Data Validation Summary Report
Phase B Investigation Area I Soil
Tronox LLC
Henderson, Nevada

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Responsible CEM for this project

I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state and local statutes, regulations and ordinances.

Susan M. Crowley, CEM 1428 Exp.:03/08/11
Crowley Environmental LLC

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ACRONYMS AND ABBREVIATIONS

%R	Percent Recovery
PCB	Polychlorinated Biphenyl
CCV	Continuing Calibration Verification
CEM	Certified Environmental Manager
CLP	Contract Laboratory Program
CN	Cyanide
CCV	Continuing Calibration Verification
%D	Percent Difference
DOE	Department of Energy
DRO	Diesel Range Organic
DQI	Data Quality Indicator
DUP	Duplicate
EDD	Electronic Data Deliverable
EDL	Estimated Detection Limit
EDXA	Energy Dispersive X-ray Analysis
EPA	U.S. Environmental Protection Agency
FSAP	Field Sampling and Analysis Plan
GC/MS	Gas Chromatograph/Mass Spectrometer
GRO	Gasoline Range Organic
HCB	Hexachlorobenzene
ICP	Inductively Coupled Plasma
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LDC	Laboratory Data Consultants
LIMS	Laboratory Information Management System
LOU	Letter of Understanding
MARLAP	Multi-Agency Radiological Laboratory Analytical Protocols Manual
MBAS	Methylene Blue Active Substance
MDL	Method Detection Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NDEP	Nevada Division of Environmental Protection
NELAP	National Environmental Laboratory Accreditation Program

ORO	Oil Range Organic
PCB	Polychlorinated Biphenyl
PCDD/PCDF	Polychlorinated Dibenzodioxin/Polychlorinated Dibenzofuran
PQL	Practical Quantitation Limit
QC	Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
SDG	Sample Delivery Group
SAED	Selected Area Electron Diffraction
SDG	Sample Delivery Group
SPLP	Synthetic Precipitation Leaching Procedure
SQL	Sample Quantitation Limit
SIM	Selected Ion Monitoring
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TCDD	Tetrachlorodibenzodioxin
TEM	Transmission Electron Microscope
Tronox	Tronox LLC
VOC	Volatile Organic Compound

1.0 INTRODUCTION

On behalf of Tronox LLC (Tronox), Northgate Environmental Management, Inc. (Northgate) has prepared this Data Validation Summary Report to assess the validity (based on data validation) and usability (based on project objectives) of the Phase B, Area I soil data. The Area I Phase B Investigation was initiated in 2008 by ENSR/AECOM and finalized by Northgate in 2009.

Area I soils were collected and analyzed in accordance with the *Revised Phase B Investigation Work Plan, Tronox LLC Facility, Henderson, Nevada, December* 2008 (AECOM 2008) and the *Revised Phase B Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada, July 2009* (AECOM and Northgate 2009). Area I soils were collected from 65 borings resulting in the analyses of 6,230 environmental and 1,438 field quality control (QC) samples (field blank, equipment blanks, field duplicates and matrix spike [MS]/MS duplicate [MSD] analysis). Selected soil locations were analyzed by synthetic precipitation leaching procedure (SPLP). Tests with SPLP extraction fluids 2 and 3 were conducted on 340 environmental samples. The sampling and analysis summary of the 65 Area I borings is presented in Table 1-1. Analysis as proposed in the *Revised Phase B Investigation Work Plan, Tronox LLC Facility, Henderson, Nevada, December* 2008 (AECOM 2008), was completed with the following additions:

- Gasoline Range Organics (GRO) – Two additional locations (RSAM-10B, RSAM-20B) were analyzed by Method 8015;
- Organic Acids and Organophosphorous Pesticides – One additional soil sample (RSAI2-0.5) was analyzed by HPLC-UV per Alpha Analytical SOP E.64rev5, and EPA 8141, respectively;
- SPLP, PCB – One additional location (RSAM3 -10B) was analyzed by Method 8082;
- Cyanide – During the 2008 sampling event, four cyanide samples proposed in the Phase B Work Plan were not collected from soil locations: RSAJ7-30B, RSAK2-25B, SA46-31B, and SA67-25B. However, during the sampling event, seven locations not listed in the Work Plan were analyzed for cyanide (RSAJ8-0.5B, RSAJ8-10B, RASJ8-20B, RSAJ8-30B, RSAJ8-33B, RSAI7-32B, and RSAL2-40B);
- RSAL2-40B was collected during the 2008 Phase B sampling and analyzed for: perchlorate, metals, Cr6, DRO/ORO, VOC, Wet Chemistry, cyanide, OCPs, SVOC, PCB/8082, and radiological methods; and
- Organochlorine Pesticides (OCPs) – The SAP proposed the collection of 201 soil samples for organochlorine pesticide analysis. Soils were submitted for OCPs from the top, middle and bottom of the boring. The middle boring was extracted and held. The laboratory proceeded with the analysis of the middle boring only when OCPs were

detected in the top and bottom, resulting in the analysis of only 183 of the 201 OCP soil samples proposed.

Laboratory analytical services were provided by the eight laboratories presented in the *Revised Phase B Investigation Work Plan, Tronox LLC Facility, Henderson, Nevada, December 2008* (AECOM 2008), and the *Revised Phase B Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada, July 2009* (AECOM and Northgate 2009), with Columbia Analytical Services, Inc., in Rochester, New York, as the primary laboratory throughout the Phase B Investigation. Distribution of the nineteen analytical groups is summarized below.

Laboratory	**Location**	**Analytical Group(s)**
Alpha Analytical	Sparks, NV	Organic Acids
Columbia Analytical Services	Houston, TX	Dioxin/Furans and PCB Congeners
Columbia Analytical Services	Kelso, WA	Metals, Chlorate, Perchlorate
Columbia Analytical Services	Rochester, NY	VOC, SVOC, Organochlorine Pesticide, PCB, TPH, CN, Cr6, Formaldehyde, Wet Chemistry
EMSL Analytical	Westmont, NJ	Asbestos
General Engineering Laboratories	Charleston, SC	Radionuclides
PTS Laboratories, Inc.	Santa Fe Springs, CA	Geotechnical
Test America	Denver, CO	Organophosphorous Pesticide

Field samples and the associated field QC samples were logged into the laboratories in Sample Delivery Groups (SDGs). The Area I soil data are contained in 79 soil SDGs and 11 SPLP SDGs. A complete listing of the Area I soil samples and SDGs is presented in Table 1-2.

The analytical data were validated by Laboratory Data Consultants, Inc. (LDC) in accordance with procedures described in the Nevada Division of Environmental Protection (NDEP) *Data Verification and Validation Requirements - Supplement* established for the BMI Plant Sites and Common Areas Projects, Henderson, Nevada, April 13, 2009. The association between the laboratory SDGs and LDC validation reports is presented in Table 1-3.

2.0 DATA VALIDATION PROCESS

A formal validation of the Phase B Investigation Area I soil analytical results was performed to determine the suitability of the data for potential use in the conceptual site model, risk assessment, and other future on-site environmental assessments.

Consistent with the Phase B Work Plan (AECOM 2008), the Tronox Quality Assurance Project Plan (QAPP; AECOM/Northgate 2009), and NDEP Supplemental Guidance (NDEP 2009d), all of the Phase B Investigation data were validated. The Area I soil data are contained in 79 soil SDGs and 11 SPLP SDGs. Approximately 90% of the analytical data were validated as Stage 2B and approximately 10% were validated by Stage 4 data validation procedures. EPA Stage 2B (EPA 2009) validation evaluates the following QC criteria:

- Completeness of deliverable;
- Technical holding times and sample preservation;
- Sample integrity and cooler/sample temperature at the time of laboratory receipt;
- Laboratory and field blank contamination;
- Surrogate spike recoveries;
- Tracer recoveries (radiochemical data only);
- MS/MSD recoveries and RPDs;
- Laboratory duplicate RPDs;
- LCS recoveries; and
- Initial and continuing calibrations.

The comprehensive validation, consistent with EPA designation of Stage 4 (EPA 2009), involves in-depth review of compound identification and quantification, spot-checks of calculations, and verification of summary data against the raw data. Table 1-3 is a cross-reference of laboratory SDG and validation reports. Field samples presented with shading were validated as Stage 4 (EPA 2009).

2.1 Data Deliverables

Analytical data deliverables were provided as an electronic data deliverable (EDD) version of the full data package, equivalent to a Contract Laboratory Program (CLP) deliverable (i.e., consisting of all the information required in a CLP package, including CLP-like summary forms). The electronic data packages were presented in PDF format with embedded text

wherever possible and include complete bookmarking for all forms, tables, and sections. Each data package was also delivered as an EDD.

Asbestos deliverables included sample results, a case narrative, chain-of-custody, QC summary data, sample prep data, Transmission Electron Microscope (TEM) calibration data (chrysotile beam dose sensitivity, camera constant calibrations, crocidolite spectrum Na sensitivity, Mg-Si K-alpha peak resolvability, K factors, and detector resolution of the Mn K-alpha peak), one Energy Dispersive X-Ray Analysis (EDXA) and one Selected Area Electron Diffraction (SAED) image per asbestos type per sample, filter blank lot data (4%), lab blanks, method blanks, equipment blanks, and all analyst worksheets. The analytical reports for all Area I soils are presented in Appendix A.

In addition to the laboratory deliverables, field information was provided to the validation staff in order to associate the field QC samples (field blanks, equipment blanks, and field duplicates) with the primary field samples prior to validation.

2.2 Validation of Analytical Deliverables

Validation of the Area I soil data was performed by LDC using the appropriate EPA guidelines (EPA 1999, 2004, 2008, 2009) or equivalent regional EPA validation guidelines such as Region 9 Superfund Data Evaluation/Validation Guidance, R9QA/006.1 (US EPA 2001), Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP), Department of Energy (DOE) guidance, the BMI Plant Site-Specific Supplemental Guidance on Data Validation from NDEP (NDEP 2009b, 2009c, 2009d, 2009e) and the Basic Remediation Company (BRC) Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009). These federal EPA guidelines, which were prepared for CLP data, were adapted to reflect the analytical methods and measurement quality objectives established for the Phase B Investigation methods and the guidance provided by NDEP. LDC validation reports for Area I soils are presented in Appendix B.

Analytical data deficiencies were qualified using the data validation qualifiers in Table 2-1 and project specific reason codes shown in Table 2-2. The finalized NDEP EDD (NDEP 2009f) for the Area I soil is presented in Appendix C.

3.0 DATA VALIDATION RESULTS

The data validation qualifiers and reason codes were used to indicate all the data in the database where results were qualified as a result of validation. This information was sorted by the QC review elements listed below:

- Holding times and sample preservation;
- Initial and continuing calibrations;
- Serial dilution;
- Laboratory blanks/equipment blanks/field blanks;
- LCS/LCSD results;
- MS/MSD results;
- Surrogate recoveries;
- Internal standard performance;
- Laboratory duplicate results;
- Field duplicate results; and
- Quantitation problems.

Tables 3-1 through 3-12 present the qualified results based on QC deficiencies identified during the validation process. Reason codes for each qualifier assignment have been provided in each table. Where available, a numerical data quality indicator (DQI) result value and acceptance criteria for that value have been added to the tables in columns to the right of the reason codes per NDEP's request. No QC problems were identified that resulted in qualification of results based on mass spectrometer tuning, GC/MS performance checks, compound identification, or peak integration. A summary of the rejected results is presented as Table 3-13. The data validation summary results table contents are sorted by sample ID and SDG to assist the data user in locating the associated data validation memoranda. The data validation memorandum presented in Appendix B discusses the application of qualifiers in detail. Tables 3-1 through 3-13 are provided to NDEP on CD as Excel spreadsheets that can be re-sorted to assist the data user in locating validation information for any particular sample, SDG, method, or analyte.

3.1 Holding Times and Sample Preservation

Sample preservation and analytical holding times are evaluated to assure that the sample integrity is intact for accurate sample preparation and analysis. Sample preservation and

analytical hold time are presented for each method of analysis in Table B-1 of the QAPP (AECOM 2009). Holding time exceedances can cause loss of sample constituents due to biodegradation, precipitation, volatization, and chemical degradation. In accordance with EPA guidance (USEPA 2004, 2008), sample results for organic and non-metal analyses that were performed after the method holding time but less than two times the method holding time were qualified as estimated (J- or UJ). Sample results for analyses that were performed after two times the method holding time were qualified as rejected (R). Inorganic hold time exceedances were qualified as estimated J- or R. Less than 1% (0.61%) of the Area I soil and SPLP sample data were qualified due to hold time and preservation exceedances, as presented in Table 3-1.

Several short hold time methods – (24 hours) hexavalent chromium and (48 hours) pH, nitrate, nitrite, and VOC/8260 – were qualified for exceedances, resulting in three rejected (R) nitrate results and five rejected (R) nitrite results. All other hold time exceedances were estimated.

Four cyanide SPLP extracts were rejected (R) for not adjusting the pH $\geq$ 12 by the laboratory. Several VOC field samples, trip blanks, equipment blanks and field blanks were qualified as estimated due to headspace identified in the sample containers. No other preservation exceedances were identified.

3.2 Initial and Continuing Calibration

Instrument performance was evaluated during the review of initial and continuing calibration. The following target analytes exhibited poor response: Method 8141 naled, Method 8260 acetone, and t-butyl alcohol. Hexachlorobenzene (HCB) by Method 8081 was not part of the continuing calibration standard during a period of analysis, resulting in estimated results. HCB was also analyzed by Method 8270. Approximately 3% (3.24%) of the Area I soil and SPLP sample data were qualified due to calibration deficiencies, as presented in Table 3-2. No data were rejected.

3.3 Serial Dilution

Sample matrix interference was exhibited by the following target analytes that resulted in a serial dilution exceedance greater than 2x the acceptance limit of 10% Difference (%D): nickel, lead, total chromium, and zinc. In accordance with EPA guidance (USEPA 2004), the associated results were qualified as estimated (J/UJ). Less than 3% (2.92%) of the Area I soil and SPLP sample data were qualified due to serial dilution exceedances, as presented in Table 3-3. No data were rejected.

3.4 Laboratory Blanks/Equipment Blanks/Field Blanks

The Area I soil data were assessed using the following blanks: field blanks, equipment blanks, trip blanks, and laboratory method blanks. Equipment blanks were collected at a frequency of 10% during the Phase B Investigation, and one field blank was collected for each investigative Area per matrix. Data were evaluated and qualified in accordance with EPA guidance (USEPA 2004, 2008), NDEP Supplemental Guidance on Data Validation for the BMI Plant Sites and Common Areas Projects (NDEP 2009c,d,e), and the BRC Standard Operating Procedure (SOP) 40, Data Review Validation, May 7, 2009 (BRC 2009).

Method 8290 and Method 1668 samples results were qualified for laboratory blank contamination. Radium, thorium, and uranium were qualified for equipment blank and laboratory blank contamination. Inorganic non-metal methods: chloride, nitrate, nitrite, sulfate, and methylene blue active substances (MBAS) were predominately qualified for field blank and equipment blank contamination. Tungsten results were qualified due to field blank contamination. Tin and boron were qualified due to laboratory blank contamination. Common laboratory contaminants: acetone, methylene chloride, 2-butanone, chloroform, toluene, di-N-butyl phthalate, and diethyl phthalate were detected in the laboratory blanks and trip blanks. Approximately 4% (4.19%) of the Area I soil and SPLP sample data were qualified based on blank contamination, as presented in Table 3-4.

3.5 LCS/LCSD Results

Laboratory Control Samples (LCS) were used to assess laboratory accuracy. Area I soil samples were evaluated in accordance with the BRC SOP 40, Data Review Validation, May 7, 2009. All data exceedances were qualified as estimated (J/UJ). Less than 2% (1.6%) of the Area I soil and SPLP sample data were qualified due to laboratory control sample exceedances, as presented in Table 3-5.

3.6 MS/MSD Results

Matrix spike (MS) and matrix spike duplicate (MSD) samples consist of aliquots of environmental samples spiked with a subset of target compounds. MS/MSD samples monitor potential interference from the site-specific sample matrix and its effect on target compounds. Additional field sample aliquots were collected at a frequency of 5% during the Phase B Investigation sampling to evaluate site-specific matrix interference. Samples were evaluated using the EPA guidance (USEPA 2004, 2008), NDEP Supplemental Guidance on Data

Validation for the BMI Plant Sites and Common Areas Projects (NDEP 2009c,d,e), the BRC SOP (BRC 2009), and professional judgment.

All data were usable as qualified with the exception of 13 bromide, 16 antimony, three MBAS and one endrin aldehyde results which were qualified as rejected for MS and/or MSD precision and accuracy failure outside of the acceptance limit criteria. Less than 4% (3.56%) of the Area I soil and SPLP sample data were qualified due to MS/MSD exceedances, as presented in Table 3-6.

3.7 Surrogate Recoveries

Surrogate and tracer recoveries were reviewed for organic and radiochemistry methods. No tracer recovery exceedances were identified. Organic data were evaluated using the EPA guidance (USEPA 2004, 2008), NDEP Supplemental Guidance on Data Validation for the BMI Plant Sites and Common Areas Projects (NDEP 2009c,d,e), and the BRC SOP (BRC 2009). Less than 1% (0.14%) of the Area I soil and SPLP sample data were qualified due to surrogate recovery exceedances, as presented in Table 3-7. No data were rejected.

3.8 Internal Standard Performance

Internal standards were prepared for certain organic and ICP/MS analyses by adding compounds similar to target compounds of interest to sample aliquots. Internal standards are used in the quantitation of target compounds in the sample or sample extract. Internal standards were reviewed using the EPA guidance (USEPA 2008), NDEP Supplemental Guidance on Data Validation for the BMI Plant Sites and Common Areas Projects (NDEP 2009c,d,e), and the BRC SOP (BRC 2009). All data were usable with the exception of one Method 8260b sample (SA127-32B) where the selected target compounds were rejected. Less than 1% (0.47%) of the Area I soil and SPLP sample data were qualified due to internal standard performance exceedances, as presented in Table 3-8.

3.9 Laboratory Duplicate Results

Laboratory duplicate analysis involves the preparation and analysis of an additional aliquot of a field sample. Results from duplicate sample analyses measure laboratory precision as well as homogeneity of contaminants in the field matrix. The Relative Percent Difference (RPD) of the duplicate results were evaluated in accordance with EPA guidance (USEPA 2004, 2005), NDEP Supplemental Guidance (NDEP 2009c,d,e), and the BRC SOP (BRC 2009). Less than 4% (3.97%) of the Area I soil and SPLP sample data were qualified due to laboratory duplicate RPD exceedances, as presented in Table 3-9. No data were rejected.

3.10 Field Duplicate Results

Field duplicates are used to evaluate sampling technique precision and homogeneity of the sample matrix. Field duplicates were collected at a frequency of 10% during the Phase B Investigation. In accordance with the Tronox QAPP (AECOM 2009), NDEP Supplemental Guidance (NDEP 2009c,d,e), and the BRC SOP (BRC 2009), the precision goal for field duplicate analyses was ± 50 percent RPD. If the field duplicate RPD exceeds the 50 percent limit, non-detected sample results shall be qualified as estimated at the sample quantitation limit (SQL; UJ) and detected results shall be qualified as estimated (J). The RPD will be calculated using the reporting limit for non-detected sample results. Similar to analytical duplicates, this limit does not apply when the result for either the sample or its duplicate is less than five times the practical quantitation limit (PQL). For this situation, the absolute value of the PQL is to be used as the control limit. Field duplicate exceedances were qualified as estimated (J/UJ). Less than 1% (0.44%) of the Area I soil and SPLP sample data were qualified due to field duplicate exceedances, as presented in Table 3-10. No data were rejected.

3.11 Quantitation Problems

Area I soil results that were qualified based on quantitation issues are presented in Table 3-11. Results were qualified using method specific criteria and EPA guidance (USEPA 2004, 2008). Data were qualified as estimated (J/UJ) for dual column confirmation, Percent Difference (%D), or an exceedance of the calibration range. Less than 1% (0.76%) of the Area I soil and SPLP sample data were qualified due to sample quantitation issues. No data were rejected.

3.12 Professional Judgment

Professional judgment was used to evaluate and qualify field sample IDs RSAJ8 -0.5B and RSAJ8 30B as estimated (J/UJ) for methods 8015 (extractables only DRO/ORO), 8081, and 8270. Soil sample containers arrived at the laboratory with water in the jars for the above sample fractions. It was believed that the water came from melted iced used during shipping. A summary of qualified results for these sample results is presented as Table 3-12.

4.0 EVALUATION OF QUALITY INDICATORS

Data quality indicators (DQIs) of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) were used to verify that sampling and analytical systems used in support of project activities are effective and the quality of the data generated for the project is appropriate for making decisions affecting future activities. This section will discuss the DQIs for the Area I Soil Phase B Investigation dataset. DQIs address the field and analytical data quality aspects as they affect uncertainties in the data collected for site characterization and risk assessment. The PARCCS parameters definition and assessment are presented in the Tronox Revised Phase B QAPP (AECOM/Northgate 2009), and the Project Plan (BRC/ERM 2008). Data validation activities included the evaluation of PARCCS parameters; all data not meeting the established PARCCS criteria were qualified during the validation process using the guidelines presented in the Tronox QAPP (AECOM/Northgate 2009), National Functional Guidelines (US EPA 2004, 2005, 2008), BRC Validation SOP (BRC 2009), each analytical method employed, and professional judgment.

4.1 Precision

Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions. Field precision was assessed through the collection and measurement of field duplicates and expressed as the RPD of the sample and field duplicate pair results. The assessment of field duplicate precision is discussed in Section 3.10 of this report, and is listed on Table 3-10. In general, field duplicate precision was acceptable for all analytes. No data were rejected.

Laboratory precision evaluates DQIs such as calibration, surrogates, MS/MSD, DUP, LCS/LCSD and interference check samples previously discussed in Section 3 of this report. All laboratory precision was acceptable with exception of those noted in Sections 3.5, 3.6, and 3.9.

4.2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference or true value. Laboratory accuracy was assessed during the validation using the recoveries of following QC parameters:

- Holding times and sample temperatures;
- Calibration;
- LCS percent recovery;

- MS/MSD percent recovery (organics);
- Serial dilution recovery (inorganics);
- Surrogate spike recovery; and
- Blank sample results.

Accuracy was evaluated for each of the DQIs in Sections 3.1 through 3.7. Evaluation of the Stage 4 QC elements that contribute to accuracy – such as mass spectrometer tuning, compound or element identification, peak integration and mass spectral matches, and calculation/ transcription verifications – did not result in the qualification or rejection of any data points during validation.

4.3 Representativeness

Representativeness is a qualitative parameter defined by the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or a process or environmental condition. There is no formula for evaluating representativeness. Aspects of representativeness addressed during validation include the review of sample collection information in the chain-of-custody documentation, conformity of laboratory analyses to Work Plan intentions, adherence of the documented laboratory procedures to method requirements, and completeness of the laboratory data packages. Most of the issues identified during this evaluation did not result in the qualification of laboratory data but did involve resubmittal of data from the laboratories to correct problems that were discovered during the validation process.

4.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system, compared to the amount expected under normal conditions. “Normal conditions” are defined as the conditions expected if the program specific work plan was implemented as proposed.

Field completeness is defined as the percentage of samples actually collected versus those intended to be collected per the Work Plan. The goal stated in the QAPP for this project was greater than 90% field completeness. A comparison of the Work Plan sample tables with the database sample IDs indicates that actual field completeness was 99.99%, exceeding the goal established for the project. Field completeness was assessed using the total sample locations scheduled in the Work Plan compared to actual number submitted for analysis.

Laboratory completeness is defined as percentage of valid data points versus the total expected from the laboratory analyses. Valid data are defined as all the data points judged to be usable (i.e., not rejected as a result of the validation process). The objective stated in the QAPP for this project was greater than 95% laboratory completeness. Actual laboratory completeness was 100% on the basis of sample analysis (i.e., all requested analyses were performed and reported by the laboratories), and 99.82% completeness based on valid data.

4.5 Comparability

Comparability is a qualitative expression of the measure of confidence that two or more data sets may contribute to a common analysis. Comparability of data within the investigation was maximized by using standard methods for sampling and analysis, reporting data, and data validation.

4.6 Sensitivity

Sensitivity is the capability of a method to discriminate an actual deflection or response above instrument noise. For the EPA methods employed in this project, sensitivity is measured by the Method Detection Limit (MDL) and PQL. Both nominal MDLs and PQLs were provided by the laboratories in the laboratory data packages and were verified during validation. MDLs in general were adjusted for each Area I soil sample to include the necessary dilution factors, preparation factors, and dry-weight factors of an individual sample as the SQL. The sensitivity requirements were based on the laboratory's ability to detect and report consistent and reliable limits.

5.0 CONCLUSIONS

One hundred percent of the laboratory data for the Phase B Investigation Area I Soil were validated using standardized guidelines and procedures recommended by EPA and NDEP. Based on the validated data, 99.82% of the results for Area I Soil were determined usable and considered valid for all decision-making purposes.

A subset of the laboratory results was qualified during validation, and those results are summarized in Tables 3-1 through 3-12. Qualified data are grouped by QC deficiency. A summary of Area I Soil rejected data are presented as Table 3-13. Less than 1% of the data were rejected. Data qualifiers and qualifier reason codes are presented as Table 2-1 and 2-2, respectively.

All the qualified results were evaluated with respect to the data quality indicators and compared to the QAPP and Work Plan goals. Details of this evaluation are discussed in Section 4 of this report. Based on the results of data validation, actual laboratory completeness was 99.99% on the basis of sample analysis, and 99.82% completeness based on valid data. The overall goals for data quality were achieved for the Phase B Investigation Area I Soils.

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