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DATA VALIDATION PROGRAM

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ENCLOSURE

REMEDIAL INVESTIGATION
AND
FEASIBILITY STUDY
FEED MATERIALS PRODUCTION CENTER

DATA VALIDATION PROGRAM

Rev. 0
U.S. Department of Energy
Oak Ridge Operations Office

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LIST OF ABBREVIATIONS/ACRONYMS

ANSI	American National Standards Institutes
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BFB	Bromofluorobenzene
CC	Chain-of-Custody (form)
CCC	Calibration Check Compound
CCS	Contract Compliance Screening
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	Calibration Factor
CLP	Contract Laboratory Program
CRDL	Contract Required Detection Limit
CRHT	Contract Required Holding Time
CRQL	Contract Required Quantitation Limit
CRR	Contract Required Recovery
DCR	Document Change Request
DFTPP	Decafluorotriphenylphosphine
DOE	U.S. Department of Energy
DQO	Data Quality Objective
DVP	Data Validation Program Document
DVT	Data Validation Team
EPA	U.S. Environmental Protection Agency
FADL	Field Activity Daily Log
FFCA	Federal Facility Compliance Agreement
FMPC	Feed Materials Production Center
GC/EC	Gas Chromatography/Electron Capture Detector
GC/MS	Gas Chromatograph/Mass Spectrometer
IDL	Instrument Detection Limit
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma
ICS	Interference Check Sample
ICV	Initial Calibration Verification
IS	Internal Standards
LCS	Laboratory Control Sample
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSA	Method of Standard Addition
m/z	The ratio of mass (m) to charge (z) of ions measured by GC/MS
NCP	National Contingency Plan
OADS	Organic Analysis Data Sheet
OU	Operable Unit
PCB	Polychlorinated biphenyl
PE Sample	Performance Evaluation Sample
% D	Percent Difference

PIC	Pressurized Ionization Chamber
QAMS	Quality Assurance Management Staff
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QCL	Quality Control Limits
RAS	Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
RIC	Reconstructed Ion Chromatogram
RFA	Request for Analysis (form)
RI/FS	Remedial Investigation/Feasibility Study
RPD	Relative Percent Difference
RRF	Relative Response Factor
RRT	Relative Retention Time
RSD	Relative Standard Deviation
RT	Retention Time
SARA	Superfund Amendments and Reauthorization Act
SAS	Special Analytical Services
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	System Performance Check Compound
SV	Semivolatile analysis
TCL	Target Compound List
TIC	Tentatively Identified Compound
VOA	Volatile Organic Analysis
VTSR	Validate Time of Sample Receipt

PREFACE

The Feed Materials Production Center (FMPC), a 1050-acre site located about 20 miles northwest of downtown Cincinnati, Ohio, is a government-owned, contractor-operated facility which was used for the production of pure uranium metals for the U.S. Department of Energy (DOE). The principal operations consisted of metal fabrication and the processing of accumulated plant residues and miscellaneous feed materials obtained from other DOE sites. As a result of these activities both radioactive and non-radioactive wastes were generated, and in 1985 the U.S. Environmental Protection Agency (EPA) expressed major concern over the potential environmental impacts associated with these wastes. In 1986, a Federal Facility Compliance Agreement (FFCA) was jointly signed by DOE and EPA, which required that the environmental impacts associated with past and present activities at the FMPC be adequately investigated such that appropriate remedial response actions could be formulated, assessed, and implemented.

In response, a site-wide Remedial Investigation and Feasibility Study (RI/FS) is being conducted pursuant to Section 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and in conformance with EPA's Guidance on Remedial Investigations Under CERCLA, and Guidance on Feasibility Studies Under CERCLA. The RI/FS is also consistent with the guidelines, criteria, and considerations set forth in the National Contingency Plan (NCP) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Over the past several years, contractors have conducted preliminary evaluations to facilitate the scoping of the RI/FS Work Plan, as well as the actual remedial investigations (RIs) at selected site locations called operable units (OUs). The purpose of the RI is to determine the nature and extent of any release (or threat of release) of hazardous or radioactive substances, pollutants, or contaminants, and to gather the necessary data to support the development of the feasibility study (FS). Typical RI activities entail the collection and analysis of surface and subsurface soil samples, surface water and groundwater samples, and the performance of radiological screening and various geotechnical tests to confirm and characterize the extent of organic (volatiles, semi-volatiles, PCBs, and pesticides), inorganic (metals), and radioactive material contamination. The purpose of the FS is to develop and evaluate remedial action alternatives to protect public health and the environment from these characterized substances, pollutants, or contaminants. The EPA will select the remedy or remedies based on the findings and recommendations of the FS.

It is this end use of the data - the technical evaluation and decision-making - that requires the validation of the RI-generated data. For the purpose of the FMPC RI/FS Project, the definition and application of the term validation will comply with the EPA's Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80), which states: " . . . data validation is a systematic process for reviewing a body of data against a set of criteria to provide assurance that the data are adequate for their intended use." The requirement for data validation is addressed in Section 4 (Volume I) of the FMPC RI/FS Work Plan, the Data Management Plan (Volume IV of the Work Plan), and Section 10 of the Quality Assurance Project Plan (QAPP) (Volume V, Rev. 3 of the Work Plan). This document supplements and amplifies the requirements presented in Section 10 of the QAPP.

The purpose of the FMPC RI/FS data validation program is to provide assurance that the data used in FMPC RI/FS processes are qualified and adequate for their intended uses.

The purpose of this FMPC RI/FS Data Validation Program Document (DVP) is to provide the following:

- A description of the data validation process, its methodology, and the documentation generated.
- Guidelines for documenting and resolving those review findings which may affect the data's usability.
- Data validation authority, responsibility, and reporting structure.
- A plan for validation of RI/FS data.

I. INTRODUCTION

Validation Terminology

The terms "verification," "validation," and "evaluation" are often used interchangeably. This is understandable because the terms as defined in Webster's Dictionary are almost identical. However, according to QAMS-005/80, verification is but one important aspect of the validation process.

"Verification" is an ongoing, routine checking by technical, analytical, and clerical personnel on small sets of data to determine if the data have been accurately quantified, recorded, and transcribed; if prescribed procedures have been complied with; if the data appear suitably complete; and if the data appear to be reasonable and consistent, based on what is already known about the characteristics of the site being investigated.

"Validation" is an after-the-fact, independent, systematic process which compares a body of data against a set of performance objectives or data quality objectives (DQOs) to determine consistency with, and applicability to, specific purposes. The DQOs for chemical analysis are contained in either the (QAPP) and/or Laboratory Data Validation Guidelines for Evaluating Organic Analysis, U.S. EPA, February 1988 and the Laboratory Data Validation Guidelines for Evaluating Inorganic Analysis, U.S. EPA, July 1988. Currently, there is no documented, specific EPA guidance for validating radiochemical analyses.

Whereas validation stamps data as reliable or "good" data, "evaluation" determines its technical usefulness. Upon completion of validation, OU personnel perform a technical evaluation, which entails the reduction, tabulation, manipulation, interpretation, and environmental fate and transport modeling/evaluation. These activities result in the production of technical reports.

FMPC RI/FS Data Validation

For the FMPC RI/FS project, data validation means:

1. Reviewing documentation of field measurements and observations, analytical results, and associated QA/QC information to ensure that the data were gathered and analyzed according to appropriate criteria specific to the analyses performed and results/information requested.

2. Identifying and correcting/rationalizing data discrepancies/deficiencies.

3. Characterizing the data with respect to their usability.

Data validation includes:

1. Assurance that field sampling and laboratory analysis are performed under approved project and laboratory QA programs.

2. Data results and documentation review by the data validation team and others using specific checklists and procedures to verify compliance with predetermined sampling/data-gathering requirements, verify adequacy of laboratory analyses against established criteria, document discrepancies and deficiencies, and recommend data qualifiers (signifying the data's conformance to QC requirements).

3. Reconciliation of discrepant and deficient data by field managers, project technical personnel, and data users to determine/decide the data's validity with respect to their intended use.

4. Review of data discrepancies/deficiencies by the project QA officer to determine and accomplish any required project QA/QC system actions.

5. Assignment of appropriate data qualifiers (signifying the data's usability for a particular purpose) by project technical personnel and incorporation of the data qualifiers into the project database by data management personnel.

The entire data validation process requires participation by the data validation team, laboratory QA personnel, the project QA officer, project technical personnel, data users, and database management personnel. Data validation results require approval of the project director.

The expected product of the data validation process is confirmation/certification that the data to be used are adequate for their intended use.

Data validation is complete when the project director approves use of the data for a particular purpose and appropriate qualifiers are incorporated in the project database.

This DVP is the FMPC RI/FS Project guidance for conducting the data validation process. The objective of the validation process is to provide assurance that a defensible data collection "road map" exists that can be used to trace and justify activities, analyses, and decisions based on the data. This assurance rests principally on the adequacy of:

- Sample collection procedures
- Sample tracking procedures
- Field and analytical instrument calibration
- Field and analytical quality control procedures
- Training and qualification of personnel
- Documentation

II. TECHNICAL APPROACH

To ensure that all data validation activities are conducted in a cost-effective, technically sound, and defensible manner, the following technical approach will be used:

- All validation activities will be conducted in accordance with this program, which addresses the technical, regulatory, and QA requirements for this RI/FS project. A listing of documents containing project guidance and requirements is provided in the References section of this program.

- Review checklists and procedures will be used to perform the data review. Checklists used to validate chemical analyses are directly traceable to the appropriate requirements and industry standards (e.g., ANSI, ASTM, ASME).

Checklist Development

The checklists in Appendix A were developed from DQOs in the FMPC QAPP, Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analysis, and other QA acceptance criteria for non-EPA methods.

Some of the key criteria or DQOs which are examined during laboratory analysis are:

- Organics

  - holding times
  - gas chromatograph/spectrometer tuning
  - calibration
  - blanks
  - surrogate recovery
  - matrix spike/matrix spike duplicates
  - field duplicates

- Inorganics

  - holding times
  - calibration
  - blanks
  - field duplicates
  - matrix spike/matrix spike duplicates
  - furnace atomic absorption
  - serial dilution analysis
  - CRDL standards for AA and ICP

- inductively-coupled plasma interference check sample
- verification of instrument parameters (e.g., detection limits and linear ranges)

• Radiochemical

- blanks
- replicates
- relative standard deviation
- spikes
- percent bias exceeding control limits

To comply with official QAMS-005/80 guidance, data are of acceptable quality only if they meet specified DQOs for precision, accuracy, representativeness, completeness, and comparability. Upon completion of data validation by laboratory personnel (and before submittal of the certificate of analysis and completed data packages to the Project Office), the data are clearly flagged with code letters which represent laboratory data qualifiers.

Graded Approach

A graded approach will be used to determine the usefulness of data generated, and the extent of the validation effort. These will be based on:

1. Intended use of the data (level of confidence necessary)
2. Analytical level associated with the sample
3. Data Validation phase
4. Usefulness of qualified data
5. Non-technical review for defensibility and completeness

1. Intended Use of the Data: In general terms, the key to determining the amount of validation effort required is two-fold--the intended use of the data and the level of quality required to assure usefulness (i.e., what level of confidence must be present). Once the data use categories have been specified in the sampling plan, the intended use will help identify the validation level for each data category.

In practical project terms, this graded approach to quality (i.e., the level of precision, accuracy, representativeness, comparability, and completeness required) is driven in part by where in the investigative process the data are generated. For example, the quality required from an initial walk-on radiological screening to determine if anomalous levels of radiation are present differs significantly from that required to determine the exact concentrations of thorium or if thorium has leached into a public water supply's aquifer.

2. Analytical Support Levels: The rigor of QA/QC testing and resultant documentation (and therefore the extent of verification and validation to be performed) directly relates to the level in which the data are placed. These five levels are described in Section 4.3 of the Data Quality Objectives for Remedial Response Activities: Development Process, (EPA/540/G-87/003). These five analytical support levels deal only with quality assurance levels and are not the same as validation levels:

- Level I (qualitative) - applies to field screening or analysis using portable instruments. Results are often not compound-specific and not quantitative, but results are available in real-time.

- Level II (semi-quantitative) - includes both field and laboratory analyses using either more sophisticated portable analytical field instruments or controlled laboratory procedures. There is a wide range in the quality of data that can be generated. The quality depends on the use of suitable calibrations standards, reference materials, sample collection techniques, equipment calibration, and the training of the operator. Results are defendable as approximations of the true values of measured analytes and may include "qualified" Level III, IV, or V data as well. Complete field documentation regarding sample collection and handling are necessary to support Level III, IV, and V data.

- Level III (quantitative, not reported with QA/QC documentation) - includes all analyses performed in an off-site analytical laboratory. Level III analyses provide quantitative results within the limits of the laboratory quality assurance program. Results may or may not be defendable due to the absence of supporting data to determine actual compliance with established QA/QC requirements. Level III analyses may or may not use Contract Laboratory Program (CLP) procedures, but do not usually utilize the validation or documentation procedures required of CLP Level IV Analysis. The laboratory may or may not be a CLP laboratory.

- Level IV (quantitative, reported with QA/QC documentation) - CLP routine analytical services. All analyses are performed in an off-site CLP analytical laboratory using CLP protocols. Level IV data which is not qualified is defendable as a quantitative value within the limits of the laboratory QA/QC program. Qualified data may meet Level II, III, or V requirements depending on the nature of the variance. Level IV is characterized by rigorous QA/QC protocols and documentation.

- Level V (quantitative, not reported with QA/QC documentation) - analysis by non-standard methods. All analyses are performed in an off-site analytical laboratory which may or may not be a CLP laboratory. Non-standard methods are defined as any method or procedure which has not been subjected to performance and/or peer review by the scientific community. Conversely, standard methods are those which have been accepted and/or published by EPA or other recognized standards writing organizations. As defined, non-standard methods include published

methods where material deviations have been made, such as extension of recommended holding times, and methods developed or modified to analyze for specific constituents or detection limits. Radiological data may fall into this latter category. Data derived from non-standard methods have the same QA/QC documentation requirements as Level IV data and requires additional internal validation of the method by the laboratory. While quantitative in nature, data may or may not be defendable depending upon the extent of method validation done to determine both precision and bias, and general acceptance in the scientific community.

Examples of probable data levels for this project are:

- Level I - walk-on radiological screening data
- Level II - field data collected for pH and alkalinity
  - laboratory data qualified as approximate (J)
- Level III -data collected from SW-846 methods
  - Level IV data which lacks proper documentation
- Level IV - routine RI/FS target compound list for soil and water (CLP)
- Level V - radiological samples
  - non conventional parameters
  - data from non-standard methods

The quality assurance levels are incorporated into the checklists as presented in Appendix B of this Program.

3. Validation Phase: The QAPP, section fifteen, divides validation into two levels. The first validation level is a verification of electronically transferred data against a laboratory hard copy of analytical results. This DVP addressed the second validation level--the technical analysis of data.

This validation program is divided into two phases. The first phase deals with field data and is validated to Quality Assurance Levels I and II. Level II data is then submitted to the second phase which deals with analytical results and is validated to Levels III, IV, V. The analytical results are analyzed in discrete sets with associated quality control samples, and the validation will be performed on these individual and discrete sets of data.

The first phase of the validation process is a routine verification or checking that the appropriate procedures for field observations, sampling, and measurements were specified and followed. Level II and higher data require documentation that a representative sample has been collected for submission to field or laboratory analysis. Verification of calibration procedures is necessary to validate Level II field data. This first phase typically covers the time from sample planning to the time the packaged sample is received and logged in at the laboratory. Validation of data at the second phase is conditional on obtaining valid Level II field data.

The second phase is the verification or checking of analytical elements such as holding time, detection limit results, and calibration results against performance criteria or DQOs. It requires practical experience, on-site project knowledge, and technical judgment. It includes validation of laboratory analytical results (which are documented in the certificate of analysis and associated data package) and review of the laboratory's validation efforts by the data validation team.

The non-CLP analytical criteria used in the checklists are CLP criteria, where applicable. The rest of the data will be validated against established criteria in the QAPP. Data that are not covered by the QAPP or CLP will be validated on a case-by-case basis against documented criteria in the checklists.

The review of calibration and raw data of non-level IV (non-CLP) QA/QC review cannot be performed since raw data are not reported. Therefore the review areas concerning non-level IV (non-CLP) raw data shall be covered by internal and external audits of the laboratory for compliance to the QAPP.

4. Usefulness of Qualified Data: A final classification of data is performed based on deficiencies noted in the validation process. Data is either rejected due to a lack of technical merit, or is qualified in some way to indicate a departure from the desired quality objectives.

Qualified data may or may not meet the requirements for its intended use - but may be usable nonetheless at a different analytical level. For example, intended Level IV data which lacks documentation required under the CLP package can be qualified as Level III data where the laboratory keeps evidence of QA/QC compliance on file at the lab site. Where technical qualifiers are present, intended Level IV data is usable only for Analytical Level II, indicating the "semi-quantitative" nature of the result. In cases where departures have been made to published methods (i.e., analysis of samples past recommended holding times), the results should be classified as Level V data, indicating the use of a non-standard method.

5. Non-Technical Review For Defensibility and Completeness: A final review is made to determine both the representativeness and completeness of data which is in essence a legal review. The non-technical review considers the probative value of the data in light of qualifiers added, and the analytical level assigned. The grade 5 review deals with data defensibility as it applies to the representativeness of results obtained, when compared to "in situ" conditions encountered in the field. This is a different standard of review from that of defending the confidence of results obtained by the lab.

The non-technical review includes assurances that samples were correctly sampled, preserved, and transported to the laboratory as evidence by a complete chain of possession. The data generated must be properly authenticated, and the results entered into the database must be accurate. Other factors are considered such as access to data and file by non-authorized personnel, use of non-standard methods and procedures, data gaps, etc.

The non-technical review is performed upon completion of field and laboratory data validation.

The sequence of validation activities is illustrated in Figures 1 and 2 and described below:

<u>Phase I Review (Field Measurements and Observations)</u>

Step 1 Identify data (i.e., sample numbers, well numbers, etc.) to be validated.

Figure 1
Phase I Review
(Field Measurements and Observations)

Step 1	Identify Data
Step 2	Obtain data forms/records
Step 3	Review data using designated procedures and checklists
Step 4	Initiate Discrepancies/Deficiency Resolution Process for deficient data
Step 5	Report grouped data validation results to Project Director
Step 6	Retain copies of completed checklists. Replace original data forms/records in Project Files

Step 2 Obtain original completed field data forms/records.

Step 3 Review data in planned sequence using field data review instructions, procedures, and checklists (Appendix A-I).

Step 4 If data meet checklist requirements, field data validation process is complete. If data are discrepant or deficient, initiate Discrepancy/Deficiency Resolution Process.

Step 5 Report field data validation results to the project director. List all sample numbers, flag discrepant/deficient data samples, include copies of appropriate data validation deficiency reports (less review checklists).

Step 6 Retain copies of completed review checklists in DVT files. Replace original field data forms/records in FMPC project files.

Phase II Review (Laboratory Analyses)

Step 7 Obtain original completed laboratory certificate of analysis /data packages.

Step 8 Review data sets using laboratory analyses review instructions, procedures, and checklists (Appendices A-II through A-VI).

Step 9 If laboratory analyses and results meet review requirements, laboratory analysis validation process is complete. If laboratory analyses or results do not meet review requirements, initiate Discrepancy/Deficiency Resolution Process.

Step 10 Determine the Analytical Level associated with all qualified results and submit as part of the Discrepancy/Deficiency Resolution Process.

Step 11 Report laboratory data review results to the project director. List all sample numbers, flag discrepant/deficient/questionable samples, include copies of appropriate data validation deficiency reports (less review checklists).

Step 12 Retain copies of completed review checklists in DVT files. Replace original laboratory analyses and results in FMPC project files.

Step 13 Once data validation is complete, the non-technical review is initiated to determine legal defensibility.

Phase I and II validation may result in data of questionable acceptability. This questionable acceptability may be due to the absence/insufficiency of one or more of the following requirements for quality data:

- Specified, adequate sample collection procedures and adherence to those procedures by trained personnel.

- Specified, adequate sample tracking procedures and adherence to those procedures by trained personnel.

- Specified, adequate field and analytical instrument calibration and adherence by trained personnel to the work plan and additional approved procedures on file in the Project QA office.

- Specified, adequate quality control procedures and adherence to those procedures by trained personnel.

Discovery of an absent or non-compliant attribute necessary to support the integrity of the data will result from the completion of the detailed review checklists contained in Appendix A.

The checklists ask many specific questions; however, an unacceptable answer to one does not necessarily indicate that the data are automatically bad or unusable. Specific guidance on the information to be provided for each major measurement parameter is provided in Section 5.10 of QAMS-005/80, "Data Reduction, Validation, and Reporting."

For checklist items which cause the reviewer to question the data's integrity, a formal evaluation/proposed resolution will be conducted, and the proposed resolution will be reviewed and approved by the project director. Documentation of the process will become part of the project files.

- All original project documentation, original validation documentation, and any reports summarizing or evaluating the validation effort shall be retained in the FMPC Project Files.

- DVT data validation/review reports to the project director according to the review sequence will document progress of the validation process.

- The validation process will be periodically inspected/surveilled by the QA staff to monitor and document compliance with the DVP by the validation team, and to assess the team's effectiveness.

Discrepancy/Deficiency Resolution Process

1. The data validation team (DVT) will document discrepancies/deficiencies by filling out the FMPC RI/FS Data Validation Deficiency Report and attaching the appropriate, completed CLP, non-CLP, and radiochemical review checklist (summarizing memo only for field observations and measurements) thereto.

2. The technical representative will sign and date the deficiency report, and assure that the report is sequentially numbered and logged in the FMPC RI/FS Data Validation Deficiency Reports Log.

3. DVT member will deliver the completed, numbered, signed deficiency report to the project QA officer.

4. QA officer will review the deficiency report to determine Quality Assurance actions (non-conformance reports, field feedback program, etc.).

   A. If the identified discrepancy/deficiency is associated with field observations and measurements, the QA officer will assign the discrepancy/deficiency to field technical requirements manager to (1) find the missing information, (2) reaccomplish the procedure, or (3) explain the impact of the data discrepancy/deficiency on the validity of the data. The field technical requirements manager's signed and dated explanations/comments will be legibly printed in ink on the reverse side of page 2 of the deficiency report, and returned to the QA officer.

   B. For both laboratory analysis and field data discrepancies, QA officer will affirm initiation of appropriate QA/QC system actions, and sign and date the data validation deficiency report.

5. QA officer will deliver the DVT- and QA-signed deficiency report to the project deputy director/technical or project technical manager.

6. Deputy director/technical or technical manager will review the data user's recommendation on the deficient/discrepant data's validity for their intended use; comment on the recommendation, if necessary; sign the data validation deficiency report; and deliver the package to the project director.

7. Project director will indicate his concurrence with the data user's recommendation and/or his approval to use the deficient/discrepant data for a particular purpose by signing the data validation deficiency report.

8. Usability status of the data (identified by data qualifier assigned to each data sample number) will be entered in the RI/FS project database.

9. After data qualifiers have been entered in the project database, the approved/signed deficiency report will be placed in the project files.

Qualifier Code Identification

The following codes shall be assigned to chemical data in order to identify confidence of identification and quantitation. These qualifiers are taken from the fundamental guide for organic and inorganic analysis validation:

Laboratory Data Validation Functional Guidelines for Evaluation Inorganic Analysis, U.S. Environmental Protection Agency, July 1, 1988, and

Laboratory Data Validation Functional Guidelines for Evaluating Organic Analysis, U.S. Environmental Protection Agency, February 1, 1988.

Codes Relating To Identification
(confidence concerning presence or absence of compounds):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Detected at a level greater than the instrument detection level (IDL) but less than the contract required detection limit (CDRL).

[IDL is defined as the lowest measureable quantity above that of random noise multiplied times a factor of two (2)]

R = Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.

Codes Related To Quantitation
(can be used for both positive results and sample quantitation limits):

J = Analyte present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

JB = Approximate data due to blank contamination.

The following codes shall be assigned to radiochemical samples in order to identify confidence of quantitation.

C = Calculated total uranium value is outside the acceptance limits.

D = Calculated percent enrichment value is outside the acceptance limits.

E = Calculated $^{U}234$ to $^{U}238$ activity is outside the acceptance limits.

F = QC data not located.

G = QC data exceed control limits.

Other Codes Related to Data Usability

X = Data not usable

XB = Reject data due to blank contamination

XM = Reject data due to multiple deficiencies

XR = Reject due to other quality assurance criteria

III= Results suitable for Analytical Level III

V= Results suitable for Analytical Level V

Figure 3 shows the lines of authority and reporting structure for the FMPC data validation program.

The Project Director will identify the project data to be validated. The Project QA Officer is responsible for managing the data validation effort. He will advise the Project Director directly of overall validation progress. The Project Director or designee will review the results, direct resolution of data validation deficiencies, and approve the data's use for technical evaluations and reports.

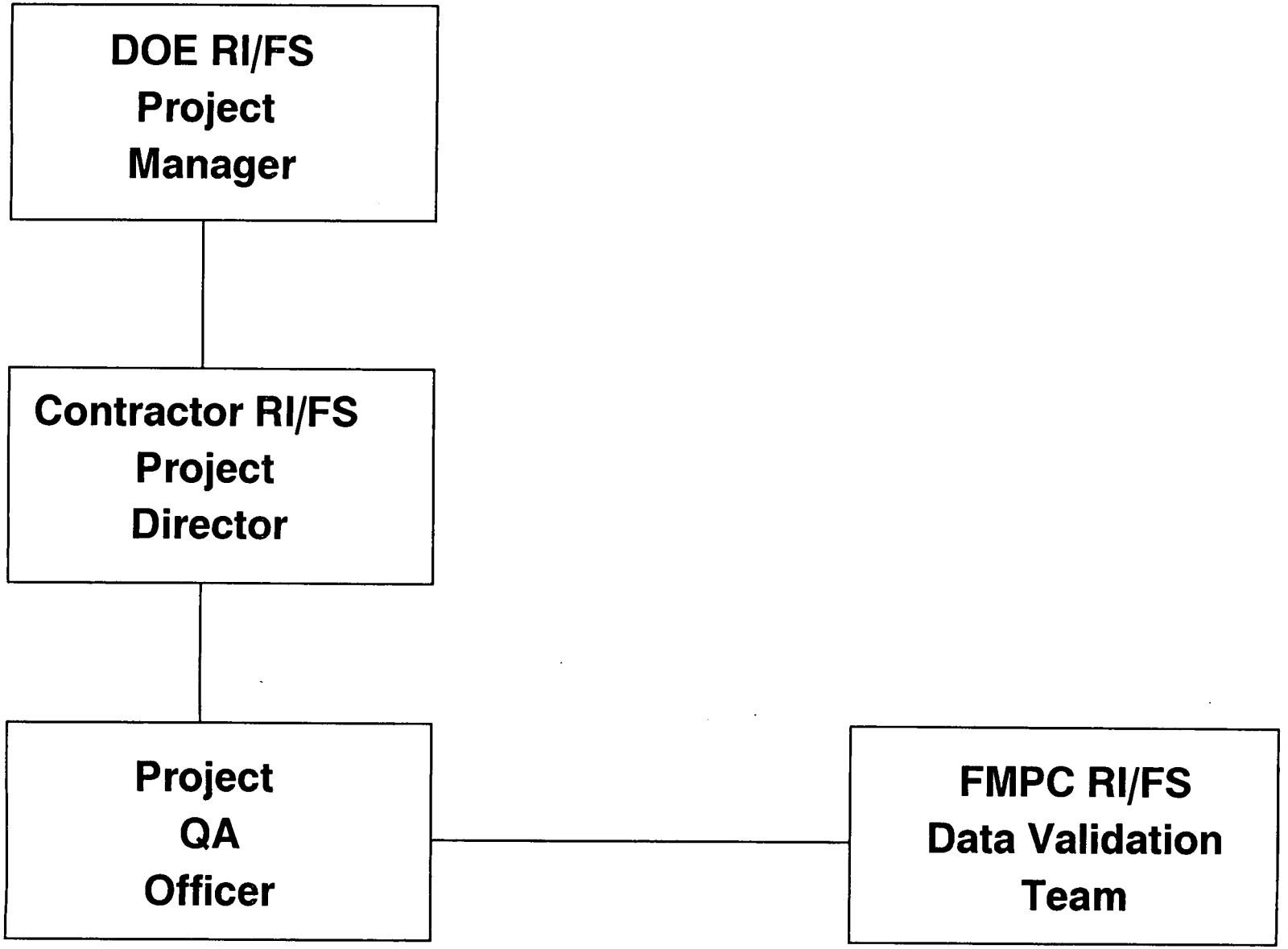
Overall responsibility for project use of all data rests with the DOE Project Manager. Data validation issues unresolvable at lower levels will be elevated to him/her through the project structure.

The Project Director or designee will provide administrative, logistics, and funding support for the data validation effort.

Independent of Project Control

The DVT is responsible for reviewing the identified project data in accordance with this DVP. The DVT takes their direction from the Project QA Officer.

Figure 3
Data Validation Reporting and Coordination Structure



IV. DVT ORGANIZATIONAL RESPONSIBILITIES AND FUNCTIONS

Figure 4 shows DVT internal organizational responsibilities.

The following specific functions are associated with the Figure 4 organizational responsibilities:

(1) Plan, assign, direct, coordinate, control,and report DVT activities and results; review and sign Data Validation Discrepancy Reports.

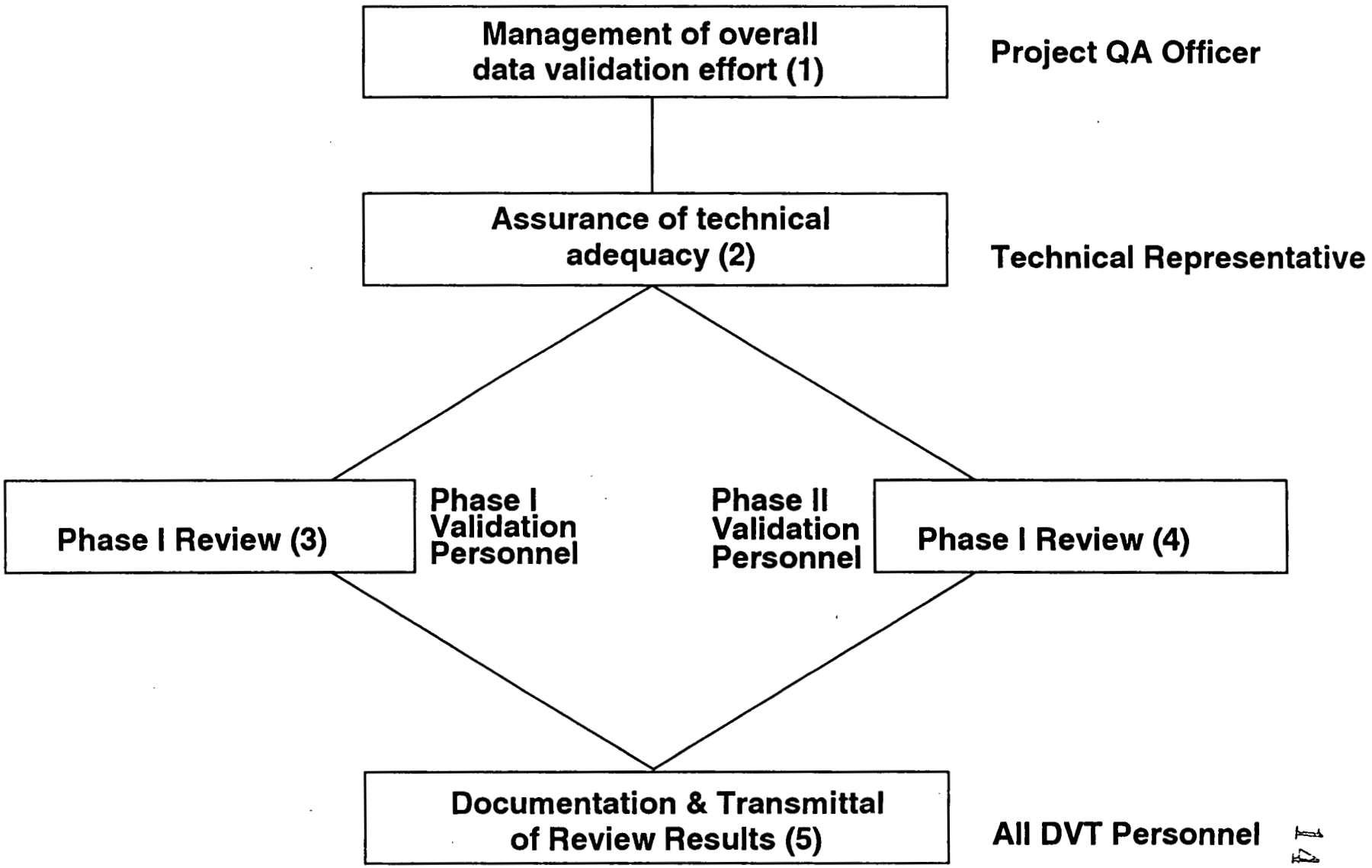
(2) Review DVP for technical adequacy; develop Phase I and Phase II checklists and procedures; advise Project QA Officer on personnel qualifications and training; train DVT phase I and phase II validation personnel; review completed phase I and phase II checklists; recommend appropriate qualifiers for reviewed data; review and sign Data Validation Discrepancy Reports.

(3) Review and verify field measurements and observations in accordance with phase I review procedures; complete phase I review checklists; complete Data Validation Discrepancy Reports.

(4) Review, verify, and certify laboratory analyses in accordance with phase II review procedures; complete phase II review checklists; complete Data Validation Discrepancy Reports.

(5) Ensure DVT technical representative signature on completed Data Validation Discrepancy Reports; log discrepancy reports in Data Validation Discrepancy Report Log; copy all discrepancy reports and completed checklists for retention in DVT files; deliver completed discrepancy report/checklist package to Project QA Officer.

Figure 4
DVT Organizational Responsibility



V. DVT PERSONNEL QUALIFICATIONS AND TRAINING

Each team member will have training covering data validation responsibilities. The DVT technical representative will supervise training in the use of checklists.

DVT Basic Orientation/Training

DVT member basic orientation/training consists of:

- General field techniques briefing.
- FMPC RI/FS Work Plan, Vol. I, Section 4 (Technical Approach: Remedial Investigation) study and familiarity.
- FMPC RI/FS Quality Assurance Project Plan, study and familiarity.
- FMPC RI/FS Data Validation Program.

Basic orientation/training for each DVT member will be documented on the Data Validation Team Member Basic Orientation/Training form (Appendix B). The completed form will be retained in DVT files.

The following list specifies the minimum education, training and experience necessary for DVT functions.

Phase I, QA levels I, II

- Validation Level 1 - verification of data
  - Associate degree or related experience
  - Trained in use of FMPC RI/FS Data Validation Phase I checklists and procedures
  - Complete DVT Training/Orientation Program

- Validation Level 2 - field data validation
  - AA degree in Environmental Science, Engineering, Geology, or Chemistry
  - B.S. in related field
  - Trained in use of FMPC RI/FS Data Validation Phase I checklists and procedures
  - Complete DVT Training/Orientation Program

Phase II, QA Levels III, IV, V

- Validation Level 1 - verification of data (chemical and radiological)
  - AA degree in chemistry plus two years of laboratory experience
  - B.S. in chemistry or experience

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- B.S. in related field with two years of laboratory experience
- Trained in use of FMPC RI/FS Data Validation Phase I checklists and procedures
- Complete DVT Training/Orientation Program

- Validation Level 2 - validation of laboratory data (chemical)

- B.S. in chemistry required, Masters degree preferred
- Five years experience in organic and inorganic analysis
- Two years of CLP, CLP audit, or QA/QC audit experience
- Complete DVT Training/Orientation Program

- Validation Level 2 - validation of laboratory data (radiological)

- B.S. in Chemistry, Physics, or Physical Science, Masters degree preferred
- Five years experience in Health Physics or Radiological Science
- Two years related CLP or QA/QC experience
- Complete DVT Training/Orientation Program

VI. PLANNED RI/FS DATA REVIEW AND REPORTING

Data Validation will be reviewed/performed on field and laboratory data, including but not limited to:

1. groundwater
2. Task 3.2.1 (subsurface soil)
3. Task 3.3 (surface water and sediment)
4. Task 3.4.2 (surface soil)
5. Task 3.7 (facilities testing)
6. Task 3.7.4 (facilities testing-soil)
7. Task 3.7.5 (geochemical)
8. Task 9.25 (WMCO RCRA groundwater)
9. Task 9.27 (WMCO RCRA groundwater and EMP)
10. Task 3.8 (Building 69 investigation)
11. Task 5.6 (Bench scale permeability)
12. Task 3.5 (biological)
13. Other FMPC sampling and analysis tasks (as applicable)

The DV report will list the data sample numbers and flag the discrepant/deficient data samples, and will include copies of the appropriate DVT-generated Data Validation Deficiency Reports (less review checklists).

Separate final reports will be presented for radiochemical and other data validation as required by specific RI/FS work plans.

References

Data Management Plan, Volume IV of the FMPC RI/FS Task 2 Report Work Plan Requirements, March 1988.

Data Quality Objectives for Remedial Response Activities (Development Process), U.S. Environmental Protection Agency, March 1987.

Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80, 1980.

Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis, U.S. Environmental Protection Agency, July 1, 1988.

Laboratory Data Validation Functional Guidelines for Evaluating Organic Analysis, U.S. Environmental Protection Agency, February 1, 1988.

Quality Assurance Project Plan, Volume V of the FMPC RI/FS, Task 2 Report Work Plan Requirements, Revision 3, March 1988.

Quality Assurance Manual, IT Corporation Environmental Projects Group Analytical Services, Revision 1, February 1, 1988.

Quality Assurance Manual, IT Corporation Environmental Projects Group Engineering Operations, Revision 1, July 1, 1987.

Quality Assurance Manual Laboratory-Specific Attachment, IT Corporation Knoxville Laboratory (Middlebrook Pike), Revision 1, August 18, 1989.

Quality Assurance Manual Laboratory-Specific Attachment, IT Corporation Mixed Waste Laboratory, Revision 1, December 6, 1989.

Quality Assurance Manual Laboratory-Specific Attachment, IT Corporation Radiological Sciences Laboratory, Revision 0, August 1, 1987.

Sampling Plan, Volume I of the FMPC RI/FS Task 2 Report Work Plan Requirements, March 1988.

Work Plan Addendum, Production and Additional Suspect Areas, October 1989.

Work Plan for Conducting the Site-wide Remedial Investigation and Feasibility Study of the Feed Materials Production Center, FMPC RI/FS Task 2 Report Work Plan Requirements, March 1988.

APPENDIX A
REVIEW CHECKLISTS AND INSTRUCTIONS

GENERAL INSTRUCTIONS

Data validation procedures for determining the acceptability of data generated during previous, recent, and ongoing studies for the FMPC will follow the same criteria described in Section 10.0 and 11.0 of the project-specified QAPP. QA will assign individuals to validate the data. This effort will be accomplished in accordance with the method described in this appendix.

- It may be necessary to originate a new data report form. This requires all appropriate signatures.
- All data must be returned in a validation data package, appropriately identified as to its status.
- Response to problems resulting from the validation shall go through the resolution process and be signed off by the project director.
- Data validation for geochemical data is covered under the field and analytical check lists.
- Changes to original documents are performed in accordance with RI/FS QAPP and Page A-4.

APPENDIX A-I
FIELD MEASUREMENTS AND OBSERVATIONS

INSTRUCTIONS

The purpose of this instruction is to provide an organized method to review documentation of sampling performed in the RI/FS at FMPC. Checklists are contained herein to aid in identifying discrepancies and deviations to procedures contained in Volume I of the RI/FS Work Plan "Sampling Plan" and Volume V "Quality Assurance Project Plan" (QAPP).

Field measurements and observations generated in accordance with the project specific work plan will primarily consist of radiological screening data, field temperature, pH, and specific conductance data, and data associated with soil boring advancement, monitoring well installation and development, groundwater data, geophysical logging and soil classification, etc. These data will be validated by a review of the project documentation to check that all forms specified in the work plan and QAPP have been completely and correctly filled out and that documentation exists for the required instrument calibration. This review of documentation will be considered sufficient to certify that proper procedures have been followed during the field investigation per Section 10.2 of the QAPP. The DV technical representative shall certify that the data reports or forms have been adequately validated.

General Instructions

As each document is reviewed, record instances of the following:

- Use of "white out" on a document
- Changes and/or corrections not properly made

  NOTE: All corrections should be indicated by a single line through the entry, with initials and date of the individual making the correction. Note these occurrences on the checklists provided and reference the **particular document where this discrepancy or deviation occurred.**

Do not make corrections to any document being reviewed.

As each document is reviewed, complete each appropriate checklist. Traceability to each document reviewed is to be maintained. The reviewer shall also signify completion of the review by signature and date.

Obtain a copy of the filing system index to familiarize yourself with document locations.

Copies of the data base are available for your use. These copies cross reference various documents of a particular sample well number, or document control number.

Use the checklist provided to trace a particular sample from one document to another. An example of this is a sub-surface soil sample indicated on the boring log, sample

collection log, chain-of-custody form (CC), Request For Analysis form (RFA) and the Field Activity Daily Log (FADL) or Geologist Field Log.

The checklist is to be used as a guide to ensure that all requirements of the QAPP were implemented at the time the document was prepared. If no deviations are found on a particular document, the completion of a checklist is still required. If a discrepancy is found, the appropriate box on the checklist shall be marked and pertinent comments made. The checklist will be retained for further review by the DV technical representative to determine the effect that particular discrepancy has on data quality (if any). Documentation of discrepancies will also aid in determination of future corrective action.

References are made in this Appendix to appropriate sections of the QAPP. This is to aid the reviewer in determining all of the requirements which may apply to a particular document and drawing conclusions as to whether a discrepancy actually exists.

As each document is reviewed, verify that calibration documentation exists for the required instrument at the time of usage.

As each document is reviewed, verify that training records exist for the field personnel involved in data collection and reporting.

All field measurements and observations forms or reports shall be checked for completeness. All space entries are to be filled out. There are to be no blank data entry spaces.

All field measurements and observations forms or reports shall be checked for accuracy. All spaces shall contain reasonable entries (e.g., temperature space shall contain a temperature reading, not a check mark).

Per data reporting format and protocols in Section 5.3 of the QAPP, all lines on the forms will be completed. The letter designation "NA" for not applicable or "NK" for not known will be used in all blank spaces. Also acceptable is a neat and precisely drawn arrow through applicable spaces from an "NA" or "NK." If some steps or procedures were not performed as described, the reason must be stated as completely as possible on the appropriate form or submitted as an attachment thereto.

General Validation Checklists (QA Levels I and II)

Field measurements and observations validation shall use the General Validation Checklists for each of the following data form or report.

A. Field Daily Activity Logs
B. Sample Collection Log
C. Chain of Custody

D. Request for Analysis
E. Training, procedures, nonconformances, variances, document change requests, audits, surveillances, and instrument calibrations

Specific Validation Checklist (QA Levels I and II)

Specific Validation Checklist will be used for each of the following data forms or reports.

A. Subsurface Soil Sampling
B. Well Construction and Development
C. Aquifer/Permeability Testing
D. Groundwater Sampling
E. Surface Soil Sampling
F. Surface Water and Sediment Sampling
G. Biological Sampling
H. Radiation Survey (Node and Walkover Surveys)

The general validation checklists are incorporated with the specific validation checklist as one line item where applicable. Biological samples will require that each of the general checklists be filled out.

Subsurface Soil Samples

A. Refer to the Specific Validation Checklist for Subsurface Soil Sampling.

B. Each soil boring log (QAPP Figure 5.8) contains the number of soil samples taken from that boring. Each sample should appear in the Sample Collection Log, C-C, RFA, and FADL (or field log). Make certain each form is correctly filled out by utilizing checklists for these forms.

C. Sections 4.3 through 4.5 of the Sampling Plan (Work Plan Vol. 1) provide background information for subsurface soil sampling. Section 5.2 of QAPP contains drilling procedures. Section 7.1 of QAPP contains requirements for Sample Collection Logs, C-C and RFA. (NOTE: There are General Validation Checklists for each of these standard forms.)

D. **The RFA should indicate the type of analysis the sample should undergo.** The lab performing the analysis is responsible for assuring that the packaging requirements, as contained in Table 4-1 of the sampling plan, correspond to the type of analysis requested on the RFA.

E. Radiological sampling requirements of subsurface soil are contained in Section 6.6.2 of the QAPP.

Well Construction and Development

A. Refer to the Specific Validation Checklist for Well Construction and Development.

B. The following documents require review (for each well):

- FADLs (use General Validation Checklist)
- Figure 5-12 "Monitoring Well Installation Details"
- Figure 5-9 "Piezometer Installation Sheet," Note that construction should correspond with requirements contained within QAPP Section 5.3
- Figure 5-13 "Monitoring Well Completion Checklist"
- Figure 5-10 "Piezometer Sensitivity Test"
- Figure 5-16 "Monitoring Well Development"

C. Section 3.3 of the Sampling Plan contains background information relative to well construction.

D. QAPP Section 5.3 contains background information relative to monitoring well construction. QAPP Sections 5.4 and 5.5 contain requirements for well development and geophysical logging respectively.

Aquifer/Permeability Testing and Water Level Measurements

A. Refer to the Specific Validation Checklist for Aquifer Testing

B. The following documents require review (for applicable wells):

- FADLs (use General Validation Checklist)
- Figure 5-18 or Figure 5-19, "Falling Head" or "Constant Head" Permeability Test respectively
- Figure 5-1 "Piezometer Data Sheet"

C. Section 3.4 of Sampling Plan contains background information relative to aquifer testing and water level measurements.

D. QAPP Section 5.6 contains requirements for aquifer testing, and QAPP Section 6.1.2 contains requirements for water level measurements.

Groundwater Sampling

A. Refer to Specific Validation Checklist for Groundwater Sampling.

B. The following documents require review:

- Figure 6-1 "Water Quality Field Collection Report"
- C-C, RFA, FADL, Sample Collection Log (NOTE: Use General Validation Checklists for review of these standard documents.)

C. Section 3.5 of Sampling Plan contains information relative to groundwater sampling.

D. QAPP Section 6.1 contains requirements for groundwater sampling. Please pay particular attention to Section 6.1.1 -each sample type requires a specific container. The RFA, Sample Collection Log, and C-C forms should be correlated and the correct container type recorded for each sample.

E. QAPP Section 6.2 contains requirements for field analytical procedures. All documentation of analytical test performed on samples and field calibration should be properly recorded on the Water Quality Field Collection report. Note: Some of the earlier samples (1988) did not have specific conductance calibration information or readings listed on H_2O Quality Field Collection Reports. This was listed on the Field Activity Daily Logs.

Surface Soil Sampling

A. Refer to the Specific Validation Checklist for Surface Soil Sampling.

B. Each sample should appear in the Sample Collection Log, C-C, RFA, and FADL (or field log). Make certain each form is correctly filled out by utilizing General Validation checklists for these forms.

C. Sections 2.2 and 2.4 of the Sampling Plan (Work Plan Vol. 1) provide background information for subsurface soil sampling. Section 6.4 of QAPP contains sampling procedures. Section 7.1 of QAPP contains requirements for Sample Collection Logs, C-C and RFA. (NOTE: There are General Validation Checklists for each of these standard forms.)

D. **The RFA should indicate the type of analysis the sample should undergo.** The lab performing the analysis is responsible for assuring that the packaging requirements, as contained in Table 4-1 of the sampling plan, correspond to the type of analysis requested on the RFA.

Surface Water and Sediment Sampling

A. Refer to the Specific Validation Checklist for surface water/sediment.

B. Each sample should appear in the Sample Collection Log, C-C, RFA, and FADL (or field log). Make certain each form is correctly filled out by utilizing General Validation Checklists for these forms. Alternately, if numberous discrepancies exist, make a copy of the document and circle the discrepancies with a red pen. Note this fact on the checklist and attach the copy.

C. Sections 5.3 the Sampling Plan (Work Plan Vol. 1) provide background information for subsurface soil sampling. Section 6.3 and 6.5 of QAPP contains drilling procedures. Section 7.1 of QAPP contains requirements for Sample Collection Logs, C-C and RFA. NOTE: (there are General Validation Checklists for each of these standard forms).

Biological Sampling

A. Refer to the Specific Validation Checklist for Biological Sampling.

B. Each sample should appear in the Sample Collection Log, C-C, RFA, FADL (or field log) and the Ecological Field Survey Collection Log. Make certain each form is correctly filled out by utilizing General Validation Checklists for these forms. Alternately, if numerous discrepancies exist, make a copy of the document and circle the discrepancies with a red pen. Note this fact on the checklist and attach the copy.

C. Section 6.3 of the Sampling Plan (Work Plan Vol. 1) provides background information for biological sampling. Section 7.1 of QAPP contains requirements for Sample Collection Logs, C-C and RFA. (NOTE: There are General Validation Checklists for each of these standard forms.)

D. **The RFA should indicate the type of analysis the sample should undergo.** Packaging requirements for samples are contained in section 6.3.4 of the sampling plan, and should correspond to type of analysis requested on the RFA.

Radiation Survey

A. Refer to the Specific Validation Checklist for Radiation Survey Sampling.

B. Each sample should appear in the Sample Collection Log and FADL (or field log). Make certain each form is correctly filled out by utilizing General Validation Checklists for these forms. Alternately, if numerous discrepancies exist, make a copy of the document and circle the discrepancies with a red pen. Note this fact on the checklist and attach the copy.

C. Sections 1.2 through 1.4 of the Sampling Plan (Work Plan Vol. 1) provide background information for subsurface soil sampling. Section 5.1 of QAPP contains radiation measurement procedures.

D. The following documents require review:

- FADLs (use general Validation Checklist)
- Figure 5-4, Shielded Delta-Gamma In-Situ Measurement, Background Assessment
- Figure 5-5, Shielded Delta-Gamma In-Situ Measurements, Field Radiation Measurements
- Figure 5-6, Gamma-Ray Exposure Rate Survey
- Figure 5-7, Exposure Rate Correlation Data, Entry Form - Site-Specific

Radiation survey measurements were performed utilizing stationary Pressurized Ionization Chambers (PICs), Sodium Iodide Scintillation Detector (SPA-3) measurements at one meter above ground level, and SPA-3/FIDLER grid area walkover measurements. Four sets of differing criteria are shown below to quantify radiation emissions in the field.

A node is the intersection point of the 100' x 100' sampling grids. Radiation measurements were performed at nodes throughout the Fernald site.

E. Pressurized Ionization Chamber (PIC) Measurements

1. Review all exposure rates at each measurement location to determine if the exposure rates are in the appropriate ranges for each location.

   a. Exposure rates that are distant from known radiation-sources (i.e., waste storage area, thorium storage buildings, K-65 silos, etc.) should be within the normal background range of 5 to 15 R/hr.

   b. Exposure rates near known radiation sources should increase with decreasing distance from the source.

2. Anomalies are to be investigated by reviewing field logs and other site records to determine if the source of the anomaly is present.

F. SPA-3 Measurements at One-Meter Height

1. Review of all readings to determine if they are in the expected range of 1×10^4 to 4.0×10^5 counts per minute (CPM).

2. Review plots and tables of data for discontinuities.

3. Calculate the ratio of exposure rate to count rate for all locations where both PIC and SPA-3 (at one-meter height) readings were made.

   The exposure rate-to-counts per minute (ETC) range was generated from the observation that the majority of all calculated ETC ratios fell within the limits 2.0 to 9.0×10^{-4} R/hr/CPM. All values outside the range are considered to be anomalous and must be reviewed by a Data Validation Technical Representative or by the Technical Advisory Group for resolution.

4. Anomalies are to be investigated by reviewing field logs and other site records to determine if the source of the anomaly is present.

G. SPA-3 Grid Area Walkover Measurements

1. Review all readings to determine if they are in the expected range of 3 x 10^4 to 16 x 10^4 counts for a two-minute integration for each 25' x 25' subgrid.

2. Review plots of data and tables for discontinuities.

3. Anomalies are to be investigated by reviewing field logs and other site records to determine if the source of the anomaly is present.

H. FIDLER Grid Area Walkover Measurements

1. Review all normalized readings to determine if they are in the expected range of 9 to 50 x 10^3 counts for a three-minute integration for each 25' by 25' subgrid.

2. Review plots of data and tables for discontinuities.

3. Anomalies are to be investigated by reviewing field logs and other site records to determine if the source of the anomaly is present.

The comparison of FIDLER instrument measurements from different FIDLER instrument assemblies was highly variable (six FIDLER instrument assemblies were used at Fernald). It was readily apparent that these measurements must be corrected to one instrument response (normalization of all FIDLER measurements to those of one instrument). Normalization of FIDLER measurements began July 8, 1988. It was not until June 6, 1990 that normalization factors for SPA-3 measurements were developed. At present, each instrument, SPA-3 and FIDLER, has been normalized. The DVP will be changed as necessary to incorporate updated material.

GENERAL VALIDATION CHECKLIST				TITLE: SAMPLE COLLECTION LOG (QAPP 7.1.3)
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
UNIQUE SAMPLE NUMBER				
SAMPLE LOCATION				
COLLECTOR INITIALS				
DATA & TIME SAMPLE COLLECTED				
SAMPLE COORDINATES				
SAMPLE IDENTIFICATION				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

GENERAL VALIDATION CHECKLIST				TITLE: CHAIN OF CUSTODY (QAPP 7.1.2)
PROJECT:				DATE: / PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
PROJECT NAME/NUMBER				
LAB DESTINATION				
SAMPLE TEAM MEMBERS				
CARRIER/WAYBILL NO.				
SAMPLE NO.				
SAMPLE LOCATION & DESCRIPTION				
DATE & TIME COLLECTED				
SAMPLE TYPE				
CONTAINER TYPE				
DISPOSAL RECORD NO.				
CONDITION ON RECEIPT				
RA CONTROL NO.				
C/C CONTROL NO.				
SIGNATURE(S)				
ORIGINAL RETURNED FROM LAB				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

GENERAL VALIDATION CHECKLIST				TITLE: REQUEST FOR ANALYSIS (QAPP 7.1.4)
PROJECT:				DATE: / PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
R/A CONTROL NO.				
C/C CONTROL NO.				
PROJECT NAME & NO.				
DATE SAMPLES WERE SHIPPED				
LAB DESTINATION & LAB CONTRACT				
UNIQUE SAMPLE NUMBER				
SAMPLE TYPE				
SAMPLE VOLUME				
PRESERVATIVE				
REQUESTED TESTING PROGRAM				
APPLICABLE SPECIAL INSTRUCTION				
TURN AROUND TIME INDICATED				
POSSIBLE HAZARD I.D. INDICATED				
ORIGINAL R/A RETURNED BY LAB				
CORRESPONDENCE TO LAB REPORT				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

GENERAL VALIDATION CHECKLIST				TITLE: FIELD ACTIVITY DAILY LOG (QAPP 5.0)	
PROJECT:				DATE:	PAGE __ OF __
SAMPLE/I.D.:				LOCATION:	
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS	
PROJECT NAME & NO.					
FIELD ACTIVITY SUBJECT & DATE					
WORK ACTIVITY					
UNUSUAL EVENTS					
CHANGES TO PLANS & SPECS.					
VISITOR(S) ON SITE					
WEATHER CONDITIONS					
SUBCONTRACTOR PROGRESS					
COMMUNICATION WITH AGENCIES					
ASI/IT PERSONNEL ON SITE					
IMPORTANT PHONE CALLS					
SUPERVISOR SIGNATURE & DATE					
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:	

GENERAL VALIDATION CHECKLIST				TITLE: TRAINING, PROCEDURES, AUDITS, NONCONFORMANCES, SURVEILLANCES, VARIANCES, DOCUMENT CHANGE REQUEST
PROJECT:				DATE: / PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
PROCEDURES APPROVED AT THE TIME OF DATA COLLECTION, ALSO DOCUMENT CHANGE REQUESTS				
PERSONNEL TRAINED TO PROCEDURES AND DOCUMENT CHANGE REQUESTS				
INSTRUMENTS CALIBRATED AT THE TIME OF COLLECTION				
THE FOLLOWING REQUIRE QA VERIFICATION:				
IMPACT ON DATA BY SITE AUDITS, NONCONFORMANCES, VARIANCES, OR SURVEILLANCES				
DEFICIENT CHARACTERISTICS FLAGGED FOR FIELD DATABASE				
ANY VARIANCES THAT MAY IMPACT DATA				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: SURFACE SOILS SAMPLING	
PROJECT:				DATE:	PAGE __ OF __
SAMPLE/I.D.:					
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS	
CORRECT FORM USED					
UNIQUE SOILS SAMPLE NUMBERS					
SAMPLE LOCATION					
COLLECTOR'S INITIALS					
COLLECTION DATE AND TIME					
NORTHERLY/EASTERLY COORDINATES					
WAS THE SAMPLE RINSATE					
SAMPLE DEPTH/UNITS					
SAMPLE TYPE					
DEFINITION OF COMPOSITE					
SAMPLE MEDIA					
TEMPERATURE TO COOL/PUT TO 4oC					
IS THE SAMPLE SEQUENCE CORRECT					
IS THE SAMPLE A SPIKE OR BLANK					
ID OF THE SPIKE OR BLANK					
Is the Chain of Custody Complete and correct?					
Is the Request For Analysis Complete and Correct?					
Is the Field Activity Daily Log Complete and correct?					
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:	

SPECIFIC VALIDATION CHECKLIST				TITLE: SUBSURFACE SOIL SAMPLING	
PROJECT:				DATE:	PAGE __ OF __
SAMPLE/I.D.:					
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS	
VISIUAL CLASSIFICATION OF SOILS (BORING LOG) COMPLETE AND CORRECT					
SAMPLE NUMBERS ON SAMPLE COLLECTION LOG CORRESPOND TO BORING LOG					
CALIBRATION RECORDS COMPLETE					
IS THE SAMPLE COLLECTION LOG COMPLETE & CORRECT (QAPP 7.1.3)					
IS THE CHAIN-OF -CUSTODY COMPLETE & CORRECT					
IS TGE REQUEST FOR ANALYSIS COMPLETE & CORRECT					
IS THE FIELD ACTIVITY DAILY LOG COMPLETE & CORRECT					
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:	

SPECIFIC VALIDATION CHECKLIST				TITLE: WELL CONSTRUCTION AND DEVELOPMENT
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS (QAPP 5.3)	YES	NO	N.A.	REMARKS/COMMENTS
MONITORING WELL INSTALLATION DETAILS SCHEMATIC COMPLETE AND CORRECT				
PIEZOMETER INSTALLATION SHEET COMPLETE AND CORRECT				
MONITORING WELL DEVELOPMENT COMPLETION CHECK LIST COMPLETE AND CORRECT				
MONITORING WELL DEVELOPMENT FORM COMPLETE AND CORRECT				
PIEZOMETER SENSITIVITY TEST FORM COMPLETE AND ACCURATE				
CALIBRATION RECORDS COMPLETE				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: SURFACE WATER AND SEDIMENT SAMPLING
PROJECT:				DATE: / PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
WATER QUALITY LOG COMPLETE CORRECT (QAPP SECT. 6.2)				
IF WATER QUALITY SAMPLE WAS COLLECTED PRIOR TO REVISION 3 OF THE WORK PLAN, IS SAMPLE COLLECTION DOCUMENTED IN ACCORDANCE WITH APPENDIX K OF THE WORK PLAN				
IS THE SAMPLE COLLECTION LOG COMPLETE & CORRECT (QAPP 7.1.3)				
IS THE CHAIN-OF-CUSTODY COMPLETE AND CORRECT?				
IS THE REQUEST FOR ANALYSIS COMPLETE AND CORRECT?				
IS THE FIELD ACTIVITY DAILY LOG COMPLETE AND CORRECT?				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: RADIATION MEASUREMENT (NODE SURVEYS)
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
CORRECT FORM USED				
SAMPLE ID NUMBER(S)				
LOCATIONS COORDINATES				
DATE/TIME OF SAMPLE COLLECTION				
LOCATION DESCRIPTION				
LISTING OF SAMPLING TEAM MEMBERS				
DESCRIPTION OF WEATHER CONDITIONS				
INSTRUMENT AND PROBE SERIAL/ MODEL NUMBERS				
BACKGROUND RESULTS				
SAMPLE RESULTS				
*INSTRUMENT CALIBRATION DUE DATE				
IS THERE A QA REVIEW OF FORM?				
IS THE SAMPLE SEQUENCE CORRECT				
*(THIS CURRENTLY NOT BEING DOCUMENTED ON THE SURVEY SHEETS OR THE FIELD DAILY LOGS)				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: BIOLOGICAL RESOURCES SAMPLING	
PROJECT:				DATE:	PAGE __ OF __
SAMPLE/I.D.:					
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS	
IS THE ECOLOGICAL FIELD SURVEY LOG COMPLETE AND ACCURATE?					
IS THE CHAIN-OF-CUSTODY COMPLETE AND ACCURATE?					
IS THE REQUEST FOR ANALYSIS COMPLETE AND ACCURATE?					
IS THE SAMPLE COLLECTION LOG COMPLETE AND ACCURATE?					
IS THE FIELD ACTIVITY DAILY LOG COMPLETE AND ACCURATE?					

ADDITIONAL VALIDATION COMMENTS:

REVIEWED BY: DATE:	CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: BIOLOGICAL RESOURCES SAMPLING ECOLOGICAL FIELD SURVEY COLLECTION LOG
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				EPA/600/4-85/014--EPA/600/4-85/013
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
PROJECT NAME AND NUMBER				
COLLECTORS NAME,DATE AND TIME				
STATION NAME AND NUMBER				
LOCATION OF SAMPLE COLLECTION				
WEATHER CONDITION & AIR TEMP				
SAMPLE NUMBER				
SAMPLE TYPE				
COLLECTION METHOD AND SAMPLER				
DEPTH & COLLECTION DIMENSIONS				
SAMPLE PRESERVATIVES				
LOCATION SKETCH				
HABITAT TYPE				
HABITAT WIDTH/DEPTH/TURBIDITY				
HABITAT PERCENT SHADING & FLOW VELOCITY				
HABITAT COVER, SUBSTRATE, GRADIENT, BANKS				
GENERAL DESCRIPTION OF LAND USE				
DESCRIPTION-POSSIBLE POLLUTION				
DESCRIPTION-FLOODPLAIN				
DESCRIPTION-MACROPHYTES				
DESCRIPTION-CONDITIONS/COMMENTS				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: AQUIFER/PERMEABILITY TESTING (SLUG TEST)
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
PERMEABILITY TESTING CONDUCTED AND DOCUMENTED AS DESCRIBED IN SECT. 5.6 OF QAPP				
PERMEABILITY TEST DATA FORM COMPLETE AND CORRECT				
DIAGRAM OF EQUIPMENT USED TO CONDUCT TEST				
CALIBRATION DOCUMENTATION SUPPLIED BY VENDOR FOR EQUIPMENT (GAUGES, FLOW METERS, ETC.) COMPLETE				
ARE WATER METER CALIBRATION RECORDS ON FILE AND COMPLETE				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: RADIATION MEASUREMENT (WALK OVER SURVEY)
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				LOCATION:
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
CORRECT FORM USED				
SAMPLE ID NUMBER(S)				
GRID AREA LOCATION				
DATE/TIME OF SAMPLE COLLECTION				
LOCATION DESCRIPTION				
LISTING OF SAMPLING TEAM MEMBERS				
COUNT TIME/UNIT OF COUNT				
INSTRUMENT AND PROBE SERIAL/ MODEL NUMBERS				
BACKGROUND RESULTS				
SAMPLE RESULTS				
INSTRUMENT CALIBRATION DUE DATE				
IS THERE A QA REVIEW OF FORM?				
IS THE SAMPLE SEQUENCE CORRECT				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: GROUND WATER SAMPLING AND FIELD ANALYTICAL DATA
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
WATER QUALITY FIELD COLLECTION REPORT COMPLETE (INCLUDING CALIBRATIONS)				
IS THE SAMPLE COLLECTION LOG COMPLETE & CORRECT (QAPP 7.1.3)				
IS THE CHAIN-OF-CUSTODY COMPLETE AND CORRECT?				
IS THE REQUEST FOR ANALYSIS COMPLETE AND CORRECT?				
IS THE FIELD ACTIVITY DAILY LOG COMPLETE AND CORRECT?				
TEMPERATURE (6.2.1)				
pH (6.2.2)				
SPECIFIC CONDUCTANCE (6.2.3)				
DISSOLVED OXYGEN (6.2.4)				
ALKALINITY (6.2.5)				
ALL READINGS RECORDED ON FIELD MEASUREMENT FORM (WATER QUALITY FIELD COLLECTION REPORT, QAPP FIGURE 6.1)				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

APPENDIX A-II
CLP LABORATORY DATA

ORGANIC DATA (QA Level IV)

The data packages are reviewed and the quality assurance performance data summarized by entering the data on the review lists and categorizing (flagging) the data according to the action criteria. The general criteria used to determine the performance were based on (but not limited to) an examination of:

- Holding times
- Field/Lab precision evaluation
- DFTPP and BFB performance results
- Initial and continuing calibration
- Blank analysis results
- Surrogate spike results
- Matrix spike results

Field Duplication: Positive results shall have recorded relative percent difference (RPD) values. IF RPD is greater than 20, the results shall be evaluated.

The assignment of qualifiers to the organic data shall be documented on a copy of the analytical report forms. Acceptable data shall have no qualifiers on the forms, but the reviewer shall have his/her initial and date at the low right of the forms indicating the data has been reviewed. The reviewer shall use the SOW for organic analysis and the Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis as reference for more detailed guidance.

Holding Times and Preservation:

Samples should be analyzed within the requirements of 40CFR136 whenever possible and must not exceed the Contract Required Holding Times (CRHT) for parameters tested. Holding times are measured from the time of sample collection until the time of analysis.

Where documentation is present showing compliance with 40CFR136 collection and preservation, these holding times will be applied. Otherwise, if CRHT holding times are exceeded, positive results will be qualified as (R) unreliable, or may be classified as Analytical Level I indicating a departure from accepted protocols. Non-detected parameters should be qualified (UJ) approximate. There is little data concerning holding times for soil samples. For this review soil sample holding times will be the same as those used for water.

Field/Lab precision evaluation:

Field and laboratory duplicate analyses will be evaluated to determine precision achieved. The relative percent difference (RPD) is calculated and compared to the CLP performance criteria required for that compound. When the RPD exceeds established Quality Control Limits, the results are approximated (J) for that compound. When 50% or more of the RPD's are greater than established Control Limits, all parameters in the fraction should be approximated.

GC/MS Tuning, DFTPP and BFB Performance:

Tuning criteria will be reviewed. Spot checks on calculations will be performed where a computer performs computations, however, manual calculations shall be examined more thoroughly. Background subtraction will be examined.

TABLE A1 APPLICATION OF QUALIFIERS DUE TO SURROGATE OUTLIERS

Fraction	Number of Surrogates Outside Control Limits	Direction of Bias	Qualifier for Positive Results	Qualifier for Quantitation Limits
base neutral	2 or 3	all high	K	none
	2 or 3	all low	L	UL
	2 or 3	mixed high and low	J	UJ
	1 or more	less than 10 percent	L	X
acid	2 or 3	all high	K	none
	2 or 3	all low	L	UL
	2 or 3	mixed high and low	J	UJ
	1 or more	less than 10 percent rec.	L	X
volatile	2 or 3	all high	K	none
	2 or 3	all low	L	UJ
	2 or 3	mixed high and low	J	UJ
	1	low or high	J	UJ
	1 or more	less than 10 percent rec.	L	X

When DFTPP and BFB do not meet criteria, the reviewer shall refer to the EPA Functional Guidelines for Evaluating Organic Analysis, Section IID for evaluating the reliability of the data.

Surrogate Spike Recoveries:

If any two surrogates within a base/neutral or acid fraction (or one surrogate for the VOA fraction) are out of specification, or if any one base/neutral, acid or VOA surrogate has a recovery of less than 10%, then there should be a reanalysis with surrogate results still outside the criteria. In many cases the review may need to use informed professional judgement and Section V of the Functional Guidelines for Organics. For surrogate spike recoveries out of specification, Table A-1 is to be used as a guide to assign qualifiers to the data.

Matrix-Spike Recoveries:

Before the reviewer qualifies data, the reviewer should first try to determine to what extent the results of the MS/MSD affect the associated data. This determination should be made with regard to the MS/MSD sample itself as well as specific analytes for all samples associated with the MS/MSD. Using informed professional judgement, the data reviewer may use the MS/MSD criteria to determine the need for some qualification of the data.

Field Duplicates:

The positive results will be reviewed and RPD calculated.

Blanks:

There should be no contaminants present in the blanks. There are common lab contaminants listed below:

methylene chloride
acetone
toluene
2-butanone
common phthalate esters

Any compound (other than the above list) detected in the sample, which was also detected in any associated blank, must be qualified when the sample concentration is less than five times the blank concentration. For the above list, the results are qualified by elevating the

limit of detection when the sample concentration is less than 10 times the blank concentration. See the Functional Guidelines for Organics for more guidance.

Initial and Continuing Calibrations:

If errors are detected in the calculations performed a more comprehensive review and recalculation will be performed.

For initial and continuing calibration use the following for action guide.

If any TCL compound has an RF of less than 0.05 positive results for that compound will be flagged as biased low (L) and non-detects flagged as unusable (X).

If TCL compound has a % RSD of greater than 30% for initial calibration and % D of greater than 25% for continuing calibration, positive results will be flagged as estimated (J) and non-detects will be qualified using professional judgement.

Internal Standards Performance:

The internal standard (IS) area counts must not vary by more than a factor of two (-50% to +100%) form associated calibration standard. The retention time of the internal standard must not vary more than $\pm$30 seconds from the associated calibration standard. If an IS retention time varies by more than 30 seconds, the chromatographic profile must be examined to determine if any false positive or negatives exist. The reviewer is to use professional judgement in qualifying data.

Compound Identification:

Calculations will be verified for positive results. The TCL compound (tentatively identified compounds) identified will be verified as outlined in the Functional Guidelines for Organics, Section IX & XI.

QUALITY ASSURANCE REVIEW
ORGANIC DATA PACKAGE

Project File: _____ Sampling Date: _____

Case Number: _____ Receipt Date: _____

SDG Number: _____ Number Samples: _____

Matrix: _____

The above data package has been reviewed and the quality assurance and performance data summarized. The general criteria used to determine the performance were based on an examination of:

* Holding Times
* Field/Lab Precision Evaluation
* DFTPP and BFB performance results
* Initial and Continuing Calibration
* Blank analysis results
* Detection Limit results
* Surrogate Spike results
* Matrix Spike results

Overall comments: _____

_____

_____

_____

_____

Definitions:
J - Approximate data due to other quality control criteria.
XB - Reject Data due to blank contamination.
XR - Reject data due to other quality assurance criteria.
U - Not detected.
N - Tentatively identified compound.

Reviewed by: _____ Date: _____

Concurred by: _____ Date: _____

Review based on SOW 10/86 Revised 7/87.

I HOLDING TIMES (W = Water, S = Soil) (P = preserved pH <2 HCI, U = unpreserved)

Date Received: _____	Date Sampled _____	40CFR136	CLP
VOA analysis date: _____	Holding Time: _____	(14W-14S) (7W-7S) U	(10W-10S)
(Aromatics): _____	Holding Time: _____	(14W-14S) P	(10W-10S)
BNA extraction date: _____	Holding Time: _____	(7W-7S)	(10W-10S)
P/P extraction date: _____	Holding Time: _____	(7W-7S)	(5W-5S)
BNA analysis date: _____	Holding Time: _____	(40)	(40)
P/P analysis date: _____	Holding Time: _____	(40)	(40)

Action: Results of compounds detected in samples not analyzed within the contract required holding times (CRHT) should be qualified as (R), unreliable. Non-detects should be qualified (UJ). Results should be rejected where holding times are grossly exceeded or where multiple deficiencies exist.

Remarks: _____

_____

II DFTPP AND BFB PERFORMANCE RESULTS

___ Mass calibration is correct, verify from raw data.

___ The DFTPP performance results were reviewed and found to be within specified criteria and run every 12 hour period.

___ The BFB performance results were reviewed and found to be within specified criteria and run every 12 hour period.

___ Calculations checked from raw data?

The DFTPP/BFB performance result(s) was/were reviewed and the following abundances were found to fall outside the specified criteria:

Compound	m/z	Required Abundance	Actual Abundance
_____	___	_____	_____
_____	___	_____	_____

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Remarks: _____

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III SURROGATE SPIKE RECOVERIES

For any given fraction, determine the number of surrogate compounds with unacceptable recoveries per the total number of surrogates in that fraction. Check raw data to verify the recoveries on the Surrogate Recovery (Form II).

Client ID	Lab ID	VOA	B/N	PEST

Surrogate actions:

	Percent Recovery		
	<10%	10% - CRR	>CRR
Positive result	L	L	K
Non-detected compounds	X	UL	Accept

CRR = Contract required recovery range
Surrogate action should be applied when one VOA or two B/N surrogate recoveries do not meet contractual requirements.

If surrogate spike recoveries are out of specification on initial analysis, but meet criteria on reanalysis, report results based on results of reanalysis.

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IV MATRIX-SPIKE RECOVERIES

For any given fraction, determine the number of unacceptable recoveries per the total number of matrix spike recoveries in that fraction. See Form III in data package.

Client ID	Lab ID	VOA	B/N	PEST

Matrix Spike Actions:

	Percent Recovery		
	≤10%	10% - CRR	>CRR
Positive result	L	L	K
Non-detected compounds	X	UL	Accept

CRR = Contract required recovery range

In general, matrix spike actions should be applied when 50% of the matrix spike recoveries per fraction do not meet the advisory limits. When the percent recovery does not meet advisory contractual limits for a matrix spike compound in both sets of duplicate spike sample results, the results of the compound in the unspiked sample should be qualified.

Matrix spike recoveries not within the advisory contractual limits should be applied only to the sample on which the spike was performed.

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V MATRIX SPIKE DUPLICATE ANALYSIS RESULTS

Matrix: _____

The relative percent difference (RPD) for each parameter was evaluated. The established advisory RPD criteria for each matrix spike compound is listed on Form III. When the RPD is greater than the advisory contractual limit for a matrix spike compound, the result for the compound in the unspiked sample should be approximated. In general, the results of the entire fraction for the unspiked sample may be approximated (J'd), when 50% of the RPDs are greater than the established Quality Control Limits.

Fraction	Compound	Sample Number	Dupl. Number	RPD

Remarks: _____

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VI FIELD PRECISION RESULTS

Matrix: _____

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VII BLANK ANALYSIS RESULTS

The blank analysis was reviewed. The contamination in the blanks are listed below.

A. Laboratory Blanks

Date	LAB ID #	FRACTION	COMPOUND	CONC., ppb	CRDL

B. Field Blanks

Date	LAB ID #	FRACTION	COMPOUND	CONC., ppb	CRDL

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VII BLANK ANALYSIS RESULTS (CONT.)

C. BLANK ACTION TABLE

Action levels should be based upon the highest concentration of contaminant in any field or laboratory blank. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor.

	Reject	Approximate	Accept
Common contaminants	<10x	10-20x	>20x
Other contaminants	<5x	5-10x	>10x

Common contaminants are compounds such as methylene chloride, acetone, toluene, 2-butanone and phthalates.

For example:
If 10 ppb of methylene chloride was the highest concentration detected in one of the laboratory blanks, the action level for a field sample diluted by a factor of 10 would be calculated to be:

(conc. x dilution factor x action level factor)

a) 10 ppb x (10/1) x 10 = 1000 ppb
b) 10 ppb x (10/1) x 20 = 2000 ppb

Reject all concentrations less than 1000 ppb (ug/L).
Approximate results in samples between 1000-2000 ppb (ug/L).
Accept all results with concentrations greater than 2000 ppb.

Detection limits need not be adjusted for blank contamination in this data validation.

COMPOUND	MAX. CONC. DETECTED ppb	"X" up to	"J" between	SAMPLES AFFECTED

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VIII INITIAL AND CONTINUING CALIBRATION

____ IS within -50% to +100% area count of daily standard.

____ Retention time is within ±30 seconds of associated standard.

If an IS area count is outside range, flag all compounds as estimated (J) that are referenced to that IS. For non-detects flag as estimated (UJ). If area counts are very low (<10%) and/or exhibits an abrupt drop-off, then flag non-detects as unusable (X).

Where RT's exceed the allowable range for the IS, referencd compounds should be flagged (R) unreliable for non-detects. Positive results should be checked for proper identification and quantitation.

A. Volatile Calibration Verification

Date of Initial Calibration: _____

Date of Continuing Calibration(s): _____

Spot check of raw data to verify calculations of RF, RSD, %D ___

Date	Instrument	QC Criteria OUT RF %RSD %D	Compounds (Results)	Samples Affected and Action
___	_____	_____		
___	_____	_____		
___	_____	_____		
___	_____	_____		
___	_____	_____		

Action:

Calibration	Accept	Approximate(+)*	Approximate(+) and Reject(ND)
Initial	RF≥0.300(SPCC)+ RF≥0.05** RSD≤30%	RSD>30%	RF<0.300(SPCC) RF<0.05**
Continuing	RF≥0.300(SPCC) RF≥0.05** %D≤25	%D>25	RF<0.300(SPCC) RF<0.05**

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NOTE: * - Non-detected results are evaluated with professional judgement.
** - All other compounds.
(ND) - Non-detected compounds.
SPCC - System performance calibration compound.
RF - Response factor.
RSD - Relative Standard Deviation.
%D - Percent Difference.
+ - Bromoform RF≥0.250

Actions should be applied to all results in the volatile fraction when contractual and established advisory criteria are not met for the initial calibration. When continuing calibration requirements are not met, actions apply only to samples analyzed on the day the calibration was not met.

B. Semi-volatile Calibration Verification

Date of Initial Calibration: _____

Date of Continuing Calibration(s): _____

Spot check of raw data to verify calculations of RF, RSD, %D

Date	Instrument	QC Criteria OUT RF	%RSD	%D	Compounds (Results)	Samples Affected and Action
—	———					
—	———					
—	———					
—	———					
—	———					

Action:

Calibration	Accept	Approximate(+)*	Approximate(+) and Reject(ND)
Initial	RF≥0.05 RSD≤30%	RSD>30%	RF<0.05

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Continuing	RF≥0.05 %D≤25	%D>25	RF<0.05

NOTE: * - Non-detected results are evaluated with professional judgement.
** - All other hazardous substance list compounds.
(ND) - Non-detected compounds.
SPCC - System performance calibration compound.
RF - Response factor.
RSD - Relative Standard Deviation.
%D - Percent Difference.

Actions should be applied to all results in the volatile fraction when contractual and established advisory criteria are not met for the initial calibration. When continuing calibration requirements are not met, actions apply only to samples analyzed on the day the calibration was not met.

_____ Analytical sequence followed for primary analysis and confirmation analysis as outlined in SOW and Functional Guidelines for Organics.

_____ Verified positive results by GC/MS when greater than 10 g/L.

C. Pesticide Calibration Verification

_____ In evaluating linearity, it was noted that the percent relative standard deviation (%RSD) was less than 10% for the column used for quantitative determinations.

_____ The criteria for linearity was not met. Action: All associated quantitative results should be considered approximate and flagged (J).

_____ The percent difference (%D) between calibration factors during the twelve hour period was evaluated and found to be less than 15% for quantitation columns and less than 20% for confirmation columns.

_____ The %D was greater than specified criteria for the following compounds:

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Date	Compound	%D	Column	Action

Action: Approximate (J) all positive results for samples with a %D greater than the specified criteria.

____ The retention time (RT) for DDT was reviewed and found to be greater than 12 minutes.

____ Upon review of DDT retention time, it was noted that the RT was less than 12 minutes. Action: Reject pesticide results due to poor resolution.

____ Retention time windows (RT) were reported on Form IX and standard/sample results were found to be within established RT windows.

____ Retention time windows were reported on Form IX. The following compounds had RTs which were outside the established windows:

Date	Compound	RT Window	RT	Action
____	_____	_____	___	_____
____	_____	_____	___	_____
____	_____	_____	___	_____

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Action: Positive sample results should be considered tentatively identified due to the RT not meeting the established window.

____ The total percent breakdown for DDT was <20%.

____ The total percent breakdown for endrin was <20%.

____ Breakdown for DDT was >20%. Action: Approximate all quantitative results for DDT flagged as biased low (L). If DDT not present, but DDD and DDE are positive, then flag DDT as unusable (X). Qualitative and quantitative results for DDD and DDE should be considered estimated and tentatively identified (N).

____ Breakdown for endrin was >20%. Action: Approximate all quantitative results for endrin and flag as estimated (J). Qualitative and quantitative for endrin ketone should be considered unreliable (R).

____ A review of %D in RT for DBC indicated all standards and samples had a RT less than 2% for packed and 0.3% for capillary columns.

____ RT shift for DBC was reviewed and found to be outside specified criteria. The analysis should be considered unusable (X) for samples: _____

_____

_____

_____

_____

IX DETECTION LIMIT RESULTS

_____ Instrument detection limit results were present and found to be less than the CRDL for those compounds.

_____ Detection limits were not included in the data package.

_____ Detection limits were present, but the criteria was not met for the following compounds: _____

Internal Standard Area Summary

For a given fraction, determine the number of internal standard compounds outside established limits per total number of internal standards in that fraction.

Client ID	Lab ID	VOA	B/N	Pest

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Editorial Corrections

The package for Project File _____ was reviewed for editorial accuracy in accordance with NQA-1 guidelines. Included in this review is a check for completeness, accuracy, proper xeroxing, initials and dates for line-throughs, absence of traceovers, absence of white-out, and complete filling out of all blocks on a given form.

_____ The package has been found to complete with respect to editorial accuracy.

_____ The package has been found to be in need of the following editorial corrections:

Page/Form #	Problem

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INORGANIC DATA (QA Level IV)

The data packages are reviewed and the quality assurance performance data summarized by entering the data on the review lists and categorizing (flagging) the data according to the action criteria. The general criteria used to determine the performance were based on an examination of:

- Holding times
- Calibration Verification
- Field and lab blank
- Interference QC results
- Matrix spike & recovery results
- Laboratory precision results
- Lab control sample results
- Standard addition results
- Serial dilution results

Field duplicate analysis will be evaluated according to laboratory Precision Evaluation Sheet using the same criteria for lab duplicates.

All validation qualifiers shall be placed on the inorganic analytical report forms.

Holding Times and Preservation

Samples should be analyzed within the requirements of 40CFR136 whenever possible and must not exceed the Contract Required Holding Times (CRHT) for parameters tested. Holding times are measured from the time of sample collection until the time of the time of analysis.

Where documentation is present showing compliance with 40CFR136 collection and preservation, those holding times will be applied. Otherwise, if CRHT holding times are exceeded, positive results will be qualified as (R) unreliable, or may be classified as Analytical Level I indicating a departure from accepted protocols. Non-detected parameters should be qualified (UJ) approximate. There is little data concerning holding times for soil samples. For this review, soil sample holding times will be the same as those used for water.

Calibration

Instruments must be calibrated daily and each time the instrument is set up. ICP analysis must have a blank and at least one standard to establish the analytical curve. Atomic absorption analysis must have a blank and at least three standards, one must be at the CRDL

to establish an analytical curve. The absorbance data must have a correlation coefficient of $\geq$0.995. At least one ICV and CCV %R is recalculated for each type of analysis, (ie GFAA, ICPs) using the following equation:

$$\%R = \frac{\text{Found}}{\text{True}} \times 100$$

Found = concentration of each analyte measured in the analysis of the ICV or CCV solution.

True = concentration of each analyte in the ICV or CCV source.

Due to possible rounding discrepancies, allow results to fall within 1% of the contract windows (eg., 89-111%)

All data which does not have a daily calibration or the minimum number of standards shall be qualified as unusable (X). If the correlation coefficient is <0.995, qualify results >CRDL as estimated (J), and results <CRDL as estimated (UJ).

If the midrange cyanide standard was not distilled, qualify all associated results as estimated (J).

Blanks

The assessment of blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks applies to any blank associated with the samples. If problems with any blank exists, all data associated with the set must be carefully evaluated to determine if there is an inherent variability in the data or if the problem is an isolated occurrence not affecting other data.

The blank summary (Form III) as well as the raw data for blanks shall be reviewed and verified that the results were accurately reported.

Action in the case of unsuitable blank results depends on the circumstances and origin of the blank. Sample results <CRDL but <5 times the amount in any blank should be qualified as (U).

Any blank with a negative result whose absolute value is >CRDL must be carefully evaluated to determine its effect on the sample data.

Cautions should be taken in comparing results of blanks. The weights, volumes, or dilution factors may vary due to basis of units used for samples. The reviewer may find it easier to work from the raw data when applying 5x criteria to soil sample data/calibration blank data.

The results must not be corrected by subtracting any blank value.

ICP Interference Check Samples (ICS)

An ICS must be run at the beginning and end of each sample analysis run (or a minimum of twice per 8-hour working shift, whichever is more frequent.) Recovery results for the ICS solution AB analysis must fall within the control limits of ±20% of the true value.

Recalculate from raw data one or more recoveries using the following equation:

$$\% \text{ Recovery} = \frac{\text{Found Solution AB}}{\text{True Solution AB}} \times 100$$

Where:

Found Solution AB = concentration (in ug/L) of each analyte measured in the analysis of solution AB

True Solution AB = concentration (in ug/L) of each analyte in Solution AB

Check ICS raw data for results with an absolute value >CRDL for those analytes which are not present in the ICS solution.

For samples with concentration of Al, Ca, Mg, and Fe which are comparable to or greater than their respective levels in the Interference Check Sample:

1) If the ICS recovery for an element is >120% and the sample results are <CRDL, this data is available for use.

2) If the ICS recovery for an element is >120% and the sample results are >CRDL, qualify the affected data as estimated (J).

3) If the ICS recovery for an element falls between 50 and 79% and the sample results are >CRDL, qualify the affected data as estimated (J).

4) If sample results are <CRDL, and the ICS recovery for that analyte falls within the range of 50-79%, the possibility of false negatives may exist. Qualify the data for these samples as estimated (UJ).

5) If ICS recovery results for an element fall <50%, qualify the affected data as unusable (X).

If results >CRDL observed for elements which are not present in the EPA provided ICS solution, the possibility of false positive exists. An evaluation of the associated sample data for the affected elements should be made. For samples with comparable or higher levels of interference and with analyte concentrations that approximate those levels found in the ICS (false positive), qualify sample results >CRDL as estimated (J).

If negative results are observed for elements that are not present in the EPA ICS solutions, and their absolute value is >CRDL, the possibility of false negatives in the samples may exist.

If the absolute value of the negative results is >CRDL, an evaluation of the associated sample data should be made. For samples with comparable or higher levels of interferents, qualify results for the affected analytes <CRDL as estimated (UJ).

In general, the sample data can be accepted if the concentrations of Al, Ca, Fe and Mg in the sample are found to be less than or equal to their respective concentrations in the ICS. If these elements are present at concentrations greater than the level in the ICS, or other elements are present in the sample at >10 mg/L, the reviewer should investigate the possibility of other interference effects by using Table 2 given on page D-22 of the 7/87 SOW. These analyte concentration equivalents presented in the Table should be considered only as estimated values, since the exact value of any analytical system is instrument specific. Therefore, estimate the concentration produced by an interfering element. If the estimate is >2X CRDL and also greater than 10% of the reported concentration of the affected element, qualify the affected results as estimated (J).

Matrix Spike Result

Samples identified as field blanks cannot be used for spike samples analysis. Spike recovery (%R) must be within the limits 75-125%. However, spike recovery limits do not apply when sample concentration exceeds the spike concentration by a factor of 4 or more.

Review spike recoveries and verify that results fall within the specified limits. Verify from raw data and recalculate one or more % R using the following equation:

$$\%R = \frac{SSR - SR}{S} \times 100$$

Where:

SSR = spiked sample result
SR = sample result
S = amount of spike

Actions to be taken:

If the spike recovery is >125% and the reported sample results are <CRDL, the data is acceptable for use.

If the spike recovery is >125% or <75% and the sample results are <CRDL, qualify the data for these samples as biased high (K) or biased low (L).

If the spike recovery falls within the range of 30-74% and the sample results are <CRDL, qualify the data for these samples as not detected, limit probably higher (UL).

If the spike recovery results fall <30% and the sample results are >CRDL, qualify the data for these samples as unusable (X).

If the field blank was used for matrix spike analysis, all other QC data must be carefully checked and professional judgement exercised when evaluating the data.

Laboratory Precision Evaluation

Duplicate analyses are indicators of laboratory precision based on each sample matrix. Samples identified as field blanks cannot be used for duplicate sample analysis.

A control limit of ± 20% (35% for soil) for the Relative Percent Difference (RPD) shall be used for sample values >5X CRDL.

A control limit of ±CRDL (±2X CRDL for soil) shall be used for sample values <5X CRDL, including the case when only one of the duplicate sample values is <5X CRDL.

If either sample or duplicate values are less than 5 x CRDL, then the absolute difference between the two values must be less than the CRDL to be in control.

Check the raw data and recalculate one or more RPD using the following equation to verify that results have been correctly reported on Form VI.

$$RPD = \frac{|S-D|}{(S+D)/2} \times 100$$

Where:

S = First Sample Value (original)
D = Second Sample Value (duplicate)

Verify that the field blank was not used for duplicate analysis.

If duplicate analysis results for a particular analyte fall outside the appropriate control windows, qualify the results for that analyte in all associated samples of the same matrix as estimated (J).

Laboratory Control Sample (LCS)

The laboratory control sample serves as a monitor of the overall performance of all steps in the analysis, including the sample preparation.

All aqueous LCS results must fall within the control limits of 80-120%R, except Sb and Ag which have no control limits.

All solid LCS results must be evaluated on a case by case basis.

Review and verify that results fall within the control limits.

Check the raw data (ICP printout, strip charts, bench sheets) to verify the reported recoveries on Form VII. Recalculate one or more of the recoveries (%R) using the following equation:

$$\text{LCS \%R} = \frac{\text{LCS Found}}{\text{LCS True}} \times 100$$

Where:

LCS Found = concentration (in ug/L for aqueous; mg/kg for solid analyte measured in the analysis of LCS solution

LCS True = concentration (in ug/L for aqueous; mg/kg for solid) of each analyte in the LCS source

Action to be taken:

If the LCS recovery for any analyte falls within the range 50 - 79% or >120%, qualify results >CRDL as estimated (J).

If results are <CRDL and the LCS recovery is greater than 120%, the data are acceptable

If results are <CRDL and the LCS recovery falls within the range of 50-79%, qualify the data for the affected analytes as estimated (UJ).

If LCS recovery results are <50%, qualify the data for these samples as unusable (R).

If the solid LCS recovery for any analyte falls outside the EPA control limits, qualify all sample results >CRDL as estimated (J).

If the solid LCS results are higher than the control limits and the sample results are <CRDL, the data are acceptable.

If the solid results are lower than the control limits, qualify all sample results <CRDL as estimated (UJ).

Standard Additions/Graphite Furnace Atomic Absorption (GFAA) Analysis

Duplicate injections and furnace post digestion spikes establish the precision and accuracy of the individual analytical determinations.

For sample concentrations >CRDL, duplicate injections must agree within ±20% Relative Standard Deviation (RSD), or (Coefficient of Variation (CV), otherwise the sample must be rerun once (at least two additional injections).

Spike recovery must be ≥85% and ≤115%

The Furnace Atomic Absorption Scheme must be followed as described in the 7/87 SOW, p. E-15.

Check raw data to verify that duplicate injections agree within ±20% RSD (or CV) for sample concentrations >CRDL.

Review GFAA raw data to verify that the Furnace Atomic Absorption Scheme has been followed.

Action to be taken:

If duplicate injections are outside the ±20% RSD (or CV) limits and the sample has not been rerun once as required, qualify the data as estimated (J).

If the rerun sample results do not agree within ±20% RSD (or CV), qualify the data as estimated (J).

If the post digestion spike recovery is ≤40%, qualify results >CRDL as estimated (J).

If the post digestion spike recovery is ≥10%, but <40%, qualify results <CRDL as not detected, limit probably higher (UL).

If the post digestion spike recovery is <10%, qualify results <CRDL unusable (X).

If sample absorbance is <50% of the post digestion spike absorbance then:

a. If the furnace post digestion spike recovery is not within 85-115%, qualify the sample results >CRDL as estimated (J).

b. If the furnace post digestion spike recovery is not within 85-115%, qualify the sample results <CRDL as estimated (UJ).

If Method of Standard Additions (MSA) is required but has not been done, qualify the data as estimated (J).

If any of the samples run by MSA have not been spiked at the appropriate levels, qualify the data as estimated (J).

If the MSA correlation coefficient is <0.995, qualify the data as estimated (J).

Serial Dilution

The serial dilution determines whether significant physical or chemical interferences exist due to sample matrix.

If the analyte concentration is sufficiently high (concentration in the original sample is minimally a factor of 50 above the CRDL), an analysis of a 5-fold dilution must agree within 10% Difference (%D) of the original results.

Check the raw data and recalculate the %D using the following equation to verify that the dilution analysis results agree with results reported on Form IX.

$$\%D = \frac{|I-S|}{I} \times 100$$

Where:

I = Initial Sample Result
S = Serial Dilution Result (Instrument Reading x 5)

check the raw data for evidence of negative interference, i.e., results of the diluted sample are significantly higher than the original sample.

When the criteria are not met, qualify the associated data as estimated (J).

If evidence of negative interference is found, use professional judgment to qualify the data.

The raw data should be examined to verify the correct calculation of sample results reported by the laboratory. Digestion and distillation logs, instrument printouts, strip charts, etc. should be compared to the reported sample results.

1. Examine the raw data for any anomalies (i.e., baseline shifts, negative absorbances, omissions, legibility, etc.).

2. Verify that there are no transcription or reduction errors (e.g., dilutions, percent solids, sample weights) on one or more samples.

3. Verify that results fall within the linear range of the ICP (Form XIII) and within the calibrated range for the non-ICP parameters.

4. Verify that sample results are >5X ICP, if ICP analysis results are used for As, TI, Se, Pb.

Note: When the laboratory provides both ICP and furnace results for an analyte in a sample and the concentration is > ICP CRDL, the results can assist in identifying quantitation problems.

Action to be taken:

If there are any discrepancies found, the laboratory may be contacted by the designated representative to obtain additional information that could resolve any differences. If a discrepancy remains unresolved, the reviewer may determine qualification of the data is warranted.

QUALITY ASSURANCE REVIEW
INORGANIC DATA PACKAGE

1455

Project File: _____ Sampling Date: _____

Case Number: _____ Receipt Date: _____

SDG Number: _____ Number of Samples: _____

The above data package has been reviewed and the quality assurance and performance data summarized. The general criteria used to determine the performance were based on an examination of:

* Holding times
* Calibration Verification
* Field and lab blank
* Interference QC Results
* Matrix Spike %R Results
* Laboratory Precision Results
* Field precision Evaluation
* Lab Control Sample Results
* Detection Limit Results
* Standard addition results
* Serial Dilution Results
* CRDL Results

Overall Comments:

_____

_____

_____

_____

_____

_____

_____

Definition of Qualifiers:

JB - Approximate data due to blank contamination
J - Approximate data due to other quality control criteria
X - Reject due to quality control review
U - Non-detected element

Reviewed by: _____ Date: _____

Concurrence by: _____ Date: _____

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I HOLDING TIMES Date Samples Collected _____

Date samples received: _____ Date analyzed (Hg): _____

Date samples analyzed (CN): _____

Date samples analyzed (all others) by: _____

Action: If samples are analyzed for mercury (28 days), cyanide (14 days) or any other element (6 months) from dated collection, in excess of the holding times, qualify as (R) results unreliable. Non-detects should be qualified as (UJ). Results should be rejected where holding times are grossly exceeded or where multiple deficiencies exist.

Remarks: _____

_____

Preservation metals, pH <2 _____ Cyanide, pH >12 _____

IIA INITIAL AND CONTINUING CALIBRATION VERIFICATION

_____ Calibrations were performed every ten samples.

_____ Calibrations were within +/- 10 % (Metals) +/-15% (CN), or +/-20% (HG) for ICV and CCU

_____ Calibrations were not performed every ten samples for
(AA) ___ (ICP) ___ (CVAA) ___ (GFAA) ___ (CN) ___

_____ Calibrations were not within specified limits for
(AA) ___ (ICP) ___ (CVAA) ___ (GFAA) ___ (CN) ___

The correlation coefficient must be $\geq$0.995 for :

AA standard curve ___ Hg standard curve ___ Cyanide standard curve ___

_____ Verify that the midrange CN standard was distilled

_____ Verify calculations of ICV and CCV (one per type of analysis; ICP, AP, etc.

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Action windows for ICV and CCV

	Accept	Approximate	Reject
Mercury	80-120 for +/ND ≥ 121 for ND	65-79 for +/ND 121-135 for +	<65 or >135 for +/ND
Cyanide	85-115 for +/ND ≥ 116 for ND	70-84 for +/ND 116-130 for +	<75 or >130 for +/ND
all others	90-110 for +/ND ≥ 111 for ND	75-89 for +/ND 111-125 for +	<75 or >125 for +/ND

Note: results <CRDL are acceptable (positive bias)
ND = non-detected element
+ = positive result

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IIB INITIAL AND CONTINUING CALIBRATION VERIFICATION

CRA/CRI Check Samples

M	Analyte	True Value (ug/L)	Percent Recovery
P	Antimony	120	
F	Arsenic	10	
P	Beryllium	10	
P	Cadmium	10	
P	Chromium	20	
P	Cobalt	100	
P	Copper	50	
F	Lead	5	
P	Manganese	30	
P	Nickel	80	
F	Selenium	5	
P	Silver	20	
F	Thallium	10	
P	Vanadium	100	
P	Zinc	40	

Remarks:

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III. BLANK ANALYSIS RESULTS

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EL	ICB	CCB1	CCB2	CCB3	CCB4	CCB5	Prep B1	Action
Al								
Sb								
As								
Ba								
Be								
Cd								
Ca								
Cr								
Co								
Cu								
Fe								
Pb								
Mg								
Mn								
Hg								
Ni								
K								
Se								
Ag								
Na								
Tl								

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EL	ICB	CCB1	CCB2	CCB3	CCB4	CCB5	Prep Blk	Action
V								
Zn								
CN								
Mo								
*								

* = other

Note: Contamination detected above IDLs should be evaluated and qualified.

Action levels are determined by multiplying the highest concentration determined in any field or laboratory blank by five. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor.

All results less than 5 times the action level should be considered highly suspect and reported as "JB". No action should be taken on the blank itself.

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IV ICP INTERFERENCE CHECK SAMPLE

The ICAP interference check sample analysis is performed to verify the contract laboratories interelement and background correction factors.

_____ Interference QC samples were run before sample analysis and at the end of the analysis run (or every eight hours, whichever is more frequent).

_____ Interference QC samples were within the specified limits of +/- 20 percent.

_____ Interference QC samples were run but did not meet recovery criteria for: _____
_____

_____ Are these results >CRDL for analytes which are not present in the ICS solution?

In general, the sample data can be accepted without qualification if the concentrations of Al, Ca, Fe, and Mg are less than 50% of the ICS concentrations.

_____ Are these results >10mg/L of other than ICS analytes present.

Note: The 20% contract limit is based on the true value for EPA standards, and on the mean value (run at least five times) for non-EPA standards.

Remarks: _____

_____

_____

_____

_____

_____

_____

_____

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Quality Assurance Review
Inorganic Data Package

V. MATRIX SPIKE RESULTS

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Sample Number: _____

_____ recalculations of %R from raw data were verified on one or more analytes

Element	SSR	SR	S	%R	Action
Aluminum					
Antimony					
Arsenic					
Barium					
Beryllium					
Cadmium					
Chromium					
Cobalt					
Copper					
Iron					
Lead					
Manganese					
Mercury					
Nickel					
Potassium					
Selenium					
Silver					
Thallium					
Vanadium					
Zinc					
Cyanide					
Molybdenum					
Other					

Calculation: $\%R = \frac{SSR-SR}{S} \times 100$

Accept	Approximate	Reject
SSR (75-125%)		SSR(ND, +) & SSR<30%[2]
	SR(+,ND) & SSR(30-74%)[3]	
	SR(+) & SSR>125%[4]	

If the sample concentration exceeds the spike concentration by a factor of 4 or more, no action is taken.

NOTE: S = Amount of spike; SSR = spiked sample result;
SR = Sample result; %R = percent recovery; + = positive result;
ND = non-detected element.

1 - Accept.
2 - Possible false negative; analytical deficiencies - reject (X).
3 - Detection limit may be biased low - qualify as (L) or (UL).
4 - False positive possible or results biased high - qualify as (K).

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VI. LABORATORY PRECISION EVALUATION

Sample #: _____ Duplicate Sample #: _____

Element	CRDL	Sample	Duplicate	RPD	Action
Aluminum	200				
Antimony	60				
Arsenic	10				
Barium	200				
Beryllium	5				
Cadmium	5				
Calcium	5000				
Chromium	10				
Cobalt	50				
Copper	25				
Iron	100				
Lead	5				
Magnesium	5000				
Manganese	15				
Mercury	0.2				
Nickel	40				
Potassium	5000				
Selenium	5				
Silver	10				
Sodium	5000				
Thallium	10				
Vanadium	50				
Zinc	20				
Cyanide	10				
Molybdenum	N/A				
Other	N/A				

Duplicate actions should be applied to all other samples of the same matrix type.

Actions: For samples which have an RPD of >20% (35% for soils) shall be qualified as estimated (J) for each element affected. If sample results are less than 5x the CRDL, then action limits are +/- CRDL. For sample results less than the CRDL, the RPD is not calculated.

Calculation: $RPD = \frac{|A-B|}{(A+B)/2} \times 100$

NOTE: CRDL - Contract Required Detection Limit
RPD - Relative Percent Difference
A - Sample Result
B - Duplicate Result

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VII LABORATORY CONTROL SAMPLE

_____ Laboratory Control analysis was performed.

_____ Laboratory Control analysis was within specified limits.

_____ Laboratory Control analysis was not performed for the following: _____

_____ Laboratory Control analysis was outside specified limits for the following: _____

Actions:	Accept	Approximate	Reject
% Recovery	80-120 for +,ND >120% for ND	50-79 for +,ND >120% for + <50% for +	<50% for ND

Note: an aqueous LCS is not required for mercury.

VIII DETECTION LIMIT RESULTS

_____ Instrument detection limit results were present and found to be less than the CRDL for those elements.

_____ Detection limits were not included in the data package.

_____ Detection limits were present, but the criteria was not met for the following elements: _____

Action:

Adjust sample detection limits for elements not meeting contractual criteria listed above. Elements detected below the adjusted detection limit should be rejected (X).

Calculating detection limits for soil samples:
PQL (mg/kg) =

$$\frac{\text{CRDL (ug/L)}}{\text{\%Solids}} \times \frac{\text{Volume diluted to (mL)}}{\text{wet weight digested (g)}} \times \frac{1\text{L}}{1000\text{mL}} \times \frac{1000\text{g}}{1\text{kg}} \times \frac{1\text{mg}}{1000\text{ug}}$$

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IX STANDARD ADDITION/FURNACE ATOMIC ABSORPTION ANALYSIS

_____ Duplicate injections were performed for all samples and analytical spikes.

_____ Duplicate injections agreed within 20%.

_____ Duplicate injections were not performed for the following:

_____

_____ Duplicate injections did not agree within 20% for the following:

_____

_____ Spike recoveries were within 85-115% for all samples.

_____ Spike recoveries were outside 85-115% but greater than 40% and sample abs <50% of spike abs for the following (flagged W):

_____

_____ Spike recoveries were less than 40% for sample and less than 40% for dilution for the following (flagged E):

_____

_____ Spike recoveries were outside 85-115% but greater than 40% and sample abs >50% of spike abs for the following (quantitated by MSA):

_____

Action:	Spike Recov. 85-115%	Spike Recov. <85 or >115%	Spike Recov. <10%
Sample conc. >50% of spike value	Accept	use MSA	Reject

If the spike recovery is less than 40% and the laboratory has not reanalyzed the sample on dilution, approximate (J) the data for that sample.

_____ Method of standard additions was not performed as required for the following samples: _____

_____

_____ MSA was used to quantitate analytical results when contractually required.

_____ Correlation > .995 for samples: _____

_____ Correlation < .995 for samples: _____
(J Data)

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X SERIAL DILUTION RESULTS/ICP ANALYSIS

Serial dilution analysis enables the reviewer to evaluate whether significant physical or chemical interferences exist due to sample matrix for samples analyzed by ICP. Sample results for elements analyzed and quantitated by Furnace Atomic Absorption should not be evaluated.

_____ Serial dilutions were performed for each matrix and results of the diluted analysis agreed within ten percent of the original undiluted analysis.

_____ Serial dilutions were not performed for the following:

_____

_____ Serial dilutions were performed, but analytical results did not agree within 10% for analyte concentrations greater than 10 x the CRDL after dilution.

Element	CRDL	CRDL x 10	Sample	Ser. Dil	Action
Aluminum					
Antimony					
Barium					
Beryllium					
Cadmium					
Calcium					
Chromium					
Cobalt					
Copper					
Iron					
Magnesium					
Manganese					
Nickel					
Sodium					
Vanadium					
Zinc					
Molybdenum					
Other					

Actions: All data for samples of the same matrix for that element should be approximated (J'd) when the serial dilution results do not meet contractual requirements.

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Editorial Corrections

The package for Project File _____ was reviewed for editorial accuracy in accordance with NQA-1 guidelines. Included in this review is a check for completeness, accuracy, proper xeroxing, initials and dates for line-throughs, absence of traceovers, absence of white-out, and complete filling out of all blocks on a given form.

_____ The package has been found to be complete with respect to editorial accuracy.

_____ The package has been found to be in need of the following editorial corrections:

Page /Form #	Problem
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

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APPENDIX A-III
NON-CLP LABORATORY DATA

NON-CLP LABORATORY DATA (QA Level III)

The purpose of this instruction is to provide an organized method to review non-CLP chemical data from the laboratory. Those areas reviewed include blanks, spikes, and duplicates. The laboratory verifies and validates the analytical data as outlined in the QAPP. Quality Assurance performance data are reviewed and summarized by entering the data on the review lists. Due to analytical problems, i.e., matrix interferences, reports may not meet QC requirements. Therefore, the data need to be evaluated and assigned qualifiers if needed. In cases where data is unclear, response from the laboratory will be requested.

BLANKS

Blanks are screened by reviewing results above detection limits.

Action levels are determined by multiplying the highest concentration determined in any field or laboratory blank by five. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor.

All results less than 5 times the action level should be considered highly suspect and reported as a "JB" - approximate data (value) due to blanks contamination. No action should be taken on the blank itself.

MATRIX SPIKES

Matrix spikes are screened by reviewing spike recoveries and assigning accepted, approximate or rejected as outlined below.

If the sample concentration exceeds the spike concentration by a factor of four or more, no action is taken.

Accept	Qualify	Reject
SSR (75-125%)	SR(+) & SSR (30-74&)[1] SR(ND) & SSR (30-74%)[3] SR(+) & SSR>125%[4]	SR (+, ND) & SSR<30%

NOTE: S = amount of spike; SSR = spiked sample result;

SR = Sample result; %R = percent recovery, + = positive result
ND = Non-detected element
1 - Sample results could be biased low - qualify as (L)
2 - Possible false negative; analytical deficiencies - qualify as (X)
3 - Detection limit may be biased low - qualify as (UL)
4 - False positive possible or results biased high - qualify as (K)

DUPLICATE ANALYSIS

Duplicate analyses are compared by calculating relative percent difference (RPD) of each set. Duplicate actions should be applied to all other samples of the same matrix type.

Actions: For samples which have an RPD of >20% (35% for soils) shall be qualified as estimated (J). If sample results are less than 5x the CRDL< then action limits are +/- CRDL. For sample results less than the CRDL, the RPD is not calculated.

Calculations: $RPD = \frac{|A-B|}{(A+B)/2} \times 100$

NOTE:
CRDL - Contract Required Detection Limit
RPD - Relative Percent Difference
A - Sample Result
B - Duplicate Result

BLIND DUPLICATE ANALYSIS

The blind duplicate samples will be identified and RPDs calculated per duplicate analysis above.

The reviewer shall use professional judgement when assigning qualifiers to data and document the evaluation on the checklist.

Non CLP
Review Checklist

1455

Project File: _____ Sampling date: _____
Matrix: _____ Receipt date: _____

Overall Comments:

The above data package has been reviewed and the quality assurance and performance data summarized. The general criteria used to determine the performance has been based on an examination of:

* Holding times
* Field and lab blank
* Interference QC results
* Matrix spikes
* Laboratory precision results
* Detection limits

Definitions of Qualifiers:

JB - Approximate data due to blank contamination
J - Approximate data due to other quality control criteria
X - Reject due to quality control review
U - Non-detected element

Reviewed by: _____ Date: _____

Concurrence by: _____ Date: _____

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I. HOLDING TIMES

		Holding times
Date samples received	_____	
Date samples analyzed (Hg):	_____	28 days
Date samples analyzed (CN):	_____	14 days
Date samples analyzed other metals	_____	6 months
Date samples analyzed Cr + 6	_____	24 hours
Date samples analyzed (TON) (Ammonia)	_____	28 days
Date samples analyzed (Cl, F, SO_4)	_____	28 days
Date samples analyzed NO_3 with preservative	_____	28 days
Date samples analyzed TOC	_____	28 days
Date samples analyzed TOX	_____	14 days
Date samples analyzed PO_4	_____	28 days
Date samples analyzed Sulfide	_____	7 days
Date samples analyzed Phenol	_____	28 days

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II. BLANK ANALYSIS RESULTS

	Blank	Blank
EL		
Al		
Sb		
As		
Ba		
Be		
Cd		
Ca		
Cr		
Cu		
Fe		
Pb		
Mg		
Mn		
Hg		
Ni		
K		
Se		

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II. BLANK ANALYSIS RESULTS

	Blank	Blank
Ag		
Na		
T1		
V		
EL		
Zn		
CN		
Mo		
Cr+6		
TKN		
Ammonia		
F		
C1		
SO_4		
NO_3		
PO_4		
TOC		

Quality Assurance Review
Inorganic Data Package

II. BLANK ANALYSIS RESULTS

	Blank	Blank
TOX		
Sulfide		
Phenol		

Note: Contamination detected above CRDLS should be evaluated and qualified

Action levels are determined by multiplying the highest concentration determined in any field or laboratory blank by five. The action level for samples which have been concentrated or diluted should be multiplied by the concentration/dilution factor.

All results less than 5 times the action level should be considered highly suspect and reported as "JB". No action should be taken on the blank itself.

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III. LABORATORY PRECISION EVALUATION

Sample #: _____ Duplicate Sample #: _____

Element	CRDL ug/L	Sample	Duplicate	RPD	Action
Aluminum	200				
Antimony	60				
Arsenic	10				
Barium	200				
Beryllium	5				
Cadmium	5				
Calcium	5000				
Chromium	10				
Cobalt	50				
Copper	25				
Iron	100				
Lead	5				
Magnesium	5000				
Manganese					
Mercury	0.2				
Nickel	40				
Potassium	5000				
Selenium	5				
Silver	10				
Sodium	5000				
Thallium	10				
Vanadium	50				
Zinc	20				
Cyanide	10				
Molybdenum	N/A				
Other	N/A				
Cr+6					
TKN					
Ammonia					
Fluoride					
Cl					
SO_4					
NO_3					
PO_4					
TOC					
TOX					
Sulfide					
Phenol					

Duplicate actions should be applied to all other samples of the same matrix type.

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Actions: For samples which have an RPD of >20% (35% for soils) shall be qualified as estimated (J) for each element affected. If sample results are less than 5x the CRDL, then action limits are +/- CRDL. For sample results less than the CRDL, the RPD is not calculated.

Calculation: $RPD = \frac{|A-B|}{(A+B)/2} \times 100$

NOTE: CRDL - Contract Required Detection Limit
RPD - Relative Percent Difference
A - Sample Result
B - Duplicate Result

Quality Assurance Review
Inorganic Data Package

IV. MATRIX SPIKE RESULTS

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Sample Number: _____

Element	SSR	SSRD	SR	S	%R	%RD	RPD	Action
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Cyanide								
Molybdenum								
Other								
Cr+6								
TKN								
Ammonia								
Fluoride								
Cl								
SO_4								
NO_3								
PO_4								
TOC								
TOX								
Sulfide								
Phenol								

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Calculation: %R = SSR-SR / S X 100

Accept	Approximate	Reject
SSR (75-125%)	SR(+) & SSR (30-74%)[1] SR(+,ND) & SSR(30-74%)[3] SR(+) & SSR>125%[4]	SR(+, ND) & SSR<30%[2]

If the sample concentration exceeds the spike concentration by a factor of 4 or more, no action is taken.

NOTE: S = Amount of spike; SSR = spiked sample results; SSRD = spiked sample result duplicate

SR = Sample result; %R = percent recovery; + = positive result; ND = non-detected element.

RPD - Relative Percent Difference
A - Sample Result
B - Duplicate Result

1 - Sample results could be biased low - qualify as biased low (L).
2 - Possible false negative; analytical deficiencies - qualify as (X) reject.
3 - Detection limit may be biased low - qualify as (UL).
4 - False positives possible or results biased high - qualify as (K).

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APPENDIX A-IV
RADIOCHEMICAL DATA

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RADIOLOGICAL LABORATORY ANALYSIS QUALITY CONTROL (QA Level V)

The radiological analysis laboratory QC will provide that the required analysis, QC sample checks, and verification of the results are performed and that the acceptability of the results is known and verifiable. Any deficiencies in the testing program will be identified so proper corrective action can be taken.

DUPLICATE SAMPLE ANALYSIS

One duplicate sample will be run for every 10 to 20 samples. The results of these analyses will be used to determine the percent relative standard deviation (percent RSD), which will be recorded on radiological analysis quality control forms (e.g., control charts) for the parameters being tested. If the results of the percent relative standard deviation are excessive (i.e., outside the control limits) for the materials analyzed and method used, the samples will be reanalyzed. Qualify outlying results as (G).

MATRIX SPIKE ANALYSIS

One sample out of every 10 to 20 will be spiked prior to analysis with the parameters of interest to determine the percent bias. The percent bias will be recorded on radiological analysis QC forms (e.g., control charts). If the results of the percent bias determinations fall outside appropriate values (i.e., control limits) for the material analyzed and method used, the samples will be reanalyzed and the values recorded. Qualify outlying results as (G)

METHOD AND FIELD BLANK ANALYSES

At least one method blank for each group of samples will be analyzed for the pertinent radiological parameters. The method blanks will consist of a distilled or de-ionized water sample.
Field blanks will be analyzed to monitor for possible sample contamination during storage and shipment. Field blanks will be prepared by filling two sample containers with distilled water and shipping the blanks to the lab with the sample bottles. The field blanks accompany the sample bottles through collection and shipment to the laboratory and are stored with the samples. If the field blanks indicate possible contamination of the samples, the laboratory manager and site manager will be notified immediately and, depending upon the nature and extent of the contamination, the sample results may be corrected for the field blank concentration or the sources resampled. Results of method and field blank analyses will be filed with the corresponding sample analytical data.
Radiological measurements (i.e., surface and subsurface soil, sediment, surface and ground water, and radiation survey measurements) which have not undergone complete validation should use the following criteria.

I. Radiation Survey Measurements

The procedure and checklists shown in Appendix A-1 should be used to validate data that has not previously been validated.

II. Soil/Sediment Measurements

A. Review separately the analytical data from each radiological parameter for all samples.

1. For each parameter with results listed as "less than the detection limit" verify that the following detection limits are listed.

Radiological Laboratory Detection Limits

Parameter	Lab Detection Limits (pCi/g)	Rinsate Limits (pCi/l)
Uranium, total	1 *ug/g*	1 *ug/l*
Np-237	0.6	30.0
Tc-99	0.9	5.0
Sr-90	0.5	1.0
Pu-239, 240	0.6	1.0
Pu-238	0.6	1.0
Th-232	0.6	1.0
Th-230	0.6	1.0
Th-228	0.6	1.0
U-238	0.6	1.0
U-235, 236	0.6	1.0
U-234	0.6	1.0
Ra-228	0.5	3.0
Ra-226	0.3	1.0
Ru-106	1.0	150.0
Cs-137	0.2	20.0

(RI/FS, FMPC, Volume V: QAPP, Rev. 3, Section 4, p. 19)

2. For each sample and each parameter, determine whether results are greater than the laboratory detection limit for that parameter.

3. If laboratory detection limits are exceeded, the location of the soil sample is investigated by reviewing the field sample logs and other site records to determine, if possible, the source of the activity.

4. For every reading above the detection limit, verify that there is a two standard deviation (95%) uncertainty listed. Verify that the uncertainty does not exceed the parameter reading.

5. Anomalies are investigated by reviewing field logs and other site records to determine if the source of the anomaly is apparent.

B. Review the consistency of total uranium data

1. Calculate the mass concentration of uranium in each sample using the formula:

U-238(pCi/g) x 3 + U-235(pCi/g) x 0.5 = g/g

This equation is used to estimate the mass concentration. The factors, 3 and 0.5, are the reciprocals to the specific activities for ^{238}U and ^{235}U, respectively.

Specific Activity = Lambda x N,

Lambda = In2/Radioactive Halflife, and
N = Number of Atoms per gram of Radioactive Material

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Lambda (^{238}U) = In2/(4.5 x 10^9 yrs x 3.15 x 10^7 sec/yr) = 4.89 x 10^{-15} sec^{-1}

$$N\ (^{238}U) = \frac{6.02 \times 10^{23}\ \text{atoms/g-mole} \times 10^{12}\ \text{pCi/Ci}}{238\ \text{g/g-mole} \times 3.7 \times 10^{10}\ \text{dps/Ci} \times 10^{6}\ \text{g/g}} = 0.33\ \text{pCu/g}$$

The reciprocal being 1/0.33, or 3 g/pCi. The same calculation can be performed for ^{235}U substituting in the radiological halflife of 7.1 x 10^6 yrs and the atomic mass of 235 g/g-mole. The answer in this case being 0.47 g/pCi.

The second formula is simply the ratio of the ^{238}U specific activity to the ^{235}U specific activity multiplied by 100. The same calculations as those used above were used. The specific activity for ^{238}U is 0.33 pCi/g while that for ^{235}U is 2.15 pCi/g (2.15 pCi/g). The ratio times 100 is 15.6.

2. Compare this calculated value with the reported "total uranium" values (g/g) by calculating the ratio of the two values.

3. Any ratio outside of the range of 0.8 - 1.2 is considered an outlier and the laboratory data sheets for that sample are to be reviewed for errors.

4. Anomalies are investigated by reviewing field logs and other site records to determine if the source of the anomaly is apparent. Qualify as (C) all results falling outside the acceptable range.

C. Review the consistency of isotopic uranium data

1. Calculate the percent enrichment (by mass) of U-235 for each sample using the formula:

$$\frac{\text{U-235 (pCi/g)}}{\text{U-238 (pCi/g)}} \times 15.56 = \_\_\%$$

2. Any percent enrichment outside of the range of 0.2 - 1.3% is considered an outlier and the laboratory data sheets for that sample are to be reviewed for errors. Qualify as (D) all results falling outside of the acceptable range.

3. Calculate the ratio of U-234 (pCi/g) to U-238 (pCi/g) for each sample.

4. Any ratio outside the range 0.4 to 1.3 is considered an outlier and the laboratory data sheets for the sample are to be reviewed for errors.

5. Anomalies are investigated by reviewing field logs and other site records to determine if the source of the anomaly is apparent. Qualify as (E) all results falling outside of the acceptable range.

D. Review maps and plots of total uranium in soil samples.

1. Soil concentrations of total uranium should be within the background range of 0.5 to 5 pCi/g if the location is distant from known areas of elevated concentrations (sewage treatment plant, NE corner of plant).

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The range of total uranium values was determined by soil samples taken distant to the FMPC site. A range of 0.76 to 2.2 pCi/g for U-238 in soil was presented by T. E. Myrick, et al, for 12 samples taken in the state of Ohio which is comparable with the estimate used in the Data Validation Plan. Concentration outside of the range were considered anomalous, investigated, and unresolved items noted in a memorandum to the Data Validation Technical Representative, (Myrick, T. E., et al, "Determination of Concentrations of selected Radionuclides in Surface Soils in the U.S.", Health Physics, Vol. 45, No. 3, pp. 631-42.)

2. Measured concentration near known areas of elevated concentrations should increase with decreasing distance from the area.

3. Anomalies are investigated by reviewing field logs and other site records to determine if the source of the anomaly is apparent.

4. Any unresolved anomalies are noted in a memorandum to the DV Technical Rep.

E. Review maps and plots of other parameters in soil samples

1. Anomalies are investigated by reviewing field logs and other site records to determine if the source of the anomaly is apparent.

III. Surface and GroundWater Measurements

The criteria used above in Section II. Soil/Sediment Measurements, Parts A - C, should be used in addition to the following to validate surface and groundwater sample data.

A. Review maps and plots of surface water measurements

1. Surface water concentrations of total uranium should be within the background range of 1 to 2 pCi/ℓ if the location is distant from known areas of elevated concentration.

The "Hydrogeologic Study of FMPC Discharge to the Great Miami River" (IT Corporation, August 1, 1988) documents a total uranium range of 1.0 to 1.8 pCi/liter. Recent Fernald Environmental Monitoring Reports have presented varying concentrations found at location W5 (Paddys Run, north of the railroad tracks entering the site) which are in the 1.0 to 2.0 pCi/liter range.

2. Anomalies are investigated by reviewing field logs and other site records to determine if the source of the anomaly is apparent.

B. Review maps and plots of ground water measurements

1. Ground water concentrations of total uranium should be within the background range of 1 to 2 pCi/ℓ if the location is distant from known areas of elevated concentration.

2. Anomalies are investigated by reviewing field logs and other site records to determine if the source of the anomaly is apparent. It is important to utilize information from different depth wells to validate that results are noted elsewhere in the area if a positive result is observed.

IV. Review of Radiochemical Blanks, Replicates and Spikes

A. Are blanks analyzed at least every 20 samples?

B. Do the blanks exhibit high background?

C. Was the high background investigated?

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D. Are replicates run at least every 20 samples?

E. Does the normalized range exceed control limits (for liquids)?

F. Does the normalized range exceed control limits (for inorganic solids)?

G. Are spikes run at least every 20 samples?

H. Were normalized deviation results documented on control charts?

I. Does the normalized deviation result exceed control limits?

V. Actions To Be Taken On Radiological Data

Accept: All non-qualified results may be accepted as Analytical Level V data

Qualify: Radiological data having any of the following qualifiers should be qualified (J), indicating an approximate result:

C = Calculated total uranium value is outside the acceptance limits
D = Calculated percent enrichment value is outside the acceptance limits
E = Calculated U-234 to U-238 activity is outside the acceptance limits

Data having the following qualifiers are qualified (R), indicating that results are unreliable due to lack of traceable QC procedures:

F = QC data not located

Reject: Data which is subject to two or more qualifiers (multiple deficiencies - XM) or data which is qualified (G), QC data exceeds quality control limits; or data where negative responses are recorded for questions (A, D, or G) above should be rejected (X).

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SPECIFIC VALIDATION CHECKLIST	RADIOCHEMICAL CHECKLIST FOR BLANKS, SPIKES, DUPLICATES							
PROJECT: 303317 FERNALD	SAMPLE/I.D.:				PAGE OF		DATE:	
CHECKLIST ITEMS	U-234/238	Pu-239	Np-237	Th-232	Tc-99	Sr-90	U-Tot	Ra-226/228
ARE BLANKS RUN EVERY 20 SAMPLES?								
BLANK SAMPLE FORM #'S								
BLANK BACKGROUND COUNT RATE (DPM)								
ARE HI BKGROUNDS DOCUMENTED/INVESTIGATED?								
ARE SPIKES RUN EVERY 20 SAMPLES?								
SPIKE SAMPLE FORM #'S								
SPIKE NORMALIZED DEV.S								
ARE NORMALIZED DEVIATIONS WITHIN CONTROL LIMITS? (-3<X<+3)								
ARE DUPLICATES RUN EVERY 20 SAMPLES?								
RESULTS: IF DUP#=SAM#								
ARE NORMALIZED RANGES WITHIN CONTROL LIMITS (0<X<+4)-FOR LIQUIDS?								
-FOR INORGANIC SOLIDS?								

NOTES: NA - NOT APPLICABLE
- - QC INFO NOT FOUND
- QC INFO FOUND
#(xx) - QC INFO FOUND, BUT WAS AFTER xx SAMPLES (i.e. MORE THAN 20)

COMMENTS:

REVIEWED BY:	DATE:	CONCURRENCE BY:	DATE:

MATRIX SPIKE/DUPLICATE ANALYSIS RESULTS

The relative percent difference (RPD) for each parameter was evaluated. The established advisory RPD criteria for each matrix spike is 20%. Positive results shall have recorded RPD values. If the RPD is greater than 20, the results shall be evaluated.

RI/FS Sample Number: _____

RI/FS Duplicate Sample Number: _____

Parameter	RI/FS Sample Result	RI/FS Duplicate Sample Result	RPD
238U			
235U			
234U			
U TOTAL			
232Th			
230Th			
228Th			
Th TOTAL			
239Pu			
238Pu			
228Ra			
226Ra			
237Np			
137Cs			
90Sr			
99Tc			
106Ru			

Data Validation Procedures for Biology Data

The procedures for Biology Sampling on page A-9 of Appendix A-I, Field Measurements and Observations, cover the biological sampling conducted in 1987 and 1988.

1.0 Macroinvertebrate Surveys of Paddys Run and the Great Miami River, Task 3.05.01

A. Refer to the Specific Validation Checklist for Macroinvertebrate Surveys.

B. Each sample and sampling event should be properly recorded in the field log, along with physicochemical data recorded in the field at the time of sampling.

C. The following document requires review:

* Field Log (bound notebook, specific to Fernald, kept by field personnel).

D. The Plan of Work for Macroinvertebrate Surveys, in the Project Files Task 3.5, provides background information for macroinvertebrate surveys.

E. Macroinvertebrates collected from Paddys Run and the Great Miami River are identified using the following references and keys:

* Mason, W.T., 1973, An Introduction to the Identification of Chironomid Larvae, Analytical Quality Control Laboratory, NERC/EPA, Cincinnati, Ohio.

* Merritt, R.W. and K.W. Cummins (eds.), 1984, An Introduction to the Aquatic Insects of North America, 2nd ed., Kendall/Hunt Publishing Company, Dubuque, Iowa.

* Parrish, F.K., 1975, Keys to Water Quality Indicative Organisms of the Southeastern United States, 2nd ed., Office of Research and Development, USEPA, Cincinnati, Ohio.

* Pennak, R.W., 1978, Freshwater Invertebrates of the United States, 2nd. ed., Ronald Press Company, New York New York.

* Ward, H.B. and G.C. Whipple (eds.), 1959, Freshwater Biology, 2nd ed., John Wiley and Sons, New York, New York.

F. Organisms are classified into pollution tolerance classes according to the following references:

* Conn, C.C., 1973, Biological Survey of the Great Miami River, The Miami Conservancy District.

* Merritt, R.W. and K.W. Cummins (eds.), 1984, An Introduction to the Aquatic Insects of North America, 2nd ed., Kendall/Hunt Publishing Company, Dubuque, Iowa.

* Weber, C.I., 1973, Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents, EPA/670/4-73/001, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

G. Surber samplers, used to collect organisms from Paddys Run, are used in accordance with American Society for Testing and Materials (ASTM) practice, described in the following reference:

* Cairns, J. and K.L. Dickson (eds.), 1973, Biological Methods for the Assessment of Water Quality, ASTM Special Technical Publication 528, American Society for Testing and Materials, Philadelphia, Pennsylvania.

H. Statistical analyses of data are performed according to the following references:

* Green, R.H., 1979, Sampling Design and Statistical Methods for Environmental Biologists, John Wiley and Sons, New York, New York.

* Ludwig, J.A. and J.F. Reynolds, 1988, Statistical Ecology, John Wiley and Sons, New York, New York.

* Zar, J.H., 1974, Biostatistical Analysis, Prentice Hall, Inc., Englewood Cliffs, New Jersey.

I. Dissolved oxygen, temperature, pH, conductivity, and oxidation reduction potential of the water at macroinvertebrate sampling stations are recorded with a Hydrolab Surveyor II water quality analyzer, calibrated according to the manufacturer's instructions.

J. The Technical Review of the Macroinvertebrate Survey Report, which will be deposited in the Project File Task 3.5, should also be consulted to ensure that all technical comments have been properly dispositioned.

2.0 Acute and Chronic Toxicity Testing of FMPC Effluent, Task 3.05.02

A. Refer to the Specific Validation Checklist for Acute and Chronic Toxicity Testing.

B. The following documents require review:

* SCL (Use General Validation Checklist for this document.)
* C-C (Use General Validation Checklist for this document.)
* RFA (Use General Validation Checklist for this document.)
* FADL or field log.

SPECIFIC VALIDATION CHECKLIST				TITLE: MACROINVERTEBRATE SURVEYS
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
IS THE FIELD LOG COMPLETE AND ACCURATE?				
HYDROLAB SURVEYOR II WATER QUALITY ANALYZER CALIBRATED				
SAMPLES FROM FIELD PROPERLY LOGGED INTO ANALYTICAL LAB, CHECKING ID AGAINST FIELD LOG				
TABLES OF PHYSICOCHEMICAL DATA FOR REPORTS VERIFIED AGAINST FIELD LOG				
FOR QA CHECKS OF ORGANISM ID'S AND NUMBERS, ORGANISM ID'S MATCH AND COUNTS MATCH WITHIN 10 %				
REPORT CHECKLIST SHOWS VERIFICATION OF CALCULATIONS OF INDICES AND STATISTICS USED IN REPORTS				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

C. The Plan of Work for Acute and Chronic Testing, in the Project Files Task 3.5, provides background information for acute and chronic toxicity testing. Testing requirements are contained in the following documents: 1455

Acute Testing

USEPA, 1985, Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, Third Edition, EPA/600/4-85/013, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

Chronic Testing

USEPA, 1989, Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Second Edition, EPA/600/4-89/001, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

Items on the Specific Validation Checklist are adapted from these documents.

D. The specific tests conducted on FMPC effluent are listed below. Recommended test conditions are stated in the referenced table.

Acute Toxicity Tests

1. Daphnia pulex (Water Flea) 48 Hour Survival Test (USEPA, 1985, Table 5)

2. Pimephales promelas (Fathead Minnow) 96 Hour Survival Test (USEPA, 1985, Table 7)

Chronic Toxicity Tests

1. Selanastrum capricornutum (Algal) Growth Test (USEPA, 1989, Section 13, Table 3)

2. Ceriodaphnia dubia (Cladoceran) Survival and Reproduction Test (USEPA, 1989, Section 12, Table 3)

3. Pimephales promelas (Fathead Minnow) Larval Survival and Growth Test (USEPA, 1989, Section 10, Table 1)

E. The Technical Review of the Acute and Chronic Toxicity Testing Report, which will be deposited in the Project File Task 3.5, should also be consulted to ensure that all technical comments have been properly dispositioned.

3.0 Wetlands Delineation, Task 3.05.03

A. The Plan of Work for Wetlands Delineation, in the Project File Task 3.5, provides background information for wetlands delineation.

SPECIFIC VALIDATION CHECKLIST				TITLE: BIOLOGICAL RESOURCES ACUTE/CHRONIC
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				TEST TYPE:
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
DILUTION WATER OBTAINED FROM AN UPSTREAM SOURCE				
SAMPLE PRESERVED ON ICE				
SAMPLE ANALYZED WITHIN 72 HOURS				
INSTRUMENTS TO MEASURE DO, pH, CONDUCTIVITY, ALKALINITY AND HARDNESS CALIBRATED				
WATER TEMPERATURE MAINTAINED WITHIN + or - 2 C OF TEST RANGE				
pH KEPT BETWEEN 6.0 - 9.0				
DO AND pH CHECKED DAILY				
DO EXCEED 40% (4 MG/L) SATURATION				
CONTROL SURVIVAL EXCEED 80%				
TEST ORGANISM DISEASE FREE				
ORGANISMS AT APPROPRIATE AGE				
REF TOXICANT CHECKED MONTHLY				
LC 50 FOR REFERENCE TOXICANT WITHIN EXPECTED RANGE				
DO 2 OR MORE CONCENTRATIONS EXHIBIT A TREND DEVIATION?				
TEST CONDUCTED IN GEN. ACCORDANCE USEPA GUIDANCE (1985,1989)				
ANY UNEXPLAINED DISCREPANCIES IN MORTALITY BETWEEN REPLICATE TREATMENT?				
IN PHYSICOCHEMICAL DATA?				
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:

B. Requirements for valid wetlands delineation are contained in the following document: 1455

* Federal Interagency Committee for Wetland Delineation, 1989, Federal Manual for Identifying and Delineating Jurisdictional Wetlands, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S.D.A. Soil Conservation Service, Washington, D.C. Cooperative technical publication. 76 pp. plus appendices.

C. The Technical Review of the Wetlands Delineation Report, which will be deposited in the Project File Task 3.5, should also be consulted to ensure that all technical comments have been properly dispositioned.

4.0 Bioaccumulation Study, Task 3.05.04

A. Refer to the Specific Validation Checklist for the bioaccumulation study.

B. Each sample should appear in the CC, RFA, and FADL (or field log). Make certain each form is correctly filled out by using General Validation Checklists for these forms. Alternately, if numerous discrepancies exist, make a copy of the document and circle the discrepancies with a red pen. Note this fact on the checklist and attach the copy.

C. The Plan of Work for the Bioaccumulation Study, in the Project Files Task 3.5, provides background information for the bioaccumulation study. Section 7.1 of QAPP contains requirements for CC and RFA. NOTE: there are General Validation Checklists for each of these forms.

D. The RFA should indicate the type of analysis the sample should undergo. Packaging requirements for samples are contained in section 6.3.4 of the Sampling Plan, and should correspond to the type of analysis requested on the RFA.

E. The Technical Review of the Bioaccumulation Report, which will be deposited in the Project File Task 3.5, should also be consulted to ensure that all technical comments have been properly dispositioned.

5.0 Soils and Sediment Toxicity Testing, Task 3.05.05

A. Refer to the Specific Validation Checklists for Soils and Sediment Toxicity Testing and for Surface Soil Sampling.

B. Soils and sediment sample collection and radiological analyses should follow data validation procedures outlined in the QAPP Addendum, Section 9.1.8, Surface Soil Sampling.

C. Background information on soil and sediment toxicity testing is provided in the Plan of Work for soils and sediment toxicity testing, in the Project Files Task 3.5. Testing requirements are contained in the following documents:

* USEPA, 1985, Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, Third Edition, EPA/600/4-85/013, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

* USEPA, 1989, Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Second Edition, EPA/600/4-89/001, Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

* Nebecker, A., 1984, "Biological Methods for Determining Toxicity of Contaminated Freshwater Sediments to Invertebrates", Environmental Toxicology and Chemistry, Vol. 1, pp. 617-630.

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Items on the Specific Validation Checklist are adapted from these documents.

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D. The following documents require review:
   * SCL (Use General Validation Checklist for this document.)
   * CC (Use General Validation Checklist for this document.)
   * RFA (Use General Validation Checklist for this document.)
   * FADL or field log.

E. The specific tests conducted on soils and sediments are listed below.

   1. Pimephales promelas (Fathead Minnow) 96 Hour Static Acute Whole Sediment Bioassay

   2. Chironomus tentans (Chironomid) 10-Day Acute Whole Sediment Bioassay

   3. Daphnia magna (Water Flea) 48 Hour Static Nonrenewal Sediment Bioassay

F. The Technical Review of the Soils and Sediment Toxicity Testing Report, which will be deposited in the Project File Task 3.5, should also be consulted to ensure that all technical comments have been properly dispositioned.

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SPECIFIC VALIDATION CHECKLIST				TITLE: BIOACCUMULATION STUDY
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
IS THE REQUEST FOR ANALYSIS COMPLETE AND ACCURATE?				
IS THE CHAIN OF CUSTODY COMPLETE AND ACCURATE?				
IS THE FADL COMPLETE AND ACCURATE?				
LOCATION OF FISH CAGES AND TIME AND DATE OF PLACEMENT RECORDED IN BOUND NOTEBOOK?				
FISH HEALTHY AT THE TIME OF PLACEMENT IN CAGES				
FISH ALL PROCURED FROM SAME SUPPLIER, AT ONE TIME				
TABLES OF PHYSICOCHEMICAL DATA FROM FIELD, USED FOR REPORTS VERIFIED AGAINST FIELD LOG				
REVIEWED BY : DATE:				CONCURRENCE BY: DATE:

SPECIFIC VALIDATION CHECKLIST				TITLE: SOILS AND SEDIMENT TOXICITY
PROJECT:				DATE: PAGE __ OF __
SAMPLE/I.D.:				
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS
TEST CONDUCTED IN GENERAL ACCORDANCE WITH APPROVED METHOD				
TEMPERATURE WITHIN ± 2C OF TEST TEMPERATURE				
TWO OR MORE CONCENTRATIONS EXHIBIT A TREND DEVIATION				
HOLDING TIMES FOR SEDIMENTS LESS THAN 30 DAYS AT 4 C.				
ANY UNEXPLAINED DISCREPANCIES IN MORTALITY BETWEEN REPLICATE TREATMENTS				
ANY UNEXPLAINED DISCREPANCIES IN PHYSICOCHEMICAL DATA BETWEEN REPLICATE TREATMENTS				
REVIEWED BY : DATE :				CONCURRENCE BY: DATE:

GEOTECHNICAL OF INTERNAL QUALITY CONTROL CHECKS (QA Level II)

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Internal quality control checks, (e.g., QC samples) are not applicable to geotechnical testing. This is due to the inability of obtaining samples with known characteristics. Blanks and spikes are also not applicable to geotechnical testing.

QC measures to insure accuracy and precision of test results include the following:

100% verification on all numerical results - all raw data entries, transcriptions and calculations entered by lab technicians are checked, recalculated and verified by the geotechnical laboratory manager.

Data validation through test reasonableness - summaries of all test results for individual reports are reviewed by the geotechnical laboratory manager to determine the overall reasonableness of data and to determine the presence of any data that may be considered outliers.

Routine instrument calibration - all instruments, gauges, and equipment used in testing are calibrated on a timely routine basis. All instrument calibration follows ASTM or manufacturer's guidelines.

Maintenance of all past calibration records - records and certification documents of all instruments, gauges, and equipment are updated routinely and maintained in the geotechnical analytical instruments; in some cases, the instruments may be set up in a mobile laboratory on site. There is a wide range in the quality of data that can be generated. The quality depends on the use of suitable calibration standards, reference materials, sample preparation equipment, and the training of the operator. Results are available in real-time or several hours.

The following QA/QC measures are the mainstay of Geotechnical Services:

A. Procurement and control of instrumentation and supplies required for laboratory operation

B. Sample receipt, chain-of-custody completion, and sample storage

C. Calibration of testing equipment

D. Geotechnical tests in accordance with prescribed, industry-standard test methods

E. Data processing, validation, and reporting

F. Control and maintenance of laboratory records

G. Identify and resolve nonconformances requiring corrective action

H. Audits to verify laboratory performance and the reporting of audit results to management

The reviewer shall verify that those items on the check list have been accomplished.

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Geotechnical Testing Procedures

Soil Sampling	*ASTM D420
Preserving and Transporting Samples	ASTM D4220
Preparation of Soil Samples	ASTM D421/D2217
Water Content	ASTM D2216
Particle Size Distribution	ASTM D422
Atterberg Limits	ASTM D4318
Bulk Density	ASTM D4531
Specific Gravity	ASTM D854
Permeability	ASTM D2434
Saturated Hydraulic Conductivity	ASTM D2434
Porosity	ASTM D2434
pH	**MOSA 12-2.6

*ASTM - American Society for Testing and Materials
**MOSA - Methods of Soil Analysis Part 2

Test Method	Sample Size	Reporting Unit
ASTM D420	NOT APPLICABLE	NOT APPLICABLE
ASTM D4220	NOT APPLICABLE	NOT APPLICABLE
ASTM D421/D2217	NOT APPLICABLE	NOT APPLICABLE
ASTM D2216	25 g	% WATER-OVEN DRY BASIS
ASTM D422	100 g	% PER DIAMETER CLASS
ASTM D4318	250 g	% WATER LIQUID LIMIT
		% WATER PLASTIC LIMIT
		PLASTICITY INDEX USCS
CLASSIFICATION		
ASTM D4531	100 g (UNDISTURBED)	g/cm^3
ASTM D854	50 g	g/cm^3
ASTM D2434	500 g	COEFFICIENT OF PERMEABILITY (cm/sec)

SPECIFIC VALIDATION CHECKLIST				TITLE: GEOTECHNICAL	
PROJECT:				DATE:	PAGE __ OF __
SAMPLE/I.D.:					
CHECKLIST ITEMS	YES	NO	N.A.	REMARKS/COMMENTS	
IS CHAIN-OF-CUSTODY COMPLETE?					
IS REQUEST FOR ANALYSIS COMPLETE?					
WAS HYDROMETER CALIBRATED?					
IS CALIBRATION DONE ON EQUIPMENT WHICH REQUIRES DAILY CALIBRATION?					
ARE THERMOMETERS NBS TRACEABLE?					
ARE SIEVES CERTIFIED TO ASTM.11.87?					
ARE CALIPERS CALIBRATED?					
ARE PYCNOMETERS CALIBRATED?					
ARE QA CHECKS PERFORMED ON DATA (I.E. CALCULATIONS,TRANSCRIPTION ERRORS)					
REVIEWED BY: DATE:				CONCURRENCE BY: DATE:	

APPENDIX B
DATA VALIDATION TEAM FORMS

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No. _____

Page 1 of 2

FMPC RI/FS DATA VALIDATION
DEFICIENCY REPORT

Date _____

Task:

Field Data Form:

Lab Project Number:

Sample Numbers:

Problem Description:

Problem Significance/Impact:

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Data Validation Team Recommendation:

DVT Leader/Tech Rep _____ Date _____

QA Officer _____ Date _____

Dep Dir Technical/Tech Manager _____ Date _____

Project Director _____ Date _____

IP940.kg2

*Completed Checklist Attached

FMPC RI/FS DATA VALIDATION
DEFICIENCY REPORTS LOG

NO./DATE	FIELD DATA FORM/ LAB PROJECT NO.	TASK	SAMPLE NOS.

DATA VALIDATION

TEAM MEMBER BASIC ORIENTATION/TRAINING

NAME	GENERAL FIELD TECHNIQUES BRIEFING	WORK PLAN VOL. I, SEC. 4	QAPP, SEC. 10	FMPC RI/FS DATA VALIDATION PROCEDURE	DVP	