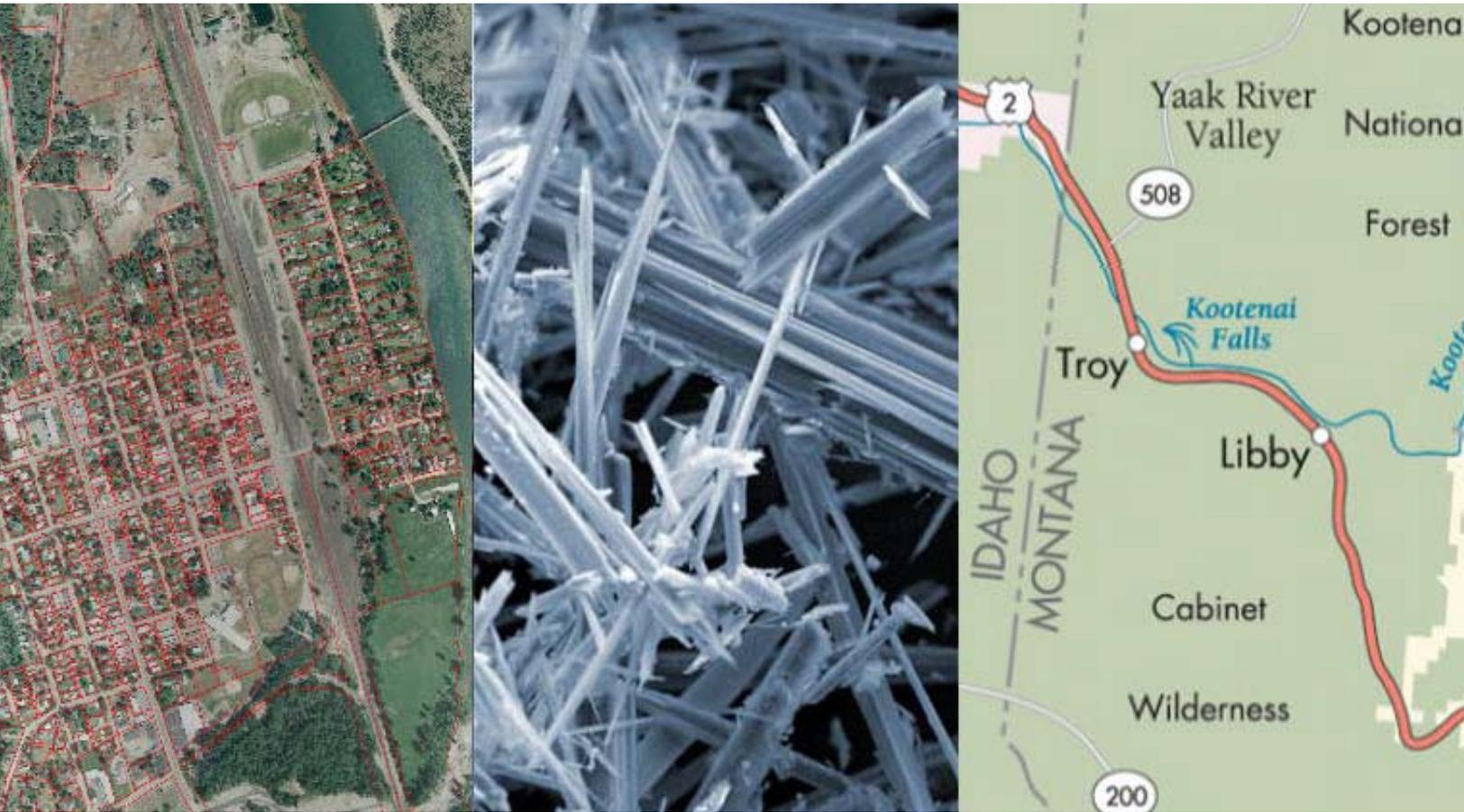


Final Quarter 4 Memorandum Outdoor Ambient Air Study

Operable Unit Number 7 of the
Libby Asbestos Superfund Site



Prepared for:

Montana Department of Environmental Quality

Helena Montana

Prepared by:

Tetra Tech

Helena, Montana

December 2010

**FINAL
QUARTER 4 MEMORANDUM
OUTDOOR AMBIENT AIR STUDY**

**Operable Unit Number 7
of the Libby Asbestos Superfund Site**

December 15, 2010

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
Remediation Division
P.O. Box 200901
Helena, Montana 59620

Contract Number 407026
Contract Task Order Number 47

Prepared by:

TETRA TECH EM INC.
Power Block Building, Suite 612
7 West 6th Avenue
Helena, Montana 59601
(406) 442-5588

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LIST OF ACRONYMS AND ABBREVIATIONS

AA Database	Ambient Air Analytical Database
COC	Chain-on-custody
DEQ	Montana Department of Environmental Quality
EDD	Electronic data deliverables
ESAT	Environmental Services Assistance Team
FSDS	Field sampling data sheet
ISO	International Organization for Standardization
LA	Libby amphibole
OU7	Operable Unit Number 7
QC	Quality control
SOP	Standard operating procedure
SRC	Syracuse Research Corporation
TEM	Transmission electron microscopy
Tetra Tech	Tetra Tech EM Inc.

1.0 INTRODUCTION

As part of the remedial investigation in Operable Unit Number 7 (OU7), which consists of the residential and commercial areas in and around Troy, Montana of the Libby Asbestos Superfund Site, Tetra Tech EM Inc. (Tetra Tech) continued to conduct outdoor ambient air monitoring for the Montana Department of Environmental Quality (DEQ) to evaluate the presence of Libby Amphibole (LA) asbestos in outdoor ambient air throughout OU7.

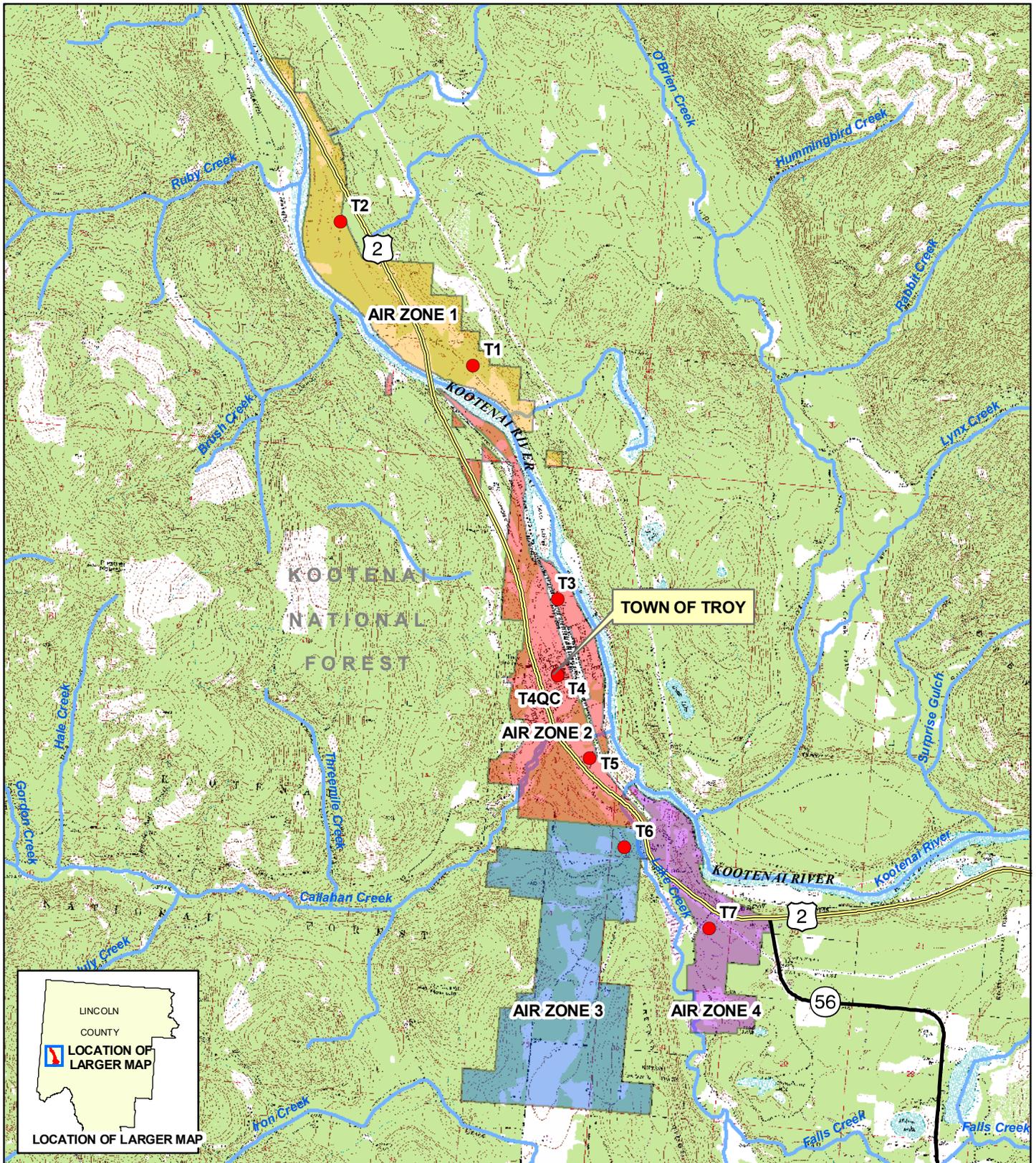
The outdoor ambient air monitoring program implemented by Tetra Tech is based on the Remedial Investigation Work Plan, Outdoor Ambient Air Study (Tetra Tech 2009a) and the associated health and safety plan (Tetra Tech 2009b) and includes monitoring of ambient air in four distinct “air zones” across OU7. After taking into account variable wind patterns, Tetra Tech established seven monitoring station locations in the four air zones to evaluate human health exposure scenarios throughout OU7.

This quarter 4 memorandum summarizes activities related to monitoring station maintenance performed, outdoor ambient air monitoring activities conducted, issues encountered, and resolutions from the period of August 5, 2010 through October 28, 2010 of the outdoor ambient air monitoring program. This report also provides a summary of validated ambient air data available at the time this document was prepared (Sampling Periods 19 through 23 [collected during quarter 3]).

Complete analytical data from outdoor ambient air monitoring stations through quarter 4 were not available for incorporation into this memorandum as data has yet to be validated. At the request of DEQ, validation has been delayed until data is properly loaded into the Troy Ambient Air Analytical Database (AA Database). Once the data is loaded, quarter 4 validation efforts will be completed. However, sampling periods 19 through 23 were validated during quarter 4 using methods described in Section 3.1 and the results are presented in this memorandum. A discussion relating to the limited validation of analytical data is provided in Section 2.4 (Outdoor Ambient Air Monitoring, Issues and Resolutions).

2.0 QUARTER 4 AMBIENT AIR MONITORING PLAN IMPLEMENTATION

Quarter 4 OU7 outdoor ambient air monitoring was initiated on August 5, 2010 and was the final quarter of year one of monitoring that began in October of 2009. Initial field activities such as selection of site monitoring stations and assembly and installation of monitoring equipment are described in the Quarter 1 Memorandum (Tetra Tech 2010). Figure 2-1 shows the monitoring station locations and Table 2-1 provides the general and detailed locations and rationale for selecting the seven station locations.



LIBBY ASBESTOS SUPERFUND SITE

**FIGURE 2-1
OPERABLE UNIT 7
AMBIENT AIR MONITORING
STATION LOCATIONS**

LEGEND

- OU 7 AMBIENT AIR SAMPLE STATION
- AMBIENT AIR ZONES**
- ZONE 1
- ZONE 2
- ZONE 3
- ZONE 4



**TABLE 2-1
OUTDOOR AMBIENT AIR SAMPLING LOCATIONS**

Station Number	General Location*	Detailed Location	Purpose
T1	Community exposure site and upper-middle boundary of OU7, located at the small community area NE of the Kootenai River	Residential property at North River Road <i>Long -115.9109194</i> <i>Lat 48.49736625</i>	This site is used to evaluate LA concentrations at the small community area and the upper-middle boundary of OU7
T2	Upwind/downwind site near the NW border of OU7	Fire station at Forest Drive at Vacation Road in Kootenai Vista <i>Long -115.9355267</i> <i>Lat 48.5124475</i>	This site is used to evaluate LA concentrations at the northern boundary of OU7
T3	City of Troy northern site	Water treatment station at north end of Roosevelt Park <i>Long -115.893191033333</i> <i>Lat 48.47169145</i>	This site is used to evaluate LA concentrations north of the Troy community
T4	City of Troy population exposure site	DEQ Troy Information Center at 303 Third Street <i>Long -115.89226045</i> <i>Lat 48.4631302166667</i>	This site is used to evaluate LA concentrations in the Troy community (specifically in the population center).
T4QC	City of Troy population exposure site	DEQ Troy Information Center at 303 Third Street <i>Long -115.89226045</i> <i>Lat 48.4631302166667</i>	Co-located sample station of T4
T5	City of Troy southern site	North of Highway Department Shop within fenced sewer lift station enclosure on 11 th Street <i>Long -115.8855304</i> <i>Lat 48.45401671</i>	This site is used to evaluate LA concentrations south of the Troy community
T6	Upwind/downwind site near the SW boarder of OU7	Water tower at Iron Creek Rd. ¾ mile south of Hwy 2 <i>Long -115.878429133333</i> <i>Lat 48.4441892166667</i>	This site is used to evaluate LA concentrations at the SW boundary of the OU and confirm if any LA is entering or leaving OU7
T7	Upwind/downwind site near the SE boarder of OU7	Residential property at corner of Hummingbird Way and Bighorn Way in Wilderness Plateau <i>Long -115.862912383333</i> <i>Lat 48.4357253333333</i>	This site is used to evaluate LA concentrations at the SE boundary of the OU

Notes:

LA	Libby Amphibole	SE	Southeast	Lat	Latitude
NE	Northeast	SW	Southwest	Long	Longitude
NW	Northwest	OU7	Troy Operable Unit		

* Predominant winds in the area blow from the southeast and northwest. Stations on the southeast and northwest boundaries of OU7 will act as upwind and downwind receptors depending on wind direction.

During quarter 4 monitoring, sampling activities were completed with no technical or mechanical issues and none of the seven stations were moved. No additional modifications to sampling protocol were instituted.

2.1 QUARTER 4 SAMPLING SCHEDULE

Quarter 4 ambient air sampling consisted of 9 five-day sampling periods generally separated by five off days between each period. Between some sampling periods, the five days were modified by one or two days to adjust for weather or scheduling issues, however, the overall sampling schedule was not impacted. Quarter 4 sampling began with Period 28 on August 5, 2010 and ended with Period 36 on October 28, 2010. Table 2-2 provides a summary of sampling dates for periods 28 through 36.

**TABLE 2-2
OU7 OUTDOOR AMBIENT AIR SAMPLING
QUARTER 4 SAMPLE PERIOD DATES**

QUARTER 4 SAMPLE PERIODS	
Sample Period 28	August 5, 2010 through August 9, 2010
Sample Period 29	August 15, 2010 through August 19, 2010
Sample Period 30	August 25, 2010 through August 29, 2010
Sample Period 31	September 4, 2010 through September 8, 2010
Sample Period 32	September 14, 2010 through September 18, 2010
Sample Period 33	September 24, 2010 through September 28, 2010
Sample Period 34	October 4, 2010 through October 8, 2010
Sample Period 35	October 14, 2010 through October 18, 2010
Sample Period 36	October 24, 2010 through October 28, 2010

2.2 ISSUES AND RESOLUTIONS

During quarter 4 sampling, no technical or mechanical issues arose that compromised data collection or data usability. Issues related to entry of analytical results into the database during quarter 4 ambient air activities are summarized below.

2.2.1 Troy Ambient Air Analytical Database Data Entry Issues

Tetra Tech completed data validation on ambient air data through period 23 (middle of quarter 3), after which period, DEQ requested that Tetra Tech delay validation efforts until all analytical data could be uploaded into the AA Database. Prior to this direction from DEQ, the Tetra Tech chemist manually sorted and recorded data instead of performing a simple query for the pertinent data in the AA Database. Tetra Tech has not yet validated the quarter 4 analytical results, as these data are not yet in the AA

Database. Data validation will resume once all quarter 4 analytical data has been uploaded into the AA Database.

2.2.2 Modifications to Ambient Air Sampling Protocol

No modifications to ambient air sampling protocol were required during quarter 4 sampling.

2.2.3 Pump Failures and Repairs

No pump failures occurred and no pump repairs were required during quarter 4 sampling.

3.0 QUARTER 4 OUTDOOR AMBIENT AIR MONITORING DATA

During this reporting period, samples from periods 28 through 36 were submitted to the Environmental Services Assistance Team (ESAT) laboratory for Transmission Electron Microscopy (TEM) analyses. All sample filter cassettes were shipped to the ESAT Laboratory in Golden, Colorado, under chain-of-custody (COC) protocol, where the samples were stored in a desiccator to prevent the growth of mold prior to analysis.

During quarter 4, sample results for periods 19 to 23 were validated. The following sections provide a description of the data validation procedures used, data validation findings, and also provide a summary of LA detections noted during sample periods 19 to 23.

3.1 DATA VALIDATION PROCEDURES AND FINDINGS

During quarter 4, Tetra Tech conducted data review and data entry verification of the outdoor ambient air TEM data from sampling periods 19 through 23 in accordance with standard operating procedure (SOP) EPA-LIBBY-09 (revision 1) (Syracuse Research Corporation [SRC] 2008). A copy of this SOP is contained in Appendix F of the Remedial Investigation Work Plan, OTDOOR Ambient Air Study (Tetra Tech 2009a). Tetra Tech followed the data review and verification procedures outlined in SOP EPA-LIBBY-09, with minor deviations for OU7. Examples of OU7-specific deviations include: (1) the SOP refers to the Libby 2 Database; however, OU7 data is stored in the Troy Ambient Air Sampling Database and the AA Database using the same database protocols, (2) the SOP describes the process for randomly selecting TEM records for review and verification. Approximately 25 percent of the period 19 through 23 records underwent review and verification. For these records, rather than random selection from the AA Database as described in the SOP, records were hand selected for review and verified based on result type (detected LA) and sample type (field duplicate pairs and field blanks). Remaining data validation will be

completed once analytical data are entered into the AA Database and can be randomly selected as per the SOP.

Tetra Tech's review and verification process has three steps: (1) the selection of data records for review and verification, (2) a review of the original laboratory bench sheets, and (3) verification of the transfer of results from the bench sheets onto the electronic data deliverables that will be uploaded to the AA Database. Tetra Tech reviewed field and laboratory quality control (QC) sample results for adherence to minimum frequency requirements and procedures and QC limits in SOP LB-000029b (SRC 2008), and qualified the associated field data accordingly. The data verification and validation process is described in detail in the subsections below.

3.1.1 Selection of TEM Records for Review

Since the incidence of significant errors (e.g. incorrect transfer of structure counts from bench sheets to electronic data deliverables [EDDs]) noted during analysis of early samples (from quarter 1) has been addressed, the number of records selected for review was reduced from 100 percent to approximately 25 percent of the period 19 through 23 field samples (SOP EPA-Libby-09 specifies a 10 percent selection rate). The reduction in percentage of samples selected for validation was discussed with DEQ based on an increased confidence in laboratory reporting and will be lowered to the SOP-specified rate of 10 percent in later rounds if confidence levels remain high. Records reviewed were selected on the basis of result type (detected LA) and sample type (field duplicate pairs and field blanks) because a random selection technique through the AA Database was not available.

3.1.2 Consistency Review of Laboratory Bench Sheets

Tetra Tech inspected the information recorded on the original hand-written laboratory bench sheets in accordance with the consistency review of laboratory bench sheets procedure outlined in Section 5 of SOP EPA-LIBBY-09 (revision 1) (SRC 2008) which is modified as needed for OU7. The bench sheets were reviewed to identify any data omissions, apparent inconsistencies, or potential errors in structure. The review entailed determining whether the raw structure data were recorded in accordance with International Organization for Standardization (ISO) 10312 counting rules (as modified by all applicable Libby laboratory modifications).

Corrective Action – Tetra Tech summarized all apparent inconsistencies, omissions, and suspected errors, and provided them to ESAT, which forwarded them to the appropriate labs for response, as deemed appropriate. The ESAT laboratory determined which items were authentic errors that require

correction. None of the inconsistencies, omissions, or suspected errors identified during data review and verification performed during quarter 4 affects the outcome of interest to the investigation (i.e., the number of LA structures or the concentration of LA). Tetra Tech anticipates the analytical laboratories will submit further revised bench sheets to ESAT. Tetra Tech will download the revised documents provided by ESAT, review them, and replace the previous ones as appropriate.

3.1.3 Verification of Data Transfer from Bench Sheet to Database

To ensure that data from laboratory bench sheets are transferred, via the EDDs, into the AA Database without error or omission, Tetra Tech compared the selected analysis-specific information in the laboratory bench sheets to that in the EDD. Tetra Tech followed the verification of data transfer procedure outlined in Section 6.0 of SOP EPA-LIBBY-09 (revision 1) (SRC 2008), modified as needed for OU7. The bench sheets include the laboratory COC form, sample check-in form, preparation log, and hand-written data record sheets. This process entailed comparing analysis-specific information in the EDD to the original laboratory job documentation (e.g., internal laboratory COC; preparation logs; bench sheets, etc.); and included verifying (by recalculation) the reported air sensitivities for amphibole and chrysotile; the area analyzed; and for indirect preparations, the indirect preparation dilution factor. Using the bench sheets, Tetra Tech also recounted the countable LA structures across all grid openings evaluated and compared this number (and the calculated concentrations) to the total number of LA structures in the EDD.

The final step in this process will be to verify the data are loaded into the AA Database without error or omission. Since the analytical data are not yet ready for use in the AA Database, this step has not been completed. Theoretically, the information in the EDDs will match that in the database; however, a final verification step is recommended and will be completed.

Corrective Action – Tetra Tech summarized all apparent inconsistencies, omissions, and suspected errors, and provided them to ESAT, which forwarded them to the appropriate labs for response, as deemed appropriate. The ESAT laboratory determined which items were authentic errors that require correction. None of the inconsistencies, omissions, or suspected errors identified during data review and verification performed during quarter 4 affects the outcome of interest to the investigation (i.e., the number of LA structures or the concentration of LA). Tetra Tech anticipates the analytical laboratories will submit further revised bench sheets to ESAT. Tetra Tech will download the revised documents provided by ESAT, review them, and replace the previous ones as appropriate.

A similar corrective action process is expected for the final verification step (review of the uploaded analytical data in the AA Database).

3.1.4 Review of Field and Laboratory Quality Control Sample Results

Review of field and laboratory quality control sample results, including implementation of corrective actions, will be completed once all year one QC sample data are loaded into the AA database. At present, a limited amount of this data has been loaded; however, it is expected that the entire year one data will be available in the AA database in the near future and will allow for a complete review and implementation of corrective actions if necessary.

Tetra Tech reviews field QC samples (including co-located samples and field blanks) and laboratory QC samples (including laboratory blanks, recounts, and reparations) for adherence to the minimum frequency requirements in the work plan (Tetra Tech 2009a) and in SOP LB-000029b (SRC 2007).

Laboratory QC sample results are evaluated by the laboratory and field QC sample results are evaluated by Tetra Tech, for conformance with the QC limits specified in SOP LB-000029b (SRC 2007). For the co-located field samples, Tetra Tech will use the same statistical comparison test used for the Libby ambient air study (SRC 2009). Each co-located sample pair will be compared using the Poisson rate test (Nelson 1982) included as Attachment 4 to SOP LB-000029b (SRC 2007), to determine whether the results are statistically different from one other at the 95 percent confidence level. The Poisson rate test is suitable for this analysis because fiber counts on TEM grids are considered to be independent and random.

Corrective Action –For laboratory QC sample exceptions to QC criteria, the appropriate corrective actions are described in detail in LB-000029b (SRC 2007). For co-located field sample pairs, Tetra Tech will review the Poisson rate test results and investigate the basis for any statistical differences and the need for any appropriate corrective actions. Poisson rate test results that indicate the co-located samples are similar at the 95 percent confidence interval will be considered good. Test results in the 90 to 95 percent confidence interval range will be considered acceptable, and test results that fall below the 90 percent confidence interval will be considered poor for similarity. If test results are below the 90 percent interval, Tetra Tech will investigate the basis for the discrepancy and take corrective action in sampling and/or analysis of the samples, as appropriate. Tetra Tech will, as a rule, report the results from the original sample (as opposed to co-located or laboratory recount results). A possible exception to this rule is an ESAT interlab recount result. If, during validation, an interlab recount result is deemed to be more

representative than the original result, Tetra Tech will discuss these findings with DEQ and report whichever result is determined to be most representative.

Tetra Tech has reviewed and will continue to review the results for all field blanks for adherence to the QC limits specified in SOP LB-000029b (SRC 2007). All of the blank results received to date are within QC limits.

3.2 AMBIENT AIR LA DETECTIONS

LA fibers were not detected in any of the 45 ambient air samples collected from period 19 to 23 samples at any of the 7 stations. Complete analytical results and a summary of validation findings for sample periods 19 to 23 are provided in Appendix B.

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- Nelson, WB. 1982. Applied Life Data Analysis. John Wiley and Sons. Hoboken, NJ.
- Syracuse Research Corporation (SRC). 2007. Request for Modification to Laboratory Activities (LB-000029B). April.
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APPENDICES

(Appendices are provided on the attached disk)

APPENDIX A

**QUARTER 4 OUTDOOR AMBIENT AIR SAMPLING
FIELD SAMPLING DATA SHEETS (FSDS)
AUGUST 5, 2010 THROUGH OCTOBER 28, 2010**

APPENDIX B

**SAMPLE PERIOD 19 THROUGH 23 AMBIENT AIR SAMPLING VALIDATED ANALYTICAL
RESULTS**