



CB&I  
2700 Chandler Avenue, Building C  
Las Vegas, NV 89120  
Tel: +1 702 795 0515  
Fax: +1 702 795 8210  
[www.CBI.com](http://www.CBI.com)

July 10, 2015

Julie Wroble  
EPA Site Manager Region 10  
EPA Region 10  
1200 6<sup>th</sup> Ave, Suite 900  
Seattle, WA 98101

Document ID #: 3015-07102015-6

Dear Ms. Wroble:

EPA CONTRACT NUMBER EP-W-10-033  
TASK ORDER NUMBER 3015  
ASBESTOS QA SUPPORT

Enclosed please find the Release of Validated Data Report for the validation of Polarized Light Microscopy-Visual Estimation (PLM-VE) and Transmission Electron Microscopy (TEM) soil sample data, Laboratory Job Number 142958. The twenty-four (24) soil samples associated with these data were analyzed by Lab/Cor Portland, Inc., Portland, Oregon for the Sumas Mountain Asbestos Soil Project. This report and accompanying appendices are deliverables under Task 10 of the subject Task Order.

If you have any questions, please feel free to contact me.

Sincerely,

Lyndsay Gensler  
Task Leader, QATS Program  
CB&I Federal Services LLC  
Phone: 702.895.8730  
E-Mail Address: [lyndsay.gensler@cbifederalservices.com](mailto:lyndsay.gensler@cbifederalservices.com)

cc: Shari Myer, EPA-ASB, QATS Task Order Project Officer  
Administrative Contracting Officer (letter only)



*The Quality Assurance Technical Support (QATS) contract is operated by CB&I Federal Services LLC.  
The QATS Program's Quality Management System is certified to the ISO 9001:2008 International Standard.*

**RELEASE OF VALIDATED DATA**

DATE: July 10, 2015

SUBJECT: Review of Data for Laboratory Job Number: 142958

LABORATORY: Lab/Cor Portland, Inc., Portland, Oregon

FROM: Quality Assurance Technical Support (QATS) Program, Las Vegas, NV  
CB&I Federal Services LLC

TO: Julie Wroble, Environmental Protection Agency

QATS reviewed the data for the following case:

Applicable SAP: NA

Chain-of-Custody Number: 10-100614-121545-0001

Method: Transmission Electron Microscopy (TEM) by EPA 600-R-93-116, (with preparation by ASTM D7521), and Polarized Light Microscopy (PLM) VE by CARB 435.

Applicable Laboratory  
Modification(s): NA

Number and Type  
of Samples: 24 Soil Samples

EPA Sample Numbers: 14394100, 14394101, 14394102, 14394103, 14394104, 14394105,  
14394106, 14394107, 14394108, 14394109, 14394110, 14394111,  
14394112, 14394113, 14394114, 14394115, 14394116, 14394117,  
14394118, 14394119, 14394120, 14394121, 14394122, 14394123.

Note that samples 14294100 through 14394122 were analyzed by TEM as indicated on the ASTM D7521 results sheet.

## VALIDATION SUMMARY

Twenty-four (24) soil samples from Laboratory Job Number 142958, were collected on 09/30/2014 and 10/01/2014 and shipped to Lab/Cor Portland, Inc. in Portland, OR for PLM-VE analysis by CARB 435 (with preparation by ASTM D7521), and TEM by EPA 600-R-93-116. The samples were received at the laboratory intact on 12/15/2014, and were analyzed between 01/25/2015 and 01/30/2015 for PLM and between 02/03/2015 and 02/19/2015 for TEM.

Listed below are the Data Qualification Summary Table, EDD/Bench Sheet Discrepancy Table, Data Qualifier Table, and Reason Code Table.

### DATA QUALIFICATION SUMMARY TABLE

Criteria Exceeded	EPA Sample ID	Validation Qualifier	Reason Code
PLM Daily Calibration was not documented for 01/26/2015.	14394108 14394109 14394110 14394111 14394112 14394113	UJ	MC
TEM k-factors not performed at required frequency.	14394109 14394109 (RD QC Sample)	J	IC
TEM Daily Calibration was not documented for 02/11/2015.	14394110 (RD QC Sample) 14394109 (RD QC Sample)	UJ J	MC

### EDD/BENCH SHEET DISCREPANCY TABLE

EPA Sample ID	C# *	Method/Matrix	Lab. Job No.	Analysis Date	Discrepancy
14394121	NA	ASTM D7521	142958	01/28/2015	The (W <sub>M</sub> ) value reported on the ASTM D7521 Total Asbestos % sheet for sample 14394121 (132.2 g) does not match the value recorded on the ASTM D7521 Prep Sheet (133.2 g).

\*\*\* The EDD correction number in column 2. (i.e., C0, C1, C2, etc..)

### DATA QUALIFIER TABLE

Qualifier	Definition
J	The result is estimated. The associated numerical value is an approximation.
UJ	The non-detect result may be inaccurate or imprecise due to the quality of the data generated because certain QC criteria were not met.
R	The sample results are rejected due to serious deficiencies.
X	Validator defined.

### TEM REASON CODE TABLE

Reason Code	Definition
MC	Structure/fiber counts and recorded structure dimensions may be inaccurate due to improper or infrequent scope alignment and/or magnification calibrations.
IC	Identification by elemental composition or diffraction pattern may be inaccurate due to improper or infrequent EDXA or camera constant calibration.
PA	Structure/fiber counts and reported concentrations may be inaccurate due to improper or infrequent calibration of the plasma asher.
SC	The reported concentration may be inaccurate due to the condition of samples upon receipt at the laboratory.

Reason Code	Definition
<b>DL</b>	The area analyzed, structures counted, or AS do not meet the requirements specified in the applicable SAP Analytical Summary.
<b>ID</b>	The asbestos identification and concentrations may be inaccurate because the recorded structure types are not consistent with those described in the applicable TEM Method and/or laboratory modification(s).

### PLM REASON CODE TABLE

Reason Code	Definition
<b>MC</b>	Reported concentrations or analyte identification may be inaccurate due to improper or infrequent scope alignment.
<b>IC</b>	Identification may be inaccurate due to improper or infrequent Refractive Index (RI) liquid calibrations.
<b>B</b>	The reported concentration may be inaccurate due to the presence of analyte structures/fibers in the associate contamination check or a contamination check was not performed daily.
<b>SC</b>	The reported concentration may be inaccurate due to the condition of samples upon receipt at the laboratory and/or improper storage prior to sample preparation and/or analysis.
<b>ID</b>	The asbestos identification and concentrations may be inaccurate because the recorded optical properties are not consistent with those described in the project-specific PLM SOPs.

## VALIDATION PROCESS

The samples for Laboratory Job Number 142958 were collected from the subject site on 09/30/2014 and 10/01/2014. All samples were prepared and analyzed in accordance with CARB 435, ASTM D7521, and EPA 600-R-93-116. CB&I's Quality Assurance Technical Support (QATS) Program performed validation and a transcription check in accordance with method-specific data validation SOPs. QATS preparation of this report was performed under Technical Direction 03, Task 10, of Task Order 3015.

The sample results on bench sheets and other supporting documents provided in the hardcopy deliverables were compared to the entries in the associated laboratory method-specific EDDs (where applicable) to ensure that the reported results are complete, compliant with the specified methodology, and accurate. Additional support information provided in this data validation report include the QATS Data Review Checklist used to document the data validation process (see Appendix A); and the sample results as reported by the laboratory, with qualifiers as applicable (see Appendix B).

## TEM VALIDATION SUMMARY

1. **DATA PACKAGE INVENTORY AND SAMPLE RECEIPT:** The data package included a narrative, Chain-of-Custody (COC) record, EDD files, raw data (bench sheets), and QC samples. The samples were properly packaged, sealed, undamaged, and labeled upon receipt at the laboratory. The COC record was reviewed and found to be acceptable.
2. **SAMPLE PREPARATION:** The appropriate preparation documents were provided.
3. **EQUIPMENT CALIBRATION AND PERFORMANCE CHECKS (i.e., daily microscope alignment, screen magnification, EDS calibration, and sensitivity checks):** The equipment alignment and calibration documentation provided shows that instrument alignment and calibration were performed at the correct frequency, indicating that the instruments were in proper working order during the time of sample analyses. Two exceptions include: The daily calibration was not recorded for 02/11/2015 on instrument H-7000, affecting QC (RD) samples 14394109 and 14394110. These samples are qualified "J" and "UJ", respectively. The TEM the k-factors provided by the laboratory were performed on 01/24/2014 for instrument (scope) H-7000, more than six months prior to the analyses of the samples in this SDG. The laboratory's QAPP states for k-factors "Calibration is performed on a biyearly basis, the first week of January and the first week of July." QATS requested the January 2015 k-factors from the laboratory; however, k factors calculated on 03/30/2015 were received. As a result of the described k-factor deficiency, one sample and the Recount Same (RS) of that sample, each with an amphibole result, are qualified "J".
4. **ANALYTICAL SENSITIVITY:** A sufficient number of grid openings have been analyzed to achieve the required analytical sensitivity and/or the appropriate stopping rule was invoked.
5. **STRUCTURE RECORDING AND ASBESTOS IDENTIFICATION:** The structure recording and asbestos identification were found to be acceptable.
6. **BLANK ANALYSIS:** No blanks were analyzed and reported with this sample set.
7. **ANALYTICAL VARIABILITY:** The laboratory performed two recount different (RD) analyses on EPA Sample Nos. 14394109 and 14394110 and two recount same (RS) analyses on EPA Sample Nos. 14394100 and 14394101. All QC samples passed the established QC criteria.

- 8. OVERALL ASSESSMENT OF DATA:** With the exception of the k-factor and calibration discrepancies, the deliverable was found to be complete and accurate. Qualified samples are listed in the Data Qualification Summary Table.

**REVIEWED BY:** Shellee McGrath **DATE:** 07/09/2015

### **PLM VALIDATION SUMMARY**

1. **DATA PACKAGE INVENTORY AND SAMPLE RECEIPT:** The data package included a narrative, Chain-of-Custody (COC) record, EDD files, raw data (bench sheets), and QC samples. The samples were properly packaged, sealed, undamaged, and labeled upon receipt at the laboratory. The COC record was reviewed and found to be acceptable.
2. **SAMPLE PREPARATION:** The appropriate preparation documents were provided.
3. **EQUIPMENT CALIBRATION AND PERFORMANCE CHECKS (i.e., daily microscope alignment, RI liquid calibration check):** The Scope ID was not documented in the NADES file; however, the analyst and dates were matched up to PLM #1. According to the NADES file the samples were analyzed on 01/25/2015, 01/26/2015, 01/27/2015, and 01/30/2015. The 142958R02\_020150325 Final PLMVis.pdf file lists the analysis date for all 24 samples as 02/05/2015. For the calibration requirement, the analysis dates from the NADES file were used. The required daily microscope alignments and monthly calibration of the commonly used RI oils was performed and recorded for all dates with the exception of 01/26/2015; therefore, six samples, 14394108 through 14394113, were qualified "UJ" due to the lack of daily calibration documentation. The QC samples were analyzed on 03/16/2015, the calibration was provided for this date on both PLM instruments.
4. **MINERAL/FIBER IDENTIFICATION:** The fiber identification and quantification were found to be acceptable.
5. **CONTAMINATION CHECK:** The appropriate daily contamination checks were performed and recorded on the Equipment Maintenance Form for all dates except 01/26/2015 (see Comment #3 above).
6. **REFERENCE MATERIAL ANALYSIS (CALIBRATION STANDARDS):** The PLM Reference Material Comparison spreadsheet, PLM Accuracy QC and RTI Reference Material Comparison.xls, provided Reference Material results for analyst R. Brown. The analyst for the samples in this SDG is S. Golden; therefore, the PLM Reference Material analysis could not be evaluated.
7. **ANALYTICAL VARIABILITY:** The laboratory performed three Laboratory Duplicates (by the same analyst) on EPA Sample Nos. 14394106, 14394117, and 14394123 and two Laboratory Duplicates (by a different analyst) on EPA Sample Nos. 14394106 and 14394109. All QC samples passed the established QC criteria.
8. **LABORATORY MODIFICATIONS:** NA
9. **GRAVIMETRIC ANALYSIS:** Gravimetric analysis was performed and recorded on the ASTM D7521 Prep Sheets.
9. **OVERALL ASSESSMENT OF DATA:** With the exception of the daily calibration documentation for 01/26/2015, and the  $W_M$  value discrepancy in the EDD/Bench Sheet Discrepancy Table, the deliverable was found to be complete and accurate. Qualified samples are listed in the Data Qualification Summary Table.

**REVIEWED BY:** Shellee McGrath **DATE:** 06/08/2015

# **Appendix A**

## **Data Review Checklist**



### Data Review Checklist for the Verification and Validation of Transmission Electron Microscopy (TEM) Data Deliverables

<b>Project Name: Sumas Mtn Asbestos Soil Project</b>	<b>Case or Sample Set ID: 142958</b>
<b>Number of Samples/Matrix: 23 Soil Samples</b>	<b>COC Number: 10-100614-121545-0001</b>
<b>TEM Analytical Method: EPA 600-R-93-116</b>	<b>Level of Validation (Circle one): 1 2 <u>3</u> Other</b>

1.0 Data Package Inventory	Yes	No	Comments
1.1 Were the project-specific requirements (i.e. acceptance criteria & analytical sensitivities) provided by the client prior to the initiation of validation activities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A request was made to the laboratory on 06/04/2015 for the laboratory's QAPP and/or SOPs documenting the frequency of the different TEM calibrations. The documents were received on 06/18/2015. k-factors were also requested from the laboratory.  The laboratory performed two recount different (RD) analyses on EPA Sample Nos. 14394109 and 14394110 and two recount same (RS) analyses on EPA Sample Nos. 14394100 and 14394101.  NA
1.2 Did the received hard copy deliverables contain all the necessary components:			
1.2.1 Case Narrative (Level 1, 2 & 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.2 Chain-of-Custody (Level 1, 2 & 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.3 Form I or equivalent (Level 1, 2 & 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.4 Raw Data - Count Sheets (Level 1, 2 & 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.5 QC Sample Data (Level 2 & 3):	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.5.1 Blank(s)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.2.5.2 Replicate(s)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.5.3 Duplicate(s)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.5.4 Verified Analysis?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.2.6 Calibration Data (Level 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.7 Communication Records (Level 1, 2 & 3)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.2.8 Miscellaneous?	<input type="checkbox"/>	<input type="checkbox"/>	
1.3 Were the necessary components received to perform the requested level of validation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>2.0 Chain-of-Custody Information Verification (Level 1, 2 &amp; 3)</b>			
2.1 Were the following information recorded in the hard copy electronic deliverables (if applicable) consistent with the information recorded on the COC:			
2.1.1 COC Number?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.2 Case or Sample Set Number?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.3 EPA Sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.4 Date/Time Collected?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.5 Sample Volume?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.6 Sample Matrix?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.7 Analyses (Method)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.8 Date/Time Received?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.9 Other (describe)?	<input type="checkbox"/>	<input type="checkbox"/>	
2.2 Were the COC records signed and dated upon receipt?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Additional Comments:</b>			

### Data Review Checklist for the Verification and Validation of Transmission Electron Microscopy (TEM) Data Deliverables

3.0 Sample Result Verification & Validation (Level 1, 2 & 3)	Yes	No	Comments
3.1 Is the sample preparation method documented and final sample volume recorded?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.2 Is the correct number of grid openings used to achieve the specified analytical sensitivity?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3 Verify that the following information from the laboratory's bench sheets have been transcribed correctly:			
3.3.1.1 Grid identification?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3.1.2 Grid opening?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3.1.3 Structure type?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3.1.4 Number of primary and secondary structures?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3.1.5 Length and width dimensions?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3.1.6 Structure identification?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3.1.7 Mineral type?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.4 Are overloaded samples correctly reported to the specified percent obscuration (i.e. 10%, 25%)?	<input type="checkbox"/>	<input type="checkbox"/>	NA
3.5 If overloading occurs, are samples prepared by an alternate method (i.e. indirect preparation)?	<input type="checkbox"/>	<input type="checkbox"/>	NA
3.6 Verify that the following information is documented correctly:			
3.6.1 Magnification?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.6.2 Field or QC sample type?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.6.3 Number of grids prepared?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.6.4 Filter area in (mm <sup>2</sup> )?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.6.5 Analysis date?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.7 Verify the totals reported on the count sheets for the various types of structures. These may include:			
3.7.1 Total EPA Structures	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.7.2 PCMe Structures	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.7.3 AHERA Structures	<input type="checkbox"/>	<input type="checkbox"/>	NA
3.7.4 Berman Crump Structures	<input type="checkbox"/>	<input type="checkbox"/>	NA
3.8 Are the required spectra included for all hits reported (i.e. ED, EDXA, SAED)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.9 Recalculate the reported concentration on at least 10% of the results reported.			
3.9.1 Are the recalculated concentrations consistent with those reported?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Additional Comments:</b>			

### Data Review Checklist for the Verification and Validation of Transmission Electron Microscopy (TEM) Data Deliverables

4.0 Quality Control Verification & Validation (Level 2 and 3)	Yes	No	Comments
4.1 <u>Blanks</u>			
4.1.1 Are laboratory blanks (direct, indirect) prepared and analyzed at the required frequency?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.1.2 Are laboratory blank results within the specified criteria?	<input type="checkbox"/>	<input type="checkbox"/>	
4.1.2.1 If "no" then qualify the associated results in accordance with the Blank Result table in SOP QATS-70-091.			
4.2 <u>Replicate Analyses</u>			
4.2.1 Are replicate (second analyst on the same grids but different grid openings) sample analyses performed at the required frequency?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.2.2 Are replicate sample results within the specified acceptance limits?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The laboratory performed two recount different (RD) analyses on EPA Sample Nos. 14394109 and 14394110 and two recount same (RS) analyses on EPA Sample Nos. 14394100 and 14394101.
4.2.2.1 If "no" then qualify the associated results in accordance with the Analytical Variability Results table in SOP QATS-70-091.			
4.3 <u>Duplicate Analyses</u>			
4.3.1 Are duplicates (analysis of a second sample preparation obtained from the final filter) prepared and analyzed at the required frequency?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.3.2 Are duplicate sample results within the specified acceptance limits?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.3.2.1 If "no" then qualify the associated results in accordance with the Analytical Variability Results table in SOP QATS-70-091.			
4.4 <u>Verified Analyses</u>			
4.4.1 Are verified analyses (second analysis on same grids and grid openings) at the required frequency?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4.2 Are sample verification results within the specified acceptance limits?	<input type="checkbox"/>	<input type="checkbox"/>	
4.4.2.1 If "no" then qualify the associated results in accordance with the Analytical Variability Results table in SOP QATS-70-091.			
<b>Additional Comments:</b>          			

### Data Review Checklist for the Verification and Validation of Transmission Electron Microscopy (TEM) Data Deliverables

5.0 Calibration & Microscope Alignment Validation (Level 3)	Yes	No	Comments
5.1 Is evidence of the calibration of TEM Screen Magnification provided for all sample analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>Daily calibration was not performed on 02/11/2015 affecting two QC samples. The samples are qualified "J" or "UJ".</p> <p>The k-factors provided by the laboratory were performed on 01/24/2014, more than one year prior to the analysis of the samples in this SDG. The laboratory's QAPP states for k-factors "Calibration is performed on a biyearly basis, the first week of January and the first week of July." As a result, one sample and one QC sample are qualified "J" due to the k-factor calibration.</p>
5.1.1 Camera Constant Calibration?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.1.2 Calibration of the EDXA System?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.1.3 k-Factors?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.2 Are the calibration checks listed above performed at the required frequencies?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3 Are the calibration checks within the specified criteria?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.4 Are all calibration checks traceable to the associated samples analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.5 If required, are the following additional system checks provided:			
5.5.1 Beam Dose Check?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.5.2 Spot Size Check?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.5.3 Detector Resolution Check?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.5.4 Resolvable Na, Mg, and Si Peaks?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.5.5 If "no" then qualify the associated results in accordance with the Calibration Results table in SOP QATS-70-091.			
<b>6.0 Case Narrative Validation (Levels 2 &amp; 3)</b>			
6.1 Does the data package narrative include descriptions of the following:			
6.1.1 Samples received (matrix/method)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<p>NA</p> <p>NA</p> <p>NA</p>
6.1.2 Method/project requirement deviations?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.1.3 Example sample calculation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.1.4 Laboratory blank contamination?	<input type="checkbox"/>	<input type="checkbox"/>	
6.1.5 Quality control analyses outside specified criteria?	<input type="checkbox"/>	<input type="checkbox"/>	
6.1.6 Any problems encountered and subsequent corrective action?	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Additional Comments:</b>			

 Validator's Signature Shellee McGrath

 Date 07/09/2015

 QA Review Lyndsay Gensler

 Date 07/09/2015

### Data Review Checklist for the Verification and Validation of Polarized Light Microscopy (PLM) Data Deliverables

<b>Project Name: Sumas Mtn Asbestos Soil Project</b>	<b>Case or Sample Set ID: 142958</b>
<b>Number of Samples/Matrix: 24 Soil Samples</b>	<b>COC Number: 10-100614-121545-0001</b>
<b>PLM Analytical Method: CARB 435; ASTM D7521</b>	<b>Level of Validation (Circle one): 1 2 <u>3</u> Other</b>

1.0 Data Package Inventory	Yes	No	Comments
1.1 Were the project-specific requirements (i.e. acceptance criteria & analytical sensitivities) provided by the client prior to the initiation of validation activities?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The laboratory performed three Laboratory Duplicates (by the same analyst) on EPA Sample Nos. 14394106, 14394117, and 14394123 and two Laboratory Duplicates (by a different analyst) on EPA Sample Nos. 14394106 and 14394109.  NA
1.2 Did the received hard copy deliverables contain all the necessary components:			
1.2.1 Case Narrative (Level 1, 2 & 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.2 Chain-of-Custody (Level 1, 2 & 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.3 Form I or equivalent (Level 1, 2 & 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.4 Raw Data - Count Sheets (Level 1, 2 & 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.5 QC Sample Data (Level 2 & 3):	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.5.1 Blank(s)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.2.5.2 Replicate(s)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.5.3 Duplicate(s)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.6 Calibration Data (Level 3)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1.2.7 Communication Records (Level 1, 2 & 3)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.2.8 Miscellaneous?	<input type="checkbox"/>	<input type="checkbox"/>	
1.3 Were the necessary components received to perform the requested level of validation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>2.0 Chain-of-Custody Information Verification (Level 1, 2 &amp; 3)</b>			
2.1 Were the following information recorded in the hard copy electronic deliverables (if applicable) consistent with the information recorded on the COC:			
2.1.1 COC Number?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.2 Case or Sample Set Number?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.3 EPA Sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.4 Date/Time Collected?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.5 Sample Matrix?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.6 Analyses (Method)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.7 Date/Time Received?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.1.8 Other (describe)?	<input type="checkbox"/>	<input type="checkbox"/>	
2.2 Were the COC records signed and dated upon receipt?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Additional Comments:</b>			

### Data Review Checklist for the Verification and Validation of Polarized Light Microscopy (PLM) Data Deliverables

3.0 Sample Result Verification & Validation (Level 1, 2 & 3)	Yes	No	Comments
<p>3.1 Prior to analysis by PLM, are samples examined at low magnification using a stereoscope?</p> <p>3.1.1 Are the following observations recorded for each sample:</p> <p>3.1.1.1 Color?</p> <p>3.1.1.2 Texture?</p> <p>3.1.1.3 Percent (%) fibrous material?</p> <p>3.2 Is the technique used to prepare samples to slides recorded (i.e. particle size reduction, acid treatment, heating, melting or teasing)?</p>	<p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><input type="checkbox"/></p>	
<p>3.3 Were gravimetric analysis performed?</p> <p>3.3.1 If yes, were the necessary sample weights and tare weights recorded and provided?</p> <p>Using the recorded weights, recalculate a minimum of 10% of the samples for which gravimetric analysis was performed.</p> <p>3.3.1.1 Are the recalculated concentrations consistent with those reported?</p>	<p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	ASTM D7521
<p>3.4 Is qualitative identification of fibrous materials made by examining fiber morphology and observance of optical properties?</p> <p>3.4.1 Are the following recorded for all reported fibrous materials:</p> <p>3.4.1.1 Morphology?</p> <p>3.4.1.2 Refractive Indices?</p> <p>3.4.1.3 Sign of Elongation?</p> <p>3.4.1.4 Extinction Angle?</p> <p>3.4.1.5 Pleochroism?</p> <p>3.4.1.6 Birefringence?</p> <p>3.5 Do the recorded morphology and optical properties in the raw data agree with the type of fibrous material(s) reported?</p> <p>Note: Refer to Attachments A and B of SOP QATS-70-090 for the morphology and optical properties of various asbestos and non-asbestos fibers.</p>	<p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><input type="checkbox"/></p>	.
<p><b>Additional Comments:</b></p>			

### Data Review Checklist for the Verification and Validation of Polarized Light Microscopy (PLM) Data Deliverables

3.0 Sample Result Verification & Validation (Level 1, 2 & 3)	Yes	No	Comments
3.6 Was quantitative analysis performed by point counting?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
3.6.1 Was the point counting performed as described in the project and/or method specified?	<input type="checkbox"/>	<input type="checkbox"/>	
3.6.2 Where the following recorded:			
3.6.2.1 Magnification?	<input type="checkbox"/>	<input type="checkbox"/>	
3.6.2.2 Graticule size/type?	<input type="checkbox"/>	<input type="checkbox"/>	
3.6.2.3 Number of slide mounts prepared?	<input type="checkbox"/>	<input type="checkbox"/>	
3.6.2.4 Empty and non-empty points counted?	<input type="checkbox"/>	<input type="checkbox"/>	
3.6.2.5 The observance of fibers in a field of view, but not directly under a point?	<input type="checkbox"/>	<input type="checkbox"/>	

4.0 Quality Control Verification & Validation (Level 2 and 3)	Yes	No	Comments
4.1 <u>Blanks</u>			
4.1.1 Are laboratory contamination blanks prepared and analyzed at the required frequency?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	A daily calibration blank was not analyzed on 01/26/2015, affecting 6 samples.
4.1.2 Are laboratory blank results within the specified criteria?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.1.2.1 If "no" then qualify the associated results in accordance with the Blank Result table in SOP QATS-70-090.			
4.2 <u>Replicate Analyses</u>			
4.2.1 Are replicate (reanalyzed by the same or second analyst) sample analyses performed at the required frequency?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The laboratory performed three Laboratory Duplicates (by the same analyst) on EPA Sample Nos. 14394106, 14394117, and 14394123 and two Laboratory Duplicates (by a different analyst) on EPA Sample Nos. 14394106 and 14394109.
4.2.2 Are replicate sample results within the specified acceptance limits?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.3 <u>Duplicate Analyses</u>			
4.3.1 Are duplicate sample analyses performed at the required frequency?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.3.2 Are duplicate sample results within the specified acceptance limits?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.3.2.1 If "no" then qualify the associated results in accordance with the Analytical Variability Results table in SOP QATS-70-090.			

**Additional Comments:**

### Data Review Checklist for the Verification and Validation of Polarized Light Microscopy (PLM) Data Deliverables

4.0 Quality Control Verification & Validation (Level 2 and 3)	Yes	No	Comments
4.4 <u>Reference Slide Analysis (if applicable)</u>			The PLM Reference Material Comparison spreadsheet, PLM Accuracy QC and RTI Reference Material Comparison.xls, provided Reference Material results for analyst R. Brown. The analyst for the samples in this SDG is S. Golden; therefore, the PLM Reference Material analysis could not be evaluated.
4.4.1 Are reference slide analyses performed at the required frequency?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.4.2 Are the reference slide analyses results within the specified acceptance criteria?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.4.2.1 If "no" then qualify the associated results in accordance with the Reference Slide Analysis table in SOP QATS-70-090.			
<b>5.0 Calibration &amp; Microscope Alignment Validation (Level 3)</b>			
5.1 Are evidence of microscope alignment and Refractive Index (RI) liquid calibration provided for all sample analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The daily scope alignment and contamination blank check were performed for all dates except 01/26/2015, resulting in the qualification of 6 samples analyzed on that date.
5.1.1 Microscope-specific alignment checks?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1.2 Microscope-specific contamination checks?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1.3 Calibration RI liquids?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.2 Are alignment and calibration checks listed above performed at the required frequencies?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3 Are alignment and calibration checks within the specified criteria?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.4 Are all alignment and calibration checks traceable to the associated samples analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.4.1 If "no" then qualify the associated results in accordance with the Calibration Results table in SOP QATS-70-090.			
<b>6.0 Case Narrative Validation (Levels 2 &amp; 3)</b>			
6.1 Does the data package narrative include descriptions of the following:			NA NA NA
6.1.1 Samples received (matrix/method)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.1.2 Method/project requirement deviations?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.1.3 Example sample calculation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.1.4 Laboratory blank contamination?	<input type="checkbox"/>	<input type="checkbox"/>	
6.1.5 Quality control analyses outside specified criteria?	<input type="checkbox"/>	<input type="checkbox"/>	
6.1.6 Any problems encountered and subsequent corrective action?	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Additional Comments:</b>			

 Validator's Signature Shellee McGrath

 Date 06/08/2015

 QA Review Lyndsay Gensler

 Date 06/19/2015



## **Appendix B**

### **Qualified Result Forms**

**WARNING:** The current file will be saved and Microsoft Excel will be closed as part of the export process.

State/Federal

QA by:	K. March
QA Date:	03/29/15

Data Entry by: S. Golden  
Data Entry Date: 03/18/15

[illegible]

\*RC= Reason Code

it be  
it close

thophyllite (AN)			Chrysotile (CH)			Crocidolite (CR)			Tremolite (TR)			winchite/richterite/ tremolite/actinolite (WRTA)			Other Amphibole (OA)			Non-asbestos Material (NAM)			Other Mineral Type (OM)		
AN-AF (%)	AN-MF (%)		CH-AF (%)	CH-MF (%)		CR-AF (%)	CR-MF (%)		TR-AF (%)	TR-MF (%)		WRTA-AF (%)	WRTA-MF (%)		OA-AF (%)	OA-MF (%)		NAM-AF (%)	NAM-MF (%)		OM-AF (%)	OM-MF (%)	OM Type
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## Lab/Cor Portland, Inc.

**Customer Name:** Alion Science and Technology      **LCP Job Number:** 142958  
**Cust. Project Name:** Sumas Mtn Asbestos Soil  
**Cust. Project Number:** 10-100614-121545-0001

Total Asbestos (%)=

$$\frac{[\%_F \text{ PLM PC} * W_F] + [\%_M \text{ PLM} * W_M] + [\%_C \text{ PLM} * W_C]}{W_F + W_M + W_C}$$

Client Sample ID	Sample Number	Fine Fraction		Medium Fraction		Coarse Fraction		Total %
		W <sub>F</sub>	PC	W <sub>M</sub>	PLM	W <sub>C</sub>	PLM	
14394100	S1	6.8	0 *	60.6	0	113.8	0	0
14394101	S2	9.2	0 *	86.6	0	133.4	0	0
14394102	S3	5.8	0 *	61	0	24.6	0	0
14394103	S4	9.8	0 *	137.4	0	65.8	0	0
14394104	S5	7.6	0 *	77	0	45.2	0	0
14394105	S6	7.8	0 *	78	0	45.8	0	0
14394106	S7	7.4	0 *	83.4	0	44.2	0	0
14394107	S8	7.2	0 *	88	0	64	0	0
14394108	S9	6.8	0 *	70.8	0	71.8	0	0
14394109	S10	6	0 *	61	0	54.6	0	0
14394110	S11	7	0 *	77.4	0	64	0	0
14394111	S12	11.4	0 *	108.2	0	60.6	0	0
14394112	S13	9.6	0 *	77.2	0	134.6	0	0
14394113	S14	8.8	0 *	104.6	0	82.4	0	0
14394114	S15	9.8	0 *	75	0	140	0	0
14394115	S16	10.8	0 *	109.4	0	78.4	0	0
14394116	S17	8	0 *	97	0	47.4	0	0
14394117	S18	8.6	0 *	89.2	0	48.8	0	0
14394118	S19	7.2	0 *	84.8	0	47.6	0	0
14394119	S20	12.2	0 *	108.8	0	109	0	0
14394120	S21	10.8	0 *	116.6	0	83.4	0	0
14394121	S22	9.1	0 *	132.2	0	81.4	0	0
14394122	S23	11.2	0 *	143.2	0 **	80.2	0	0
14394123	S24	12.2	2	221.4	2	81.8	3	2.2594

\* Indicates samples that were sent to TEM Analysis

\*\* Indicates trace (<1%) asbestos by PLM


**Lab/Cor Portland, Inc.**

 4321 SW Corbett Ave., Ste A  
 Portland, OR 97239

**Final Report**

 Phone: (503) 224-5055  
 Fax: (503) 228-8282  
<http://www.labcorpdx.net>
*Asbestos and Environmental Analysis*
**EPA 600-R-93-116 - TEM - Bulk Quantitative**

 Job Number: 142958 PDX  
 Client: Alion Science and Technology  
 Project Name: Sumas Mtn Asbestos Soil  
 Project No.: 10-100614-121545-0001

 Report Number: 142958R02  
 Date Received: 12/15/2014

 Lab/Cor Sample No. : S1  
 Client Sample No. : 14394100 -  
 GRR : 0.359  
 Dilution : 0.0025  
 Dilution Factor : 1

 As Received Weight (g) : 189.60  
 Lab Filter Area (mm2) : 193  
 Grid Openings Analyzed : 10  
 Average Grid Opening Area (mm2) : 0.01042  
 Area Analyzed (mm2) : 0.1042  
 Analytical Sens. (Weight Percent) : 1.33E-07  
 Analytical Sens. (struc/g) : 2.21E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/3/2015	H-7000	20000
TH	2/8/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 2213154.996	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 2213154.996	0	0.00E+00
Total Chrysotile Structures	NA*	< 2213154.996	0	0.00E+00

 Lab/Cor Sample No. : S2  
 Client Sample No. : 14394101 -  
 GRR : 0.359  
 Dilution : 0.0025  
 Dilution Factor : 1

 As Received Weight (g) : 229.80  
 Lab Filter Area (mm2) : 193  
 Grid Openings Analyzed : 10  
 Average Grid Opening Area (mm2) : 0.01042  
 Area Analyzed (mm2) : 0.1042  
 Analytical Sens. (Weight Percent) : 1.33E-07  
 Analytical Sens. (struc/g) : 2.21E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/3/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 2213154.996	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 2213154.996	0	0.00E+00
Total Chrysotile Structures	NA*	< 2213154.996	0	0.00E+00

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.


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**Final Report**

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*Asbestos and Environmental Analysis*
**EPA 600-R-93-116 - TEM - Bulk Quantitative**

 Job Number: 142958 PDX  
 Client: Alion Science and Technology  
 Project Name: Sumas Mtn Asbestos Soil  
 Project No.: 10-100614-121545-0001

 Report Number: 142958R02  
 Date Received: 12/15/2014

Lab/Cor Sample No. : S3

Client Sample No. : 14394102 -

GRR : 0.235

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 92.40

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 9.18E-08

Analytical Sens. (struc/g) : 1.53E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/3/2015	H-7000	20000
TH	2/4/2015	H-7000	20000
TH	2/8/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1528197.012	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1528197.012	0	0.00E+00
Total Chrysotile Structures	NA*	< 1528197.012	0	0.00E+00

Lab/Cor Sample No. : S4

Client Sample No. : 14394103 -

GRR : 0.266

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 215.80

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 1.14E-07

Analytical Sens. (struc/g) : 1.90E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	2.07E-02	1.14E+07	6	2.02E-07
Total Asb & Libby-OtherAmph Structures	2.07E-02	1.14E+07	6	2.02E-07
Total Chrysotile Structures	2.07E-02	1.14E+07	6	2.02E-07

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.


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*Asbestos and Environmental Analysis*
**EPA 600-R-93-116 - TEM - Bulk Quantitative**

 Job Number: 142958 PDX  
 Client: Alion Science and Technology  
 Project Name: Sumas Mtn Asbestos Soil  
 Project No.: 10-100614-121545-0001

 Report Number: 142958R02  
 Date Received: 12/15/2014

 Lab/Cor Sample No. : S5  
 Client Sample No. : 14394104 -  
 GRR : 0.252  
 Dilution : 0.0025  
 Dilution Factor : 1

 As Received Weight (g) : 130.60  
 Lab Filter Area (mm2) : 193  
 Grid Openings Analyzed : 10  
 Average Grid Opening Area (mm2) : 0.01042  
 Area Analyzed (mm2) : 0.1042  
 Analytical Sens. (Weight Percent) : 1.00E-07  
 Analytical Sens. (struc/g) : 1.67E+06

 Analyst(s) Analysis Date Microscope Magnification  
 TH 2/4/2015 H-7000 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1666837.74	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1666837.74	0	0.00E+00
Total Chrysotile Structures	NA*	< 1666837.74	0	0.00E+00

 Lab/Cor Sample No. : S6  
 Client Sample No. : 14394105 -  
 GRR : 0.241  
 Dilution : 0.0025  
 Dilution Factor : 1

 As Received Weight (g) : 133.20  
 Lab Filter Area (mm2) : 193  
 Grid Openings Analyzed : 10  
 Average Grid Opening Area (mm2) : 0.01042  
 Area Analyzed (mm2) : 0.1042  
 Analytical Sens. (Weight Percent) : 1.11E-07  
 Analytical Sens. (struc/g) : 1.84E+06

 Analyst(s) Analysis Date Microscope Magnification  
 TH 2/4/2015 H-7000 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1839422.923	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1839422.923	0	0.00E+00
Total Chrysotile Structures	NA*	< 1839422.923	0	0.00E+00

 Lab/Cor Sample No. : S7  
 Client Sample No. : 14394106 -  
 GRR : 0.333  
 Dilution : 0.0025  
 Dilution Factor : 1

 As Received Weight (g) : 135.60  
 Lab Filter Area (mm2) : 193  
 Grid Openings Analyzed : 10  
 Average Grid Opening Area (mm2) : 0.01042  
 Area Analyzed (mm2) : 0.1042  
 Analytical Sens. (Weight Percent) : 1.28E-07  
 Analytical Sens. (struc/g) : 2.14E+06

 Analyst(s) Analysis Date Microscope Magnification  
 TH 2/4/2015 H-7000 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 2138273.631	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 2138273.631	0	0.00E+00
Total Chrysotile Structures	NA*	< 2138273.631	0	0.00E+00

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.


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*Asbestos and Environmental Analysis*
**EPA 600-R-93-116 - TEM - Bulk Quantitative**

 Job Number: 142958 PDX  
 Client: Alion Science and Technology  
 Project Name: Sumas Mtn Asbestos Soil  
 Project No.: 10-100614-121545-0001

 Report Number: 142958R02  
 Date Received: 12/15/2014

Lab/Cor Sample No. : S8

Client Sample No. : 14394107 -

GRR : 0.205

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 160.00

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 9.55E-08

Analytical Sens. (struc/g) : 1.59E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1589378.381	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1589378.381	0	0.00E+00
Total Chrysotile Structures	NA*	< 1589378.381	0	0.00E+00

Lab/Cor Sample No. : S9

Client Sample No. : 14394108 -

GRR : 0.212

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 149.80

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 11

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.11462

Analytical Sens. (Weight Percent) : 7.41E-08

Analytical Sens. (struc/g) : 1.23E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1232527.787	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1232527.787	0	0.00E+00
Total Chrysotile Structures	NA*	< 1232527.787	0	0.00E+00

Lab/Cor Sample No. : S10

Client Sample No. : 14394109 -

GRR : 0.326

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 121.20

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 1.22E-07

Analytical Sens. (struc/g) : 2.03E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	2.81E-03	2.03E+06	1	2.56E-08
Total Asb & Libby-OtherAmph Structures	2.81E-03	2.03E+06	1	2.56E-08
Total Chrysotile Structures	NA*	< 2029475.095	0	0.00E+00

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.





## Final Report

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## Asbestos and Environmental Analysis

## EPA 600-R-93-116 - TEM - Bulk Quantitative

Job Number: 142958 PDX  
 Client: Alion Science and Technology  
 Project Name: Sumas Mtn Asbestos Soil  
 Project No.: 10-100614-121545-0001

Report Number: 142958R02  
 Date Received: 12/15/2014

Lab/Cor Sample No. : S11 As Received Weight (g) : 148.60  
 Client Sample No. : 14394110 - Lab Filter Area (mm2) : 193  
 GRR : 0.205 Grid Openings Analyzed : 10  
 Dilution : 0.0025 Average Grid Opening Area (mm2) : 0.01042  
 Dilution Factor : 1 Area Analyzed (mm2) : 0.1042  
 Analytical Sens. (Weight Percent) : 5.50E-08  
 Analytical Sens. (struc/g) : 9.16E+05

Analyst(s) Analysis Date Microscope Magnification  
 TH 2/4/2015 H-7000 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	1.10E-05	9.16E+05	1	2.22E-10
Total Asb & Libby-OtherAmph Structures	1.10E-05	9.16E+05	1	2.22E-10
Total Chrysotile Structures	1.10E-05	9.16E+05	1	2.22E-10

Lab/Cor Sample No. : S12 As Received Weight (g) : 179.80  
 Client Sample No. : 14394111 - Lab Filter Area (mm2) : 193  
 GRR : 0.218 Grid Openings Analyzed : 10  
 Dilution : 0.0025 Average Grid Opening Area (mm2) : 0.01042  
 Dilution Factor : 1 Area Analyzed (mm2) : 0.1042  
 Analytical Sens. (Weight Percent) : 8.91E-08  
 Analytical Sens. (struc/g) : 1.48E+06

Analyst(s) Analysis Date Microscope Magnification  
 TH 2/4/2015 H-7000 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1482309.802	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1482309.802	0	0.00E+00
Total Chrysotile Structures	NA*	< 1482309.802	0	0.00E+00

Lab/Cor Sample No. : S13 As Received Weight (g) : 221.80  
 Client Sample No. : 14394112 - Lab Filter Area (mm2) : 193  
 GRR : 0.222 Grid Openings Analyzed : 10  
 Dilution : 0.0025 Average Grid Opening Area (mm2) : 0.01042  
 Dilution Factor : 1 Area Analyzed (mm2) : 0.1042  
 Analytical Sens. (Weight Percent) : 9.00E-08  
 Analytical Sens. (struc/g) : 1.50E+06

Analyst(s) Analysis Date Microscope Magnification  
 TH 2/4/2015 H-7000 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	3.54E-05	1.50E+06	1	4.37E-10
Total Asb & Libby-OtherAmph Structures	3.54E-05	1.50E+06	1	4.37E-10
Total Chrysotile Structures	3.54E-05	1.50E+06	1	4.37E-10

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.


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*Asbestos and Environmental Analysis*
**EPA 600-R-93-116 - TEM - Bulk Quantitative**

 Job Number: 142958 PDX  
 Client: Alion Science and Technology  
 Project Name: Sumas Mtn Asbestos Soil  
 Project No.: 10-100614-121545-0001

 Report Number: 142958R02  
 Date Received: 12/15/2014

Lab/Cor Sample No. : S14

Client Sample No. : 14394113 -

GRR : 0.212

Dilution : 0.01

Dilution Factor : 1

As Received Weight (g) : 198.80

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 4.54E-08

Analytical Sens. (struc/g) : 7.55E+05

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 755421.212	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 755421.212	0	0.00E+00
Total Chrysotile Structures	NA*	< 755421.212	0	0.00E+00

Lab/Cor Sample No. : S15

Client Sample No. : 14394114 -

GRR : 0.238

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 224.60

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 1.02E-07

Analytical Sens. (struc/g) : 1.69E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1689471.442	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1689471.442	0	0.00E+00
Total Chrysotile Structures	NA*	< 1689471.442	0	0.00E+00

Lab/Cor Sample No. : S16

Client Sample No. : 14394115 -

GRR : 0.321

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 199.20

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 1.25E-07

Analytical Sens. (struc/g) : 2.09E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 2086170.32	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 2086170.32	0	0.00E+00
Total Chrysotile Structures	NA*	< 2086170.32	0	0.00E+00

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.


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*Asbestos and Environmental Analysis*
**EPA 600-R-93-116 - TEM - Bulk Quantitative**

 Job Number: 142958 PDX  
 Client: Alion Science and Technology  
 Project Name: Sumas Mtn Asbestos Soil  
 Project No.: 10-100614-121545-0001

 Report Number: 142958R02  
 Date Received: 12/15/2014

Lab/Cor Sample No. : S17

Client Sample No. : 14394116 -

GRR : 0.174

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 152.00

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 3.39E-08

Analytical Sens. (struc/g) : 5.63E+05

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	2.57E-05	1.13E+06	2	8.45E-10
Total Asb & Libby-OtherAmph Structures	2.57E-05	1.13E+06	2	8.45E-10
Total Chrysotile Structures	2.57E-05	1.13E+06	2	8.45E-10

Lab/Cor Sample No. : S18

Client Sample No. : 14394117 -

GRR : 0.182

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 145.60

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 4.70E-08

Analytical Sens. (struc/g) : 7.83E+05

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	1.60E-05	7.83E+05	1	3.78E-10
Total Asb & Libby-OtherAmph Structures	1.60E-05	7.83E+05	1	3.78E-10
Total Chrysotile Structures	1.60E-05	7.83E+05	1	3.78E-10

Lab/Cor Sample No. : S19

Client Sample No. : 14394118 -

GRR : 0.401

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 130.00

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 9.59E-08

Analytical Sens. (struc/g) : 1.60E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/4/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1596421.547	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1596421.547	0	0.00E+00
Total Chrysotile Structures	NA*	< 1596421.547	0	0.00E+00

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.


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*Asbestos and Environmental Analysis*
**EPA 600-R-93-116 - TEM - Bulk Quantitative**
**Job Number:** 142958 **PDX**  
**Client:** Alion Science and Technology  
**Project Name:** Sumas Mtn Asbestos Soil  
**Project No.:** 10-100614-121545-0001

**Report Number:** 142958R02  
**Date Received:** 12/15/2014

**Lab/Cor Sample No. :** S20  
**Client Sample No. :** 14394119 -  
**GRR :** 0.344  
**Dilution :** 0.0025  
**Dilution Factor :** 1

**As Received Weight (g) :** 140.00  
**Lab Filter Area (mm2) :** 193  
**Grid Openings Analyzed :** 10  
**Average Grid Opening Area (mm2) :** 0.01042  
**Area Analyzed (mm2) :** 0.1042  
**Analytical Sens. (Weight Percent) :** 1.15E-07  
**Analytical Sens. (struc/g) :** 1.91E+06

**Analyst(s)** TH **Analysis Date** 2/4/2015 **Microscope** H-7000 **Magnification** 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1914828.878	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1914828.878	0	0.00E+00
Total Chrysotile Structures	NA*	< 1914828.878	0	0.00E+00

**Lab/Cor Sample No. :** S21  
**Client Sample No. :** 14394120 -  
**GRR :** 0.332  
**Dilution :** 0.0025  
**Dilution Factor :** 1

**As Received Weight (g) :** 211.40  
**Lab Filter Area (mm2) :** 193  
**Grid Openings Analyzed :** 10  
**Average Grid Opening Area (mm2) :** 0.01042  
**Area Analyzed (mm2) :** 0.1042  
**Analytical Sens. (Weight Percent) :** 1.03E-07  
**Analytical Sens. (struc/g) :** 1.72E+06

**Analyst(s)** TH **Analysis Date** 2/5/2015 **Microscope** H-7000 **Magnification** 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 1717449.578	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 1717449.578	0	0.00E+00
Total Chrysotile Structures	NA*	< 1717449.578	0	0.00E+00

**Lab/Cor Sample No. :** S22  
**Client Sample No. :** 14394121 -  
**GRR :** 0.193  
**Dilution :** 0.01  
**Dilution Factor :** 1

**As Received Weight (g) :** 224.20  
**Lab Filter Area (mm2) :** 193  
**Grid Openings Analyzed :** 10  
**Average Grid Opening Area (mm2) :** 0.01042  
**Area Analyzed (mm2) :** 0.1042  
**Analytical Sens. (Weight Percent) :** 1.81E-08  
**Analytical Sens. (struc/g) :** 3.02E+05

**Analyst(s)** TH **Analysis Date** 2/5/2015 **Microscope** H-7000 **Magnification** 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 302049.859	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 302049.859	0	0.00E+00
Total Chrysotile Structures	NA*	< 302049.859	0	0.00E+00

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.

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*Asbestos and Environmental Analysis***EPA 600-R-93-116 - TEM - Bulk Quantitative**

**Job Number:** 142958 **PDX**  
**Client:** Allon Science and Technology  
**Project Name:** Sumas Mtn Asbestos Soil  
**Project No.:** 10-100614-121545-0001

**Report Number:** 142958R02  
**Date Received:** 12/15/2014

**Lab/Cor Sample No.:** S23  
**Client Sample No.:** 14394122 -  
**GRR:** 0.169  
**Dilution:** 0.0025  
**Dilution Factor:** 1

**As Received Weight (g):** 230.80  
**Lab Filter Area (mm<sup>2</sup>):** 193  
**Grid Openings Analyzed:** 10  
**Average Grid Opening Area (mm<sup>2</sup>):** 0.01042  
**Area Analyzed (mm<sup>2</sup>):** 0.1042  
**Analytical Sens. (Weight Percent):** 5.12E-08  
**Analytical Sens. (struc/g):** 8.52E+05

**Analyst(s)** **Analysis Date** **Microscope** **Magnification**  
TH 2/5/2015 H-7000 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total		Wa
Total Asbestos Structures	1.83E-04	8.52E+05		1	3.98E-09
Total Asb & Libby-OtherAmph Structures	1.83E-04	8.52E+05		1	3.98E-09
Total Chrysotile Structures	1.83E-04	8.52E+05		1	3.98E-09

Reviewed by:

x 

**Stephanie Golden**  
**Technical Manager**

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.

**LabCor Portland Inc.** **Lab/Cor Portland, Inc.**  
4321 SW Corbett Ave., Ste A  
Portland, OR 97239

**Final Report**

Phone: (503) 224-5055  
Fax: (503) 228-8282  
<http://www.labcorpdx.net>

*Asbestos and Environmental Analysis***EPA 600-R-93-116 - TEM - Bulk Quantitative**

Job Number: Q142958a PDX  
Client: Alion Science and Technology  
Project Name: Sumas Mtn Asbestos Soil  
Project No.: 10-100614-121545-0001

Report Number: Q142958aR01  
Date Received: 12/15/2014

Lab/Cor Sample No. : S1  
Client Sample No. : 14394100 -  
GRR : 0.359  
Dilution : 0.0025  
Dilution Factor : 1

As Received Weight (g) : 189.60  
Lab Filter Area (mm2) : 193  
Grid Openings Analyzed : 10  
Average Grid Opening Area (mm2) : 0.01042  
Area Analyzed (mm2) : 0.1042  
Analytical Sens. (Weight Percent) : 1.33E-07  
Analytical Sens. (struc/g) : 2.21E+06

Analyst(s) Analysis Date Microscope Magnification  
TH 2/19/2015 H-7000 20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 2213154.996	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 2213154.996	0	0.00E+00
Total Chrysotile Structures	NA*	< 2213154.996	0	0.00E+00

Reviewed by:

x

Tracy Handrich  
Analyst

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.

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Portland, OR 97239**Final Report**Phone: (503) 224-5055  
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<http://www.labcorpdx.net>*Asbestos and Environmental Analysis***EPA 600-R-93-116 - TEM - Bulk Quantitative**

Job Number: Q142958b PDX

Client: Alion Science and Technology

Project Name: Sumas Mtn Asbestos Soil

Project No.: 10-100614-121545-0001

Report Number: Q142958bR01

Date Received: 12/15/2014

Lab/Cor Sample No.: S2

Client Sample No.: 14394101 -

GRR: 0.359

Dilution: 0.0025

Dilution Factor: 1

As Received Weight (g): 229.80

Lab Filter Area (mm<sup>2</sup>): 193

Grid Openings Analyzed: 10

Average Grid Opening Area (mm<sup>2</sup>): 0.01042Area Analyzed (mm<sup>2</sup>): 0.1042

Analytical Sens. (Weight Percent): 1.33E-07

Analytical Sens. (struc/g): 2.21E+06

Analyst(s)	Analysis Date	Microscope	Magnification
TH	2/19/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	NA*	< 2213154.996	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 2213154.996	0	0.00E+00
Total Chrysotile Structures	NA*	< 2213154.996	0	0.00E+00

Reviewed by:

x

  
 Tracy Handrich  
 Analyst

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.


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 Portland, OR 97239

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*Asbestos and Environmental Analysis*
**EPA 600-R-93-116 - TEM - Bulk Quantitative**

 Job Number: Q142958d PDX  
 Client: Alion Science and Technology  
 Project Name: Sumas Mtn Asbestos Soil  
 Project No.: 10-100614-121545-0001

 Report Number: Q142958dR01  
 Date Received: 12/15/2014

Lab/Cor Sample No. : S11

Client Sample No. : 14394110 -

GRR : 0.205

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 148.60

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

Analytical Sens. (Weight Percent) : 5.50E-08

Analytical Sens. (struc/g) : 9.16E+05

Analyst(s)	Analysis Date	Microscope	Magnification
PK	2/11/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count' Primary/Total	Wa
Total Asbestos Structures	NA*	< 916215.226	0	0.00E+00
Total Asb & Libby-OtherAmph Structures	NA*	< 916215.226	0	0.00E+00
Total Chrysotile Structures	NA*	< 916215.226	0	0.00E+00

Reviewed by:

x

 Paulina Kho  
 Analyst

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.



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Portland, OR 97239**Final Report**Phone: (503) 224-5055  
Fax: (503) 228-8282  
<http://www.labcorpdx.net>*Asbestos and Environmental Analysis***EPA 600-R-93-116 - TEM - Bulk Quantitative**Job Number: Q142958e PDX  
Client: Alion Science and Technology  
Project Name: Sumas Mtn Asbestos Soil  
Project No.: 10-100614-121545-0001Report Number: Q142958eR01  
Date Received: 12/15/2014

Lab/Cor Sample No. : S10

Client Sample No. : 14394109 -

GRR : 0.326

Dilution : 0.0025

Dilution Factor : 1

As Received Weight (g) : 121.20

Lab Filter Area (mm2) : 193

Grid Openings Analyzed : 10

Average Grid Opening Area (mm2) : 0.01042

Area Analyzed (mm2) : 0.1042

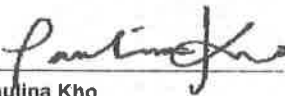
Analytical Sens. (Weight Percent) : 1.22E-07

Analytical Sens. (struc/g) : 2.03E+06

Analyst(s)	Analysis Date	Microscope	Magnification
PK	2/11/2015	H-7000	20000

Structure Type	Weight Percent (%)	Concentration (struc/g)	Struct Count <sup>1</sup> Primary/Total	Wa
Total Asbestos Structures	1.54E-03	4.06E+06	2	1.41E-08
Total Asb & Libby-OtherAmph Structures	1.54E-03	4.06E+06	2	1.41E-08
Total Chrysotile Structures	7.65E-05	2.03E+06	1	6.98E-10

Reviewed by:

x   
Paulina Kho  
Analyst

\* NA - weight percent is only calculated using total structures, counting categories that are counted using primary structures are not calculated.