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SCOPE OF WORK
Region IX START

El Dorado Hills Naturally Occurring Asbestos Project

Air Analysis by TEM

PAN: 001275.0440.01TA
TDD Number: 09-04-0-0011

1.0 GENERAL

Ecology and Enviro Inc., (E & E), wit iness office located at 350 Sansome Street, Suite 300, San Franc , ct No. 68-W-01-012) with the U.S. Environmental Protection Agency (US EPA) to procure as needed various analytical services.

The US EPA has directed E & E to collect samples to determine types and concentrations of asbestos structures/fibers in ambient and indoor air. Samples will be collected at various locations during various activities at a site which contains naturally occurring asbestos. The sampling is expected to begin in late September 2004. The majority of the sampling will be completed in a three week period. However, sample will also be collected at six day intervals for one year. E & E will collect approximately 500 air samples and blanks.

2.0 ANALYTICAL REQUIREMENT

2.1 PURPOSE OF ANALYSIS

The samples will be collected to determine the concentrations of asbestos fibers and structures in ambient, outdoor and indoor air environments. During sample collection, fugitive dust emissions will be purposefully generated by various activities. The specific analysis parameters required are indicated in sections 2.2, 2.3, 2.4, 3.0 and 4.0. The data will be used by the US EPA to assist them in their exposure assessment and decision making process.

2.2 SPECIFIC PROJECT REQUIREMENTS

All laboratory services will be provided to E & E by the E & E contracted laboratory with no additional sub-contracting of services to be allowed. Air samples will be analyzed for asbestos fibers following ISO 10312, *Ambient Air-Determination of Asbestos Fibers: Direct-Transfer Transmission Electron Microscopy Method*.

If samples cannot be analyzed by ISO 10312 due to filter over-loading, E & E may request that the sample be analyzed by ISO 13794, *Ambient Air-Determination of Asbestos Fibers: Indirect-Transfer Transmission Electron Microscopy Method*.

Specific project requirements and specifications for the method are listed in Table 2-1 Table 2-2 and Table 2-3. Other required specification are described in sections 3 through 5 of this SOW

To insure quality for the analytical project the following measures are required:

- All analyses will be conducted by a NVLAP-certified laboratory for the analysis of asbestos fibers.
- The laboratory must provide documentation of successful proficiency in detection of "Libby amphibole" asbestos.
- The laboratory must conduct zone axis patterns measurement and quantitative EDS chemistries for identification.
- The laboratory will have previous experience in the determination of chrysotile, regulated amphibole asbestos fibers in air by ISO TEM methodologies.
- The laboratory will have previous experience in the determination and reporting of non-regulated amphibole by TEM.
- The laboratory will have previous experience with providing detailed analytical documentation of TEM analysis to support US EPA projects.
- Analytical precision will be documented with duplicate and replicate analyses.
- The laboratory must willing and able to provide technical assistance to START project management regarding analysis prior to and after generation of data.

2.3 TURNAROUND TIME

Approximately 150 samples are considered "priority turnaround" samples. The report turnaround requirements for priority samples and non-priority sample is specified in Table 2-2 Turnaround time begins from the validated time of sample receipt (VTSR) of the last sample in each sample delivery group (SDG). Turnaround times for Data packages and Electronic data deliverables, which is required for all analyses, is also specified in Table 2-2..

2.4 ANALYTICAL PROTOCOL REQUIRED

Samples are to be prepared, analyzed, confirmed, documented, and reported as specified in the ISO 10312 method and the ISO 13794 method as needed. Any modifications to these protocols should be specified and approved prior to acceptance of project. Protocol, procedures and parameters not discussed in the method or specified in this SOW should be addressed in the laboratory Standard Operating Procedure (SOP) for TEM analysis by ISO 10312.

Table 2-1
Summary of
Samples to be Collected

Method:	ISO 10312, *Ambient Air-Determination of Asbestos Fibers–Direct-Transfer Transmission Electron Microscopy Method* or ISO *13794-Ambient Air - Determination of Asbestos Fibres - Indirect-Transfer Transmission Electron Microscopy Method*
Sample Container:	Cassette with a 25 millimeter diameter, mixed cellulose ester filter with pore size less than or equal to 0.80 micrometers.

Estimated Sample Collection Volumes	**Estimated Number of Non-Priority Samples**	**Estimated Number of Priority Samples**	**Total Number of Samples**
300 Liter	105 samples	25 Priority samples	130 samples
900 Liters	--	20 Priority samples	20 samples
1,200 Liters	100 samples	30 Priority samples	130 samples
. 4,000 Liters	60 Samples	50 Priority samples	110 samples
Filter Blanks	7 filter blanks	8 filter blanks	15 filter blanks
Trip Blanks	15 trip blanks	15 trip blanks	30 trip blanks
Total Field Samples (including field blanks and blind PE samples).	287 samples	148 Priority samples	435 samples

Frequency is estimated up to 10 priority and 20 non-priority samples generated each work day for 3 to 4 week duration.

Table 2-2
Analytical Requirements
for El Dorado Hills Naturally Occurring Asbestos

Each samples will be collected with a carbon-filled polypropylene cassette with cowl, tapered-end style with a 25 millimeter diameter, mixed cellulose ester filter with pore size less than or equal to 0.80 micrometers.
Sample collection dates: October 2004 **Sample delivery date: October 2004**

Method	**ISO 10312- Ambient Air-Determination of Asbestos Fibers: Direct-Transfer Transmission Electron Microscopy Method**

Specification	**Turnaround Times**
- Preparation and analysis of medium and low priority samples are to be initiated when directed by E & E. Notify E & E when it is determined that indirect TEM analysis is necessary on a sample. **Collection volume less than 4,000 liters** - Sensitivity: 0.001 structures /cubic centimeter. - Zero fibers Detection Limit: 0.003 structures /cubic centimeter . **Collection volume greater than 4,000 liters** - Sensitivity: 0.0003 structures /cubic centimeter. - Zero fibers Detection Limit: 0.001 structures /cubic centimeter . - TEM specimen acceptance criteria, structure counting, size analysis, energy dispersive X-ray calibration and analysis and calculation of results as per the ISO method. - Sample preparation as per the ISO method for cellulose ester filters. *ADDITIONAL COUNT CRITERIA* - Count all structure having a > 3:1 aspect ratio irrespective of length. - Count structures with length greater than 5 Fm and having a > 3:1 aspect ratio. - Count structures with length greater than 5 Fm but less than or equal to 10 Fm and having a diameter less than or equal to 0.5 Fm. - Count structures with length greater 10 Fm and having a diameter less than or equal to 0.5 Fm.	**Final Data Report:** **Priority samples:** Within 5 working days of receipt. **Samples**: Report for remaining samples within 10 working days of E & E direction. **Data Package and Electronic Data Deliverable:** **All Samples:** Within 10 working days of final report.

Over loaded Filters: Method ISO 13794- Ambient Air - Determination of Asbestos Fibres - Indirect-Transfer Transmission Electron Microscopy Method

- Preparation and analysis of priority samples by indirect method are to be initiated when needed and will require E & E approval. - Preparation and analysis of non-priority samples by indirect method are to be initiated as directed by E & E. - Same specification as ISO 10312 (see above).	**Final Data Report:** Report for remaining samples within 10 working days of E & E direction. **Data Package and Electronic Data Deliverable:** Within 10 working days of final report.

Table 2-3
Analytical Requirements Summary per Each Sample
for El Dorado Hills Naturally Occurring Asbestos

Mineral Identification of Representative Structures

- Identification of asbestiforms shall include the following:

Regulated - tremolite, anthophyllite, actinolite, crocidolite, amosite and chrysotile
Other amphibole asbestiforms - winchite, richterite, ferro-edenite , magnesio-arfvedsonite**,** and *magnesio-reibeckite (etc.)*
Non-Asbestos Material- all other mineralogy

Structure Classification for Each Structure

Dimensions for Each Structure

Counting

Stopping Rule: 50 primary structures, provided the reported concentration exceeds 0.1 structures per cubic centimeter

Counted structure shall include the following:
Regulated - tremolite, anthophyllite, actinolite, crocidolite, amosite and chrysotile
Other amphibole asbestiforms - winchite, richterite, ferro-edenite , magnesio-arfvedsonite**,** and magnesio-reibeckite etc.

Primary Structure Counts Irrespective of Length with aspect ratio of greater than or equal to 3:1 (Regulated).
Structure Counts Irrespective of Length with aspect ratio of greater than or equal to 3:1 (Regulated).
Structures with Lengths Greater than 5 Fm with aspect ratio of greater than or equal to 3:1 (Regulated).
Fibers and Bundles with Lengths Greater than 5 Fm with aspect ratio of greater than or equal to 3:1 (Regulated).
Structures with Lengths Greater than 5 Fm with aspect ratio of greater than or equal to 3:1 (Regulated)
Structures with Lengths Greater than 5 Fm but less than or equal to 10 Fm and having a diameter less than or equal to 0.5 Fm (Regulated).
Structures with Lengths Greater than 10 Fm and having a diameter less than or equal to 0.5 Fm (Regulated).
Total Structure Counts with Lengths Greater than 5 Fm with aspect ratio of greater than or equal to 3:1 (Regulated).

Primary Structure Counts Irrespective of Length with aspect ratio of greater than or equal to 3:1 (Other amphibole asbestiforms).
Structure Counts Irrespective of Length with aspect ratio of greater than or equal to 3:1(Other amphibole asbestiforms).
Structures with Lengths Greater than 5 Fm with aspect ratio of greater than or equal to 3:1(Other amphibole asbestiforms)..
Fibers and Bundles with Lengths Greater than 5 Fm with aspect ratio of greater than or equal to 3:1 (Other amphibole asbestiforms)..
Structures with Lengths Greater than 5 Fm. with aspect ratio of greater than or equal to 3:1(Other amphibole asbestiforms).
Structures with Lengths Greater than 5 Fm but less than or equal to 10 Fm and having a diameter less than or equal to 0.5 Fm (Other amphibole asbestiforms).
Structures with Lengths Greater than 10 Fm and having a diameter less than or equal to 0.5 Fm (Regulated).
Total Structure Counts with Lengths Greater than 5 Fm (Other amphibole asbestiforms).

Table 2-3 Analytical Requirements Summary per Each Sample for El Dorado Hills Naturally Occurring Asbestos		
Calculations Counted structure shall include the following: Regulated - tremolite, anthophyllite, actinolite, crocidolite, amosite and chrysotile Other amphibole asbestiforms - winchite, richterite, ferro-edenite , magnesio-arfvedsonite**,** and magnesio-reibeckite Asbestos Structures Per Cubic Centimeter Asbestos Structures Per Square Millimeter of Filter 95 % Confidence Interval for Each Reported Concentration		
Parameters		
Analytical Sensitivity Filtered Area of Filter Analyzed	Grids Opened Total Filter Area	Volume of Ambient Air

3.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

Method-specific quality assurance/quality control (QA/QC) requirements specified in ISO 10312 are to be followed.

The following replicate and duplicate analyses are required for all samples:

Replicate Analysis:	New grids counted by same analyst:	% 5
Replicate Analysis:	New preparation by same analyst:	% 5
Duplicate Analysis:	Same grids recounted by different analyst:	% 5
Duplicate Analysis:	New grid counted by different analyst:	% 5
Duplicate Analysis:	New preparation by different analyst:	% 5

Other QA/QC requirements should include analysis of a laboratory control standard, process blanks, field blanks and filter blank with each group of samples. A determination of a blind internal laboratory control sample by the analyst during the analysis phase of this project is recommended. However, if this is not practical, documentation of the primary analyst performance results from the most recent quarterly inter-laboratory performance verification may be substituted in lieu of a laboratory control sample. The quality assurance limits used to evaluate the QA/QC samples must be indicated with quality assurance data reporting.

The laboratory is expected to adhere to standard laboratory practices when analyzing samples and documenting results. Questions concerning specific sample analyses should be addressed prior to analysis of samples. If the laboratory has any questions or problems concerning the analysis of received samples, E & E should be notified immediately by phone, followed by a letter in hard copy that discusses the problem(s) and associated resolution(s). All correspondence between the laboratory and E & E should be documented in the data package. **If established QC limits are exceeded,**

appropriate actions must be taken to correct or address the problem. Re-analysis of the affected samples is required for all non-matrix related problems.

4.0 DELIVERABLES REQUIREMENTS

Samples analyzed by the laboratory for this project will require the following deliverables:

- Final data report,
- Complete data package, and
- Electronic data deliverable.

An analytical project is not complete until all deliverable requirements have been met.

4.1 FINAL DATA REPORT

The final data report may be reported either in a summary table or on individual sample sheets. Reports must be signed and should either be hard copies sent by mail or image files sent by e-mail or mail. The data should be clearly identified as being final. All QC summary information must be included.

The following data is required in the final report:

Narrative on conditions of sample, method, counting rule, and summary of any quality assurance or quality control problems encountered during analysis.

For each sample and all QC samples, include client sample name, laboratory identification number, fiber types, analytical sensitivity, volume, grids opened, filter area, area analyzed, analyst, and analysis date.

For each regulated asbestiform include the following:

- structures per cc,
- Structure counts with length greater than 5 Fm and having a >3:1 aspect ratio;
- Structure counts with length greater than 5 Fm but less than or equal to 10 Fm and having a diameter less than or equal to 0.5 Fm;
- Structure counts with length greater 10 Fm and having a diameter less than or equal to 0.5 Fm, and
- And 95 % confidence interval.

For each other amphibole asbestiforms include the following:

- structures per cc,
- Structure counts with length greater than 5 Fm and having a >3:1 aspect ratio;
- Structure counts with length greater than 5 Fm but less than or equal to 10 Fm and having a diameter less than or equal to 0.5 Fm;
- Structure counts with length greater 10 Fm and having a diameter less than or

equal to 0.5 Fm, and

- And 95 % confidence interval.

For each sample and all QC samples, include the TEM Asbestos Fiber Count-Raw data information table. This table should include for each grid, the grid number, grid coordinates, primary and total structures, lengths, width, structure type, and asbestos type.

4.2 COMPLETE PROJECT DATA PACKAGE

The final data package may be reported either as a compilation of printed data or as a compact disk-read only memory (CD-ROM) with image files that are a facsimile of the printed data package. The image file should be in portable document format (pdf).

The data package shall include all copies of the original documentation generated in support of a method performed under the contracted Statement of Work. The data packages will be used to demonstrate and document that all requirements of the method have been met. The data packages will be used to support US EPA decisions and cost recovery efforts. Data and data packages may be used to support US EPA civil enforcement activities. The documentation includes, but is not limited to, sample tags, custody records, shipping information, standard preparation records, sample preparation/extraction records, and sample analysis record including printouts and copies of log pages or copies of log sheets. The laboratory must maintain all original information and documentation required in the data package for five years. All related method records in permanently bound notebooks and all related computer files must also be maintained for five years. Otherwise, the laboratory must provide original documents and files in the data package rather than copies.

The following deliverables are required in the data package. The following data requirements are included to specify and emphasize general documentation requirements and are not intended to supercede or change the requirements of each method.

- Raw data (to support all summary data) should include the following:
  1. Copies of all analysis preparation sheets.
  2. Copies of all analyst count sheets.
  3 Copies of all information necessary to calculate data reported in the final data report.
- Pages within the final data report and data validation package will be numbered sequentially.
- A copy of the laboratory's certification for TEM analysis must be included with data validation package.

4.3 ELECTRONIC DATA

The structure of the EDD must conform to the structure indicated in Attachment E1. Field names must match precisely the field names listed.

DO NOT include results for any other quality control samples.

The laboratory must perform a QC check on the electronic data versus the final data summary report prior to submission of the electronic data.

The EDD may be a Microsoft Access data table, a tab-delimited or fixed field width ASCII file, or a Microsoft Excel or Lotus 1-2-3 spreadsheet. Comma-delimited ASCII files will not be accepted. The EDD may be delivered on a three and half inch diskette, CD-ROM as a e-mailed attachment.

5.0 ADDITIONAL REQUIREMENTS

All samples and prepared materials related to the samples must be held for six months. Prior to disposal of any sample, E & E must be notified and may require that the samples be returned to E & E, at E & E cost.

Disposal of samples and sample containers must be in compliance with local, state, and federal regulations and will be the responsibility of the laboratory. **Disposal cost must be included in the price of analysis**.

The data package will be independently validated within two months of package receipt. The laboratory will likely be contacted during the validation process to clarify any discrepancies or problems. The laboratory will perform corrective action as required. **All post sampling costs related to validation and corrective actions must be included in the price of analysis**.

All hard and electronic data generated in relation to E & E projects must be archived for five years.

Audits may be performed by E & E or the US EPA Quality Assurance Office. Performance Evaluation samples may be submitted to the laboratory at any time.

All work must be performed by the contract specified laboratories.

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