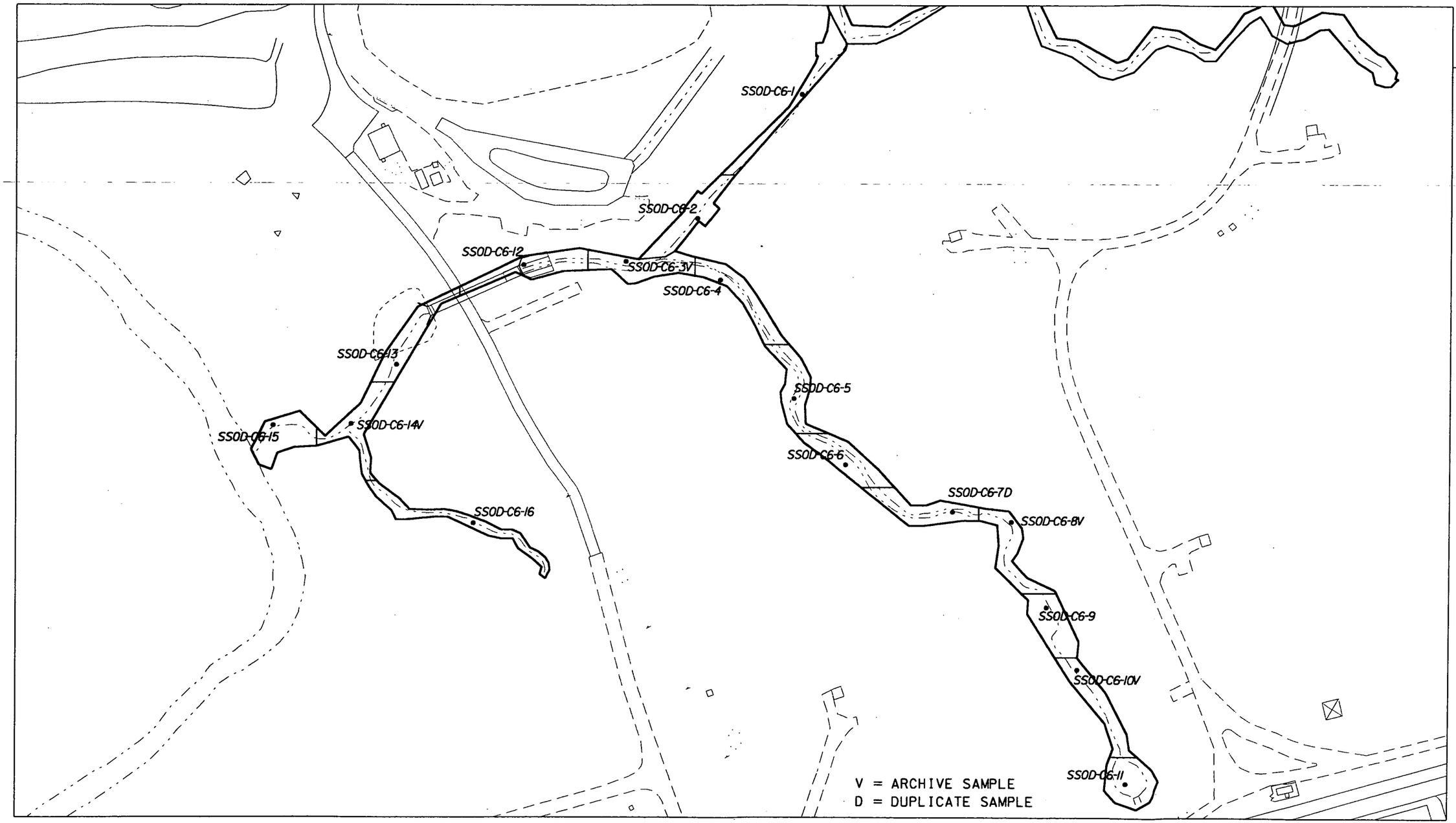
LEGEND:

• SAMPLE LOCATION

SCALE
100 50 0 100 FEET

DRAFT

FIGURE 2-2. STREAM CORRIDORS STORM SEWER OUTFALL DITCH SUB CU AND SAMPLE LOCATION MAP FOR CUs 4 & 5 CERTIFICATION



LEGEND:

• SAMPLE LOCATION

SCALE
120 60 0 120 FEET

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FIGURE 2-3. STREAM CORRIDORS STORM SEWER OUTFALL DITCH SUB CU AND SAMPLE LOCATION MAP FOR CU 6 CERTIFICATION

3.0 OVERVIEW OF FIELD ACTIVITIES

In accordance with the SEP, prior to conducting precertification and certification activities, all soil demonstrated to contain contamination above the associated FRLs were evaluated for remedial actions. Based on the results of sampling and scanning activities summarized in Sections 3.1 and 3.2, it has been determined that no further remedial actions are.

3.1 AREA PREPARATION AND PRECERTIFICATION

Percertification surveys were performed from February 11, 1999 through July 12, 2005 per the PSP Guidelines for General Characterization for Sitewide Soil Remediation, Sections 3.0 and 6.0 (DOE 2005c).

The total population of the data used to support the conclusion that the area is ready for certification consisted of predesign data for the areas requiring no remedial action and precertification data from the excavated/remediated footprints.

3.2 CHANGES TO SCOPE OF WORK

The scope of work for the SSOD was documented in the final CDL and Certification PSP. No significant changes were required to the scope outlined in this document.

4.0 ANALYTICAL METHODOLOGIES, DATA VALIDATION PROCESSES AND DATA REDUCTION

4.1 ANALYTICAL METHODOLOGIES

All samples collected 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 analysis of certification samples was conducted using approved analytical methods, as discussed in Appendix H of the SEP. The minimum detection level was set at 10 percent of the FRL and analyses were conducted to Analytical Support Level (ASL) D or E, where the minimum detectable level (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 for all of the analytical data for the required ASCOCs. All data were validated. Once data were validated as required, results were entered into the FCP SED. Final certification results are provided in Appendix A. A summary of the analytical methods used follows.

4.1.1 Chemical Methods

Metals

The method used for the metals (arsenic and beryllium) was inductively coupled plasma-atomic emission spectrometry (ICP-AES).

Polychlorinated Biphenyl (PCBs)

Samples submitted for PCB analyses (aroclor-1254) were analyzed by gas chromatography (GC).

4.1.2 Radiochemical Methods

The radiochemical analytical methods depended on the specific nuclides of interest. Performance-based specification criteria included highest allowable minimum detectable concentration (HAMDC), percent overall tracer/chemical recovery, percent matrix spike recovery, method blank concentration, percent recovery of laboratory control sample, and percent recovery for duplicate samples were specified for each analyte. Laboratories were required to meet these specifications using the methodologies described below.

Total Uranium

Samples were analyzed for uranium-238 using gamma spectrometry, and the results were used to calculate the total uranium value. The calculation used was as follows:

Total Uranium (mg/kg) = (2.998544) x Uranium-238 gamma spectrometry result (pCi/g)

The validation qualifier assigned to the total uranium value was the same as the uranium-238 qualifier.

Radium-226

Samples were analyzed by gamma spectrometry, and radium-226 was quantified by measuring gamma rays emitted by members of its decay chain. This method does not require chemical separation, but the samples must be allowed a 20-day progeny in-growth period before counting. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all SSOD certification results.

Radium-228

Following gamma spectrometry analysis, radium-228 was also quantified by measuring gamma rays emitted by members of its decay chain. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate the SSOD certification results.

Isotopic Thorium

Isotopic thorium (thorium-228, thorium-230, and thorium-232) was quantified by measuring gamma rays emitted by members of its decay chain by gamma spectrometry. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate the SSOD certification results.

4.2 DATA VERIFICATION AND VALIDATION

This section discusses the data verification and validation (V&V) process used to examine the quality of field and laboratory results. Data were qualified to indicate the level of data usability, or level of confidence in the reported analytical results. 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, was used for this process.

Specific parameters associated with the data were evaluated during V&V to determine whether or not the data quality objectives were met. Five principal quality assurance (QA) parameters (i.e., precision, accuracy, completeness, comparability, and representativeness) were addressed during V&V. Field sampling and handling, laboratory analysis and reporting, and non-conformances and discrepancies in the data were examined to ensure compliance with appropriate and applicable procedures.

The V&V process evaluated the following parameters:

- Specific field forms for sample collection and handling
- Chain of Custody Forms
- Completeness of laboratory data deliverable.

The data validation process examined the analytical data to determine the level of confidence of the results. General areas examined include the following:

- 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
- Laboratory control sample recoveries and compliance with established limits.

Parameters unique to the evaluation of radiochemical analyses include:

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

For this project, all the radiological data were reviewed and validated for all criteria noted above. Per project requirements, a minimum 10 percent of the certification data were validated to Validation Support Level (VSL) D. This validation included the same review process as for VSL B, but included a systematic review of the raw data and recalculations. To meet this project requirement (as specified in the SEP and Data Quality Objectives SL-052), all analyses from the selected data were validated to VSL D, and the remaining data were validated to VSL B.

Following V&V, qualifier codes were applied to specific data points, reflecting the level of confidence assigned to the particular datum. These codes can include the following:

- No qualification; the positive result or detection limit is confident as reported

J Positive result is estimated or imprecise; data point is usable for decision-making purposes. Positive results less than the contract required reporting limit are also qualified in this manner.

R Positive result or detection limit is considered unreliable; data point should not be used for decision-making purposes.

U Undetected result at the stated limit of detection

UJ Undetected result; detection limit is considered estimated or imprecise; the data point is usable for decision-making purposes

N Positive result is tentatively identified - that is, there is some question regarding the actual identification and quantification of the result. Compound reported is best professional judgment of the interpretation of the supporting data, such as mass spectra. Caution must be exercised with the use of this data.

NJ Positive result is tentatively estimated; detection limit is considered estimated or imprecise.

NV Not validated. The results for this sample were not validated

Z This result, or detection limit in this analysis is not the best one to use; another analysis (e.g., the dilution or re-analysis) contains a more confident and usable result

The V&V of this data set did not identify any problems. All the results were either not qualified (-), qualified as estimated (J) and/or non-detects (U), or tentatively estimated (NJ). No results were qualified as rejected.

4.3 DATA REDUCTION

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

Field Information

- Sample Identification Number - A unique number assigned to each discrete sample point
- Coordinate Information - Northing and Easting locations
- Certification Unit - Each sample is assigned to a CU based on a location

Laboratory Information

For each sample result the following information is entered:

- Laboratory Result - The reported analytical value from the laboratory
- Laboratory Qualifier - The qualifier reported from the lab. For radiological parameters non-detect values are assigned a U qualifier.
- Total Propagated Uncertainty (TPU) - This value represents the uncertainty associated with the reported result. TPU includes the counting error, as well as uncertainty from other laboratory measurements and data reduction. (Applicable to radiological parameters only.)
- Units - The units in which the Laboratory Result is reported

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 associated minimum detectable concentration (MDC), the validation result becomes the MDC value

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 in which the Validation Result is reported

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

1. All the data for each CU were queried from SED. All the data were used even if the CU had more than the minimum required data points

2. The data from the validation fields were used for statistical calculations

3. Data with a qualifier of R or Z was not used in the statistical calculations

4. The highest of the two duplicate results was used in the statistical calculations

5. One half of the non-detect (U or UJ) values were used in the statistical calculations.

5.0 CERTIFICATION EVALUATION AND CONCLUSIONS

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

5.1 CERTIFICATION RESULTS AND EVALUATION

All six CUs for the SSOD passed the certification criteria. Final certification data are presented in Appendix A. Based on these results, DOE has determined that the remedial objectives of the OU5 ROD have been achieved in the SSOD and no further remedial actions are required.

5.2 SSOD 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 SSOD. Therefore, upon EPA and Ohio Environmental Protection Agency (OEPA) concurrence, DOE has determined that no further soil remedial actions are required in the SSOD and that the certification activities for the SSOD are complete. The subject areas will be released for final land use.

6.0 PROTECTION OF CERTIFIED AREAS

DOE has restricted access to certified areas in order to maintain their integrity prior to transferal for final land use. FCP Procedure EP-0008, Access to a Certified Area, has been developed to implement a process to protect certified areas from being recontaminated.

The procedure is summarized as follows:

- Prior to the initiation of certification sampling activities for a remediation area, temporary fencing will be installed to delineate the perimeter of the "certified" area if existing fencing is not already present.
- Signs will be posted upon the temporary perimeter limiting access to authorized individuals or projects.
- Personnel desiring admittance to a "certified" area to conduct work will submit a written request to gain access, using Form FS-F-4878, to the Environmental Closure Project Compliance Section.
- The purpose of entry must be described on the form, including any proposed chemical applications such as pesticides or herbicides.
- Any equipment to be used within the "certified" area must have been cleaned in accordance with FCP certified area access.
- Employees/operators should be briefed on the entry and exit requirements for a "certified" area.
- Additional restrictions apply to certified areas that have been restored. The Environmental Closure Project Compliance Section will forward access requests for restored areas to the Environmental Closure Project Natural Resources for written approval prior to entry.

After DOE, EPA and OEPA agree that an area is certified, the area will be released for restoration and final land use. At that time, best management practices and administrative controls will need to be used to protect the area from contamination, and other controls will be implemented as needed. Following approval of this certification report by the EPA and OEPA, DOE will proceed with planning the natural resource restoration and development of final land use for the area.

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APPENDIX A

STATISTICAL ANALYSIS OF SAMPLE DATA WITHIN THE STORM SEWER OUTFALL DITCH

APPENDIX A
STATISTICAL ANALYSIS OF THE STORM SEWER OUTFALL DITCH CERTIFICATION UNIT 1

	Primary COCs					Secondary COCs			
SAMPLE ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Thorium-230	Arsenic	Beryllium	Aroclor-1254
SSOD-C1-2	1.35 J	1.06 J	1.06 J	1.06 J	32.4 J	1.90 J	8.61 -	0.628 -	8.90 U
SSOD-C1-3	1.06 J	0.895 J	0.840 J	0.895 J	20.5 J	3.12 -	5.08 -	0.550 -	4.00 UJ
SSOD-C1-4	1.08 J	0.879 J	0.861 J	0.879 J	3.20 U	1.10 J	6.07 -	0.440 -	4.00 UJ
SSOD-C1-5	1.54 J	0.979 J	0.969 J	0.979 J	28.2 J	2.64 -	5.14 -	0.533 -	33.0 U
SSOD-C1-7	1.17 J	0.794 J	0.820 J	0.794 J	4.10 J	1.51 J	4.17 -	0.304 -	34.0 U
SSOD-C1-8	1.03 J	0.782 J	0.801 J	0.782 J	8.82 J	2.10 J	4.89 -	0.218 -	29.0 U
SSOD-C1-8-D	1.10 J	0.806 J	0.743 J	0.806 J	10.5 J	2.85 -	6.43 -	0.346 -	18.0 U
SSOD-C1-9	1.22 J	0.845 J	0.872 J	0.845 J	7.34 J	1.01 J	6.21 -	0.594 -	24.0 U
SSOD-C1-10	0.577 J	0.327 J	0.336 J	0.327 J	5.62 J	0.840 J	3.82 -	0.129 J	3.50 UJ
SSOD-C1-12	0.895 J	0.390 J	0.352 J	0.390 J	5.44 J	1.53 J	5.50 -	0.381 -	10.0 U
SSOD-C1-13	0.923 J	0.791 J	0.792 J	0.791 J	3.06 U	1.26 J	4.77 -	0.353 -	12.0 U
SSOD-C1-14	1.24 J	0.848 J	0.861 J	0.848 J	6.11 J	1.12 J	5.30 -	0.457 -	18.0 U
SSOD-C1-16	0.903 J	0.605 J	0.623 J	0.605 J	2.60 U	0.803 J	4.94 -	0.379 -	10.0 U
Limit	1.7	1.8	1.7	1.5	82	280	12	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	ug/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%
Max. Result	1.54	1.06	1.06	1.06	32.4	3.12	8.61	0.628	34.0 U
Max. >= Limit	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	3	0	0	0	12
% Nondetects	0%	0%	0%	0%	25%	0%	0%	0%	100%
Est. Mean*	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--
a posteriori Sample Size calculation	--	--	--	--	--	--	--	--	--

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 A
STATISTICAL ANALYSIS OF THE STORM SEWER OUTFALL DITCH CERTIFICATION UNIT 2

	Primary COCs					Secondary COCs			
SAMPLE ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Thorium-230	Arsenic	Beryllium	Aroclor-1254
SSOD-C2-1	0.903 -	0.623 -	0.615 -	0.623 -	5.72 -	1.53 -	5.52 -	0.484 -	7.80 J
SSOD-C2-2	0.821 -	0.479 -	0.483 -	0.479 -	3.48 -	1.08 -	4.69 -	0.283 -	7.30 J
SSOD-C2-3	1.01 -	0.688 -	0.711 -	0.688 -	6.01 -	1.17 -	6.64 -	0.453 -	5.40 J
SSOD-C2-5	1.39 -	1.17 -	1.18 -	1.17 -	10.4 -	1.48 -	9.39 -	0.879 -	4.00 U
SSOD-C2-6	1.13 -	0.876 -	0.871 -	0.876 -	10.6 -	1.17 -	6.63 -	0.508 -	4.00 U
SSOD-C2-7 (SCEC-SSOD-BF02)	1.02 -	0.700 -	0.693 -	0.700 -	7.22 J	1.84 J	9.08 J	0.439 -	16.0 -
SSOD-C2-9 (SCEC-SSOD-BF01)	0.891 -	0.559 -	0.553 -	0.559 -	5.36 J	1.64 J	8.13 J	0.414 -	3.90 U
SSOD-C2-10	0.641 -	0.331 -	0.320 -	0.331 -	2.41 J	1.20 -	4.05 -	0.203 -	3.80 U
SSOD-C2-11	0.725 -	0.521 -	0.491 -	0.521 -	4.21 J	0.991 -	5.29 -	0.518 -	3.60 U
SSOD-C2-13	0.537 -	0.418 -	0.426 -	0.418 -	2.11 U	1.07 -	3.59 -	0.275 -	3.70 U
SSOD-C2-14	0.965 -	0.973 -	0.933 -	0.973 -	38.0 -	1.72 -	6.76 -	0.590 -	6.70 J
SSOD-C2-14-D	1.08 -	0.963 -	0.955 -	0.963 -	32.6 -	1.75 -	7.14 -	0.592 -	4.10 U
SSOD-C2-16	0.733 -	0.714 -	0.715 -	0.714 -	3.06 U	1.12 -	5.42 -	0.487 -	3.90 U
Limit	1.7	1.8	1.7	1.5	82	280	12	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	ug/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%
Max. Result	1.39	1.17	1.18	1.17	38.0	1.84	9.39	0.879	16.0
Max. >= Limit	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	2	0	0	0	7
% Nondetects	0%	0%	0%	0%	17%	0%	0%	0%	58%
Est. Mean*	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--
a posteriori Sample	--	--	--	--	--	--	--	--	--
Size calculation	--	--	--	--	--	--	--	--	--

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 A
STATISTICAL ANALYSIS OF THE STORM SEWER OUTFALL DITCH CERTIFICATION UNIT 3

	Primary COCs					Secondary COCs			
SAMPLE ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Thorium-230	Arsenic	Beryllium	Aroclor-1254
SSOD-C3-2 (SCEC-SSOD-BF03)	0.684 -	0.416 -	0.427 -	0.416 -	11.7 -	1.25 J	7.70 J	0.237 -	1.70 J
SSOD-C3-3	1.60 -	1.43 J	1.43 J	1.43 J	25.6 -	2.55 J	15.4 -	0.997 -	7.60 -
SSOD-C3-4	1.07 -	1.02 J	0.970 J	1.02 J	5.70 J	1.14 J	8.38 J	0.599 -	3.90 U
SSOD-C3-4-D	1.09 -	1.09 J	1.04 J	1.09 J	6.92 -	1.53 J	11.5 J	0.959 -	3.90 U
SSOD-C3-6	0.823 -	0.672 J	0.687 J	0.672 J	2.93 U	0.938 J	5.74 -	0.450 -	1.50 J
SSOD-C3-7	0.582 -	0.452 J	0.461 J	0.452 J	2.10 U	0.918 J	6.25 -	0.270 -	13.0 -
SSOD-C3-8	1.08 -	1.04 J	1.00 J	1.04 J	7.11 -	1.32 J	8.26 -	0.541 -	15.0 -
SSOD-C3-9	0.825 -	0.619 J	0.606 J	0.619 J	2.54 U	1.11 J	6.42 -	0.309 -	4.50 -
SSOD-C3-10	0.896 -	0.755 J	0.748 J	0.755 J	7.58 -	1.12 J	5.45 -	0.396 -	13.0 -
SSOD-C3-12	0.692 -	0.844 J	0.855 J	0.844 J	6.82 -	1.11 J	3.91 -	0.175 -	4.50 -
SSOD-C3-13	0.842 -	0.797 J	0.797 J	0.797 J	7.69 -	3.21 -	5.97 -	0.476 -	2.70 J
SSOD-C3-15	1.04 -	0.900 J	0.931 J	0.900 J	4.77 J	1.44 J	7.73 -	0.571 -	13.0 -
SSOD-C3-16	1.17 -	1.05 J	1.01 J	1.05 J	9.47 -	0.990 J	6.60 -	0.575 -	1.30 J
Limit	1.7	1.8	1.7	1.5	82	280	12	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	ug/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%
Max. Result	1.60	1.43	1.43	1.43	25.6	3.21	15.4	0.997	15.0
Max. >= Limit	No	No	No	No	No	No	Yes	No	No
W-statistic Prob. #	--	--	--	--	--	--	45.3% (LN)	--	--
Test Procedure	--	--	--	--	--	--	Lognormal	--	--
Sample Size	12	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	3	0	0	0	1
% Nondetects	0%	0%	0%	0%	25%	0%	0%	0%	8%
Est. Mean*	--	--	--	--	--	--	7.58	--	--
UCL	--	--	--	--	--	--	8.88	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	pass	--	--
a posteriori Sample	--	--	--	--	--	--	3	--	--
Size calculation	--	--	--	--	--	--	Pass	--	--

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 A
STATISTICAL ANALYSIS OF THE STORM SEWER OUTFALL DITCH CERTIFICATION UNIT 4

	Primary COCs					Secondary COCs			
SAMPLE ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Thorium-230	Arsenic	Beryllium	Aroclor-1254
SSOD-C4-1	0.969 J	0.744 J	0.752 J	0.744 J	7.84 J	18.5 NJ	8.04 -	0.525 -	110 UJ
SSOD-C4-2	0.611 J	0.483 J	0.493 J	0.483 J	7.50 J	14.6 NJ	4.76 -	0.250 -	110 UJ
SSOD-C4-4	1.45 J	1.18 J	1.18 J	1.18 J	10.0 J	17.0 NJ	5.08 -	0.689 -	4.00 U
SSOD-C4-6	1.47 J	1.26 J	1.23 J	1.26 J	17.5 J	16.7 NJ	7.26 -	0.717 -	1.60 NJ
SSOD-C4-7	1.12 J	0.742 J	0.740 J	0.742 J	3.23 U	17.7 NJ	6.45 -	0.573 -	4.00 U
SSOD-C4-8	0.946 J	0.717 J	0.694 J	0.717 J	4.11 J	14.6 NJ	6.22 -	0.522 -	3.80 U
SSOD-C4-9	1.07 J	0.689 J	0.627 J	0.689 J	2.48 U	14.6 NJ	5.19 -	0.372 -	3.80 U
SSOD-C4-10	1.04 J	0.836 J	0.871 J	0.836 J	7.85 J	9.70 NJ	6.58 -	0.495 -	6.30 UJ
SSOD-C4-12	0.683 J	0.603 J	0.586 J	0.603 J	3.70 J	9.83 NJ	2.79 -	0.242 -	4.10 U
SSOD-C4-13	0.805 J	0.675 J	0.677 J	0.675 J	2.48 J	10.2 NJ	3.67 -	0.308 -	3.80 U
SSOD-C4-13-D	0.960 J	0.787 J	0.777 J	0.787 J	3.12 J	6.86 NJ	4.89 -	0.506 -	3.80 U
SSOD-C4-14	1.28 J	0.954 J	0.946 J	0.954 J	4.28 J	12.5 NJ	3.23 -	0.666 -	4.30 U
SSOD-C4-16	1.18 J	0.848 J	0.833 J	0.848 J	7.09 J	11.7 NJ	9.03 -	0.598 -	4.10 U
Limit	1.7	1.8	1.7	1.5	82	280	12	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	ug/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%
Max. Result	1.47	1.26	1.23	1.26	17.5	18.5	9.03	0.717	1.6
Max. >= Limit	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	2	0	0	0	11
% Nondetects	0%	0%	0%	0%	17%	0%	0%	0%	92%
Est. Mean*	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--
a posteriori Sample	--	--	--	--	--	--	--	--	--
Size calculation	--	--	--	--	--	--	--	--	--

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 A
STATISTICAL ANALYSIS OF THE STORM SEWER OUTFALL DITCH CERTIFICATION UNIT 5

	Primary COCs					Secondary COCs			
SAMPLE ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Thorium-230	Arsenic	Beryllium	Aroclor-1254
SSOD-C5-1	1.02 J	0.751 J	0.779 J	0.751 J	3.18 U	18.0 NJ	5.29 J	0.473 -	4.60 UJ
SSOD-C5-3	1.14 J	1.11 J	1.17 J	1.11 J	9.21 -	10.5 NJ	5.02 J	0.469 -	4.20 UJ
SSOD-C5-4	1.02 J	0.756 J	0.760 J	0.756 J	5.09 -	14.0 NJ	7.23 J	0.765 -	4.00 UJ
SSOD-C5-4-D	1.14 J	0.926 J	0.977 J	0.926 J	7.36 -	8.61 NJ	4.94 J	0.509 -	3.90 UJ
SSOD-C5-5	1.22 J	0.967 J	0.968 J	0.967 J	6.83 -	14.7 NJ	5.77 J	0.674 -	4.10 UJ
SSOD-C5-6	1.26 J	0.997 J	0.999 J	0.997 J	7.93 -	9.64 NJ	4.52 J	0.580 -	4.00 UJ
SSOD-C5-8	1.00 J	0.909 J	0.893 J	0.909 J	19.1 -	17.1 NJ	5.21 J	0.546 -	3.90 NJ
SSOD-C5-10	1.34 J	1.03 J	1.06 J	1.03 J	7.82 -	10.8 NJ	13.5 J	0.646 -	4.10 UJ
SSOD-C5-11	0.774 J	0.473 J	0.478 J	0.473 J	3.65 -	12.3 NJ	3.84 J	0.252 -	4.00 UJ
SSOD-C5-12	1.10 J	0.790 J	0.788 J	0.790 J	6.99 -	15.3 NJ	7.66 J	0.555 -	5.40 NJ
SSOD-C5-14	0.938 J	0.697 J	0.727 J	0.697 J	2.84 U	15.6 NJ	4.35 J	0.340 -	4.00 UJ
SSOD-C5-15	0.911 J	0.733 J	0.710 J	0.733 J	3.39 U	18.7 NJ	4.29 J	0.507 -	4.20 UJ
SSOD-C5-16	1.12 J	0.899 J	0.916 J	0.899 J	6.74 -	19.5 NJ	4.39 J	0.526 -	4.50 UJ
Limit	1.7	1.8	1.7	1.5	82	280	12	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	ug/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%
Max. Result	1.34	1.11	1.17	1.11	19.1	19.5	13.5	0.765	5.40
Max. >= Limit	No	No	No	No	No	No	Yes	No	No
W-statistic Prob. #	--	--	--	--	--	--	2.9% (LN)	--	--
Test Procedure	--	--	--	--	--	--	Median (Sign)	--	--
Sample Size	12	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	3	0	0	0	10
% Nondetects	0%	0%	0%	0%	25%	0%	0%	0%	83%
Est. Mean*	--	--	--	--	--	--	5.12	--	--
UCL	--	--	--	--	--	--	5.77	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	Pass	--	--
a posteriori Sample	--	--	--	--	--	--	5	--	--
Size calculation	--	--	--	--	--	--	Pass	--	--

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 A
STATISTICAL ANALYSIS OF THE STORM SEWER OUTFALL DITCH CERTIFICATION UNIT 6

	Primary COCs					Secondary COCs			
SAMPLE ID	Radium-226	Radium-228	Thorium-228	Thorium-232	Uranium, Total	Thorium-230	Arsenic	Beryllium	Aroclor-1254
SSOD-C6-1	0.879 -	0.496 -	0.512 -	0.496 -	4.86 -	13.1 NJ	4.74 -	0.217 -	5.70 J
SSOD-C6-2	0.946 -	0.584 -	0.583 -	0.584 -	3.89 J	13.8 NJ	5.9 -	0.438 -	11.9 J
SSOD-C6-4	0.968 -	0.666 -	0.677 -	0.666 -	4.84 J	16.5 NJ	8.35 -	0.446 -	3.96 U
SSOD-C6-5	1.01 -	0.773 -	0.788 -	0.773 -	2.97 U	16.7 NJ	6.66 -	0.555 -	3.91 U
SSOD-C6-6	0.779 -	0.474 -	0.490 -	0.474 -	2.45 U	12.6 NJ	3.1 -	0.209 -	3.71 U
SSOD-C6-7	0.869 -	0.600 -	0.664 -	0.600 -	3.11 U	17.6 NJ	6.63 -	0.529 -	3.85 U
SSOD-C6-7-D	0.948 -	0.591 -	0.589 -	0.591 -	3.17 U	18.5 NJ	6.71 -	0.554 -	3.86 U
SSOD-C6-9	0.879 -	0.518 -	0.547 -	0.518 -	3.39 U	19.4 NJ	5.06 -	0.288 -	3.55 U
SSOD-C6-11	0.913 -	0.442 -	0.442 -	0.442 -	5.84 J	18.2 NJ	4.78 -	0.343 -	4.63 U
SSOD-C6-12	1.14 -	0.819 -	0.830 -	0.819 -	11.9 -	13.6 NJ	7.52 -	0.433 -	55.1 -
SSOD-C6-13	0.574 -	0.354 -	0.346 -	0.354 -	2.42 J	8.41 NJ	2.47 -	0.147 J	44.7 -
SSOD-C6-15	0.578 -	0.346 -	0.331 -	0.346 -	2.34 J	9.47 NJ	5.73 -	0.174 -	3.53 U
SSOD-C6-16	0.751 -	0.490 -	0.489 -	0.490 -	4.59 -	12.0 NJ	6.32 -	0.503 -	3.96 U
Limit	1.7	1.8	1.7	1.5	82	280	12	1.5	130
Units	pCi/g	pCi/g	pCi/g	pCi/g	µg/g	pCi/g	mg/kg	mg/kg	ug/kg
Conf. Level	95%	95%	95%	95%	95%	90%	90%	90%	90%
Max. Result	1.14	0.819	0.830	0.819	11.9	19.4 U	8.35	0.555	55.1
Max. >= Limit	No	No	No	No	No	No	No	No	No
W-statistic Prob. #	--	--	--	--	--	--	--	--	--
Test Procedure	--	--	--	--	--	--	--	--	--
Sample Size	12	12	12	12	12	12	12	12	12
Nondetects	0	0	0	0	4	12	0	0	8
% Nondetects	0%	0%	0%	0%	33%	100%	0%	0%	67%
Est. Mean*	--	--	--	--	--	--	--	--	--
UCL	--	--	--	--	--	--	--	--	--
Prob. > Limit	--	--	--	--	--	--	--	--	--
Pass / Fail	--	--	--	--	--	--	--	--	--
a posteriori Sample	--	--	--	--	--	--	--	--	--
Size calculation	--	--	--	--	--	--	--	--	--

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