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REPORT OF INITIAL FINGERPRINTING FINDINGS RELATED TO PUERTO RICO OLEFIN SITE PEÑUELAS, PUERTO RICO

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I. SUMMARY

AES International was contracted to perform the first phase of sampling and analyses of dust, soil and bulk materials present inside the regulated area of Olefins facility, Tallaboa Industrial Park and compare the data with the results of dust samples collected from selected areas/properties located around the site. The main purpose was to investigate the presence of Naturally Occurring Asbestos (NOA) rocks versus men made asbestos products present in the vicinity of the Tallaboa Ward, municipality of Penuelas. The investigation included using fingerprinting methods for the asbestos containing dust found within and outside Olefins facility. Fingerprinting was used in the past in establishing a connection between materials in dust samples and potential sources.

Methods used included Polarized Light Microscopy (PLM), Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM)/X-ray Energy Dispersive Spectrometry (EDS) analysis.

It was demonstrated thru mineral assays and compositional matches in aluminum and iron contents that main source of dust contaminated with Chrysotile outside Olefins facility is not from the ACM found inside the Olefins facility but rather from Naturally Occurring Asbestos (NOA) found as Serpentinite rocks commonly used as gravel for dirt roads, parking lots in the areas, or backfill for the asphalt roads. The source of Serpentinite is from the local quarries that were and are still active in the south-west part of Puerto Rico.

Contamination caused by deterioration of asbestos containing TSI present in the industrial facilities around the area does not show a significant contribution to the general high asbestos background observed in the area.

There are other additional sources of potential contamination of the Tallaboa Encarnación Community. Uncontrolled renovation/remodeling activities conducted at residential/commercial properties within the community are evident sources that can affect ACM observed in the area and significantly contaminate the surrounding properties.

Construction debris with asbestos-containing corrugated panels was found approximately 2.2 miles away from the neighborhood, on the beach area. The presence of ACM waste thrown on the beach may suggest that some renovation activities in the surrounding neighborhoods were not conducted in accordance to federal and local regulations and requirements, which adds to their potential of being a source.

1.0 PROJECT OBJECTIVES

AES International was contracted to perform the first phase of sampling and analyses of dust, soil and bulk materials present inside the regulated area of Olefins facility, Tallaboa Industrial Park and compare the data with the results of dust samples collected from selected areas/properties located around the site. The main purpose was to investigate the presence of Naturally Occurring Asbestos (NOA) versus men made asbestos products, using fingerprinting methods for the asbestos containing dust found within and outside Olefins facility. Fingerprinting of dust from ground zero was used by the EPA after 9-11 to determine areas where cleanup efforts were needed (1, 2, and 3).

2.0 BACKGROUND INFORMATION

The Puerto Rico Olefins facility (Site) (See Appendix I) is located at Road 385, KM 5.4, Tallaboa Poniente Peñuelas, Puerto Rico. During a visual inspection, the U.S. Environmental Protection Agency (EPA) claimed to have received information from a neighbor that fugitive dust clouds were migrating out of the facility during demolition activities conducted by HOMECA Recycling Center Inc. (Homeca), resulting in potential asbestos contamination throughout the Site and in residential neighborhoods downwind of the Site. Subsequently EPA conducted a number of sampling events presented herein:

2.1 EPA's Phase I Sampling

On November 21, 2013, as part of Phase I of the Removal Assessment, Weston (an EPA contractor) mobilized to the Site to perform multi-media sampling. Five bulk samples, including one field duplicate, four soil samples, including one field duplicate, and ten wipe samples, including one wipe blank were collected. Samples were collected from outside areas where suspected asbestos contamination may have occurred and inside areas where asbestos may have entered the building.

On December 13, 2013, as part of Phase I of the Removal Assessment, Weston remobilized to the Site to collect two additional bulk samples. Samples were collected from outside areas where suspected asbestos contamination may have occurred.

Based on the analytical results of the samples collected as part of Phase I of the Removal assessment, asbestos was detected in bulk samples ranging from non-detect to 40% amosite and 20% chrysotile, in soil samples ranging from 3 amosite/chrysotile asbestos structures to 9 amosite/chrysotile asbestos structures, and in wipe samples ranging from 7,760 structures per square centimeter (str/cm^2) to 374,000 str/cm^2. The two additional bulk samples collected on December 13, 2013 were both non-detect for asbestos.

2.2 EPA's Phase II Sampling

On December 4 and 5, 2013, as part of Phase II of the Removal Assessment, Weston mobilized to the Jorge Lucas Perez Valdivieso School, located approximately 0.25 miles southeast of the Site, to conduct air sampling activities within classrooms identified by the EPA. Three air sampling stations within eight of the schools classrooms (CR01 through CR08) were established, but only one of the air samples from each of the classrooms was submitted for asbestos analysis. Based on the analytical results of the samples collected as part of Phase II of the Removal Assessment, chrysotile asbestos was detected in 8 of the 10 field air samples submitted for asbestos analysis. The total number of asbestos structures in the positive detections ranged between 2 and 25. The reported concentrations in the positive detections ranged between 0.0004 structures per cubic centimeter (s/cc) and 0.0032 s/cc.

2.3 EPA's Phase III Sampling

On December 12 and 13, 2013, as part of Phase IIIA of the Removal Assessment, Weston mobilized to the Jorge Lucas Perez Valdivieso School to perform wipe dust sampling within the classrooms of the school. The areas identified in each classroom to be sampled were the entrance, near a window, and the dustiest area in the room. A total of 90 wipe samples, including five field blanks and one lot blank, were collected from 28 classrooms

Based on analytical results of the samples collected as part of Phase IIIA of the Removal Assessment, Chrysotile asbestos was detected in wipe samples ranging from non-detect to 363,000 str/cm2.

On December 17 through 19, 2013, as part of Phase IIIB of the Removal Assessment, Weston mobilized to the Tallaboa Encarnación Community to perform wipe sampling on the exterior of several properties. A total of 27 wipe samples, including two field blanks, were collected from 24 properties. Asbestos was detected in wipe samples from non-detect to 32,200,000 str/cm2.

On January 2 and 3, 2014, as part of Phase IIIC of the Removal Assessment, Weston and the Puerto Rico Environmental Quality Board (EQB) mobilized to background locations, selected by the EPA, at different distances and directions from the Site. Properties P0029 through P0032 were located over five miles northwest of the Site; properties P0033 through P0036 were located over one mile north of the Site; and properties P0037 through P0040 were located over two miles southeast of the Site. Wipe samples were collected and submitted for asbestos analysis via ASTM 6480-05 Method. A total of 13 wipe samples, including one field blank, were collected from 12 properties. Analytical results of the samples collected range from non-detect to 160,000 str/cm^2 Chrysotile.

As part of Phase IIID of the investigation, Weston conducted wipe sampling at the Head Start Encarnación School located approximately 0.5 miles south of the Site. EPA collected five samples from inside the classrooms. Chrysotile asbestos was detected in wipe samples ranging from 2,910 str/cm^2 to 41,700 str/cm^2.

EPA concluded that while air samples show that the asbestos in the school's air is below health-based screening levels, the asbestos present in the dust does appear to be elevated. If this asbestos became airborne it could pose a health risk.

2.4 EPA's Phase IV Sampling

As part IV of the investigation conducted from March 4 through 27, 2014, Weston was mobilized to the Tallaboa Encarnación area in Peñuelas, Puerto Rico to perform indoor air (PCM and TEM) and micro vacuum sampling activities at 32 residential/commercial properties (property P0008 is considered two separate properties) located within 0.25 miles of the Site.

The PCM analytical results of the air samples collected show fiber content ranging from <0.001 fibers per cubic centimeter (f/cc) to 0.02 F/cc. TEM analytical results of the air samples collected as part of Phase IV show presence of chrysotile, anthophyllite, actinolite, or tremolite asbestos fibers in 16 of the 32 properties sampled. The reported concentrations in the positive detections ranged between 0.00018 s/cc to 0.5299 s/cc. Six properties (including the separated property P0008) contained asbestos concentrations which exceeded EPA's Site-Specific Action Levels of 0.0009 s/cc for residential properties and 0.002 s/cc for commercial properties.

Dust samples collected using micro-vacuuming show presence of chrysotile, actinolite, or amosite in 26 of the 32 properties sampled. The reported concentrations in the positive detections ranged between 231.3 str/cm^2 to 12,782,000 str/cm^2. In addition, thirteen properties (including the separated property P0008) contained asbestos concentrations which exceeded EPA's Site-Specific Action Levels of 5,000 s/cm^2.

3.0 SAMPLING METHODOLOGY

Dust samples were collected by AESI using ASTM method D5756 "Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Mass Surface Loading".

Bulk samples were collected from suspected Thermal System Insulation (TSI) materials present on the pipes laying on the ground at the site, or on selective installed components at the site. Bulk samples were collected in accordance to EPA ERT SOP 2015 (1994).

Soil and aggregate samples were collected at the site from the surface up to a depth of 2" using a plastic spoon. Soil samples were collected using guidelines specified in EPA ERT SOP 2012, Soil sampling.

AESI technicians used Level C PPE that included Purifying Air Powered Respirators (PAPR) with HEPA filters, coveralls, head coverings, steel toes boots and gloves while collecting the samples inside the site, as materials are friable ACM and the work area was declared as regulated area.

4.0 SAMPLING STRATEGY AND DESCRIPTION OF SAMPLES

Initially the sampling strategy was developed based on Weston's data and was directed to selected sites, on, or in the vicinity of locations where high concentration of asbestos fibers in dust/bulk/soil were reported to be present. Upon completion of the initial studies, additional samples were collected from rocks/gravel and from waste/debris suspected to be the source of contamination.

The sampling events were focused on five areas:

a. Areas surrounding the site where high concentrations of asbestos (mainly chrysotile) in dust were reported by EPA (see Table 1). There was no access to residential properties tested by EPA, therefore samples were drawn as close as possible to the specific properties listed in Table 1. Dust samples in the school area were expected to show low asbestos concentrations (if any), as cleaning activities were conducted by Homeca subsequent to EPA's sampling phase. At least one sample was collected from each of the dust sampling phases I thru III (see Table 1).

b. Area within site where asbestos chrysotile and/or amosite were reported by EPA to be present on insulation debris spread on the floor, in soil, or as dust on the surface (see Table 1). Selective bulk samples, representative of the insulation, were collected initially from the pipes with insulation lying on the floor. Dust samples were collected from two locations, but in one of the locations (front flare) the soil was covered with grass. An additional bulk sample was collected at a later phase from the TSI of a distillation column in the vicinity of vessel OV-302.

c. A quarry in Yauco and an outcrop in Media Quijada where representative samples from Serpentinites rocks were collected.

d. Area around intersection of state road PR-127 with an unpaved dirt road where selected gravel samples were collected.

e. Beach area in the vicinity of Encarnación ward where samples were collected from selective piles of debris/waste present.

Sampling point's locations and photo logs of the samples collected are shown in Appendix II. Additional documentation for samples collected from areas previously not sampled by Weston is also included in Appendix II.

Table 1. Location of AESI and Weston sampling points and concentration of asbestos structures in Weston samples (Data from Weston reports).

EPA SAMPLING PHASE	WESTON SAMPLE LOCATION/CONCENTRATIONS	WESTON SAMPLE ID	AESI SAMPLE LOCATION	AESI SAMPLE ID
Phase I	Area OV409-bulk sample-Amosite 2%, Chrysotile 20%	ACM-004-001	Bulk, area OV409	B-OL-OV409-ER1
	Front flare-dust-Amosite/Chrysotile (102,000 str/cm2)	W-001-001	Dust, front flare	D-OL-FF-ER2
	Front flare-soil-Amosite/Chrysotile-0.1%	S0001-0006-001	Soil, front flare	S-OL-FF-ER3
	Front flare-bulk-Amosite-40%, Chrysotile-2%	ACM-003-001	Bulk , front flare	B-OL-FF-ER4
	Scrap metal front Crane-dust-Chrysotile (252,000 str/cm2)	W-003-001	Dust, front of previous crane	D-OL-SM-ER6
	El Velorio-outside porch-dust- (374,000).-Amosite/Chrysotile	W-008-001	Dust, El Velorio, front porch	D-EV-FP-ER1
Phase IIIA School	Classroom 10, entrance/near window-dust (desk near window, vinyl 146,000 and concrete floor entrance 194,000 str/cm^2).	P0002-CR10-WP01-01	Dust, hallway, 1st bldg.	D-JLPV-CR10-1F-H-ER5
	Classroom 19-dust (shelf, wood, dusty area 363,000 str.cm^2).	P0002-CR19-WP03-01	Dust, hallway, bldg. next to basketball court	D-JLPV-CR19-1F-H-ER4
	Classrooms 23-dust (metal bottom of student desk 257,000 str.cm^2)	P0002-CR23-WP03-01	Dust, hallway, 2nd floor, Adm. Bldg.	D-JLPV-CR23-2F-H-ER3
Phase IIIB Community Tallaboa	Emergency generator, facility entrance-dust-Chrysotile (8,730.000)	P0005-WP01-01	Dust, Gulf facility entrance	D-TEC-GULF-GS-ER8
	Top of air conditioning, facility entrance,-dust-Chrysotile (32,200.000)	P0006-WP01-01	Dust, AR Exchange Boiler	D-TEC-ARE-P0006-ER7
	Top of garage wall-dust-Chrysotile (178,000)	P0018-WP01-01	Dust, corner street 2	D-TEC-P0018-C2-ER12
	Top of table-garage-dust-Chrysotile (146,000)	P0021-WP01-01	Dust, street 2, intersection with 4	D-TEC-P0021-C2-ER11
Phase IIIC	Bus stop, seat, concrete-dust- (160,000)	P0036-WP01-01	Dust MV, bus stop bench, Rd.385, Int. 384 (10/2/14)	D-NOW-P0036-BS-ER10
	Traffic barrier, metal-dust- (116,000)	P0035-WP01-01	Dust, traffic barrier rd.384, km3.2	D-NOW-P0035-TB-ER09
			Dust wipe, bench left side bus stop (10/23/14)	D-385-W-ER1
			Dust MV, bus stop bench, (11/11/14)	D-NOW-P0036-BS-ER1
			Dust wipe, bus stop bench, (11/11/14)	W-NOW-P0036-BS-ER1
			Dust MV, bus stop bench, (11/18/14)	D-NOW-P0036-BS-ER1
			Dust wipe, bus stop bench, (11/18/14)	W-NOW-P0036-BS-ER1
Phase IIID	Headstart, entrance, concrete floor-dust- Chrysotile (41,700)	P0014-WP02-01	Dust, exterior next to playground	D-HS-PG-ER2

5.0 ANALYTICAL LABORATORY AND QUALITY CONTROL

Laboratory used to analyze samples for fingerprinting investigation is MVA Scientific Consultants ("MVA"), an independent analytical testing laboratory and consulting company located in Duluth, Georgia. MVA provides services to the environmental, pharmaceutical, nanotechnology, stack testing, industrial quality control, and litigation industries. MVA took part in the response to the attack on World Trade Center in New York, by characterizing samples of dust from the area to determine the properties and components of the dust. This characterization or "fingerprinting" of dust from ground zero was used by the EPA to determine areas where cleanup efforts were needed.

Analytical methods used for fingerprinting are described in Appendix V for each batch of samples. Generally, the samples were initially analyzed under an Olympus SZ-10 stereomicroscope at magnification from 7x to 40x. Forceps and tungsten needles were used to collect representative portions of the particulates found in the samples. The particulate was then transferred onto a microscope slide and mounted in Cargill refractive index liquids for analysis by Polarized Light Microscopy (PLM) using an Olympus BH-2 PLM microscope with a magnification range from 100X to 1,000X. The PLM analysis for asbestos followed the EPA/600/R-93/116 method.

Field blanks were collected with every batch of dust samples. All laboratory results were validated. Split bulk/soil/insulation samples were sent to both, MVA and AESI, a NVLAP accredited laboratory for asbestos PLM analysis (see Credentials in Appendix III). The results of the split samples are summarized in Appendix III. All QA/QC samples results were found to be within the acceptable limits set up by requirements of NVLAP program.

6.0 RESULTS AND DISCUSSION

Discussion of data/results will be around a number of aspects that include:

- Interpretation of Weston dust data collected by wipes and micro-vacuuming using ASTM standard D7390-7 (section 6.1).

- Results of fingerprint studies for dust samples collected from areas outside site and comparison of data against Natural Occurring Asbestos (NOA) outcrops and commercial products (section 6.2).

6.1 Interpretation of EPA/Weston Data from Wipes and Micro-vacuuming Samples-ASTM standard D7390-7.

Between November 21, 2013 and March 27, 2014 Weston collected dust and soil, or air, and/or bulk samples during four sampling phases (I thru IV). From the examination of Weston dust samples results the following can be summarized:

a. One hundred twenty three (123) dust samples were collected in Phases I thru III using the ASTM wipe method (D6480-05). Ninety seven (97) samples out of the one hundred twenty three (123) dust samples (excluding blanks), collected outside Olefins facility, are showing only Chrysotile as the asbestos mineral present. Only two (2) samples are showing both Amosite and Chrysotile and one (1) sample shows Chrysotile and Actinolite. The other samples have reported asbestos fibers below the limit of detection.

b. Five (5) samples out of the nine (9) dust samples collected inside Olefins facility are showing Chrysotile and four (4) samples are showing Chrysotile and Amosite. Four (4) bulk samples are showing both Amosite and Chrysotile, same as the four (4) soil samples collected.

c. One hundred (100) air samples, including two lot blanks and five field blanks, and one hundred and three (103) micro vacuum samples (method ASTM D 5755-09), including two lot blanks and five field blanks were collected during Phase IV. Chrysotile, Anthophyllite, Actinolite, or Tremolite were detected in the air samples collected from 16 of the 32 properties tested. Chrysotile, Actinolite and/or Amosite were detected in the dust samples collected from 26 of the 32 properties tested. Amosite was only detected in one dust sample.

There is no data interpretation in the reports of Phase I thru III generated by Weston, but only statements related to ranges of dust concentrations. Interpretation of data during sampling Phase IV is based on Site-Specific Action Levels for air samples (0.0009 s/cc for residential properties and 0.002 s/cc for commercials) and 5,000 s/cm^2 for dust samples.

Interpretation of the data produced by the dust methods has been controversial. Some investigators calculate the mass of the asbestos in the dust and suggest that only levels above 1 percent are subject to government regulations. Visible dust in an area where asbestos-containing materials have been disturbed is considered asbestos-containing material as well by USEPA and OSHA, but no government regulations use data on asbestos in settled dust as determined by any of the ASTM methods. Another interpretation of the dust data is reference levels based on observations made by experienced industrial hygienists, in which a level less than 1,000 structures per square centimeter is considered "background," greater than 10,000 structures per square centimeter is considered "above background," and above 100,000 structures per square centimeter is considered "high."

There are no regulatory standards established to determine what asbestos dust contamination is. Contamination extent can be determined by comparative studies, but the same sampling collection method has to be used for the samples to be compared. The results of EPA/Weston's sampling events, Phases I thru III against Phase IV, are not comparable one to each other as the efficiency of dust collection on a given surface is likely to be different for wipes and micro-vacuum method (see ASTM standard D7390-07, 6.2.1.3, reference to Crankshaw et all, see also bus station experiment Table 1). Consequently, Phase I thru III and Phase IV will be discussed separately.

ASTM standard D7390-07 was developed to evaluate dust on surface by comparing two environments. According to the standard, there are two ways the comparison can be done:

1. Comparison to the background
   If one environment is typical to the building (or area) this could be used as the source of background samples against which study samples from the area in question shall be compared.

2. Comparison to control
   One environment may be taken as control against which to compare study samples from other area.

If comparison to the background will be done, there is a need to establish what is background, or define an area that represents background. For each group of samples, one collected from the background area and one collected from the contaminated area, there will be a need to calculate the asbestos loadings along with upper and lower 95% confidence limits on this estimate. Once the calculations are completed there are two ways to determine if there is a difference between the two areas:

a. Compare the confidence limits of the two groups. If the two sets are clearly the same, or completely different, there is no more need for further comparison and areas could be declared either non-contaminated (if there is no difference) or contaminated (if there is a difference). Confidence limits are considered to be overlapped if the upper confidence limit of group of samples with the lower estimated mean exceeds the lower confidence limit of the group of samples with the higher estimated mean If the confidence limits do not overlap then the asbestos loadings are different. No further action is required.

b. If comparison is inconclusive, or if another way of comparison is needed, a Z test must be performed.

The standard stipulates: "If the mineral form of the asbestos in the two sets of samples (study samples and control or background samples) are different, the sites cannot be considered equivalent in terms of dust loadings and additional investigation may be necessary".

It is also important to mention that sample collection method can affect the results. Variability between different types of sampling methods was previously noted by Crankshaw, Perkins and Beard in "Overview of settled dust methods and their relative effectiveness", 2000. They noted that microvac methods tend to more accurately reflect potential re-entrainable asbestos, while wipe samples tend to more accurately reflect all accumulated asbestos. They mentioned however, that the real world samples will be likely to have substantial variability attributable to the samples themselves and not to the method or to the personnel collecting the samples.

The probability that sampling method may affect the results was tested as a part of this study and the results are shown in Annex A1. The results are showing that the two methods generate different results and therefore cannot be compared against each other.

6.1.1 Statistical Interpretation of Dust Data for dust wipes samples collected by Weston from outside the site.

All data of dust wipes samples containing Chrysotile collected outside Olefins facility was initially examined. The data (str/cm^2) is presented on the graph below (Figure 1) in accordance to sampling events (I thru III) performed by Weston. It can be clearly observed that there are two (2) outliers way above all the others and both are from samples located in the area south-east of the Olefins plant (Weston samples PO006-WP1-01 and PO005-WP01-01), close to state road PR-127.

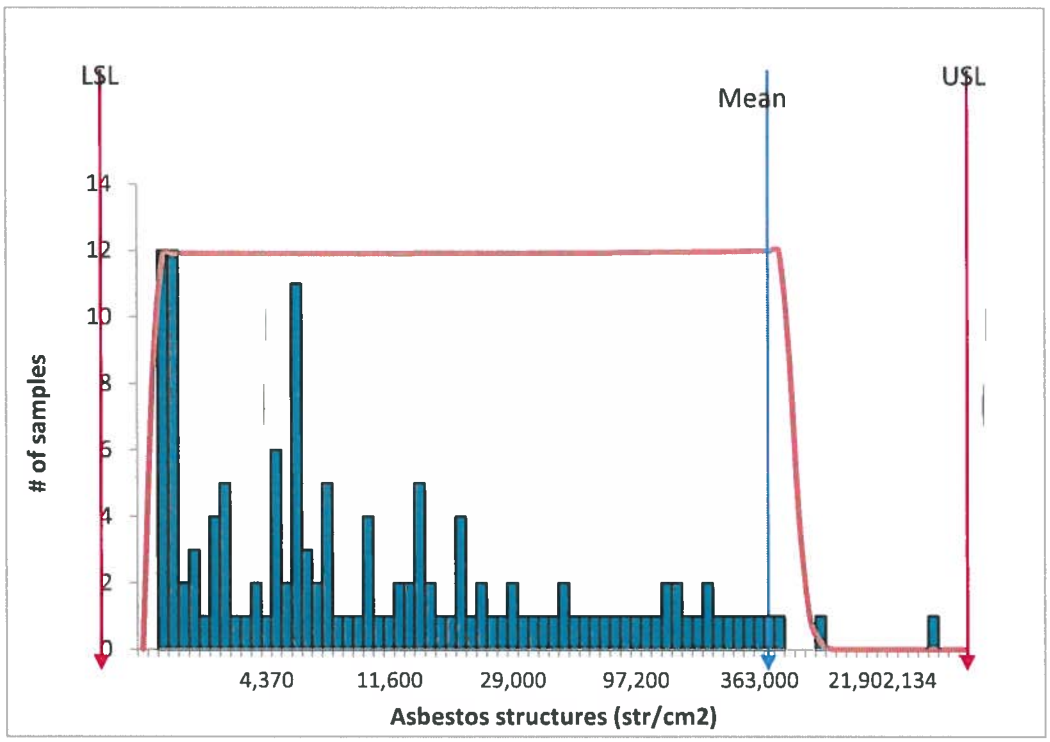


Figure 1. Frequency Histogram for outside Olefins dust wipes data
(Data from Weston reports I thru III)

The two outliers and the two highest values above 400,000 str/cm^2 present in the Encarnacion Community are from samples located in the same area (see Figure 2 air photo below from Weston report, Phase IIIB sampling) and are close to state road PR-127.

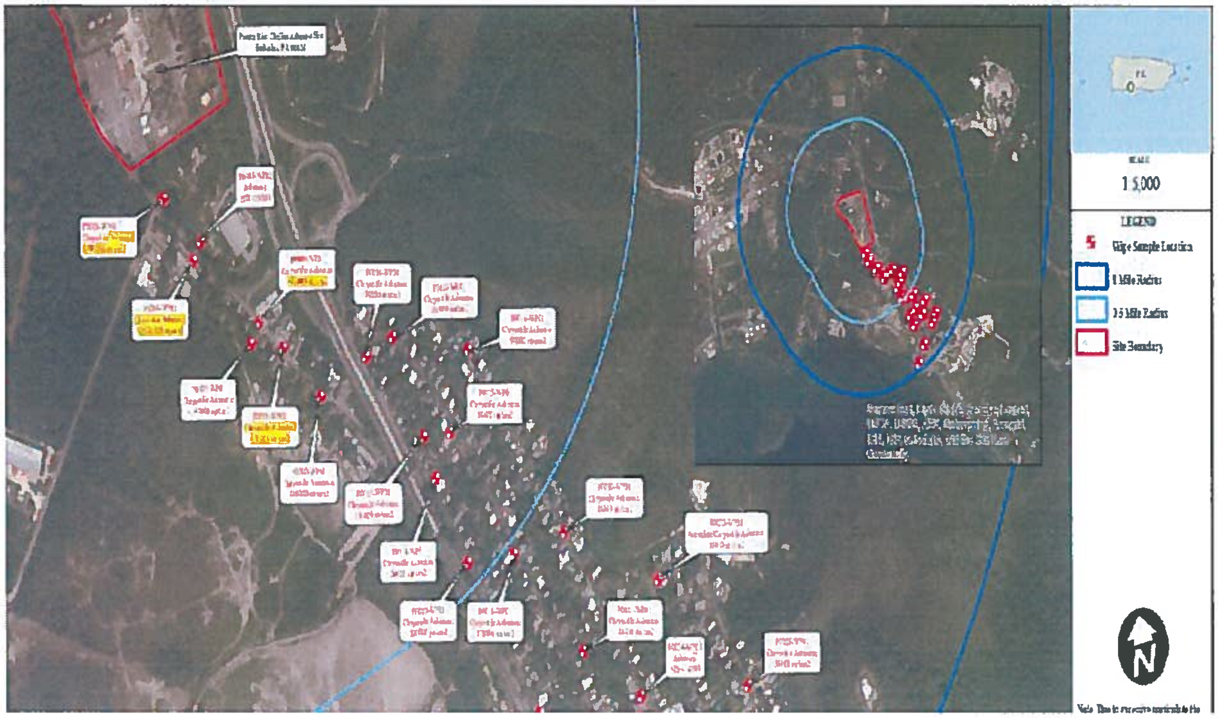


Figure 2. Dust sampling points (Highlighted) found by Weston to contain Chrysotile concentrations higher than 400,000 str/cm^2 (data from Weston report IIIB).

Following D7390-07 ASTM protocol, calculations for the weighted average of asbestos structures and 95% confidence limits for all samples were performed. Comparative results of the outliers with all the other areas sampled during sampling Phases I through III are presented in Table 2. Clearly outliers results are way higher than the background. Therefore, the samples representing the outliers area may be considered as having excessive Chrysotile content above the general background. Same can be said, although to a less extent, about the community samples which are also showing results above the UCL (Upper Confidence Limit) of the background samples.

Therefore, there are two questions to be answered:

1. Why are the asbestos background concentrations so high?
2. What is the source of the asbestos contamination for sites locations showing asbestos concentrations above the background levels?

The background and the potential sources of contamination will be further discussed in Section 6.2. It is noticeable that asbestos counts' range in the 6 miles radius background are above the school and headstart ranges suggesting no contamination above background levels is present in these two sites.

Table 2. Comparison of results for asbestos structures and confidence limits for dust wipes sampled during Phases I thru III.

Site	LCL (95%)	Weighted Average	UCL (95%)
Two outliers-Area A	13,145,000	14,599,000	16,113,000
Community (except 2 outliers)	31,297	34,009	37,128
School	7,420	7,650	7,910
Headstart	11,058	14,170	17,848
Background 6 miles radius	18,963	22,004	25,284

6.1.2 Statistical Interpretation of Dust Data for micro-vacuum samples collected by Weston outside the site (Sampling event IV)

All micro-vacuum data (str/cm^2) containing Chrysotile collected from the interior of the properties located outside Olefins facility were initially plotted and are shown in the graph below (Figure 3). It can be clearly observed that there is one (1) outlier (12,728,000.0 str/cm^2) much higher than the other samples. The Chrysotile outlier is located in the residential part of property P0008 (Weston sample I.D. P0008-MV04-01), where construction activities were mentioned as going on at the sampling time (see Weston's Table 4 in the Phase IV sampling report). Anthophyllite was also observed in the micro-vacuum sample collected from the commercial part of the structure.

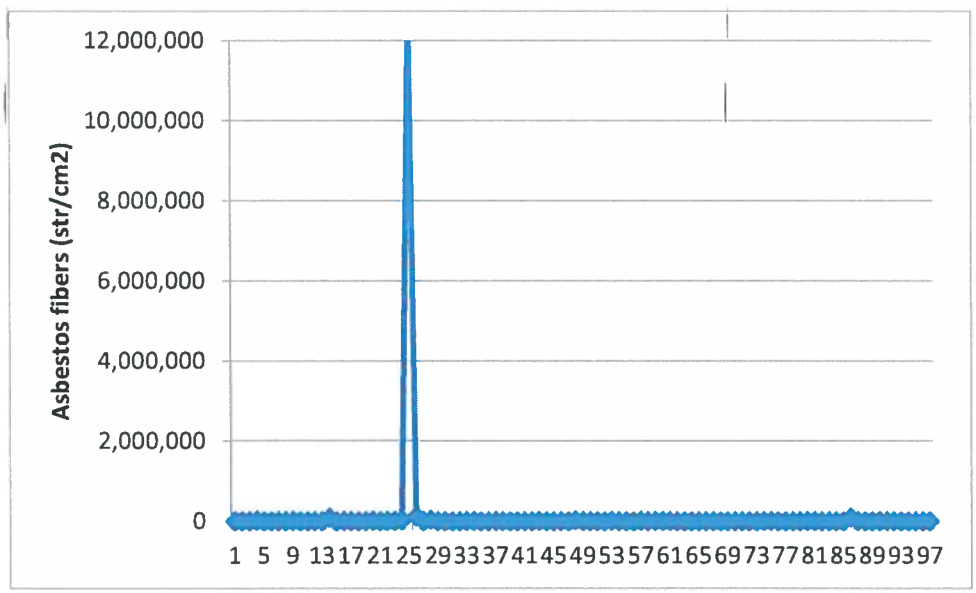


Figure 3. Distribution of asbestos TEM-data (str/cm^2)
for dust micro-vacuum samples collected from the interior properties
(Data from Weston report #IV)

Results of Chrysotile in dust of property P0008 are much higher than the entire area sampled using micro-vacuum method, as the UCL (95%) of all the remaining data is observed to be 4,683 str/cm^2 (weighted average is 4,610 str/cm^2 and LCL is 4,555 str/cm^2). Therefore, the property is considered as an outlier, as having excessive Chrysotile content. The same property was previously identified as containing levels of Chrysotile above 400,000 str/cm^2 in dust wipe samples.

As mentioned, Weston identified ongoing construction activities in the residential part of the P0008 structure. A pile of construction debris is visible in the front of the property. There is a possibility that property P0008 was contaminated during construction activities that perturbed the PACM (popcorn ceiling reported in the commercial part to be present but no analytical data are available, see Figure 4 below). Such contamination may also affect the other properties around. Pictures of the spray on ceiling are shown in Figure 5. Clearly the spray on ceiling appears to be friable, its physical condition is damaged on the exterior of the first floor. There appear to be some residuals left on the ceiling of the second floor.

In addition to spray on ceiling (popcorn) present in property P0008, spray on ceiling was also identified be Weston in Phase IV sampling report to be present in property P0006, which was one of the two outliers identified in statistical analysis conducted for dust wipes samples. There was no access to inside property to sample, or further assess the condition of the materials.

Figure 4. General view of Commercial (bottom) and Residential (top) Property P0008.

Figure 5. Suspected ACM (spray on) present on ceiling, first floor outside (left) and inside (right)-Commercial part of property P0008.

6.2 Results of Fingerprint Studies for Dust samples and Comparison Against Natural Occurring Asbestos (NOA) Outcrops and Commercial products.

6.2.1 Results of Dust samples, Areas Outside Olefins Facility

The results of dust samples collected by AESI from areas outside the site are shown in Tables 3a and 3b. Eleven (11) dust samples and two (2) field blanks were collected and they are included in the chain of custody of samples collected on 10/1/2014 and 10/2/2014. Samples were initially analyzed by Polarized Light Microscopy (PLM), followed by analysis by Transmission Electron Microscopy (TEM). Scanning Electron Microscopy (SEM) was also used. A report of analytical results is provided in Appendix V under MVA Report #1.

Amosite asbestos was not identified in any of the dust samples collected outside the site but only in one dust sample collected inside the site. Amosite was also identified in the samples collected from insulation materials present inside the site.

The PLM, TEM and SEM results (See Table 3a and 3b below) are showing two Mg-silicates of the serpentine group present in five samples:

- Chrysotile asbestos fibers and bundles (fibrous serpentine) was detected in 8 samples.
- Lizardite (non-fibrous serpentine) were detected in five (5) samples.

Traces of both Chrysotile and Lizardite were found in the following dust samples (see Figure 6 for location of Sampling Points):

- D-TEC-ARE-PO006-ER7-Dust from the facilities of AR Exchange Boiler Specialist, exterior, Tallaboa Encarnación Community.
- D-TEC-GULF-GS-ER 8-Dust from Gulf facility entrance, Tallaboa Encarnación Community
- D-NOW-P0036-BS-ER10-Dust bus stop bench Rd.385 intersection with state road PR-384
- D-TEC-P0021-C2-ER11-Dust on the sidewalk, front of house located on the corner of street 2 and intersection with street 4 in Tallaboa Encarnación Community.
- D-TEC-P0021-C2-ER12-Dust corner of street 2, west of streets 2/4 intersection.

Traces of Chrysotile only were found in the following dust samples:

- D-EV-FP-ER1 (PLM and TEM)-Dust from the porch entrance to El Velorio Bar, located on state road PR-127 to the south-southeast of the Site, in the Pueblito ward.
- D-HS-PG-ER2 (TEM)-Dust from exterior, next to playground, Headstart
- D-JLPV-CR19-1F-H-ER4 (TEM)-Dust from hallway, next to basketball court, JLPV school.

Table 3a. Summary of Analytical Results for Samples Collected 01 October 2014

MVA #	Sample I. D.	PLM Analysis Results %	Additional Materials Observed	TEM Analysis Results	Comments
Z2124	D-EV-FP-ER1	Trace Chrysotile	Carbonate, Iron/Rust, Quartz, Cellulose, Insect Parts, Rubber, Tarry Particles	Calcic and clay minerals, two Chrysotile bundles	Iron/Rust adhering to Chrysotile (PLM) Trace Fe/Al present in Chrysotile (TEM)
Z2125	D-HS-PG-ER2	NAD	Cellulose, Carbonate, Quartz	Calcic and clay minerals, two Chrysotile fibers	Trace Fe/Al present in Chrysotile (TEM)
Z2126	D-JLPV-CR23-2F-H-ER3	NAD	Carbonate, Quartz, Cellulose, Paint, Rubber	Clay minerals	Small sample volume
Z2127	D-JLPV-CR19-1F-H-ER4	NAD	Cellulose, Carbonate, Cotton, Hair, Insect Parts	Clay minerals, one Chrysotile	Trace Fe/Al present in Chrysotile (TEM)
Z2128	D-JLPV-CR10-1F-H-ER5	NAD	Carbonate, Quartz, Cellulose, Plant Debris, Insect Parts, Plastic/Polymer	Clay minerals	Small sample volume
Z2129	BLK-ER6	NA	NA	NAD	ASTM D5755 Analysis

NA – Not Analyzed
NAD – No Asbestos Detected

Table 3b. Summary of Analytical Results for Samples Collected 02 October 2014

MVA #	Sample I. D.	PLM Analysis Results % Asbestos	Additional Materials	TEM Analysis Results	Comments
Z2130	D-TEC-ARE-PO006-E-ER7	Trace Chrysotile	Lizardite, Carbonate, Iron/Rust, Quartz, Cellulose	Clay minerals, one Chrysotile fiber	SEM (Clay minerals, lizardite)
Z2131	D-TEC-GULF-GS-ER8	NAD	Lizardite, Carbonate, Quartz, Feldspar, Pollen	Clay minerals, one Chrysotile fiber, one chrysotile	SEM (Clay minerals, lizardite, quartz) Trace Fe/Al present in Chrysotile (TEM)
Z2132	D-NOW-P0035-TB-ER9	NAD	Carbonate, Quartz, Cellulose, Plant Debris, Insect Parts, Rubber, Iron/Rust, Fungal	Clay minerals	---
Z2133	D-NOW-P0036-BS-ER10	NAD	Lizardite, Quartz, Carbonate, Iron/Rust, Hornblende	Clay minerals, one Chrysotile bundle	Trace Fe/Al present in Chrysotile (TEM) [Five additional structures detected during D5755 analysis - reported separately]
Z2134	D-TEC-P0021-C2-ER11	Trace Chrysotile	Lizardite, Quartz, Carbonate, Iron/Rust, Feldspar	Calcic and clay miner	---
Z2135	D-TEC-P0018-C2-ER12	NAD	Lizardite, Magnetite, Quartz, Carbonate	Clay minerals and four Chrysotile fibers/bundles	Trace Fe/Al present in Mg-reduced Chrysotile (TEM)
Z2136	BLK-FB-ER13	NA	NA	NAD	[Analysis via D5755 - reported separately]

NA – Not Analyzed
NAD – No Asbestos Detected

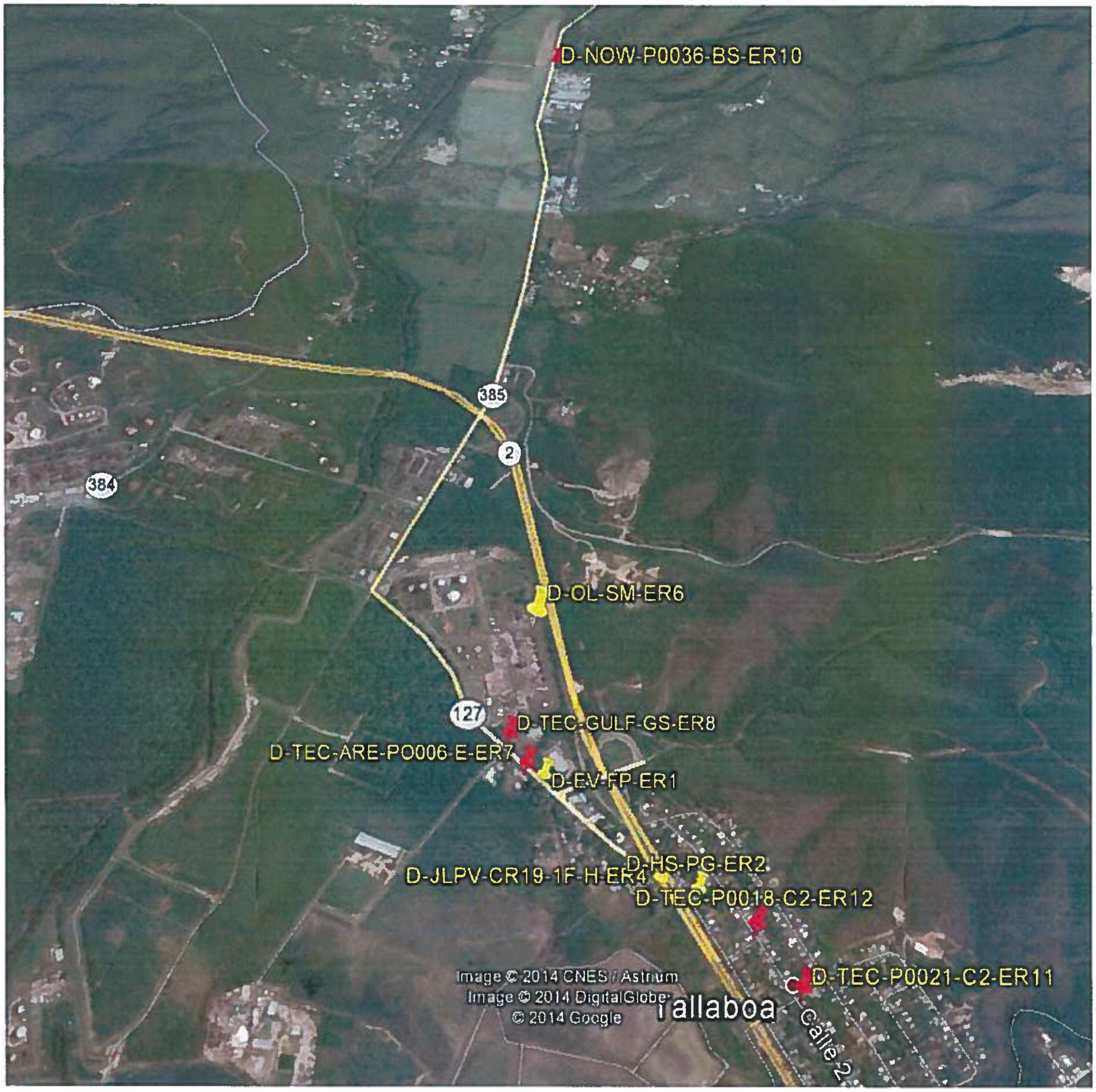


Figure 6. Distribution of Chrysotile and Lizardite in Dust Samples collected Inside/Outside Olefins facility

Legend: **Chrysotile**
Chrysotile and Lizardite

Chrysotile and Lizardite found in the dust samples consistently exhibit trace amounts of aluminum and/or iron (see Table 4). MVA reported that Chrysotile examined via TEM-EDS (Table 7 in their report) in dust samples analyzed exhibited iron levels ranging from 0.8% to 6.8% and aluminum levels as high as 4.2%. Substitutions of either magnesium or silicon for aluminum and of magnesium for iron are well documented, although not commonly seen in commercial asbestos-containing products. Magnetite (Fe_3O_4) was also observed in one sample.

Table 4. EDS Characterization (atomic weight percent) of Chrysotile structures detected in settled dust samples collected from outside and inside Olefins facility.

MVA #	AES Sample I.D.	Mg	Al	Si	Fe	O
Z2124	D-EV-FP-ER1	28.6	0.7	22.6	2.3	45.8
		25.0	1.4	24.0	3.6	46.1
Z2125	D-HS-PG-ER2	27.4	0.0	25.1	0.8	46.8
		25.5	1.2	24.5	2.4	46.4
Z2127	D-JLPV-CR19-1F-H-ER4	27.2	1.0	24.1	1.2	46.6
Z2130	D-TEC-ARE-PO006-E-ER7	27.3	1.2	23.7	1.5	46.4
Z2131	D-TEC-GULF-GS-ER8	23.0	4.2	23.7	2.6	46.6
		28.2	1.1	23.1	1.3	46.3
Z2133	D-NOW-P0036-BS-ER10	27.5	0.9	22.6	3.4	45.6
Z2135	D-TEC-P0018-C2-ER12	22.2	1.8	26.7	2.2	47.2
		29.0	0.0	24.1	0.9	46.4
		19.7	1.5	26.1	6.8	45.9
		24.1	1.2	25.2	3.0	46.5
Z2377	D-OL-SM-ER6 (*sample inside Olefins)	27.1	1.0	23.9	1.7	46.4
		23.7	2.4	23.3	4.9	45.7
Ave		25.7	1.3	24.2	2.6	46.3
Std. Dev.		2.7	1.0	1.2	1.6	0.4
Max		29.0	4.2	26.7	6.8	47.2
Min		19.7	0.0	22.6	0.8	45.6

The average iron (2.6%) and aluminum (1.3%) concentrations detected in the population of Chrysotile structures from the settled dust samples are consistent with the levels detected in aggregates from gravel samples (see section 7). Aggregates samples exhibit average trace to minor amounts of iron (2.9%) and aluminum (1.5%).

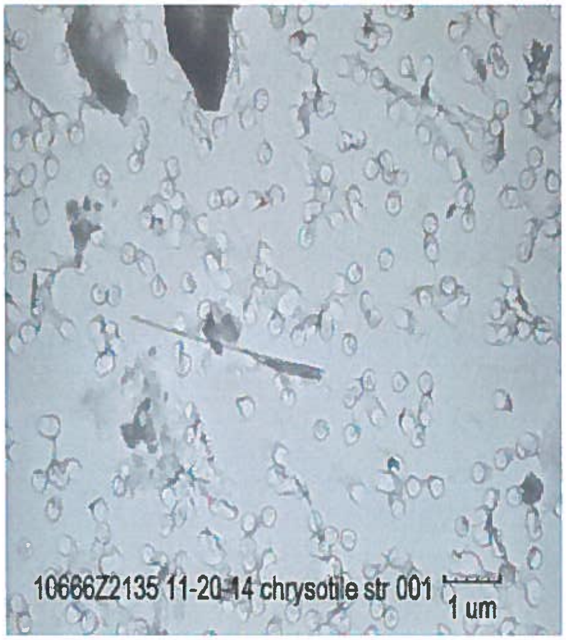
Aspect ratios of the Chrysotile fibers/bundles detected by TEM-EDS were primarily less than 20:1 (length:width). Two of the 15 structures reported in Table 5 had aspect ratios greater than 20:1 (approximately 23:1 and 37:1). Aspect ratios of the remaining 13 structures range from 4:1 to 17:1. Most of the structures were less than 3 micrometers in length. The aluminum/iron content and size/aspect ratios of the fibers are comparable to the fibers observed during analysis of the local mineral samples (see section 6.4.2).

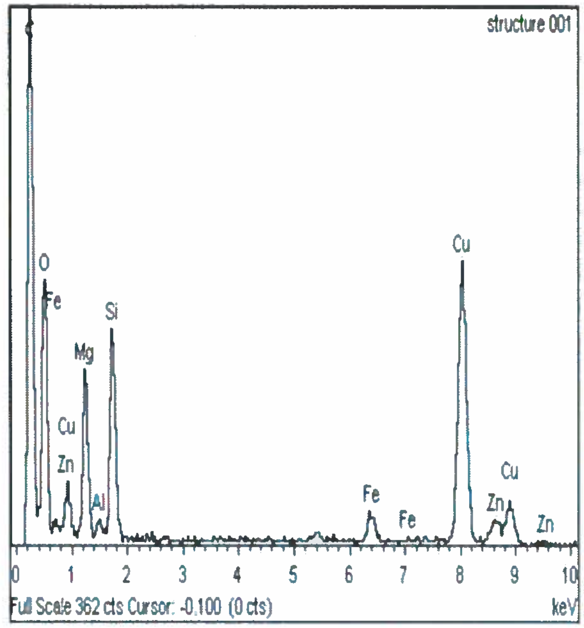
The results of a one dust samples collected inside Olefins facility is also shown in Table 4 (Sample Z2377/D-OL-SM-ER6) and it is consistent with the other Chrysotile data (this sample has also Amosite). Traces of iron (average 3.3%) and aluminum (average 1.7%) were observed.

Typical photographs of a chrysotile bundle with carbonates matrix present in samples D-EV-FP-ER1 (dust sample collected from the porch of El Velorio Bar) and sample D-TEC-ARE-PO006-E-ER7 (dust sample collected from floor, AR exchanger boiler specialist exterior) are shown below. A typical TEM photo with EDS spectrum is also shown in Figure 9a and 9b. Presence of an iron (Fe) peak is clearly noted in the EDS spectrum (Figure 9b).

Figure 7. PLM image of Chrysotile bundle detected during analysis of sample D-EV-FP-ER1, Dust, floor, front porch entrance stair, El Velorio Bar.

Figure 8. PLM image of Chrysotile bundle detected during analysis of sample D-TEC-ARE-PO006-E-ER7, Dust, floor, AR exchanger boiler specialist exterior Tallaboa Encarnación Community





Figures 9a and 9b. TEM image (left) and EDS spectrum (right) of a Chrysotile asbestos bundle detected in sample D-TEC-P0018-C2-ER12, Dust floor, corner street 2, west of street 2, Tallaboa Encarnación Community

The matrix material present in the dust samples is mostly clay minerals and/or calcium carbonates with some of the samples containing lizardite fragments (samples ER7, ER8, ER10, ER11 and ER12). A photograph of a Lizardite particle from sample D-TEC-P0018-C2-ER12 is shown below (Figure 10a). Sample was taken from the dust on the corner of street 2, Tallaboa Encarnación Community.

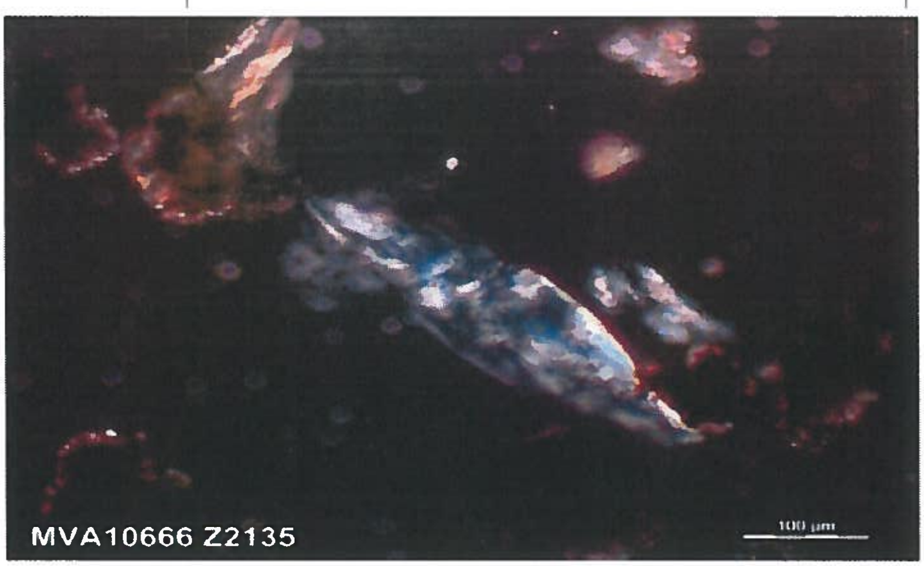


Figure 10a. PLM image of Lizardite particle detected during analysis of sample D-TEC-P0018-CR-ER12, Dust, floor, corner street 2, west of street 2, Tallaboa Encarnación Community

An SEM photo of a Lizardite mineral particles from dust sample D-NOW-P0036-BS-ER10 (MVA Z2133) collected from the bus station bench is shown in Figure 10b below.

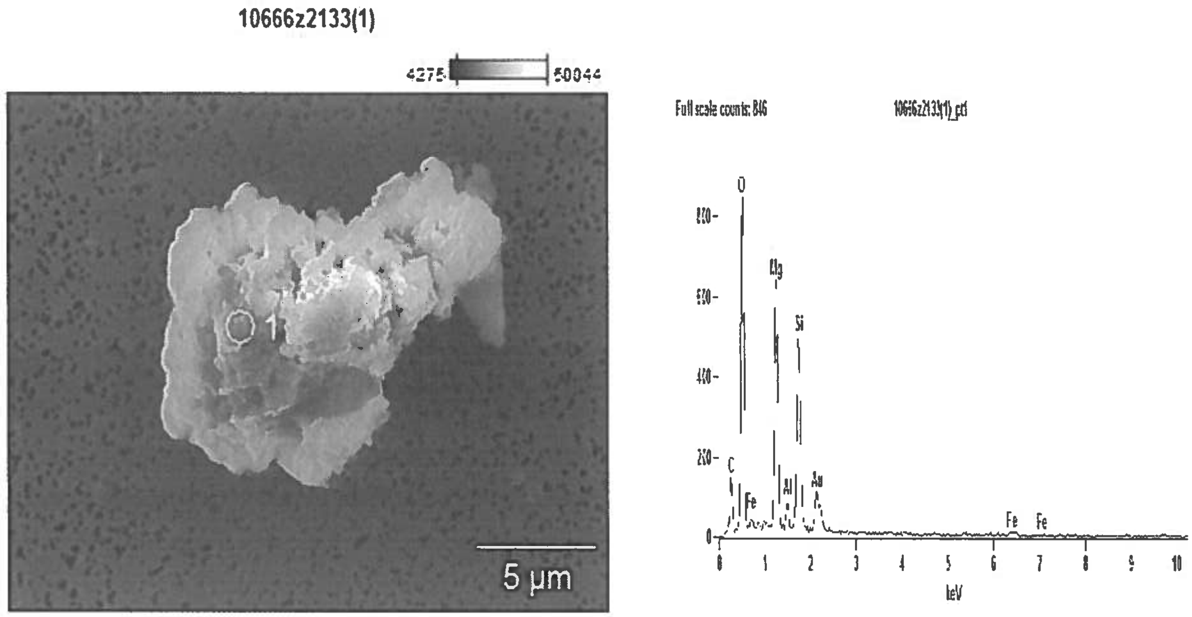


Figure 10b. SEM image of Lizardite particle (left) and EDS spectra (right) detected during analysis of dust sample D-NOW-P0036-BS-ER10 (MVA Z2133) collected from bus stop bench, intersection of state Roads 385 and 384. Note presence of aluminum and iron.

Additional Lizardite SEM images and EDS analyses are included in MVA report (Appendix V-1).

The presence of Lizardite particles in the dust samples is considered to be a marker pointing towards indication of serpentinite rock, a Natural Occurring Asbestos (NOA) rock as a source. Serpentine is a general name applied to several members of a polymorphic group. These minerals have essentially the same chemistry but different structures. minerals, their formulas and symmetry class:

- Antigorite; $(Mg,Fe)_3Si_2O_5(OH)_4$; monoclinic.
- Lizardite; $Mg_3Si_2O_5(OH)_4$; trigonal and hexagonal.
- Clinochrysotile; $Mg_3Si_2O_5(OH)_4$; monoclinic.
- Orthochrysotile; $Mg_3Si_2O_5(OH)_4$; orthorhombic.
- Parachrysotile; $(Mg,Fe)_3Si_2O_5(OH)_4$; orthorhombic.

Their differences are minor and almost indistinguishable in hand samples. However, the Chrysotile minerals are more likely to form fibrous serpentine asbestos, while Antigorite and Lizardite form cryptocrystalline masses sometimes with a lamellar, or micaceous character. Minerals of the serpentine group are present in a rock named Serpentinite. Serpentinite is a metamorphic rock that forms from the hydration of ultramaphic rocks. In the process, minerals such olivine and pyroxene change to Lizardite, Chrysotile (asbestiform) and Antigorite.

6.2.2 Analytical Results of rock samples, area Outside the site

The presence of Lizardite/Chrysotile suggests that Natural Occurring Asbestos (NOA) identified as "Serpentinite" (a metamorphic rock) may be the source for their presence in dust.

Exposed Serpentinite occupies approximately 140 km^2 in southwestern Puerto Rico within three belts (Monte del Estado, Río Guanajibo and Sierra Bermeja) (6). The distribution of serpentinites rocks in Puerto Rico is shown in Figure 11. The mineral composition varies with its location (5). The Serpentinite found in the Monte del Estado (Maricao) has a mineral composition of olivine, orthopyroxene, chromite as its primary minerals. The one found at Rio Guanajibo, near Cabo Rojo is composed of olivine, orthopyroxene, chromite and diopside, and the one found at Sierra Bermeja has Olivine, orthopyroxene and diopside. The mineralogical composition of the serpentines group minerals in the Rio Guanajibo and Monte de Estado is mostly Chrysotile and Lizardite (4, 5, and 6).

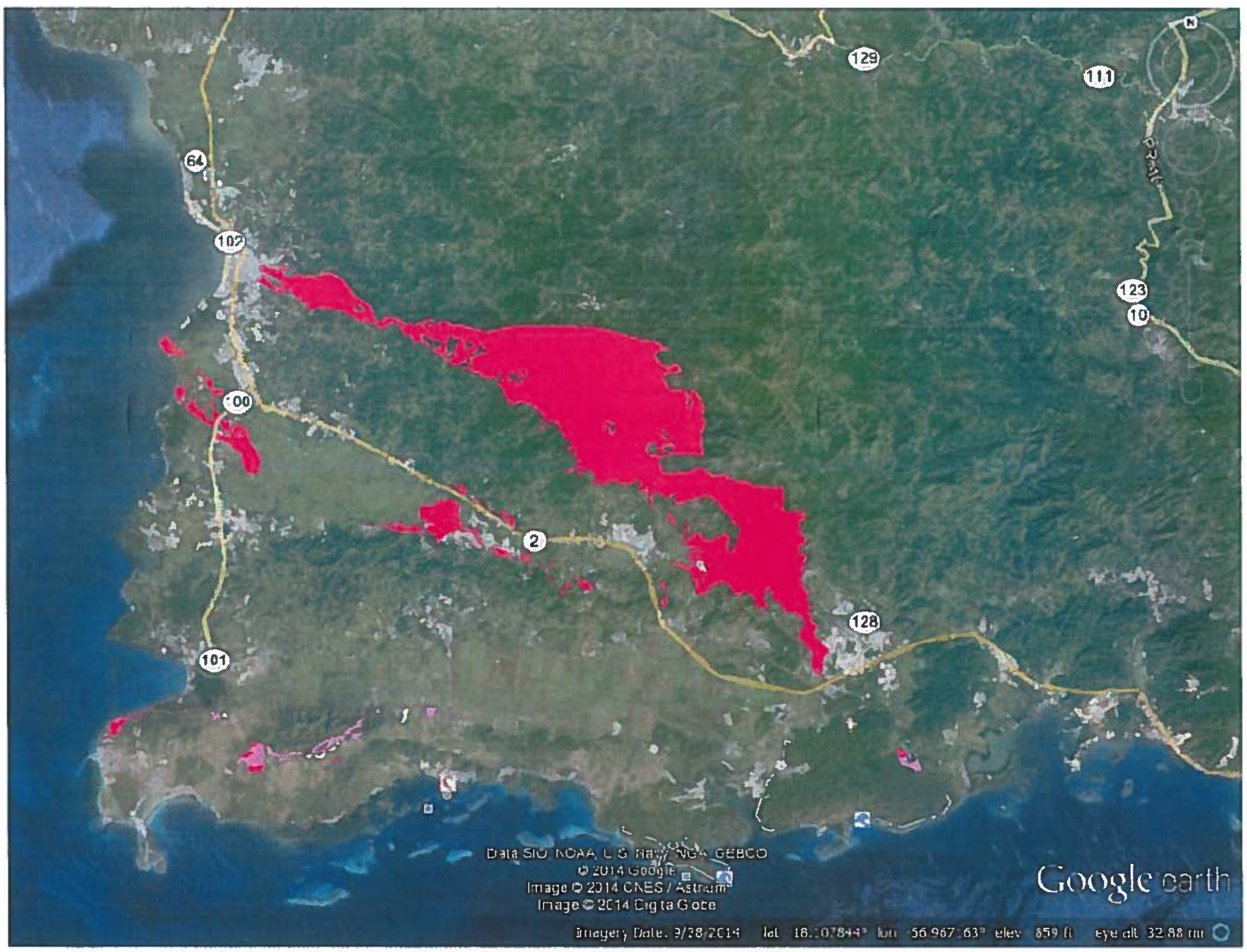


Figure 11. Distribution of serpentinites in Puerto Rico. Large belt in the middle of the map is Monte Estado and underneath (parallel and south of PR Road #2) is Rio Guanajibo. Sierra Bermeja is the south most belt.

In order to confirm the presence of Chrysotile/Lizardite in the Serpentinites rocks present in Puerto Rico, two (2) rock samples were collected from areas where serpentinite rocks are exposed on the surface (see Appendix VII, geological map of Yauco Punta Verraco Quadrangle areas colored green and labeled S and Ks in Yauco and Media Quijada locations). Sample R-Q1-AP-4 was taken from an abandoned quarry located in Susúa Baja sector Cuatro Calles in Yauco, along Ave. Luis Muñoz Marín (see Appendix II, also Figure 12). The quarry labeled as Quarry 1 in this section will be identified as Quarry #16 in the quarry inventory list (see Appendix II and Appendix VI for location). Sample R-MC-AP-3 was taken from a side road located in Media Quijada, where serpentinite rocks are exposed (see Figure 13).

Figure 12. General view of abandoned Quarry 1- Yauco.
The quarry is identified as #16 in the quarries inventory list.

Figure 13. Sample from Serpentinite exposed in Media Quijada

The results are presented in MVA report #3 (see Appendix V). A summary of analytical results is provided in Table 5. Both samples contain the serpentine mineral Lizardite. Sample R-Q1-AP4 also contains fibrous serpentine (chrysotile asbestos). Types of serpentine minerals, the non-fibrous lizardite and the fibrous Chrysotile (see Table 6), contain trace to minor amounts of iron (approximately 2.4 to 7.1%) and in some instances detectable amounts of aluminum (up to 1.4%). Percentages, derived from EDS data, are atomic weight percentages of twelve serpentine structures (fibrous and non-fibrous) analyzed by both SEM-EDS and TEM-EDS. Magnetite was reported in both samples.

Table 5. Summary of analytical report for samples collected from Serpentinites rocks-Yauco and Media Quijada.

MVA #	AES Lab ID	PLM Analysis Results % Asbestos	Additional Materials Observed	SEM Analysis Results	TEM Analysis Results
Z2284	R-MC-AP3	NAD	Non-Fibrous Serpentine (Lizardite), Magnetite	NA	*Composite Sample* Non-Fibrous (Lizardite) and Fibrous (Chrysotile)
Z2285	R-Q1-AP4	Trace Chrysotile	Non-Fibrous Serpentine (Lizardite), Magnetite	Serpentine: Non-Fibrous (Lizardite) and Fibrous (Chrysotile)	

NA – Not Analyzed
NAD – No Asbestos Detected

Table 6. EDS Characterization (Elemental Weight %) of Fibrous and Non-Fibrous Serpentine Structures Detected in Mineral Samples Z2284 (RM-MC-AP3) and Z2285 (R-Q1-AP4)

	Mg	Al	Si	Fe	O
TEM P001	28.7	0.0	22.8	3.0	45.6
TEM P002	25.4	1.4	22.4	5.7	45.1
TEM P003	24.9	0.0	25.1	2.9	46.4
TEM P004	25.8	1.1	23.4	3.9	45.8
TEM F001	30.5	0.0	19.6	5.4	44.2
TEM F002	27.1	0.0	22.8	4.1	45.5
TEM F003	25.6	0.6	22.2	7.1	44.6
SEM (3)_Pt1	26.1	0.8	23.7	2.4	47.0
SEM (3)_Pt2	25.2	0.8	20.5	2.8	50.7
SEM (3)_Pt3	25.9	0.8	24.3	3.2	45.8
SEM (4)_Pt1	25.7	0.7	21.3	2.9	49.4
SEM (4)_Pt2	26.5	0.9	26.8	6.4	39.4
Ave	26.4	0.6	22.9	4.1	45.8
Std. Dev.	1.6	0.5	2.0	1.6	2.8
Max	30.5	1.4	26.8	7.1	50.7
Min	24.9	0.0	19.6	2.4	39.4

Low aspect ratios (length/width) of three Chrysotile fibers characterized by TEM-EDS were observed. The ratios of the 3 fibers tested were approximately 8:1, 8:1, and 14:1 (10:1 on average and most less than 20:1).

SEM images of Lizardite (left, #1) and bundles of Chrysotile fibers (right, #2 and #3) are shown in Figure 14. A non-fibrous Lizardite is also shown at a higher magnification in Figure 15b. The bundle of Chrysotile fibers (#3) is shown at a higher magnification in Figure 16b.

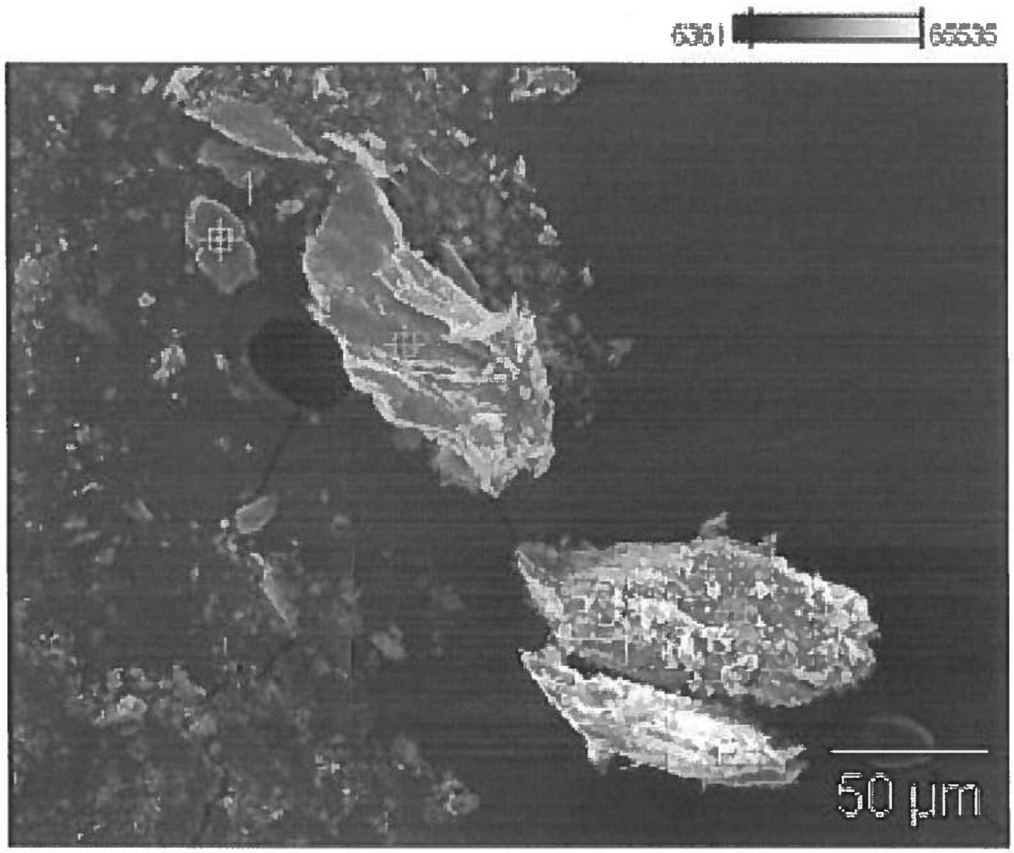


Figure 14. SEM photo of fibrous and non-fibrous serpentine
Lizardite #1 and Chrysotile (#2 and #3)
detected during analysis of sample, R-Q1-AP4

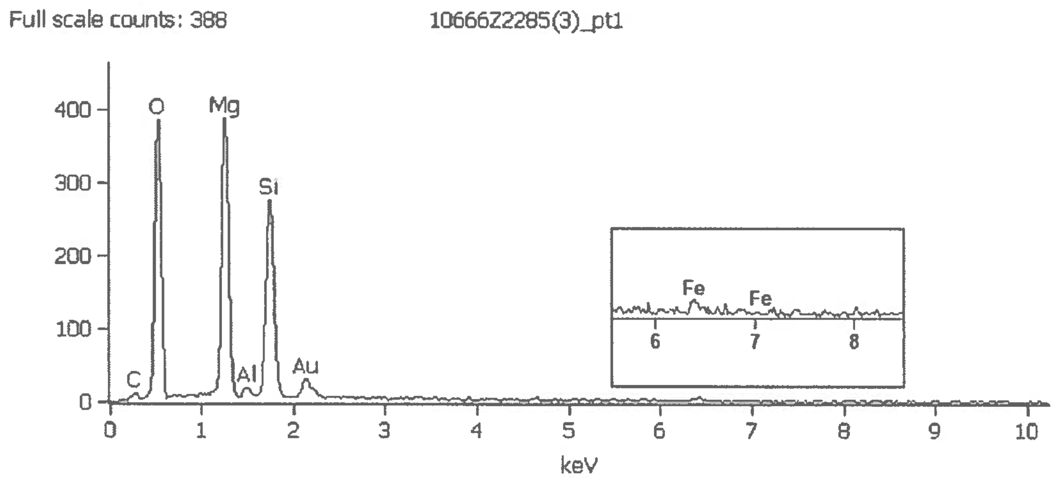


Figure 15a. Area 1 from Figure 14. Lizardite flake. Insert shows an enlarged view of iron peak.

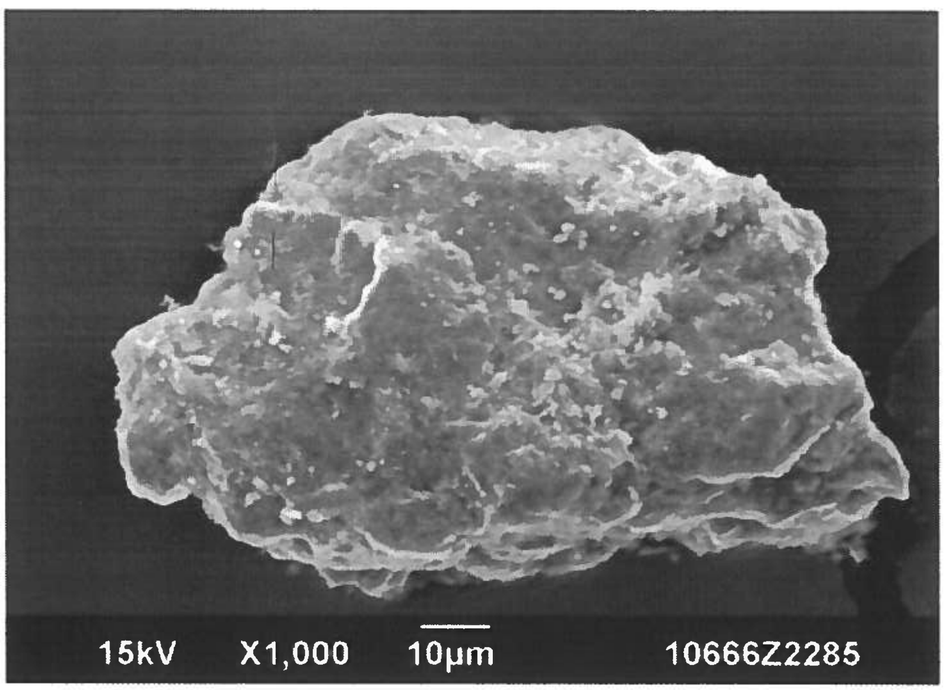


Figure 15b. SEM photo of non-fibrous serpentine (Lizardite) detected during analysis of Quarry 1 sample R-Q1-AP4)

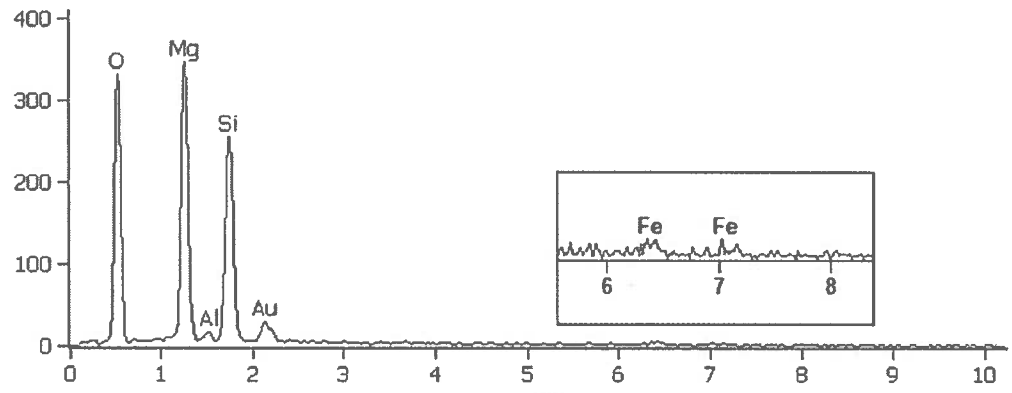


Figure 16a. Area 3 from Figure 14, Fibrous Serpentine (Chrysotile). Insert shows an enlarged view of iron peak.

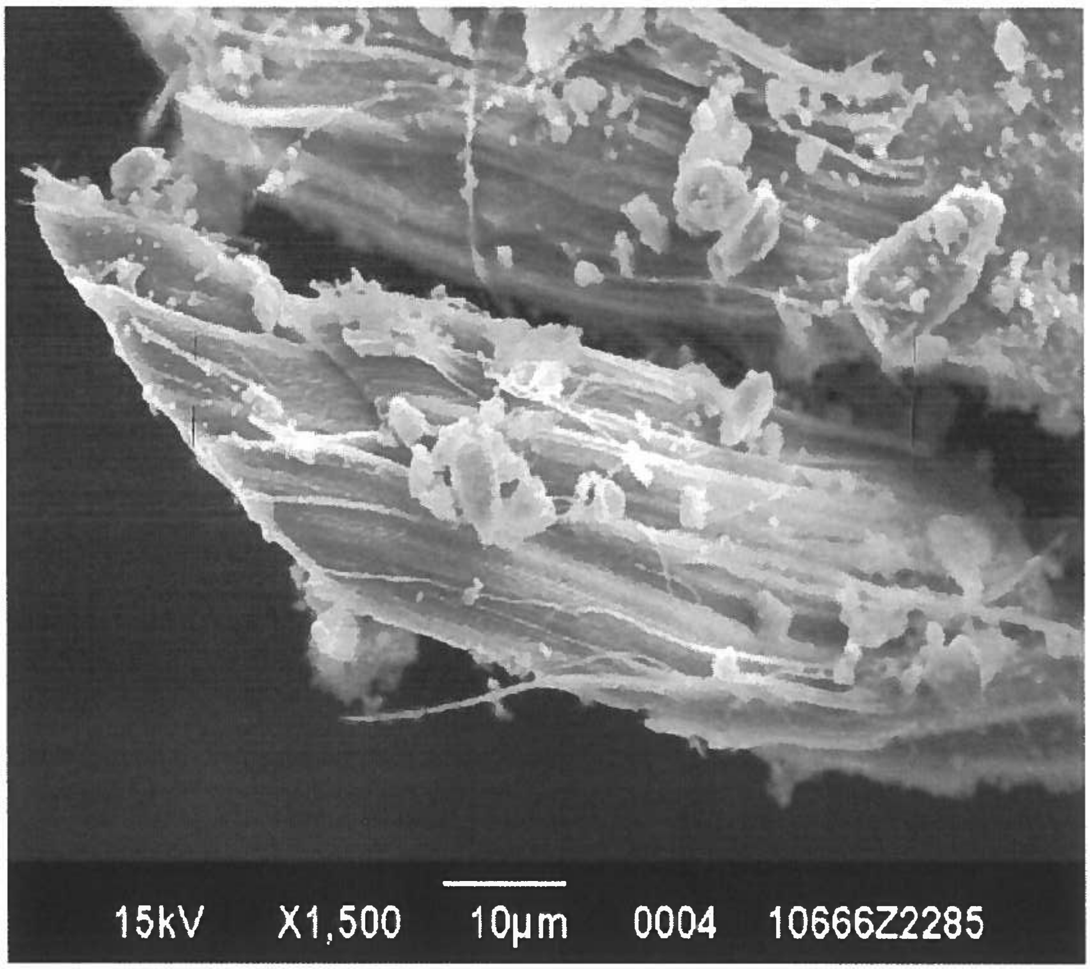


Figure 16b. SEM photo of fibrous serpentine (Chrysotile, confirmed by TEM analysis) detected during analysis of Quarry 1 sample R-Q1-AP4. Chrysotile appears to be a pseudomorph.

6.2.3 Evidence of Commercial Uses of Serpentinites rocks

A study was conducted to identify cuts, outcrops of serpentinites and quarries in the southwest part of Puerto Rico (see complete report in Appendix VI). Twenty (20) quarries were found in the southwest area and eleven (11) of them are still active (see location map of quarries in Figure 18a and 18b). The active quarries are #1, #2 and #3 in Cabo Rojo, #9 in Sabana Grande, #11, #12, #13, #14, #15 and #17 in Yauco and #20 in San Germán.

Selective photos of quarries, cuts and outcrops are shown below (see complete report in Appendix VI).

Quarry 16 (identified during the sampling phase as Quarry 1) was used for serpentine minerals characterization presented in section 6.2.2. An abandoned cement plant (Hormigonera Mayaguezana) is present in the vicinity of the quarry suggesting that the extracted material was crushed and used for commercial purposes (see Figure 17).

Figure 17. Abandoned Cement plant located in Yauco.
Plant was purchased by Cemex and closed down in 2005.

Figure 18a. Active Serpentinite quarries #s 1, 2 and 3.

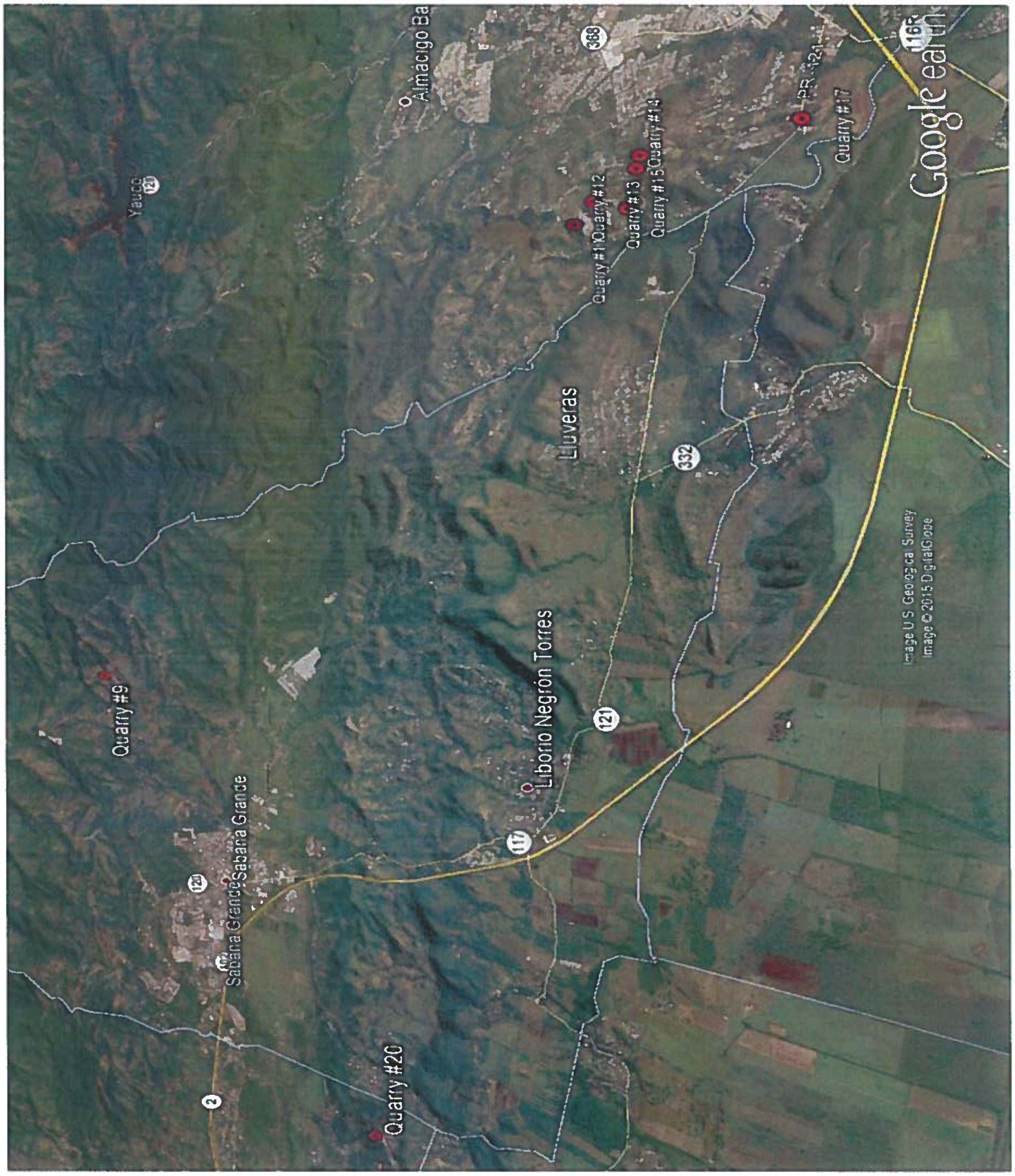


Figure 18b. Active Serpentinite quarries #s 9, 11, 12, 13, 14, 15, 17 and 20

A photo of quarry #20 located in San Germán is shown below (Figure 19). Quarry #20 is located in the municipality of San Germán route PR-329 KM 3.2. The quarry is named Cantero y Gravero. Its sign does not show its permit number. The access to the quarry was restricted but the access road is currently paved with Serpentinite gravel.

Figure 19. Quarry #20, Cantero y Gravero. Entrance Road paved with Serpentinite

Another quarry located in the municipality of Mayagüez near PR-105 KM 105, behind "Centro Juvenil de Mayagüez Aguadilla" (Figure 20), used for cut and fill for the construction of the project and/or the parking lot. A sign showing the name of permit number of the project or the quarry could not be found.

Figure 20. A quarry behind Centro Juvenil de Mayagüez, Aguadilla

On the other hand, small cuts and outcrops can be found along almost every road that goes through the Serpentinite Formations, principally along routes PR-120 and PR-365. Four significant outcrops were found on route PR-119 in San Germán, route PR-308 in Sabana Grande, and sector Media Quijada in Yauco. A smaller outcrop shown in Figure 25 was found along PR-2 km 172.6. This cut appears to be constructed during the expansion of state road PR-2 in the past years.

Figure 21-Cut along PR-2 km 172.6. This cut appears to be constructed during the expansion of state road PR-2.

During the reconnaissance studies was noticed that Serpentinite is the main rock, if not the only rock mined in the southwest part of the Island. It is used as pavement in several homes and industries especially near the quarries. Industries such as Better Roads, a major asphalt company and several concrete plants used Serpentinite as gravel (see report in Appendix VI). An active Better Road plant located on state road PR 3311 (km 0.2) was observed to have piles of various aggregate sizes suspected of being processed Serpentinites, stored in the open area (see Figure 22).

Figure 22. View of piles stored on the facility of Better Roads, State Road PR 3311, Cabo Rojo.

6.2.4 Results of Gravel (aggregates) samples, area Outside Olefins Facility

Four (4) gravel samples were collected from the gravel used as backfill for State road PR-127 and from a dirt road perpendicular to it:

- Two (2) samples were on collected on 11/10/2014 from the gravel found in the vicinity of state road PR-127 at the entrance to Olefins and AR Exchange boilers facilities, respectively. Each of the two samples was sieved into two fractions (>19mm and <19mm).

- Two (2) additional samples were collected on from the unpaved, dirt road perpendicular to PR-127 and from the front entrance to Gulf facilities (see map for samples location in Appendix II).

Results are presented in Table 7 (see MVA report #3 in Appendix V). Fibrous minerals detected by PLM in samples S-TEC-ARE-P0006-ER1, S-TEC-TNT-SER1, and S-TEC-BUS-ER2 (MVA Z2617, Z2754, and Z2755, respectively) include fibers consistent with Chrysotile asbestos as well as some fibers with the same morphology, but higher than expected refractive indices. Some of the high refractive index fibers from sample S-TEC-ARE-P0006-ER1 (MVA Z2617) were picked using a tungsten needle during the PLM analysis step and analyzed by TEM-EDS. Fibers analyzed from this subsample were found to contain iron and aluminum peaks, consistent with the majority of the Chrysotile asbestos detected in the four aggregate samples. It is possible that the iron content has expanded the inherent refractive index of the fibers beyond what is typically reported for Chrysotile asbestos, as this phenomenon is well known among other mineral species with varying levels of iron (ex: forsterite to fayalite).

All four aggregate samples consist of plant debris and soil minerals. Carbonate and serpentine minerals were prevalent in all four samples, with magnetite present in three samples. All four samples contained Lizardite, the non-fibrous serpentine and trace amounts of fibrous serpentine confirmed by SEM-EDS and TEM-EDS to be primarily Chrysotile with varying amounts of aluminum and/or iron (Table 8). Some fiber structures contained calcium and, in some cases, sulfur peaks. These peaks were observed only on fibers with other surface particulate present, therefore these peaks may be attributed to extraneous particles. Single particle serpentine minerals (with no observed surface particulate) contain up to 2.1% aluminum (elemental weight % by EDS) and up to 2.9% iron (elemental weight % by EDS).

Table 7a. Summary of Aggregates Samples

MVA #	Sample I. D.	Client ID - Sample Description	Collection Date
Z2617A	S-TEC-ARE-P0006-ER1A	"Gravel from road backfill entrance to AR Exchanger Boiler Specialist (fraction <19mm)" [fine fraction]	11/10/14
Z2617B	S-TEC-ARE-P0006-ER1B	"Gravel from road backfill entrance to AR Exchanger Boiler Specialist (fraction >19mm)" [course fraction]	11/10/14
Z2618A	S-TEC-MEOL-ER2A	"Gravel from road backfill entrance to Olefins (fraction <19mm)" [fine fraction]	11/10/14
Z2618B	S-TEC-MEOL-ER2B	"Gravel from road backfill entrance to Olefins (fraction >19mm)" [course fraction]	11/10/14
Z2754	S-TEC-TNT-S-ER1	Gravel from Dirt Road next to Intersection of the Trail with Road #127, Front of Gulf Entrance	11/21/14
Z2755	S-TEC-BU-S-ER2	Gravel from Dirt Road approximated 200 feet from intersection with Road #127 and Dirt Trail	11/21/14

Table 7b. Summary of Analytical Results- Aggregates

MVA #	AESI #	PLM Analysis Results % Asbestos	Additional Materials Observed	SEM Analysis Results	TEM Analysis Results
Z2617	S-TEC-ARE-P0006-ER1	Trace Chrysotile	Plant Debris and Gravel - Including: Carbonate, Serpentine **(Lizardite)**, **Magnetite**	Non-fibrous **(Lizardite)** and Fibrous (Chrysotile) Serpentine; Other Soil Minerals	Non-fibrous **(Lizardite)** and Fibrous (Chrysotile) Serpentine Particles, and Other Soil Minerals
Z2618	S-TEC-MEOL-ER2	NAD	Plant Debris, Asphalt, and Gravel - Including: Quartz, Carbonate, Serpentine **(Lizardite)**, **Magnetite**	NA	Non-fibrous **(Lizardite)** and Fibrous (Chrysotile) Serpentine Particles, and Other Soil Minerals
Z2754	S-TEC-TNT-S-ER1	Trace Chrysotile	Plant Debris and Gravel - Including: Carbonate, Serpentine **(Lizardite)**, **Magnetite**	Fibrous Serpentine (Chrysotile) and Other Soil Minerals	Fibrous (Chrysotile) Serpentine and Other Soil Minerals
Z2755	S-TEC-BU-S-ER2	Trace Chrysotile	Plant Debris and Gravel - Including: Carbonate, Serpentine **(Lizardite)**	Fibrous Serpentine (Chrysotile) and Other Soil Minerals	Fibrous (Chrysotile) Serpentine and Other Soil Minerals

NA – Not Analyzed, NAD – No Asbestos Detected

Table 8. SEM/TEM-EDS Characterization (Elemental Weight %)
of Serpentine Structures Detected in Aggregate Samples

	Mg	Al	Si	Fe	O	Ca	S	Type
Z2617	26.2	0.5	24.6	2.3	46.4	---	---	Chrysotile (TEM)
	25.0	1.1	21.9	4.3	45.2	2.5	---	Chrysotile (SEM)
	27.5	0.3	23.3	2.9	45.9	---	---	Lizardite (TEM)
	22.7	2.6	21.4	5.8	45.0	2.6	---	Lizardite (SEM)
Z2618	20.7	0.9	23.8	4.8	46.4	1.6	1.9	Chrysotile (TEM)
	27.9	1.2	23.2	1.5	46.3	---	---	Lizardite (TEM)
Z2754	28.4	---	23.3	2.5	45.9	---	---	Chrysotile (TEM)
	26.1	2.1	23.0	2.5	46.3	---	---	Chrysotile (SEM)
Z2755	27.7	---	25.3	---	47.0	---	---	Chrysotile (TEM)
	25.0	0.8	22.9	3.0	45.6	2.7	---	Chrysotile (SEM)
	25.0	0.7	23.4	2.5	45.8	2.6	---	Chrysotile (SEM)

*TEM structure types confirmed by electron diffraction; SEM data not confirmed by electron diffraction

Only selective representative photos are presented in this section as a complete report is attached in Appendix V-4. Figures 23a thru 23e show data regarding the serpentine particles that were observed during analysis of the sample S-TEC-ARE-P0006-ER1 via stereomicroscopy, PLM, SEM-EDS, and TEM-EDS. The serpentine particles present in this sample consistently exhibit trace to minor amounts of aluminum and/or iron.

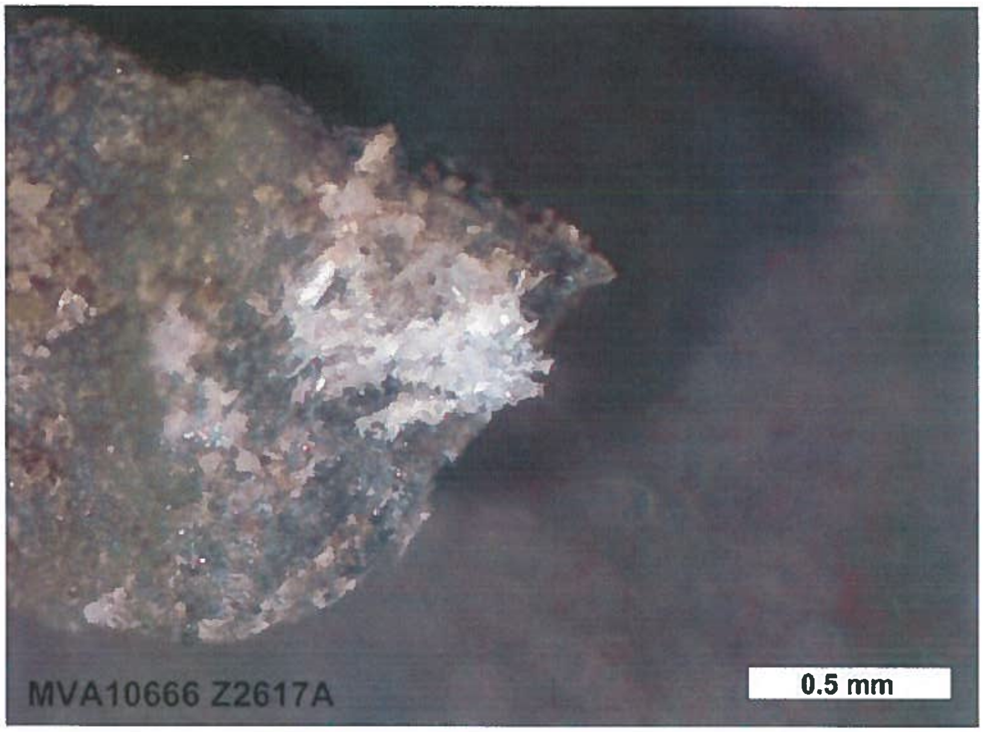


Figure 23a. Stereo-micrograph of non-fibrous serpentine mineral (lizardite) with fibrous serpentine intergrowth (chrysotile) observed in aggregate sample S-TEC-ARE-P0006-ER1.

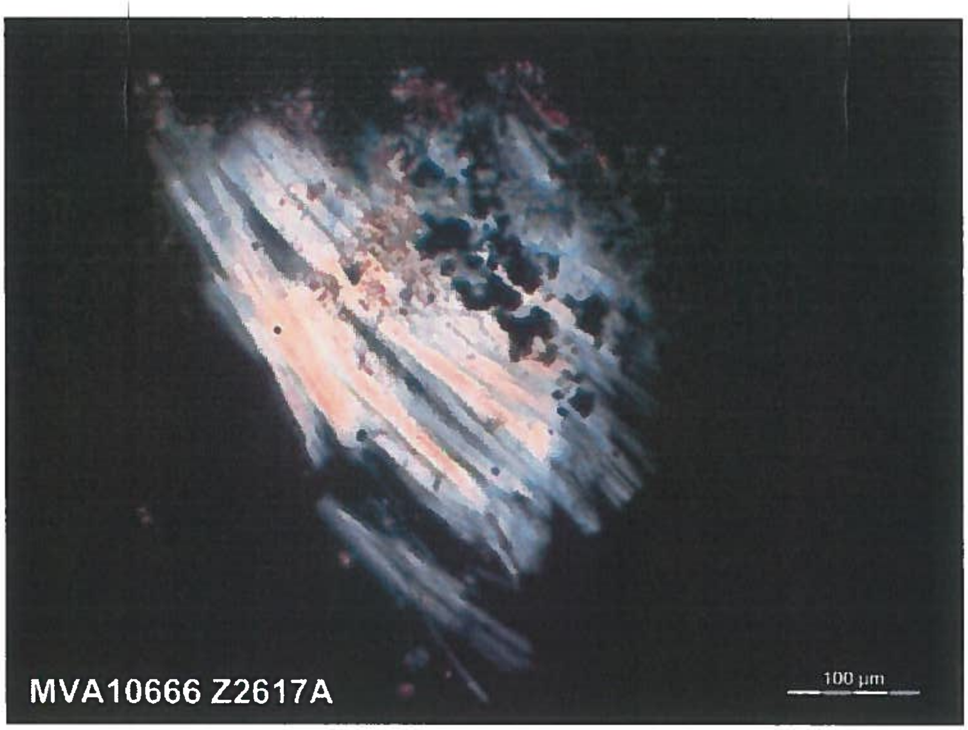


Figure 23b. PLM image of chrysotile asbestos observed in aggregate sample S-TEC-ARE-P0006-ER1.

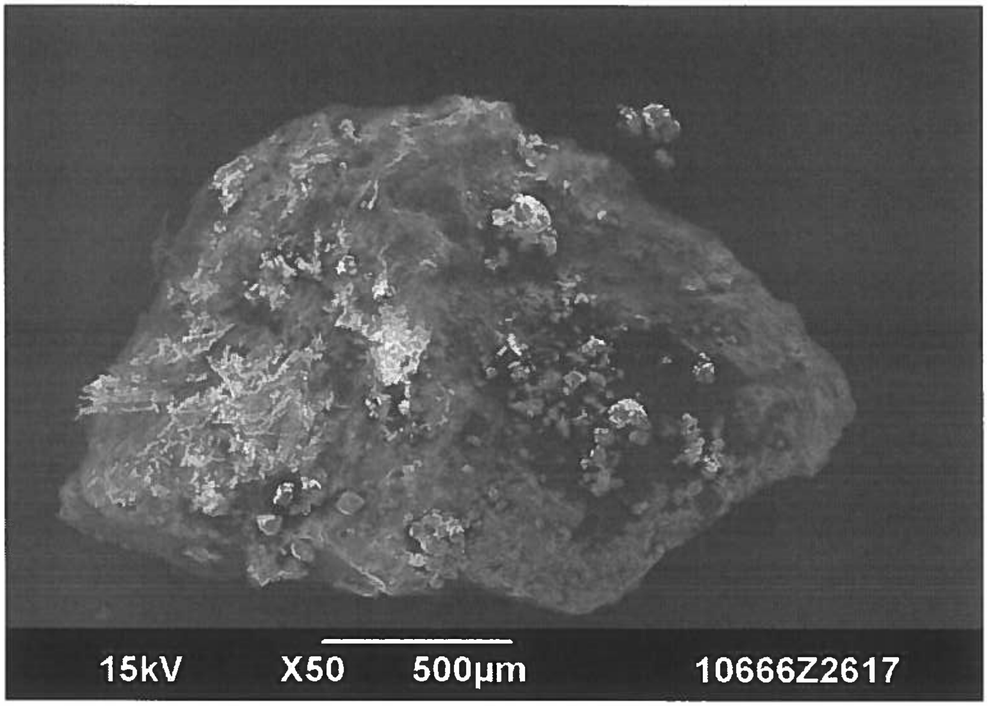


Figure 23c. SEM image of serpentine mineral (Figure 27a). Note fibrous mineral growth on left side of aggregate particle. Numbers (below) denote areas where EDS spectra were obtained.

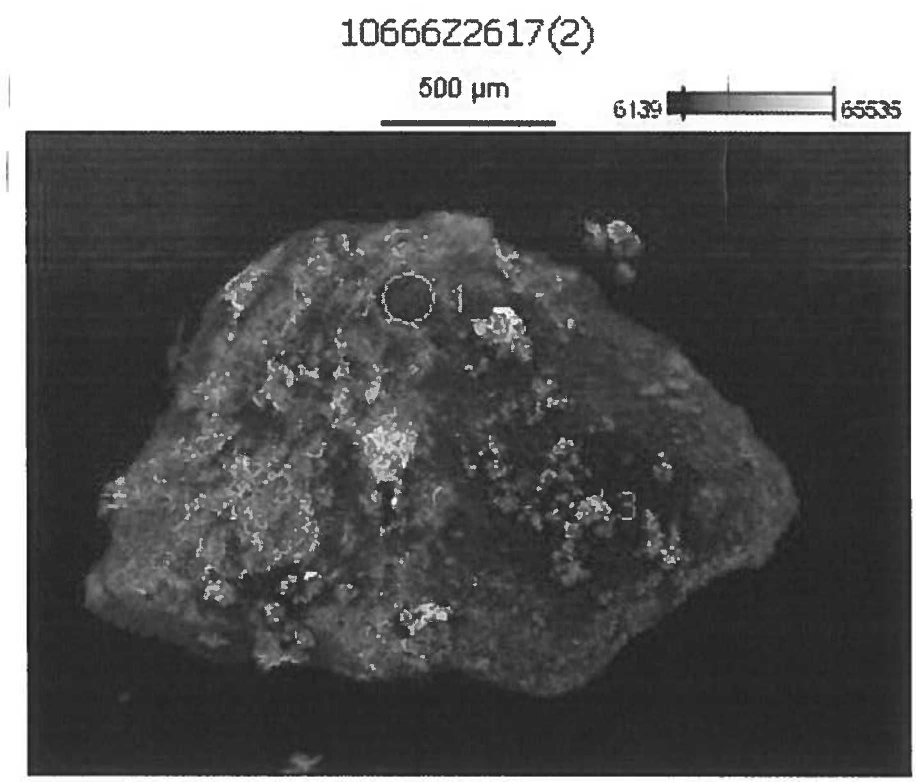
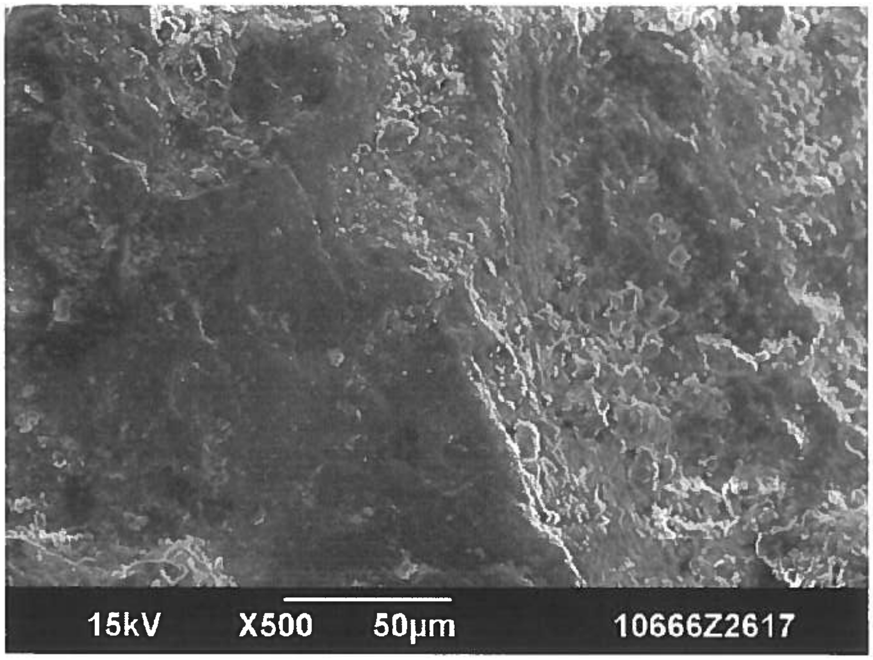


Figure 23d. SEM image of serpentine mineral (Figure 27c). Numbers denote areas where EDS spectra were obtained.



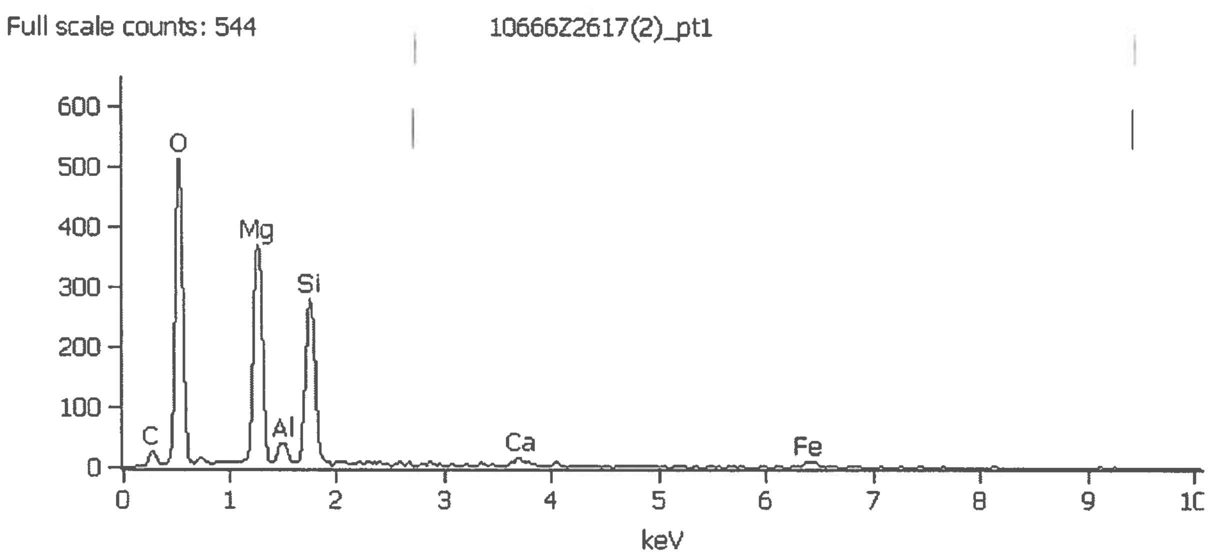
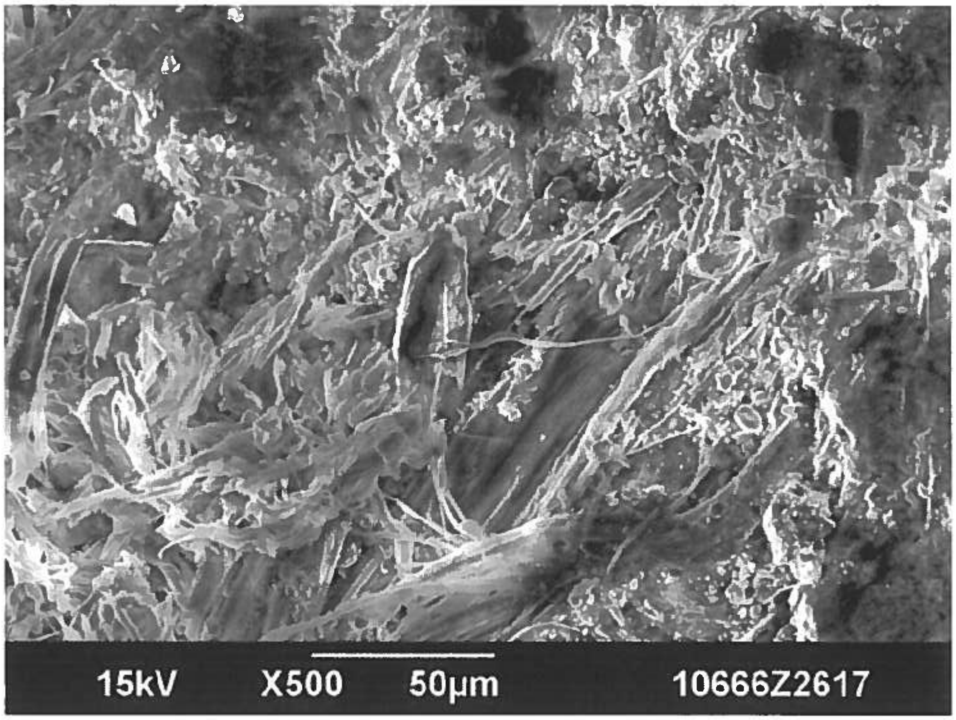


Figure 23e. SEM image (top) and EDS spectra (below) of non-fibrous serpentine (Lizardite) mineral surface (Area 1 in Figure 27d)



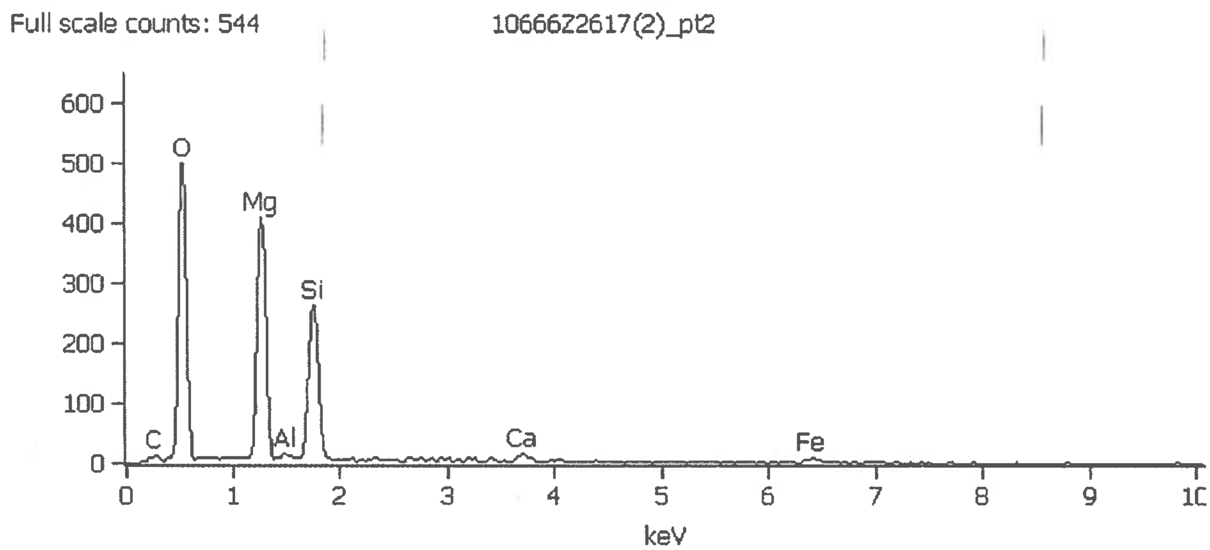
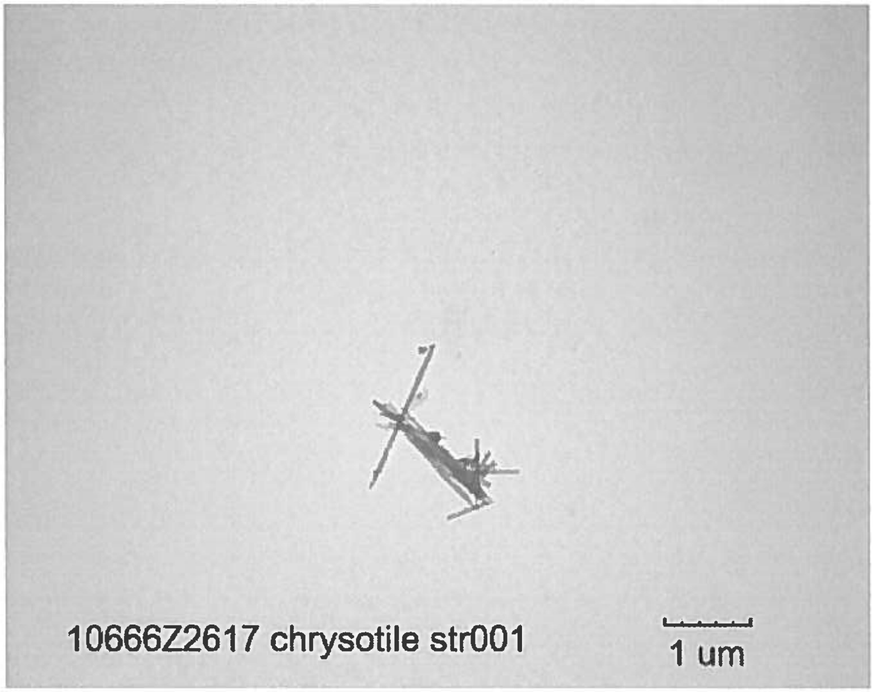


Figure 23f. SEM image (top) and EDS spectra (below) of fibrous serpentine (Chrysotile) mineral surface (Area 2 in Figure 27d)



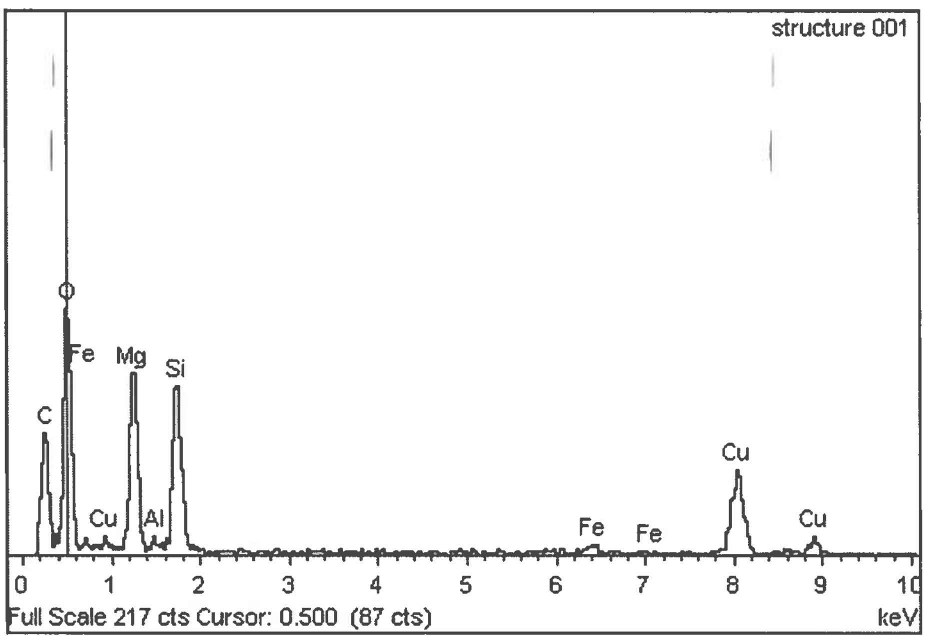
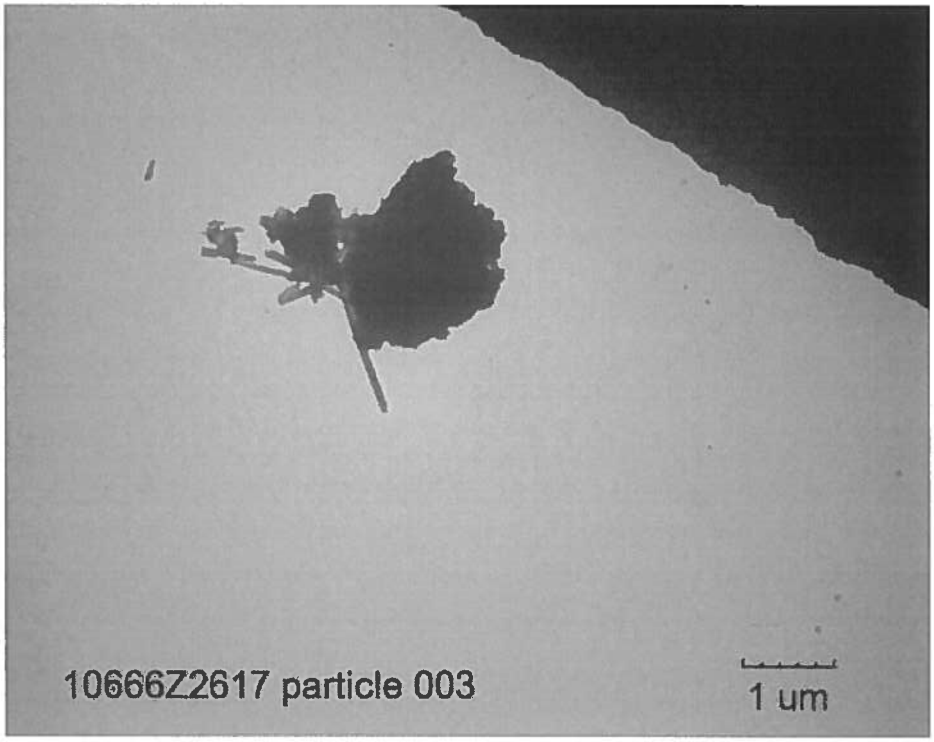


Figure 23g. TEM image (top) and EDS spectrum (bottom) of Chrysotile asbestos fiber observed during analysis of aggregate sample S-TEC-ARE-P0006-ER1



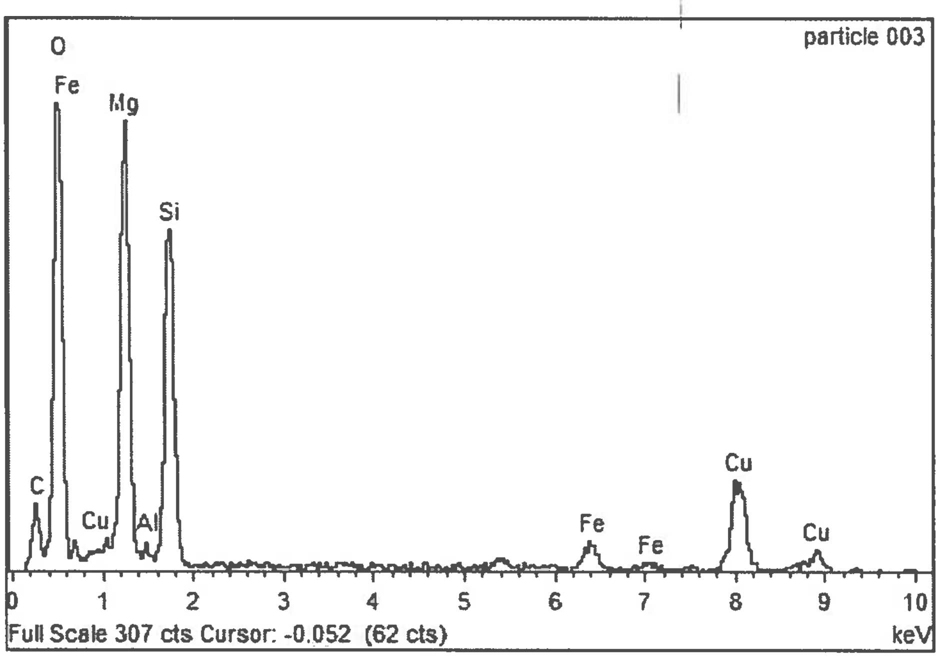


Figure 23h. TEM image (top) and EDS spectrum (bottom) of Lizardite particle observed during analysis of aggregate sample S-TEC-ARE-P0006-ER1.

Two types of Chrysotile fibers were found in sample S-TEC-BUS-ER2. One type containing traces of iron and aluminum similar to the fibers observed before in the other samples (Figure 24). Another type of a Chrysotile fiber with no visible aluminum and iron peaks above the background levels was also observed in the sample (Figure 29).

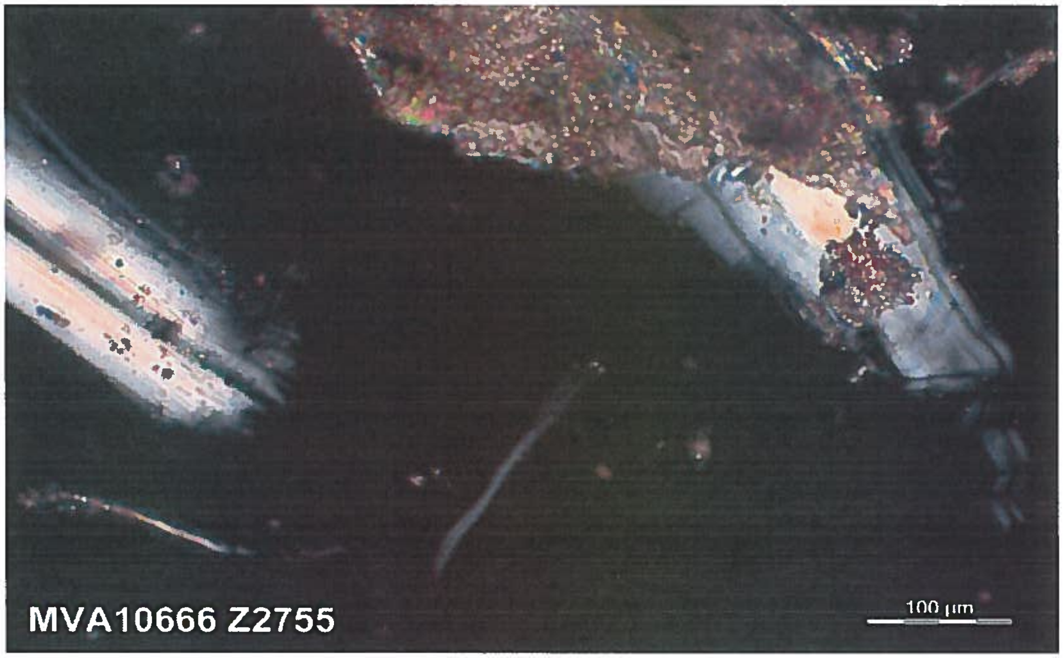


Figure 24a. PLM image of Chrysotile asbestos (center) observed in aggregate sample S-TEC-BUS-ER2.

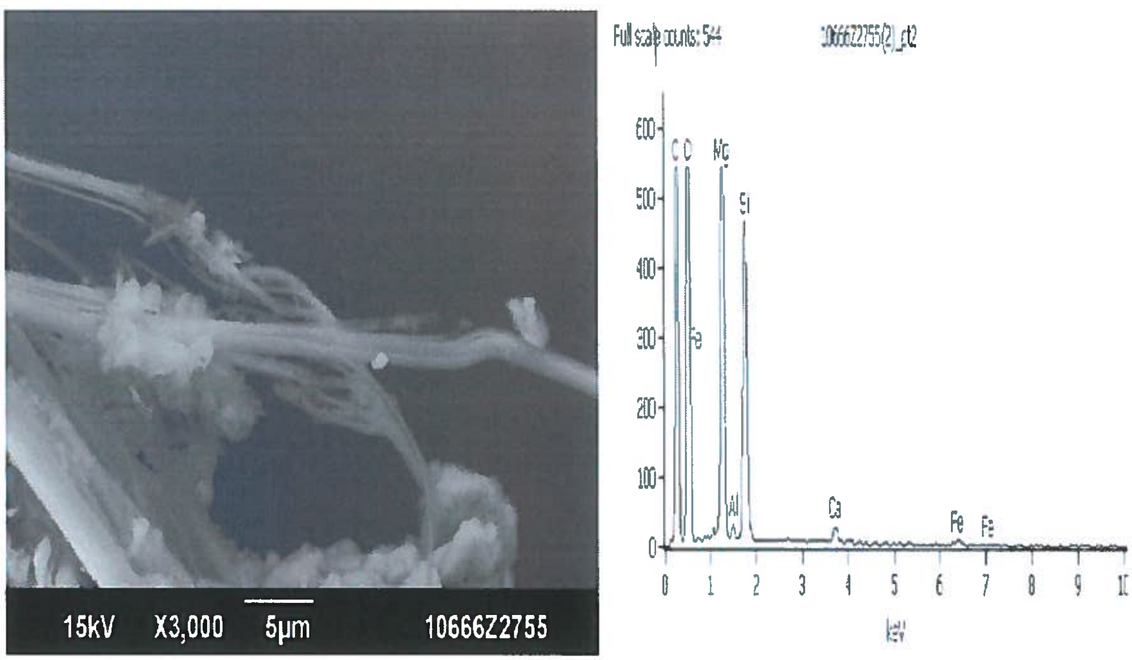


Figure 24b. SEM image of debris particles from aggregate sample S-TEC-BUS-ER2. Numbers (left) and typical EDS spectra (right). Note presence of Fe and Al traces..

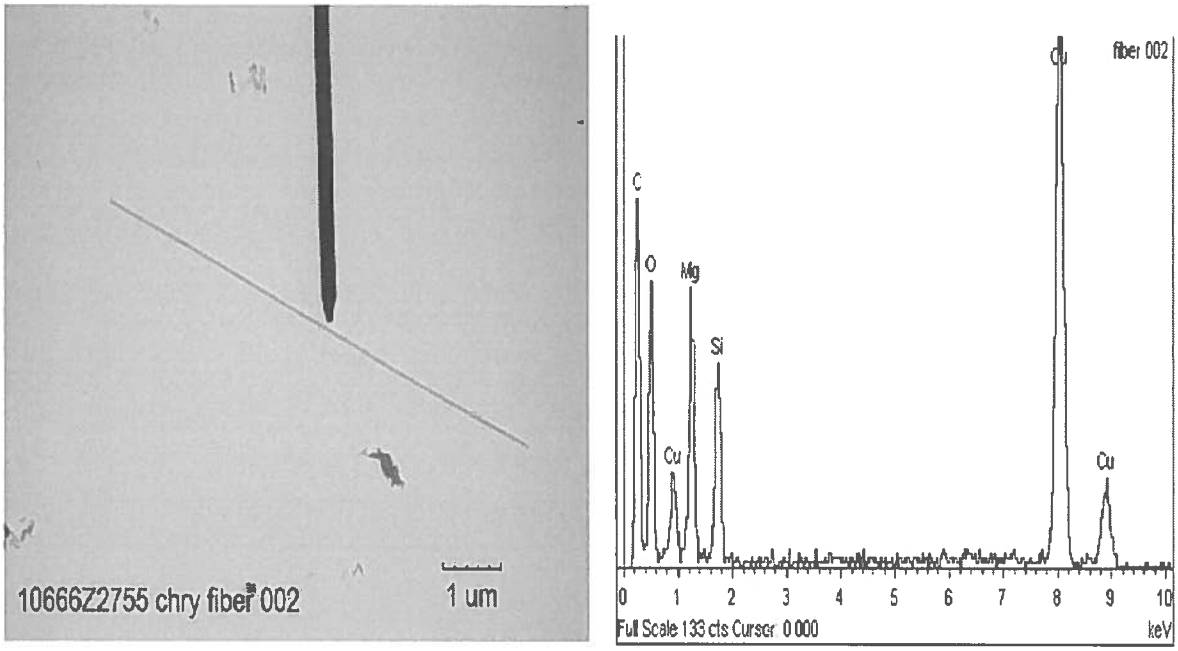


Figure 25. TEM image (left) and EDS spectrum (right) of a Chrysotile asbestos fiber observed during analysis of aggregate sample S-TEC-BUS-ER2. No Fe or Al observed.

6.2.5 Area Inside Olefins Facility

The sampling conducted inside Olefins regulated area, which is the area where Homeca conducted asbestos abatement and EPA restricted access, represents an initial reconnaissance phase to be followed by additional sampling events. The results of samples collected from inside Olefins facility collected on October 23, 2014 are shown in Table 9 (dust) and Table 10 (soil, bulk). An additional bulk insulation sample was collected on 11/21/2014 (Table 11).

MVA reports for the two sampling events are attached in Appendix V (see reports #2 and #5). Traces of Chrysotile and Amosite were found by PLM, and confirmed by TEM in the dust sample D-OL-SM-ER6 collected on the metal scrap in front of area where the crane used to be located (see Table 9). Iron content in Chrysotile present in dust was found to range from 1.6 to 4.9% and Aluminum from 1.7 to 2.4% (see Table 4).

Table 9. Summary of Analytical Results for Dust Samples Collected Inside Olefins facility on 23 October 2014

MVA #	AESI Sample I. D.	PLM Analysis Results % Asbestos	Additional Materials Observ	TEM Results	Comments
Z2376	D-OL-FF-ER2	NAD	Iron/Rust, carbonate, quartz, cellulose	Iron and quartz particle	Small Sample Volume
Z2377	D-OL-SM-ER6	Trace Amosite Trace Chrysotile	Iron/Rust, vermiculite, quartz, carbonate, cellulose, glass fibers, fungal material	Iron, aluminum, clay particles, one amosite fiber, two chrysotile bundles	SEM (probable chrysotile) Trace Fe/Al Present in Chrysotile (TEM)
Z2378	OL-SB-ER7	NA	-	NA	
Z2379	OL-FB-ER8	NA	-	NA	
Z2380	OL-FB-ER9	NA	-	NA	

NA – Not Analyzed
NAD – No Asbestos Detected

Four (4) samples from pipe insulation debris and one (1) soil sample were also collected on October 23, 2014. A summary of MVA analytical results of the five (5) samples is provided in Table 11. The three (3) insulation samples analyzed by MVA are consistent with AESI results (see quality control comparative table in Appendix II). MVA results of insulation debris samples contained approximately 60 to 80% Amosite asbestos (by volume) in addition to rust/metal flakes and a binder material.

Table 10. Summary of Analytical Results for Debris/Soil Samples Collected Inside Olefins facility on 23 October 2014

MVA #	AES Sample ID	PLM Analysis Results % Asbestos	Additional Materials Observed	TEM Analysis Results	Comments
Z2369	B-OL-OV-409-ER1	60-80% Amosite	Binder, Rust/Metal Particles, Diatoms	NA	---
Z2370	S-OL-FF-ER3	Trace Amosite	Soil Minerals, Plant Fragments, Rust/Metal Particles, Insect Parts	NAD	---
Z2371	B-OL-FF-ER4	60-80% Amosite	Binder, Rust/Metal Particles	NA	---
Z2372	B-OL-PS408-ER5	60-80% Amosite	Binder, Rust/Metal Particles, Diatoms	NA	Amosite with Silicon-rich Binder Confirmed by SEM
Z2373	B-OL-PS408-ER5-dup	NA	---	NA	---

NA – Not Analyzed
NAD – No Asbestos Detected

Two of the three samples (Z2369/B-OL-OV-409-ER1) and Z2372/B-OL-OV-PS408-ER5) contained diatoms and a silica binder (see Figure 26). PLM analysis of the soil sample by MVA shows that it is primarily consistent with soil minerals and plant fragments with a minor amount (1 to 10% by volume) of rust/metal flakes and a trace amount (<1% by volume) of insect parts. After ashing, the soil sample was found to contain trace amounts (<1% by volume) of Amosite asbestos.

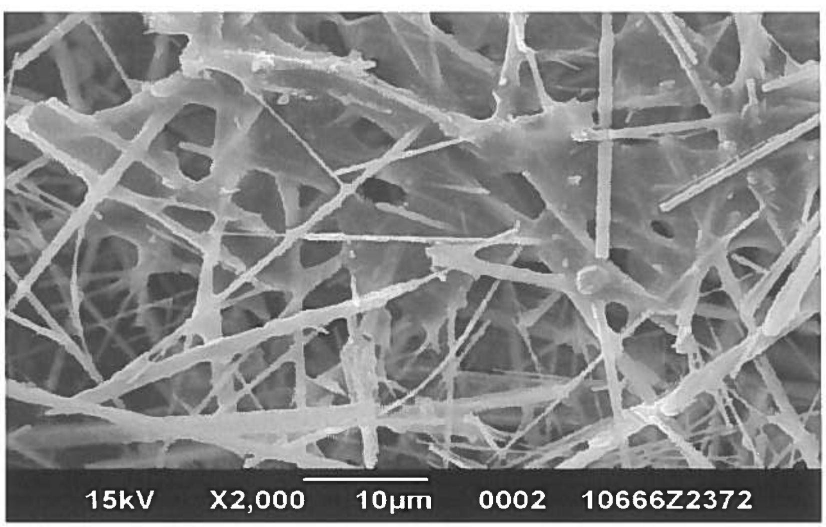


Figure 26. Scanning electron micrograph of Amosite asbestos fibers and silica binder detected during analysis of bulk insulation debris, Sample Z2372.

A bulk sample was collected on November 21, 2014 from the insulation of a distillation column in the vicinity of vessel OV-302. Sample was analyzed by PLM and SEM. The TSI on the column appears to be significantly damaged (see Figure 27).

Figure 27, TSI on a distillation column left of platform of vessel OV-302.
Note that TSI is in significantly damaged condition.

Forty (40%) to Sixty (60%) Chrysotile was found to be present as determined by MVA PLM analysis (see report in Appendix V-6) in addition to a binder material detected via PLM analysis (See Table 12 for results). Representative photos of the Chrysotile are shown in Figure 29 together with its EDS spectra.

Table 11. Analytical results of sample BULK-OL-CHM4-ER2 (MVA# Z2753)

MVA #	PLM Analysis Results % Asbestos	Additional Materials Observed	TEM Analysis Results	Comments
Z2753	40-60% Chrysotile	Binder	Chrysotile Detected	Chrysotile with Calcium Silicate Binder Confirmed by SEM

Figure 28 (top) shows PLM/SEM images of a representative Chrysotile asbestos bundle. Representative Chrysotile asbestos bundle SEM-EDS analysis shows that the fiber bundles consist of long, processed chrysotile bundles (Figures 29) with a calcium silicate binder material (Figure 28, top right). Elemental composition of the fibers via SEM-EDS shows trace amounts of aluminum, chlorine, and calcium (Figure 28 bottom); however, these peaks are likely from adhering binders and particulate material since these elements are not confirmed in the TEM-EDS data.

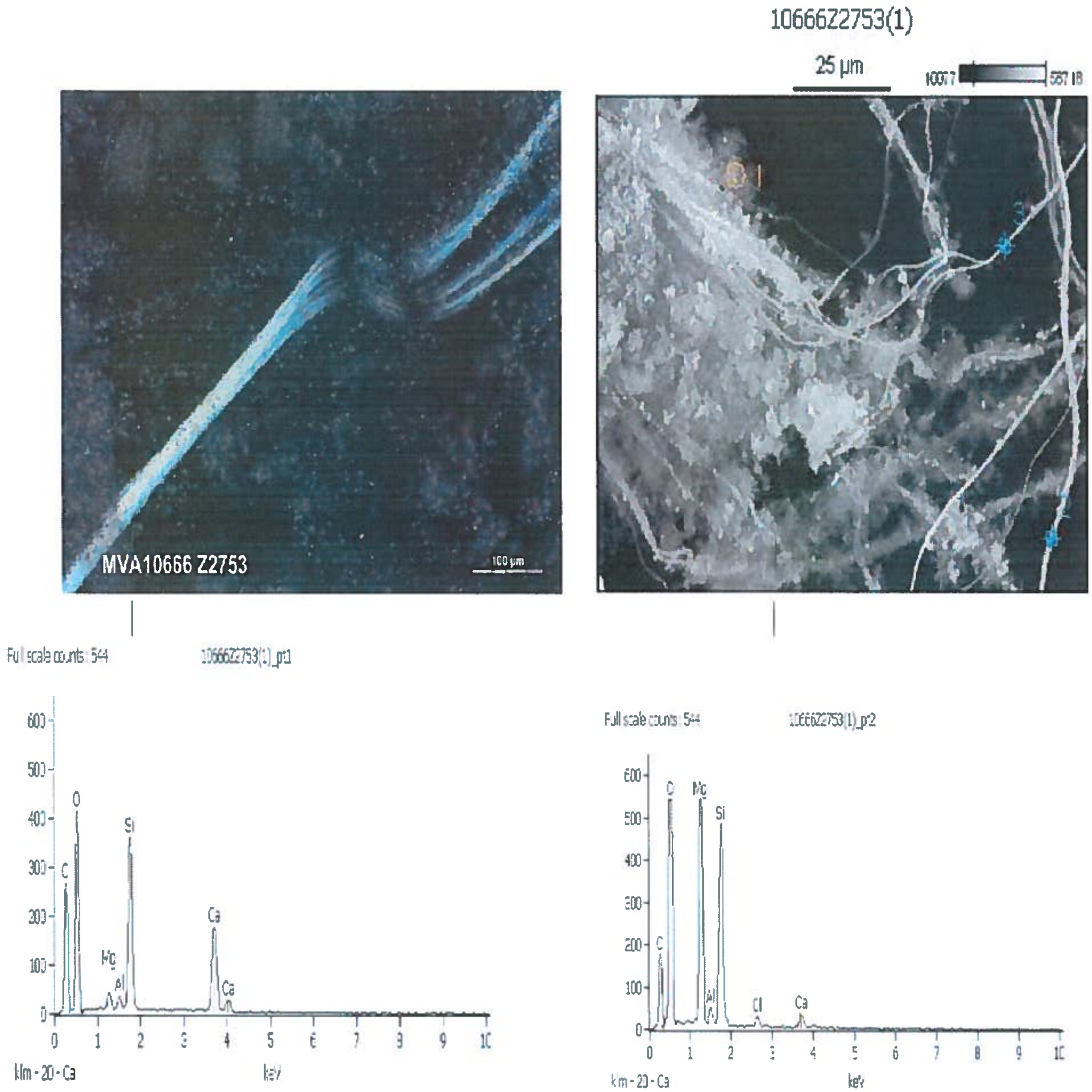


Figure 28. PLM image (top left), SEM micrograph (top right) of Chrysotile asbestos fibers and binder detected during analysis of insulation sample BULK-OL-CHM4-ER2 (MVA Z2753). Numbers denote areas where EDS spectra was collected: Bottom Left area 1-Calcium silicate binder. Bottom Right area 2-Chrysotile asbestos bundle with particulate material. No Iron peaks are visible.

Typical Chrysotile fiber TEM image and EDS spectra are shown in Figure 29. Fifteen random fibers were characterized by TEM-EDS for elemental composition as well as aspect ratios. Based on TEM-EDS, none of the 15 fibers analyzed contained any detectable level of aluminum (see Table 12). The majority of the fibers analyzed contained no detectable level of iron; however, some fibers did contain iron at or below 1.8% (elemental weight percent, Table 12). The average aspect ratio of the 15 fibers analyzed is greater than 100:1 (length:width) with a minimum aspect ratio of 7:1 and a maximum aspect ratio of over 1000:1.

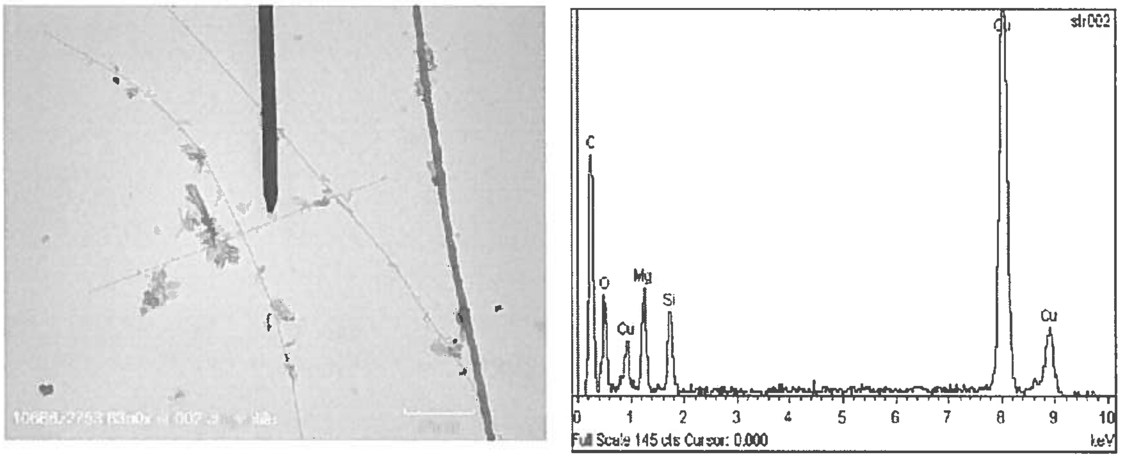


Figure 28. TEM image (left) and EDS spectrum (right) of a representative Chrysotile fiber detected during analysis of insulation sample BULK-OL-CHM4-ER2 (MVA Z2753). No Aluminum or Iron peaks are visible.

Table 12. TEM-EDS Characterization (Elemental Weight %) of Chrysotile Structures detected in insulation sample BULK-OL-CHM4-ER2 (MVA Z2753).

Structure	Mg	Si	Fe	Al
str001	26.2	24.9	0	0
str002	27.7	24.5	0	0
str003	28.0	24.4	0	0
str004	28.5	23.8	0	0
str005	26.0	25.5	0	0
str006	28.4	24.1	0	0
str007	26.9	24.9	1.67	0
str008	28.0	24.9	0	0
str009	27.3	24.8	0	0
str010	24.5	27.0	1.31	0
str011	28.9	23.3	0	0
str012	25.1	26.2	1.82	0
str013	28.2	23.9	1.55	0
str014	27.6	24.4	1.47	0
str015	27.6	24.5	1.45	0

7.0 POTENTIAL SOURCES OF ASBESTOS CONTAMINATION IN TALLABOA AREA.

The evidence presented herein and summarized below suggest that the main source of dust contaminated with Chrysotile outside Olefins facility is not from the ACM found inside the Olefins facility but rather from NOA (Serpentinite rocks) used as gravel for the dirt roads, parking lots in the areas, or backfill for the asphalt roads:

- Presence of non-fibrous (Lizardite) together with fibrous (Chrysotile) serpentines minerals and Magnetite in some of the dust samples collected around Olefins facility. Same mineral association was observed in the source rock (Serpentinites) mined from quarries located in the south-west side of Puerto Rico (Figures 14 thru 16).

- Presence of Lizardite, Magnetite and Chrysotile in the aggregate samples collected from gravel used as backfill. The source of the gravel is probably from the present/past quarries located in the southwest part of Puerto Rico. Both Lizardite and Chrysotile were observed to be present and closely intergrown in the samples collected from the aggregates (see Figure 30).

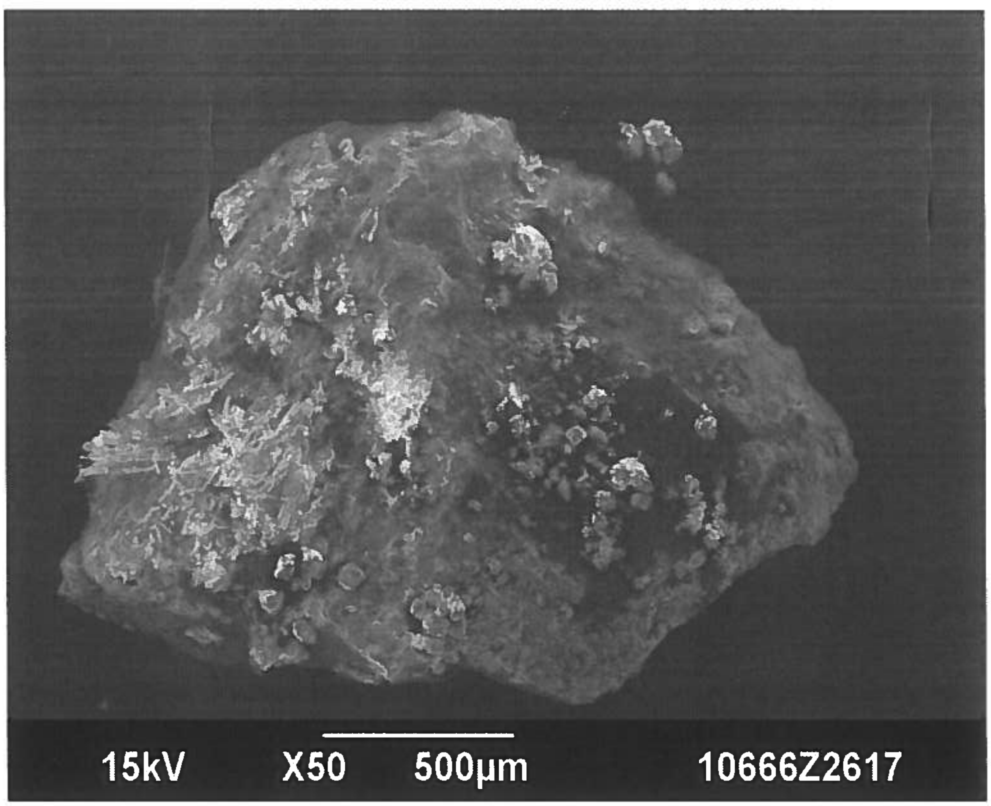


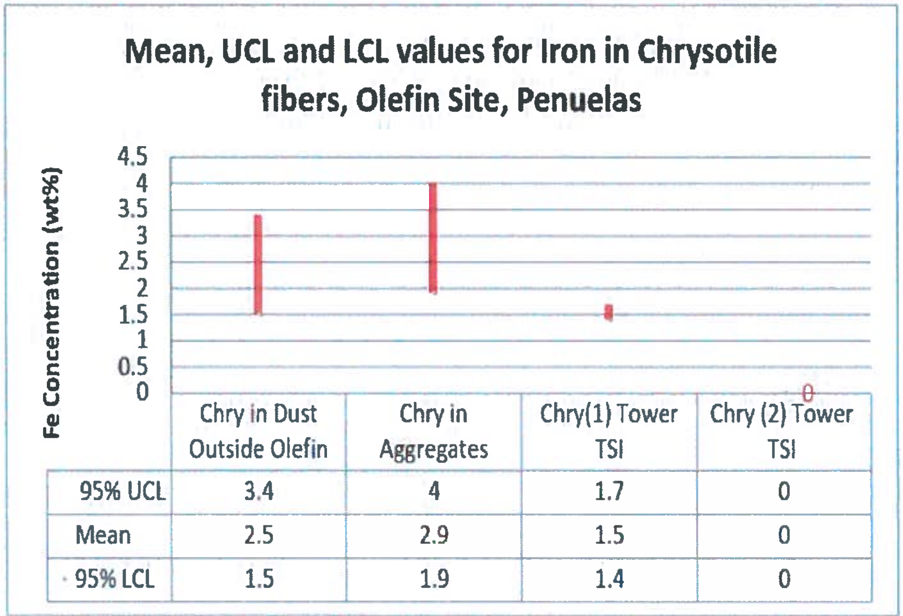
Figure 30. SEM image of Chrysotile (left fibrous) intergrowth with Lizardite (the large aggregate). The aggregate was collected from the gravel sample S-TEC-ARE-P0006-ER1

- Lack of Amosite asbestos in most of the dust samples collected by Weston outside Olefins and in all the dust samples collected by AESI. Nace (10) relates the absence of Amosite and predominant presence of Chrysotile to a mechanism of lesser release of fibers at the ground level during weathering and removal due to less dispersion than the fibers released from materials that are higher in elevation. Nace is correctly stating that there is more surface area on the distillation columns and tanks (where according to Nace, Chrysotile concentration are up to 40%, Amosite is 5%) when compared with the boilers (according to Nace, Chrysotile concentrations up to 5%, Amosite 40%), which would lead to Chrysotile being the predominate type of asbestos being released from the site. However, based on the results of a bulk sample taken from the significantly damaged TSI present on one of the high distillation stacks (see Table 12), there is indication that the Chrysotile present in TSI is either a Mg-Chrysotile and/or a Mg/Fe Chrysotile with smaller amounts of Fe (Iron) than observed in the Chrysotile found in most of the dust samples. In addition, Chrysotile found in the TSI has no traces of Aluminum (Al), contrary to the composition of the majority of the Chrysotile fibers observed in the exterior dust samples collected by AESI. The presence of Al-Fe bearing Chrysotiles is attributed to origin from NOA found in the southwest part of Puerto Rico.

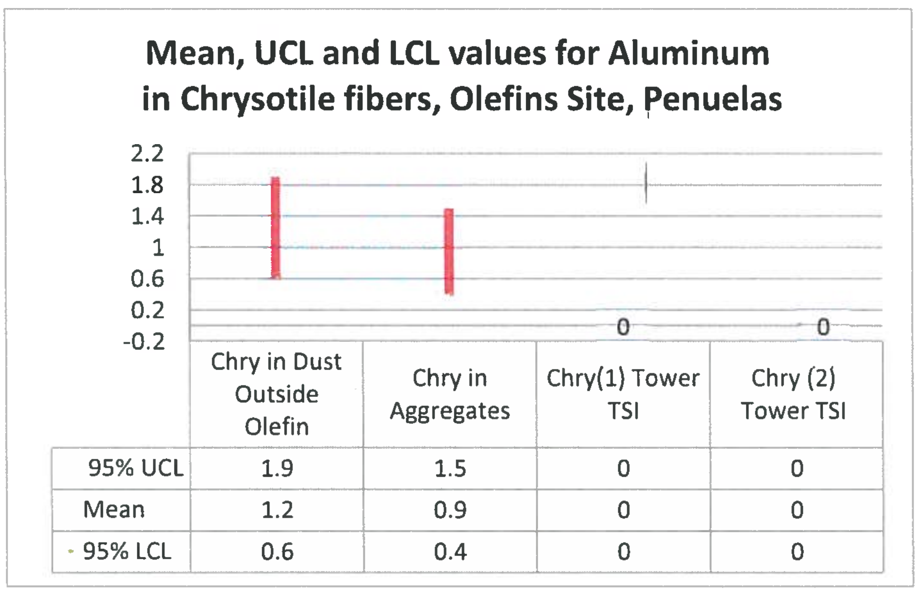
- The direct correlation between the Al-Fe concentrations of Serpentines in aggregates with the Al-Fe content of Chrysotile fibers present in the dust samples (see Figure 31).

- The difference between Iron and Aluminum concentrations of Serpentines from the aggregates and dust samples, versus Chrysotile composition of the insulation sample collected from a deteriorated TSI present on a distillation tower left of platform of vessel OV-302. A statistical comparison between the Fe and Al content of Serpentines present in the dust samples outside Olefins, aggregates samples and the one distillation column TSI sample is shown in Figure 31. Results are presented at 95% confidence using t-distribution. It is noticeable that there are two types of Chrysotile in the TSI that were separated and not averaged together. Clearly Fe and Al Concentration in Serpentines present in aggregates and dust samples almost overlap (Fe averages are 2.9% and 2.5%, respectively and Al averages are 0.9 and 1.2%, respectively), while the sample collected from the TSI insulation has either a much lower average Fe concentration (1.5%), or zero and no aluminum present.

- Initial data related to the aspect ratios (length/width) of the Chrysotile fibers/bundles detected by TEM-EDS, seem to be showing a different aspect ratios of Chrysotile fibers present in the dust samples (aspect rations were primarily less than 20:1 with two of the fifteen structures tested having aspect ratios of approximately 23:1 and 37:1) and Chrysotile fibers present in the TSI of the distillation tower (see data in Appendix V-8). TSI fibers were found to have a much larger aspect ratios; the average aspect ratio of the fifteen fibers analyzed was greater than 100:1 (329), with a minimum aspect ratio of 7:1 and a maximum aspect ratio of over 1000:1 (see Figure 32).



	Chry in Dust Outside Olefin	Chry in Aggregates	Chry(1) Tower TSI	Chry (2) Tower TSI
95% UCL	3.4	4	1.7	0
Mean	2.5	2.9	1.5	0
95% LCL	1.5	1.9	1.4	0



	Chry in Dust Outside Olefin	Chry in Aggregates	Chry(1) Tower TSI	Chry (2) Tower TSI
95% UCL	1.9	1.5	0	0
Mean	1.2	0.9	0	0
95% LCL	0.6	0.4	0	0

Figure 31. Statistical analysis of Iron (top) and Aluminum (bottom) contents in Chrysotile present in samples collected from aggregates, outside dust and TSI insulation of a distillation tower. Aggregate results include Lizardite and Chrysotile measurements.

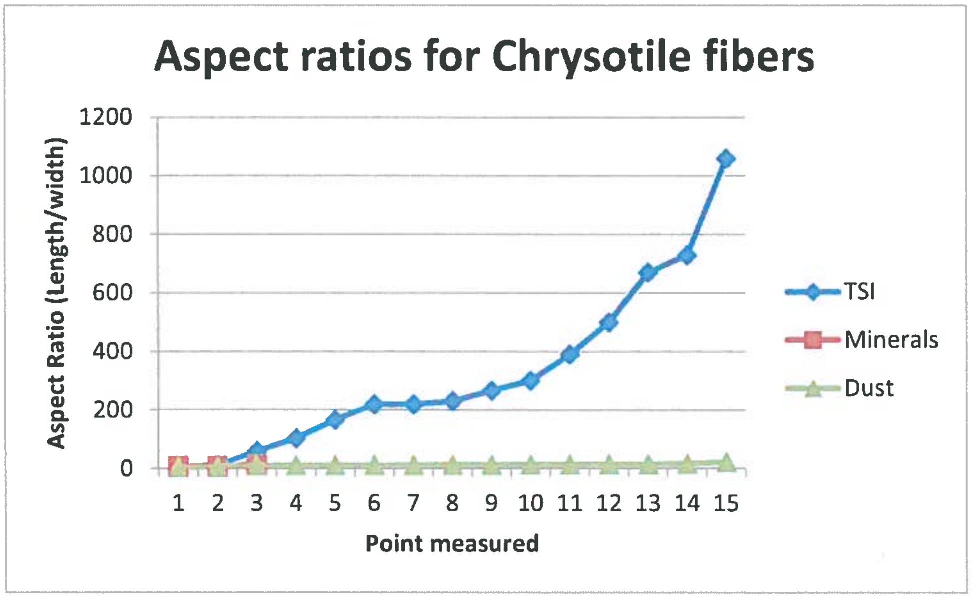


Figure 32. Aspect ratios for Chrysotile fibers present in TSI, NOA and dust. TSI is from a distillation tower.

Although more data are needed to be collected from the TSI present inside Olefins facility, it appears that the possibility of community contamination caused by abatement of TSI insulation in Olefins facility is slim and the presence of Chrysotile in the background samples collected from the community and from the surrounding areas is caused mostly by usage of NOA aggregates. Traces of Amosite in few of Weston samples and a few Mg-rich/Fe-low Chrysotile fibers were identified in some of AESI samples collected outside Olefins, but their presence seems to be associated with the physical condition of the ACM within the Olefins facility (or nearby facilities), rather than to a major release episode caused by abatement.

The source of Anthophylite, Actinolite and Tremolite observed in some dust/air samples collected by Weston and Tremolite observed by AESI in one of the dust samples collected from the bus station is not clear and must be further investigated. These minerals are very rare in commercial products where they are mainly known as impurities. Some of these minerals can be associated with the local minerals essays. Minerals such as Actinolite were identified by Lee (8) in the third serpentinite belt (Sierra Bermeja, see Figure 11). Some other minerals found in the Sierra Bermeja belt identified by Lee include Horenblende (a non-fibrous amphibole), which was also identified in one of a dust samples collected from the bus station bench.

Serpentinite gravel containing Serpentine minerals was used extensively in the roads and parking lots construction. Serpentinite gravel was used for the secondary roads even within the facilities of Olefins, as well as in many surrounding areas (e.g. parking lot south of the bus station at intersection of roads 285 and 384, see Figure 33).

The gravel, subject to daily traffic movements will continuously release Chrysotile containing dust, thus explaining the highest Chrysotile results in dust present on the exterior, in the vicinity of the roads. Valdez (9) pointed out that vehicle rims along the inside surface of the wheels were found to contain Chrysotile fibers and attributed them to Chrysotile containing breaks releasing Chrysotile during friction. The presence of gravel containing Chrysotile releasing fibers while it is being crushed may explain the traces of Chrysotile observed on car wheels on the streets dust, as well as on the dust settled on the bus station bench.

Figure 33. Aggregates containing serpentinite rocks used on the secondary road inside Olefins facility (left) and on a fenced parking lot, south of the bus stop station located at intersection of state Roads 385/384.

The mechanism of fibers release from NOA, probably caused by vehicles crushing Serpentinite gravel, was confirmed by dust studies conducted at the entrance of an active Serpentinite quarry operating in Yauco, as well as from the entrance to a parking area of a youth center located in Mayaguez that is built on serpentinite backfill.

Micro-vacuuming sampling of dust was conducted on the main road, in front on entrance to quarry #17 (quarry Luis A. Gonzalez) located on route PR-121, Sector Cuatro Calles in Yauco (Figure 34). This quarry is active and it has both Environmental Quality Board (JCA) and DRNA permits. Dust sample (D-4-17-ER3) collected from the paved road front of the entrance shows asbestos Chrysotile concentration of approximately 290,000,000 str/cm^2 (see Appendix V-7 for results).

A dust sample was also collected in front of the entrance to "Centro Juvenil de Mayagüez Aguadilla" (see Figure 20). The serpentinite rock present were used for cut and fill for the construction of the project and/or the parking lot. The dust sample (D-M-5-ER1) collected shows asbestos Chrysotile concentration of approximately 75,000,000 str/cm^2 (see Appendix V-7 for results).

The composition of Chrysotile in both samples collected in front of quarries 5 and 17 is consistent with the Al-Fe concentrations identified before in the source rock. It was noted during analysis that Lizardite particles were also present in both samples. All of the serpentine particles (Lizardite and Chrysotile fibers) analyzed contain minor/trace amounts of iron and/or aluminum.

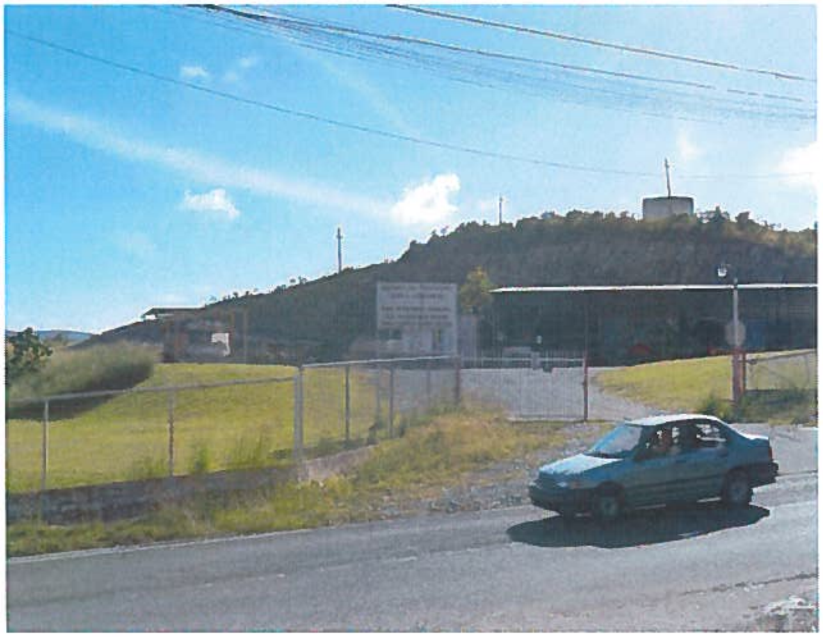


Figure 34. Front entrance to quarry #17 (Luis A. González) located on route PR-121 Sector Cuatro Calles in Yauco.

There are numerous sources for Serpentinite gravel (see Appendix VI). Quarries where serpentinites rocks are/were mined were identified as close as ten (10) miles from the Olefins site. Eleven (11) active serpentinites quarries were identified in the south-west area. During the reconnaissance studies it was also noticed that Serpentinite is the main rock, if not the only rock mined in the southwest part of the island (see Appendix VII). It is used as pavement in several homes and industries especially near the quarries. Industries such as Better Roads, a major asphalt company and several concrete plants use Serpentinite as gravel, as this is common general knowledge.

Serpentinite used as gravel is not the only source of potential contamination observed in Tallaboa Encarnación Community. The anomalies (outliers) observed in Weston results of some of the dust samples, where extremely high concentrations of Chrysotile were observed, may be attributed to activities of renovation/remodeling conducted at some sites. Example of such activities were noted by Weston for property P0008, and they may have affected the PACM (stucco, spray on ceiling) observed on the ceilings of the property. PACM stucco is still present on the first floor. Uncontrolled, dry removal of such friable PACM may results in a very large scale contamination of the surrounding areas.

Construction activities were observed on other properties as well. The church next to the school had a part of its roof remodeled and the corrugated roof panels (assumed to contain asbestos fibers) on the back of the church were removed and replaced by new panels (see Figure 35a and 35b). It is not clear how the abatement/disposal of PACM panels was done.

Figure 35a. General view on the Church, Tallaboa Encarnación Community.

Figure 35b. Side view of Church. Left side the old roof corrugated presumed asbestos containing transite panels are noted. Right side, new metal panels covering the back part of the structure.

Construction waste containing asbestos containing corrugated panels was found approximately 2.2 miles away, on the beach area (See Appendix II for location and photos). Ten (10) samples were collected. Six (6) of the ten (10) samples collected from construction waste and debris present on the beach area are showing presence of Chrysotile asbestos fibers (see Table 13). All the six (6) samples were collected from corrugated transite panels. There is no certainty that any of the construction waste piles containing ACM debris was generated by the church renovation related activities. However, presence of ACM waste thrown on the beach suggest that some renovation activities in the surrounding neighborhoods were not conducted in accordance to federal and local requirements.

Table 13. Positive bulk samples results of the waste piles found on the beach, Tallaboa area.

Sample ID	Description	Result (Percentage of Asbestos)
WP-NB-ER1	Transite Debris, Composite of Piles 1, 2 and 3	30% CHR
WP-NB-ER2	Transite Debris, Various Piles, Debris #2	35% CHR
WP-NB-ER3	Transite Debris, Inside Mangrove Area, Debris #3	25% CHR
WP-NB-ER8	Transite Panels Debris Mixed with Concrete and Plastic, Debris #8	28% CHR
WP-NB-ER9	Large Pile of Transite Debris Mixed with Trash, Debris #9	20% CHR
WP-NB-ER11	Transite Panels Found Inside the Water, Debris #11	20% CHR

Figure 36. General View of waste pile #9 that has transite panels mixed with trash.

8.0 CONCLUSIONS

Mineral assays and compositional matches in aluminum and iron contents of the serpentine minerals show that that main source of dust contaminated with Chrysotile outside Olefins facility is not from the ACM found inside the Olefins facility but rather from NOA (Serpentinite rocks) used as gravel for the dirt roads, parking lots in the areas, or backfill for the asphalt roads. The source of serpentinite is from the local quarries that were and still are active in the south-west part of Puerto Rico. This is an existing condition in that part of the Island where NOA is present, as evidenced by the sampled quarries and roads, as well as by comprehensive research work performed (4, 6) which is not caused by the condition and/or activities at the Olefins Site. Very high concentration of Chrysotile in dust were found at the entrances to a quarry and a parking lot present in the vicinity of NOA.

Contamination caused by deterioration of asbestos containing TSI present in the industrial facilities around the area may have a small contribution to the general high asbestos background observed in the area.

There are additional sources of potential contamination of the Tallaboa Encarnación Community. Uncontrolled renovation/remodeling activities conducted at residential/commercial properties within the community may have affected ACM observed in the area and resulted in a large scale contamination of the surrounding properties. Construction waste containing asbestos containing corrugated panels was found approximately 2.2 miles away, on the beach area. The presence of ACM waste thrown on the beach suggest that some renovation activities in the surrounding neighborhoods were not conducted in accordance to federal and local regulations and requirements.

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10. Nace, EPA Memorandum December, 2014 "Technical review of "Sources of Asbestos Chrysotile Structures along PR2"

ANNEX 1-BUS STATION EXPERIMENT

A.1 The Effect of Dust Sampling Methodology and Samples Preparation Method on the Data

Dust samples collected by Weston during the initial five sampling events (Phases I, IIIA, IIIIB, IIIC and IIID) were collected using wipes and analyzed by TEM using ASTM method D-6480-05. Phase IV of Weston's dust sampling was conducted using micro-vacuuming and ASTM method D-5755-09. Consequently, limitations on the interpretation of the data collected using these methods must be understood as the two sets of data collected by two different methods are not comparable one to each other.

There are three ASTM methods for collection and asbestos analysis of dust samples:

• D 5755, Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading;
• D 5756, Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Mass Surface Loading; and
• D 6480, Test Method for Wipe Sampling of Surfaces, Indirect Preparation, and Analysis for Asbestos Structure Number Concentration by Transmission Electron Microscopy.

These methods collect surface dust by vacuuming, or wiping a surface and use indirect means of sample preparation to disperse the dust particles. The samples are then analyzed by Transmission Electron Microscopy (TEM). The results of the analysis are expressed in numbers, or mass of structures per square centimeter of surface sampled.

The indirect preparation step has been questioned by some since it produces a result that is higher than a direct analysis. The indirect analysis may separate clusters of fibers or matrix materials containing fibers that were originally in a form that may not have been respirable. ASTM standard D6480-05 stipulates that "One or more large asbestos-containing particles dispersed during sample preparation may result in large asbestos surface loading results in the TEM analysis of that sample" (paragraph 5.2).

The sampling method may affect the results as the efficiency of the sampling method is likely to be different for wipes and microvacuum methods. The variability between different types of sampling methods was previously noted by Crankshaw, Perkins and Beard in "Overview of settled dust methods and their relative effectiveness", 2000. They noted that microvac methods tend to more accurately reflect potential re-entrainable asbestos, while wipe samples tend to more accurately reflect all accumulated asbestos. They mentioned however, that the real world samples will be likely to have substantial variability attributable to the samples themselves and not to the method or to the personnel collecting the samples.

The probability that sampling method may affect the results was tested as a part of this study. Dust samples (see results below) were collected from a concrete seat (bench) in a bus station located at the intersection of state roads PR-385 and PR-384. The bus stop investigated (Figure

1) is located at the intersection of state roads PR-385 and PR-384, about 1.6 miles north-west of site (see Appendix I for sampling points locations). Weston sampled this location as a part of background studies conducted on January 2 and 3, 2014 (Sampling phase IIIC). The station was selected for the experiment due to its proximity to a main road, accessibility and presence of a horizontal area easily visible and cleanable. In addition, the distance from site is large enough and the bus station is located on the opposite direction to Tallaboa community that was extensively tested by Weston/EPA. Consequently, the bus station represents conditions for real background conditions not affected by any past abatement activities that occurred at the site.

The original sample collected by Weston from a "bus station seat" during Sampling Phase IIIC, was reported to have Chrysotile concentrations of 160,000 str/cm^2. The sample was collected using ASTM wipes method (D6480). The seat (bench) was sampled by AESI inspectors on 10/2/2014 using micro vacuuming method (ASTM method D5755). The reported result was 6,300 str/cm^2. On 10/23/2014 the bench was resampled, this time using dust wipes method (ASTM D6480). The result was 880,000 str/cm^2. As the sampling events using both sampling methods were performed at different times, the bench was resampled on 11/11/2014, this time using both sampling methods (wipes and micro-vacuum) side by side. The results from 11/11/2014 are showing no structures detected using micro-vacuuming (sample D-NOW-P0036-BS-ER1) and 880,000 str/cm^2 using wipe (sample W-NOW-P0036-BS-ER1, see Table 1).

After completion of the sampling on 11/11/2014, the bench was wet cleaned and resampled on 11/18/2014. The results from 11/18/2014 are showing Chrysotile 10,000 str/cm^2 detected using micro-vacuuming (sample D-NOW-P0036-BS-ER1) and Chrysotile/Tremolite 13,000 str/cm^2 using wipe (sample W-NOW-P0036-BS-ER1, see Table 1).

General View of Sample from Bus Stop
Left Side
D-385-W-ER1

Figure 1. General view of the bus station, intersection state roads PR-385 and PR-384.

Table 1. Summary of Bus Stop Bench Samples. Unless otherwise specified results (str/cm^2) are Chrysotile fibers.

MVA #	Sample I. D.	Sample Description	Date Collected	TEM results [str/cm^2]
Z2133	D-NOW-P0036-BS-ER10	Dust, stop bus bench, rd. 385 int. with rd. 384, northwest of Olefins, between 1 and 2 miles	02 October 2014	6,300
Z2136	BLK-FB-ER13	Field blank	02 October 2014	NAD (A.S. 250)
Z2374	D-385-W-ER1	Dust 10 cm x 10 cm from bench left side bus stop	23 October 2014	880,000
Z2375	D-FB-385-ER2	Field blank	23 October 2014	NAD (A.S. 250)
Z2619	D-NOW-P0036-BS-ER1	Dust on bench bus stop intersection Road 385/384	11 November 2014	NAD (A.S. 4,200)
Z2620	D-NOW-P0036-BS-ER2	Dust under bench bus stop intersection Road 385/384	11 November 2014	NA
Z2621	D-FB-NOW-P0036-BS-ER3	Field blank	11 November 2014	NAD (A.S. 250)
Z2622	W-NOW-P0036-BS-ER1	Wipe on bench bus stop intersection Road 385/384	11 November 2014	880,000
Z2623	W-NOW-P0036-BS-ER2	Wipe under bench bus stop intersection Road 385/384	11 November 2014	NA
Z2624	W-FB-NOW-P0036-BS-ER3	Field blank	11 November 2014	NAD (A.S. 250)
Z2710	D-NOW-P0036-BS-ER1	Dust on bench bus stop intersection Road 385/384	18 November 2014	10,000
Z2711	D-NOW-P0036-BS-ER2	Dust under bench bus stop intersection Road 385/384	18 November 2014	NA
Z2712	D-FB-NOW-P0036-BS-ER3	Field blank	18 November 2014	NAD (A.S. 250)
Z2713	W-NOW-P0036-BS-ER1	Wipe on bench bus stop intersection Road 385/384	18 November 2014	13,000 total chrysotile-8,400 tremolite-4,200
Z2714	W-NOW-P0036-BS-ER2	Wipe under bench bus stop intersection Road 385/384	18 November 2014	NA
Z2715	W-FB-NOW-P0036-BS-ER3	Field blank	18 November 2014	NAD (A.S. 250)

NA = Not analyzed. NAD = No Asbestos Detected (A.S. = Analytical Sensitivity)

The major difference between the results of two sampling methods (microvacuum/wipes) is attributed to presence of asbestos bundles that break down to small fibers during the aggressive sampling performed using wipes. One bundle of Chrysotile fibers (see Figures 2, 3 and 4) can generate numerous of fibers of various sizes. During sampling the large bundles disintegrated and converted to fibers, or smaller bundles.

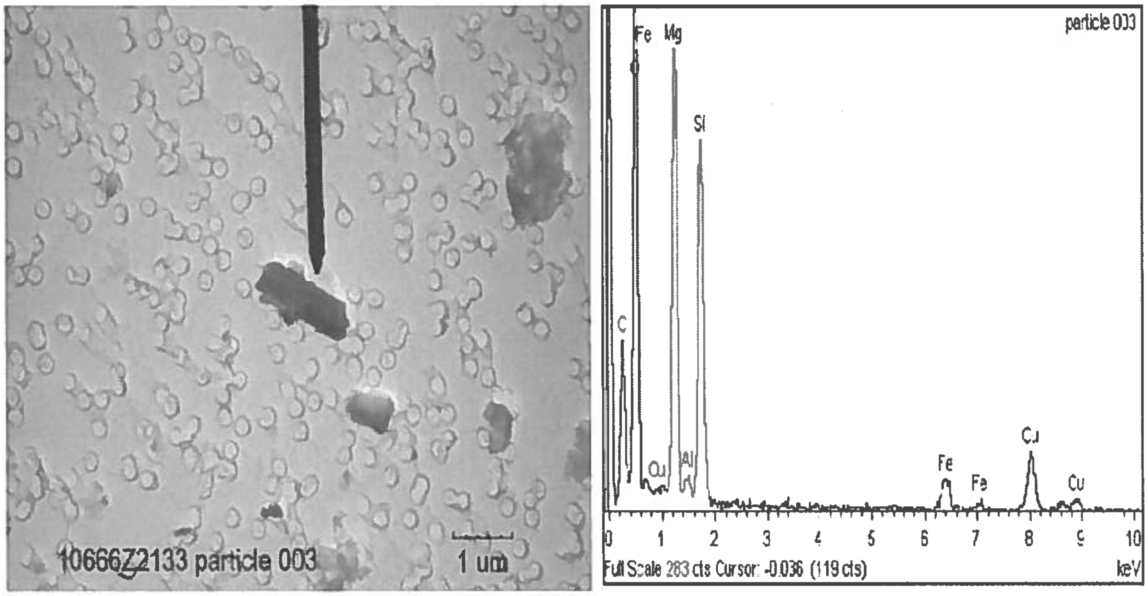
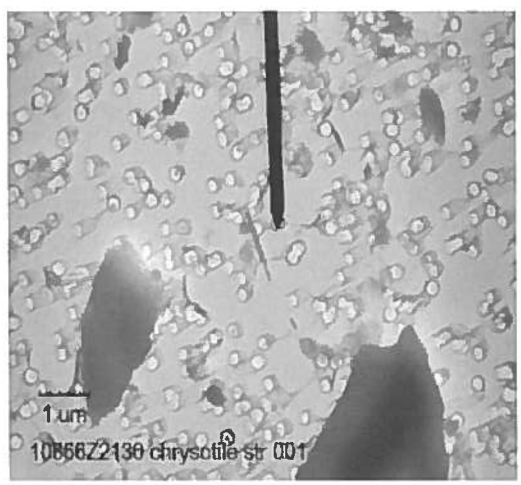


Figure 2. TEM image (left) and EDS spectrum (right) of a Chrysotile asbestos bundle detected in sample D-NOW-P0036-ER10 collected from the bus stop bench located at intersection of state roads PR-385 and PR-384, Penuelas.

Large bundles of Chrysotile were observed during microscopical investigation of additional samples collected by AESI using micro-vacuuming. As an example below (Figure 3), there is a Chrysotile bundle (left photo) collected from the floor of Exchange Boiler Specialist (MVG sample I.D#-Z2130; AESI sample #D-TEC-ARE-PO006-ER7). The bundle, as seeing by Polarized Light Microscopy (PLM) is about 275um long and 50 um wide. As the bundle is made of soft fibers, applied pressure when collecting the wipe sample may convert it to either individual fibers (see right photo below, same sample seeing by TEM), or maybe smaller bundles.

PLM image of a Chrysotile Bundle



TEM image of a Chrysotile fiber (middle gray)

Figure 3. Chrysotile bundles and fibers as viewed by PLM (left and TEM right)

A.2 The Bus Stop Bench Sampling Experiment

The results of the bus stop bench sampling were discussed in section A.1, as related to the effect of sampling method on the concentration of asbestos structures reported. The last part of the sampling experiment was intended to assess whether asbestos fibers are continuously settling on the bench, or the results are representative of asbestos fibers that settled in the past during abatement activities that may have disturbed ACM. As previously pointed out, after completion of the wipe/micro-vacuum sampling activities on 11/11/2014, the area of the bench sampled was wet cleaned and resampled on 11/18/2014. The photos collected on 11/18/204 show accumulation of dust that was not there after a clean-up was performed on 11/11/2014 (see Figure 4). Chrysotile fibers were detected in both dust wipes and micro-vacuum samples (See Table 2). The results from 11/18/2014 are showing Chrysotile concentrations of 10,000 str/cm^2 detected using micro-vacuum (sample D-NOW-P0036-BS-ER1) and total asbestos fibers of 13,000 str/cm^2 using wipe (sample W-NOW-P0036-BS-ER1, see Table 2). Chrysotile (8,400 structures/cm^2) and Tremolite (4,200 structures/cm^2) were found in the wipe sample. Tremolite found in the dust wipes sample was not detected before in any of the samples collected.

The presence of Chrysotile and Tremolite in the settled dust after the bench clean-up conducted by AESI inspector, suggest that contamination of the area is not related to a single event in the past but it is a dynamic event caused continuously by either daily winds, vehicles passing nearby stirring up the settled dust, or crushing of gravel (present in the parking lot south of the station) subject to daily traffic movement (see Section 7). The fingerprinting of the dust sample collected by AESI in the bus station suggested that not only Chrysotile but also Lizardite are present in one of the bus station samples. The consequences of Lizardite/Chrysotile appearances are discussed in Section 6.2 and are related to Natural Occurring Asbestos (NOA) rocks.

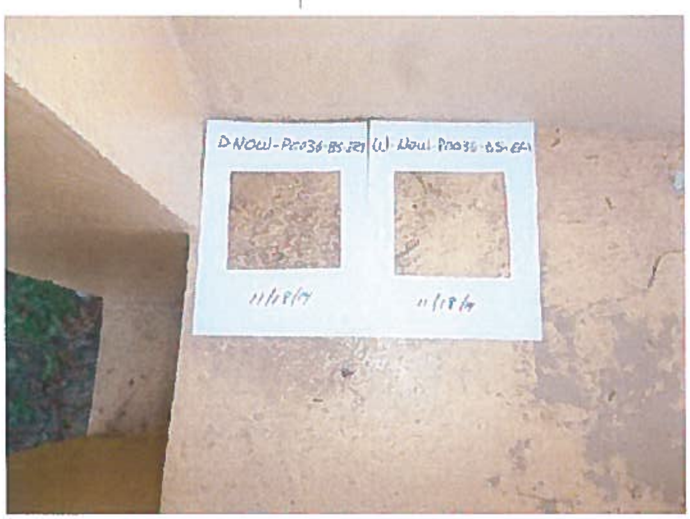


Figure 4. Bus station at intersection of state roads PR-385 and PR-384 prior to wipe/micro-vacuum side by side. Sampling conducted on 11/18/2014.

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Appendix I

Site Location of Olefin Facilities, Peñuelas, Puerto Rico

PERMIT #1

OCTOBER 2010
PIPES AND TANK
AREAS #1 & 2

NOVEMBER 2010
AREAS # 2 & 3

DECEMBER 2010
AREAS #3 & 4

JANUARY 2011
AREAS #3, 4 & 5

FEBRUARY 2011
AREA #5

MARCH 2011
AREA #5

APRIL 2011
AREA #5

MAY 2011
AREA #5

JUNE 2011
AREA #5

JULY 2011
EXTERIOR & INTERIOR AREA #5B
BOILER #1 EXTERIOR AREA #5A
AREA #5A HORIZONTAL TANKS
AREA #7 WEST SIDE OF TANKS, SOUTHEAST FLOOR, AREA
FRONT OF HMK TRAILER
EXTERIOR & INTERIOR AREA #7 PIPES
EXTERIOR BOILER #2
EXTERIOR AREA #7 PIPES
BAGOUT BOILER #2"
EXTERIOR AREA #7 BOILER #2
EXTERIOR AREA #7 CHIMNEY

AUGUST 2011
BAGOUT AREA #7
EXTERIOR AREA #7 CHIMNEY #2
REMOVAL EXTERIOR AREA #7
REMOCAL AREA #7
BOILER # 1 EXTERIOR AREA #7
EXTERIOR AREA # 7 TUBERÍA
EXTERIOR AREA # 7
EXTERIOR AREA #7 CHIMNEY 1
EXTERIOR CHIMNEY #2
EXTERIOR CHIMNEY #1
INTERIOR BOILER #2
EXTERIOR CHIMNEY #2
INTERIOR CHIMNEY #2

SEPTEMBER 2011
INTERIOR CHIMNEY #2
BAGOUT BOILER #2
PIPES EXTERIOR AREA#7
BAGOUT AREA #7
PIPES EXTERIOR AREA#7
EXTERIOR AREA #7

PERMIT #2

NOVEMBER 2011
NO WORK PERFORMED

PERMIT #2 (CONT.)

DECEMBER 2011
REM PIPES INSULATION 2ND/3RD FLOOR BOILER #2
REM & BAGOUT PIPES ON 2ND/3RD FLOOR BOILER #2 BACKGROUND BOILER #3
CLEANING PIPES ON 2ND/3RD FLOOR BOILER #2
CLEANING & BAGOUT PIPES INSULATION AT BOILER #2
CLEANING BAGOUT & CLEARANCES PIPES INSULATION AT BOILER #2
REM PIPES INSULATION AT BOILER #3
REM & BAGOUT PIPES INSULATION BOILER #3
REM PIPES INSULATION RACK & BOILER #3
REM & BAGOUT PIPES INSULATION BOILER #3
REM & BAGOUT PIPES INSULATION BOILER #3 & BACKGROUNDS BOILER #4
REM TRANSITE PANELS & CLEARANCE ENCLOSURE BOILER #3
REM TRANSITE PANELS & RACK INSULATION BOILER #3
REM RACK INSULATION FRONT OF BOILER #3

JANUARY 2012
REM RACK INSULATION FRONT OF BOILER #3
REM RACK INSULATION & BAGOUT FRONT OF BOILER#3
REM.TSI BOILER #4 TOP FLOOR
REM. TSI BOILER #4 THIRD FLOOR AND BAGOUT
REM PIPES INSULATION & BAGOUT BOILER #4
REM & BAGOUT PIPES INSULATION BOILER #4
REM. INSULATION AREA #10 AN BACKGROUND AREA#10

FEBRUARY 2012
REM TRANSITE PANELS BOILER #4 & BACKGROUND BOILER
REM TRANSITE PANELS BOILER #4 & CLEARANCE ENCLOSURE BOILER #4
REM TRANSITE PANEL BOILER #4
TRATAMIENTO DE REMOCIÓN DE ASBESTO DEL AREA #10 PRO CARIBE
REM PIPES INSULATION BOILER #3
REM PIPES INSULATION BOILER#4
REM PIPES INSULATION BOILER #5
REM.RACK CENTRAL
CLEARANCE BOILER #5 & BACKGROUND
REM. INSULATION RACK CENTRAL
REM PIPES INSULATION BOILER#6

MARCH 2012
REM PIPES INSULATION BOILER #6
REM. INSULATION RACK CENTRAL
BLACKOUT AREA CENTRAL CLEARS BOILER #6
REM. TRANSITE BOILER #5
REM. TRANSITE BOILER #6
REM.RACK CENTRAL
REM. INSULATION CENTRAL

APRIL 2012
REM. INSULATION RACK CENTRAL
REM. RACK CENTRAL
REM. TRANSITE BOILER #6
REM. RACK BACKGROUND AREA #8
REM. RACK CENTRAL CLEARANCE TRANSITE BOILER #6
REM AREA #8
REM. INSULATION AREA #8

MAY 2012
BAG OUT
BAG OUT CONTROL ROOM
BAGOUT CONTROL ROOMONTROL POR CARIBE
BAGOUT CUARTO DE CONTROL
BAGOUT CONTROL ROOM AND CLEANING
BAGOUT AND CLEANING CONTROL ROOM
REM ASBESTO RACK CENTRAL
INSULATION REMOVAL AREA #9 AND BAGOUT

JUNE 2012

BAGOUT CONTROL ROOM
REMOVAL RACK CENTRAL
REMOVAL RACK CENTRAL PRO CARIBE
REMOVAL AREA 9 CENTRAL RACK
TSI REMOVAL AREA 9

JULY 2012
REMOVAL INSULATION AREA #9
TSI REMOVAL AREA #9

AUGUST 2012
REMOVAL INSULATION AREA #10

SEPTEMBER 2012
TSI REMOVAL AREA #9
REMOVAL PIPES RACK AREA

PERMIT #3

FEBRUARY 2013
AREA 10 Y 11

MARCH 2013
AREA 11

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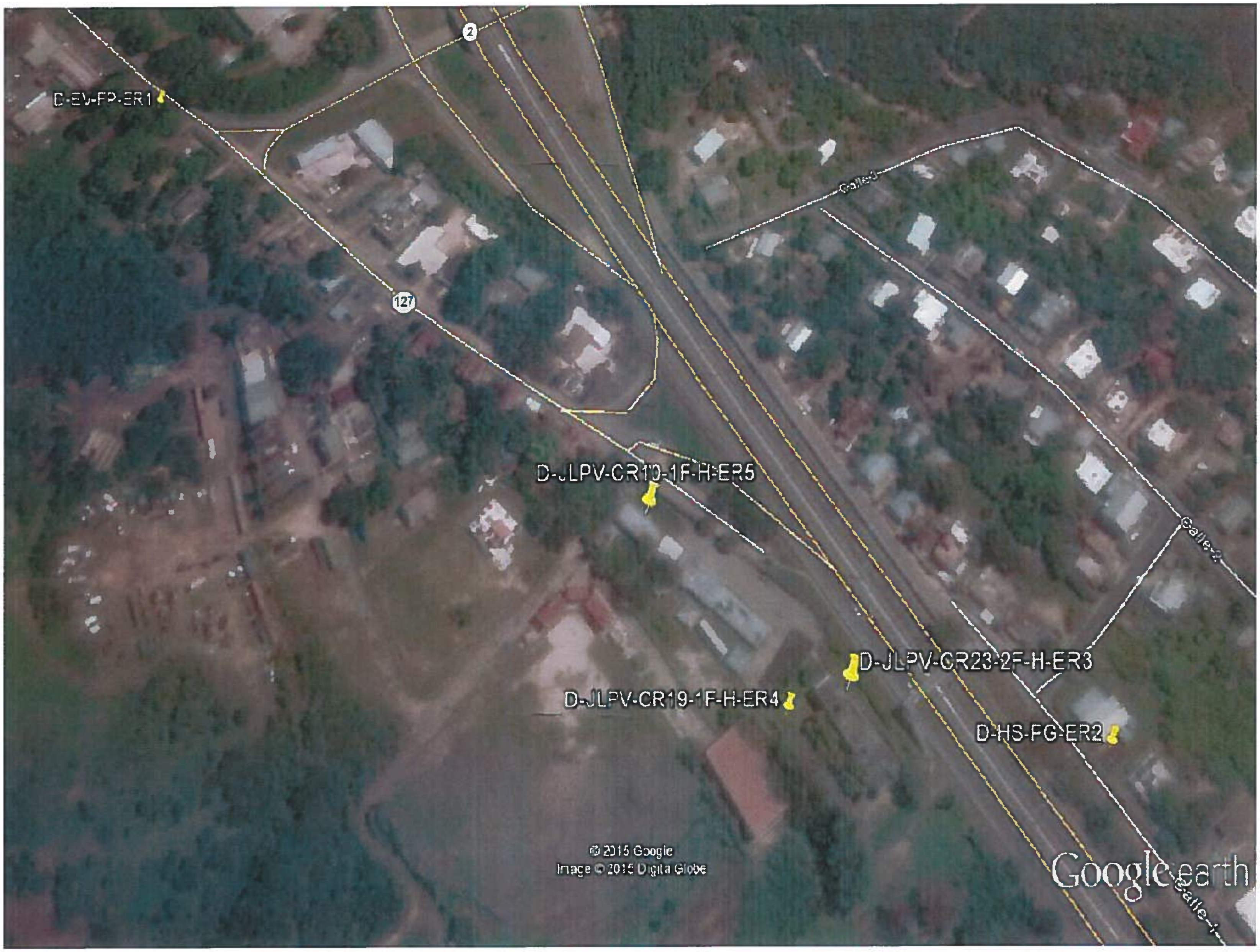
Appendix II

Location of Dust Sampling Points around Olefin Main Facility, Peñuelas, PR (10/1/14)



ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	Toro & Arsuaga, PSC	**Project Name:**	Dust studies-Olefin Site, Peñuelas
Address:	PO Box 11064, San Juan PR 00922-1064	**Sampling Date:**	10/1/14
Contact:	Rafael Toro Ramírez	**Collected by:**	Elme Rivera, Mildred Santi
Phone/Fax	787-783-7721/787-793-1146	**Company Name:**	AESI

Chain of Custody Record

COC-AIR-009/REV 1/06

	Sample Description	Pump	TIME		FLOW RATE							Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	Latitude (W)	Longitude (N)	ASTM D5755		
D-EV-FP-ER1	Dust, floor, front porch entrance stair, El Velorio restaurant	LV-237	14:52	14:54	2.00	2.00	2.00	4.0	17.99949	-66.72264	X		
D-HS-PG-ER2	Dust, floor, exterior next to playground, Head Start	LV-237	15:10	15:12	2.00	2.00	2.00	4.0	17.99692	-66.71860	X		
D-JLPV-CR23-2F-H-ER3	Dust, floor, hallway 2nd floor, Adm Building, JLPV School	LV-237	16:06	16:08	2.00	2.00	2.00	4.0	17.99724	-66.71924	X		
D-JLPV-CR19-1F-H-ER4	Dust, floor, hallway, bldg. next to basketball court, JLPV School	LV-237	16:15	16:17	2.00	2.00	2.00	4.0	17.99712	-66.71952	X		
D-JLPV-CR10-1F-H-ER5	Dust, floor, hallway, 1st. bldg. JLPV School	LV-237	16:24	16:26	2.00	2.00	2.00	4.0	17.99775	-66.72009	X		
BLK-ER7	Field Blank												

Turnaround Time: Normal: X Rush: Super Rush:

Comments: *Area of collection of the samples is 100 cm^2

Relinquished By:	[signature]	Date/Time	10/2/14 15:00	**Delivered Directly to Lab:**	**Shipped:**
Received By:	F. y. R.	Date/Time	10/2/14 15:05	**Method of Shipment:**	
Relinquished By:		Date/Time		**Lab. Recipient:**	
Received By:		Date/Time		**Date:**	

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	1290	Project Name:	PRC23673
Address:		Sampling Date:	10/1/14
Contact:		Collected by:	Elme Rivera, Mildred Santiago
Phone/Fax		Company Name:	AESI

Chain of Custody Record

COC-AIR-009/REV 1/06

Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Latitude (X)	Longitude (Y)	Dust Finguerprints	LAB ID #
D-EV-FP-ER1	Dust, floor, front porch entrance stair, El Velorio restaurant	LV-237	14:52	14:54	2.00	2.00	2.00	4.0	17.99949	-66.72264	X	
D-HS-PG-ER2	Dust, floor, exterior next to playground. Head Start	LV-237	15:10	15:12	2.00	2.00	2.00	4.0	17.99692	-66.71860	X	
D-JLPV-CR23-2F-H-ER3	Dust, floor, hallway 2nd floor, Adm. Building, JLPV School	LV-237	16:06	16:08	2.00	2.00	2.00	4.0	17.99724	-66.71924	X	
D-JLPV-CR19-1F-H-ER4	Dust, floor, hallway, bldg. next to basketball court, JLPV School	LV-237	16:15	16:17	2.00	2.00	2.00	4.0	17.99712	-66.71952	X	
D-JLPV-CR10-1F-H-ER5	Dust, floor, hallway, 1st. bldg. JLPV School	LV-237	16:24	16:26	2.00	2.00	2.00	4.0	17.99775	-66.72009	X	
BLK-ER7	Field Blank										X	

Turnaround Time: Normal: X Rush: Super Rush:

Comments: *Area sampled is 100 cm^2 **Method of collection - ASTM D5755

Relinquished By:	Kj	Date/Time	10/3/14	Delivered Directly to Lab:	Shipped:
Received By:		Date/Time		Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

El Velorio General View

El Velorio, Entrance Stair

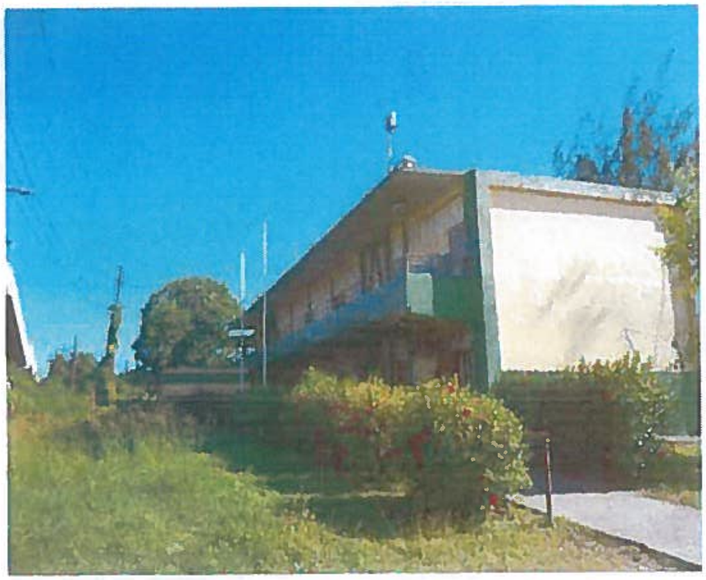
Sampling Point: D-EV-FP-ER1
EL Velorio, Entrance Stair
Area Sampled 100 cm^2

Photographic Documentation Log 10/1/14

Head Start General View

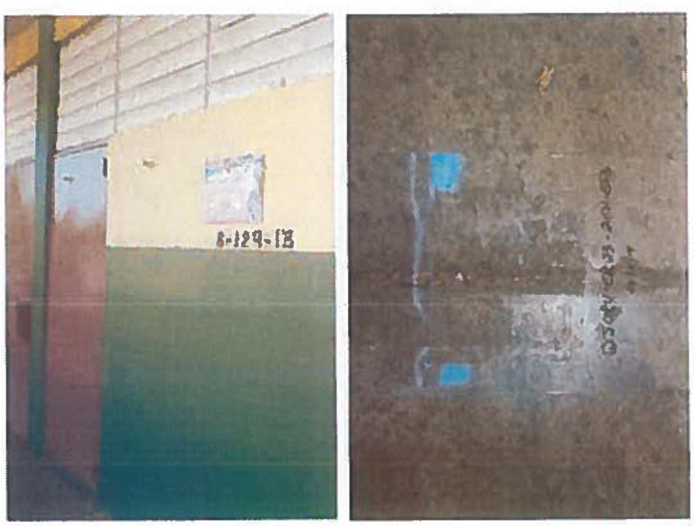
Head Start, Next to Playground
Sampling Point: D-HS-PG-ER2

Head Start, Next to Playground
Sampling Point: D-HS-PG-ER2
Area Sampled 100 cm^2



Jorge Lucas Pérez Valdivieso School
Administration Building
General View

Jorge Lucas Pérez Valdivieso School
Administration Building
Hallway 2nd Floor



Jorge Lucas Pérez Valdivieso School
Administration Building
Hallway 2nd Floor
Sampling Point: D-JLPV-CR23-2FH-ER3
Area Sampled 100 cm^2

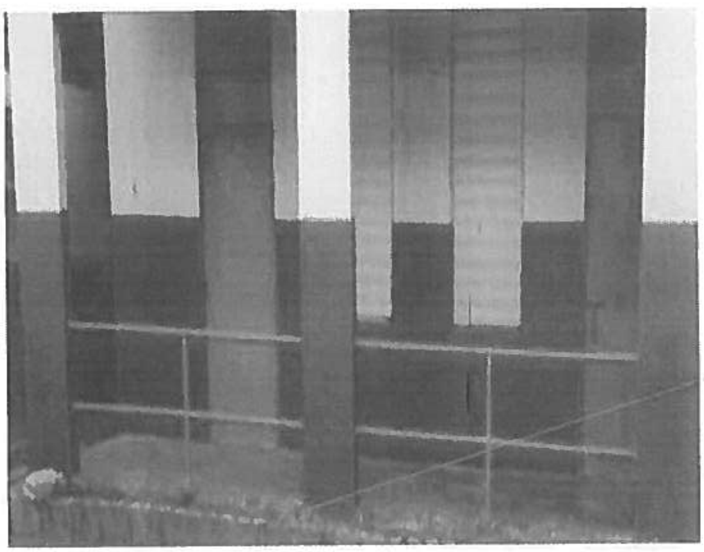
Photographic Documentation Log 10/1/14

Jorge Lucas Pérez Valdivieso School
Structure Behind Administration Bldg.
General View

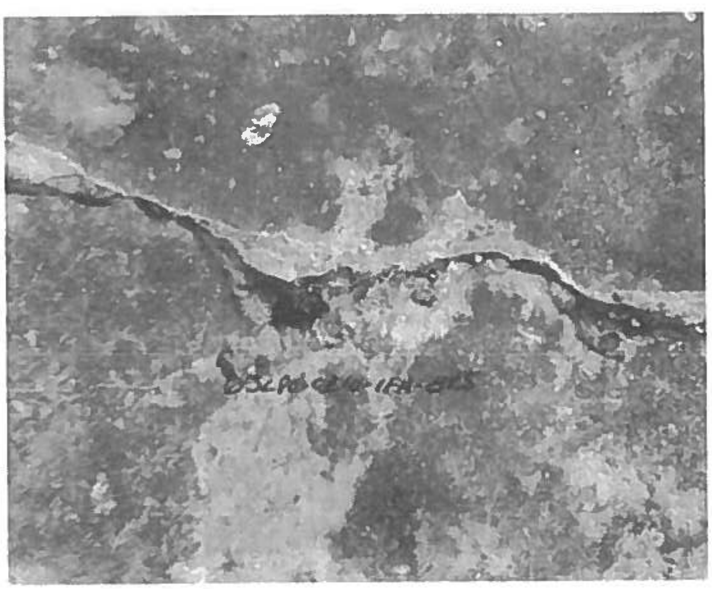
Jorge Lucas Pérez Valdivieso School
Structure Behind Administration Bldg.
Sampling Point: D-JLPV-CR19-1FH-ER4
Area Sampled 100 cm^2

Jorge Lucas Pérez Valdivieso School
Structure Behind Administration Bldg.
Sampling Point: D-JLPV-CR19-1FH-ER4
Area Sampled 100 cm^2

Jorge Lucas Pérez Valdivieso School
Ist Structure at the Right of the
School Entrance
General View



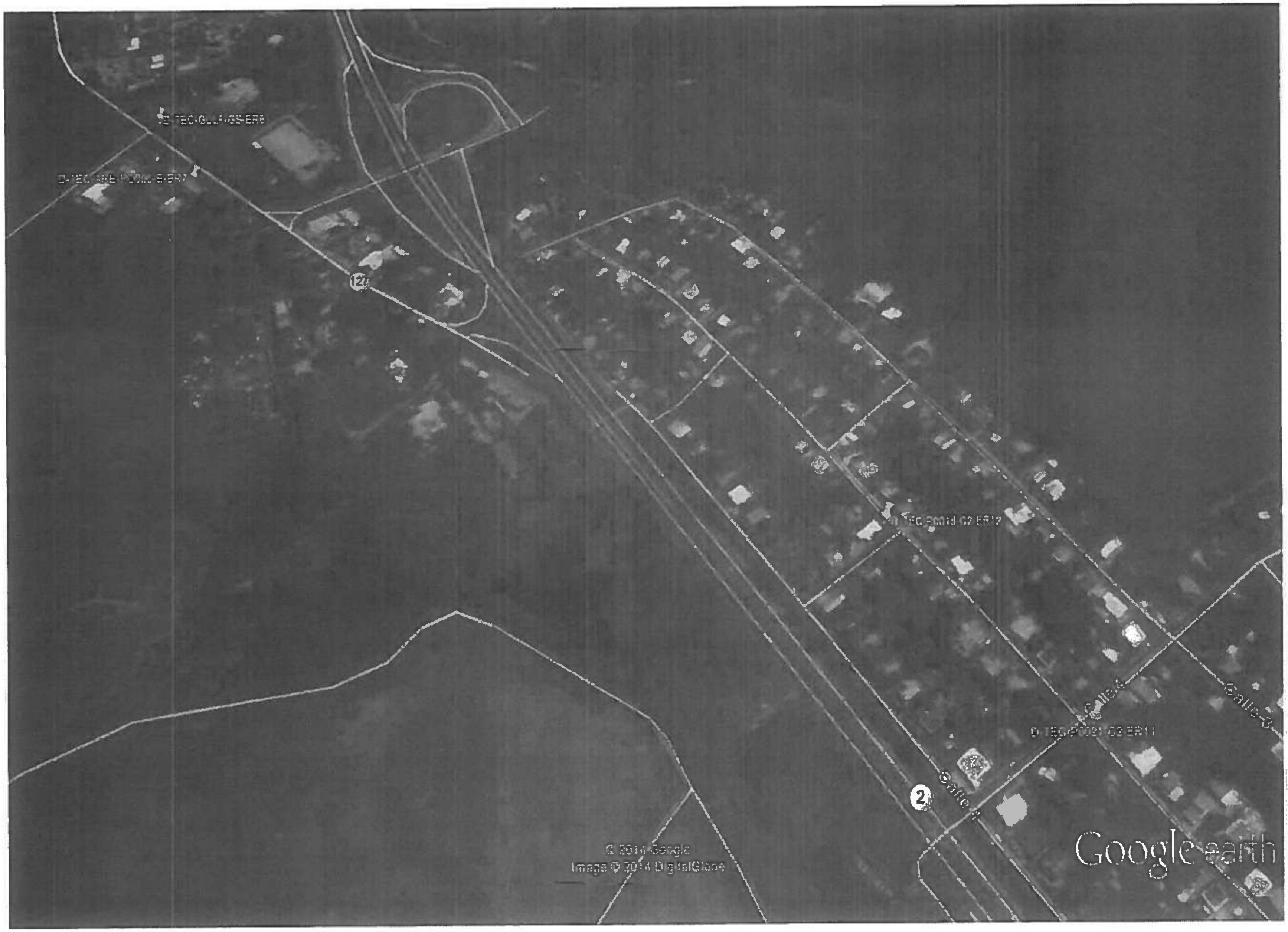
Jorge Lucas Pérez Valdivieso School
Ist Structure at the Right of the
School Entrance
Sampling Point: D-JLPV-CR10-1FH-ER5
Area Sampled 100 cm^2



Jorge Lucas Pérez Valdivieso School
Ist Structure at the Right of the
School Entrance
Sampling Point: D-JLPV-CR10-1FH-ER5
Area Sampled 100 cm^2

Location of Dust Sampling Points around Olefin Main Facility, Peñuelas, PR (10/2/14)

Location of Dust Sampling Points around Olefin Main Facility, Peñuelas, PR (10/2/14)



Location of Dust Sampling Points around Olefin Main Facility, Peñuelas, PR (10/2/14)

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: ~~(787) 722-0220~~; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	Toro & Arsuaga, PSC	**Project Name:**	Dust studies-Olefin Site, Peñuelas
Address:	PO Box 11064, San Juan PR 00922-1064	**Sampling Date:**	10/2/14
Contact:	Rafael Toro Ramírez	**Collected by:**	Elme Rivera, Mildred Santiago
Phone/Fax	787-783-7721/787-793-1146	**Company Name:**	AESI

Chain of Custody Record

COC-AIR-009/REV 1/06

Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Latitude (W)	Longitud (N)	ASTM D5755	Other	LAB ID #
D-TEC-ARE-PO006-E-ER7	Dust, floor, AR Exchanger Boiler Specialist exterior, Tallaboa Encarnacion Community	LV-238	10:37	10:39	2.00	2.00	2.00	4.0	17.99976	-66.72311	X		
D-TEC-GULF-GS-ER8	Dust, floor, Gulf Facility entrance, Tallaboa Encarnacion Community	LV-238	10:56	10:58	2.00	2.00	2.00	4.0	18.00052	-66.72366	X		
D-NOW-P0035-TB-ER9	Dust, behind traffic barrier Rd. 384 Km 3.2, north west of Olefin, between 1 and 2 miles radius	LV-238	11:26	11:28	2.00	2.00	2.00	4.0	18.03051	-66.72896	X		
D-NOW-P0036-BS-ER10	Dust, stop bus bench, Rd. 385 intersection with Rd. 384, north west of Olefin, between 1 and 2 miles radius	LV-238	11:39	11:41	2.00	2.00	2.00	4.0	18.03041	-66.72598	X		
D-TEC-P0021-C2-ER11	Dust, floor, street 2 intersection street 4, Tallaboa Encarnacion Community	LV-238	12:04	12:06	2.00	2.00	2.00	4.0	17.99489	-66.71612	X		
D-TEC-P0018-C2-ER12	Dust, floor, corner street 2 toward Oleifin, Tallaboa Encarnacion Community	LV-238	12:16	12:18	2.00	2.00	2.00	4.0	17.99620	-66.71720	X		
BLK-FB-ER13	Field Blank												

Turnaround Time: Normal: X Rush: Super Rush:

Comments: *Area of collection of the samples is 100 cm^2

Relinquished By:	[signature]	**Date/Time**	10/2/14 15:00	**Delivered Directly to Lab:** **Shipped:**
Received By:	[signature]	**Date/Time**	10/2/14 15:[illegible]	**Method of Shipment:**
Relinquished By:		**Date/Time**		**Lab. Recipient:**
Received By:		**Date/Time**		**Date:**

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Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name: 1290
Address:
Contact:
Phone/Fax

Project Name: PRC 23673
Sampling Date: 10/2/14
Collected by: Elme Rivera, Mildred Santiago
Company Name: AESI

Chain of Custody Record

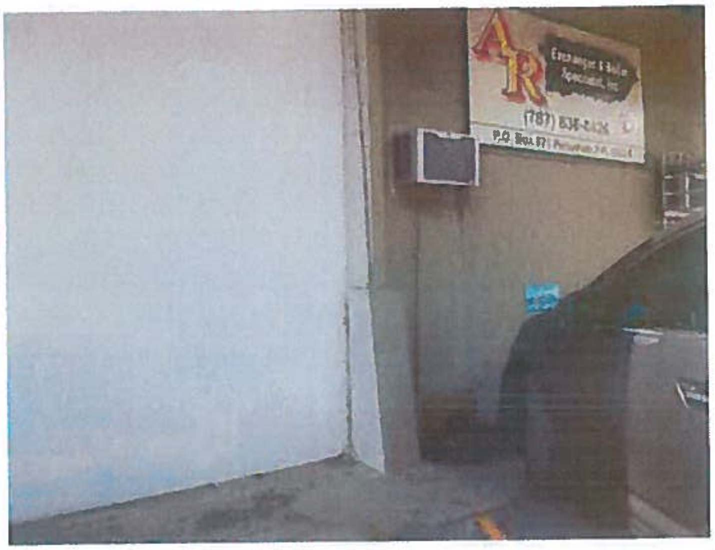
COC-AIR-009/REV 1/06

Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Latitude (X)	Longitude (Y)	Dust Finguerprints	LAB ID #
D-TEC-ARE-PO006-E-ER7	Dust, floor, AR Exchanger Boiler Specialist exterior, Tallaboa Encarnacion Community	LV-238	10:37	10:39	2.00	2.00	2.00	4.0	17.99976	-66.72311	X	
D-TEC-GULF-GS-ER8	Dust, floor, Gulf Facility entrance, Tallaboa Encarnacion Community	LV-238	10:56	10:58	2.00	2.00	2.00	4.0	18.00052	-66.72366	X	
D-NOW-P0035-TB-ER9	Dust, behind traffic barrier Rd. 384 Km 3.2, north west of Olefin, between 1 and 2 miles radius	LV-238	11:26	11:28	2.00	2.00	2.00	4.0	18.03051	-66.72896	X	
D-NOW-P0036-BS-ER10	Dust, stop bus bench, Rd. 385 intersection with Rd. 384, north west of Olefin, between 1 and 2 miles radius	LV-238	11:39	11:41	2.00	2.00	2.00	4.0	18.03041	-66.72598	X	
D-TEC-P0021-C2-ER11	Dust, floor, sidewalk front of house corner street 2 intersection street 4, Tallaboa Encarnacion Community	LV-238	12:04	12:06	2.00	2.00	2.00	4.0	17.99489	-66.71612	X	
D-TEC-P0018-C2-ER12	Dust, floor, corner street 2, west of street 2 Tallaboa Encarnacion Community	LV-238	12:16	12:18	2.00	2.00	2.00	4.0	17.99620	-66.71720	X	
BLK-FB-ER13	Field Blank										X	

Turnaround Time: Normal: ✓ Rush: Super Rush:

Comments: *Area sampled is 100 cm^2 **Method of collection - ASTM D5755

Relinquished By:	K. ...	Date/Time	10/3/14	Delivered Directly to Lab:	Shipped:
Received By:		Date/Time		Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	



Tallaboa Encarnación Community
AR Exchanger & Boiler Specialist
General View

Tallaboa Encarnación Community
AR Exchanger & Boiler Specialist
Sampling Point: D-TEC-ARE-P0006-E-ER7
Area Sampled 100 cm^2

Tallaboa Encarnación Community
AR Exchanger & Boiler Specialist
Sampling Point: D-TEC-ARE-P0006-E-ER7
Area Sampled 100 cm^2

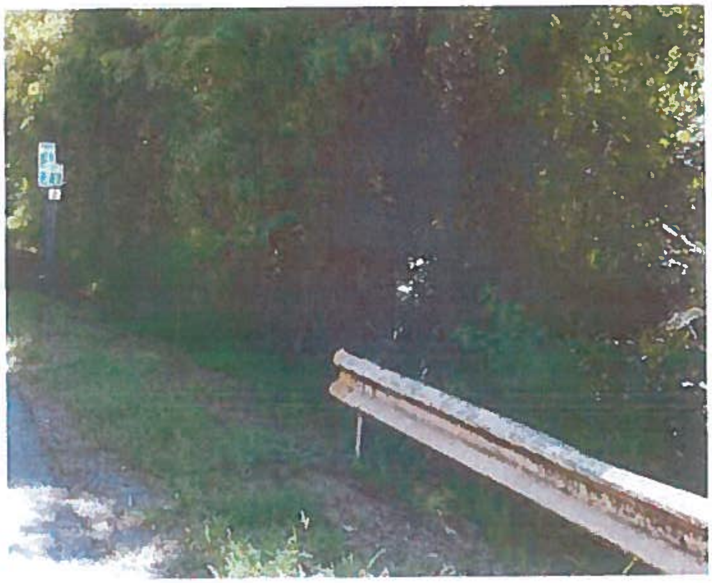
Photographic Documentation Log 10/2/14

Tallaboa Encarnación Community
Gulf Facility
General View

Tallaboa Encarnación Community
Gulf Facility
Sampling Point: D-TEC-GULF-GS-ER8
Area Sampled 100 cm^2

Tallaboa Encarnación Community
Gulf Facility
Sampling Point: D-TEC-GULF-GS-ER8
Area Sampled 100 cm^2

Photographic Documentation Log 10/2/14



North Side of Olefin
Km. 3.2
General View

North Side of Olefin
Km. 3.2
Sampling Point: D-NWO-P0035-TB-ER9
Area Sampled 100 cm^2

North Side of Olefin
Km. 3.2
Sampling Point: D-NWO-P0035-TB-ER9
Area Sampled 100 cm^2

North Side of Olefin
Intersection of Road 384-385
Bus Stop
General View

North Side of Olefin
Intersection of Road 384-385
Bus Stop
Sampling Point: D-NWO-P0036-BS-ER10
Area Sampled 100 cm^2

Photographic Documentation Log 10/2/14

Tallaboa Encarnación Community
Street 2 Intersection of Street 4
General View

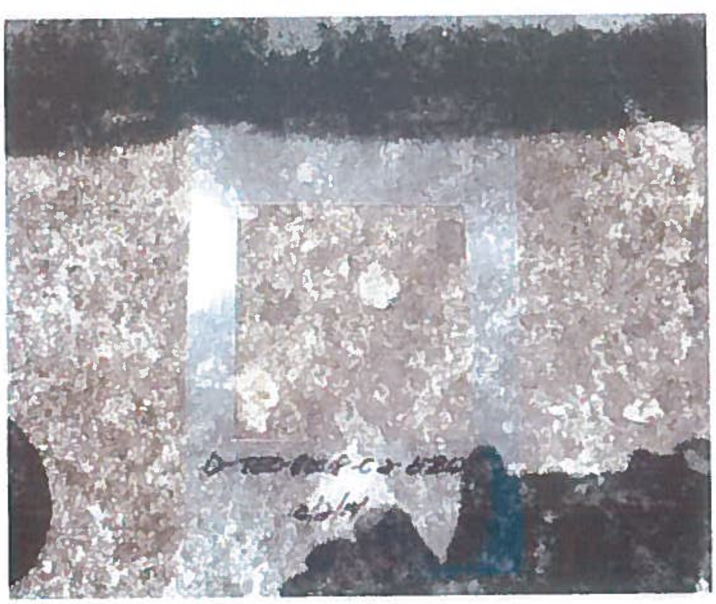
Tallaboa Encarnación Community
Street 2 Intersection of Street 4
Sampling Point: D-TEC-P0021-C2-ER11
Area Sampled 100 cm^2

Tallaboa Encarnación Community
Street 2 Intersection of Street 4
Sampling Point: D-TEC-P0021-C2-ER11
Area Sampled 100 cm^2

Photographic Documentation Log 10/2/14

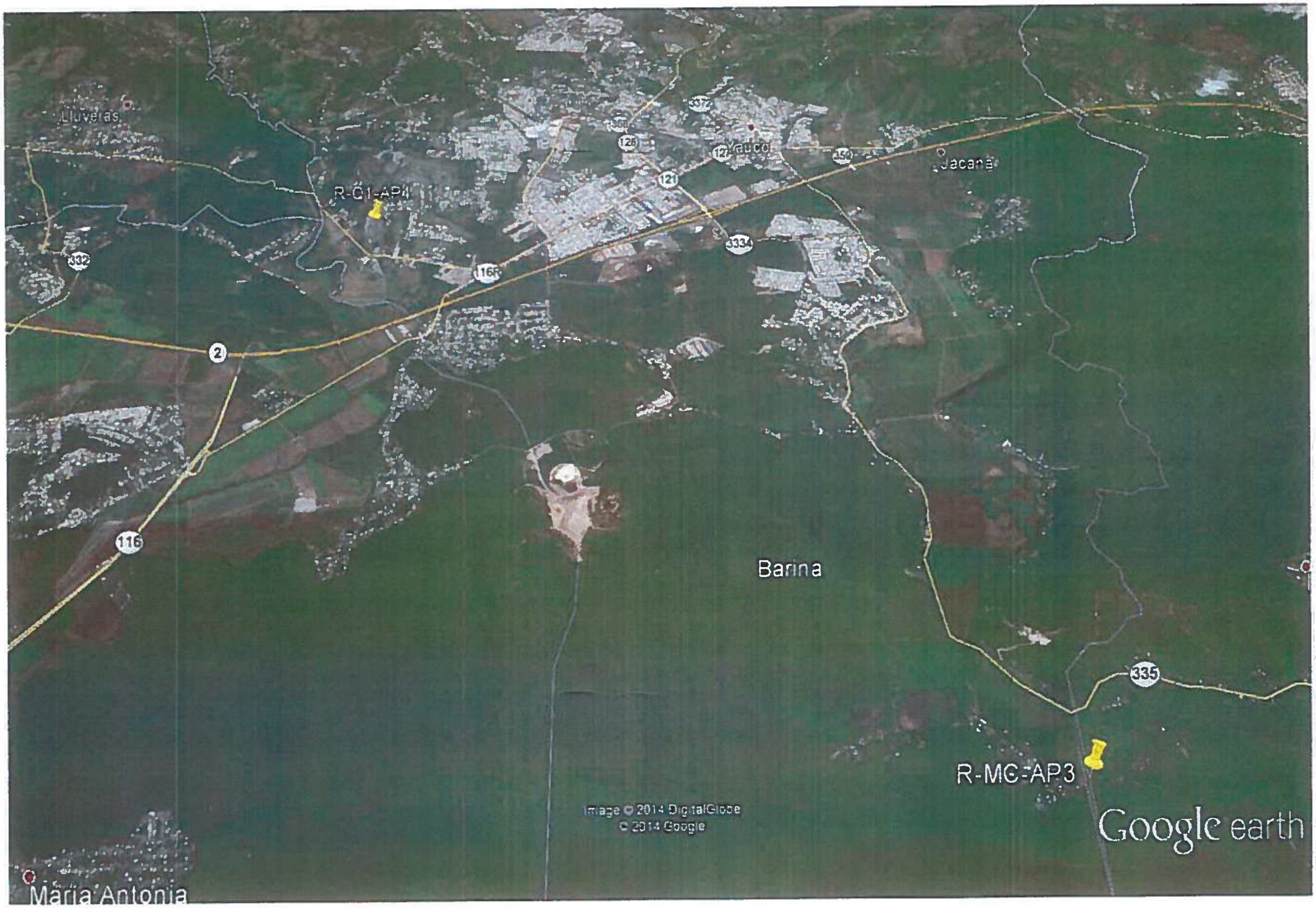
Tallaboa Encarnación Community
West of Street 2
General View

Tallaboa Encarnación Community
West of Street 2
Sampling Point: D-TEC-P0018-C2-ER12
Area Sampled 100 cm^2



Tallaboa Encarnación Community
West of Street 2
Sampling Point: D-TEC-P0018-C2-ER12
Area Sampled 100 cm^2

Location of Rock Samples from Yauco Quarry and Media Quijada (10/12/14)



ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name: Toro y Arsuaga, PSC
Address: P.O. Box 11064, San Juan, PR 00922
Contact: Rafael Toro Ramirez
Phone/Fax: 787-793-7774

Project Name: Dust studies - Olefin Site
Site Location: Penuelas
Samplers Name: Ady Pedan
Company: AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
R-MC-AP3	Serpentenite from Media Quijada	10/12/14	12:15	✓	✓	17°58'57.7N 66°50'07.8W	58878
R-Q1-AP4	Serpentenite from Quarry 1, Yauco	10/12/14	13:46	✓	✓	18°1'26.21"N 66°52'50.05"W	58879

Turnaround Time: Normal: ✓ Rush:

Relinquished By:	Ady Pedan
Date/ Time:	10/16/14 17:00
Received By:	[signature]
Date/ Time:	10/16/14 17:00
Relinquished By:	
Date/ Time:	
Received By:	
Date/ Time:	

Delivered Directly to Lab: **Shipped:**

Method of Shipment:

Lab. Recipient:

Date:

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Ph: (787) 722-0220 Fax: (787) 724-5788

Corrected COCR

Transmittal Sheet for Bulk Sample Analysis

Client Name: 1290
Address:
Contact:
Phone/Fax:

Project Name: Dust Sampling
Site Location: Penuelas
Samplers Name: Ady Padan
Company: AESI

Chain of Custody Record

COC-BULK-011/REV 1/06

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected		Analysis Required		Comments	Laboratory I.D.
		Date	Time	PLM	Other		
R-MC-AP3	serpentinite from media quijada	10/12/14	12:15	X	Dust Fingerprints		58878
R-QI-AP4	serpentinite from quarry 1, Yauco	10/12/14	13:46	X	Dust Fingerprints		58879

Turnaround Time: Normal: X Rush:

Relinquished By:	[signature]
Date/ Time:	10/17/14 15:05
Received By:	
Date/ Time:	
Relinquished By:	
Date/ Time:	
Received By:	
Date/ Time:	

Delivered Directly to Lab: Shipped:

Method of Shipment:

Lab. Recipient:

Date:

Serpentine from Media Quijada
R-MC-AP3

Serpentine from Quarry 1, Yauco
R-Q1-AP4

Location of Dust Sampling Points inside Olefin Main Facility, Peñuelas, PR (10/23/14)

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Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	Toro & Arzuaga	Project Name:	Ortin
Address:		Sampling Date:	10/23/14
Contact:		Collected by:	Elmer Rivera 120206072 AS
Phone/Fax		Company Name:	AESI

Chain of Custody Record

	Sample Description	Pump	TIME		FLOW RATE				Asbestos	Asbestos	Lead	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Final	Volume	PCM	TEM	Air		
D-OL-FF-E22	Sample on top of pipe surface from Front Floor area	LL-238	12:30	12:32	2.0	2.0	2.0	4		Dust Fingerprint ✓			
D-OL-SM-E26	Sample from surface of metal scrap in front at area where the crane was	LL-238	12:54	12:56	2.0	2.0	2.0	4		✓			
OL-SB-E27	Sealed Blank	/	/	/	/	/	/	/		✓			
OL-FB-E28	Field Blank	/	/	/	/	/	/	/		✓			
OL-FB-E29	Field Blank	/	/	/	/	/	/	/		✓			

Turnaround Time: Normal: ☐ Rush: ☑ Super Rush: ☐

Comments: Dust Sample 100 cm²

Relinquished By:	[signature]	Date/Time	10/23/14 15:10	Delivered Directly to Lab: ☐	Shipped: ☐
Received By:	[signature]	Date/Time	10/23/14 15:10	Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name: 1290
Address:
Contact:
Phone/Fax

Project Name: Dust Sampling
Sampling Date: 10/23/2014
Collected by: Elme Rivera
Company Name: AES International

Chain of Custody Record

COC-AIR-009/REV 1/06

	Sample Description	Pump	TIME		FLOW RATE				Asbestos	Dust	Lead	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	PCM	Fingerprint	Air		
D-OL-FF-ER2	Sample on top of pipe surface from front flare area	LV-238	12:30	12:32	2.0	2.0	2.0	4.0		x			61523
D-OL-SM-ER6	Sample from surface of metal scrap in front of area where the crane was	LV-238	12:54	12:56	2.0	2.0	2.0	4.0		x			61524
OL-SB-ER7	Sealed Blank									x			61525
OL-FB-ER8	Field Blank									x			61526
OL-FB-ER9	Field Blank									x			61527

Turnaround Time: Normal: X Rush: Super Rush:

Comments: **Do not analyze blanks and sealed blank**

Relinquished By:	[signature]	Date/Time	10/23/14 15:2[illegible]	Delivered Directly to Lab:	Shipped:
Received By:		Date/Time		Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

General View of Sample on Top of Pipe Surface from Front Flare Area D-OL-FF-ER2

Sample on Top of Pipe Surface from Front Flare Area D-OL-FF-ER2

General View of Sample from Surface of Metal Scrap in Front of Area where the Crane was D-OL-SM-ER6

Sample from Surface of Metal Scrap in Front of Area where the Crane was D-OL-SM-ER6

Location of Dust Sampling Points around Olefin Facilities, Peñuelas, PR (10/23/14)

Location of Bulk Sampling Points inside Olefin Facilities, Peñuelas, PR (10/23/14)

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	Toro & Arzuaga	**Project Name:**	Dust Studies Olefin Site
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D
B-OL-0V-409-ER1	Sample from debris of pipe insulation found on floor from area OV409	10/23/14	12:10	X	Dust Fingerprint		58924
S-OL-FF-ER3	Soil sample from area covered with grass. Area front of flare	10/23/14	12:23	X	Dust Fingerprint		58925
B-OL-FF-ER4	Sample from insulation under pipe on the floor. Area front of flare	10/23/14	12:39	X	Dust Fingerprint		58926
B-OL-PS408-ER5	Sample from pipe insulation on floor Debris from area PS408	10/23/14	12:43	X	Dust Fingerprint	there is still part of pipe on the column	58927
B-OL-PS408-ER5 dup	Duplicate sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:44	X	Dust Fingerprint	there is still part of pipe on the column	58928
D-385-W-ER1	wipe 10 cm x 10cm from from bench side bus stop	10/23/14	11:15		Dust Fingerprint		58929
D-FB-385-ER2	Field Blank	10/23/14	11:16		Dust Fingerprint		58930

Turnaround Time: Normal: X Rush:

Comments:

Relinquished By:	[signature]	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	10/23/14 / 15:03		
Received By:	[signature]	**Method of Shipment:**	
Date/ Time:	10/23/14 15:03		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

PLM-65/Rev. 1/ 7-09

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611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	**Project Name:**	Dust Sampling Studies
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected		Analysis Required		Comments	Laboratory I.D.
		Date	Time	PLM	Other		
B-OL-0V-409-ER1	Sample from debris of pipe insulation found on floor from area OV409	10/23/14	12:10		Dust Fingerprint		58924
S-OL-FF-ER3	Soil sample from area covered with grass. Area front of flare	10/23/14	12:23		Dust Fingerprint		58925
B-OL-FF-ER4	Sample from insulation under pipe on the floor. Area front of flare	10/23/14	12:39		Dust Fingerprint		58926
B-OL-PS408-ER5	Sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:43		Dust Fingerprint	there is still part of pipe on the column	58927
B-OL-PS408-ER5 dup	Duplicate sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:44		Dust Fingerprint	there is still part of pipe on the column	58928
D-385-W-ER1	Dust 10 cm x 10 cm from bench left side bus stop	10/23/14	11:15		Dust Fingerprint		58929
D-FB-385-ER2	Field Blank	10/23/14	11:16		Dust Fingerprint		58930

Turnaround Time: Normal: X Rush:

Comments: Do not analyze blank and duplicate

Relinquished By:	Ky~	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	10/23/14 15:20		
Received By:		**Method of Shipment:**	
Date/ Time:			
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

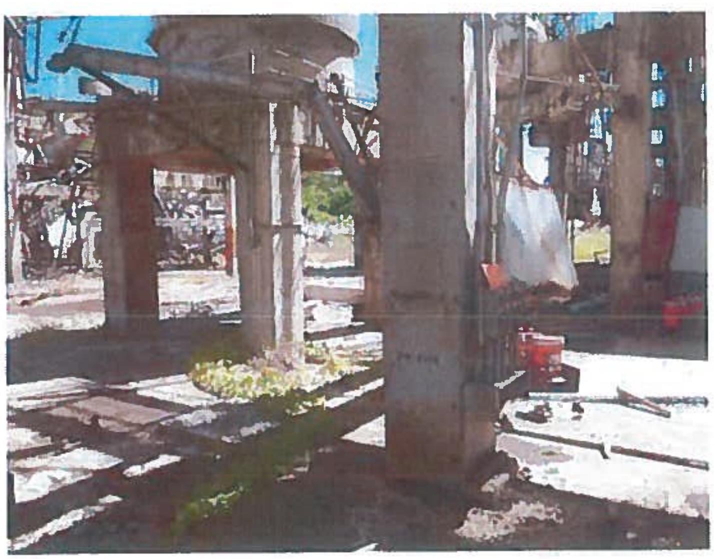
General View of Sample from Debris of Pipe Insulation found on Floor from Area OV409
B-OL-OV-409-ER1

Sample from Debris of Pipe Insulation found on Floor from Area OV409
B-OL-OV-409-ER1

General View of Samples ER3 and ER4 Area Covered with Grass in Front of Flare

Soil Sample from Area Covered with Grass,
Area in Front of Flare
S-OL-FF-ER3

Sample from Insulation Under Pipe
on the Floor, Area in Front of Flare
B-OL-FF-ER4



General View of Sample from Pipe Insulation
on Floor, Debris from Area PS408
B-OL-PS408-ER5

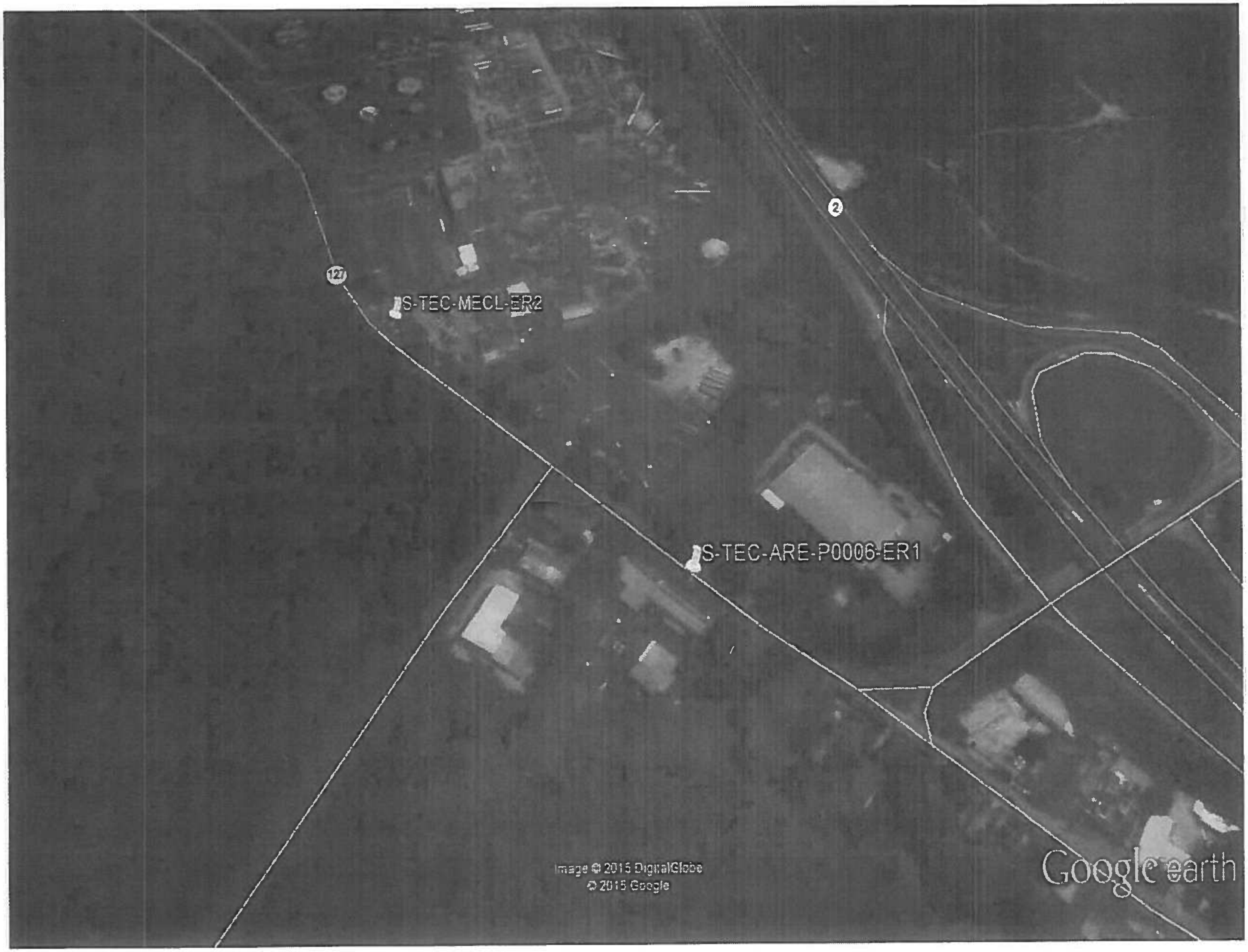
Sample from Pipe Insulation on Floor
Debris from Area PS408
B-OL-PS408-ER5

Sample from Pipe Insulation seen on Floor
from Area PS408
B-OL-PS408-ER5

General View of Sample from Bus Stop
Left Side
D-385-W-ER1

Sample from Bench Side
Bus Stop
D-385-W-ER1

Location of Gravel Samples close to Olefin Main Facility, Peñuelas, PR (11/10/14)



ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name: Toro & Arduega
Address: PO Box 11064, San Juan PR 00922-1064
Contact: Rafael Toro Ramirez
Phone/Fax: 787-783-2201 / 787-793-1146

Project Name: Dust Studies Olefin Site
Site Location: Peñuelas PR
Samplers Name: Elmer Rivera
Company: AESI

Chain of Custody Record

COC-BULK-011/REV 1/06

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected		Analysis Required		Comments	Laboratory I.D.
		Date	Time	PLM	Other		
S-TEC-ARE-Point-E21	Gravel from road backfill, entrance to AR Exchanger Boiler Specialist Fraction > 19 mm	11/10/14	13:45	X	Dust Finger Print		
S-TEC-MEOL-E22	Gravel from road backfill, entrance to Olefin Fraction > 19 mm	11/10/14	14:13	X	Dust Finger Print		
SUB S-TEC-ARE-Point-E21	Gravel from road backfill, entrance to AR Exchanger, Boiler Specialist Fraction < 19 mm	11/10/14		X	Dust Finger Print	SUB-Sample to Fraction < 19 mm Done in Laboratory	
SUB S-TEC-MEOL-E22	Gravel from road backfill entrance to olefin Fraction < 19 mm	11/10/14		X	Dust Finger Print	Sub-sample to Fraction < 19 mm Done in Laboratory	

Turnaround Time: Normal: ✓ Rush:

Relinquished By:	[signature]
Date/ Time:	11/11/14 / 7:00
Received By:	[signature]
Date/ Time:	11/11/14 7:00
Relinquished By:	
Date/ Time:	
Received By:	
Date/ Time:	

Delivered Directly to Lab: **Shipped:**

Method of Shipment:

Lab. Recipient:

Date:

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	**Project Name:**	Dust Sampling Studies
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Amended Chain of Custody Record

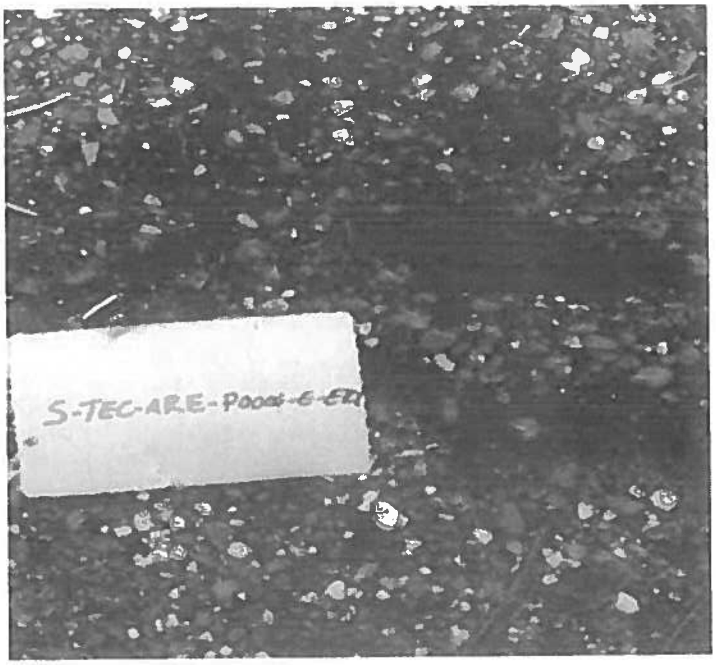
Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
S-TEC-ARE-P0006-ER1A	Gravel from road backfill entrance to AR Exchanger Boiler Specailist (fraction <19mm)	11/10/14				Dust Fingerprint	59039
STEC-MEOL-ER2A	Gravel from road backfill entrance to Olefin (fraction <19mm)	11/10/14				Dust Fingerprint	59040
S-TEC-ARE-P0006-ER1B	Gravel from road backfill entrance to AR Exchanger Boiler Specialist (fraction >19mm)	11/10/14				Dust Fingerprint	59041
S-TEC-MEOL-ER2B	Gravel from raod backfill entrance to Olefin (fraction>19mm)	11/10/14				Dust Fingerprint	59042

Turnaround Time: Normal: X Rush:

Comments: **Do not analyze field blank**

Relinquished By:	Kay. [signature]	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	11/12/14 16:00		
Received By:		**Method of Shipment:**	
Date/ Time:			
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

PLM-65/Rev. 1/ 7-09



Gravel from Road Backfill, Entrance to AR Exchanger Boiler Specialist
S-TEC-ARE-P0006-ER1

Gravel from Road Backfill, Entrance to Olefin
S-TEC-MECL-ER2

Location of Dust Samples from Bus Stop Road 385 Int with Road 384 Northwest of Olefin Facility, Peñuelas, PR (11/11/14)

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	Toro & Arsuaga PSC	**Project Name:**	Dust Study Olefin Site, Peñuelas PR
Address:	PO Box 11064 San Juan PR 00922-1064	**Sampling Date:**	11/11/14
Contact:	Rafael Toro Arsuaga	**Collected by:**	Elmer Rivera 1202004745
Phone/Fax	787-783-2721 / 787-793-1146	**Company Name:**	AESI

Chain of Custody Record

Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Asbestos PCM	Asbestos TEM	Lead Air	Other Dust Test Strip/Cloth	LAB ID #
D-Nov-Pro36-BS-E21	Dust Sample from stop bus beach Rd. 385 front with Rd. 384 northwest of Olefin between 1 & 2 miles radial	LV-238	12:05	12:07	2.0	2.0	2.0	4.0				X	
D-Nov-Pro36-BS-E22	Dust Sample from stop bus beach Rd. 385 front with Rd. 384 northwest of Olefin between 1 & 2 miles radial	LV-238	12:14	12:16	2.0	2.0	2.0	4.0				X	
D-FB-Nov-Pro36-BS-E23	Field Blank	/	/	/	/	/	/	/				X	
W-Nov-Pro36-BS-E21	Wipe 10x10 cm from stop bus beach Rd. 385 front with Rd. 384 northwest of Olefin between 1 & 2 miles radial	/	/	/	/	/	/	/				X	
W-Nov-Pro36-BS-E22	Wipe 10x10 cm from stop bus under beach Rd. 385 front with Rd. 384 northwest of Olefin between 1 & 2 miles radial	/	/	/	/	/	/	/				X	
W-FB-Nov-Pro36-BS-E23	Field Blank	/	/	/	/	/	/	/				X	

Turnaround Time: Normal: ☐ Rush: ☐

Latitude 18-03036
Longitude -66.72597

Comments: All Samples were collected with a template of 100 cm² area

Relinquished By:	[signature]	Date/Time	11/12/14 / 9:30	**Delivered Directly to Lab:** ☐	**Shipped:** ☐
Received By:	Karen	Date/Time	11/12/14 9:30	**Method of Shipment:**	
Relinquished By:		Date/Time		**Lab. Recipient:**	
Received By:		Date/Time		**Date:**	

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

#611 Monserrate, 2nd Floor, Santurce, P.R. 00907

Ph: (787) 722-0220; Fax: (787) 724-5788

Client Name:	1290	Project Name:	Dust Sampling Studies
Address:		Sampling Date:	11/11/2014
Contact:		Collected by:	Elme Rivera
Phone/Fax		Company Name:	AES International

Chain of Custody Record

	Sample Description	Pump	TIME		FLOW RATE				Asbestos	Asbestos	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	PCM	TEM	Air	
D-NOW-P0036-BS-ER1	Dust on bench bus stop intersection Road 385/384	LV-238	~~12:05~~	~~12:07~~	2.0	2.0	2.0	4.0			TEM str/cm2	329180
D-NOW-P0036-BS-ER2	Dust under bench bus stop intersection Road 385/384	LV-238	12:14	12:16	2.0	2.0	2.0	4.0			TEM str/cm2	329181
D-FB-NOW-P0036-BS-ER3	Field Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329182
W-NOW-P0036-BS-ER1	Wipe on bench bus stop intersection Road 385/384.	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329183
W-NOW-P0036-BS-ER2	Wipe under bench bus stop intersection Road 385/384.	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329184
W-FB-NOW-P0036-BS-ER3	Field Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329185

Turnaround Time: Normal: X Rush: Super Rush:

Comments: **Do not analyze Field Blank. Area sampled is 100 cm2**

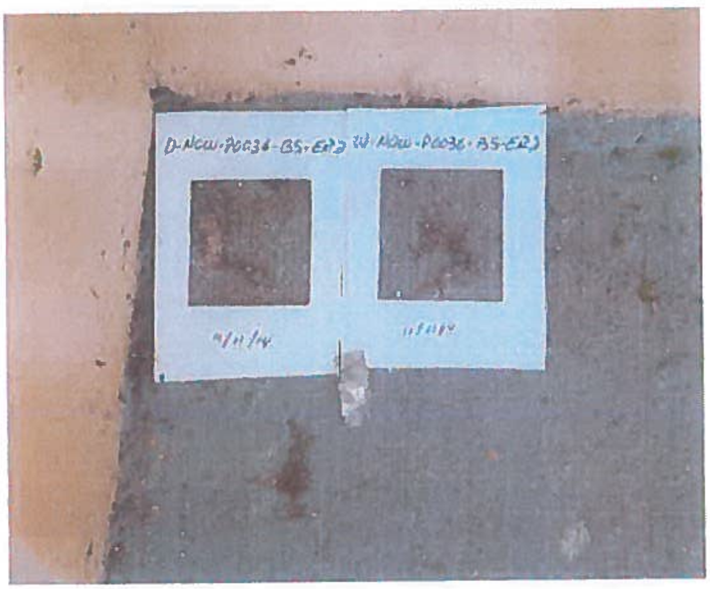
Relinquished By:	[illegible]	Date/Time	11/11/14 [illegible]	Delivered Directly to Lab: Shipped:
Received By:		Date/Time		Method of Shipment:
Relinquished By:		Date/Time		Lab. Recipient:
Received By:		Date/Time		Date:

General View of Bus Stop

General View of
Dust Sample from Bus Stop Bench

Dust Sample from Bus Stop Bench
Road. 385, Int. with Road 384
Northwest of Olefin between 1 & 2 miles Radius
D-NOW-P0036-BS-ER1

General View of
Dust Sample from under Bus Stop Bench



Dust Sample from under Bus Stop Bench
Road. 385, Int. with Road 384
Northwest of Olefin between 1 & 2 miles Radius
D-NOW-P0036-BS-ER2

Location of Dust Sample from Bus Stop Bench Road 385 Int with Road 384 Northwest of Olefin Facility, Peñuelas, PR (11/18/14)

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	Toro & Arsuaga, PSC	**Project Name:**	Dust Studies Olefin St. Rincón PR
Address:	PO Box 11064 San Juan PR 00922-1064	**Sampling Date:**	11/18/14
Contact:	Rafael Toro Arsuaga	**Collected by:**	Elmer Rivera 12020087-45
Phone/Fax	787-783-7721 / 787-793-1146	**Company Name:**	AESI

Chain of Custody Record

Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Asbestos PCM	Asbestos TEM	Lead Air	Other (Dust TEM Std 1282)	LAB ID #
D-Now-P0036-35-E21	Dust sample from step bus bench Rd. 385 Int. with Rd. 384 northwest of Olefin between 1 & 2 mile radius	LV-238	12:05	12:07	2.0	2.0	2.0	4.0				X	
D-Now-P0036-35-E22	Dust sample from step bus under bench Rd 385 Int. with Rd. 384 northwest of Olefin, between 1 & 2 mile radius	LV-238	12:09	12:11	2.0	2.0	2.0	4.0				X	
D-FB-Now-P0036-35-E23	Field Blank	/	/	/	/	/	/	/				X	
W-Now-P0036-35-E21	Wipe remission from step bus bench Rd 385 Int. with Rd. 384 northwest of Olefin between 1 & 2 mile radius	/	/	/	/	/	/	/				X	
W-Now-P0036-35-E22	Wipe remission from step bus under bench Rd 385 Int. with Rd. 384 northwest of Olefin between 1 & 2 mile radius	/	/	/	/	/	/	/				X	
W-FB-Now-P0036-35-E23	Field Blank	/	/	/	/	/	/	/				X	

Turnaround Time: Normal: ✓ Rush: [ ]

Latitude 18.03236
Longitude -66.72596

Comments: All samples were collected with a template of 100 cm^2 area

Relinquished By:	[signature]	Date/Time	11/18/14 ?:30	**Delivered Directly to Lab:** [ ]	**Shipped:** [ ]
Received By:	[signature]	Date/Time	11/13/14 7:30	**Method of Shipment:**	
Relinquished By:		Date/Time		**Lab. Recipient:**	
Received By:		Date/Time		**Date:**	

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Client Name:	1290	Project Name:	Dust Sampling Studies
Address:		Sampling Date:	11/18/2014
Contact:		Collected by:	Elme Rivera
Phone/Fax		Company Name:	AES International

Chain of Custody Record

	Sample Description	Pump	TIME		FLOW RATE				Asbestos	Asbestos	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	PCM	TEM	Air	
D-NOW-P0036-BS-ER1	Dust on bench bus stop intersection Road 385/384	LV-238	12:05	12:07	2.0	2.0	2.0	4.0			TEM str/cm2	329475
D-NOW-P0036-BS-ER2	Dust under bench bus stop intersection Road 385/384	LV-238	12:09	12:11	2.0	2.0	2.0	4.0			TEM str/cm2	329476
D-FB-NOW-P0036-BS-ER3	Field Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329477
W-NOW-P0036-BS-ER1	Wipe on bench bus stop intersection Road 385/384.	N/A	— N/A	— N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329478
W-NOW-P0036-BS-ER2	Wipe under bench bus stop intersection Road 385/384	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329479
W-FB-NOW-P0036-BS-ER3	Field Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	239480

Turnaround Time: Normal: X Rush: Super Rush:

Comments: **Do not analyze Field Blank. Area samplig is 100 cm2**

Relinquished By:	Kaz	Date/Time	11/18/14 15:00	Delivered Directly to Lab:	Shipped:
Received By:		Date/Time		Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

Photographic Documentation Log 11/18/14

General View of Bus Stop

Dust Sample from Bus Stop Bench
Road. 385, Int. with Road 384
Northwest of Olefin between 1 & 2 miles Radius
D-NOW-P0036-BS-ER1

Dust Sample from under Bus Stop Bench
Road. 385, Int. with Road 384
Northwest of Olefin between 1 & 2 miles Radius
D-NOW-P0036-BS-ER2

Location of Bulk Sample from Vessel OV-302 inside Olefin Facility, Peñuelas, PR (11/21/14)

Location of Gravel Samples from Dirt Road close to Olefin Facility, Peñuelas, PR (11/21/14)

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	Toro & Arsuaga, PSC	**Project Name:**	Dust Studies - Olefin Site
Address:	PO Box 11064 San Juan PR 00922-1064	**Site Location:**	Peñuelas PR
Contact:	Rafael Toro Quiñones	**Samplers Name:**	Elmo Rivera
Phone/Fax:	787-783-7721 / 787-783-1196	**Company:**	AESI

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
Bulk-EC-CHAIY-ER1	TSI Sample from south side right of platform at vessel EV-302	11/21/14	9:03	✓	Finger Print		59132
Bulk-EC-CHAIY-ER2	TSI sample from south side left of platform at vessel EV-302	11/21/14	9:08	✓	Finger Print		59133
S-TEC-INT-S-ER1	Gravel, from dirt road next to intersection of the trail with Rd. 127, front of Caribe [illegible]	11/21/14	12:46	✓	Finger Print	Lat- 18-00049 Lg. -66.72368	59134
S-TEC-BUS-ER2	Gravel from dirt road approximately 200 feet from intersection with Rd # 127 and dirt trail	11/21/14	12:58	✓	Finger Print	Lat- 18.00006 Lg. -66.72398	59135

Turnaround Time: Normal: ✓ Rush: ☐

Relinquished By:	[signature]	**Delivered Directly to Lab:** ☐	**Shipped:** ☐
Date/ Time:	11/21/14 / 16:46		
Received By:	[signature]	**Method of Shipment:**	
Date/ Time:	11/21/14 16:46		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	**Project Name:**	Dust Sampling Studies
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
BULK-OL-CHM4-ER2	TSI Sample from South Side, Left of Platform of Vessel OV-302	11/21/14			Dust Fingerprint		59133
S-TEC-TNT-S-ER1	Gravel from Dirt Road next to Intersection of the Trail with Road #127, Front of Gulf Entrance	11/21/14			Dust Fingerprint		59134
S-TEC-BUS-ER2	Gravel from Dirt Road approximated 200 feet from Intersection with Road #127 and Dirt Trail	11/21/14			Dust Fingerprint		59135

Turnaround Time: Normal: X Rush:

Comments:

Relinquished By:	Kagr	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	11/21/14 15:00		
Received By:	Any Nadon	**Method of Shipment:**	
Date/ Time:	11/25/14 7:00		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

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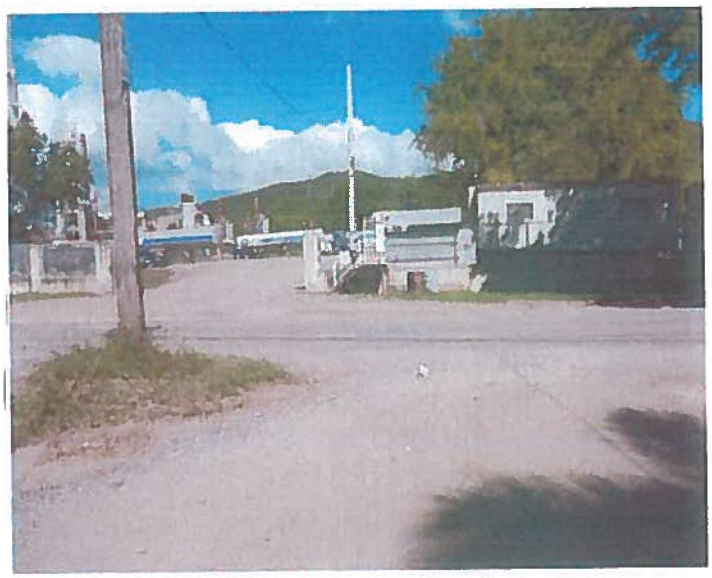
General View of BULK-OL-CHM4-ER1

TSI Sample from South Side
Right of Platform of Vessel OV-302
BULK-OL-CHM4-ER1

General View of BULK-OL-CHM4-ER2

TSI Sample from South Side
Left of Platform of Vessel OV-302
BULK-OL-CHM4-ER2



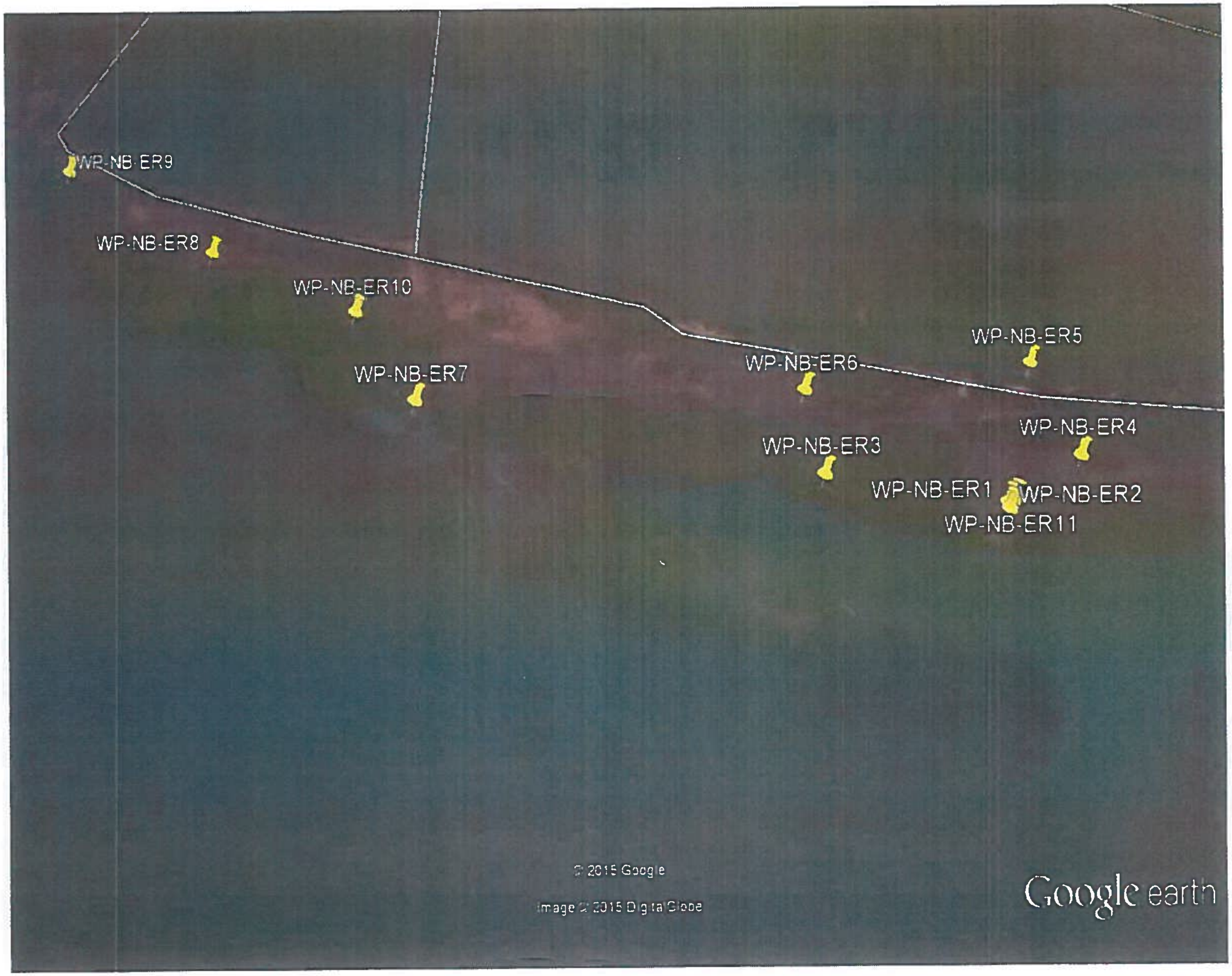
General View of S-TEC-TNT-S-ER1

Gravel from Dirt Road next to Intersection
of the Trail with Road #127, front of
Gulf Entrance
S-TEC-TNT-S-ER1

General View of S-TEC-BUS-ER2

Gravel from Dirt Road aproximated 200 ft. from Int. with Road #127 and Dirt Trial
S-TEC-BUS-ER2

Location of Debris Samples close to coast, Peñuelas, PR (12/18/14)



ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name: Toro & Arzuaga
Address:
Contact:
Phone/Fax:

Project Name: Construction Waste studies
Site Location: Penuelas
Samplers Name: Elme Rivera
Company: AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
WP-NB-ER1	Transite Debris, Composite of Piles 1, 2 and 3, 10 ft distance between each pile, Debris #1	12/18/14	14:25	X		composite	59432
WP-NB-ER2	Transite Debris, Various Piles, Debris #2	12/18/14	14:29	X		composite	59433
WP-NB-ER3	Transite Debris, Inside Mangrove Area, Debris #3	12/18/14	14:30	X		composite	59434
WP-NB-ER4	Bituminous Material found in the Dirt Road, Debris #4	12/18/14	14:33	X		composite	59435
WP-NB-ER5	Transite Pipes of Water Drain System found Inside Water Pond, Debris #5	12/18/14	14:46	X		composite	59436
WP-NB-ER6	Black, Hard Material Painted Blue with Bitumen and Rubber, Debris #6	12/18/14	14:56	X		composite	59437
WP-NB-ER7	Bituminous Material found in Gravel close to the Sea, Debris #7	12/18/14	15:05	X		composite	59438
WP-NB-ER8	Transite Panels Derbis Mixed with Concrete and Plastic, Debris #8	12/18/14	15:19	X		composite	59439
WP-NB-ER9	Large Pile of Transite Debris Mixed with Trash, Debris #9	12/18/14	15:34	X		composite	59440
WP-NB-ER10	Bituminous Material Mixed with Concrete and Ceramic Tiles, Debris #10	12/18/14	15:42	X		composite	59441
WP-NB-ER11	Transite Panels found insde the Water, Debris #11	12/18/14	16:55	X		composite	59442

Turnaround Time: Normal: X Rush:

Comments:

Relinquished By:	[signature]	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	12/18/14/ 6:00	**Method of Shipment:**	
Received By:	R y-r		
Date/ Time:	12/19/14 7:00	**Lab. Recipient:**	
Relinquished By:			
Date/ Time:		**Date:**	
Received By:			
Date/ Time:			

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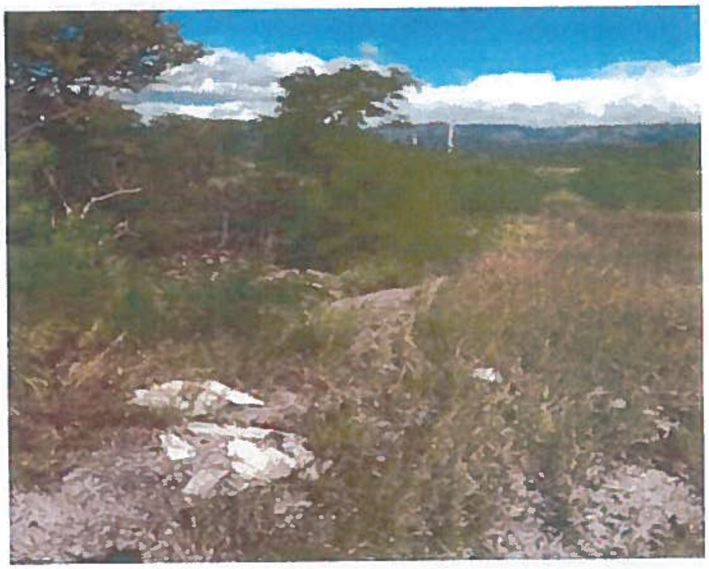
General View of Debris #1
Transite Debris, Pile 1

General View of Debris #1
Transite Debris, Pile 2

General View of Debris #1
Transite Debris, Pile 3



General View of Debris #2
Transite Debris

General View of Debris #3
Transite Debris inside Mangrove

General View of Debris #4
Bituminous Material found in Dirt Road

General View of Debris #5
Suspected Transite Pipes of Water Drain System found Inside Water Pond

General View of Debris #6
Black, Hard Material Painted Blue with Bitumen and Rubber

General View of Debris #7
Bituminous Material found in Gravel close to Sea

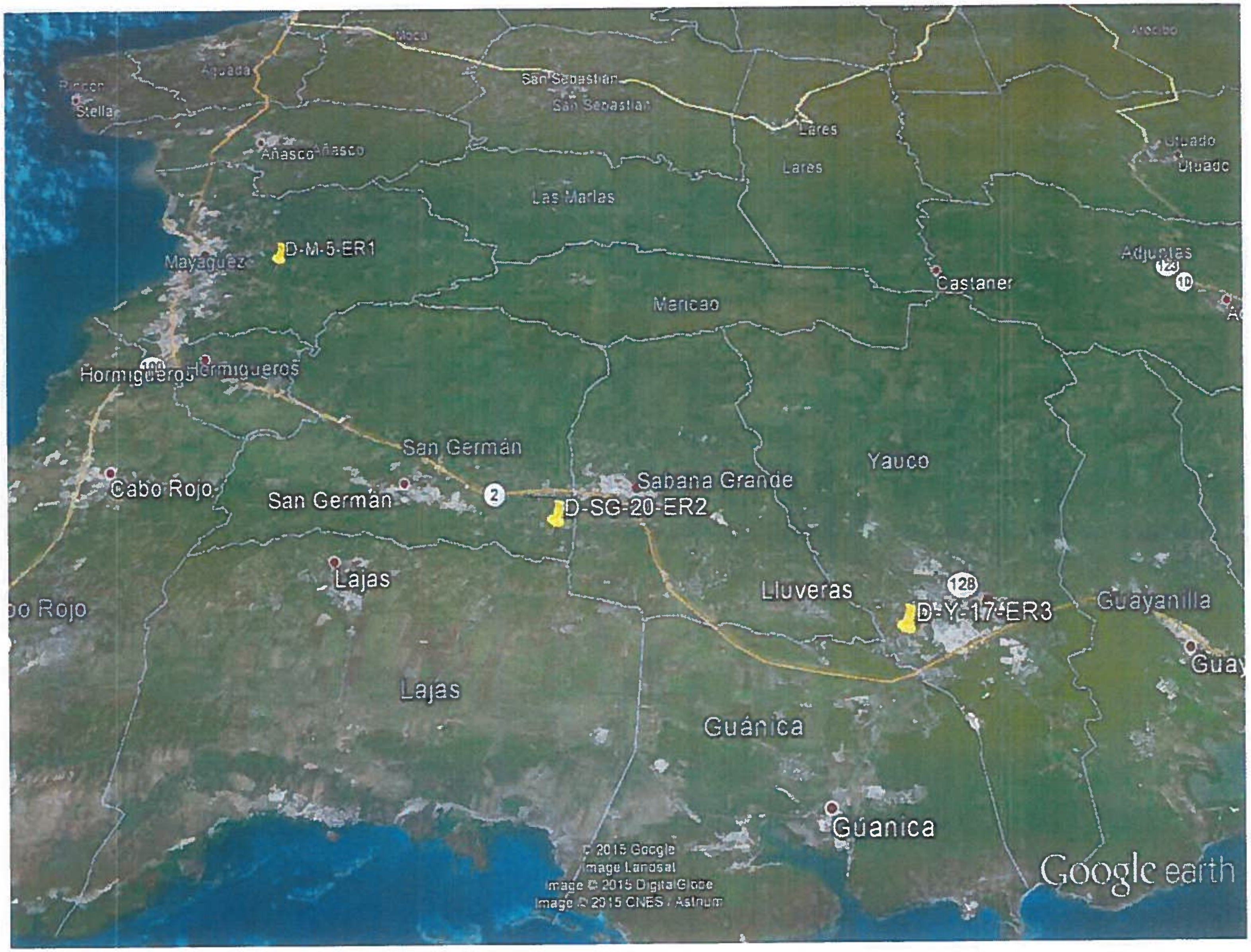
General View of Debris #8
Transite Panels Debris mixed with
Concrete and Plastic

General View of Debris #9
Large Pile of Transite Debris mixed
with Trash

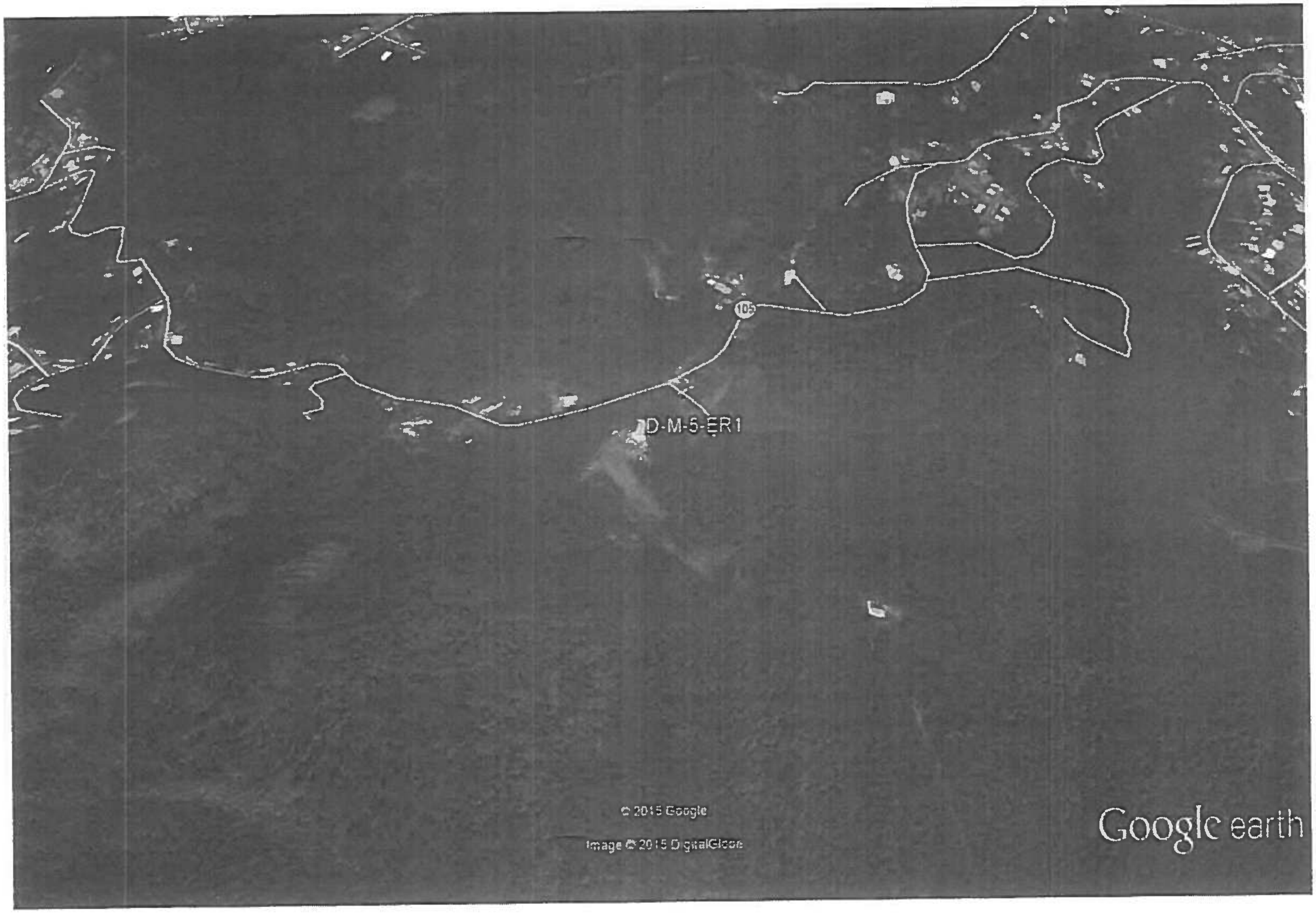
General View of Debris #10
Bituminous Material mixed with Concrete
and Ceramic Tiles

General View of Debris #11
Transite Panels found inside the Water

Location of Dust Samples collected from Entrance to different Quarries (12/31/14)

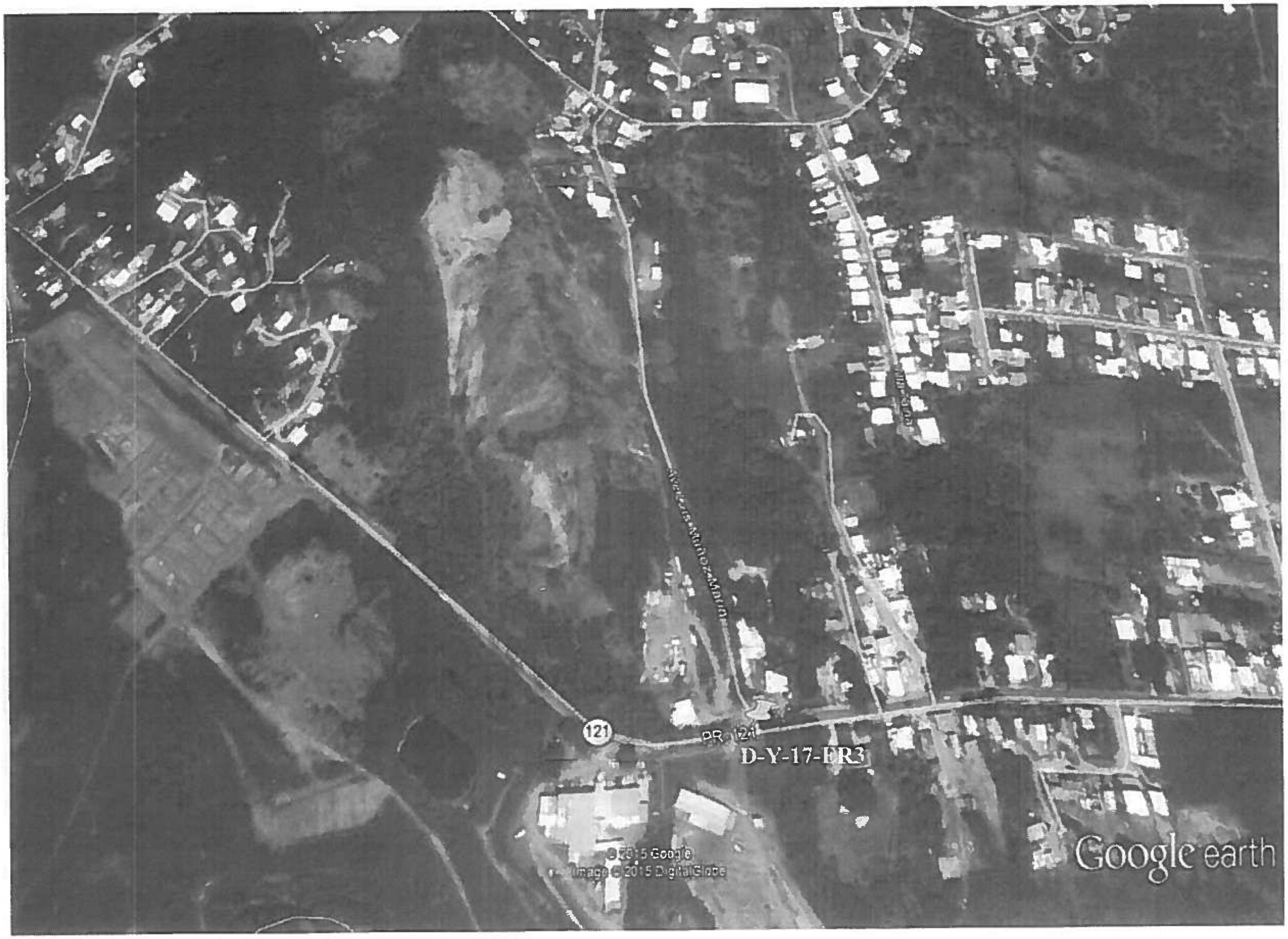


Location of Dust Samples collected from Entrance to Mayaguez Quarry (12/31/14)



Location of Dust Samples collected from Entrance to San German Quarry (12/31/14)

Location of Dust Samples collected from Entrance to Yauco Quarry (12/31/14)



ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name: ____
Address: ____
Contact: ____
Phone/Fax ____

Project Name: Cleta Dust Sampling
Sampling Date: 12/31/14
Collected by: Elmo Rivera 12020087 AS
Company Name: AESI

Chain of Custody Record

COC-AIR-009/REV 1/06

	Sample Description	Pump	TIME		FLOW RATE				Asbestos	Asbestos	Lead	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	PCM	TEM	Air		
D-M-5-E21	Sample from floor of road to main entrance of Quarries next Sunset Fortification of Mayaguez	LV-238	11:04	11:06	2.0	2.0	2.0	4					
D(W)-M-5-E21	Wipe Dust Sample 10cm x 10cm from floor of road to main entrance of Quarries at Mayaguez	/	/	/	/	/	/	/					
D-SG-20-E22	Sample from floor of road to main entrance of old Quarrie at San German	LV-238	13:02	13:04	2.0	2.0	2.0	4					
D(W)-SG-20-E22	Sample from floor dust wipe 10cm x 10cm of road to main entrance old Quarrie at San German	/	/	/	/	/	/	/					
D-Y-17-E23	Sample from floor of road to main entrance of Quarrie at Yauco	LV-238	13:45	13:47	2.0	2.0	2.0	4					
D(W)-Y-17-E23	Wipe Dust Sample 10cm x 10cm from floor of road to main entrance of Quarrie at Yauco	/	/	/	/	/	/	/					
D-FB-E24	Field Blank	/	/	/	/	/	/	/					
D(W)-FB-E24	Field Blank	/	/	/	/	/	/	/					

Turnaround Time: Normal: ✓ Rush: ☐ Super Rush: ☐

Comments: Dust Micro Vacuum and Dust wipe are collected from a template of 100 cm² (10 cm x 10 cm) Side by Side Samples from same points

Relinquished By:	Elmo Rivera	Date/Time	1/2/15 / 3:30 AM	Delivered Directly to Lab: ☐	Shipped: ☐
Received By:		Date/Time		Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Client Name: Toro & Arzuaga
Address:
Contact:
Phone/Fax

Project Name: Olefin Dust Sampling
Sampling Date: 12/31/2014
Collected by: Elme Rivera
Company Name: AES International

Chain of Custody Record

Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Asbestos in dust Method D5755	Asbestos	Other	LAB ID #
D-M-5-ER1	Dust, microvacuum taken from floor of road to main entrence of Quarries next to Juvenil	LV-238	11:04	11:06	2.0	2.0	2.0	4.0	X			59588
D(W)-M-5-ER1	Dust, wipe taken from floor of road to main entrance of Quarries at Mayaguez	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X			59589
D-SG-20-ER2	Dust. microvacuum taken from floor of road to main entrance of old Quarrie at San	LV-238	13:00	13:02	2.0	2.0	2.0	4.0	X			59590
D-(W)-SG-20-ER2	Dust. wipe taken from floor of road to main entrance of old Quarries at San German	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X			59591
D-4-17-ER3	Dust, microvacuum taken from floor of road to main entrance of Quarries at Yauco	LV-238	13:45	13:47	2.0	2.0	2.0	4.0	X			59592
D-(W)-4-17-ER3	Dust, wipe taken from floor of road to main entrance of Quarries at Yauco	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X			59593
D-FB-ER4	Field Blank								X			59594
D-(W)-FB-ER4	Field Blank								X			59595

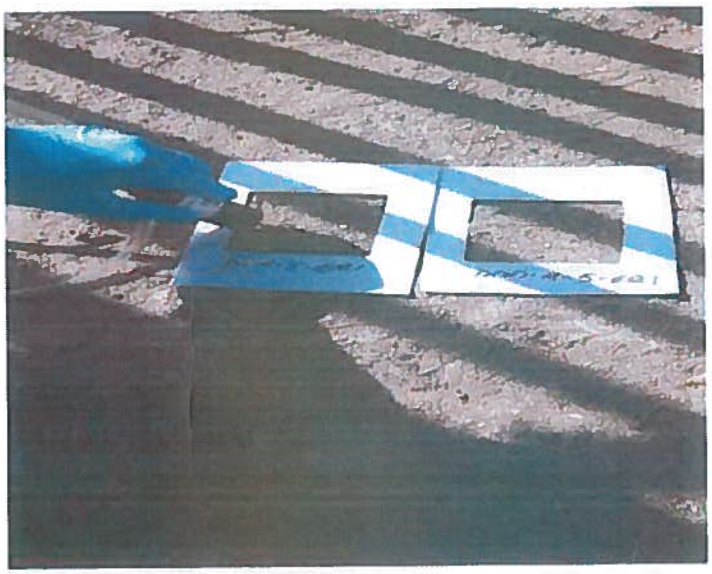
Turnaround Time: Normal: X Rush: Super Rush:

Comments: Analyze microvacuum samples only. Do not analyze Field Blank. Area sampled is 100 cm

Relinquished By:	Karnat	Date/Time	1/2/15 15:30	Delivered Directly to Lab: Shipped:
Received By:		Date/Time		Method of Shipment:
Relinquished By:		Date/Time		Lab. Recipient:
Received By:		Date/Time		Date:

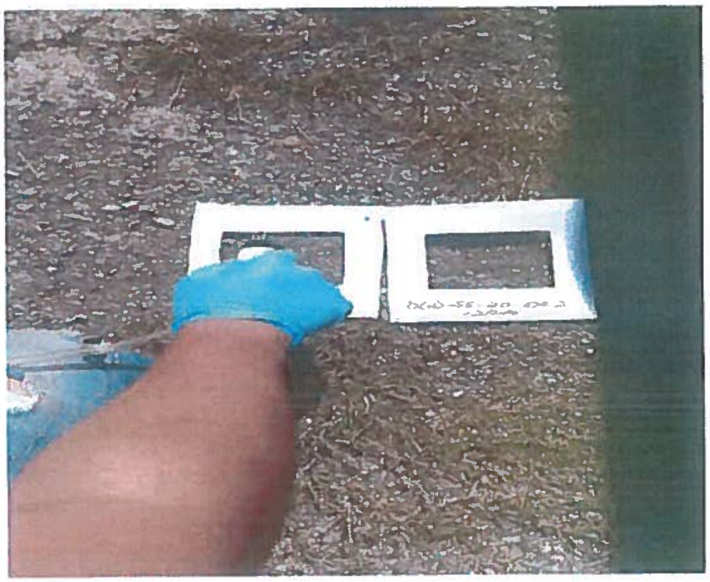
Photographic Documentation Log 12/31/14

General View of Main Entrance to Quarry
next to Juvenile Institution of Mayaguez
D-M-E-ER1



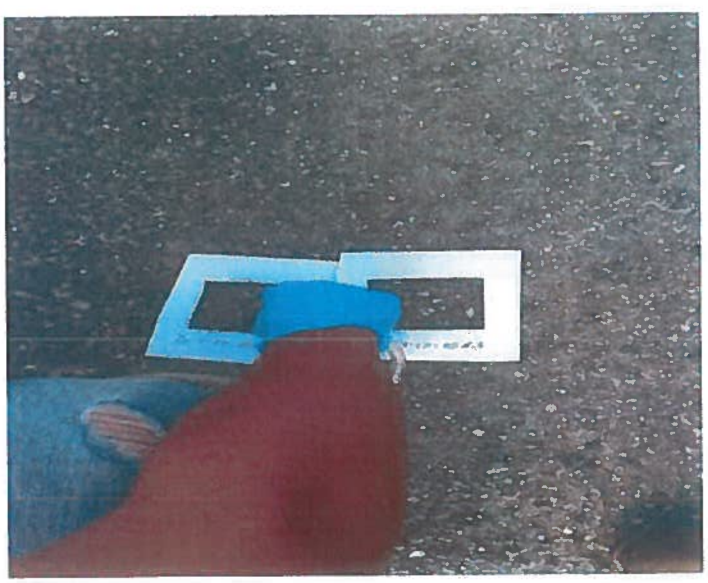
Sample from Floor of Road to
Main Entrance of Quarry
next to Juvenile Institution of Mayaguez
D-M-E-ER1

General View of Main Entrance to Old Quarry
at San German
D-SG-20-ER2



Sample from Floor of Road to
Main Entrance to Old Quarry
at San German
D-SG-20-ER2

General View of Road to Main Entrance to
Quarry at Yauco
D-Y-17-ER3



Sample from Floor of Road to
Main Entrance to Quarry at Yauco
D-Y-17-ER3

AES International Inc.

Appendix III

MVA

Quality Assurance/Quality Control Summary for MVA Project 10666

This report contains the sample data for characterization or "fingerprinting" of asbestos in dust (microvacuum or wipe samples) and other potential source samples (bulk debris or soil/aggregate/mineral samples). The Tables below indicate the MVA Sample Number, AES International Client ID Number, Date Sampled, Sample Type, and Testing Method used for samples analyzed/reported as of 14 January 2015.

Samples Received 07 October 2014:

MVA Lab ID	Client ID	Date Sampled	Sample Type	Test Method
Z2124	D-EV-FP-ER1	10/01/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2125	D-HS-PG-ER2	10/01/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2126	D-JLPV-CR23-2F-H-ER3	10/01/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2127	D-JLPV-CR19-1F-H-ER4	10/01/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2128	D-JLPV-CR10-1F-H-ER5	10/01/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2129	BLK-ER6	10/01/14	Field Blank (Microvac)	ASTM D5755
Z2130	D-TEC-ARE-PO006-E-ER7	10/02/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2131	D-TEC-GULF-GS-ER8	10/02/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2132	D-NOW-P0035-TB-ER9	10/02/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2133	D-NOW-P0036-BS-ER10	10/02/14	Dust (Microvac)	Dust "Fingerprint" Characterization; ASTM D5755
Z2134	D-TEC-P0021-C2-ER11	10/02/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2135	D-TEC-P0018-C2-ER12	10/02/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2136	BLK-FB-ER13	10/02/14	Field Blank (Microvac)	ASTM D5755

Samples Received 21 October 2014:

MVA Lab ID	Client ID	Date Sampled	Sample Type	Test Method
Z2284	R-MC-AP3	10/12/14	Bulk Mineral Sample	Dust "Fingerprint" Characterization
Z2285	R-Q1-AP4	10/12/14	Bulk Mineral Sample	Dust "Fingerprint" Characterization

Samples Received 24 October 2014:

MVA Lab ID	Client ID	Date Sampled	Sample Type	Test Method
Z2369	B-OL-OV-409-ER1	10/23/14	Insulation Debris	Dust "Fingerprint" Characterization
Z2370	S-OL-FF-ER3	10/23/14	Soil Sample	Dust "Fingerprint" Characterization
Z2371	B-OL-FF-ER4	10/23/14	Insulation Debris	Dust "Fingerprint" Characterization
Z2372	B-OL-PS408-ER5	10/23/14	Insulation Debris	Dust "Fingerprint" Characterization
Z2373	B-OL-PS408-ER5-dup	10/23/14	Insulation Debris	Dust "Fingerprint" Characterization
Z2374	D-385-W-ER1	10/23/14	Dust (Wipe)	ASTM D6480
Z2375	D-FB-385-ER2	10/23/14	Field Blank (Wipe)	ASTM D6480
Z2376	D-OL-FF-ER2	10/23/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2377	D-OL-SM-ER6	10/23/14	Dust (Microvac)	Dust "Fingerprint" Characterization
Z2378	OL-SB-ER7	10/23/14	Sealed Blank (Microvac)	ASTM D5755
Z2379	OL-FB-ER8	10/23/14	Field Blank (Microvac)	ASTM D5755
Z2380	OL-FB-ER9	10/23/14	Field Blank (Microvac)	ASTM D5755

Samples Received 14 November 2014:

MVA Lab ID	Client ID	Date Sampled	Sample Type	Test Method
Z2617	S-TEC-ARE-P0006-ER1 A/B	11/10/14	Aggregate (Gravel)	Dust "Fingerprint" Characterization
Z2618	S-TEC-MEOL-ER2 A/B	11/10/14	Aggregate (Gravel)	Dust "Fingerprint" Characterization
Z2619	D-NOW-P0036-BS-ER1	11/11/14	Dust (Microvac)	ASTM D5755
Z2620	D-NOW-P0036-BS-ER2	11/11/14	Dust (Microvac)	Not Analyzed
Z2621	D-FB-NOW-P0036-BS-ER3	11/11/14	Field Blank (Microvac)	ASTM D5755
Z2622	W-NOW-P0036-BS-ER1	11/11/14	Dust (Wipe)	ASTM D6480
Z2623	W-NOW-P0036-BS-ER2	11/11/14	Dust (Wipe)	Not Analyzed
Z2624	W-FB-NOW-P0036-BS-ER3	11/11/14	Field Blank (Wipe)	ASTM D6480

Samples Received 20 November 2014:

MVA Lab ID	Client ID	Date Sampled	Sample Type	Test Method
Z2710	D-NOW-P0036-BS-ER1	11/18/14	Dust (Microvac)	ASTM D5755
Z2711	D-NOW-P0036-BS-ER2	11/18/14	Dust (Microvac)	Not Analyzed
Z2712	D-FB-NOW-P0036-BS-ER3	11/18/14	Field Blank (Microvac)	ASTM D5755
Z2713	W-NOW-P0036-BS-ER1	11/18/14	Dust (Wipe)	ASTM D6480
Z2714	W-NOW-P0036-BS-ER2	11/18/14	Dust (Wipe)	Not Analyzed
Z2715	W-FB-NOW-P0036-BS-ER3	11/18/14	Field Blank (Wipe)	ASTM D6480

Samples Received 01 December 2014:

MVA Lab ID	Client ID	Date Sampled	Sample Type	Test Method
Z2753	BULK OL-CHM4-ER2	11/21/14	Insulation Debris	Dust "Fingerprint" Characterization
Z2754	S-TEX-TNT-S-ER1	11/21/14	Aggregate (Gravel)	Dust "Fingerprint" Characterization
Z2755	S-TEX-BUS-ER2	11/21/14	Aggregate (Gravel)	Dust "Fingerprint" Characterization

Sample Receipt

All samples were received intact, in good condition, and with a Chain of Custody (COC) enclosed.

Dust "Fingerprint" Characterization

The dust/debris/soil/aggregate/mineral samples were initially analyzed for asbestos structures using a combination of stereomicroscopy and polarized light microscopy (PLM) with techniques recommended by U. S. Environmental Protection Agency, "Test Method EPA/600/R-93/116 -- Method for the Determination of Asbestos in Bulk Building Materials." MVA Scientific Consultants has consistently demonstrated proficiency using this method as a participating laboratory since 1995 in the Bulk Asbestos Proficiency Analytical Testing (BAPAT) Program administered by the American Industrial Hygiene Association (AIHA) (Lab ID #100656). Asbestos content is reported in terms of volume percent along with descriptive information of observed asbestos and other associated materials. The optical systems of our light microscopes are cleaned and lubricated every two years; images are annotated using stage micrometers; and materials analyzed are compared to in-house reference materials, including NIST standard asbestos reference materials.

Additional characterization of dust/debris/soil/aggregate/mineral samples using electron microscopy (either scanning electron microscopy (SEM), transmission electron microscopy (TEM), or both) involves use of MVA instruments which are calibrated on a quarterly schedule. Supplemental characterization of samples using different instruments provides additional assurance (confirmation) of MVA PLM findings for any given sample while at the same time expanding the type of information known for that given sample. After initial PLM examination, representative subsamples of bulk debris/soil/aggregate/mineral samples are either examined directly by SEM or are suspended in alcohol and an aliquot of the suspension is deposited onto a carbon coated copper grid for TEM examination. After initial PLM examination, dust (microvac) samples are prepared for analysis using the filtering specifications of ASTM D5755. Secondary filter preparations (dust from the cassette suspended in asbestos-free alcohol/water and filtered through polycarbonate membrane filters) are either looked at directly by SEM examination or transferred to indexed copper grids and prepared for TEM examination according to ASTM D5755. Analysis by SEM/TEM involves characterizing the particulate present (fibrous and non-fibrous) in order to confirm/elaborate on the initial PLM findings. These samples are not analyzed according to ASTM D5755 unless specifically stated.

SEM analysis is performed using a JEOL JSM-6490LV scanning electron microscope (SEM) coupled with a Thermo Scientific Noran System SIX x-ray energy dispersive spectrometry (EDS) system. TEM analysis is performed using either a Philips EM 420 transmission electron microscope (TEM) or a Philips CM 120 TEM, both capable of selected area electron diffraction (SAED) and equipped with Oxford INCA energy dispersive spectrometry (EDS) x-ray analysis systems.

Dust (Microvac) Samples via ASTM D5755

Analysis was performed using either a Philips EM 420 transmission electron microscope (TEM) or a Philips CM 120 TEM, both capable of selected area electron diffraction (SAED) and equipped with Oxford INCA energy dispersive spectrometry (EDS) x-ray analysis systems. MVA instruments are calibrated according to the specifications of ASTM D5755. Field blanks and laboratory blanks are prepared and analyzed according to the specifications of ASTM D5755. No asbestos structures were detected in any field or laboratory blanks prepared and analyzed during the course of this project.

Dust (Wipe) Samples via ASTM D6480

Analysis was performed using either a Philips EM 420 transmission electron microscope (TEM) or a Philips CM 120 TEM, both capable of selected area electron diffraction (SAED) and equipped with Oxford INCA energy dispersive spectrometry (EDS) x-ray analysis systems. MVA instruments are calibrated according to the specifications of ASTM D6480. Field blanks and laboratory blanks are prepared and analyzed according to the specifications of ASTM D6480. No asbestos structures were detected in any field or laboratory blanks prepared and analyzed during the course of this project.

Steven P. Compton, Executive Director and Project Leader

Signature: EXECUTED BY ELECTRONIC SIGNATURE Date: January 15, 2015

Statement of Accreditations and Qualifications

MVA Scientific Consultants is accredited under ISO 17025 by The American Association For Laboratory Accreditation. MVA Scientific Consultants' certificate number is 2096-01 valid to August 31, 2015. MVA Scientific Consultants has been a participant in the Industrial Hygiene Proficiency Analytical Testing Program (IHPAT) since 1992 and always has been found to be proficient. In 1992 the program was run by NIOSH of the U.S. Department of Health and Human Services. MVA Scientific Consultants was laboratory ID 30093001. The American Industrial Hygiene Association currently runs the program. MVA Scientific Consultants is Lab ID # 100656. In specific areas like the analytical needs of the pharmaceutical industry, MVA Scientific Consultants has developed quality assurance systems in accordance with their requirements (cGMP under US CFR 21). MVA Scientific Consultants is a licensed Researcher Pharmacy by the Georgia State Board of Pharmacy (License No. PHRS000159). MVA Scientific Consultants is licensed by the US Department of Justice, Drug Enforcement Administration, to handle all schedules of controlled substances (DEA Registration RM0191229). MVA Scientific Consultants has been audited by a number of pharmaceutical companies and found to be in compliance with their QA requirements. MVA Scientific Consultants has developed and taught quality assurance procedures in specific areas at Georgia Tech, LeHigh University and the McCrone Research Institute. MVA Scientific Consultants has worked as a reference laboratory for the New York Environmental Laboratory Accreditation Program and the National Laboratory Accreditation Program (NVLAP). Mr. W. R. Boltin is currently a Technical Expert and assessor for NVLAP. Richard S. Brown of staff is a Certified Diplomate of the American Board of Criminalists. (Cert. No. 415). Mr. William Turner is a licensed professional geologist.

MVA Scientific Consultants is a research consulting laboratory which performs analysis of materials for corporate, governmental and legal clients. The Staff of MVA Scientific Consultants has considerable experience in both product constituent analysis and product identification. Staff members have qualified in court proceedings in various parts of the USA as experts in fields involving material and environmental analysis and have testified in a number of cases on the state and federal level. Included among MVA Scientific Consultants' clients have been the United States Justice Department and the Attorneys' General for the States of Maryland, Kentucky, West Virginia, Hawaii and Illinois. MVA Scientific Consultants has also served as a product identification laboratory for the National Gypsum Trust settlement board.

AESI

Bulk Samples Quality Control Studies-Olefin facilities, Penuelas

Bulk Samples Collected on 10/23/2014-Inside Olefin

Sample I.D.	Type of sample	AESI results	MVA results	Accepted/Rejected
B-OL-OV-409-ER1	bulk insulation	Amosite 50%	Amosite 60-80%	Accepted
B-OL-FF-ER3	soil	Amosite 2%	<1%	Accepted
B-OL-FF-ER4	bulk insulation	Amosite 20%	Amosite 60-80%	Accepted
B-OL-PS408-ER5	bulk insulation	Amosite 50%	Amosite 60-80%	Accepted
B-OL-PS408-ER5 Dup	bulk insulation	Amosite 45%	Amosite 60-80%	Accepted

Bulk Samples Collected on 11/21/2014-Inside Olefin

Sample I.D.	Type of sample	AESI results	MVA results	Accepted/Rejected
BULK-OL-CHM4-ER2	bulk insulation	Chrysotile 40%	Chrysotile 40%-60%	Accepted

QA/QC Officer

1/12/2015

Date

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200051-0

AES International

Santurce, PR

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

BULK ASBESTOS FIBER ANALYSIS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2015-01-01 through 2015-12-31

Effective dates

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2009-01-28)

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

AES International
611 Monserrate
Santurce, PR 00907
Mr. Ady Padan
Phone: 787-722-0220 Fax: 787-724-5788
E-Mail: YOTA1@bellsouth.net
URL: http://www.aesipr.org

BULK ASBESTOS FIBER ANALYSIS (PLM) **NVLAP LAB CODE 200051-0**

NVLAP Code	*Designation / Description*
18/A01	EPA 600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

2015-01-01 through 2015-12-31
Effective dates

For the National Institute of Standards and Technology

TARJETA DE REGISTRO
PARA EL MANEJO DE ASBESTO

Esta tarjeta autoriza a:

Javier Medina Rosa

Inspector

A trabajar en Puerto Rico en la categoria arriba indicada. Esta persona NO es un empleado, ni un representante de la Junta

ASB-1014-0453-SI
Número de Registro

19 de octubre de 2015
Fecha de vencimiento

Firma Autorizada
Junta de Calidad Ambiental

TARJETA DE REGISTRO
PARA EL MANEJO DE ASBESTO

Esta tarjeta autoriza a:

Ady Padan

Inspector

A trabajar en Puerto Rico en la categoria arriba indicada. Esta persona NO es un empleado, ni un representante de la Junta

ASB-0814-0316-SI
Número de Registro

1 de agosto de 2015
Fecha de vencimiento

Firma Autorizada
Junta de Calidad Ambiental, P.R.

TARJETA DE REGISTRO
PARA EL MANEJO DE ASBESTO

Esta tarjeta autoriza a:

Elme Rivera Pérez

Inspector

A trabajar en Puerto Rico en la categoria arriba indicada. Esta persona NO es un empleado, ni un representante de la Junta

ASB-0414-0120-SI
Número de Registro

10 de abril de 2015
Fecha de vencimiento

Firma Autorizada
Junta de Calidad Ambiental

TARJETA DE REGISTRO
PARA EL MANEJO DE ASBESTO

Esta tarjeta autoriza a:

Ady Padan

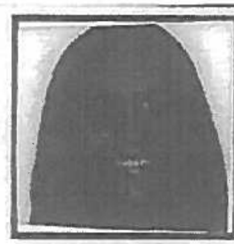
Diseñador

A trabajar en Puerto Rico en la categoria arriba indicada. Esta persona NO es un empleado, ni un representante de la Junta

ASB-0714-0285-PD
Número de Registro

18 de marzo de 2015
Fecha de vencimiento

Firma Autorizada
Junta de Calidad Ambiental, P.R.



TARJETA DE REGISTRO
PARA EL MANEJO DE ASBESTO

Esta tarjeta autoriza a:

Mildred Santiago Maldonado

Inspector

A trabajar en Puerto Rico en la categoría arriba indicada. Esta persona NO es un empleado, ni un representante de la Junta

ASB-1014-0455-SI
Número de Registro

19 de octubre de 2015
Fecha de vencimiento

Firma Autorizada
Junta de Calidad Ambiental

Resumes of Key Personnel

Principals

ADY PADAN, PH.D, P.G, LEED AP

STATEMENT OF QUALIFICATIONS

Puerto Rico Office:
611 Monserrate Street
Santurce, PR 00907
Telephone 787-722-0220
Fax 787/724-5788

Atlanta Office:
155 River Court Parkway,
Atlanta, Georgia 30328
Telephone 770/396-8449
Fax 770/551-9704

Resumes of Key Personnel

Principals

ADY PADAN, Ph.D, P.G, LEED AP
President

SUMMARY

More than twenty eight years of successful experience in all phases of Environmental Consulting, Training, Management including Operations, Laboratory Management, Field Supervision.

Major strengths are:

- Planning/Organizing
- Development of Sampling Plans
- Business Development
- Project Management
- Cost Analysis/Control
- Technical Expertize
- Quality Control
- Training Skills

ACCOMPLISHMENTS

- Initiated and conducted three laboratory/field operations in Atlanta, Georgia & San Juan, Puerto Rico (Caribbean).
- Managed major field projects related to underground storage tanks, lead/asbestos and mold abatement.
- Established state certified training program for asbestos and lead training at supervisory, designer, inspector/risk assessor, worker and RRP levels.
- Conducted numerous asbestos, lead, mold and phase I and II investigations for private and government entities.
- Developed and implemented field sampling programs in the area of hazardous materials, waste water, sludge, soil, underground storage tanks, asbestos and lead and mineral reserves.
- Wrote Standard Operating Procedure Manual for field sampling activities related to sampling of various media.
- Wrote technical specifications for abatement of lead/asbestos and mold contaminated materials.
- Developed Quality Control/Quality Assurance programs related to inorganic and organic analyses, asbestos bulk and air analysis.
- Obtained laboratory accreditation for: New York Department of Health, AIHA, South Carolina Department of Health, ELPAT program, NVLAP (Asbestos), AIHA (Fibers, metals & organic solvents), ELAP - New York (Asbestos, hazardous waste, air emission), Department of Health -South Carolina (Drinking water), ELPAT -AIHA (lead in wipes, dust & soil), Tennessee (Underground storage tanks), CPSC for lead.

ADY PADAN, Ph.D. (continued)

EDUCATION

Post Ph.D – 1985	**Geochemistry** - Georgia Institute of Technology; Atlanta, Georgia
Ph.D. - 1984	**Geochemistry** - Georgia Institute of Technology; Atlanta, Georgia Major: Geophysical Sciences
M.Sc. - 1981	**Geology** - University of Ben Gurion; Beer-Sheva, Israel Major: Geology
B.Sc. - 1978	**Geology** - University of Ben-Gurion; Beer-Sheva, Israel

PROFESSIONAL LICENSES AND AFFILIATIONS

- B.Sc., M.Sc., and Ph.D. certificates
- Professional Geologist in Puerto Rico
- LEED AP
- AHERA Asbestos Inspector and Management Planner
- NIOSH 582 certified
- Asbestos Project Designer
- Asbestos Supervisor
- Mold Inspector
- Lead Inspector/Risk Assessor
- Lead Supervisor
- Lead Project Designer
- XK3 and LPA-1 (RMD) Lead Based Paint Analyzer Operation & Radiation Safety
- Environmental Site Assessor (Phases I and II)
- Hazardous Waste Operations 40-Hours Training
- AHERA Asbestos Trainer
- EPA certified RRP trainer
- Puerto Rico certified Trainer for Asbestos/Lead Inspector/Manager Planner/Risk Assessor, Supervisor, Workers & Project Designer
- Trainer for OSHA 10 and 30 hours

ADY PADAN, Ph.D. (continued)

EXPERIENCE

1995 - Present	**President** ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC. - San Juan, Puerto Rico; Atlanta, Georgia Responsible for the training program, business development, laboratory management, quality assurance and technical support for the environmental consulting programs of the company.
1992 - 1995	**Vice-President** ANALYTICAL ENVIRONMENTAL SERVICES, INC., Atlanta, GA Major responsibilities include business development, quality assurance, and technical support for the environmental programs of the company.
1989 - 1992	**Vice-President** APPLIED ENVIRONMENTAL TESTING LABS, Atlanta, GA
1989	**Director of Research and Development** GEO-ENVIRONMENTAL SERVICES, INC. (GES), Atlanta, GA
1985 - 1989	**Main Geologist** PAMA - Mishor Rotem, mobile post Arava, 86800, Israel
1984 - 1985	**Post-doctoral Research Assistant** Geophysical Sciences Department Georgia Institute of Technology; Atlanta, GA
1981 - 1984	**Research Assistant** Geophysical Sciences Department Georgia Institute of Technology; Atlanta, GA
1978 - 1981	**Teaching Assistant** Department of Geology University of Ben Gurion, Beer-Sheva, Israel
1976 - 1978	**Research Assistant** - Department of Geology University of Den Gurion, Beer-Sheva, Israel

Sampling Date	Delivery Date	General Samples Location	Type of Sample	Number of Samples	Field Blanks	Duplicates	Fedex tracking #
10/1/14	10/7/14	Outside Olefin	Dust	5	1		8064 2105 0298
10/2/14	10/7/14	Outside Olefin	Dust	6	1		8064 2105 0298
10/12/14	10/21/14	Outside Olefin	Rock (Serpentinite)	2			8064 2105 0254
10/23/14	10/24/14	Inside/Outside	Soil (1), Dust (1), Bulk (3)	5	1	1	8064 2105 0232
10/23/14	10/24/14	Inside Olefin	Dust	2	3		8064 2105 0232
11/10/14	11/14/14	Inside Olefin	Gravel	4			8064 2105 0070
11/11/14	11/14/14	Outside Olefin	Dust	4	2		8064 2105 0070
11/18/14	11/21/14	Outside Olefin	Dust	4	2		8064 2105 0092
11/21/14	12/1/14	Inside Olefin	Gravel/Bulk	3		1	Hand Delivered
12/18/14	12/24/14	Outside Olefin	Bulk	11			N/A
12/31/14	1/6/15	Outside Olefin	Dust	6	2		8064 2105 0173

N/A- Samples analyzed by AES International in Puerto Rico

Lab Information

1. MGV 3300 Breckinridge Blvd Suite 400 Duluth GA 30096
2. AES International 611 Monserrate Street 2nd Floor, San Juan, PR, 00926

AES International Inc.

Appendix IV

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate Street
2nd Floor
Santurce, Puerto Rico 00907
Ph. (787) 722-0220
Fax (787) 724-5788

NLLAP	102702
PAT	102702
NVLAP	200051-0

POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Dust Studies at Olefin Site, Peñuelas
Lab Project # : PRB04412
Lab ID #: 58924
Sample ID#: B-OL-OV-409-ER1
Sample Location: Sample from Debris of Pipe Insulation found on Floor from Area OV409

Date Collected: 10/23/14
Date Received: 10/23/14
Date Analyzed: 10/27/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Light Gray, Soft, Fibrous with Aggregates				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile		Cellulose		Vermiculite/Mica		Bitumen	
Amosite	50	Glass Fibers	40	Perlite		Sand/Aggregates	10
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	

Comments: ________________

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Kyh
Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

AR-011/Rev 1/12-06

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NLLAP	102702
PAT	102702
NVLAP	200051-0

POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Dust Studies at Olefin Site, Peñuelas
Lab Project # : PRB04412
Lab ID #: 58925
Sample ID#: B-OL-FF-ER3
Sample Location: Soil Sample from Area Covered with Grass, Area Front of Flare

Date Collected: 10/23/14
Date Received: 10/23/14
Date Analyzed: 10/27/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Brown, Soft, Aggregates with Fibers				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile		Cellulose	5	Vermiculite/Mica		Bitumen	
Amosite	2	Glass Fibers	4	Perlite		Sand/Aggregates	80
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	9

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Karen Y. Acosta

QUALITY CONTROL: Elme Rivera

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Dust Studies at Olefin Site, Peñuelas
Lab Project # : PRB04412
Lab ID #: 58926
Sample ID#: B-OL-FF-ER4
Sample Location: Sample from Insulation under Pipe on the Floor, Area Front of Flare

Date Collected: 10/23/14
Date Received: 10/23/14
Date Analyzed: 10/27/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Yellow, Soft, Fibrous with Paint				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile		Cellulose		Vermiculite/Mica		Bitumen	
Amosite	20	Glass Fibers	72	Perlite		Sand/Aggregates	
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	8

Comments: Paint Included As Binder

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: [signature]
Karen Y. Acosta

QUALITY CONTROL: [signature]
Elme Rivera

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Dust Studies at Olefin Site, Peñuelas
Lab Project # : PRB04412
Lab ID #: 58927
Sample ID#: B-OL-PS408-ER5
Sample Location: Sample from Pipe Insulation on Floor, Debris from Area PS408

Date Collected: 10/23/14
Date Received: 10/23/14
Date Analyzed: 10/27/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Soft, Fibrous				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile		Cellulose		Vermiculite/Mica		Bitumen	
Amosite	50	Glass Fibers	50	Perlite		Sand/Aggregates	
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Kyr
Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Dust Studies at Olefin Site, Peñuelas
Lab Project # : PRB04412
Lab ID #: 58928
Sample ID#: B-OL-PS408-ER5 Dup
Sample Location: Duplicate Sample from Pipe Insulation on Floor, Debris from Area PS408

Date Collected: 10/23/14
Date Received: 10/23/14
Date Analyzed: 10/27/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Soft, Fibrous				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile		Cellulose		Vermiculite/Mica		Bitumen	
Amosite	45	Glass Fibers	55	Perlite		Sand/Aggregates	
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Karen Y. Acosta

QUALITY CONTROL: Elme Rivera

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Transmittal Sheet for Bulk Sample Analysis

Client Name: Toro & Arzuaga
Address:
Contact:
Phone/Fax:

Project Name: Dust Studies Olefin Site
Site Location: Penuelas
Samplers Name: Elme Rivera
Company: AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
B-OL-0V-409-ER1	Sample from debris of pipe insulation found on floor from area OV409	10/23/14	12:10	X	Dust Fingerprint		58924
S-OL-FF-ER3	Soil sample from area covered with grass. Area front of flare	10/23/14	12:23	X	Dust Fingerprint		58925
B-OL-FF-ER4	Sample from insulation under pipe on the floor. Area front of flare	10/23/14	12:39	X	Dust Fingerprint		58926
B-OL-PS408-ER5	Sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:43	X	Dust Fingerprint	there is still part of pipe on the column	58927
B-OL-PS408-ER5 dup	Duplicate sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:44	X	Dust Fingerprint	there is still part of pipe on the column	58928
D-385-W-ER1	wipe 10 cm x 10cm from from bench side bus stop	10/23/14	11:15		Dust Fingerprint		58929
D-FB-385-ER2	Field Blank	10/23/14	11:16		Dust Fingerprint		58930

Turnaround Time: Normal: X Rush:

Comments:

Relinquished By:	[signature]	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	10/23/14 / 15:03		
Received By:	[signature]	**Method of Shipment:**	
Date/ Time:	10/23/14 15:03		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Dust Studies at Olefin Site, Peñuelas
Lab Project # : PRB04427
Lab ID #: 59099
Sample ID#: Bulk-PT-ER1
Sample Location: Sample of Transite Panels in Debris found next to Beach in a Trail near "Pescaderia"

Date Collected: 11/18/14
Date Received: 11/20/14
Date Analyzed: 11/20/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Hard with Aggregates and Fibers				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile	15	Cellulose		Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers		Perlite		Sand/Aggregates	60
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	25

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93

MICROANALYST: Elme Rivera

QUALITY CONTROL: Ady Padan Ph.D

PLM IS NOT CONSISTENTLY RELIABLE IN DETECTING SMALL CONCENTRATION OF ASBESTOS IN FLOOR TILES AND SIMILAR NONFRIABLE MATERIALS. QUANTITATIVE TEM IS CURRENTLY THE ONLY METHOD THAT CAN BE USED TO GET THE CONCLUSIVE ASBESTOS CONTENT. THIS REPORT RELATES ONLY TO THE ITEMS TESTED THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL AND NOT WITHOUT WRITTEN APPROVAL OF THE LABORATORY. THIS REPORT SHALL NOT BE USED TO CLAIM ENDORSEMENT BY NVLAP OR ANY AGENCY OF OF THE US GOVERNMENT. ANALYSIS OF FLOOR TILE IS NOT COVERED BY THE CURRENT NEW YORK ELAP CERTIFICATION.

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Transmittal Sheet for Bulk Sample Analysis

Client Name: Toro & Arruaga, PSC
Address: PO Box 11064 San Juan PR 00922-1064
Contact: Rafael Toro Ramirez
Phone/Fax: 787-793-7121 / 787-793-1146

Project Name: Dust Studies Olefin Site, Pinuelas PR
Site Location: Pinuelas Reserve Trail
Samplers Name: Elmer Rivera
Company: AESI

Chain of Custody Record

COC-BULK-011/REV 1/0

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D
Bulk-PT-ER1	Sample of transite panels in Pedro's Farm, next to in beach, in a trail near "Aserdero"	11/18/14	15:05	✓			59099

Turnaround Time: Normal: ✓ Rush: ☐

Relinquished By:	E. Rivera	Delivered Directly to Lab: ☐	Shipped: ☐
Date/ Time:	11/20/14 6:00		
Received By:	[signature]	Method of Shipment:	
Date/ Time:	11/20/14 7:00 am		
Relinquished By:		Lab. Recipient:	
Date/ Time:			
Received By:		Date:	
Date/ Time:			

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NLLAP	102702
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NVLAP	200051-0

POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga

Date Collected: 11/21/14
Date Received: 11/21/14
Date Analyzed: 11/24/14

Project : Dust Studies Olefin
Lab Project # : PRB04432
Lab ID #: 59132
Sample ID#: Bulk-OL-CHM4-ER1
Sample Location: TSI from South Side, Right of Platform of Vessel OV-302

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	White, Soft, Fibrous				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile	40	Cellulose	10	Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers		Perlite		Sand/Aggregates	
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	50

Comments: ______

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Karen Y. Acosta

QUALITY CONTROL: E. R.
Elme Rivera

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Transmittal Sheet for Bulk Sample Analysis

Client Name: Toro & Arzuaga, PSC
Address: PO Box 11064 San Juan PR 00922-1064
Contact: Alfred Toro Arzuaga
Phone/Fax: 787-793-7721 / 787-793-1196

Project Name: Dust Studies-Olefin Site
Site Location: Peñuelas PR
Samplers Name: Elvin Rivera
Company: AESI

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected		Analysis Required		Comments	Laboratory I.D.
		Date	Time	PLM	Other		
Bulk-OL-CHMY-ER1	TSI Sample from South side right of platform at vessel CV-302	11/21/14	9:03	✓	Finger Print		59132
Bulk-OL-CHMY-ER2	TSI sample from South side left of platform at vessel CV-302	11/21/14	9:08	✓	Finger Print		59133
S-TEC-INT-S-ER1	Gravel, from dirt road next to intersection of the trail with Rd#127, front of Gulf [illegible]	11/21/14	12:46	✓	Finger Print	Lat- 18.00049 Log.-66.72368	59134
S-TEC-BU-S-ER2	Gravel from dirt road approximated 200 feet from Intersection with Rd #127 and dirt trail	11/21/14	12:58	✓	Finger Print	Lat- 18.00006 Log.-66.72398	59135

Turnaround Time: Normal: ✓ Rush:

Relinquished By:	[signature]
Date/ Time:	11/21/14 / 16:46
Received By:	[signature]
Date/ Time:	11/21/14 16:46
Relinquished By:	
Date/ Time:	
Received By:	
Date/ Time:	

Delivered Directly to Lab: Shipped:

Method of Shipment:

Lab. Recipient:

Date:

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59432
Sample ID#: WP-NB-ER1
Sample Location: Transite Debris, Composite of Piles 1, 2 and 3 10 ft. distance between each pile, Debris #1

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Hard, Fibrous with Aggregates and Black Mastic				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENT	
Chrysotile	30	Cellulose	5	Vermiculite/Mica		Bitumen	2
Amosite		Glass Fibers		Perlite		Sand/Aggregates	30
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	33

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Kya
Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59433
Sample ID#: WP-NB-ER2
Sample Location: Transite Debris, Various Piles, Debris #2

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Hard, Fibrous with Aggregates				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENT:	
Chrysotile	35	Cellulose	8	Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers		Perlite		Sand/Aggregates	30
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	27

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: KYA
Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59434
Sample ID#: WP-NB-ER3
Sample Location: Transite Debris, Inside Mangrove Area, Debris #3

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Hard, Fibrous with Aggregates				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile	25	Cellulose	5	Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers		Perlite		Sand/Aggregates	25
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	45

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Kyd
Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

PLM IS NOT CONSISTENTLY RELIABLE IN DETECTING SMALL CONCENTRATION OF ASBESTOS IN FLOOR TILES AND SIMILAR NONFRIABLE MATERIALS. QUANTITATIVE TEM IS CURRENTLY THE ONLY METHOD THAT CAN BE USED TO GET THE CONCLUSIVE ASBESTOS CONTENT. THIS REPORT RELATES ONLY TO THE ITEMS TESTED. THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL AND NOT WITHOUT WRITTEN APPROVAL OF THE LABORATORY. THIS REPORT SHALL NOT BE USED TO CLAIM ENDORSEMENT BY NVLAP OR ANY AGENCY OF THE US GOVERNMENT. ANALYSIS OF FLOOR TILE IS NOT COVERED BY THE CURRENT NEW YORK ELAP CERTIFICATION.

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59435
Sample ID#: WP-NB-ER4
Sample Location: Bituminous Material found in the Dirt Road, Debris #4

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	Yes	No. of Layers:*	2	Layer No:	1-2
Appearance:	1st Layer: Black, Semi-Hard, Bituminous with Fibers				
	2nd Layer: White, Semi-Hard, Fibrous with Aluminum and Paint				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENT	
Chrysotile		Cellulose	30	Vermiculite/Mica		Bitumen	52
Amosite		Glass Fibers		Perlite		Sand/Aggregates	
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum	10	Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	8

Comments: Paint Included as Binder

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

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Fax (787) 724-5788

NLLAP	102702
PAT	102702
NVLAP	200051-(

POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59436
Sample ID#: WP-NB-ER5
Sample Location: Transite Pipes of Water Drain System found Inside Water Pond, Debris #5

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	White, Soft, Fibrous				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile		Cellulose		Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers	100	Perlite		Sand/Aggregates	
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

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NVLAP	200051-(

POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59437
Sample ID#: WP-NB-ER6
Sample Location: Black, Hard Material Painted Blue with Bitumen and Rubber, Debris #6

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Black, Hard, Bituminous with Plastic and Fibers				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile		Cellulose	5	Vermiculite/Mica		Bitumen	80
Amosite		Glass Fibers		Perlite		Sand/Aggregates	
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	15

Comments: Plastic Included as Binder

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: [signature]
Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

PLM IS NOT CONSISTENTLY RELIABLE IN DETECTING SMALL CONCENTRATION OF ASBESTOS IN FLOOR TILES AND SIMILAR NONFRIABLE MATERIALS. QUANTITATIVE TEM IS CURRENTLY THE ONLY METHOD THAT CAN BE USED TO GET THE CONCLUSIVE ASBESTOS CONTENT. THIS REPORT RELATES ONLY TO THE ITEMS TESTED. THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL AND NOT WITHOUT WRITTEN APPROVAL OF THE LABORATORY. THIS REPORT SHALL NOT BE USED TO CLAIM ENDORSEMENT BY NVLAP OR ANY AGENCY OF THE US GOVERNMENT. ANALYSIS OF FLOOR TILE IS NOT COVERED BY THE CURRENT NEW YORK ELAP CERTIFICATION.

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PAT	102702
NVLAP	200051-(

POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59438
Sample ID#: WP-NB-ER7
Sample Location: Bituminous Material found in Gravel close to the Sea, Debris #7

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	Yes	No. of Layers:*	2	Layer No:	1-2
Appearance:	1st Layer: Black, Semi-Hard, Bituminous with Fibers				
	2nd Layer: Gray, Hard with Plastic with Paint				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile		Cellulose	2	Vermiculite/Mica		Bitumen	80
Amosite		Glass Fibers		Perlite		Sand/Aggregates	
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	18

Comments: Plastic and Paint Included as Binder

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Karen Y. Acosta

QUALITY CONTROL: E.R. Elme Rivera

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59439
Sample ID#: WP-NB-ER8
Sample Location: Transite Panels Dèbris Mixed with Concrete and Plastic, Debris #8

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Hard, Fibrous with Aggregates				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile	28	Cellulose	5	Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers		Perlite		Sand/Aggregates	37
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	30

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: KYA
Karen Y. Acosta

QUALITY CONTROL: E.R
Elme Rivera

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59440
Sample ID#: WP-NB-ER9
Sample Location: Large Pile of Transite Debris Mixed with Trash, Debris #9

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Hard, Fibrous with Aggregates				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile	20	Cellulose	5	Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers		Perlite		Sand/Aggregates	30
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	45

Comments: ______________________________

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: [signature]
Karen Y. Acosta

QUALITY CONTROL: E.R.
Elme Rivera

PLM IS NOT CONSISTENTLY RELIABLE IN DETECTING SMALL CONCENTRATION OF ASBESTOS IN FLOOR TILES AND SIMILAR NONFRIABLE MATERIALS. QUANTITATIVE TEM IS CURRENTLY THE ONLY METHOD THAT CAN BE USED TO GET THE CONCLUSIVE ASBESTOS CONTENT. THIS REPORT RELATES ONLY TO THE ITEMS TESTED THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL AND NOT WITHOUT WRITTEN APPROVAL OF THE LABORATORY. THIS REPORT SHALL NOT BE USED TO CLAIM ENDORSEMENT BY NVLAP OR ANY AGENCY OF OF THE US GOVERNMENT. ANALYSIS OF FLOOR TILE IS NOT COVERED BY THE CURRENT NEW YORK ELAP CERTIFICATION.

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POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59441
Sample ID#: WP-NB-ER10
Sample Location: Bituminous Material Mixed with Concrete and Ceramic tiles, Debris #10

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	Yes	No. of Layers:*	2	Layer No:	1-2
Appearance:	1st Layer: Gray, Hard, Compact, Partly Granular with Glue and Fibers				
	2nd Layer: Cream, Semi-Hard, Fibrous with Aggregates				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENT	
Chrysotile		Cellulose	2	Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers		Perlite		Sand/Aggregates	20
Crocidolite		Synthetics	25	Expanded Glass		Glue	4
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	49

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Karen Y. Acosta

QUALITY CONTROL: Elme Rivera

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NLLAP 102702
PAT 102702
NVLAP 200051-(

POLARIZED LIGHT MICROSCOPY (PLM)
BULK SAMPLE ANALYSIS REPORT

Client : Toro & Arzuaga
Project : Construction Waste Studies
Lab Project # : PRB04468
Lab ID #: 59442
Sample ID#: WP-NB-ER11
Sample Location: Transite Panels Found Inside the Water, Debris #11

Date Collected: 12/18/14
Date Received: 12/24/14
Date Analyzed: 12/29/14

Layered:	No	No. of Layers:*	*	Layer No:	**
Appearance:	Gray, Hard, Fibrous with Aggregates				

RESULT OF ANALYSIS (BY VISUAL ESTIMATE)

ASBESTOS FIBERS		NON ASBESTOS FIBERS		NONFIBROUS COMPONENTS		OTHERS COMPONENTS	
Chrysotile	20	Cellulose	5	Vermiculite/Mica		Bitumen	
Amosite		Glass Fibers		Perlite		Sand/Aggregates	25
Crocidolite		Synthetics		Expanded Glass		Glue	
Tremolite		Wollastonite		Styrofoam		Vinyl	
Actinolite		Talc		Aluminum		Cork	
Anthophyllite		Mineral Wool		Foam Rubber		Latex	
						Binders/Paint	50

Comments:

FOR ALL HETEROGENEOUS AND LAYERED SAMPLES EASILY SEPARATED INTO SUBLAYERS, EACH COMPONENT IS ANALYZED AND REPORTED SEPARATELY.

SAMPLE WAS ANALYZED BY PLM USING DISPERSION STAINING TECHNIQUES IN ACCORDANCE WITH US EPA METHOD: 600/R-93/116 OF JULY 93.

MICROANALYST: Karen Y. Acosta

QUALITY CONTROL: E.R. Elme Rivera

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Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	Toro & Arzuaga	**Project Name:**	Construction Waste studies
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
WP-NB-ER1	Transite Debris, Composite of Piles 1, 2 and 3, 10 ft distance between each pile, Debris #1	12/18/14	14:25	X		composite	59432
WP-NB-ER2	Transite Debris, Various Piles, Debris #2	12/18/14	14:29	X		composite	59433
WP-NB-ER3	Transite Debris, Inside Mangrove Area, Debris #3	12/18/14	14:30	X		composite	59434
WP-NB-ER4	Bituminous Material found in the Dirt Road, Debris #4	12/18/14	14:33	X		composite	59435
WP-NB-ER5	Transite Pipes of Water Drain System found Inside Water Pond, Debris #5	12/18/14	14:46	X		composite	59436
WP-NB-ER6	Black, Hard Material Painted Blue with Bitumen and Rubber, Debris #6	12/18/14	14:56	X		composite	59437
WP-NB-ER7	Bituminous Material found in Gravel close to the Sea, Debris #7	12/18/14	15:05	X		composite	59438
WP-NB-ER8	Transite Panels Derbis Mixed with Concrete and Plastic, Debris #8	12/18/14	15:19	X		composite	59439
WP-NB-ER9	Large Pile of Transite Debris Mixed with Trash, Debris #9	12/18/14	15:34	X		composite	59440
WP-NB-ER10	Bituminous Material Mixed with Concrete and Ceramic Tiles, Debris #10	12/18/14	15:42	X		composite	59441
WP-NB-ER11	Transite Panels found insde the Water, Debris #11	12/18/14	16:55	X		composite	59442

Turnaround Time: Normal: X Rush:

Comments:

Relinquished By:	[signature]	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	12/19/14/ 6:00		
Received By:	R. [illegible]	**Method of Shipment:**	
Date/ Time:	12/19/14 7:00		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

AES International Inc.

Appendix V

1. Characterization of Dust (Microvacuum/wipes) samples from Bus Stop Bench Surface

MVA SCIENTIFIC CONSULTANTS
Full Service Analytical Microscopy Laboratory

3300 Breckinridge Blvd
Suite 400
Duluth, GA 30096

770.662.8509
FAX 770.662.8532
www.mvainc.com

Environmental Forensics Services

Particle Characterization

Dust Characterization

Carbon Black Analysis

Fly Ash Characterization

Darkening Agents Identification

Soot Analysis

Asbestos Analysis & Exposure Evaluation

Unknown Material Analysis

Contamination Analysis

Source Determination

Expert Witness Services

Techniques

Light Microscopy

Scanning Electron Microscopy

Transmission Electron Microscopy

Fourier Transform Infrared Spectroscopy

Confocal Raman Microscopy

White Light Interference Microscopy

Energy Dispersive X-ray Spectrometry

Fluorescence Microscopy

Ion Milling & Ultramicrotomy

Accreditations

cGMP Compliant

ISO/IEC 17025
A2LA Certificate #2096.01

FDA Registered

Characterization of Dust (Microvacuum/Wipe) Samples Collected from Bus Stop Bench Surface

Performed for AES International, Inc.

MVA Project 10666

16 January 2015

Executive Summary

This report presents the results of analysis of twelve surface dust samples collected by either microvacuum sampling or wipe sampling methods. Two microvac samples were collected by Elme Rivera and Mildred Santiago of AES International, Inc. on 02 October 2014 and were received (along with other samples reported previously) via FedEx on 07 October 2014. Two wipe samples were collected by Elma Rivera of AES International, Inc. on 23 October 2014 and were received (along with other samples reported previously) via FedEx on 24 October 2014. Three microvac samples and three wipe samples were collected by Elme Rivera on 11 November 2014 and were received via FedEx on 14 November 2014. During this sampling event, it was reported that microvac/wipe samples were taken side-by-side both on and under the bench; however, (as requested) samples from under the bench were not analyzed. Three microvac samples and three wipe samples were collected by Elme Rivera on 18 November 2014 and were received via FedEx on 21 November 2014. During this sampling event, it was reported that microvac/wipe samples were taken side-by-side both on and under the bench; however, (as requested) samples from under the bench were not analyzed. It was requested that we analyze the surface dust samples using the appropriate ASTM test methods (D5755 for microvac samples and D6480 for wipe samples).

Five of the six analyzed surface dust samples were positive for chrysotile. Figures 1 through 6 show TEM images and EDS spectra of representative chrysotile asbestos structures detected during analysis of the samples. Many of the chrysotile fibers contain minor/trace amounts of iron and/or aluminum. One wipe sample, W-NOW-P0036-BS-ER1 (MVA Z2713) contained both chrysotile asbestos fibers and tremolite asbestos fibers. No asbestos fibers were detected in any of the laboratory or submitted field blanks.

Respectfully Submitted by: EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

Report of Results: MVA10666

Characterization of Dust (Microvacuum/Wipe) Samples Collected from Bus Stop Bench Surface

Prepared for:

AES International, Inc.
611 Monserrate St, 2nd Floor
Santurce, P.R. 00907

Respectfully Submitted by:

EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

MVA Scientific Consultants
3300 Breckinridge Boulevard
Suite 400
Duluth, GA 30096

16 January 2015

10666rptBusStopBench011615.docx

MVA SCIENTIFIC CONSULTANTS
Full Service Analytical Microscopy Laboratory

Report of Results: MVA10666

Characterization of Dust (Microvacuum/Wipe) Samples Collected from Bus Stop Bench Surface

Introduction

This report presents the results of analysis of twelve surface dust samples collected by either microvacuum sampling or wipe sampling methods. Two microvac samples were collected by Elme Rivera and Mildred Santiago of AES International, Inc. on 02 October 2014 and were received (along with other samples reported previously) via FedEx on 07 October 2014. Two wipe samples were collected by Elma Rivera of AES International, Inc. on 23 October 2014 and were received (along with other samples reported previously) via FedEx on 24 October 2014. Three microvac samples and three wipe samples were collected by Elme Rivera on 11 November 2014 and were received via FedEx on 14 November 2014. During this sampling event, it was reported that microvac/wipe samples were taken side-by-side both on and under the bench; however, (as requested) samples from under the bench were not analyzed. Three microvac samples and three wipe samples were collected by Elme Rivera on 18 November 2014 and were received via FedEx on 21 November 2014. During this sampling event, it was reported that microvac/wipe samples were taken side-by-side both on and under the bench; however, (as requested) samples from under the bench were not analyzed. Upon receipt, all samples were assigned unique MVA sample numbers (see Table 1).

It was requested that we analyze the surface dust samples using the appropriate ASTM test methods described below. These samples were analyzed during the period 07 October through 18 December 2014.

Methods

Microvac samples were analyzed using ASTM method D5755, "Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading" [1]. Wipe samples were analyzed using ASTM method D6480, "Standard Test Method for Wipe Sampling of Surfaces, Indirect Preparation, and Asbestos Analysis for Asbestos Structure Number Concentration by Transmission Electron Microscopy" [2].

The samples were prepared and examined using the appropriate ASTM test method using either a Philips EM 420 transmission electron microscope (TEM) or a Philips CM 120, both equipped with Oxford INCA energy dispersive spectrometry (EDS) x-ray analysis systems and capable of selected area electron diffraction (SAED).

Prior to preparation and analysis via ASTM D5755, one sample (D-NOW-P0036-BS-ER10; MVA Z2133) was examined using a combination of stereomicroscopy and polarized light microscopy. The results of that preliminary examination have been reported separately. All other samples, including field blanks and laboratory blanks, were prepared and analyzed according to the appropriate ASTM method.

Results and Discussion

A summary of analytical results is provided in Table 1. Figures 1 through 6 show TEM images and EDS spectra of representative chrysotile asbestos structures detected during analysis of the samples. Many of the chrysotile fibers detected contain minor/trace amounts of iron and/or aluminum. One wipe sample, W-NOW-P0036-BS-ER1 (MVA Z2713) contained both chrysotile asbestos fibers and tremolite asbestos fibers. TEM count sheets are included in the Appendix. No asbestos fibers were detected in any of the laboratory or field blanks.

References

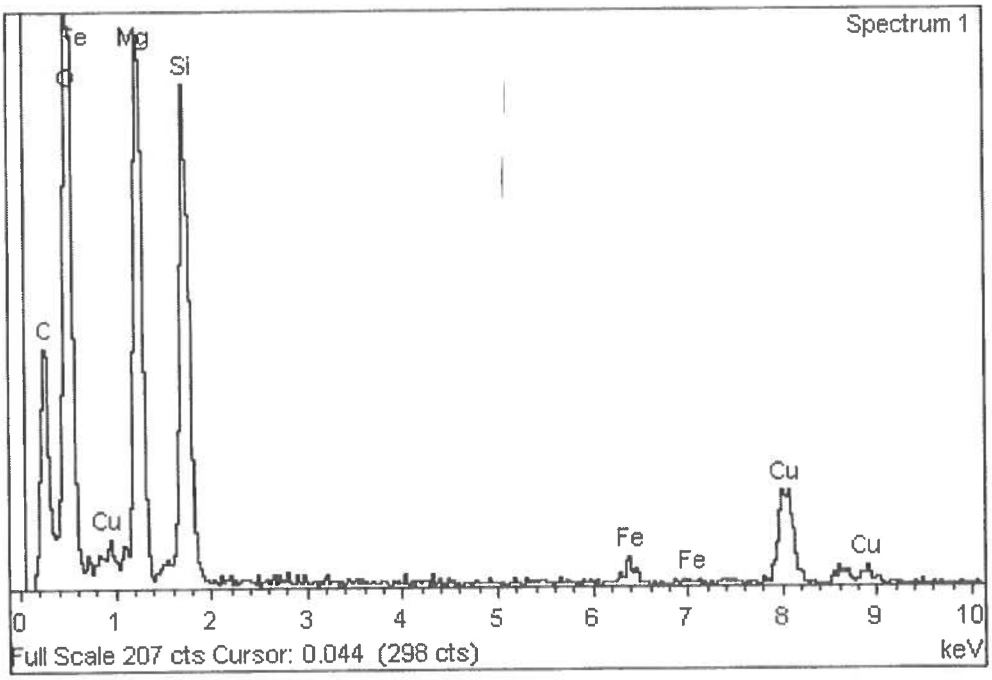
1. ASTM-International, D5755-09 (2014) Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading.
2. ASTM-International, D6480-05 (2010) Standard Test Method for Wipe Sampling of Surfaces, Indirect Preparation, and Asbestos Analysis for Asbestos Structure Number Concentration by Transmission Electron Microscopy.

Table 1. Summary of Bus Stop Bench Samples

MVA #	Sample I. D.	Sample Description	Date Collected	TEM Results [str/cm^2]
Z2133	D-NOW-P0036-BS-ER10	Dust, stop bus bench, rd. 385 int. with rd. 384, northwest of Olefin, between 1 and 2 miles radius.	02 October 2014	6,300
Z2136	BLK-FB-ER13	Field blank	02 October 2014	NAD (A.S. 250)
Z2374	D-385-W-ER1	Dust 10 cm x 10 cm from bench left side bus stop	23 October 2014	880,000
Z2375	D-FB-385-ER2	Field blank	23 October 2014	NAD (A.S. 250)
Z2619	D-NOW-P0036-BS-ER1	Dust on bench bus stop intersection Road 385/384	11 November 2014	NAD (A.S. 4,200)
Z2620	D-NOW-P0036-BS-ER2	Dust under bench bus stop intersection Road 385/384	11 November 2014	NA
Z2621	D-FB-NOW-P0036-BS-ER3	— Field blank	11 November 2014	NAD (A.S. 250)
Z2622	W-NOW-P0036-BS-ER1	Wipe on bench bus stop intersection Road 385/384	11 November 2014	880,000
Z2623	W-NOW-P0036-BS-ER2	Wipe under bench bus stop intersection Road 385/384	11 November 2014	NA
Z2624	W-FB-NOW-P0036-BS-ER3	Field blank	11 November 2014	NAD (A.S. 250)
Z2710	D-NOW-P0036-BS-ER1	Dust on bench bus stop intersection Road 385/384	18 November 2014	10,000
Z2711	D-NOW-P0036-BS-ER2	Dust under bench bus stop intersection Road 385/384	18 November 2014	NA
Z2712	D-FB-NOW-P0036-BS-ER3	Field blank	18 November 2014	NAD (A.S. 250)
Z2713	W-NOW-P0036-BS-ER1	Wipe on bench bus stop intersection Road 385/384	18 November 2014	13,000 total (8,400 chrysotile) (4,200 tremolite)
Z2714	W-NOW-P0036-BS-ER2	Wipe under bench bus stop intersection Road 385/384	18 November 2014	NA
Z2715	W-FB-NOW-P0036-BS-ER3	Field blank	18 November 2014	NAD (A.S. 250)

NA = Not Analyzed; NAD = No Asbestos Detected (A.S. = Analytical Sensitivity)

Figure 1. TEM image and EDS spectrum of chrysotile bundle observed in microvac sample D-NOW-P0036-BS-ER10 (MVA Z2133).



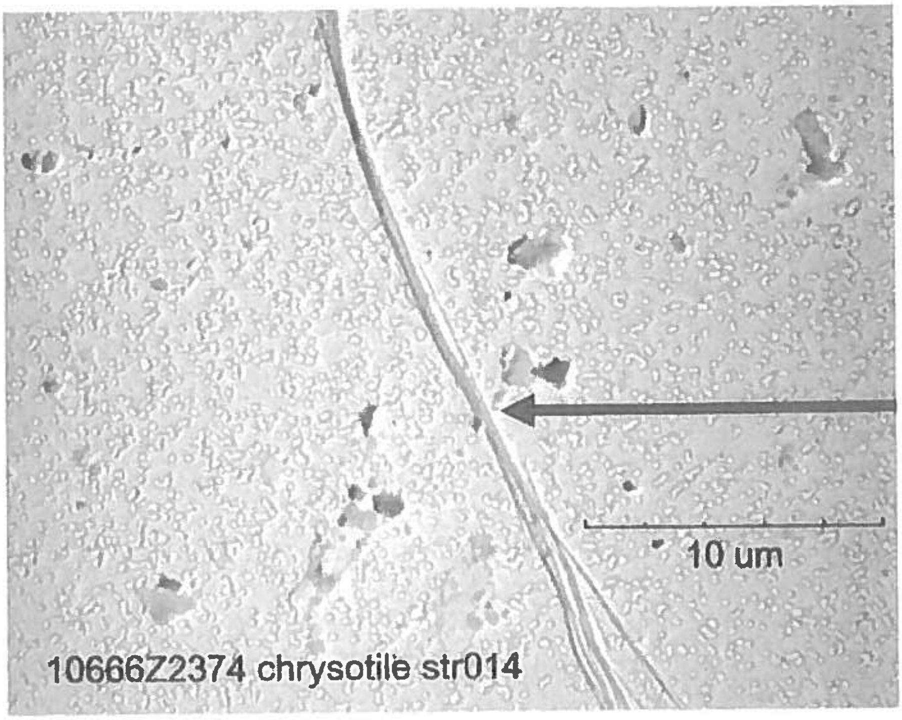
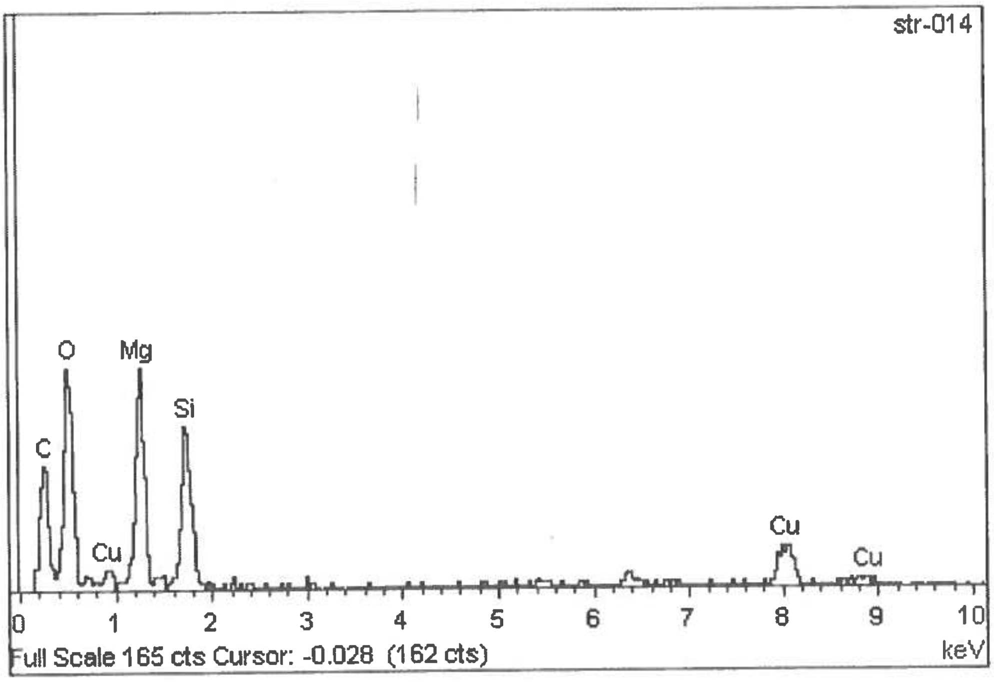


Figure 2. TEM image and EDS spectrum of chrysotile bundle observed in wipe sample D-385-W-ER1 (MVA Z2374).



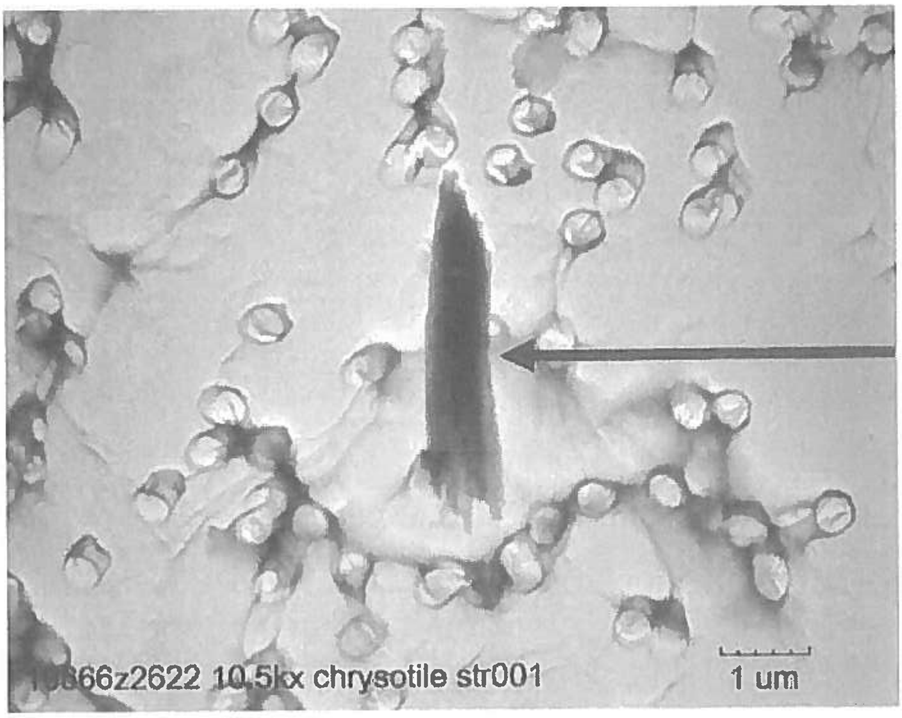
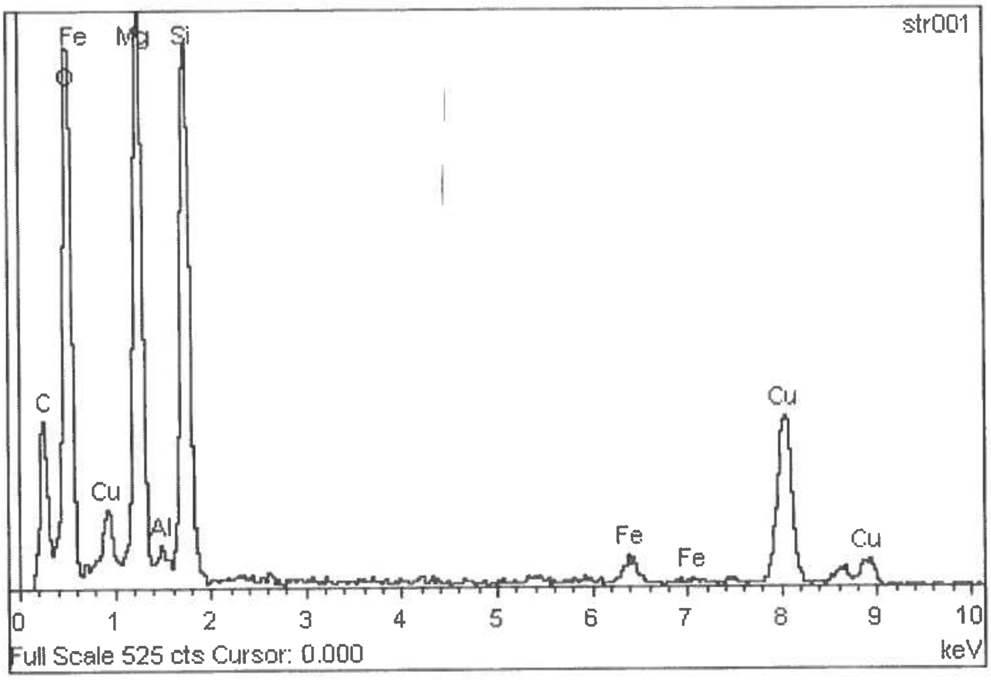


Figure 3. TEM image and EDS spectrum of chrysotile bundle observed in wipe sample W-NOW-P0036-BS-ER1 (MVA Z2622).



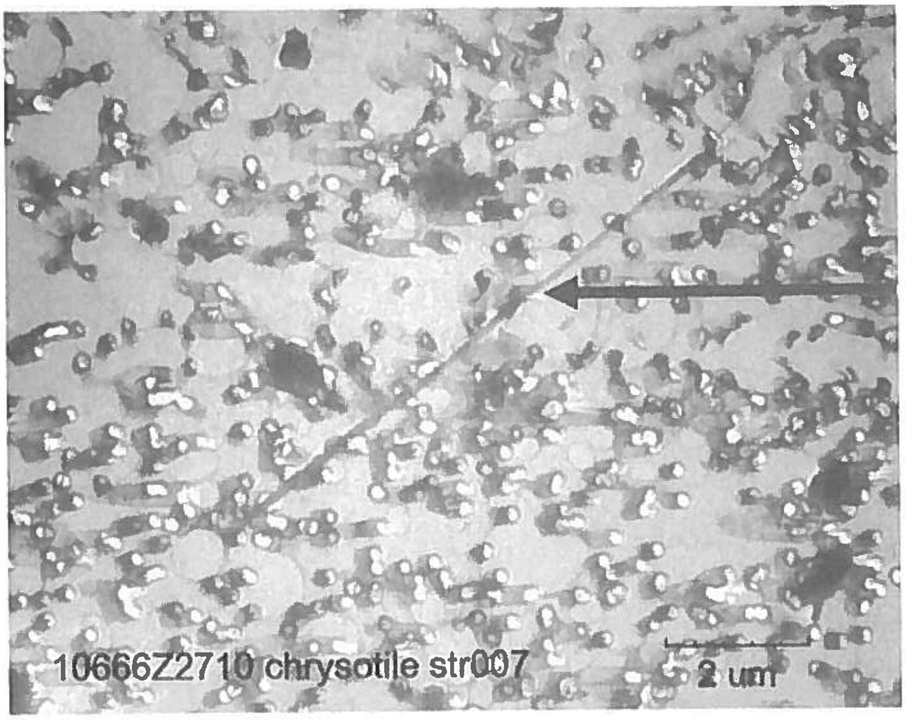
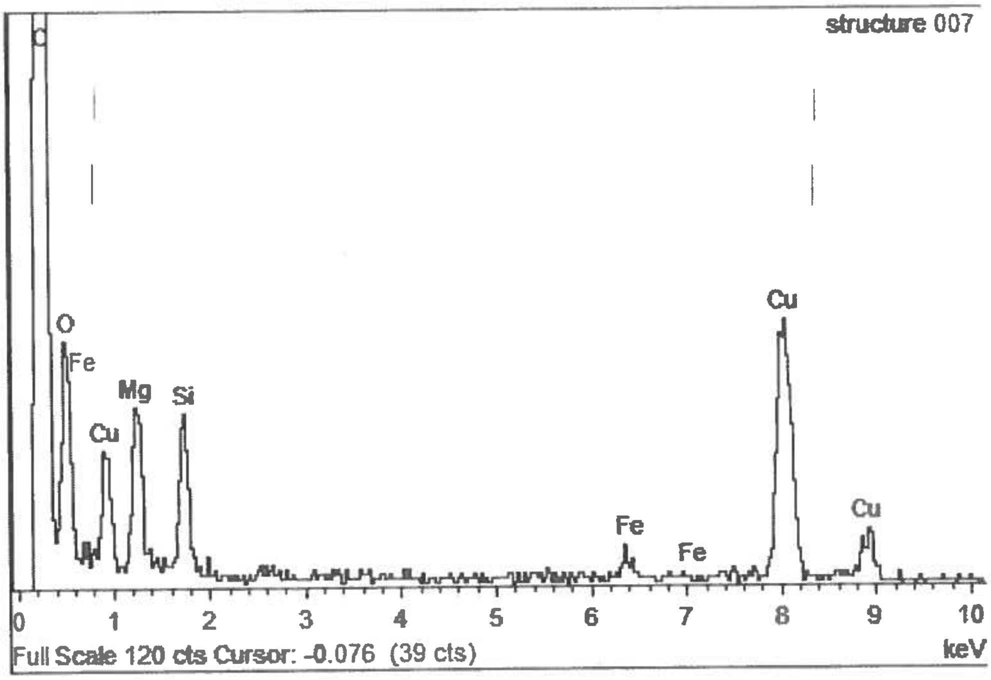


Figure 4. TEM image and EDS spectrum of chrysotile fiber observed in microvac sample D-NOW-P0036-BS-ER1 (MVA Z2710).



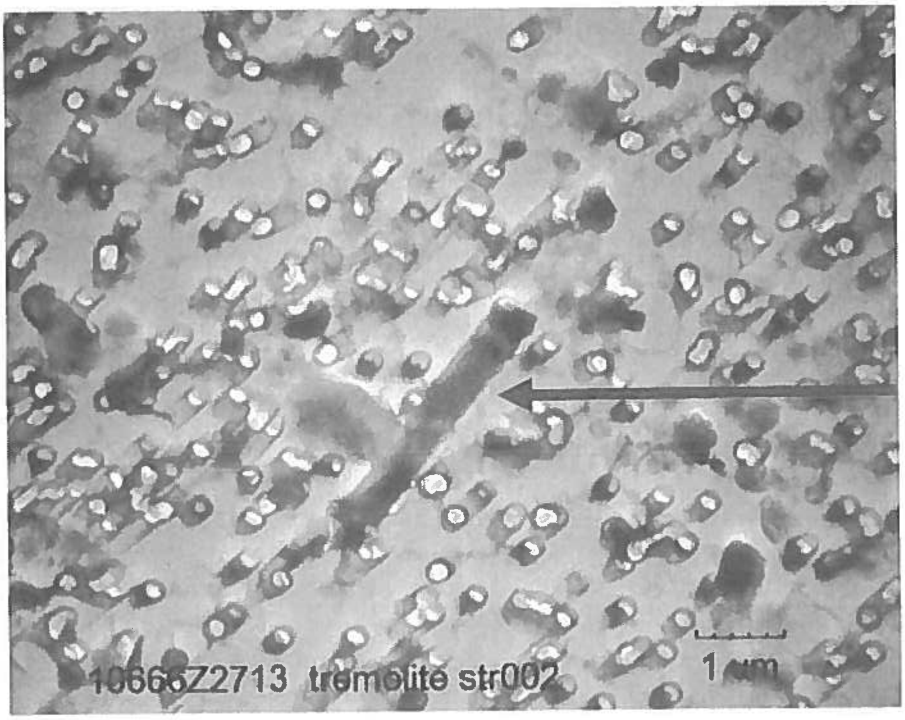
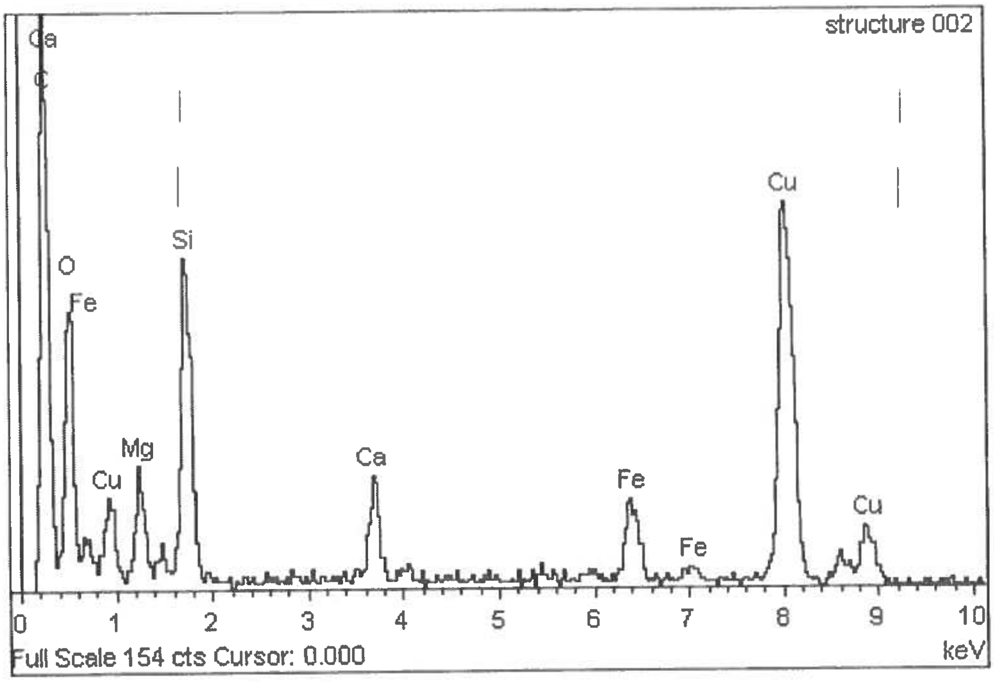


Figure 5. TEM image and EDS spectrum of tremolite fiber observed in wipe sample W-NOW-P0036-BS-ER1 (MVA Z2713).



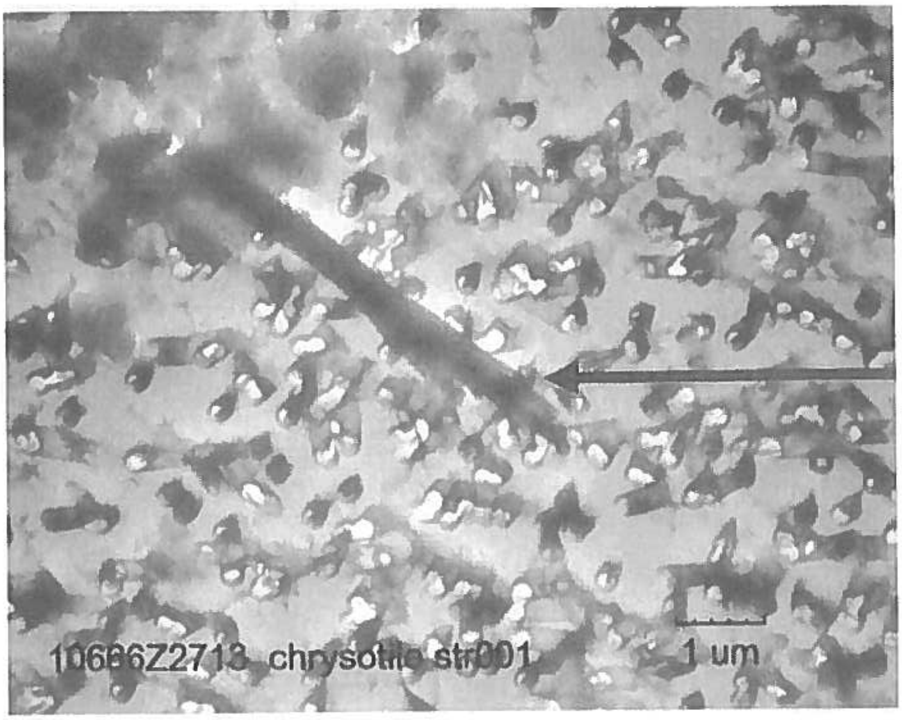
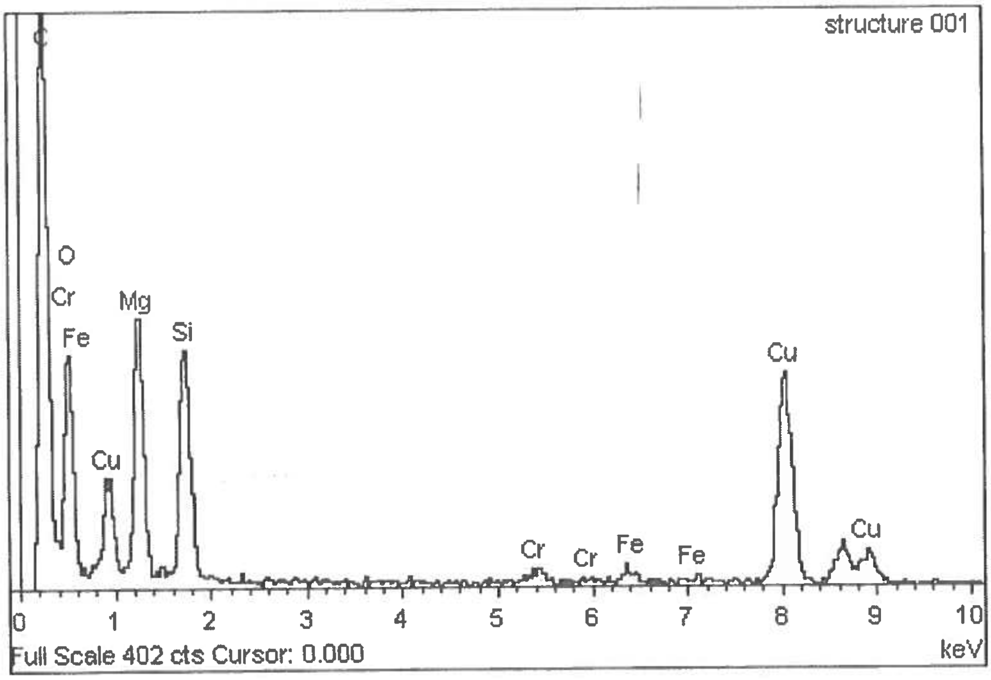


Figure 6. TEM image and EDS spectrum of chrysotile bundle observed in wipe sample W-NOW-P0036-BS-ER1 (MVA Z2713).



Appendix

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MVA SCIENTIFIC CONSULTANTS

MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#: 10666
MVA Sample#: Z2133
Client I.D.: D-NOW-P0036-BS-ER10
Instrument: Philips 420
Magnification: 21,000
Acc. Voltage: 100 kv

Amt Prepped: 100 cm2
Filter Area (mm^2): 1256
Filter Type: PC 0.2
Openings Analyzed: 10
Grid Opening (mm^2): 0.01

Analyst: AH
Date: 11/6/2014
Page: 1 of 1
Comments: 10 ML ANALYZED
ASTM D5755

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	G5-6	1	B	20.0	1.20	C	C		9.5	0.57
	F5-4	NSD								
	G4-3	NSD								
	H4-1	NSD								
	F3-6	2	F	9.0	0.20	C	C		4.3	0.10
2	F4-3	3	B	5.5	0.40	C	C		2.6	0.19
	E5-1	NSD								
	C3-6	NSD								
	E3-1	4	F	2.5	0.30		C		1.2	0.14
	G2-3	5	F	6.0	0.30	C	C		2.9	0.14

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

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MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	NA	Analyst:	AH
MVA Sample#	Z2136	Amt Prepped(cm^2):	NA	Date:	11/24/2014
Client I.D.:	BLK-FB-ER13	Filter Area (mm^2):	1256	Page:	1 of 1
Instrument:	Philips420	Filter Type:	PC	Comments:	Field Blank
Magnification:	21,000	Openings Analyzed:	10	ASTM Method: D6480	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	X

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	E3-1	NSD								
	C2-3	NSD								
	E4-4	NSD								
	F3-6	NSD								
	H4-1	NSD								
2	F2-1	NSD								
	F2-6	NSD								
	G3-1	NSD								
	G4-4	NSD								
	F4-6	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#	10666				
MVA Sample#	Z2374	Amt Prepped:	100 cm2	Analyst:	AH
Client I.D.:	D-385-W-ER1	Filter Area (mm^2):	1256	Date:	11/3/2014
Instrument:	Philips 420	Filter Type:	PC 0.2	Page:	1 of 1
Magnification:	21,000	Openings Analyzed:	10	Comments:	1 ML ANALYZED
Acc. Voltage:	100 kv	Grid Opening (mm^2):	0.01		ASTM D6480

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	G3-3	1	M-F	3.5	0.20	C	C		1.7	0.10
		2	M-F	15.0	0.20	C	C		7.1	0.10
		3	M-F	16.0	0.20	C	C		7.6	0.10
	F4-1	4	F	5.0	0.30	C	C		2.4	0.14
		5	F	7.0	0.20	C			3.3	0.10
	E4-6	6	F	6.5	0.30	C			3.1	0.14
		7	F	9.0	0.20	C			4.3	0.10
	C5-1	8	F	8.0	0.30	C			3.8	0.14
	E6-4	NSD								
2	E3-3	NSD								
	E4-6	9	F	5.0	0.20	C			2.4	0.10
	G4-4	10	F	4.5	0.30	C			2.1	0.14
3	G4-6	11	F	4.0	0.20	C			1.9	0.10
		12	F	2.5	0.30	C			1.2	0.14
	F5-4	13	F	2.0	0.20	C			1.0	0.10
		14	M-B	110.0	2.50	C	C		52.4	1.19

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

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MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#	10666				
MVA Sample#	Z2375	Amt Prepped:	NA	Analyst:	AH
Client I.D.:	D-FB-385-ER2	Filter Area (mm^2):	1256	Date:	11/3/2014
Instrument:	Philips 420	Filter Type:	PC 0.2	Page:	1 of 1
Magnification:	21,000	Openings Analyzed:	10	Comments:	250 ml analyzed
Acc. Voltage:	100 kv	Grid Opening (mm^2):	0.01		ASTM D6480

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	F4-6	NSD								
	G4-4	NSD								
	G3-1	NSD								
	E2-3	NSD								
	C3-4	NSD								
2	E4-3	NSD								
	F5-6	NSD								
	B3-4	NSD								
	C4-3	NSD								
	E5-3	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

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MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	100	Analyst:	MCJ
MVA Sample#	Z2619	Amt Prepped(cm^2):	1	Date:	11/18/2014
Client I.D.:	D-NOW-P0036-BS-ER1	Filter Area (mm^2):	1256	Page:	1 of 1
Instrument:	Philips420	Filter Type:	PC	Comments:	1 mL
Magnification:	21,000	Openings Analyzed:	10	ASTM Method: D6480	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	x

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	E4-3	NSD								
	E4-1	NSD								
	E3-4	NSD								
	F3-3	NSD								
	G3-3	NSD								
2	E2-3	NSD								
	F2-3	NSD								
	G3-1	NSD								
3	E5-6	NSD								
	G4-1	NSD								
4	E5-4	NSD						switched to 10mL		
	C4-1	NSD						10mL		

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

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MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	N/A	Analyst:	MCJ
MVA Sample#	Z2619 LB	Amt Prepped(cm^2):	N/A	Date:	11/20/2014
Client I.D.:	Lab Blank	Filter Area (mm^2):	1256	Page:	1 of 1
Instrument:	Philips120	Filter Type:	PC	Comments:	Lab Blank
Magnification:	24,000	Openings Analyzed:	10	ASTM Method: D6480	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	x

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (μm)	Width*** (μm)
1	C3-4	NSD								
	E3-6	NSD								
	F4-1	NSD								
	G4-3	NSD								
2	E5-1	NSD								
	F4-6	NSD								
	G5-6	NSD								
3	E5-3	NSD								
	F4-6	NSD								
	H5-1	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

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MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	n/a	Analyst:	MCJ
MVA Sample#	Z2621	Amt Prepped(cm^2):	n/a	Date:	11/20/2014
Client I.D.:	D-FB-NOW-P0036-BS-ER3	Filter Area (mm^2):	1256	Page:	1 of 1
Instrument:	Philips120	Filter Type:	PC	Comments:	Field Blank
Magnification:	24,000	Openings Analyzed:	10	ASTM Method: D6480	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	x

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	G3-6	NSD								
	G4-1	NSD								
	E3-6	NSD								
	C3-6	NSD								
2	F3-3	NSD								
	E3-1	NSD								
	E5-1	NSD								
	G3-3	NSD								
3	K5-1	NSD								
	H4-3	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

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MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#: 10666
MVA Sample#: Z2622
Client I.D.: W-NOW-P0036-BS-ER1
Instrument: Philips420
Magnification: 21,000
Acc. Voltage: 100kv

Amt Collected(cm^2): 100
Amt Prepped(cm^2): 0.2
Filter Area (mm^2): 1256
Filter Type: PC
Openings Analyzed: 10
Grid Opening (mm^2): 0.01

Analyst: MCJ
Date: 11/18/2014
Page: 1 of 1
Comments: 1 mL
ASTM Method: D6480 x
or D5755

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	E4-1	1	B	3.8	0.7	-	C	bundle photo	1.8	0.33
		2	F	3.5	0.1	C	-	dif, fiber, no EDS	1.7	0.05
	F4-1	NSD								
	C4-4	3	F	2.5	0.1	C	C	dif, fiber photos	1.2	0.05
2	F3-3	NSD								
	E3-1	4	F	2.2	0.17	C	C	dif, fiber photos	1.0	0.08
		5	F	8.0	0.25	C	C	dif	3.8	0.12
		6	F	2.8	0.2	C	C		1.3	0.10
		7	F	2.1	0.15	C	C		1.0	0.07
	G4-4	8	F	1.2	0.15	C	C		0.6	0.07
	H5-1	9	F	3.5	0.17	C	C		1.7	0.08
3	H3-6	10	F	4.0	0.2	C	C		1.9	0.10
	F3-6	11	F	3.1	0.4	C	C		1.5	0.19
		12	F	2.1	0.2	C	C		1.0	0.10
		13	F	1.4	0.25	C	C		0.7	0.12
	E3-3	14	F	1.5	0.2	C	C		0.7	0.10

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

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MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#: 10666
MVA Sample#: Z2622 LB
Client I.D.: Lab Blank
Instrument: Philips120
Magnification: 24,000
Acc. Voltage: 100kv

Amt Collected(cm^2): N/A
Amt Prepped(cm^2): N/A
Filter Area (mm^2): 1256
Filter Type: PC
Openings Analyzed: 10
Grid Opening (mm^2): 0.01

Analyst: MCJ
Date: 11/20/2014
Page: 1 of 1
Comments: Lab Blank
ASTM Method: D6480 x
or D5755

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (μm)	Width*** (μm)
1	F4-1	NSD								
	E5-1	NSD								
	C5-3	NSD								
	F5-3	NSD								
	G3-3	NSD								
2	C3-3	NSD								
	C4-6	NSD								
	E5-4	NSD								
	F5-1	NSD								
	G4-6	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	n/a	Analyst:	MCJ
MVA Sample#	Z2624	Amt Prepped(cm^2):	n/a	Date:	11/21/2014
Client I.D.:	W-FB-NOW-P0036-BS-ER3	Filter Area (mm^2):	1256	Page:	1 of 1
Instrument:	Philips120	Filter Type:	PC	Comments:	Field Blank
Magnification:	24,000	Openings Analyzed:	10	ASTM Method: D6480	x
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (μm)	Width*** (μm)
1	G5-1	NSD								
	F4-6	NSD								
	E4-3	NSD								
	C4-6	NSD								
2	E5-3	NSD								
	F6-1	NSD								
	H5-3	NSD								
3	C4-3	NSD								
	F5-1	NSD								
	G5-4	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#	10666				
MVA Sample#	Z2710	Amt Prepped:	10 ML	Analyst:	AH
Client I.D.:	D-NOW-P0036-BS-ER1	Filter Area (mm^2):	1256	Date:	12/1/2014
Instrument:	Philips 420	Filter Type:	PC	Page:	1 of 1
Magnification:	21,000	Openings Analyzed:	10	Comments:	10 ML ANALYZED
Acc. Voltage:	100 kv	Grid Opening (mm^2):	0.01		ASTM D5755

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	H5-3	1	F	25.5	0.30	C	C		12.1	0.14
	G5-1	NSD								
	K5-4	2	B	17.0	0.50	C	C		8.1	0.24
	G3-6	3	F	7.0	0.30	C	C		3.3	0.14
	F3-1	4	F	8.0	0.40	C	C		3.8	0.19
		5	F	8.0	0.30	C	C		3.8	0.14
2	F5-1	6	B	7.0	1.00	C	C		3.3	0.48
	F4-6	7	F	18.0	0.30	C	C		8.6	0.14
	E4-4	8	B	15.0	1.20	C	C		7.1	0.57
	F3-6	NSD								
	F3-4	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

10666rptBusStopBench011615.docx

MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#: 10666
MVA Sample#: Z2710 LB
Client I.D.: lab blank
Instrument: Philips 420
Magnification: 21,000
Acc. Voltage: 100 kv

Amt Prepped: 50 ML
Filter Area (mm^2): 1256
Filter Type: PC
Openings Analyzed: 10
Grid Opening (mm^2): 0.01

Analyst: AH
Date: 12/2/2014
Page: 1 of 1
Comments: 50 ML ANALYZED
ASTM D5755

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	F5-1	NSD								
	E4-6	NSD								
	F5-3	NSD								
	G4-4	NSD								
	H4-1	NSD								
2	G3-4	NSD								
	F4-1	NSD								
	E4-6	NSD								
	F5-1	NSD								
	G5-3	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

10666rptBusStopBench011615.docx

MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#: 10666
MVA Sample#: Z2712-FB
Client I.D.: D-FB-NOW-P0036-BS-ER3
Instrument: Philips 420
Magnification: 21,000
Acc. Voltage: 100 kv

Amt Prepped: NA
Filter Area (mm^2): 1256
Filter Type: PC
Openings Analyzed: 10
Grid Opening (mm^2): 0.01

Analyst: AH
Date: 12/2/2014
Page: 1 of 1
Comments: 50 ML ANALYZED

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	G3-1	NSD								
	F2-3	NSD								
	E3-6	NSD								
	F4-3	NSD								
	G4-1	NSD								
2	G3-4	NSD								
	F2-6	NSD								
	E3-4	NSD								
	F4-6	NSD								
	F5-1	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

10666rptBusStopBench011615.docx

MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#	10666				
MVA Sample#	Z2713	Amt Prepped:	6 cm2	Analyst:	AH
Client I.D.:	W-NOW-P0036-BS-ER1	Filter Area (mm^2):	1256	Date:	12/2/2014
Instrument:	Philips 420	Filter Type:	PC	Page:	1 of 1
Magnification:	21,000	Openings Analyzed:	10	Comments:	30 ML ANALYZED
Acc. Voltage:	100 kv	Grid Opening (mm^2):	0.01		ASTM D6480

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	H4-3	1	B	10.5	0.80	C	C		5.0	0.38
	H3-6	2	F	6.0	1.00	A	TR		2.9	0.48
	G3-3	3	B	63.0	0.80	C	C		30.0	0.38
	C5-1	NSD								
	F5-6	4	B	12.0	1.30	A	TR		5.7	0.62
2	F3-6	NSD								
	G3-1	5	B	13.0	0.80	C	C		6.2	0.38
	E2-6	NSD								
	H3-4	NSD								
	G5-1	6	F	11.0	0.30	C	C		5.2	0.14

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

10666rptBusStopBench011615.docx

MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#	10666			Analyst:	AH
MVA Sample#	Z2715-FB	Amt Prepped:	NA	Date:	12/3/2014
Client I.D.:	W-FB-NOW-P0036-BS-ER3	Filter Area (mm^2):	1256	Page:	1 of 1
Instrument:	Philips 420	Filter Type:	PC	Comments:	250 mL analyzed
Magnification:	21,000	Openings Analyzed:	10		ASTM D6480
Acc. Voltage:	100 kv	Grid Opening (mm^2):	0.01		

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	F6-4	NSD								
	G5-6	NSD								
	G4-3	NSD								
	C4-6	NSD								
	C3-3	NSD								
2	E4-3	NSD								
	C5-4	NSD								
	B5-6	NSD								
	F5-3	NSD								
	G4-1	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Asbestos Quantitative Analysis

MVA Project#	10666				
MVA Sample#	Z2713-LB	Amt Prepped:	NA	Analyst:	AH
Client I.D.:	Lab Blank	Filter Area (mm^2):	1256	Date:	12/2/2014
Instrument:	Philips 420	Filter Type:	PC	Page:	1 of 1
Magnification:	21,000	Openings Analyzed:	10	Comments:	250 ML
Acc. Voltage:	100 kv	Grid Opening (mm^2):	0.01		ASTM D6480

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	F3-6	NSD								
	G4-1	NSD								
	H3-3	NSD								
	E4-1	NSD								
	E5-6	NSD								
2	F5-1	NSD								
	G5-3	NSD								
	F4-6	NSD								
	G4-1	NSD								
	C4-6	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

106666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	1290	**Project Name:**	PRC23673
Address:		**Sampling Date:**	10/1/14
Contact:		**Collected by:**	Elme Rivera, Mildred Santiago
Phone/Fax		**Company Name:**	AESI

Chain of Custody Record — **COC-AIR-009/REV 1/06**

	Sample Description	Pump	TIME		FLOW RATE						Dust Finguerprints	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	Latitude (X)	Longitude (Y)		
D-EV-FP-ER1	Dust, floor, front porch entrance stair. El Velorio restaurant	LV-237	14:52	14:54	2.00	2.00	2.00	4.0	17.99949	-66.72264	X	
D-HS-PG-ER2	Dust, floor, exterior next to playground, Head Start	LV-237	15:10	15:12	2.00	2.00	2.00	4.0	17.99692	-66.71860	X	
D-JLPV-CR23-2F-H-ER3	Dust, floor, hallway 2nd floor, Adm. Building, JLPV School	LV-237	16:06	16:08	2.00	2.00	2.00	4.0	17.99724	-66.71924	X	
D-JLPV-CR19-1F-H-ER4	Dust, floor, hallway, bldg. next to basketball court, JLPV School	LV-237	16:15	16:17	2.00	2.00	2.00	4.0	17.99712	-66.71952	X	
D-JLPV-CR10-1F-H-ER5	Dust, floor, hallway, 1st. bldg. JLPV School	LV-237	16:24	16:26	2.00	2.00	2.00	4.0	17.99775	-66.72009	X	
BLK-~~ER7~~ ER6	Field Blank										X	
MAH 10/7/14												

Turnaround Time: Normal: X Rush: Super Rush:

Comments: *Area sampled is 100 cm^2 **Method of collection - ASTM D5755

Relinquished By:	[signature]	Date/Time	10/7/14	Delivered Directly to Lab:	Shipped:
Received By:	Melissa K Holman	Date/Time	10/7/14 3:30pm	Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

10066

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

#611 Monserrate, 2nd Floor, Santurce, P.R. 00907

Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	1290	Project Name:	PRC 23673
Address:		Sampling Date:	10/2/14
Contact:		Collected by:	Elme Rivera, Mildred Santiago
Phone/Fax		Company Name:	AESI

Chain of Custody Record

COC-AIR-009/REV 1/06

Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Latitude (X)	Longitude (Y)	Dust Finguerprints	LAB ID #
D-TEC-ARE-PO006-E-ER7	Dust, floor, AR Exchanger Boiler Specialist exterior, Tallaboa Encarnacion Community	LV-238	10:37	10:39	2.00	2.00	2.00	4.0	17.99976	-66.72311	X	
D-TEC-GULF-GS-ER8	Dust, floor, Gulf Facility entrance, Tallaboa Encarnacion Community	LV-238	10:56	10:58	2.00	2.00	2.00	4.0	18.00052	-66.72366	X	
D-NOW-P0035-TB-ER9	Dust, behind traffic barrier Rd. 384 Km 3.2, north west of Olefin, between 1 and 2 miles radius	LV-238	11:26	11:28	2.00	2.00	2.00	4.0	18.03051	-66.72896	X	
D-NOW-P0036-BS-ER10	Dust, stop bus bench, Rd. 385 intersection with Rd. 384, north west of Olefin, between 1 and 2 miles radius	LV-238	11:39	11:41	2.00	2.00	2.00	4.0	18.03041	-66.72598	X	
D-TEC-P0021-C2-ER11	Dust, floor, sidewalk front of house corner street 2 intersection street 4, Tallaboa Encarnacion Community	LV-238	12:04	12:06	2.00	2.00	2.00	4.0	17.99489	-66.71612	X	
D-TEC-P0018-C2-ER12	Dust, floor, corner street 2, west of street 2 Tallaboa Encarnacion Community	LV-238	12:16	12:18	2.00	2.00	2.00	4.0	17.99620	-66.71720	X	
BLK-FB-ER13	Field Blank										X	

Turnaround Time: Normal: ✓ Rush: Super Rush:

Comments: *Area sampled is 100 cm^2 **Method of collection - ASTM D5755

Relinquished By:	[illegible signature]	Date/Time	10/2/14	Delivered Directly to Lab:	Shipped:
Received By:	Melissa Ortega-Atelmann	Date/Time	10/7/14 3:30pm	Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	**Project Name:**	Dust Sampling Studies
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
B-OL-0V-409-ER1	Sample from debris of pipe insulation found on floor from area OV409	10/23/14	12:10		Dust Fingerprint		58924
S-OL-FF-ER3	Soil sample from area covered with grass. Area front of flare	10/23/14	12:23		Dust Fingerprint		58925
B-OL-FF-ER4	Sample from insulation under pipe on the floor. Area front of flare	10/23/14	12:39		Dust Fingerprint		58926
B-OL-PS408-ER5	Sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:43		Dust Fingerprint	there is still part of pipe on the column	58927
B-OL-PS408-ER5 dup	Duplicate sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:44		Dust Fingerprint	there is still part of pipe on the column	58928
D-385-W-ER1	Dust 10 cm x 10 cm from bench left side bus stop	10/23/14	11:15		Dust Fingerprint		58929
D-FB-385-ER2	Field Blank	10/23/14	11:16		Dust Fingerprint		58930

Turnaround Time: Normal: X Rush:

Comments: Do not analyze blank and duplicate

Relinquished By:	K y	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	10/23/14 15:30		
Received By:	St 6t	**Method of Shipment:**	
Date/ Time:	10/24/14 9:30		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

10666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	1290	Project Name:	Dust Sampling
Address:		Sampling Date:	10/23/2014
Contact:		Collected by:	Elme Rivera
Phone/Fax		Company Name:	AES International

Chain of Custody Record

COC-AIR-009/REV 1/06

	Sample Description	Pump	TIME		FLOW RATE				Asbestos	Dust	Lead	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	PCM	Fingerprint	Air		
D-OL-FF-ER2	Sample on top of pipe surface from front flare area	LV-238	12:30	12:32	2.0	2.0	2.0	4.0		x			61523
D-OL-SM-ER6	Sample from surface of metal scrap in front of area where the crane was	LV-238	12:54	12:56	2.0	2.0	2.0	4.0		x			61524
OL-SB-ER7	Sealed Blank									x			61525
OL-FB-ER8	Field Blank									x			61526
OL-FB-ER9	Field Blank									x			61527

Turnaround Time: Normal: X Rush: Super Rush:

Comments: **Do not analyze blanks and sealed blank**

Relinquished By:	[signature]	**Date/Time**	10/23/14 15:20	**Delivered Directly to Lab:**	**Shipped:**
Received By:	[signature]	**Date/Time**	10/24/14 9:30	**Method of Shipment:**	
Relinquished By:		**Date/Time**		**Lab. Recipient:**	
Received By:		**Date/Time**		**Date:**	

100666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Client Name: 1290
Address:
Contact:
Phone/Fax

Project Name: Dust Sampling Studies
Sampling Date: 11/11/2014
Collected by: Elme Rivera
Company Name: AES International

Chain of Custody Record

	Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Asbestos PCM	Asbestos TEM	Other Air	LAB ID #
22619	D-NOW-P0036-BS-ER1	Dust on bench bus stop intersection Road 385/384	LV-238	12:05	12:07	2.0	2.0	2.0	4.0			TEM str/cm2	329180
22620	D-NOW-P0036-BS-ER2	Dust under bench bus stop intersection Road 385/384	LV-238	12:14	12:16	2.0	2.0	2.0	4.0			TEM str/cm2	329181
22621	D-FB-NOW-P0036-BS-ER3	Field Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329182
22622	W-NOW-P0036-BS-ER1	Wipe on bench bus stop intersection Road 385/384.	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329183
22623	W-NOW-P0036-BS-ER2	Wipe under bench bus stop intersection Road 385/384.	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329184
22624	W-FB-NOW-P0036-BS-ER3	Field Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329185

Turnaround Time: Normal: X Rush: Super Rush:

Comments: **Do not analyze Field Blank. Area sampled is 100 cm2**

Relinquished By:	[signature]	Date/Time	11/14/14 16:30	Delivered Directly to Lab:	Shipped:
Received By:	SA LP	Date/Time	11/14/14 11:20AM	Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

106666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Client Name:	1290	Project Name:	Dust Sampling Studies
Address:		Sampling Date:	11/18/2014
Contact:		Collected by:	Elme Rivera
Phone/Fax		Company Name:	AES International

Chain of Custody Record

	Sample Description	Pump	TIME		FLOW RATE				Asbestos	Asbestos	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	PCM	TEM	Air	
D-NOW-P0036-BS-ER1	Dust on bench bus stop intersection Road 385/384	LV-238	12:05	12:07	2.0	2.0	2.0	4.0			TEM str/cm2	329475
D-NOW-P0036-BS-ER2	Dust under bench bus stop intersection Road 385/384	LV-238	12:09	12:11	2.0	2.0	2.0	4.0			TEM str/cm2	329476
D-FB-NOW-P0036-BS-ER3	Field Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329477
W-NOW-P0036-BS-ER1	Wipe on bench bus stop intersection Road 385/384.	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329478
W-NOW-P0036-BS-ER2	Wipe under bench bus stop intersection Road 385/384.	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	329479
W-FB-NOW-P0036-BS-ER3	Field Blank	N/A	N/A	N/A	N/A	N/A	N/A	N/A			TEM str/cm2	239480

Turnaround Time: Normal: X Rush: Super Rush:

Comments: **Do not analyze Field Blank. Area samplig is 100 cm2**

Relinquished By:		Date/Time	11/19/14 15:30	Delivered Directly to Lab:	Shipped:
Received By:		Date/Time	11/20/14 18:30	Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

Project: MVA 10666

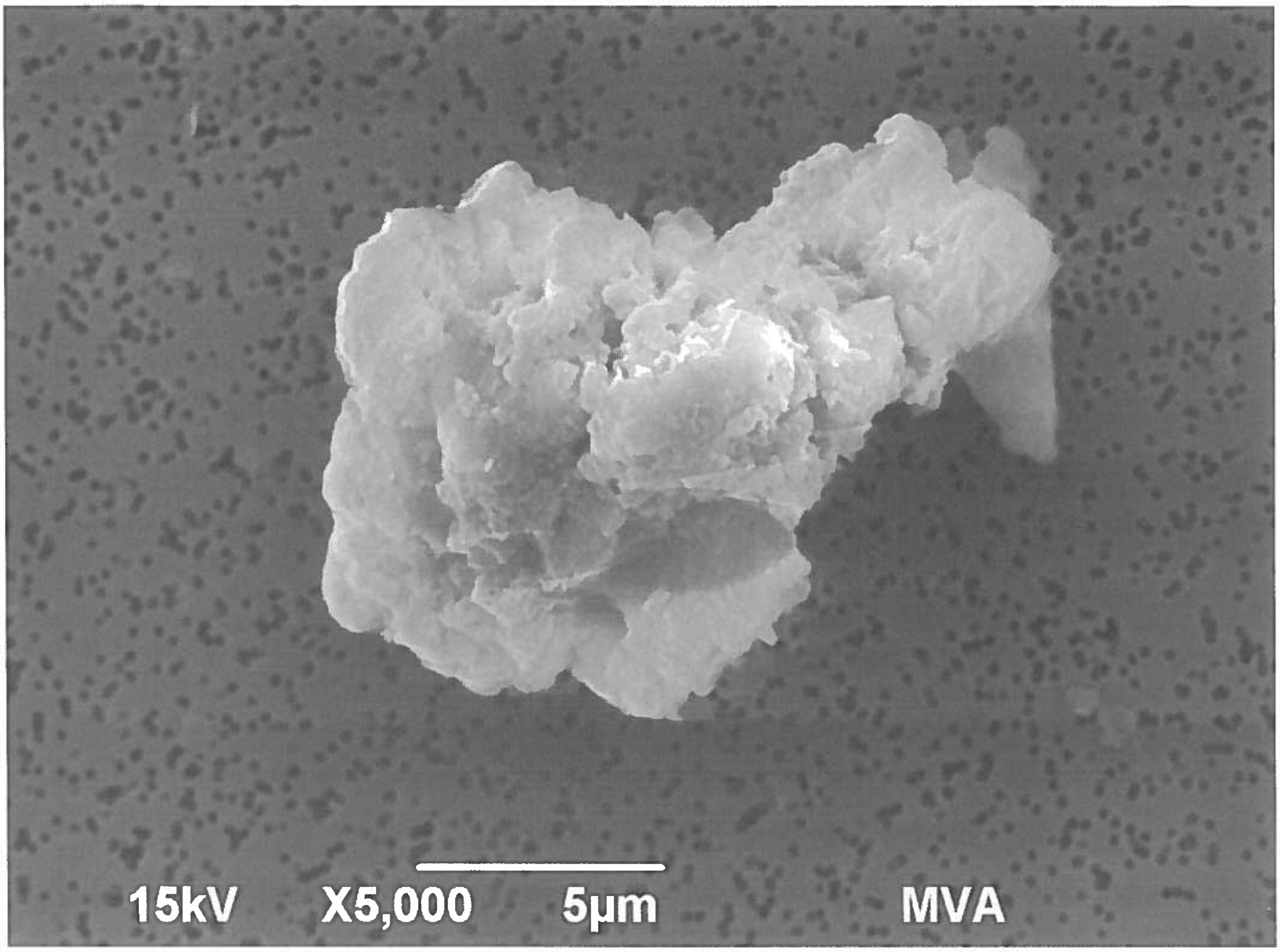
Sample: Z2133

Client ID: D-NOW-P0036-BS-ER10

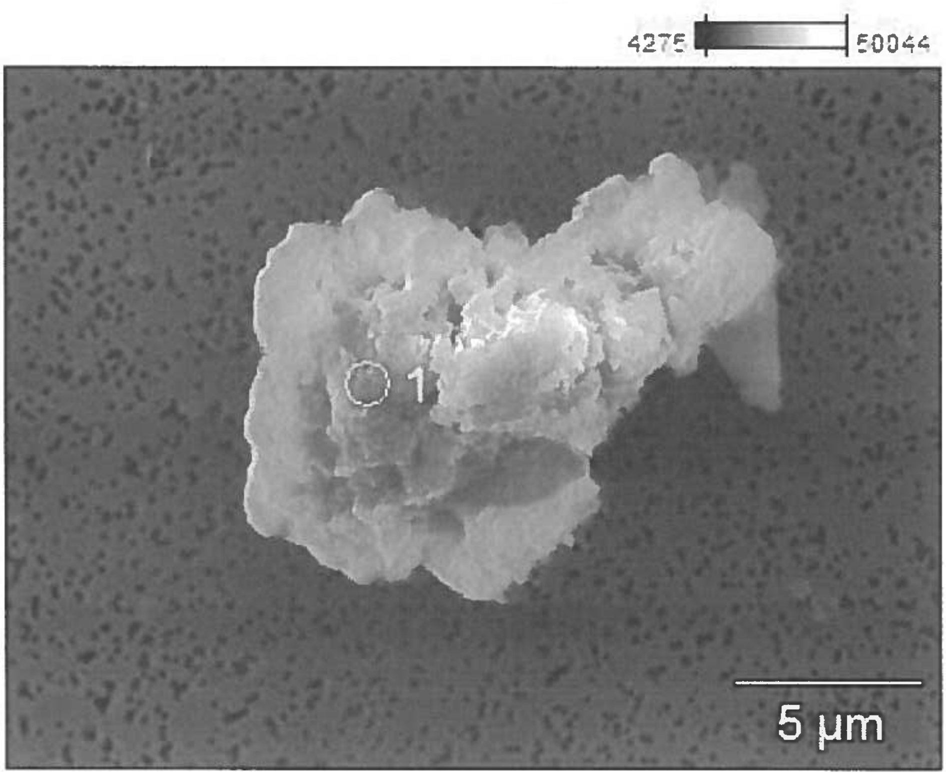
Analysis of four lizardite mineral particles from filter preparation of surface dust sample D-NOW-P0036-BS-ER10 (MVA Z2133). Filter section cut and placed onto an adhesive carbon tab on an aluminum planchette, then coated with gold for conductivity.

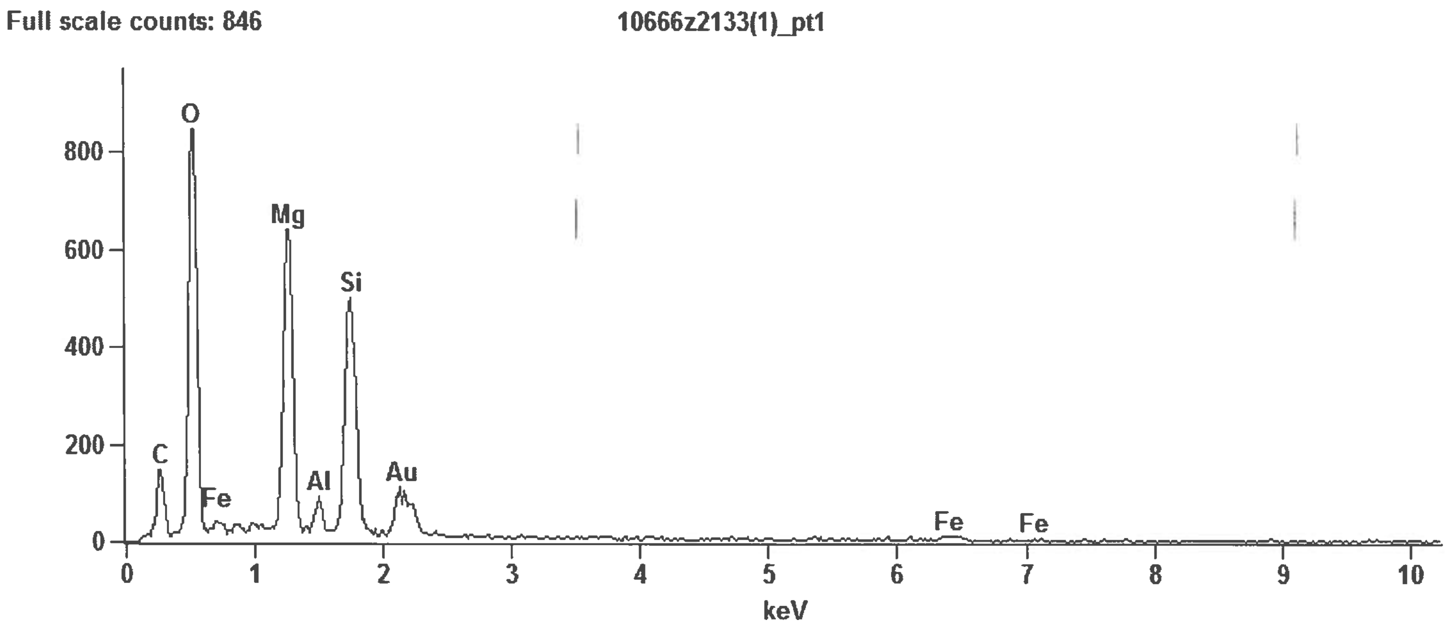
EXECUTED BY ELECTRONIC SIGNATURE

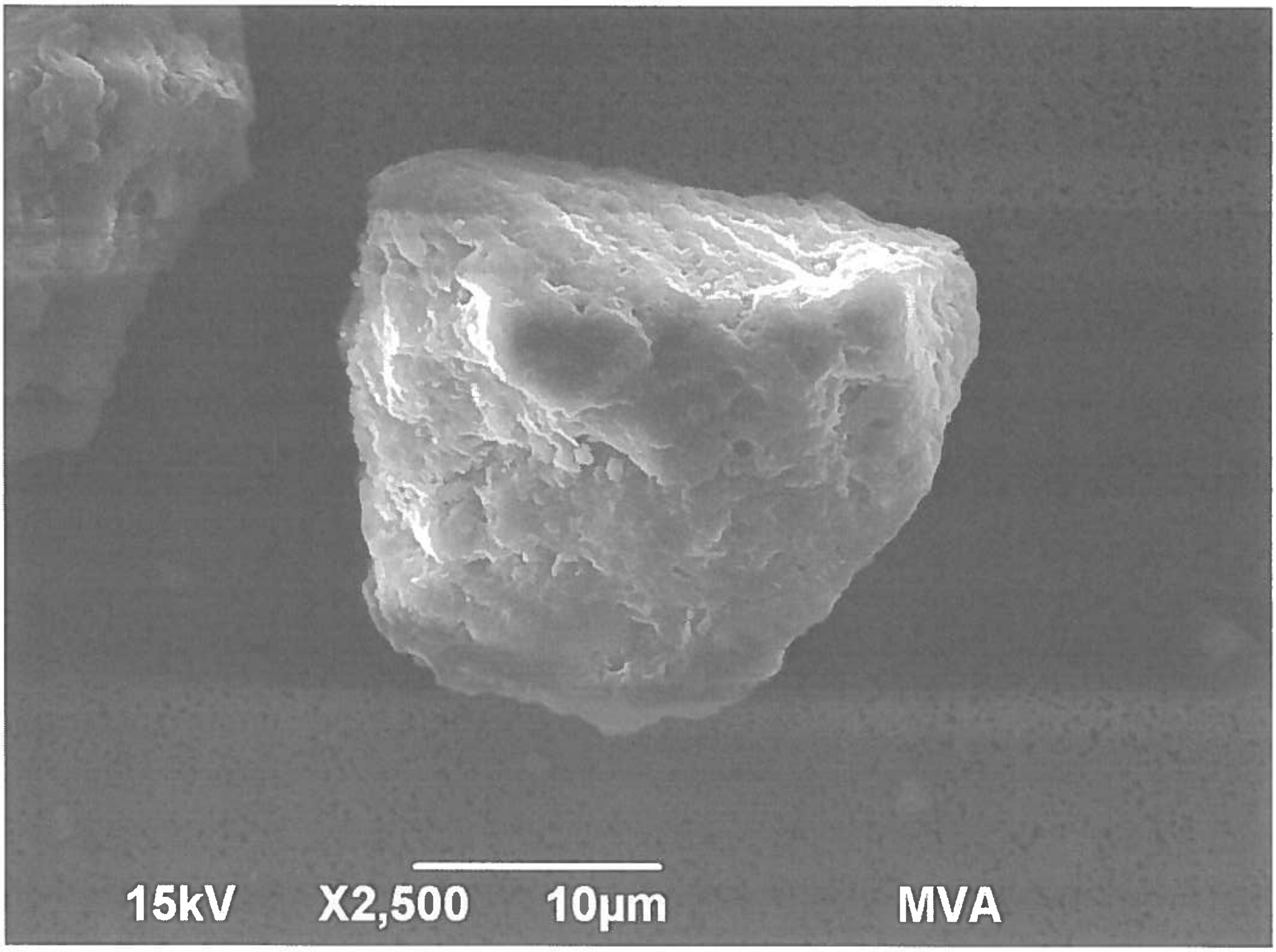
Steven P. Compton, Ph.D.
Executive Director
MVA Scientific Consultants
27 January 2015


15kV
X5,000
5μm
MVA

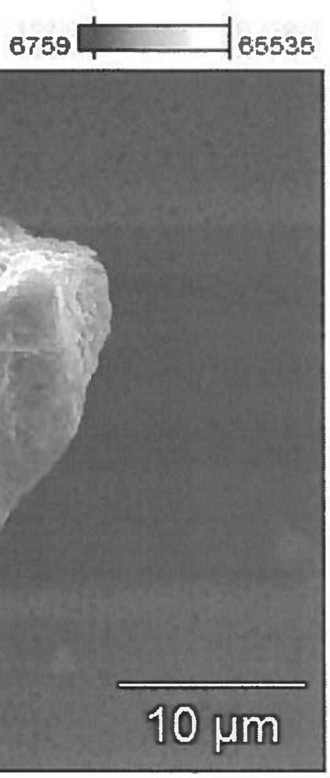
10666z2133(1)





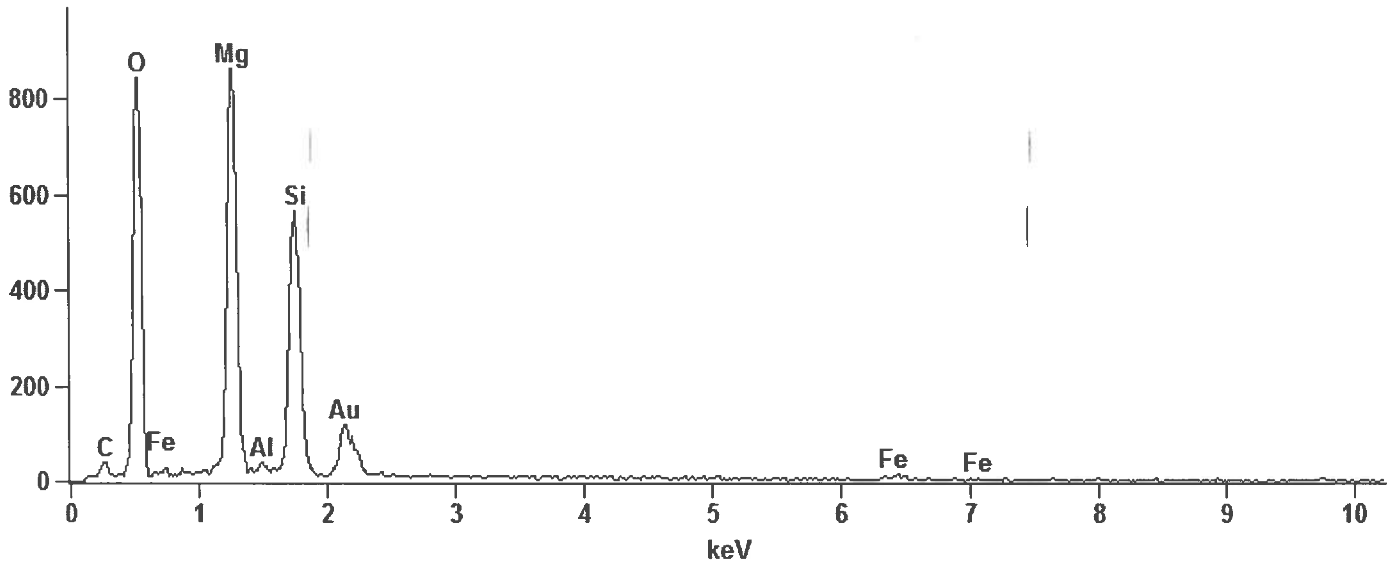

15kV
X2,500
10µm
MVA

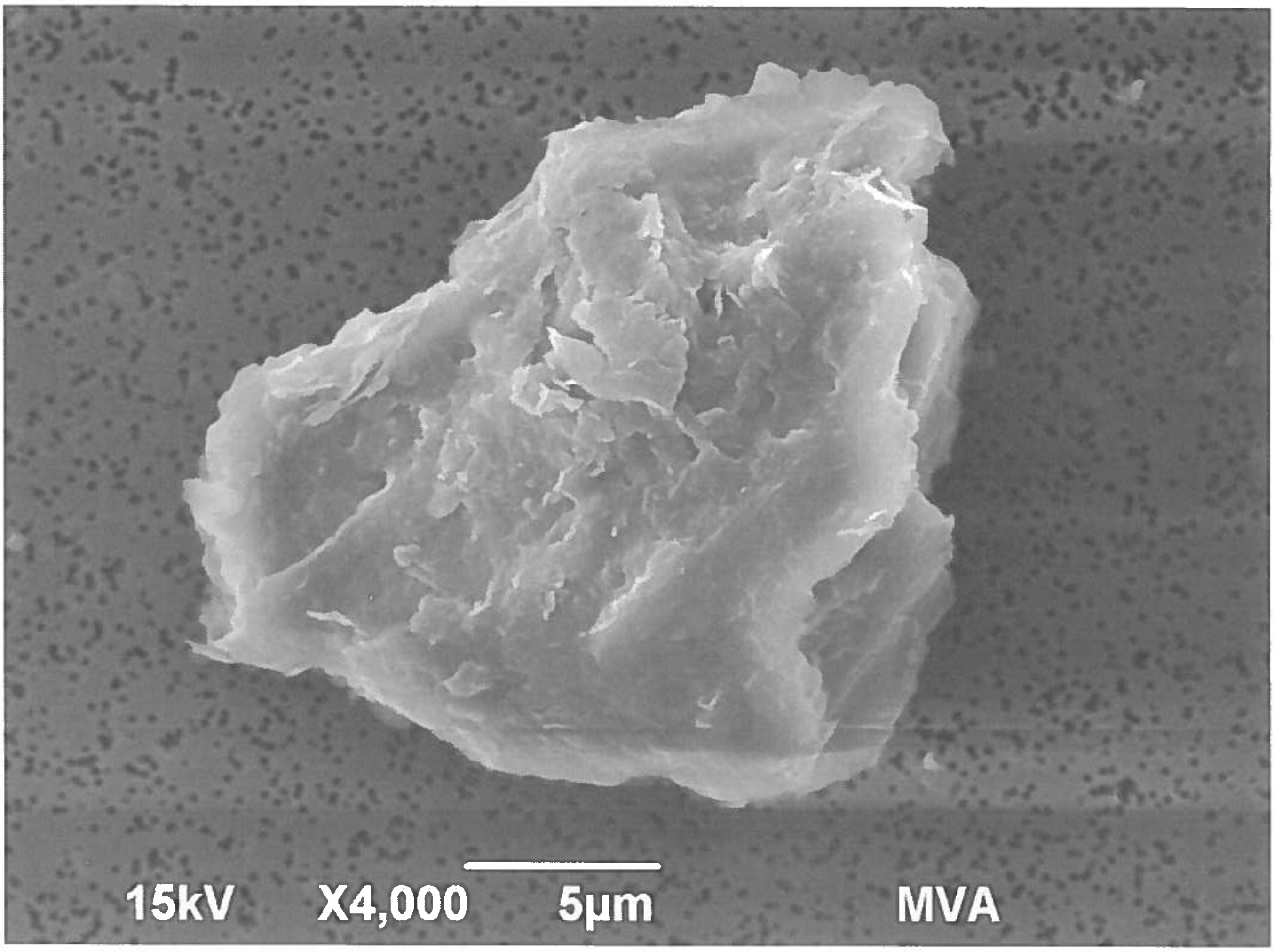
10666z2133(2)



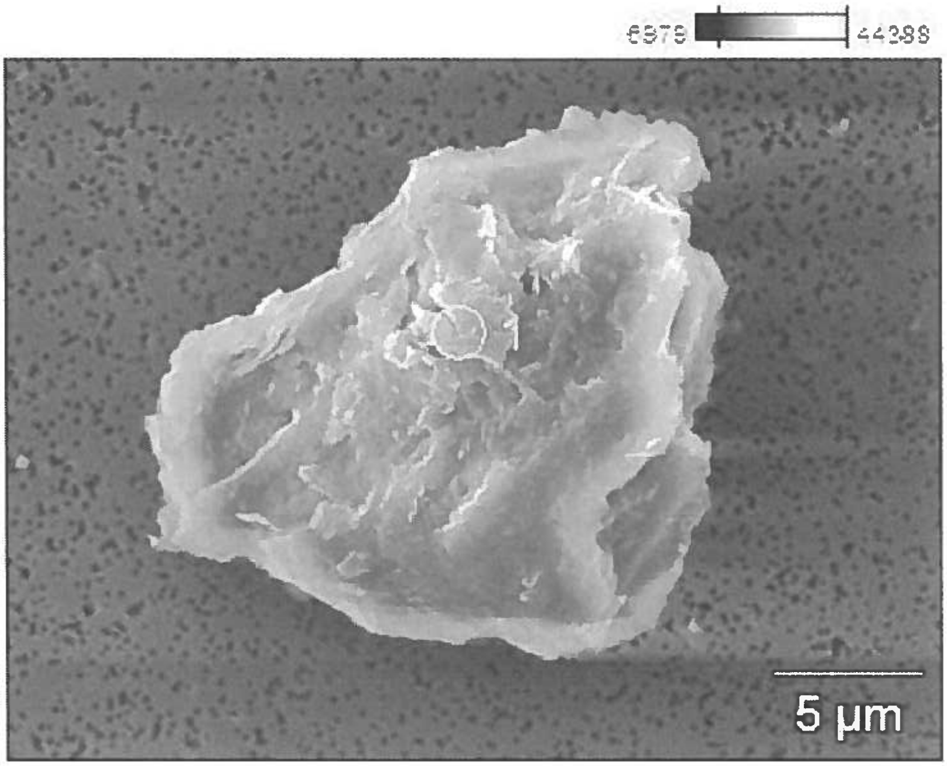
Full scale counts: 864

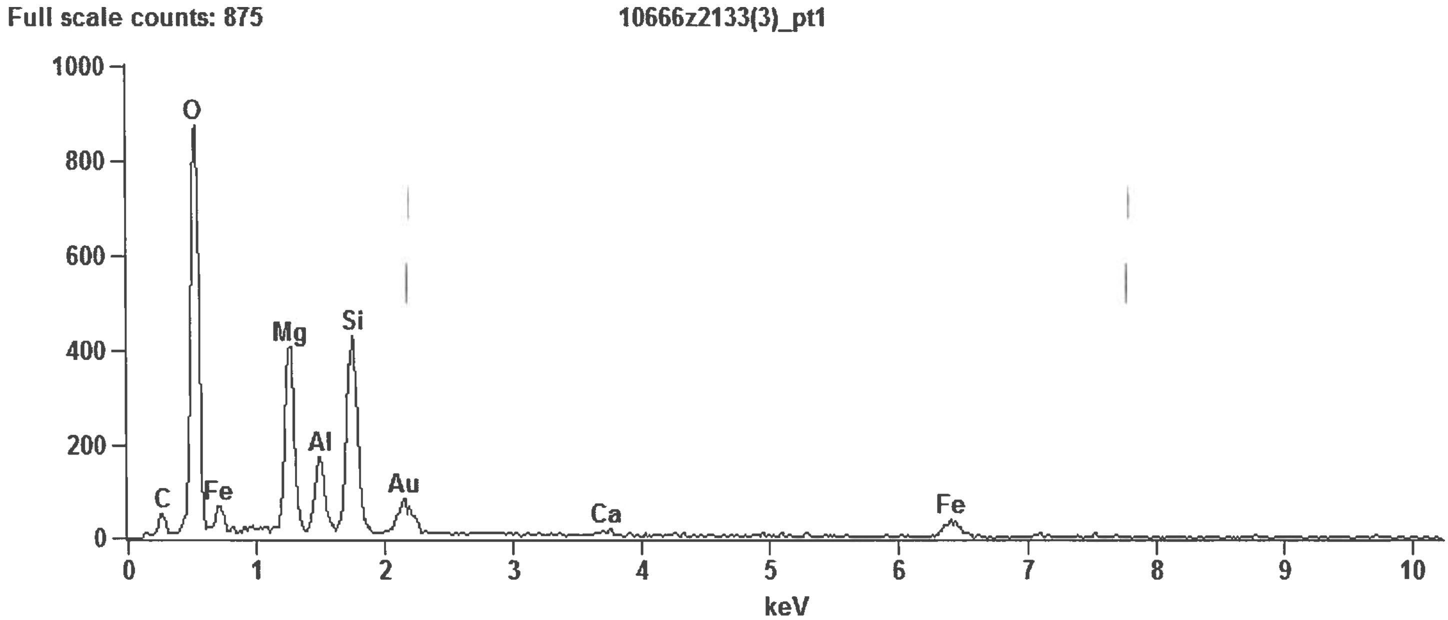
10666z2133(2)_pt1

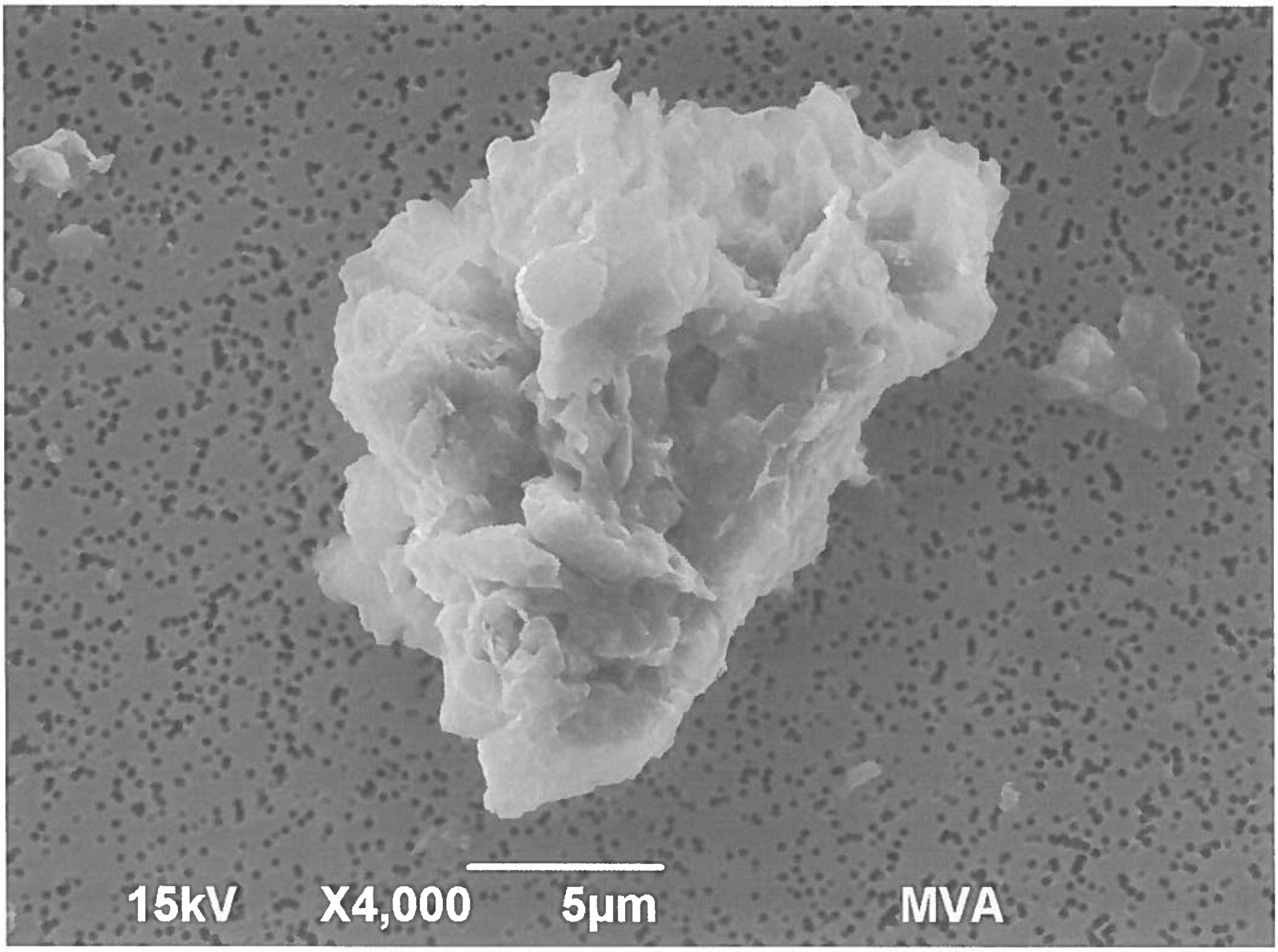



15kV
X4,000
5µm
MVA

10666z2133(3)



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X4,000
5µm
MVA

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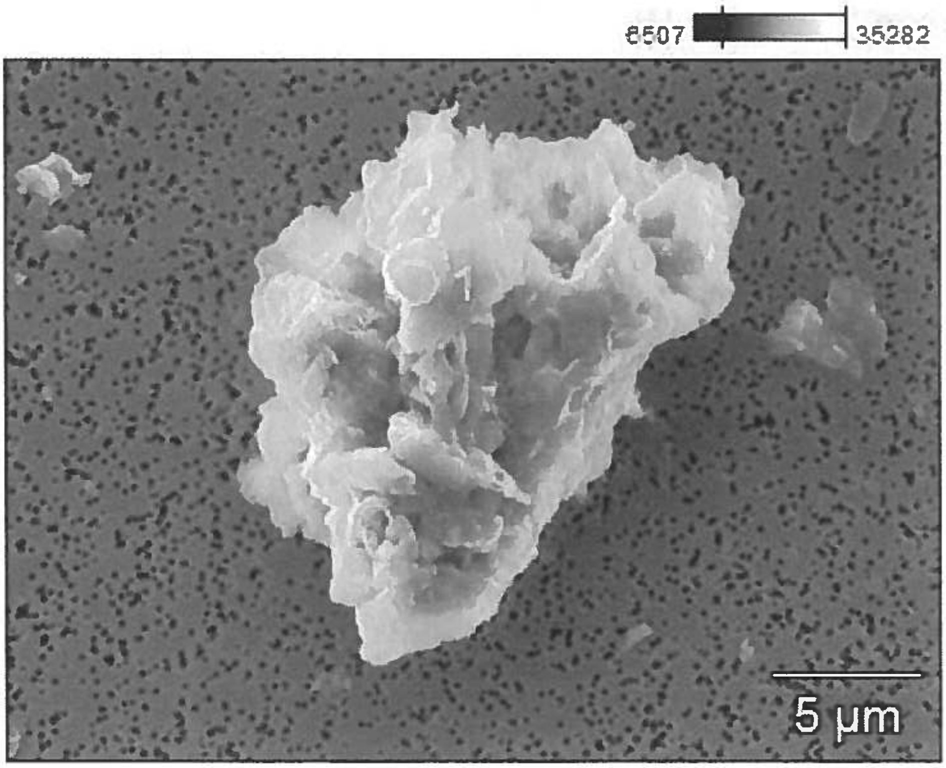

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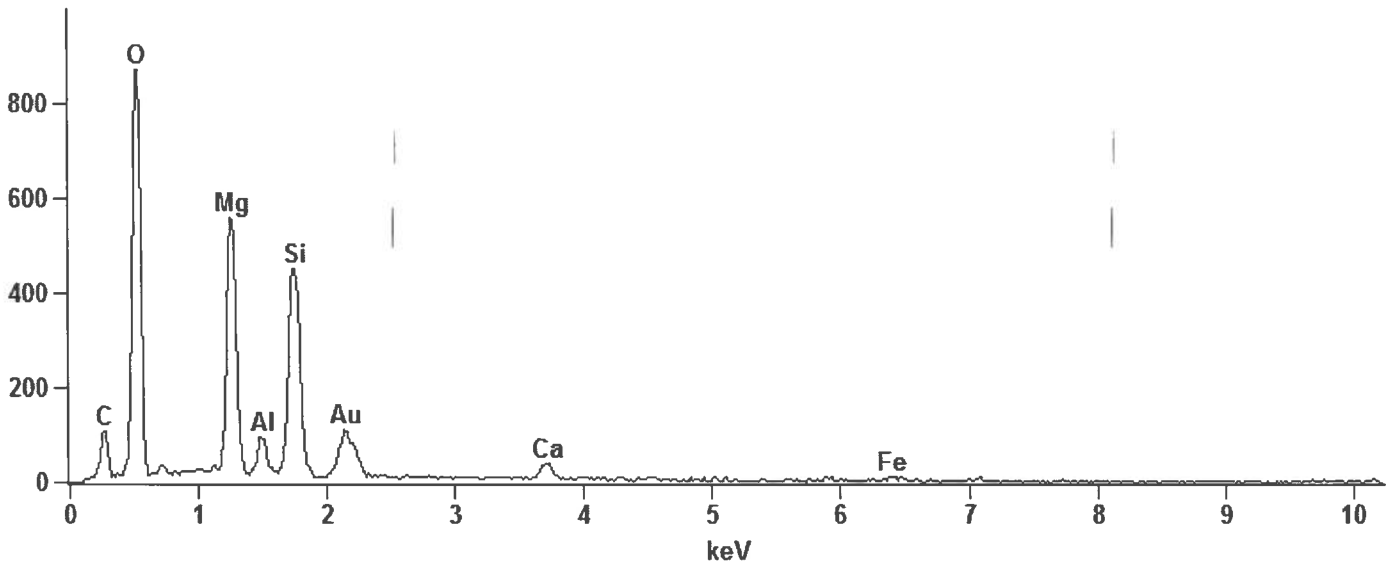

2. Characterization of Dust (Microvacuum) samples outside Olefin facility and two samples inside.

MVA SCIENTIFIC CONSULTANTS

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Dust Characterization

Carbon Black Analysis

Fly Ash Characterization

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Ion Milling & Ultramicrotomy

Accreditations

cGMP Compliant

ISO/IEC 17025
A2LA Certificate #2096.01

FDA Registered

Characterization of Dust (Microvacuum) Samples

Performed for AES International, Inc.

MVA Project 10666

16 January 2015

Executive Summary

This revised report presents the results of the characterization of eighteen dust samples collected by microvacuum sampling using ASTM method D5755. Six samples were collected by Elme Rivera and Mildred Santiago of AES International, Inc. on 01 October 2014. Seven samples were collected by Elme Rivera and Mildred Santiago of AES International, Inc. on 02 October 2014. Five samples were collected by Elme Rivera of AES International, Inc. on 23 October 2014. The samples were shipped to MVA Scientific Consultants via FedEx and were received on 07 October (first and second sample sets) and 24 October 2014 (third sample set). Upon receipt, the samples were all assigned unique MVA sample numbers. The third sample set, received on 24 October 2014, also included bulk insulation samples, a soil sample, and wipe samples that will be described and reported separately.

It was requested that we characterize the samples, both for asbestos content and for any additional characteristics that might be distinct to these samples as a "fingerprint" of the material. The report has been revised to include results of field blank samples and aspect ratios of chrysotile fibers detected via transmission electron microscopy.

Chrysotile and lizardite detected in several samples consistently exhibit trace amounts of iron and aluminum. The average iron and aluminum levels detected in the population of chrysotile structures from the settled dust samples are comparable to the levels detected in the local mineral samples. Aspect ratios of the chrysotile fibers/bundles detected by TEM-EDS were primarily less than 20:1 (length:width). Most of the structures were less than 3 micrometers in length. The average size/aspect ratios of the fibers are comparable to the fibers observed during analysis of the local mineral samples. Only one sample, Z2377, revealed the presence of amosite asbestos. This sample was collected from inside the facility from the "surface of metal scrap in front of area where the crane was."

Respectfully Submitted by: EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

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2nd Revised Report of Results: MVA10666

Characterization of Dust (Microvacuum) Samples

Prepared for:

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611 Monserrate St, 2nd Floor
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Supercedes Reports Dated 25 November and 12 December 2014

16 January 2015

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MVA SCIENTIFIC CONSULTANTS
Full Service Analytical Microscopy Laboratory

2nd Revised Report of Results: MVA10666

Characterization of Dust (Microvacuum) Samples

Introduction

This revised report presents the results of characterization of eighteen dust samples collected by microvacuum sampling using ASTM method D5755, "Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading" [1]. Six samples were collected by Elme Rivera and Mildred Santiago of AES International, Inc. on 01 October 2014 (see Table 1). Seven samples were collected by Elme Rivera and Mildred Santiago of AES International, Inc. on 02 October 2014 (see Table 2). Five samples were collected by Elme Rivera of AES International, Inc. on 23 October 2014 (see Table 3). The samples were shipped to MVA Scientific Consultants via FedEx and were received on 07 October (first and second sample sets) and 24 October 2014 (third sample set). Upon receipt, the samples were all assigned unique MVA sample numbers (see Tables 1 through 3). The third sample set, received on 24 October 2014, also included bulk insulation samples, a soil sample, and wipe samples that will be described and reported separately. The report has been revised to include results of field blank samples and aspect ratios of chrysotile fibers detected via transmission electron microscopy.

It was requested that we characterize the samples, both for asbestos content and for any additional characteristics that might be distinct (recognizably different from something else of a similar type) to these samples as a "fingerprint" of the material. The characterization of the properties of dust and this type of "fingerprint" analysis or characterization is often used in establishing a connection between materials in dust samples and potential sources [2-4]. These samples were analyzed during the period 08 October through 25 November 2014. The report has been revised to include results of field blank samples and aspect ratios of chrysotile fibers detected via transmission electron microscopy.

Methods

The samples were initially examined under an Olympus SZ-40 stereomicroscope at magnifications from 7X to 40X. Forceps and a tungsten needle were used to collect representative portions of the particulate found in the sample. The particulate was then transferred onto a microscope slide and mounted in Cargille refractive index liquids for analysis by polarized light microscopy (PLM) using an Olympus BH-2 polarized light microscope with a magnification range from 100X to 1,000X. The PLM analysis for asbestos followed the analytical procedures recommended by the U.S. Environmental Protection Agency [5].

After preliminary examination by PLM the dust samples were prepared following the ASTM method D5755. In order to characterize the dust, the prepared samples were examined, both fibrous and non-fibrous particles, using a Philips EM 420 transmission electron microscope (TEM) equipped with an Oxford INCA energy dispersive spectrometry (EDS) x-ray analysis system instead of using the analytical protocol designated in D5755.

Additional analysis of three samples (Z2131, Z2132, and Z2377) was performed to supplement the results using a JEOL JSM-6490LV scanning electron microscope (SEM) coupled with a Thermo Scientific Noran System SIX x-ray energy dispersive spectrometry (EDS) system. Sections of the filter prepared using the D5755 method were cut and transferred onto adhesive carbon tabs on separate aluminum SEM planchettes (specimen substrates).

Results and Discussion

A summary of analytical results is provided in Tables 4 through 6. Figures 1 through 5 show PLM images of chrysotile and lizardite observed in several samples during analyses. Figures 6 through 19 show TEM images and EDS spectra of chrysotile asbestos fibers and bundles (fibrous serpentine), as well as lizardite (non-fibrous serpentine) and other minerals detected during analyses. Figures 20 through 32 provide SEM images and spectra of fibers and particles detected during analyses.

Chrysotile and lizardite consistently exhibit trace amounts of iron and aluminum. Chrysotile examined via TEM-EDS (Table 7) exhibited iron levels ranging from 0.8% to 6.8% (elemental weight percent) and aluminum levels as high as 4.2% (elemental weight percent). Substitutions of either magnesium or silicon for aluminum and of magnesium for iron are well documented [6], although not commonly seen in commercial asbestos-containing products. Local mineral samples (MVA Z2284/Z2285) characterized and reported separately also exhibit trace to minor amounts of iron (2.4% to 7.1%) and aluminum (up to 1.4%). The average iron and aluminum levels detected in the population of chrysotile structures from the settled dust samples are comparable to the levels detected in the local mineral samples.

Aspect ratios of the chrysotile fibers/bundles detected by TEM-EDS were primarily less than 20:1 (length:width). Two of the 15 structures reported in Table 7 had aspect ratios greater than 20:1 (approximately 23:1 and 37:1). Aspect ratios of the remaining 13 structures range from 4:1 to 17:1. Most of the structures were less than 3 micrometers in length. The average size/aspect ratios of the fibers are comparable to the fibers observed during analysis of the local mineral samples.

Only one sample, D-OL-SM-ER6 (MVA Z2377), revealed the presence of amosite asbestos (detected by both PLM and TEM). This sample was collected from inside the facility from the "surface of metal scrap in front of area where the crane was."

References

1. ASTM-International, D5755-09 (2014) Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading.
2. Locard, E., "The analysis of dust traces," Amer. Jour. Police Sci., 1, 3, 276, 1930.
3. McCrone, W.C., and Delly, J.G., "The Particle Atlas," 2nd Ed., Ann Arbor Science Publishers, Inc., Ann Arbor, MI, 1973.
4. Millette, J., and Brown, R., "Dust Particulate from the World Trade Center Disaster of September 11, 2001," Proceedings of the American Academy of Forensic Sciences, Annual Meeting, Feb. 21-26, 2005.
5. U. S. Environmental Protection Agency, "Test Method EPA/600/R-93/116 -- Method for the Determination of Asbestos in Bulk Building Materials."
6. Deer, W.A., Howie, R.A., Zussman, J., "An Introduction to the Rock-Forming Minerals," 2nd ed., Longman Group UK Limited, Essex, England, 1992.

Table 1. Summary of Dust (Microvac) Samples Collected 01 October 2014

MVA #	Sample I. D.	Sample Description
Z2124	D-EV-FP-ER1	Dust, floor, front porch entrance stair, El Velorio restaurant.
Z2125	D-HS-PG-ER2	Dust, floor, exterior next to playground, Head Start.
Z2126	D-JLPV-CR23-2F-H-ER3	Dust, floor, hallway 2nd fl., Adm. bldg, JLPV School.
Z2127	D-JLPV-CR19-1F-H-ER4	Dust, floor, hallway, bldg. next to basketball ct., JLPV School.
Z2128	D-JLPV-CR10-1F-H-ER5	Dust, floor, hallway, 1st bldg. JLPV School.
Z2129	BLK-ER6	Field blank.

Table 2. Summary of Dust (Microvac) Samples Collected 02 October 2014

MVA #	Sample I. D.	Sample Description
Z2130	D-TEC-ARE-PO006-E-ER7	Dust, floor, AR exchanger boiler specialist exterior Tallaboa Encarnacion Community.
Z2131	D-TEC-GULF-GS-ER8	Dust, floor, Gulf Facility entrance, Tallaboa Encarnacion Community.
Z2132	D-NOW-P0035-TB-ER9	Dust behind traffic barrier Rd. 384 km 3.2, northwest of Olefin, between 1 and 2 miles radius.
Z2133	D-NOW-P0036-BS-ER10	Dust, stop bus bench, rd. 385 int. with rd. 384, northwest of Olefin, between 1 and 2 miles radius.
Z2134	D-TEC-P0021-C2-ER11	Dust, floor, sidewalk front of house corner street 2 intersection street 4, Tallaboa Encarnacion Community.
Z2135	D-TEC-P0018-C2-ER12	Dust, floor, corner street 2, west of street 2 Tallaboa Encarnacion Community.
Z2136	BLK-FB-ER13	Field blank.

Table 3. Summary of Dust (Microvac) Samples Collected 23 October 2014

MVA #	Sample I. D.	Sample Description
Z2376	D-OL-FF-ER2	Sample on top of pipe surface from front flare area.
Z2377	D-OL-SM-ER6	Sample from surface of metal scrap in front of area where the crane was.
Z2378	OL-SB-ER7	Sealed blank.
Z2379	OL-FB-ER8	Field blank.
Z2380	OL-FB-ER9	Field blank.

Table 4. Summary of Analytical Results for Samples Collected 01 October 2014

MVA #	Sample I. D.	PLM Analysis Results % Asbestos	Additional Materials Observed	TEM Analysis Results	Comments
Z2124	D-EV-FP-ER1	Trace Chrysotile	Carbonate, iron/rust, quartz, cellulose, insect parts, rubber, tarry particles	Calcic and clay minerals, two chrysotile bundles	Iron/rust adhering to chrysotile (PLM) Trace Fe/Al present in chrysotile (TEM)
Z2125	D-HS-PG-ER2	NAD	Cellulose, carbonate, quartz	Calcic and clay minerals, two chrysotile fibers	Trace Fe/Al present in chrysotile (TEM)
Z2126	D-JLPV-CR23-2F-H-ER3	NAD	carbonate, quartz, cellulose, paint, rubber	Clay minerals	Small sample volume
Z2127	D-JLPV-CR19-1F-H-ER4	NAD	cellulose, carbonate, cotton, hair, insect parts	Clay minerals, one chrysotile bundle	Trace Fe/Al present in chrysotile (TEM)
Z2128	D-JLPV-CR10-1F-H-ER5	NAD	Carbonate, quartz, cellulose, plant debris, insect parts, plastic/polymer	Clay minerals	Small sample volume
Z2129	BLK-ER6	NA	---	NAD	ASTM D5755 Analysis

NA – Not Analyzed
NAD – No Asbestos Detected

Table 5. Summary of Analytical Results for Samples Collected 02 October 2014

MVA #	Sample I. D.	PLM Analysis Results % Asbestos	Additional Materials Observed	TEM Analysis Results	Comments
Z2130	D-TEC-ARE-PO006-E-ER7	Trace Chrysotile	Lizardite, carbonate, iron/rust, quartz, cellulose	Clay minerals, one chrysotile fiber	SEM (clay minerals, lizardite)
Z2131	D-TEC-GULF-GS-ER8	NAD	Lizardite, carbonate, quartz, feldspar, pollen	Clay minerals, one chrysotile fiber, one chrysotile bundle	SEM (clay minerals, lizardite, quartz) Trace Fe/Al present in chrysotile (TEM)
Z2132	D-NOW-P0035-TB-ER9	NAD	Carbonate, quartz, cellulose, plant debris, insect parts, rubber, iron/rust, fungal material	Clay minerals	---
Z2133	D-NOW-P0036-BS-ER10	NAD	Lizardite, quartz, carbonate, iron/rust, hornblende	Clay minerals, one chrysotile bundle	Trace Fe/Al present in chrysotile (TEM) [Five additional structures detected during D5755 analysis - reported separately]
Z2134	D-TEC-P0021-C2-ER11	Trace Chrysotile	Lizardite, quartz, carbonate, iron/rust, feldspar	Calcic and clay minerals	---
Z2135	D-TEC-P0018-C2-ER12	NAD	Lizardite, magnetite, quartz, carbonate	Clay minerals and four chrysotile fibers/bundles	Trace Fe/Al present in Mg-reduced chrysotile (TEM)
Z2136	BLK-FB-ER13	NA	NA	NAD	[Analysis via D5755 - reported separately]

NA – Not Analyzed
NAD – No Asbestos Detected

Table 6. Summary of Analytical Results for Samples Collected 23 October 2014

MVA #	Sample I. D.	PLM Analysis Results % Asbestos	Additional Materials Observed	TEM Analysis Results	Comments
Z2376	D-OL-FF-ER2	NAD	Iron/rust, carbonate, quartz, cellulose	Iron and quartz particles	Small sample volume
Z2377	D-OL-SM-ER6	Trace amosite Trace chrysotile	Iron/rust, vermiculite, quartz, carbonate, cellulose, glass fibers, fungal material	Iron, aluminum, clay particles, one amosite fiber, two chrysotile bundles	SEM (probable chrysotile) Trace Fe/Al Present in chrysotile (TEM)
Z2378	OL-SB-ER7	NA	---	NAD	ASTM D5755 Analysis
Z2379	OL-FB-ER8	NA	---	NAD	ASTM D5755 Analysis
Z2380	OL-FB-ER9	NA	---	NAD	ASTM D5755 Analysis

NA – Not Analyzed
NAD – No Asbestos Detected

Table 7. EDS Characterization (Elemental Weight %) of Chrysotile Structures Detected in Settled Dust Samples

	Mg	Al	Si	Fe	O
Z2124	28.6	0.7	22.6	2.3	45.8
	25.0	1.4	24.0	3.6	46.1
Z2125	27.4	0.0	25.1	0.8	46.8
	25.5	1.2	24.5	2.4	46.4
Z2127	27.2	1.0	24.1	1.2	46.6
Z2130	27.3	1.2	23.7	1.5	46.4
Z2131	23.0	4.2	23.7	2.6	46.6
	28.2	1.1	23.1	1.3	46.3
Z2133	27.5	0.9	22.6	3.4	45.6
Z2135	22.2	1.8	26.7	2.2	47.2
	29.0	0.0	24.1	0.9	46.4
	19.7	1.5	26.1	6.8	45.9
	24.1	1.2	25.2	3.0	46.5
Z2377	27.1	1.0	23.9	1.7	46.4
	23.7	2.4	23.3	4.9	45.7
Ave	25.7	1.3	24.2	2.6	46.3
Std. Dev.	2.7	1.0	1.2	1.6	0.4
Max	29.0	4.2	26.7	6.8	47.2
Min	19.7	0.0	22.6	0.8	45.6

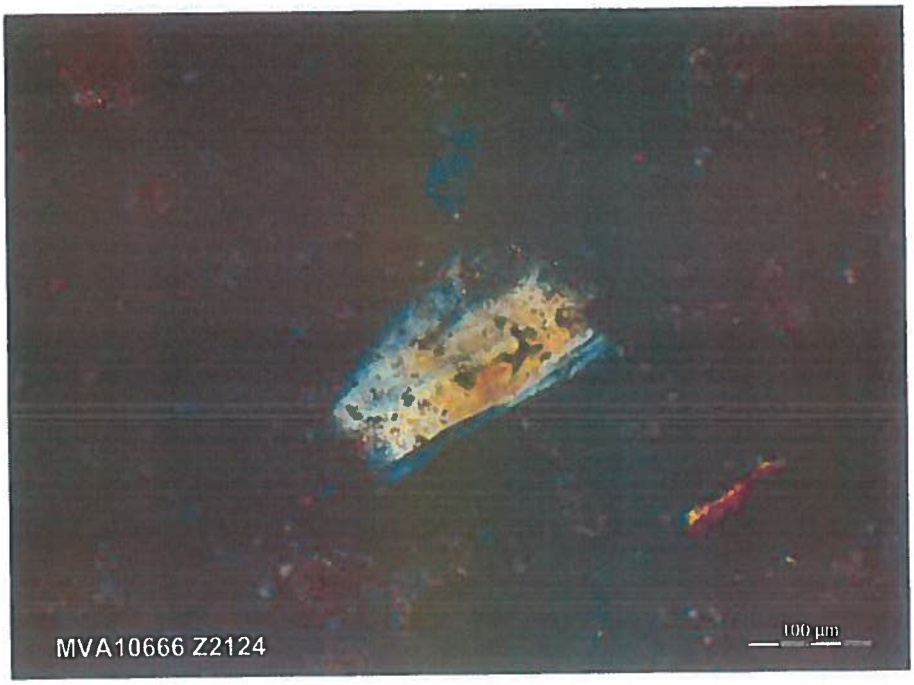


Figure 1. PLM image of chrysotile asbestos bundle detected during analysis of sample D-EV-FP-ER1, "Dust, floor, front porch entrance stair, El Velorio restaurant."

Figure 2. PLM image of chrysotile asbestos bundle detected during analysis of sample D-TEC-ARE-PO006-E-ER7, "Dust, floor, AR exchanger boiler specialist exterior Tallaboa Encarnacion Community."

Figure 3. PLM image of chrysotile asbestos bundle detected during analysis of sample D-TEC-P0021-C2-ER11, "Dust, floor, sidewalk front of house corner street 2 intersection street 4, Tallaboa Encarnacion Community."

Figure 4. Chrysotile asbestos bundle detected during analysis of sample D-OL-SM-ER6, "Sample from surface of metal scrap in front of area where the crane was."

Figure 5. PLM image of lizardite particle detected during analysis of sample D-TEC-P0018-CR-ER12, "Dust, floor, corner street 2, west of street 2 Tallaboa Encarnacion Community."

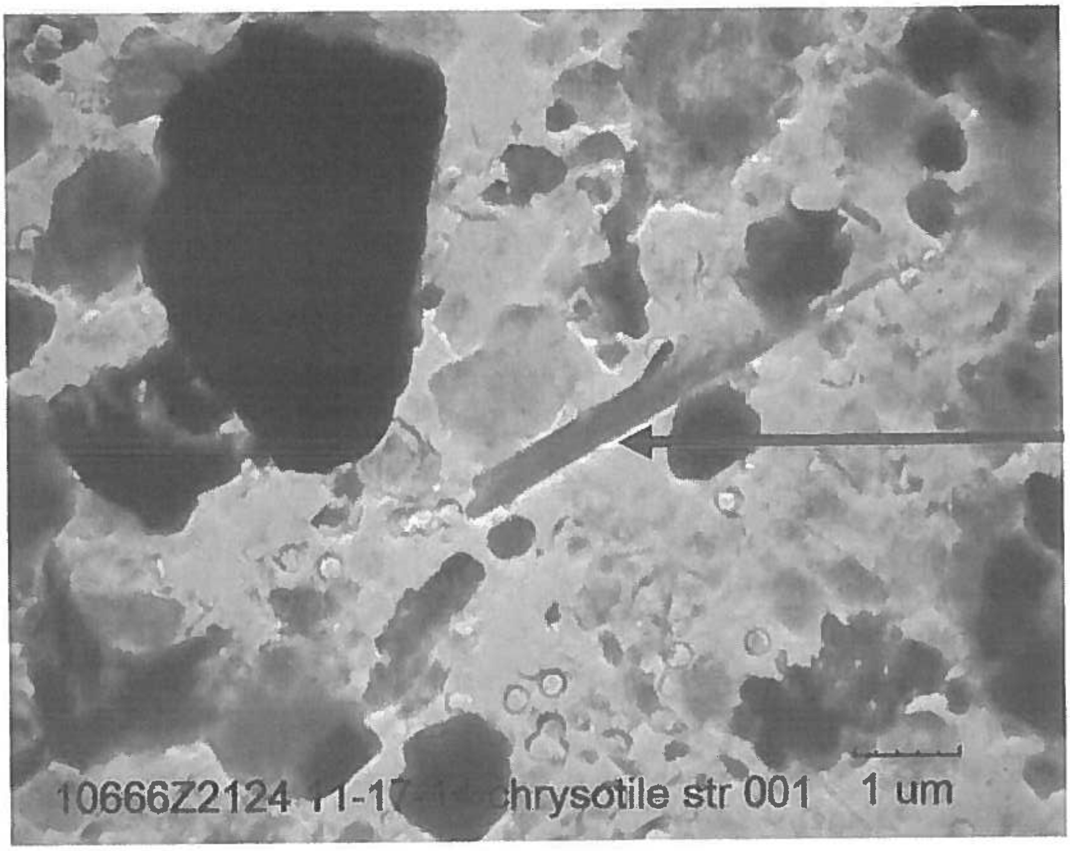
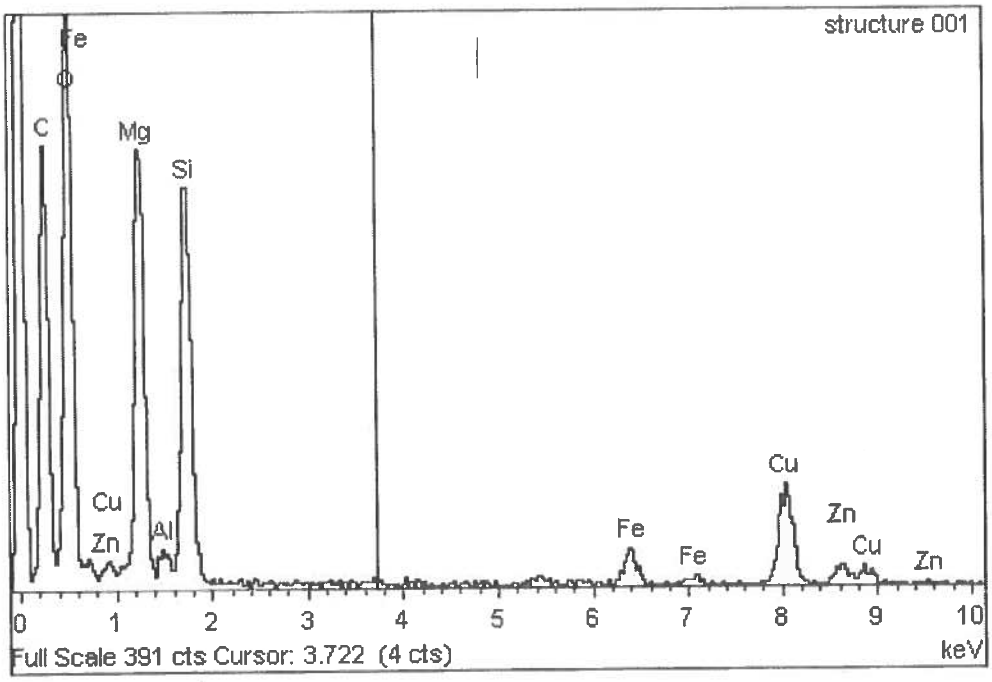


Figure 6. TEM image (above) and EDS spectrum (below) of chrysotile asbestos bundle detected in sample D-EV-FP-ER1, "Dust, floor, front porch entrance stair, El Velorio restaurant."



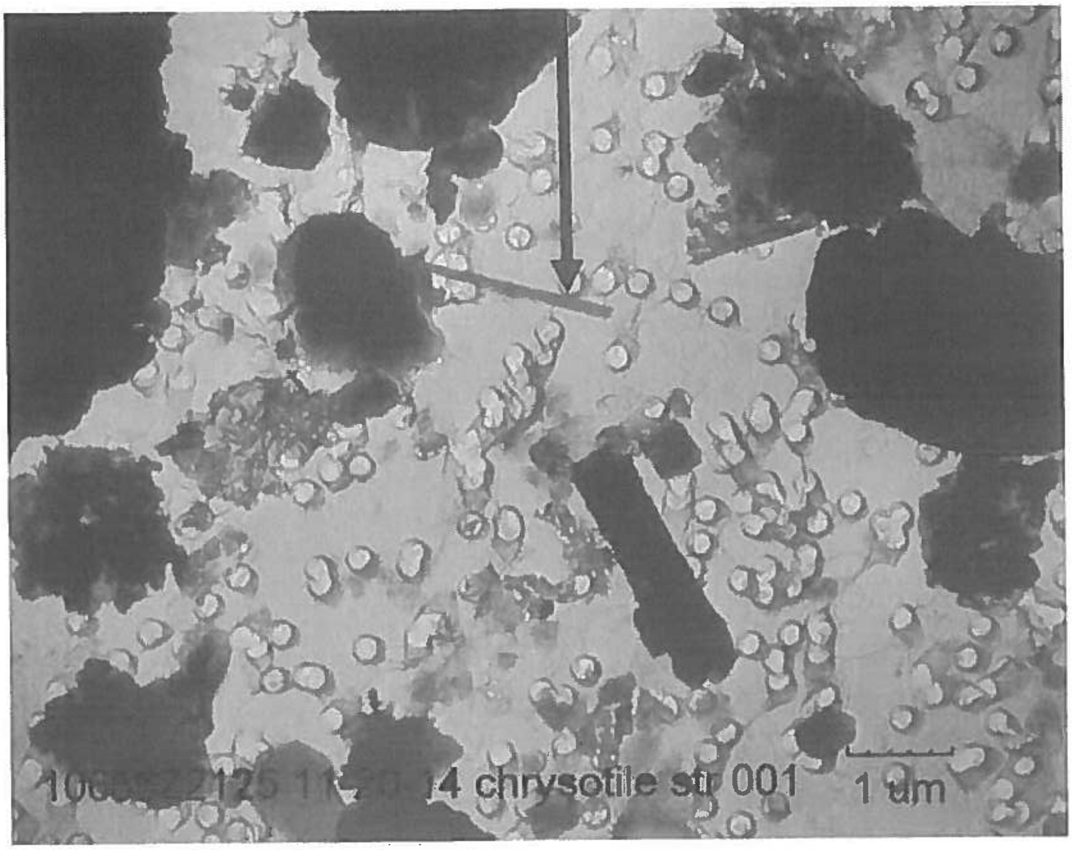
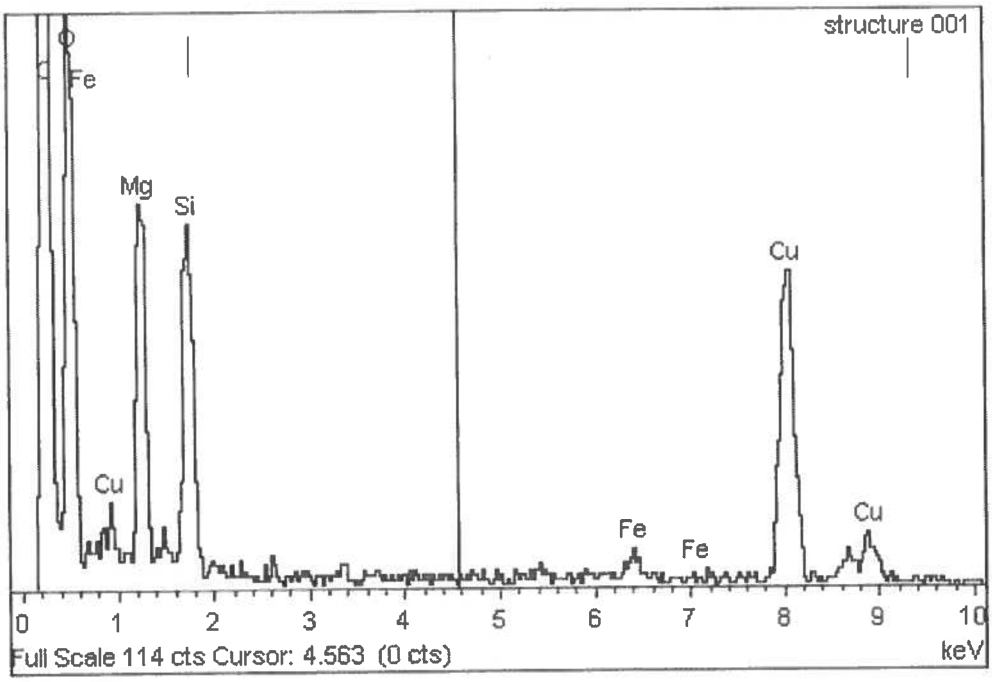


Figure 7. TEM image (above) and EDS spectrum (below) of chrysotile asbestos fiber detected in sample D-HS-PG-ER2, "Dust, floor, exterior next to playground, Head Start."



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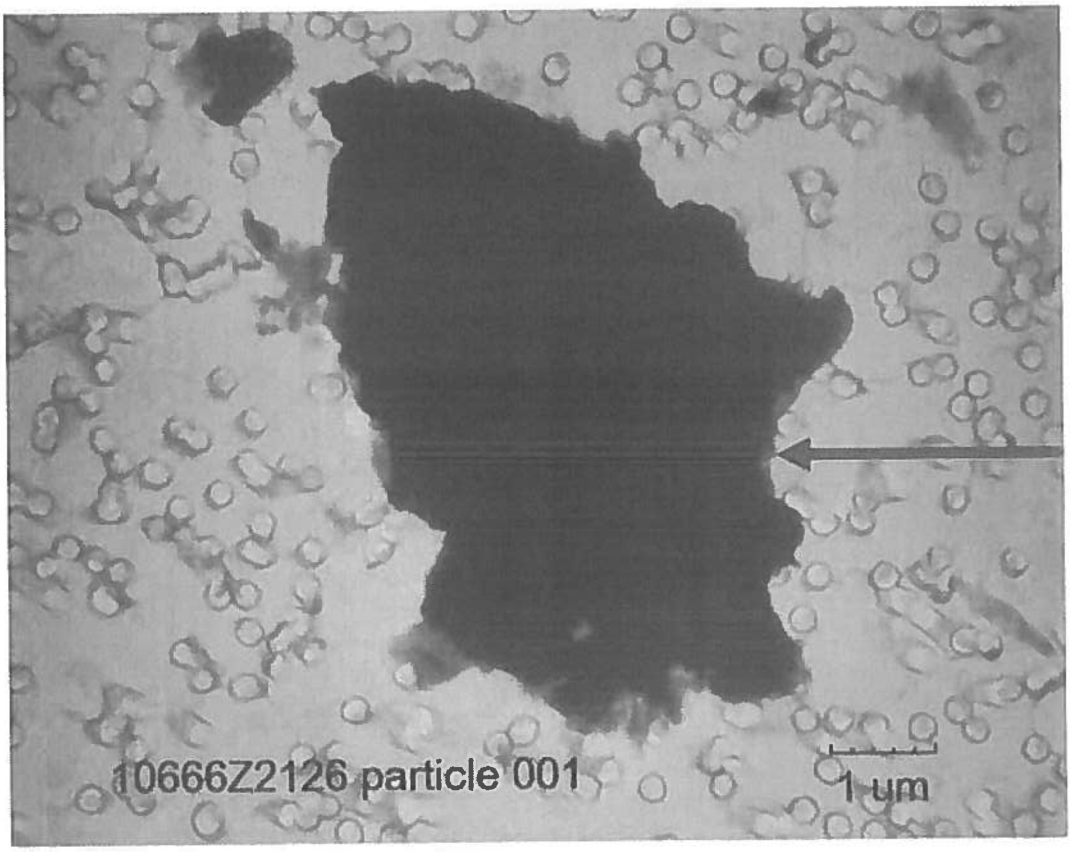
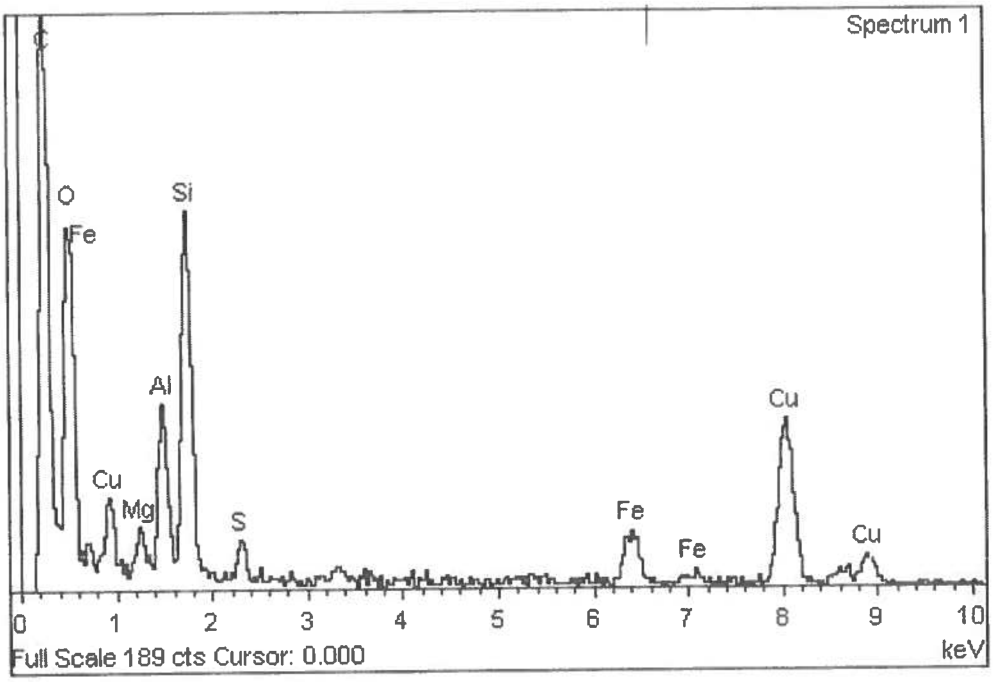


Figure 8. TEM image (above) and EDS spectrum (below) of clay mineral particle detected in sample D-JLPV-CR23-2F-H-ER3, "Dust, floor, hallway 2nd fl., Adm. bldg, JLPV School."



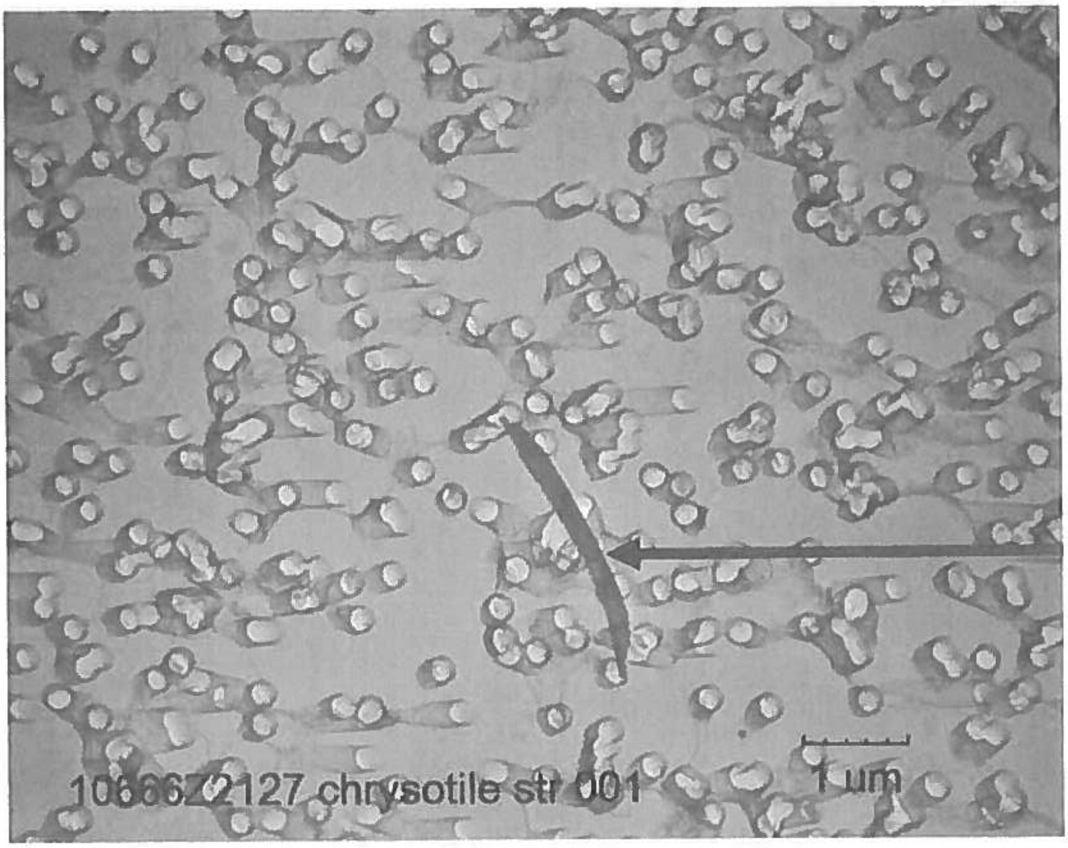
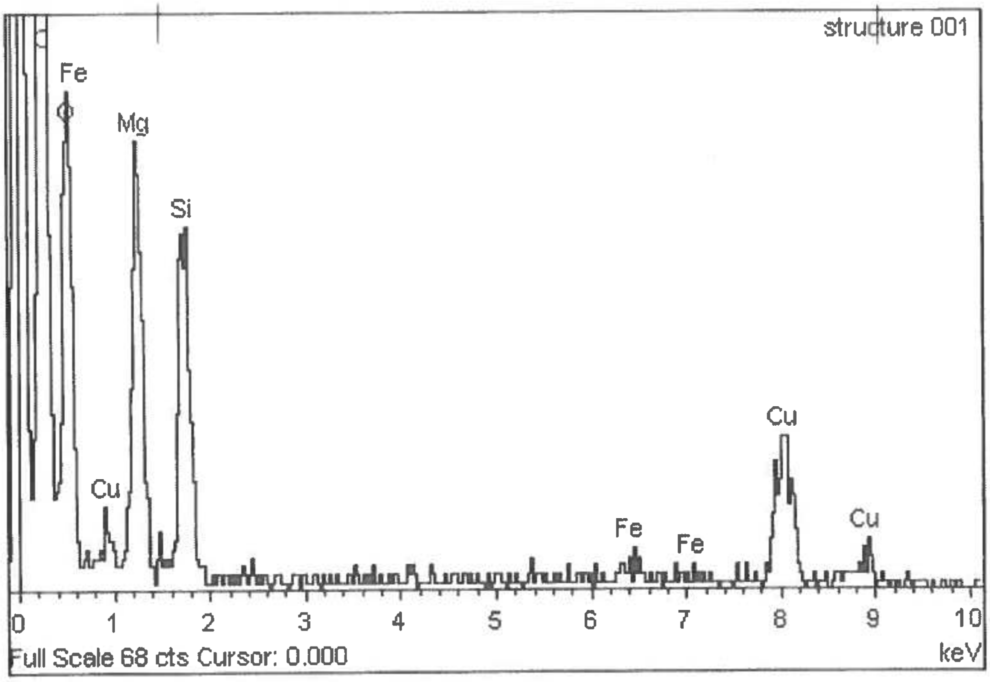


Figure 9. TEM image (above) and EDS spectrum (below) of chrysotile asbestos bundle detected in sample D-JLPV-CR19-1F-H-ER4, "Dust, floor, hallway, bldg. next to basketball ct., JLPV School."



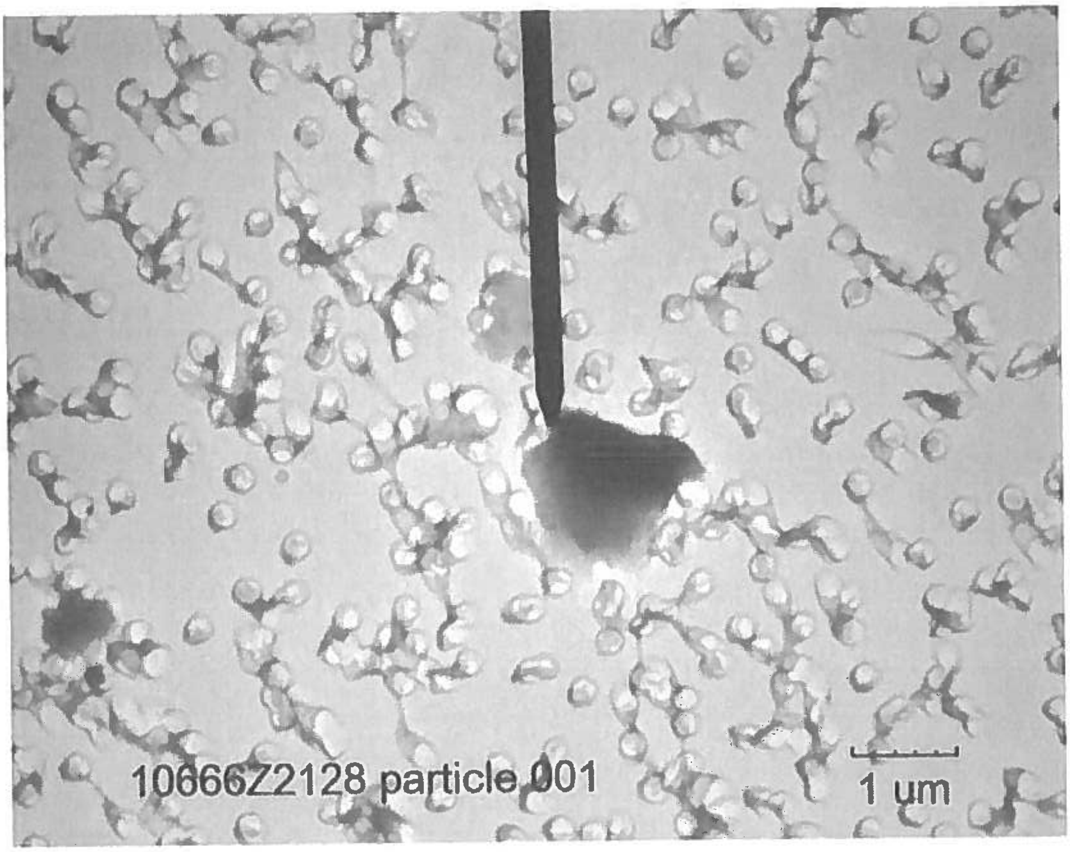


Figure 10. TEM image (above) and EDS spectrum (below) of clay mineral particle detected in sample D-JLPV-CR10-1F-H-ER5, "Dust, floor, hallway, 1st bldg. JLPV School."

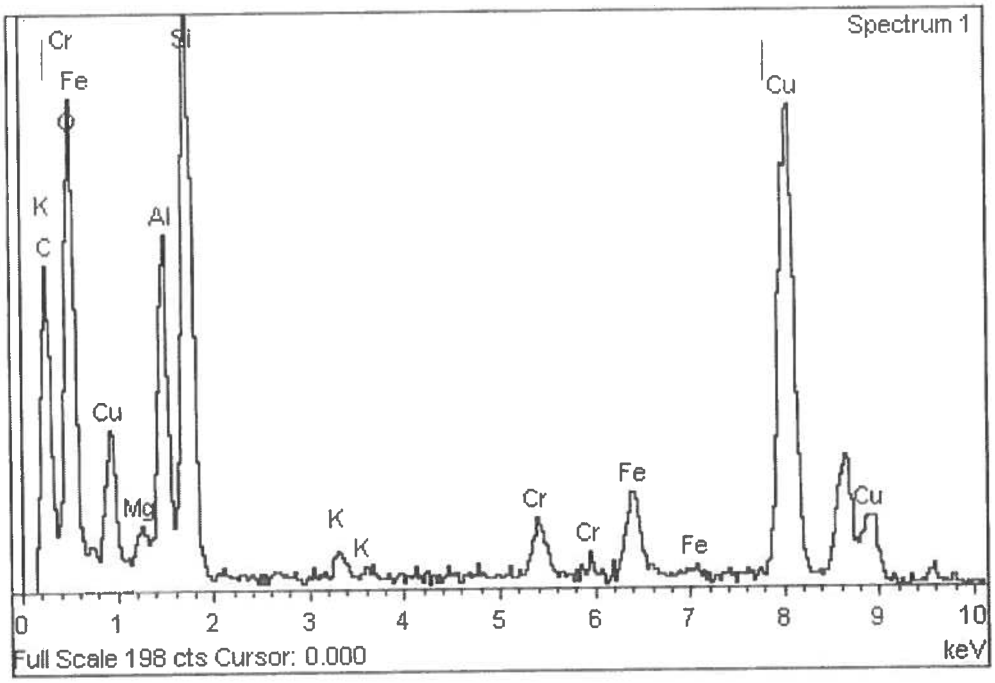
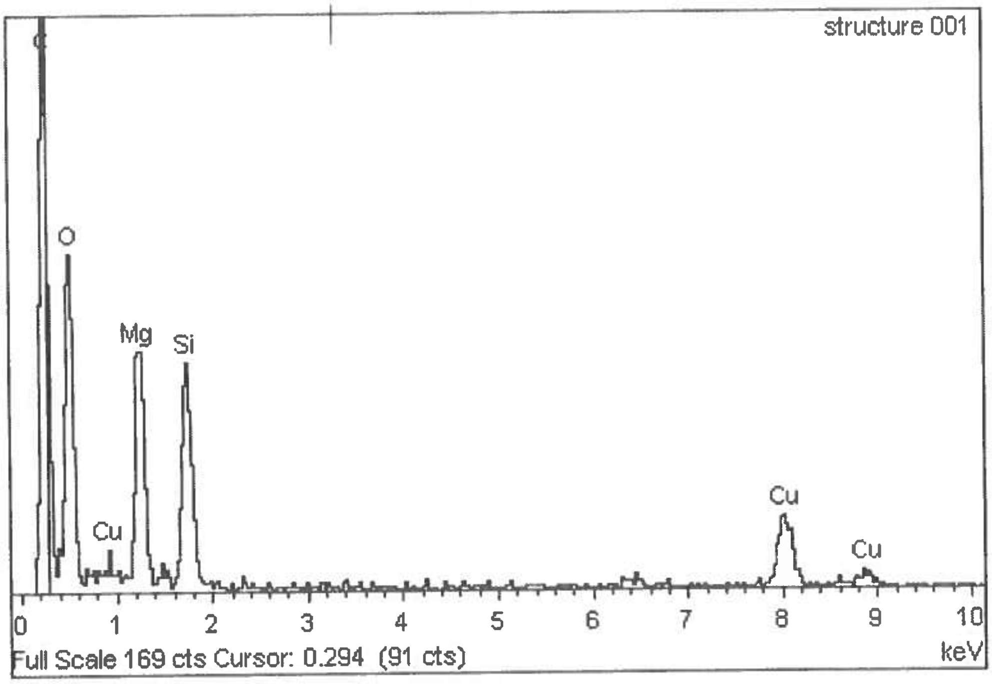


Figure 11. TEM image (above) and EDS spectrum (below) of chrysotile asbestos fiber detected in sample D-TEC-ARE-PO006-E-ER7, "Dust, floor, AR exchanger boiler specialist exterior Tallaboa Encarnacion Community."



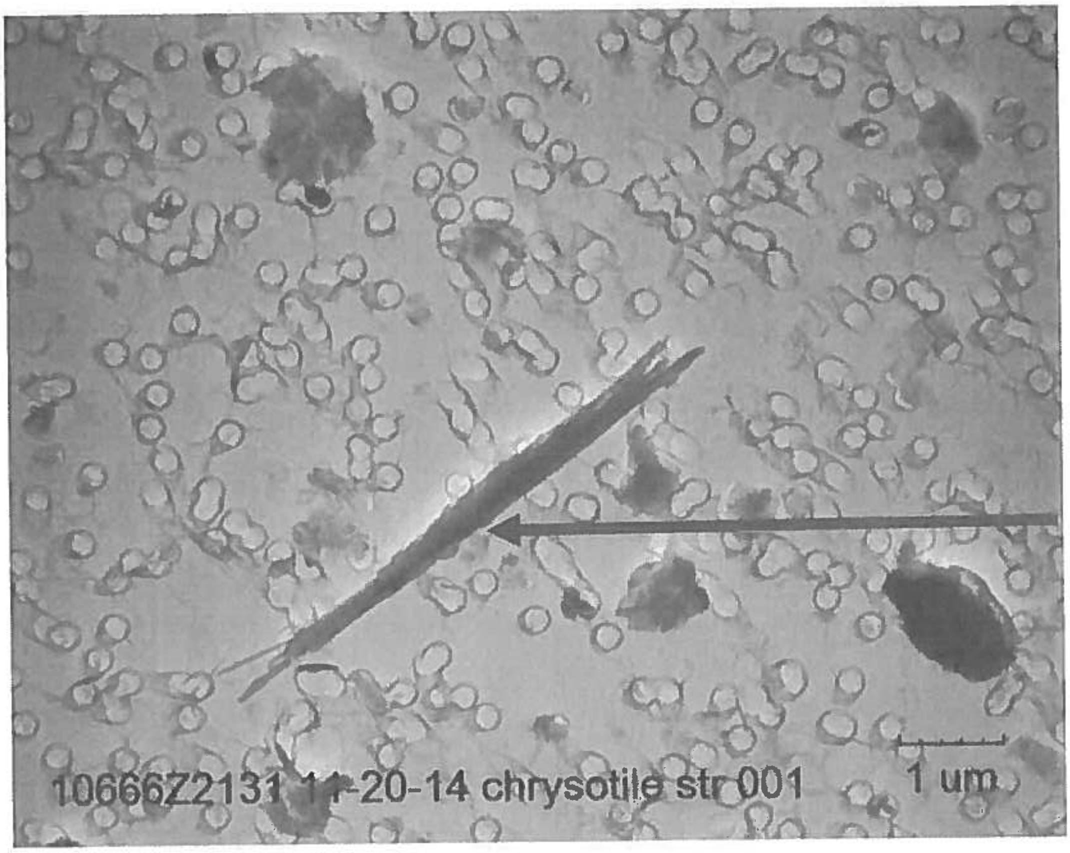
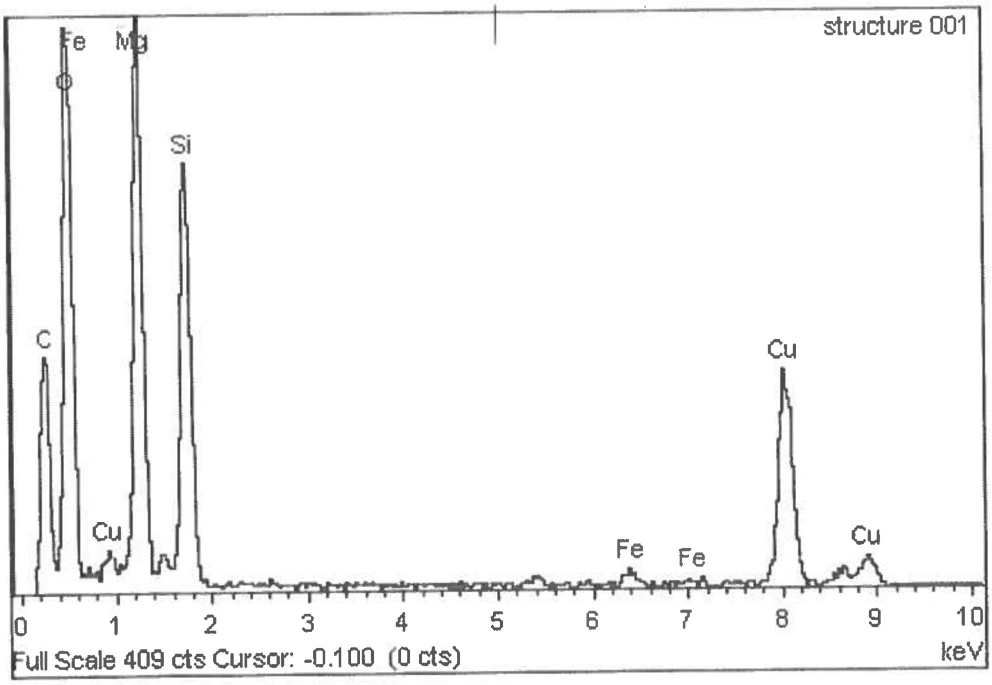


Figure 12. TEM image (above) and EDS spectrum (below) of chrysotile asbestos bundle detected in sample D-TEC-GULF-GS-ER8, "Dust, floor, Gulf Facility entrance, Tallaboa Encarnacion Community."



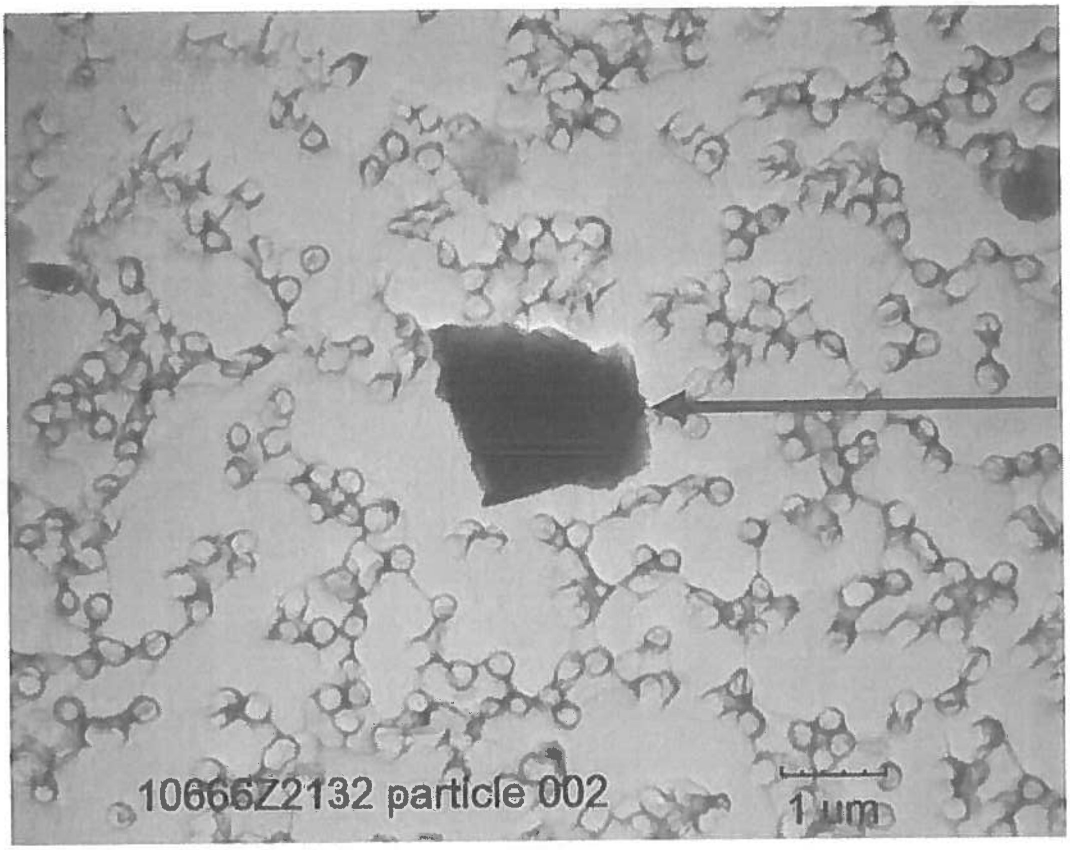
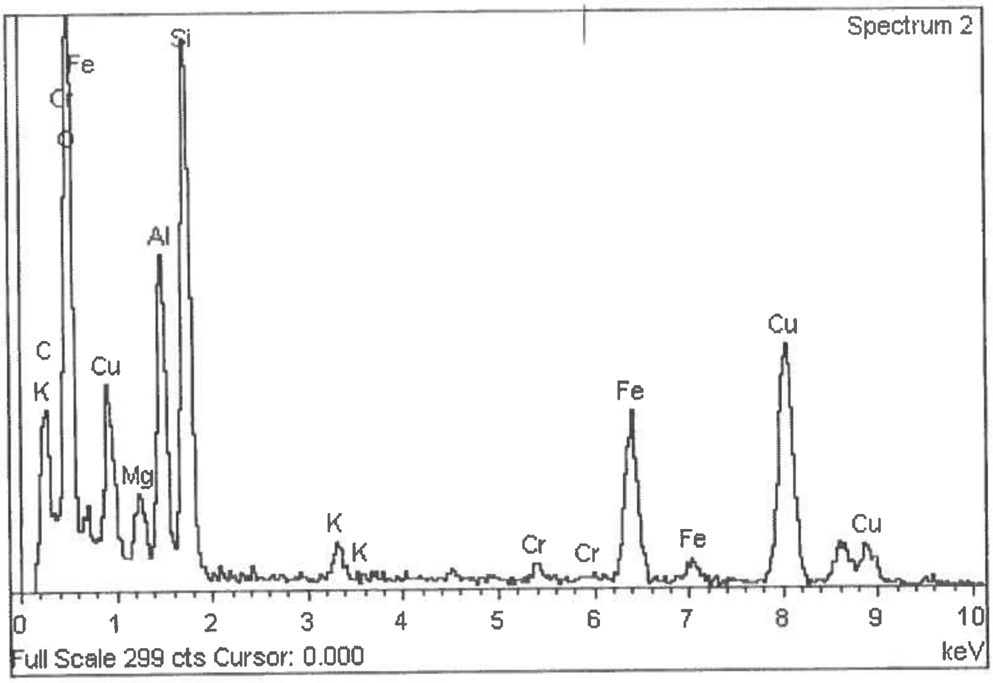


Figure 13. TEM image (above) and EDS spectrum (below) of clay mineral particle detected in sample D-NOW-P0035-TB-ER9, "Dust behind traffic barrier Rd. 384 km 3.2, northwest of Olefin, between 1 and 2 miles radius."



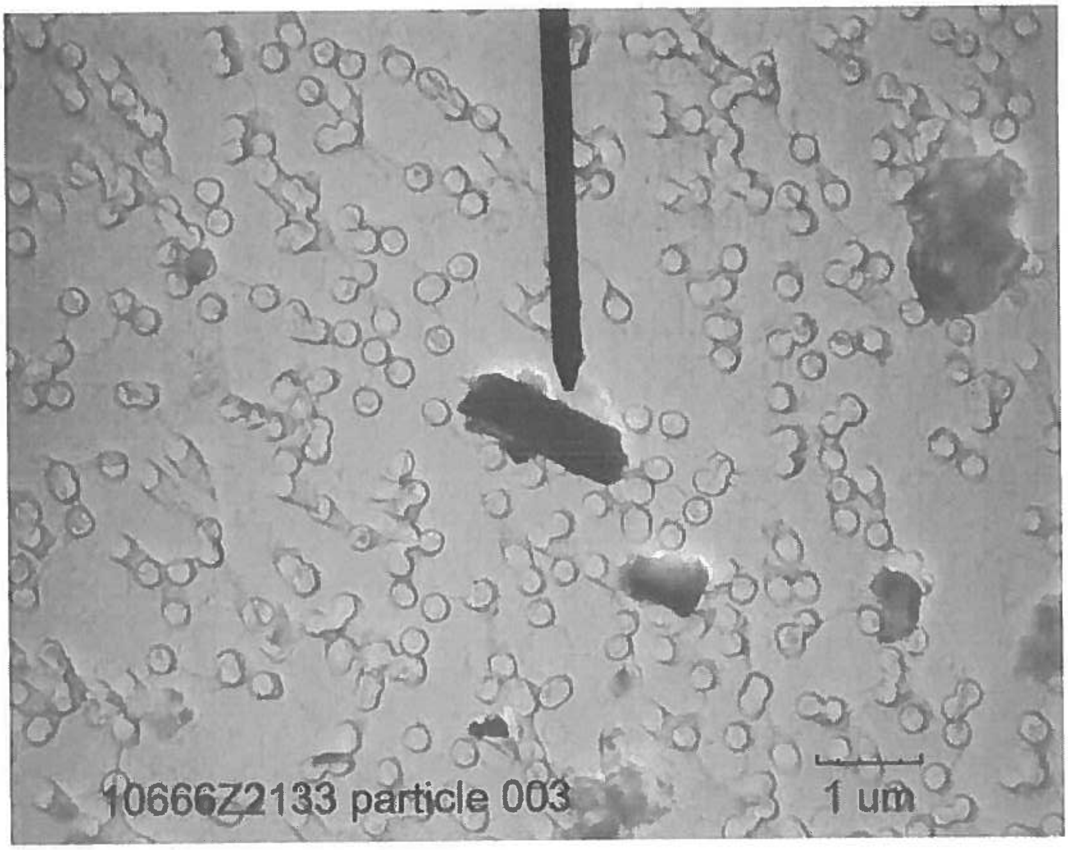
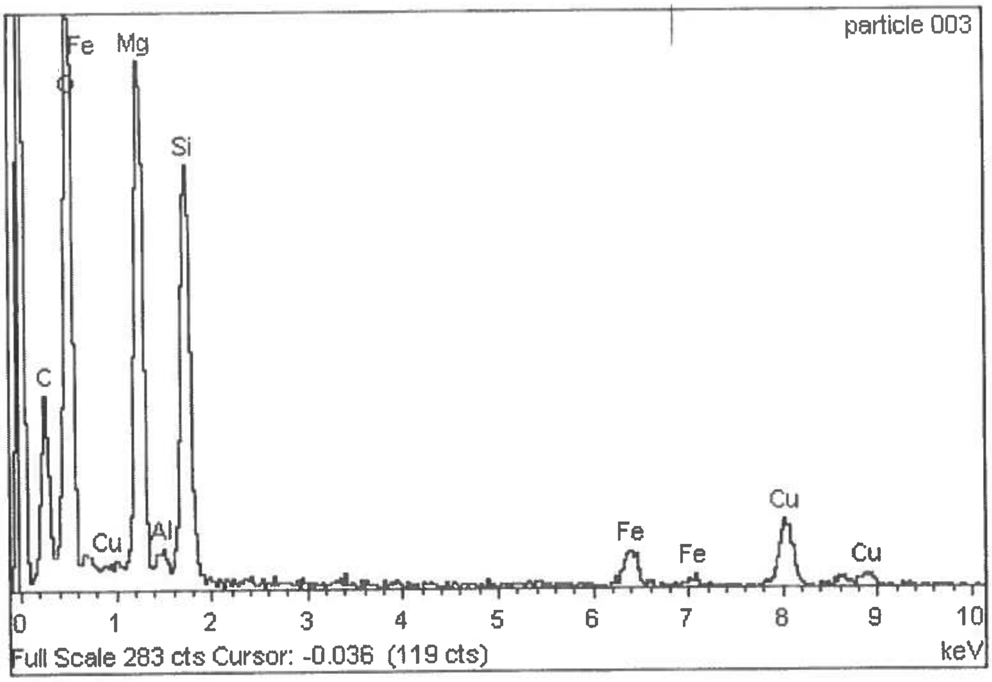


Figure 14. TEM image (above) and EDS spectrum (below) of chrysotile asbestos bundle detected in sample D-NOW-P0036-BS-ER10, "Dust, stop bus bench, rd. 385 int. with rd. 384, northwest of Olefin, between 1 and 2 miles radius."



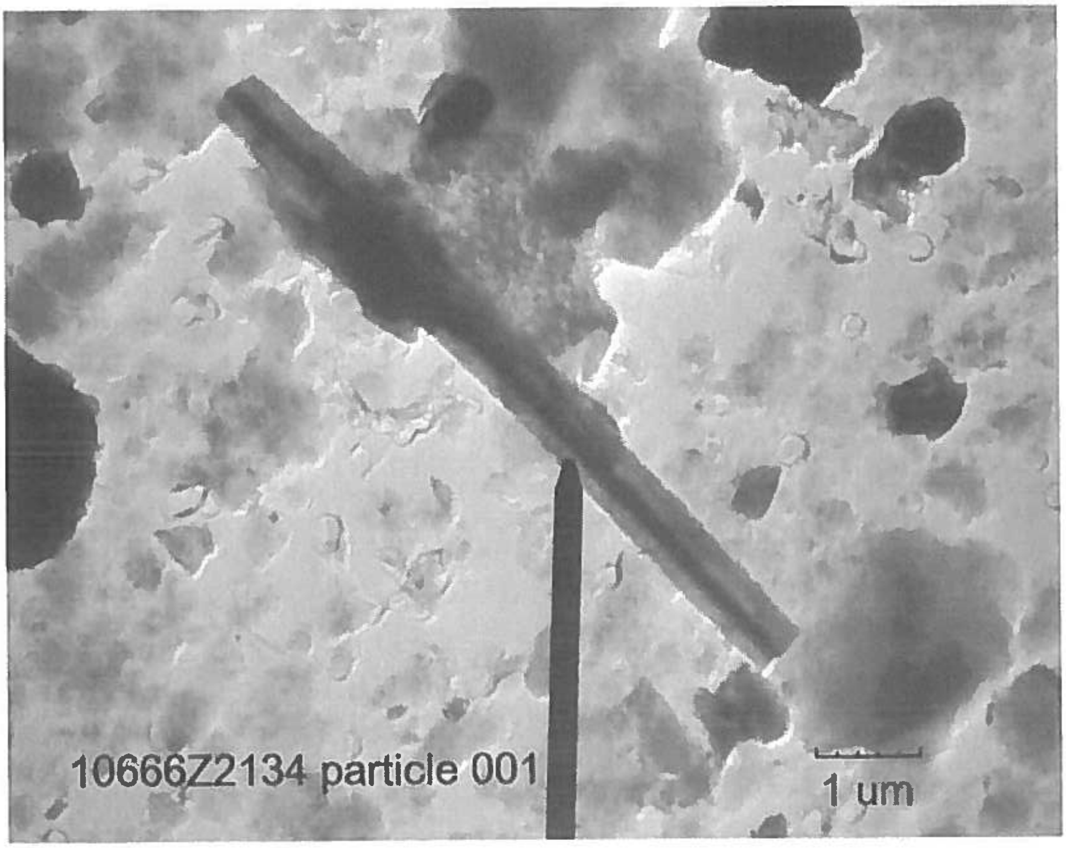
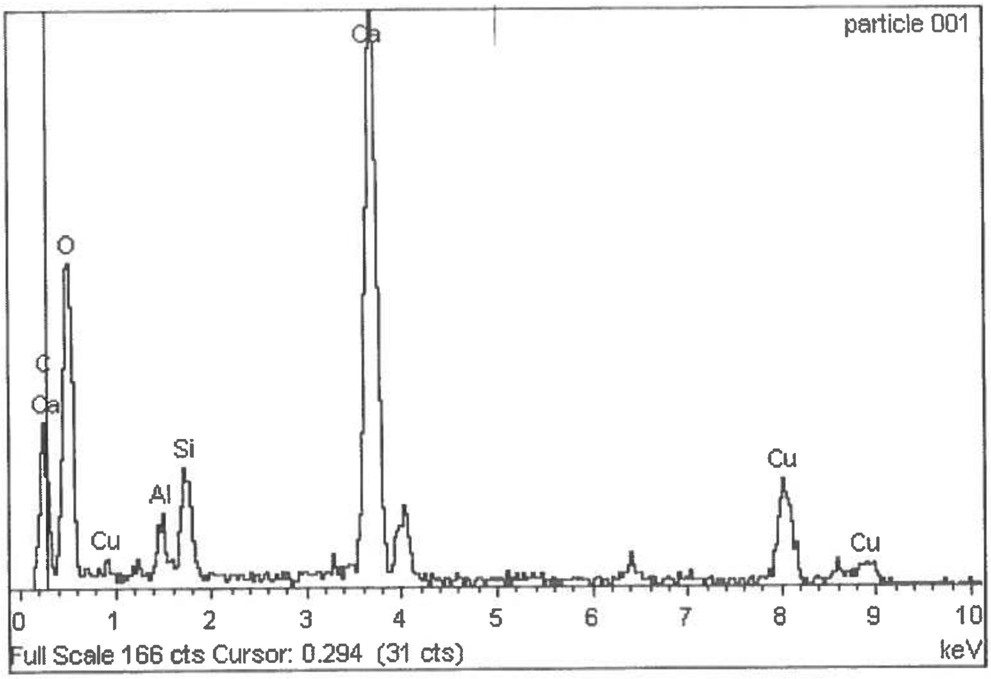


Figure 15. TEM image (above) and EDS spectrum (below) of calcic mineral fiber detected in sample D-TEC-P0021-C2-ER11, "Dust, floor, sidewalk front of house corner street 2 intersection street 4, Tallaboa Encarnacion Community."



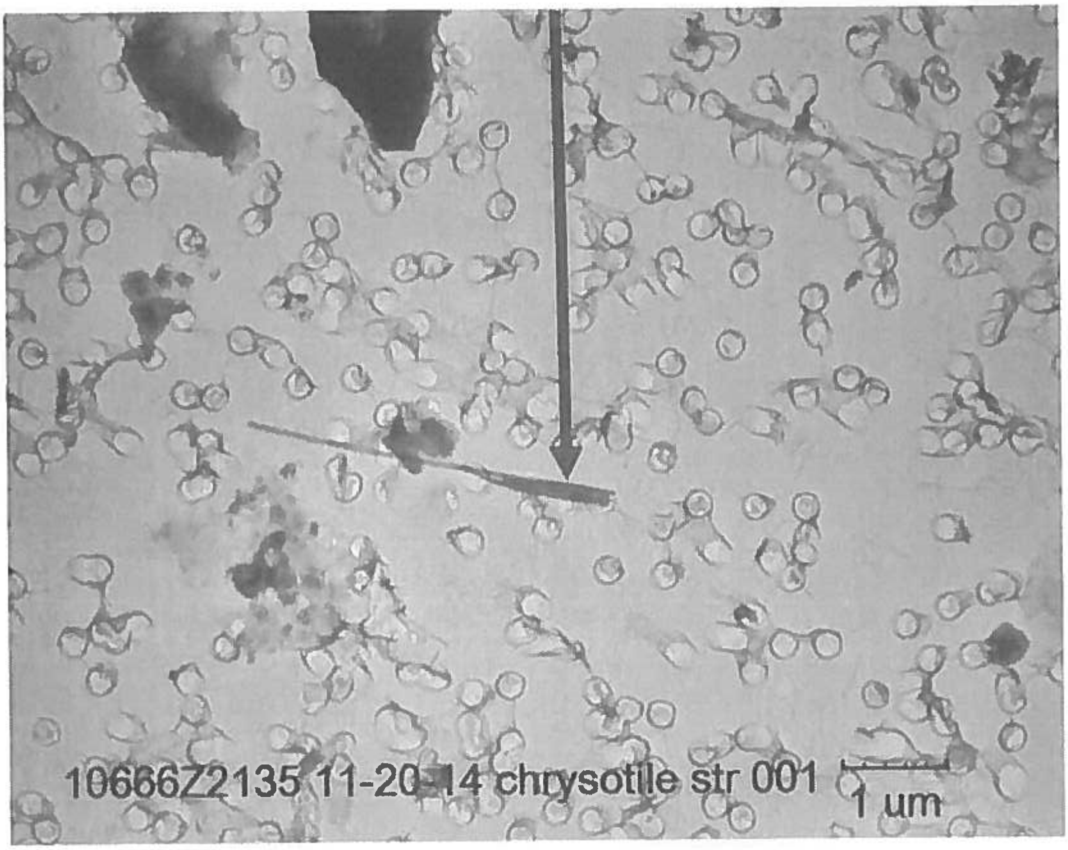
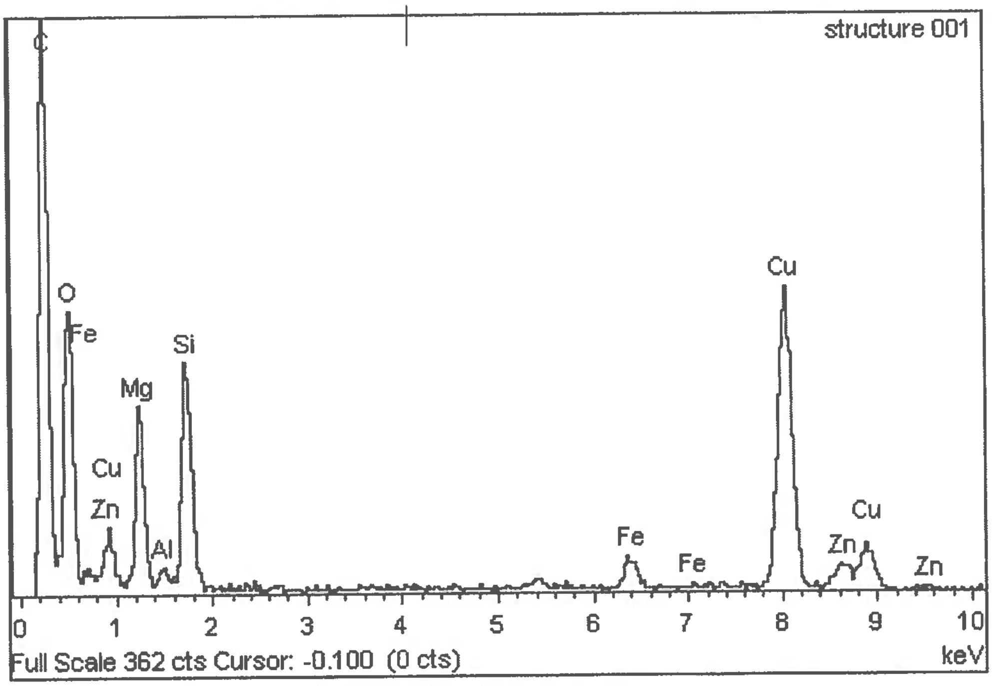


Figure 16. TEM image (above) and EDS spectrum (below) of chrysotile asbestos bundle detected in sample D-TEC-P0018-C2-ER12, "Dust, floor, corner street 2, west of street 2 Tallaboa Encarnacion Community."



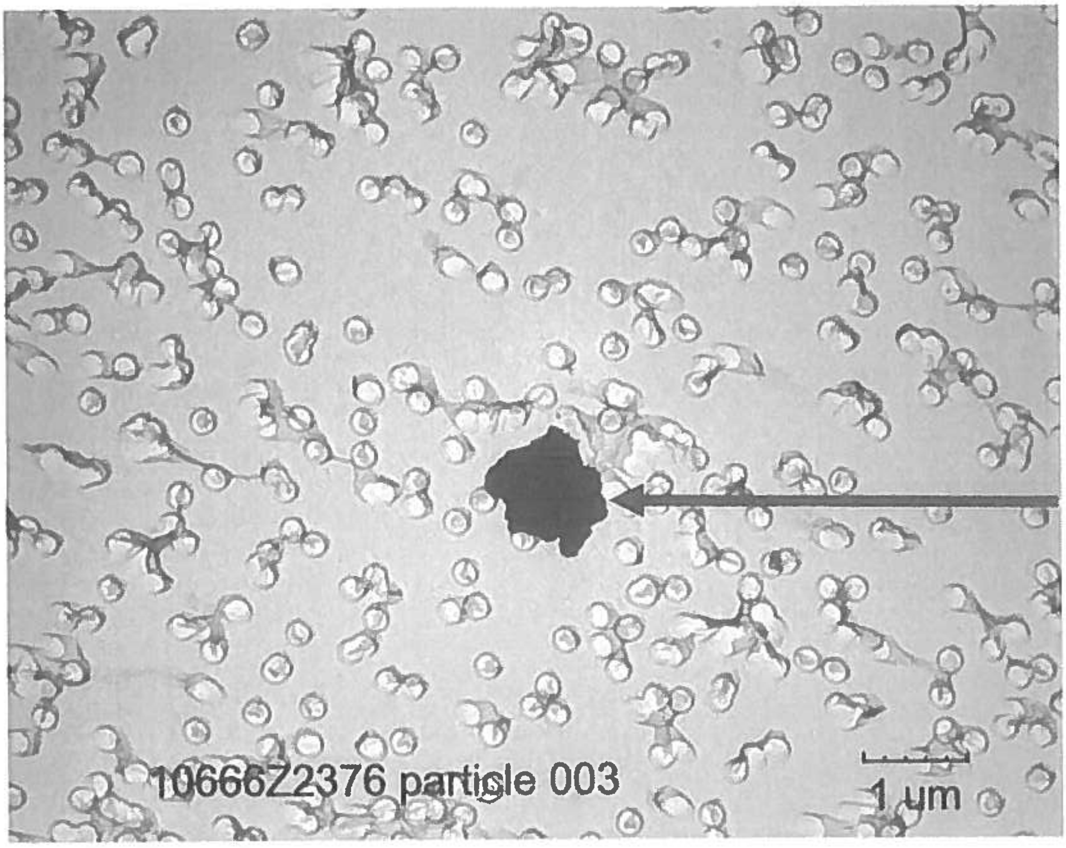
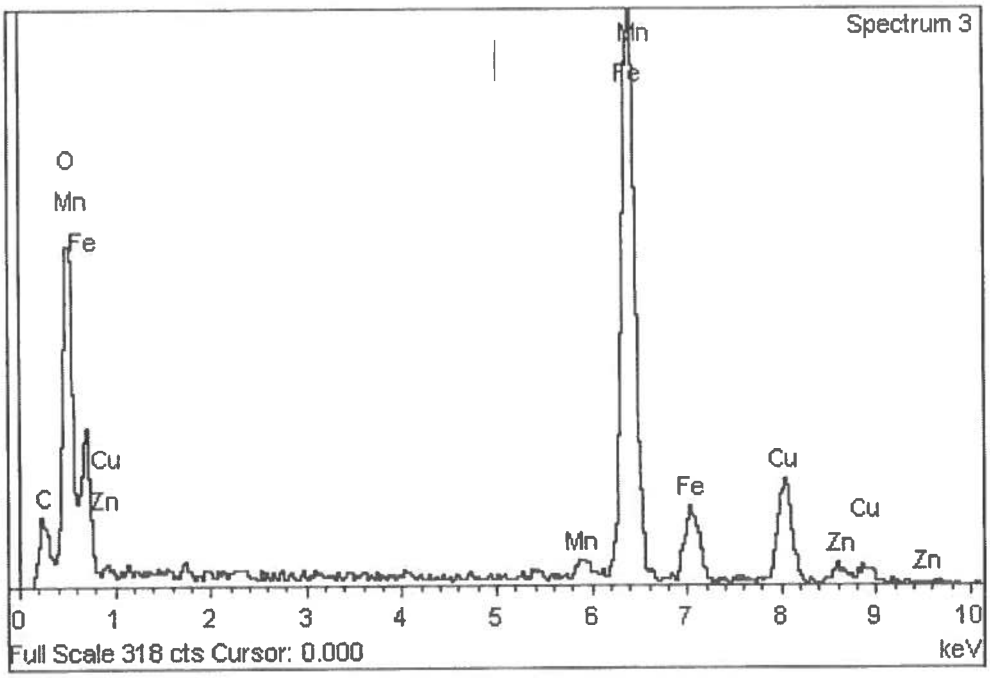


Figure 17. TEM image (above) and EDS spectrum (below) of iron-rich particle detected in sample D-OL-FF-ER2, "Sample on top of pipe surface from front flare area."



MVA SCIENTIFIC CONSULTANTS

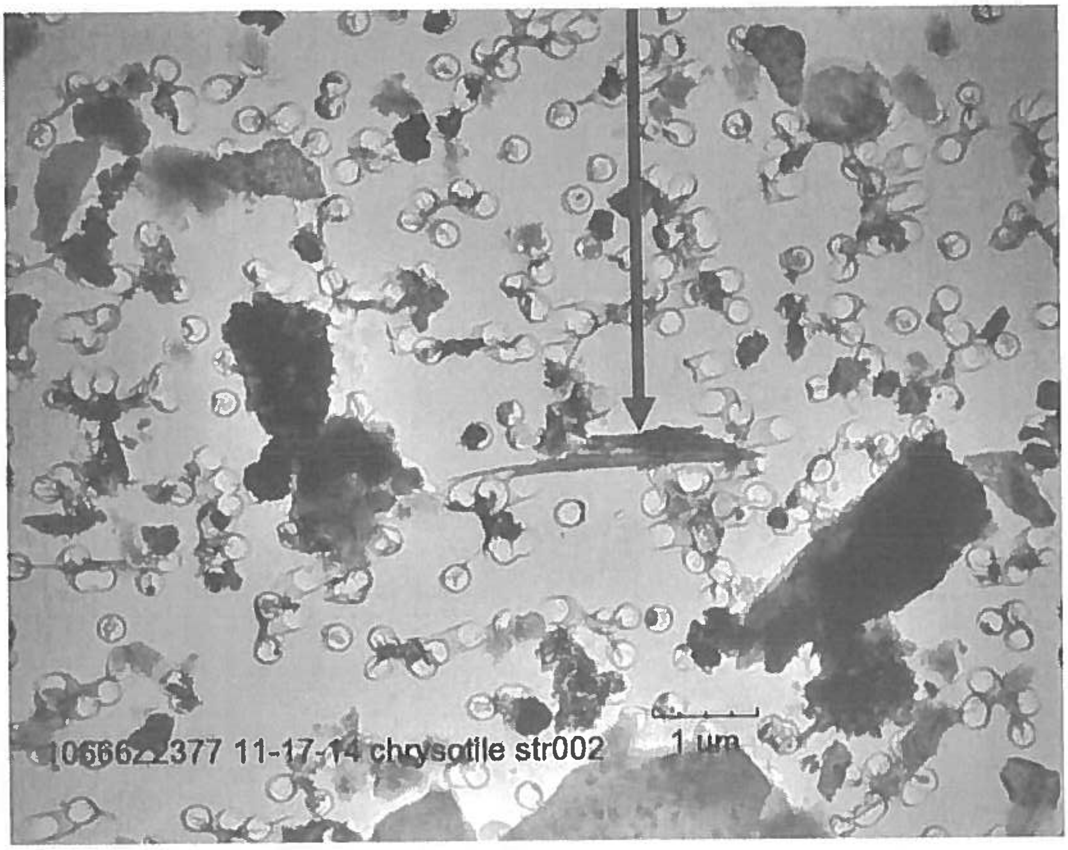
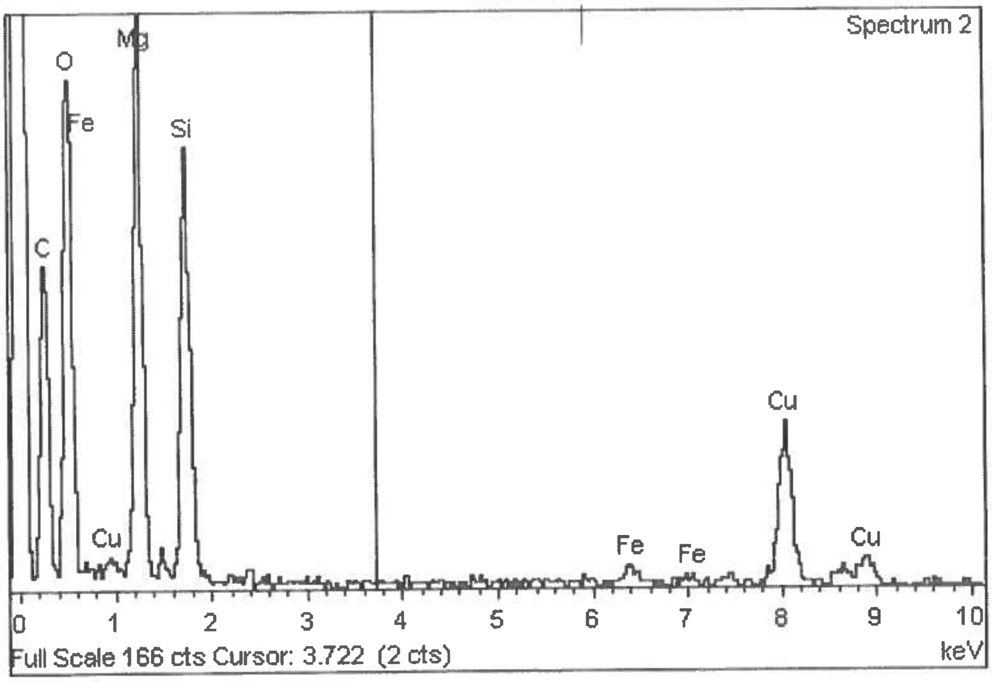


Figure 18. TEM image (above) and EDS spectrum (below) of chrysotile asbestos bundle detected in sample D-OL-SM-ER6, "Sample from surface of metal scrap in front of area where the crane was."



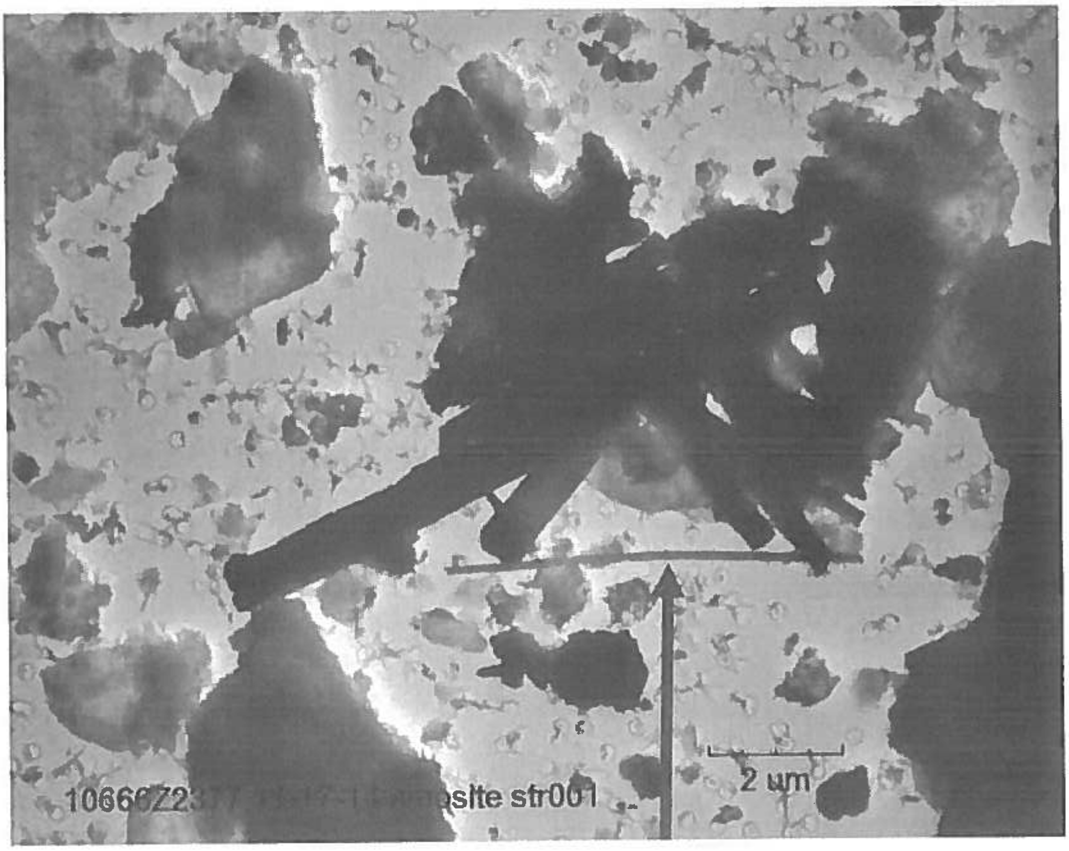
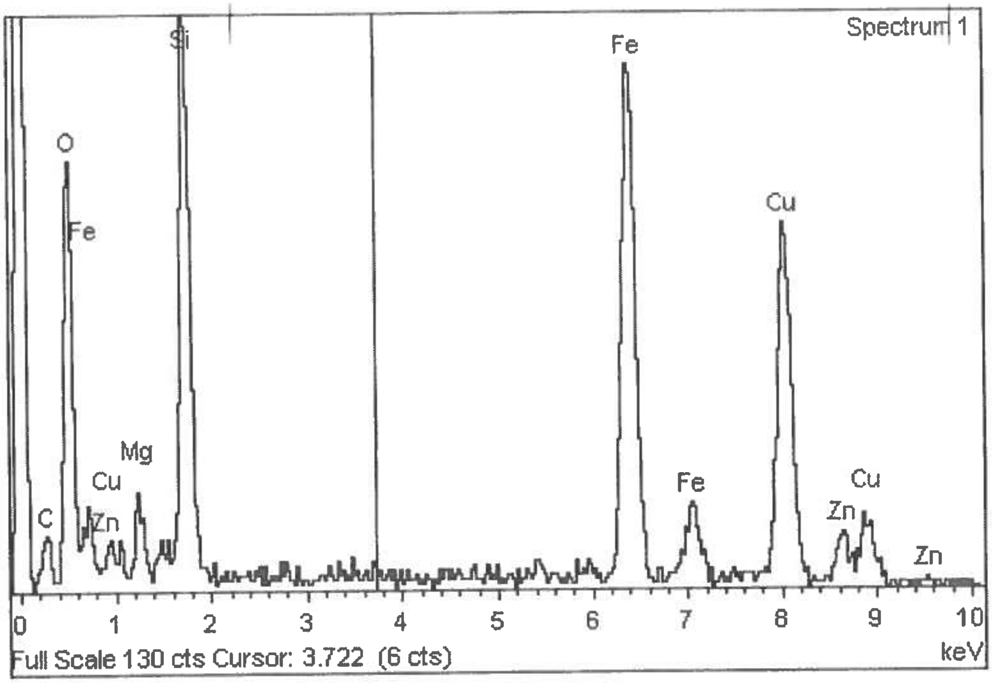


Figure 19. TEM image (above) and EDS spectrum (below) of amosite asbestos fiber detected in sample D-OL-SM-ER6, "Sample from surface of metal scrap in front of area where the crane was."



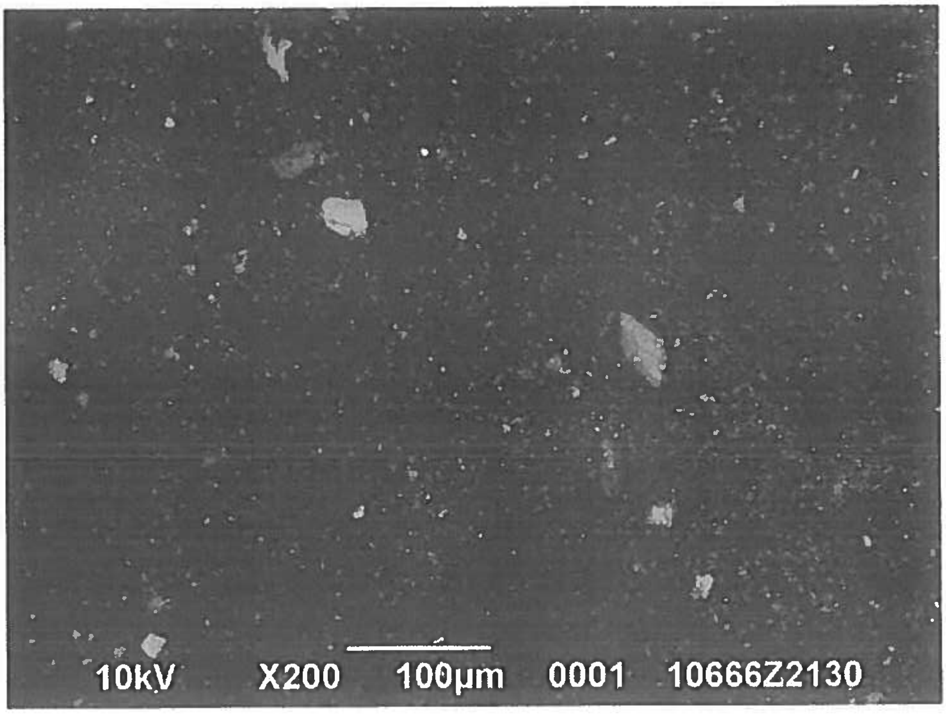


Figure 20. SEM micrograph of dust particles observed during analysis of sample D-TEC-ARE-PO006-E-ER7, "Dust, floor, AR exchanger boiler specialist exterior Tallaboa Encarnacion Community."

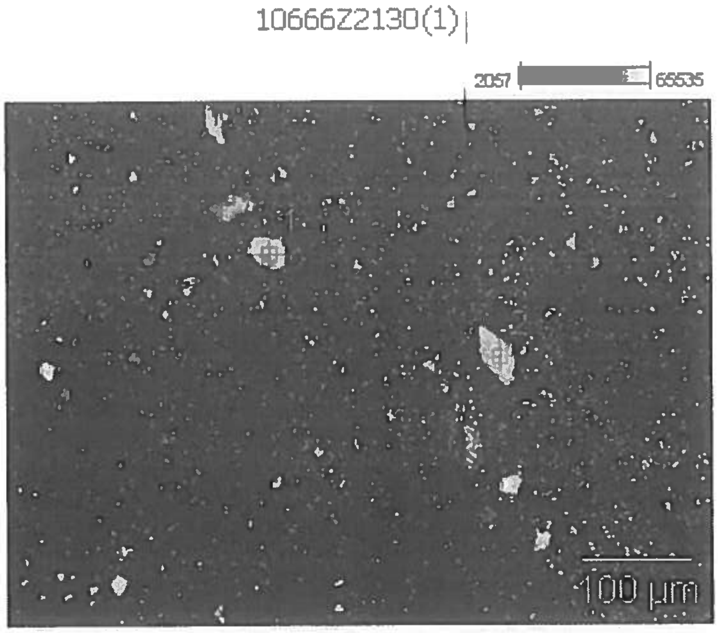


Figure 21. Sample D-TEC-ARE-PO006-E-ER7; same area as Figure 20. Numbers denote areas where EDS spectra were collected.

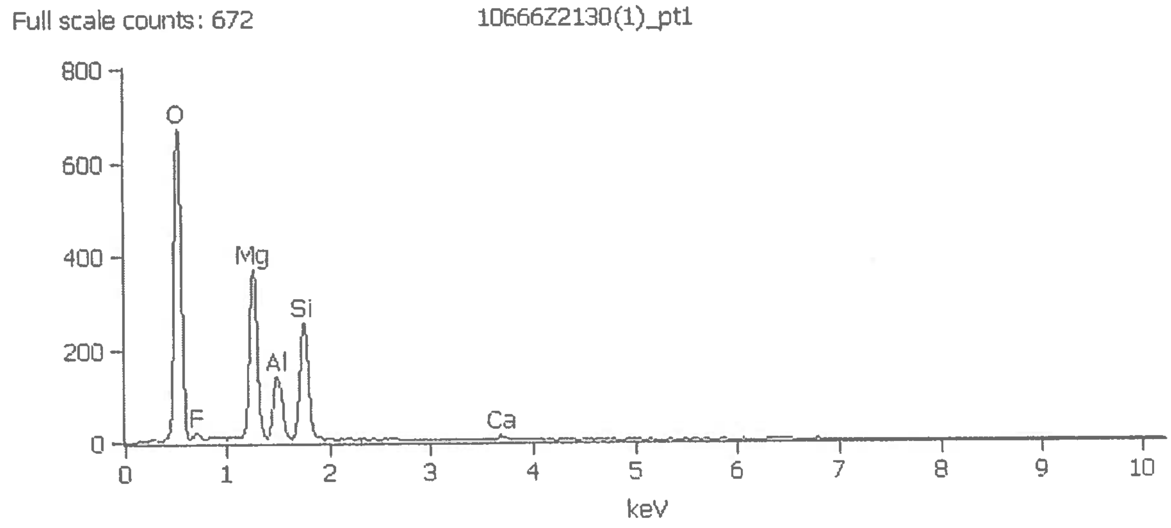


Figure 22. Area 1 from Figure 21. Mineral particle representative of those found throughout sample: O = Oxygen, Mg = Magnesium, Al = Aluminum, Si = Silicon; Ca = Calcium; F = Fluorine. Sample is mounted on adhesive carbon (C).

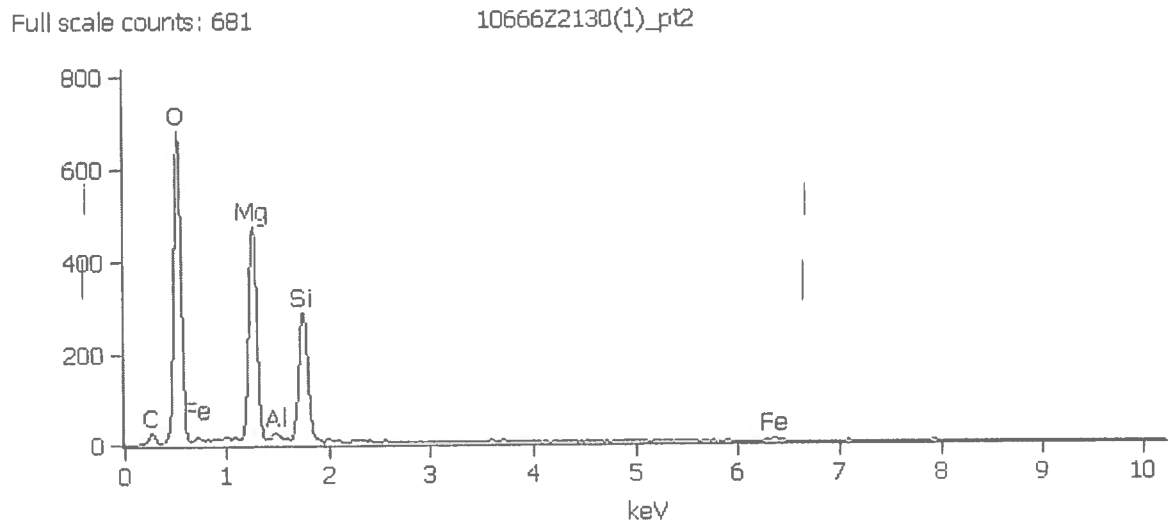


Figure 23. Area 2 from Figure 21. Serpentine mineral particle representative of those found throughout sample: Fe = Iron. Sample is mounted on adhesive carbon (C).

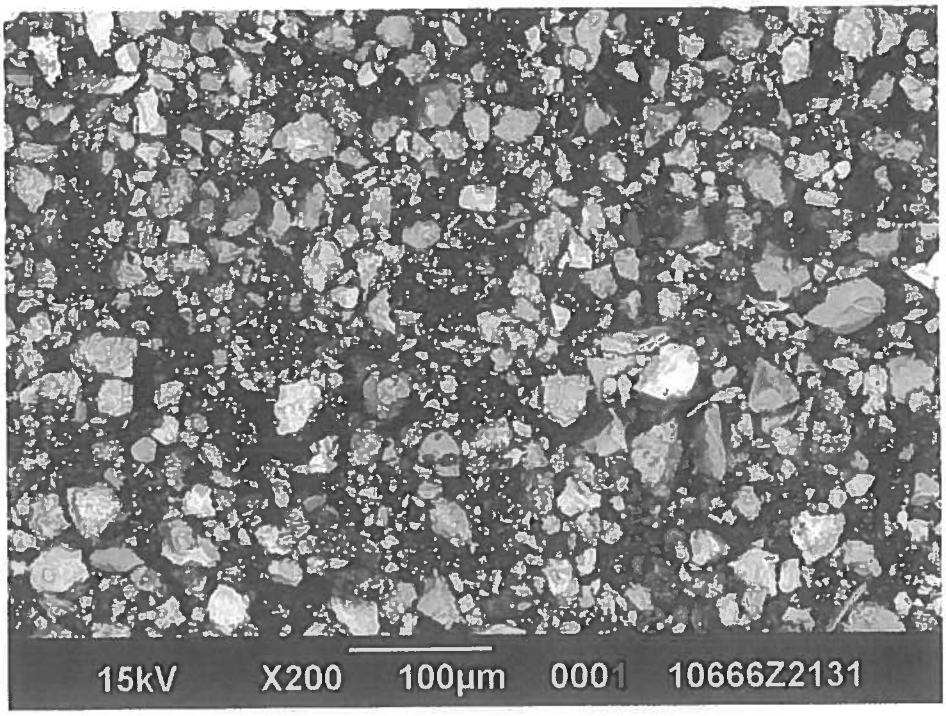


Figure 24. SEM micrograph of dust particles observed during analysis of sample D-TEC-GULF-GS-ER8, "Dust, floor, Gulf Facility entrance, Tallaboa Encarnacion Community."

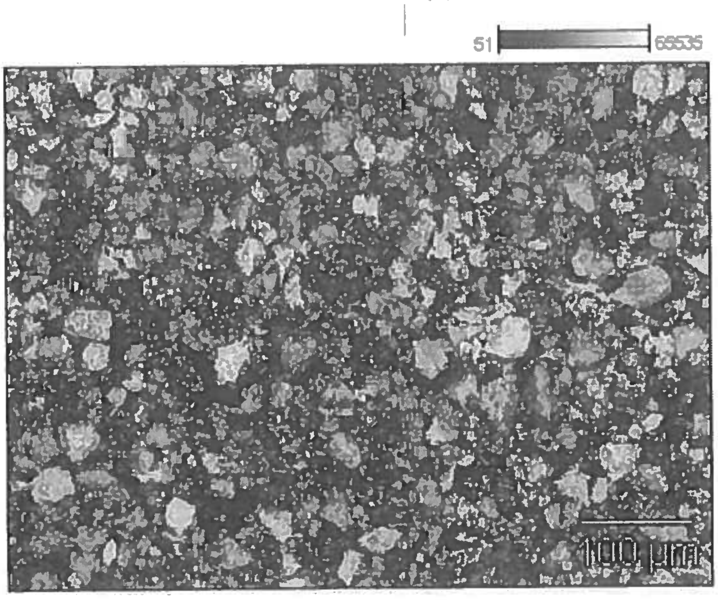


Figure 25. Sample D-TEC-GULF-GS-ER8; same area as Figure 24. Numbers denote areas where EDS spectra were collected.

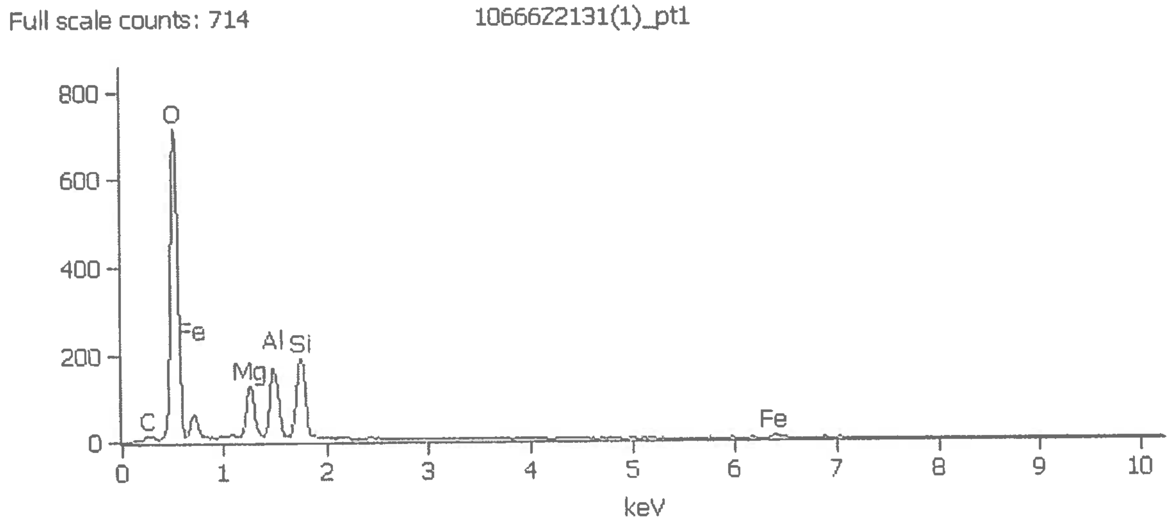


Figure 26. Area 1 from Figure 25. Clay mineral particle representative of those found throughout sample. Sample is mounted on adhesive carbon (C).

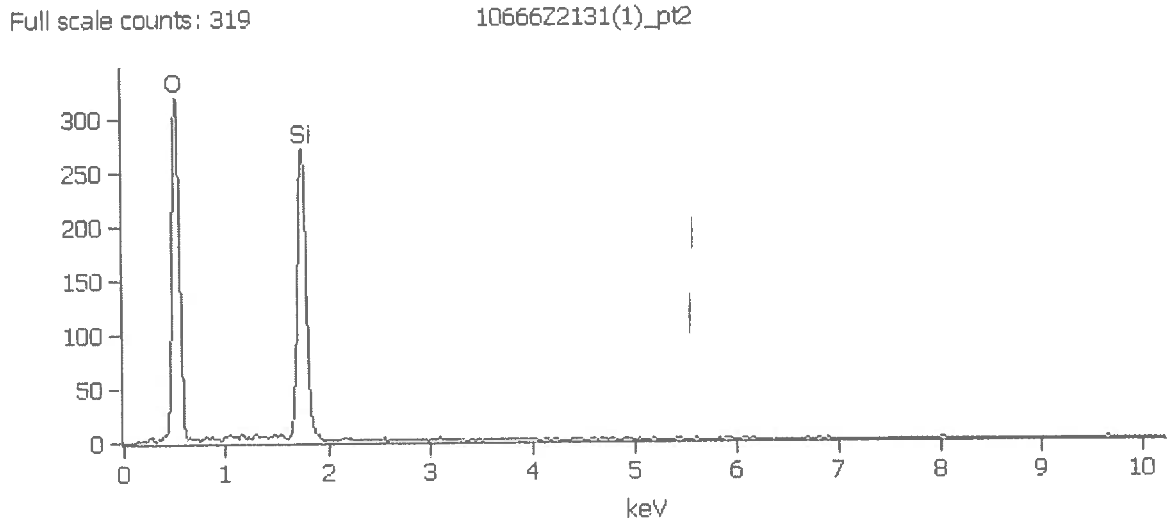


Figure 27. Area 2 from Figure 25. Quartz mineral particle representative of those found throughout sample. Sample is mounted on adhesive carbon (C).

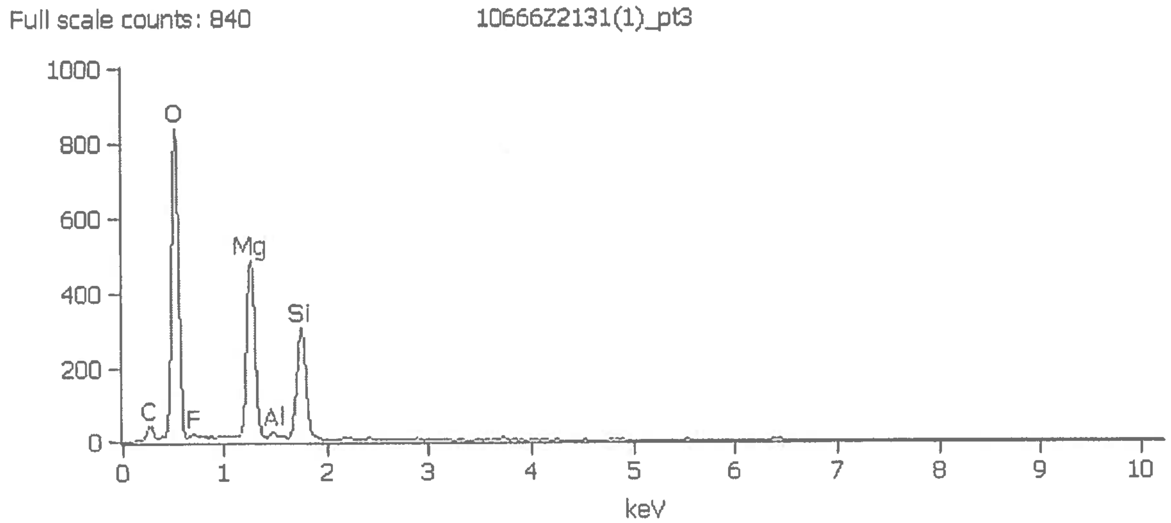


Figure 28. Area 3 from Figure 25. Serpentine mineral particle representative of those found throughout sample. Sample is mounted on adhesive carbon (C).

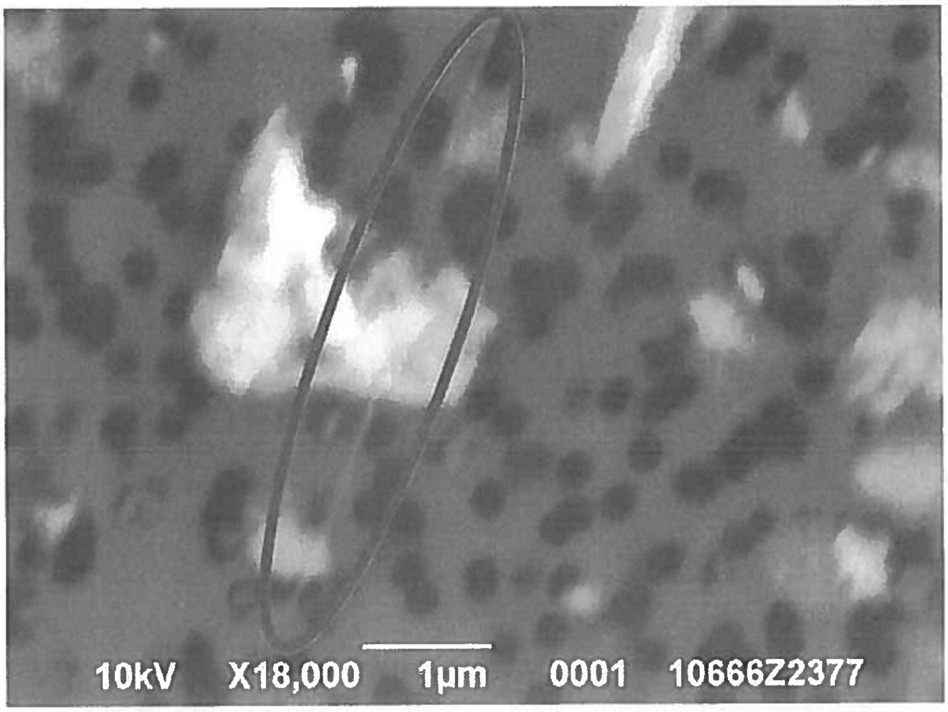


Figure 29. SEM micrograph of mineral fiber, chemically consistent with chrysotile asbestos, observed during analysis of sample D-OL-SM-ER6, "Sample from surface of metal scrap in front of area where the crane was."

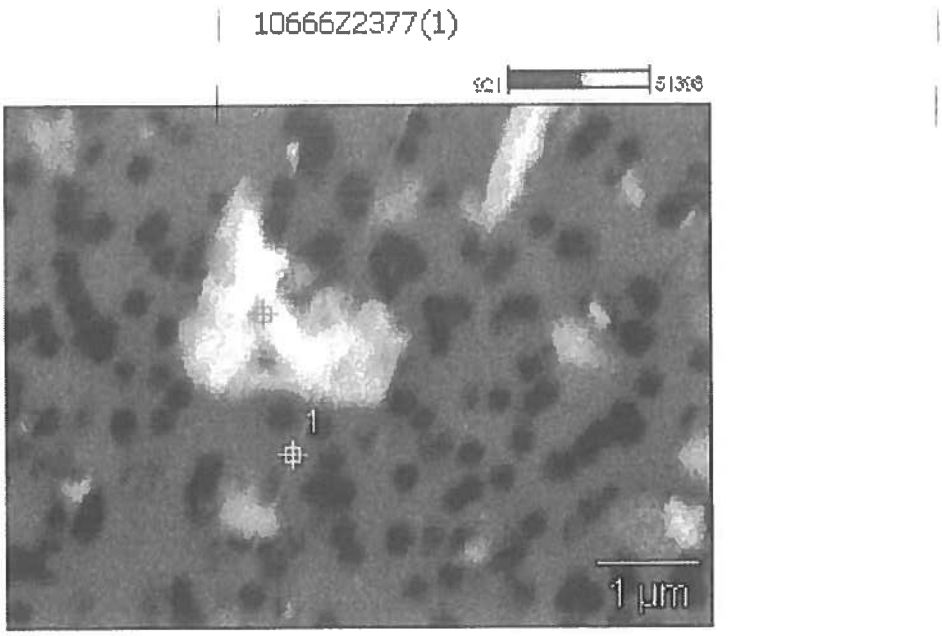


Figure 30. Sample D-OL-SM-ER6; same area as Figure 29. Numbers denote areas where EDS spectra were collected.

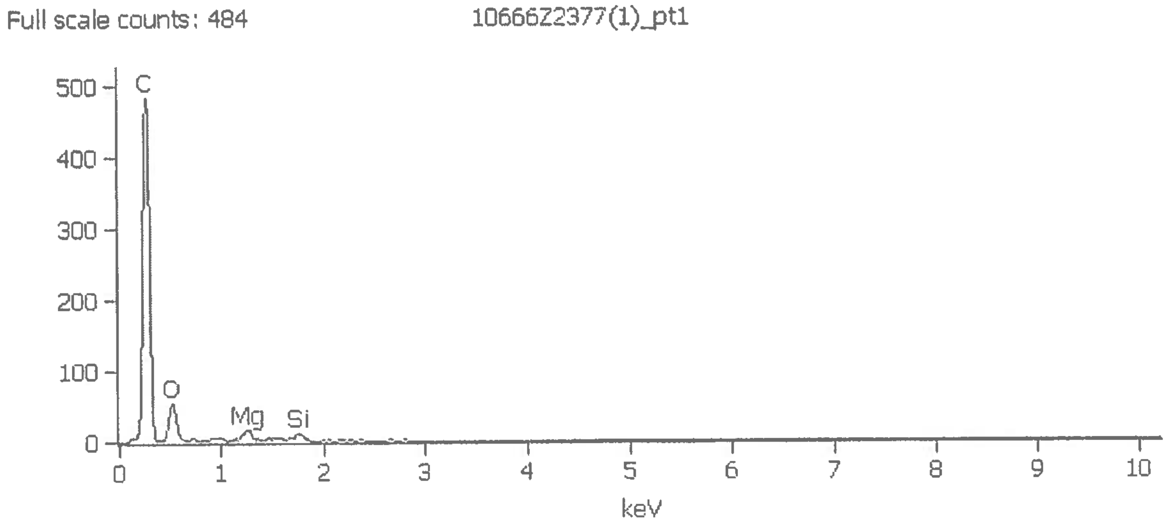


Figure 31. Area 1 from Figure 30. Likely chrysotile asbestos fiber. Sample is mounted on adhesive carbon (C).

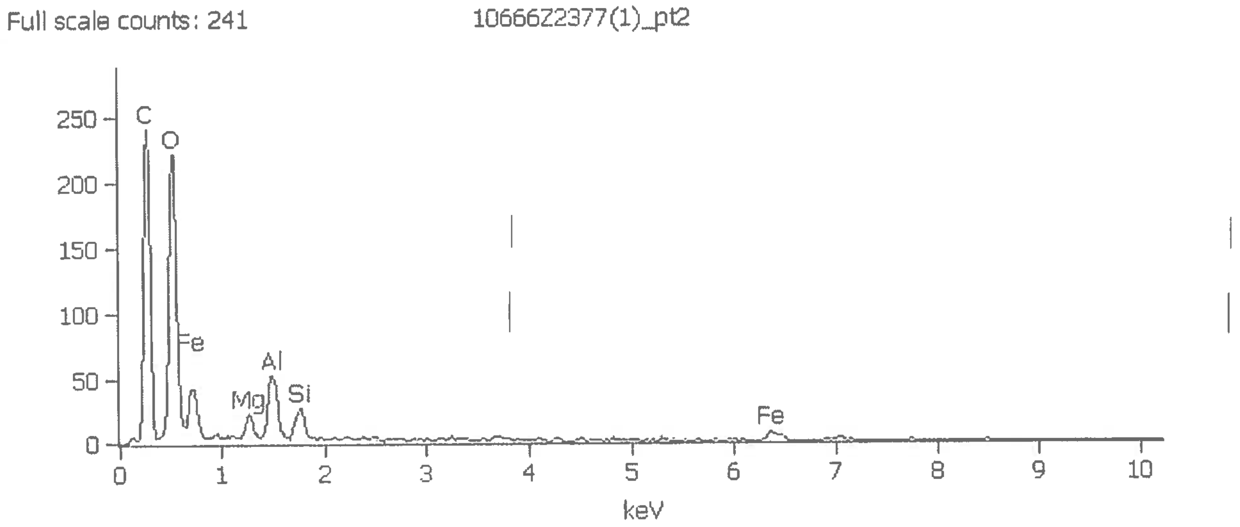


Figure 32. Area 2 from Figure 30. Mineral particle associated with probable chrysotile fiber. Sample is mounted on adhesive carbon (C).

106666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
#611 Monserrate, 2nd Floor, Santurce, P.R. 00907
Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	1290	**Project Name:**	PRC23673
Address:		**Sampling Date:**	10/1/14
Contact:		**Collected by:**	Elme Rivera, Mildred Santiago
Phone/Fax		**Company Name:**	AESI

Chain of Custody Record

COC-AIR-009/REV 1/06

Sample I.D.	Sample Description (i.e. Location, Name, etc.)	Pump Number	TIME Start	TIME Stop	FLOW RATE Initial	FLOW RATE Final	FLOW RATE Avg.	Volume	Latitude (X)	Longitude (Y)	Dust Finguerprints	LAB ID #
D-EV-FP-ER1	Dust, floor, front porch entrance stair, El Velorio restaurant	LV-237	14:52	14:54	2.00	2.00	2.00	4.0	17.99949	-66.72264	X	
D-HS-PG-ER2	Dust, floor, exterior next to playground, Head Start	LV-237	15:10	15:12	2.00	2.00	2.00	4.0	17.99692	-66.71860	X	
D-JLPV-CR23-2F-H-ER3	Dust, floor, hallway 2nd floor, Adm. Building, JLPV School	LV-237	16:06	16:08	2.00	2.00	2.00	4.0	17.99724	-66.71924	X	
D-JLPV-CR19-1F-H-ER4	Dust, floor, hallway, bldg. next to basketball court, JLPV School	LV-237	16:15	16:17	2.00	2.00	2.00	4.0	17.99712	-66.71952	X	
D-JLPV-CR10-1F-H-ER5	Dust, floor, hallway, 1st. bldg. JLPV School	LV-237	16:24	16:26	2.00	2.00	2.00	4.0	17.99775	-66.72009	X	
BLK-~~ER7~~ ER6	Field Blank										X	
MAH 10/7/14												

Turnaround Time: Normal: ✓ Rush: Super Rush:

Comments: *Area sampled is 100 cm^2 **Method of collection - ASTM D5755

Relinquished By:	[signature]	Date/Time	10/7/14	**Delivered Directly to Lab:**	**Shipped:**
Received By:	Melissa K Holman	Date/Time	10/7/14 3:30pm	**Method of Shipment:**	
Relinquished By:		Date/Time		**Lab. Recipient:**	
Received By:		Date/Time		**Date:**	

10066

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

#611 Monserrate, 2nd Floor, Santurce, P.R. 00907

Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	1290	Project Name:	PRC 23673
Address:		Sampling Date:	10/2/14
Contact:		Collected by:	Elme Rivera, Mildred Santiago
Phone/Fax		Company Name:	AESI

Chain of Custody Record

COC-AIR-009/REV 1/06

	Sample Description	Pump	TIME		FLOW RATE							LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	Latitude (X)	Longitude (Y)	Dust Finguerprints	
D-TEC-ARE-PO006-E-ER7	Dust, floor, AR Exchanger Boiler Specialist exterior, Tallaboa Encamacion Community	LV-238	10:37	10:39	2.00	2.00	2.00	4.0	17.99976	-66.72311	X	
D-TEC-GULF-GS-ER8	Dust, floor, Gulf Facility entrance, Tallaboa Encarnacion Community	LV-238	10:56	10:58	2.00	2.00	2.00	4.0	18.00052	-66.72366	X	
D-NOW-P0035-TB-ER9	Dust, behind traffic barrier Rd. 384 Km 3.2, north west of Olefin, between 1 and 2 miles radius	LV-238	11:26	11:28	2.00	2.00	2.00	4.0	18.03051	-66.72896	X	
D-NOW-P0036-BS-ER10	Dust, stop bus bench, Rd. 385 intersection with Rd. 384, north west of Olefin, between 1 and 2 miles radius	LV-238	11:39	11:41	2.00	2.00	2.00	4.0	18.03041	-66.72598	X	
D-TEC-P0021-C2-ER11	Dust, floor, sidewalk front of house comer street 2 intersection street 4, Tallaboa Encamacion Community	LV-238	12:04	12:06	2.00	2.00	2.00	4.0	17.99489	-66.71612	X	
D-TEC-P0018-C2-ER12	Dust, floor, comer street 2, west of street 2 Tallaboa Encamacion Community	LV-238	12:16	12:18	2.00	2.00	2.00	4.0	17.99620	-66.71720	X	
BLK-FB-ER13	Field Blank										X	

Turnaround Time: Normal: ✓ Rush: Super Rush:

Comments: *Area sampled is 100 cm^2 **Method of collection - ASTM D5755

Relinquished By:	[illegible]	Date/Time	10/7/14	Delivered Directly to Lab:		Shipped:	
Received By:	Melian-O-Atalma	Date/Time	10/7/14 3:30pm	Method of Shipment:			
Relinquished By:		Date/Time		Lab. Recipient:			
Received By:		Date/Time		Date:			

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	**Project Name:**	Dust Sampling Studies
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Chain of Custody Record

Sample I. D.	Sample Description (I.e. Location, Name, etc.)	Collected		Analysis Required		Comments	Laboratory I.D.
		Date	Time	PLM	Other		
B-OL-0V-409-ER1	Sample from debris of pipe insulation found on floor from area OV409	10/23/14	12:10		Dust Fingerprint		58924
S-OL-FF-ER3	Soil sample from area covered with grass. Area front of flare	10/23/14	12:23		Dust Fingerprint		58925
B-OL-FF-ER4	Sample from insulation under pipe on the floor. Area front of flare	10/23/14	12:39		Dust Fingerprint		58926
B-OL-PS408-ER5	Sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:43		Dust Fingerprint	there is still part of pipe on the column	58927
B-OL-PS408-ER5 dup	Duplicate sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:44		Dust Fingerprint	there is still part of pipe on the column	58928
D-385-W-ER1	Dust 10 cm x 10 cm from bench left side bus stop	10/23/14	11:15		Dust Fingerprint		58929
D-FB-385-ER2	Field Blank	10/23/14	11:16		Dust Fingerprint		58930

Turnaround Time: Normal: X Rush:

Comments: Do not analyze blank and duplicate

Relinquished By:	Ky	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	10/23/14 15:20		
Received By:	St Lt	**Method of Shipment:**	
Date/ Time:	10/24/14 9:30		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

10666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

#611 Monserrate, 2nd Floor, Santurce, P.R. 00907

Ph: (787) 722-0220; Fax: (787) 724-5788

Transmittal Sheets for Air Sample Analysis

Client Name:	1290	Project Name:	Dust Sampling
Address:		Sampling Date:	10/23/2014
Contact:		Collected by:	Elme Rivera
Phone/Fax		Company Name:	AES International

Chain of Custody Record

COC-AIR-009/REV 1/06

	Sample Description	Pump	TIME		FLOW RATE				Asbestos	Dust	Lead	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume	PCM	Fingerprint	Air		
D-OL-FF-ER2	Sample on top of pipe surface from front flare area	LV-238	12:30	12:32	2.0	2.0	2.0	4.0		x			61523
D-OL-SM-ER6	Sample from surface of metal scrap in front of area where the crane was	LV-238	12:54	12:56	2.0	2.0	2.0	4.0		x			61524
OL-SB-ER7	Sealed Blank									x			61525
OL-FB-ER8	Field Blank									x			61526
OL-FB-ER9	Field Blank									x			61527

Turnaround Time: Normal: X Rush: Super Rush:

Comments: **Do not analyze blanks and sealed blank**

Relinquished By:	[signature]	Date/Time	10/23/14 15:2	Delivered Directly to Lab:	Shipped:
Received By:	[signature]	Date/Time	10/24/14 9:30	Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

3. Characterization of Mineral Samples from Municipality of Yauco

MVA SCIENTIFIC CONSULTANTS

Full Service Analytical Microscopy Laboratory

3300 Breckinridge Blvd
Suite 400
Duluth, GA 30096

770.662.8509
FAX 770.662.8532
www.mvainc.com

Characterization of Mineral Samples from the Yauco Municipality of Puerto Rico

Performed for AES International, Inc.

MVA Project 10666

16 January 2015

Executive Summary

This revised report presents the results of the characterization of two mineral samples collected by Ady Padan of AES International, Inc. on 12 October 2014 and shipped to MVA Scientific Consultants via FedEx. The mineral samples were collected from two different locations in the Yauco municipality in southwestern Puerto Rico. The samples were received on 21 October 2014.

It was requested that we characterize the samples, both for asbestos content and for any additional characteristics that might be distinct to these samples as a "fingerprint" of the material. The report has been revised to include elemental weight percent data of serpentine particles and to correct the range of iron reported in the "Results and Discussion" section. Information regarding the aspect ratios of fibers has also been added.

The two samples both consist primarily of serpentine minerals containing trace to minor amounts of iron and aluminum. Sample Z2285 from Quarry 1 in Yauco contains the fibrous serpentine mineral chrysotile which also exhibited trace to minor amounts of iron and aluminum. In general, fibers observed in the sample are short (less than 3 micrometers in length) with low aspect ratios (10:1 on average and most less than 20:1).

Respectfully Submitted by: EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

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Revised Report of Results: MVA10666

Characterization of Mineral Samples from the Yauco Municipality of Puerto Rico

Prepared for:

AES International, Inc.
611 Monserrate St., 2nd Floor
Santurce, P.R. 00907

Respectfully Submitted by:

EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

MVA Scientific Consultants
3300 Breckinridge Boulevard
Suite 400
Duluth, GA 30096

Supercedes Report Dated 3 December 2014

16 January 2015

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MVA SCIENTIFIC CONSULTANTS
Full Service Analytical Microscopy Laboratory

Revised Report of Results: MVA10666

Characterization of Mineral Samples from the Yauco Municipality of Puerto Rico

Introduction

This revised report presents the results of the characterization of two mineral samples collected by Ady Padan of AES International, Inc. on 12 October 2014 and shipped to MVA Scientific Consultants via FedEx. The mineral samples were collected from two different locations in the Yauco municipality in southwestern Puerto Rico. The samples were received on 21 October 2014 and assigned unique MVA sample numbers (see Table 1).

It was requested that we characterize the samples, both for asbestos content and for any additional characteristics that might be distinct (recognizably different from something else of a similar type) to these samples as a "fingerprint" of the material. The characterization of the properties of soil/mineral dust and this type of "fingerprint" analysis or characterization is often used in establishing a connection between materials in dust samples and potential sources [1-3]. These two samples were analyzed during the period 24 October through 2 December 2014. The report has been revised to include elemental weight percent data of serpentine particles and to correct the range of iron reported in the "Results and Discussion" section. Information regarding the aspect ratios of fibers has also been added.

Methods

The samples were initially examined under an Olympus SZ-40 stereomicroscope at magnifications from 7X to 40X. Forceps and a tungsten needle were used to collect representative portions of the particulate from the mineral samples. The particulate was then transferred onto a microscope slide and mounted in Cargille refractive index liquids for analysis by polarized light microscopy (PLM) using an Olympus BH-2 polarized light microscope with a magnification range from 100X to 1,000X. The PLM analysis for asbestos followed the analytical procedures recommended by the U.S. Environmental Protection Agency [4].

Additional analysis of the quarry mineral sample (Z2285) was performed to supplement the results using a JEOL JSM-6490LV scanning electron microscope (SEM) coupled with a Thermo Scientific Noran System SIX x-ray energy dispersive spectrometry (EDS) system. Debris from the mineral sample was pressed to an adhesive carbon tab on an aluminum SEM planchette (specimen substrate). The sample was gold coated prior to analysis to improve conductivity of the specimen.

A composite sample of both mineral samples was prepared and analyzed using a Philips EM 420 transmission electron microscope (TEM) equipped with an Oxford INCA energy dispersive spectrometry (EDS) x-ray analysis system.

Results and Discussion

A summary of analytical results is provided in Table 2. The two samples both contained the serpentine mineral lizardite. Sample Z2285 also contained a trace amount (less than 1% by volume) of fibrous serpentine (chrysotile) asbestos. Both types of serpentine minerals, the non-fibrous lizardite and the fibrous chrysotile, contain trace to minor amounts of iron (approximately 2.4 to 7.1%) and in some instances detectable amounts of aluminum (up to 1.4%). Percentages, derived from EDS data, are elemental weight percentages of twelve serpentine structures (fibrous and non-fibrous) analyzed by both SEM-EDS and TEM-EDS (Table 3). Images and spectra collected during analyses of the mineral samples are provided in Figures 1 through 16. Aspect ratios of the three chrysotile fibers characterized by TEM-EDS were approximately 8:1, 8:1, and 14:1 (length:width) and all three structures were less than 3 micrometers in length.

Conclusion

The two samples both consist primarily of serpentine minerals containing trace to minor amounts of iron and aluminum. Sample Z2285 from Quarry 1 in Yauco contains the fibrous serpentine mineral chrysotile, which also exhibited trace to minor amounts of iron and aluminum. In general, fibers observed in the sample are short (less than 3 micrometers in length) with low aspect ratios (10:1 on average and most are less than 20:1).

References

1. Locard, E., "The analysis of dust traces," *Amer. Jour. Police Sci.*, 1, 3, 276, 1930.
2. McCrone, W.C., and Delly, J.G., "The Particle Atlas," 2nd Ed., Ann Arbor Science Publishers, Inc., Ann Arbor, MI, 1973.
3. Millette, J., and Brown, R., "Dust Particulate from the World Trade Center Disaster of September 11, 2001," Proceedings of the American Academy of Forensic Sciences, Annual Meeting, Feb. 21-26, 2005.
4. U. S. Environmental Protection Agency, "Test Method EPA/600/R-93/116 -- Method for the Determination of Asbestos in Bulk Building Materials."

Table 1. Summary of Insulation Debris Samples - Collected 12 October 2014

MVA #	Sample I. D.	Sample Description
Z2284	R-MC-AP3	Serpentinite from Media Quijada
Z2285	R-Q1-AP4	Serpentinite from Quarry 1, Yauco

Table 2. Summary of Analytical Results

MVA #	PLM Analysis Results % Asbestos	Additional Materials Observed	SEM Analysis Results	TEM Analysis Results
Z2284	NAD	Non-fibrous Serpentine (Lizardite), Magnetite	NA	*Composite Sample* Non-fibrous (Lizardite) and Fibrous (Chrysotile)
Z2285	Trace Chrysotile	Non-fibrous Serpentine (Lizardite), Magnetite	Serpentine: Non-fibrous (Lizardite) and Fibrous (Chrysotile)	

NA – Not Analyzed
NAD – No Asbestos Detected

Table 3. EDS Characterization (Elemental Weight %) of Fibrous and Non-Fibrous Serpentine Structures Detected in Mineral Samples Z2284 and Z2285

	Mg	Al	Si	Fe	O
TEM P001	28.7	0.0	22.8	3.0	45.6
TEM P002	25.4	1.4	22.4	5.7	45.1
TEM P003	24.9	0.0	25.1	2.9	46.4
TEM P004	25.8	1.1	23.4	3.9	45.8
TEM F001	30.5	0.0	19.6	5.4	44.2
TEM F002	27.1	0.0	22.8	4.1	45.5
TEM F003	25.6	0.6	22.2	7.1	44.6
SEM (3)_Pt1	26.1	0.8	23.7	2.4	47.0
SEM (3)_Pt2	25.2	0.8	20.5	2.8	50.7
SEM (3)_Pt3	25.9	0.8	24.3	3.2	45.8
SEM (4)_Pt1	25.7	0.7	21.3	2.9	49.4
SEM (4)_Pt2	26.5	0.9	26.8	6.4	39.4
Ave	26.4	0.6	22.9	4.1	45.8
Std. Dev.	1.6	0.5	2.0	1.6	2.8
Max	30.5	1.4	26.8	7.1	50.7
Min	24.9	0.0	19.6	2.4	39.4

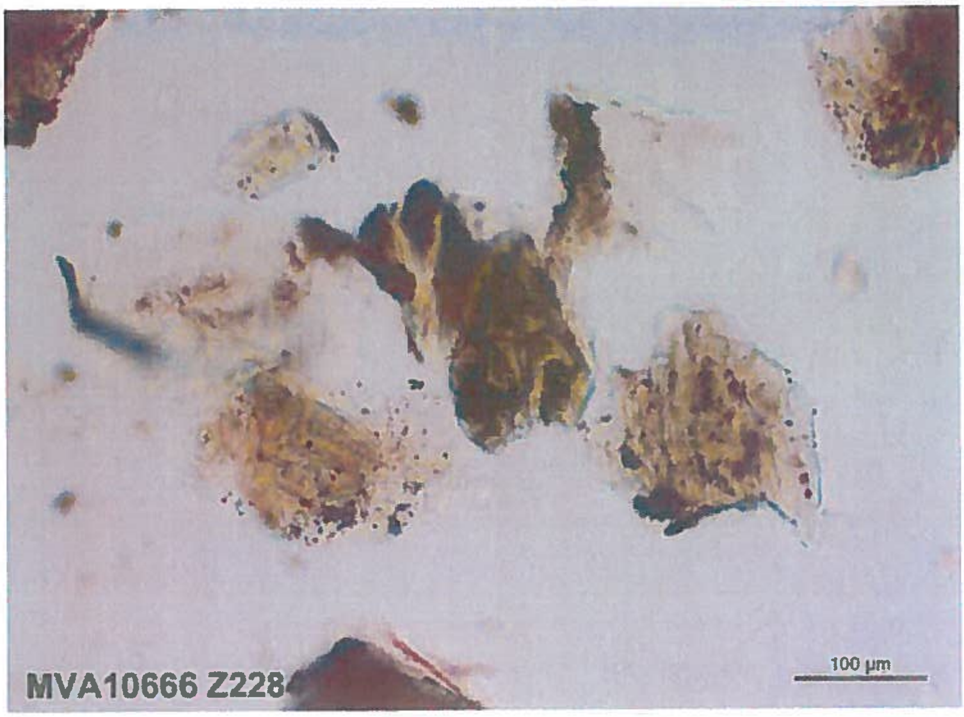


Figure 1. Polarized light microscope image of lizardite mineral particles detected during analysis of Media Quijada sample R-MC-AP3. Plane polarized light illumination.

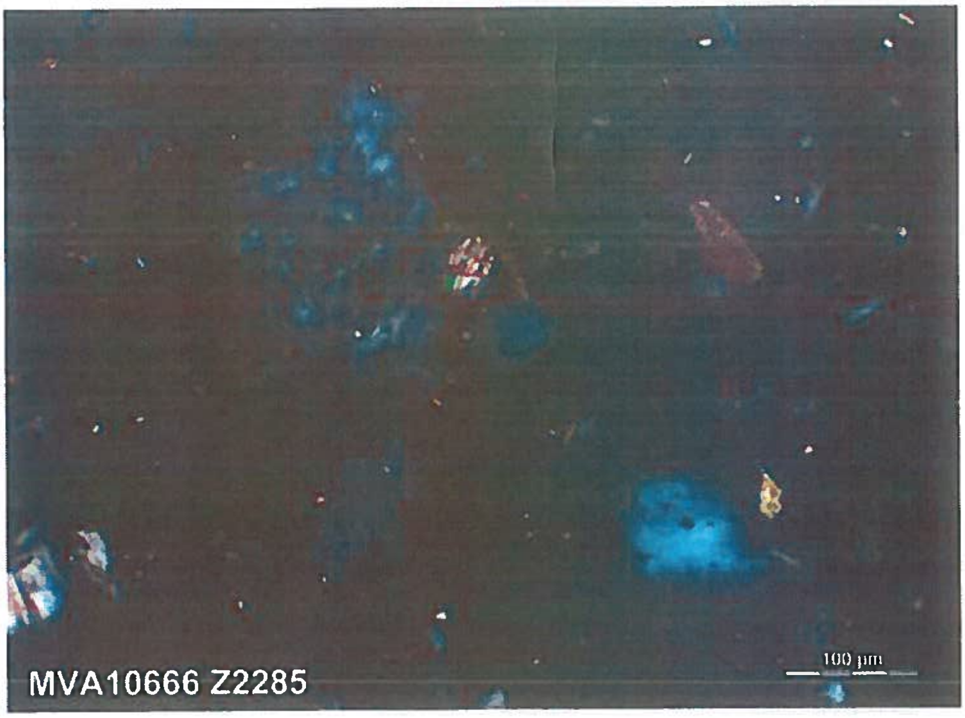


Figure 2. Polarized light microscope image of lizardite mineral particles detected during analysis of Quarry 1 sample R-Q1-AP4. Crossed polars.

Figure 3. Polarized light microscope image of chrysotile asbestos fibers detected during analysis of Quarry 1 sample R-Q1-AP4. Crossed polars.

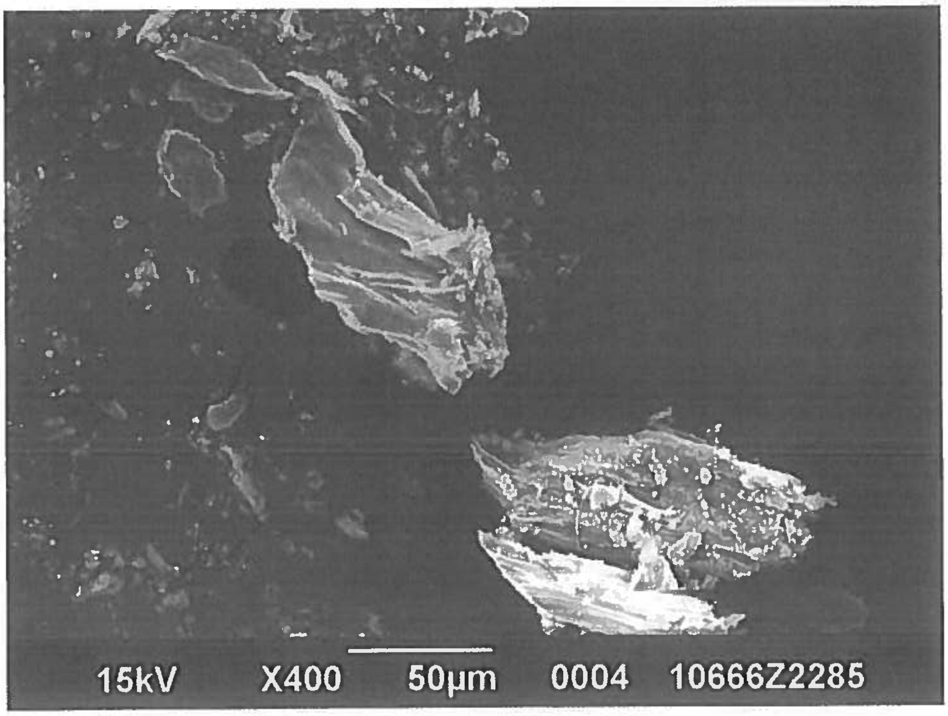


Figure 4. Scanning electron micrograph of fibrous and non-fibrous serpentine (chrysotile and lizardite, respectively) detected during analysis of Quarry 1 sample R-Q1-AP4.

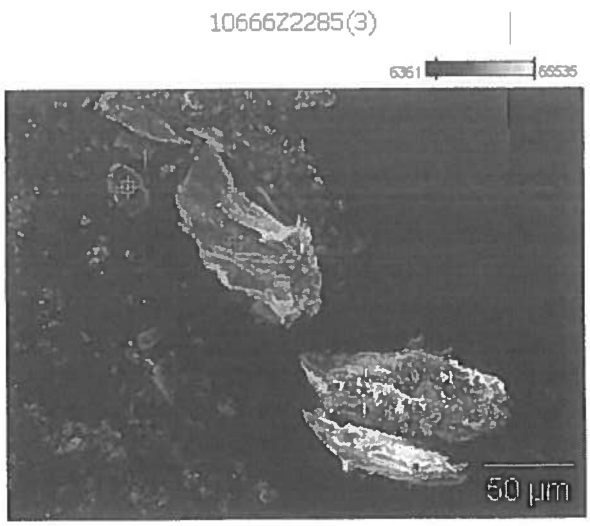


Figure 5. Quarry 1 sample R-Q1-AP4. Same area as Figure 4. Numbers denote areas where EDS spectra were collected.

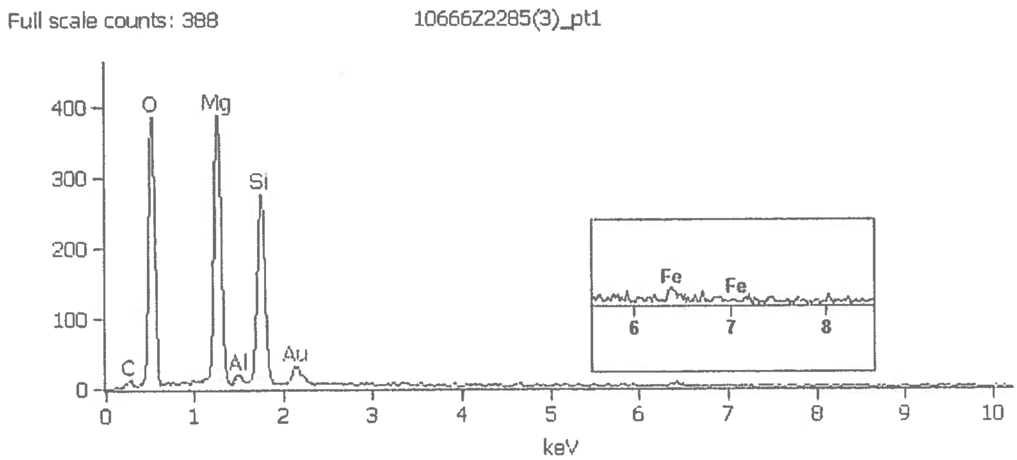


Figure 6. Area 1 from Figure 5. Lizardite flake. C = Carbon, O = Oxygen, Mg = Magnesium, Al = Aluminum, Si = Silicon, Au = Gold, Fe = Iron. Sample is mounted on adhesive carbon (C) and coated with gold (Au) for conductivity. Inset shows an enlarged view of the iron peak.

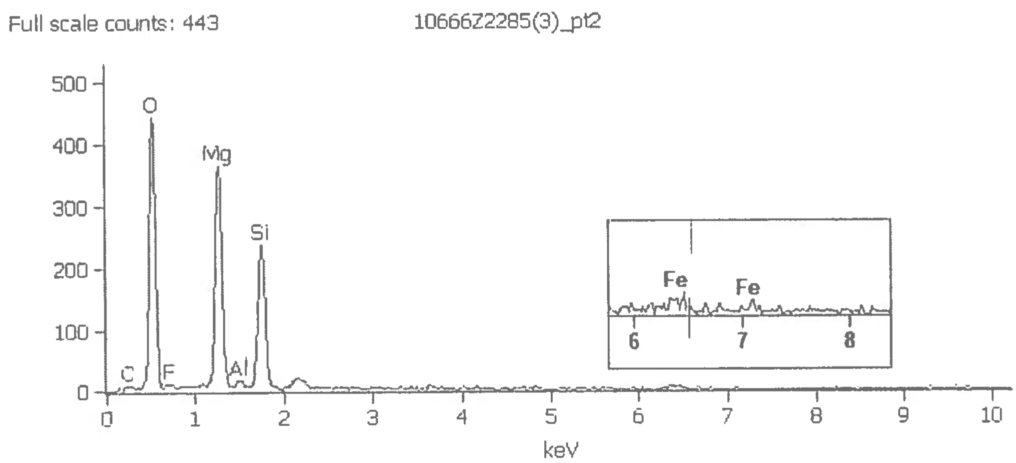


Figure 7. Area 2 from Figure 5. Fibrous serpentine (chrysotile - confirmed by TEM analysis). Inset shows an enlarged view of the iron peak.

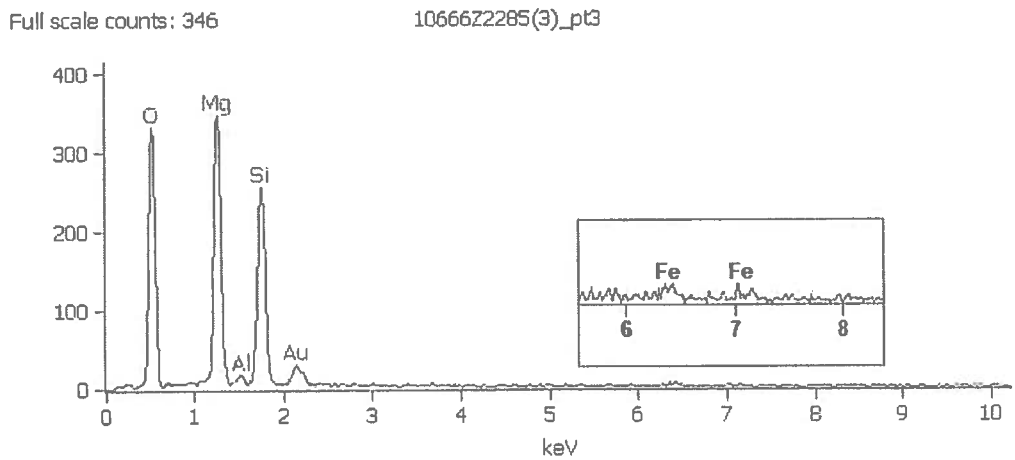


Figure 8. Area 3 from Figure 5. Fibrous serpentine (chrysotile - confirmed by TEM analysis). Inset shows an enlarged view of the iron peak.

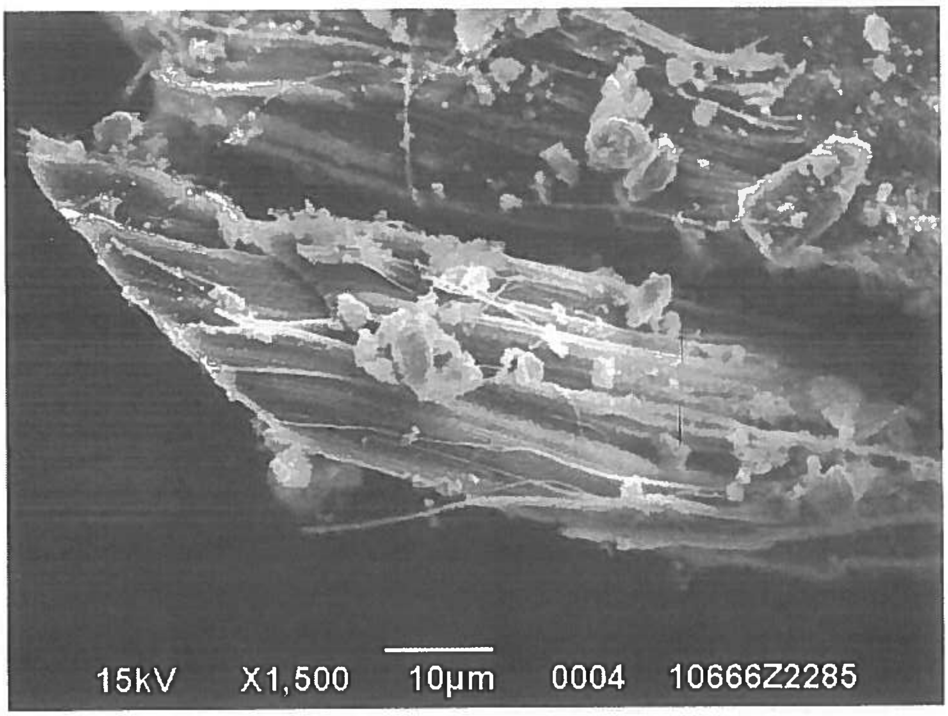


Figure 9. Scanning electron micrograph of fibrous serpentine (chrysotile - confirmed by TEM analysis) detected during analysis of Quarry 1 sample R-Q1-AP4.

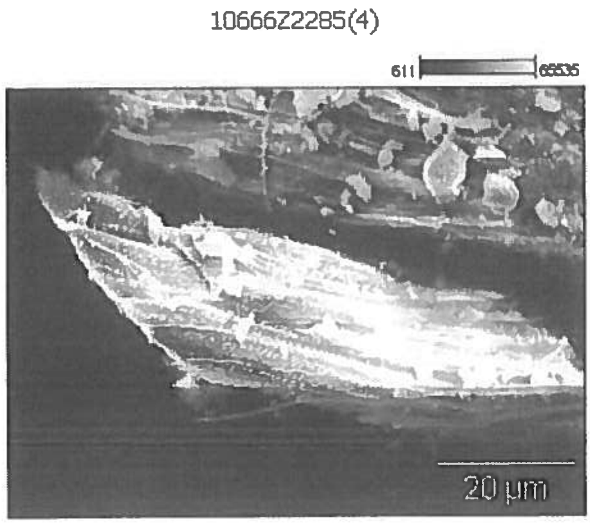


Figure 10. Quarry 1 sample R-Q1-AP4. Same area as Figure 9. Numbers denote areas where EDS spectra were collected.

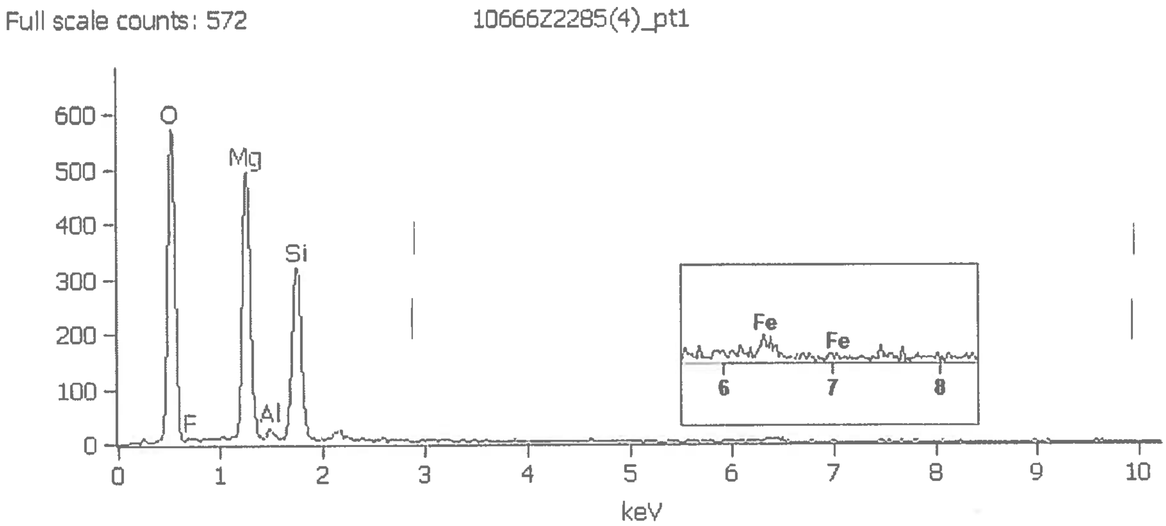


Figure 11. Area 1 from Figure 10. Non-fibrous serpentine (lizardite). Inset shows an enlarged view of the iron peak.

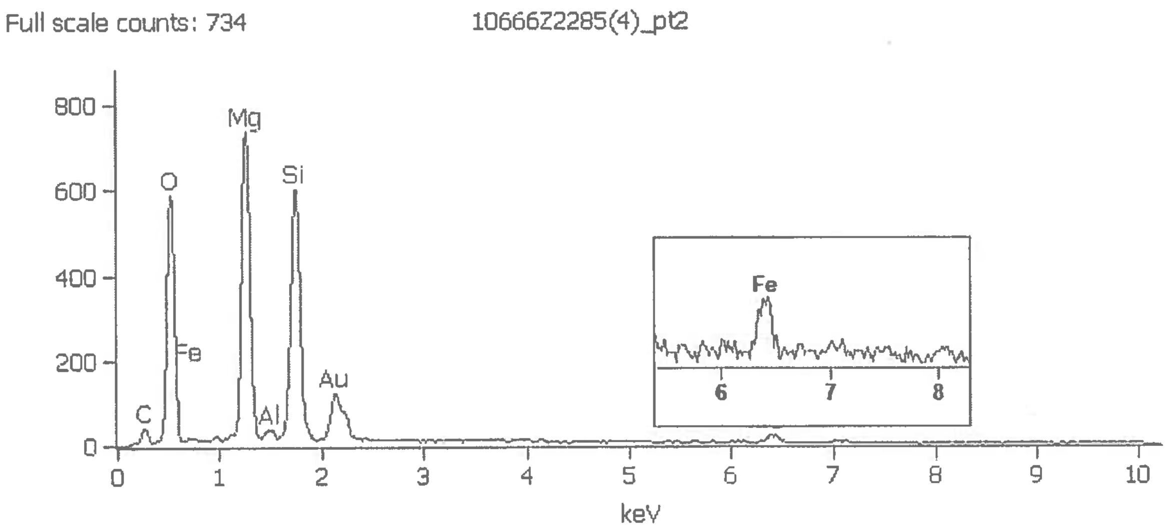


Figure 12. Area 2 from Figure 10. Fibrous serpentine (chrysotile - confirmed by TEM analysis). Inset shows an enlarged view of the iron peak.

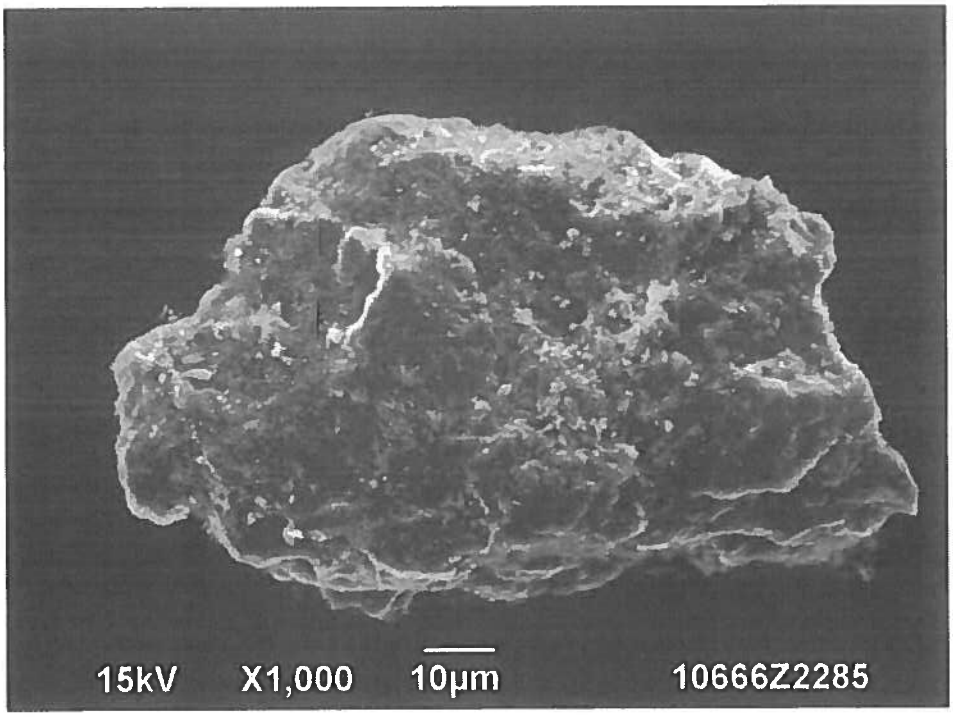


Figure 13. Scanning electron micrograph of non-fibrous serpentine (lizardite) detected during analysis of Quarry 1 sample R-Q1-AP4.

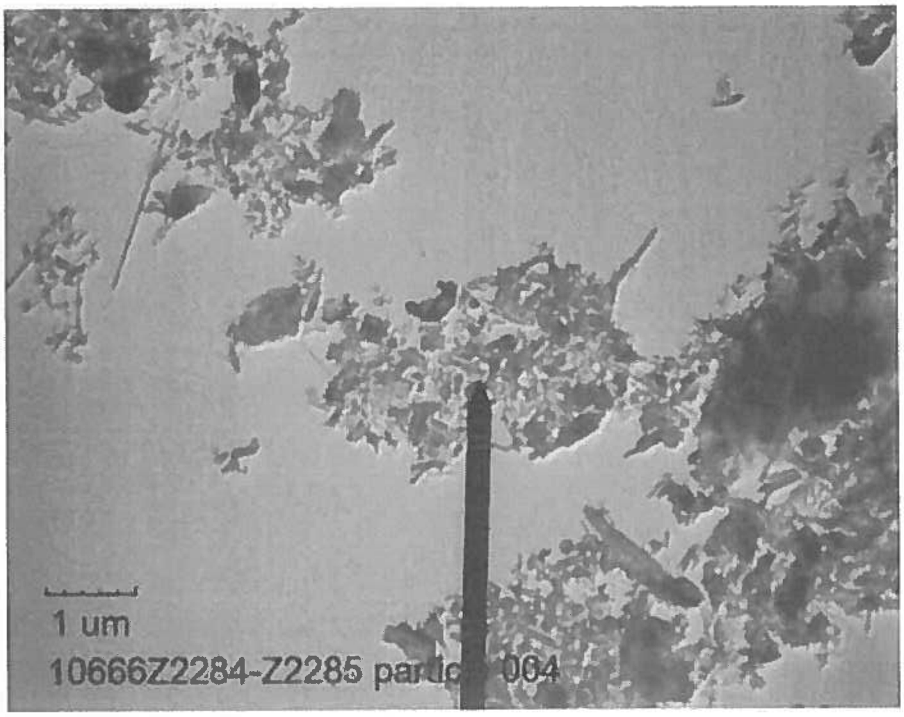
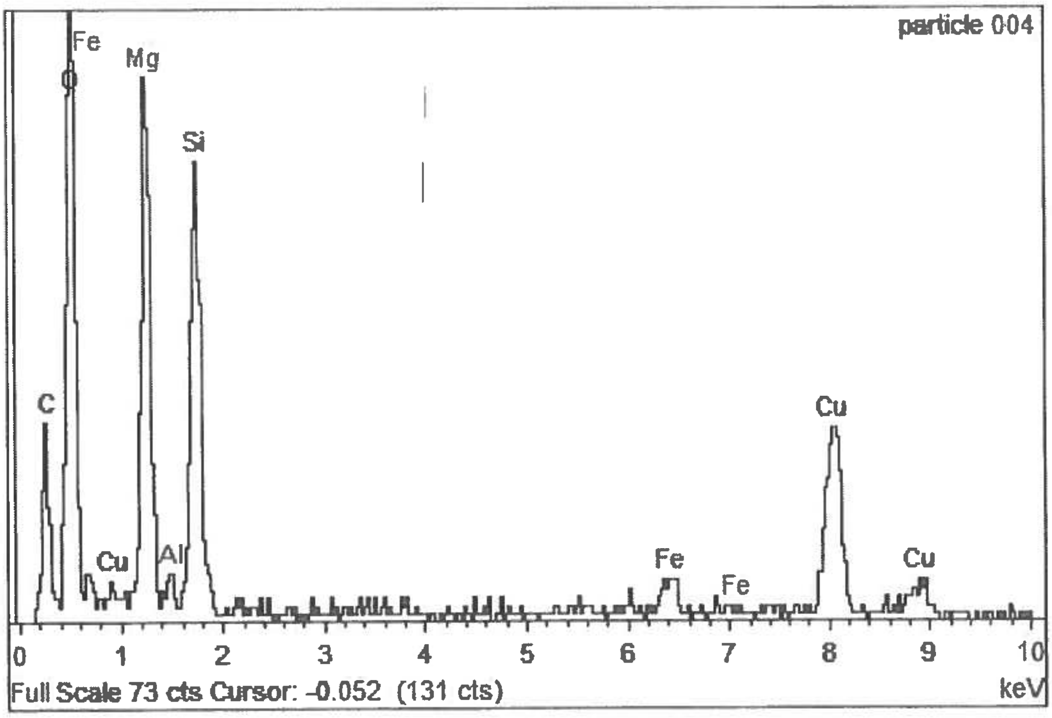


Figure 14. TEM image (above) and EDS spectrum (below) of particles in composite prep of both serpentinite mineral samples.



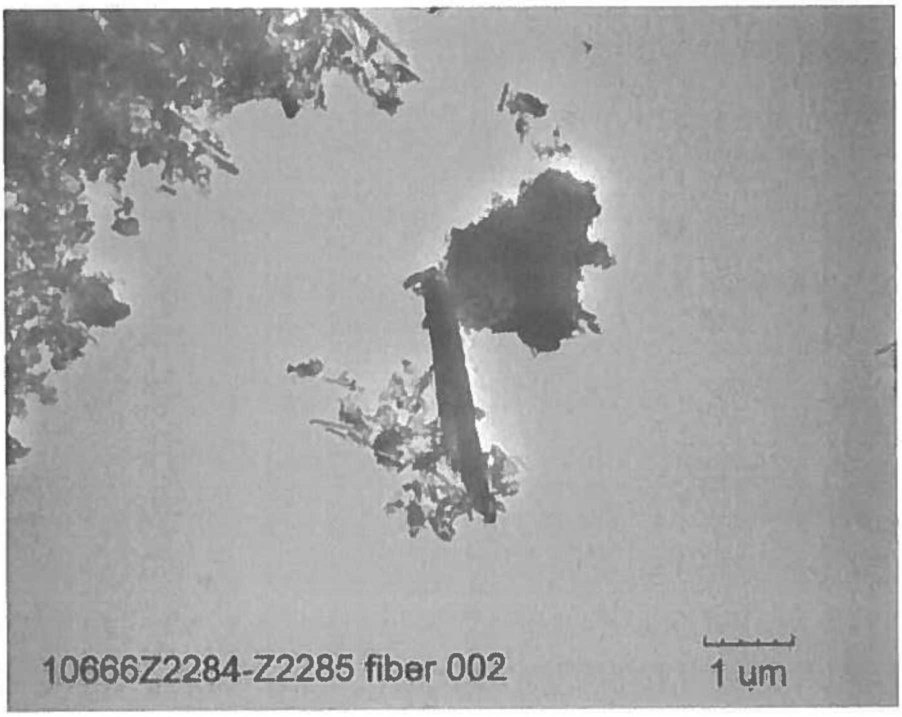
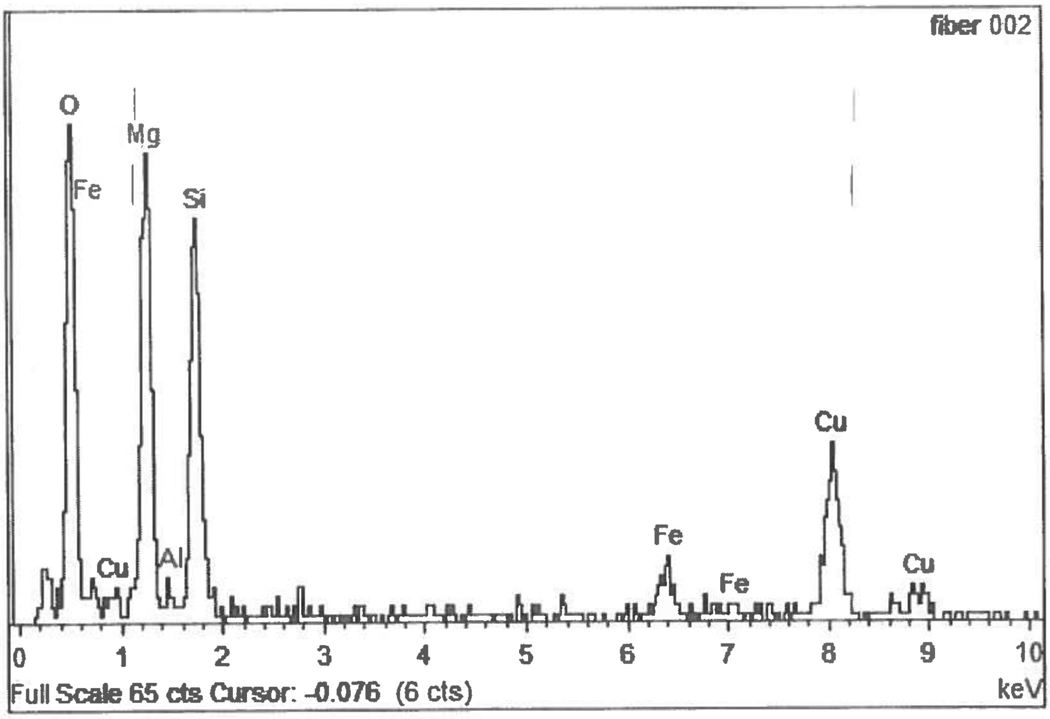


Figure 15. TEM image (above) and EDS spectrum (below) of serpentine fibers (chrysotile asbestos) in composite prep of both serpentinite mineral samples.



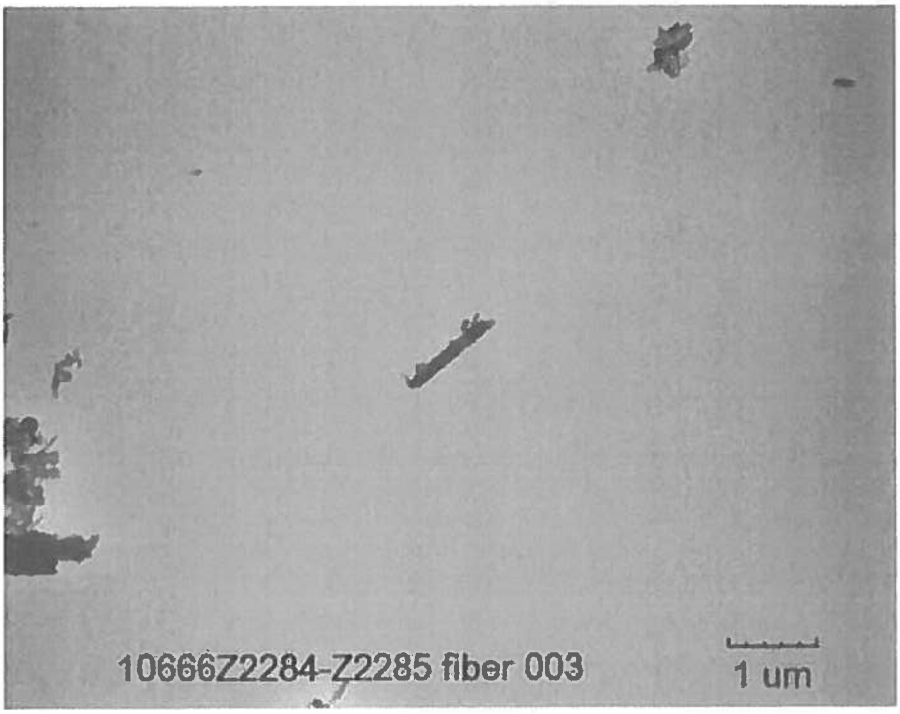
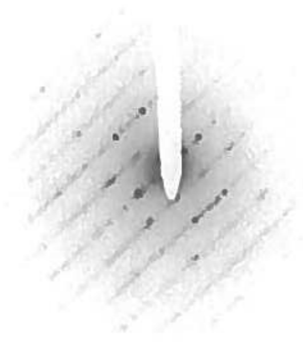


Figure 16. TEM image (above) and electron diffraction pattern (below) of representative chrysotile asbestos fiber observed during analysis of composite prep of both serpentinite mineral samples.



10666 Z2284/Z2285 SAED 480mm CL - Fiber003

1044

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Corrected COCR

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	**Project Name:**	Dust Sampling
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Ady Padan
Phone/Fax:		**Company:**	AESI

Chain of Custody Record

COC-BULK-011/REV 1/06

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
R-MC-AP3	serpentinite from media quijada	10/12/14	12:15	X	Dust Fingerprints		58878
R-QI-AP4	serpentinite from quarry 1, Yauco	10/12/14	13:46	X	Dust Fingerprints		58879

Turnaround Time: Normal: X Rush:

Relinquished By:	[signature]	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	10/17/14 15:00	**Method of Shipment:**	
Received By:	[signature]	**Lab. Recipient:**	
Date/ Time:	10/21/14 10:00	**Date:**	
Relinquished By:			
Date/ Time:			
Received By:			
Date/ Time:			

PLM-65/Rev. 1/ 7-09

SPC 10/21/14

4. Characterization of gravel/aggregate samples

Report of Results: MVA10666

Characterization of Aggregate (Gravel) Samples

Prepared for:

AES International, Inc.
611 Monserrate St., 2nd Floor
Santurce, P.R. 00907

Respectfully Submitted by:

EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

MVA Scientific Consultants
3300 Breckinridge Boulevard
Suite 400
Duluth, GA 30096

09 January 2015

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MVA SCIENTIFIC CONSULTANTS
Full Service Analytical Microscopy Laboratory

Report of Results: MVA10666

Characterization of Aggregate (Gravel) Samples

Introduction

This report presents the results of characterization of four gravel aggregate samples. Two samples were collected by Elme Rivera of AES International, Inc. on 10 November 2014 and sieved into two size fractions (greater and less than 19 mm). The four sample fractions were shipped to MVA Scientific Consultants via FedEx and received on 14 November 2014. Two additional samples were collected by Elme Rivera of AES International, Inc. on 21 November 2014 and hand delivered by Ady Padan of AES International, Inc. on 01 December 2014. Upon receipt, the samples were assigned MVA sample numbers (see Table 1).

It was requested that we characterize the samples, both for asbestos content and for any additional characteristics that might be distinct (recognizably different from something else of a similar type) to these samples as a "fingerprint" of the material. The characterization of the properties of soil/mineral dust and this type of "fingerprint" analysis or characterization is often used in establishing a connection between materials in dust samples and potential sources [1-3]. These four samples were analyzed during the period 25 November 2014 through 02 January 2015.

Methods

The samples were initially examined under an Olympus SZ-40 stereomicroscope at magnifications from 7X to 40X. Forceps and a tungsten needle were used to collect representative portions of the particulate from the mineral samples. The particulate was then transferred onto a microscope slide and mounted in Cargille refractive index liquids for analysis by polarized light microscopy (PLM) using an Olympus BH-2 polarized light microscope with a magnification range from 100X to 1,000X. The PLM analysis for asbestos followed the analytical procedures recommended by the U.S. Environmental Protection Agency [4].

Select particles picked during PLM analyses of three of the four samples (Z2617, Z2754, and Z2755) were analyzed further using a JEOL JSM-6490LV scanning electron microscope (SEM) coupled with a Thermo Scientific Noran System SIX x-ray energy dispersive spectrometry (EDS) system. Particles from the aggregate samples were pressed to adhesive carbon tabs on aluminum SEM planchettes (specimen substrates).

A subsample of particles from the fine fractions of each of the four aggregate samples were suspended in acetone and deposited dropwise onto carbon coated copper grids for analyses using a Philips EM 420 transmission electron microscope (TEM) equipped with an Oxford INCA energy dispersive spectrometry (EDS) x-ray analysis system.

Results and Discussion

A summary of analytical results is provided in Table 2. Results for the pre-sieved size fractions are provided as one combined result for each sample.

Aggregate sample S-TEC-ARE-P0006-ER1 (MVA Z2617) consisted of a mix of plant debris and soil minerals including major amounts (>10%) of carbonate, non-fibrous serpentine (lizardite) and other soil minerals; minor amounts (1%-10%) of magnetite; and trace amounts (<1%) of fibrous serpentine (chrysotile). Figures 1 through 8 show data regarding the serpentine particles that were observed during analysis of the sample via stereomicroscopy, PLM, SEM-EDS, and TEM-EDS. The serpentine particles present in this sample consistently exhibit trace to minor amounts of aluminum and/or iron. Some particles also contained trace amounts of calcium. The presence of calcium was not confirmed by the analyses of any single particle, therefore it may be present as a result of a surface contaminant carbonate particle.

Aggregate sample S-TEC-MEOL-ER2 (MVA Z2618) consisted of a mix of plant debris and soil minerals including major amounts (>10%) of carbonate, non-fibrous serpentine (lizardite), tarry particles (asphalt), and other soil minerals; minor amounts (1%-10%) of magnetite; and trace amounts (<1%) of fibrous serpentine (chrysotile; not detected by PLM). Figures 9 through 12 show data regarding the serpentine particles that were observed during analysis of the sample via stereomicroscopy, PLM, and TEM-EDS. The serpentine particles present in this sample consistently exhibit trace to minor amounts of aluminum and/or iron. One fiber bundle also contained trace amounts of calcium and sulfur, although the presence of calcium and sulfur was not confirmed by the analyses of any single particle; therefore, it may be present as a contaminant particle.

Aggregate sample S-TEC-TNT-S-ER1 (MVA Z2754) consisted of a mix of plant debris and soil minerals including major amounts (>10%) of carbonate, non-fibrous serpentine (lizardite) and other soil minerals; minor amounts (1%-10%) of magnetite; and trace amounts (<1%) of fibrous serpentine (chrysotile). Figures 13 through 17 show data regarding the particles that were observed during analysis of the sample via PLM, SEM-EDS, and TEM-EDS. The serpentine particles present in this sample consistently exhibit trace to minor amounts of aluminum and/or iron.

Aggregate sample S-TEC-BUS-ER2 (MVA Z2755) consisted of a mix of plant debris and soil minerals including major amounts (>10%) of carbonate, non-fibrous serpentine (lizardite), and other soil minerals; and trace amounts (<1%) of fibrous serpentine (chrysotile). Figures 18 through 22 show data regarding the serpentine particles that were observed during analysis of the sample via PLM, SEM-EDS, and TEM-EDS. The serpentine particles present in this sample consistently exhibit trace to minor amounts of aluminum and/or iron. Some particles also contained trace amounts of calcium. The presence of calcium was not confirmed by the analyses of any single particle; therefore, it may be present as a result of a surface contaminant carbonate particle. One chrysotile fiber was detected in which aluminum and iron peaks were not visible above background levels (Figure 22).

Fibrous minerals detected by PLM in samples S-TEC-ARE-P0006-ER1, S-TEC-TNT-S-ER1, and S-TEC-BUS-ER2 (MVA Z2617, Z2754, and Z2755, respectively) include fibers consistent with chrysotile asbestos as well as some fibers with the same morphology, but higher than expected refractive indices. Some of the high refractive index fibers from sample S-TEC-ARE-P0006-ER1 (MVA Z2617) were picked using a tungsten needle during the PLM analysis step and analyzed by TEM-EDS. Fibers analyzed from this subsample were found to contain iron and aluminum peaks, consistent with the majority of the chrysotile asbestos detected in the four aggregate samples. It is possible that the iron content has expanded the inherent refractive index of the fibers beyond what is typically reported for chrysotile asbestos, as this phenomenon is well known among other mineral species with varying levels of iron (ex: forsterite to fayalite) [5].

Conclusion

All four aggregate samples consisted of plant debris and soil minerals. Carbonate and serpentine minerals were prevalent in all four samples, with magnetite present in three samples. All four aggregates contained trace amounts of fibrous serpentine. These fibers were confirmed by SEM-EDS and TEM-EDS to be primarily chrysotile with varying amounts of aluminum and/or iron (Table 3). Some fiber structures contained calcium and, in some cases, sulfur peaks. These peaks were observed only on fibers with other surface particulate present; therefore, these peaks may be attributed to extraneous particles. Single particle serpentine minerals (with no observed surface particulate) contain up to 2.1% aluminum (elemental weight % by EDS) and up to 2.9% iron (elemental weight % by EDS).

References

1. Locard, E., "The analysis of dust traces," *Amer. Jour. Police Sci.*, 1, 3, 276, 1930.
2. McCrone, W.C., and Delly, J.G., "The Particle Atlas," 2nd Ed., Ann Arbor Science Publishers, Inc., Ann Arbor, MI, 1973.
3. Millette, J., and Brown, R., "Dust Particulate from the World Trade Center Disaster of September 11, 2001," Proceedings of the American Academy of Forensic Sciences, Annual Meeting, Feb. 21-26, 2005.
4. U. S. Environmental Protection Agency, "Test Method EPA/600/R-93/116 -- Method for the Determination of Asbestos in Bulk Building Materials."
5. Deer, W.A., Howie, R.A., Zussman, J., "An Introduction to the Rock-Forming Minerals," 2nd ed., Longman Group UK Limited, Essex, England. 1992.

Table 1. Summary of Aggregate Samples

MVA #	Sample I. D.	Client ID - Sample Description	Collection Date
Z2617A	S-TEC-ARE-P0006-ER1A	"Gravel from road backfill entrance to AR Exchanger Boiler Specialist (fraction <19mm)" [fine fraction]	11/10/14
Z2617B	S-TEC-ARE-P0006-ER1B	"Gravel from road backfill entrance to AR Exchanger Boiler Specialist (fraction >19mm)" [course fraction]	11/10/14
Z2618A	S-TEC-MEOL-ER2A	"Gravel from road backfill entrance to Olefin (fraction <19mm)" [fine fraction]	11/10/14
Z2618B	S-TEC-MEOL-ER2B	"Gravel from road backfill entrance to Olefin (fraction >19mm)" [course fraction]	11/10/14
Z2754	S-TEC-TNT-S-ER1	Gravel from Dirt Road next to Intersection of the Trail with Road #127, Front of Gulf Entrance	11/21/14
Z2755	S-TEC-BUS-ER2	Gravel from Dirt Road approximated 200 feet from intersection with Road #127 and Dirt Trail	11/21/14

Table 2. Summary of Analytical Results

MVA #	PLM Analysis Results % Asbestos	Additional Materials Observed	SEM Analysis Results	TEM Analysis Results
Z2617	Trace Chrysotile	Plant Debris and Gravel - Including: Carbonate, Serpentine (Lizardite), Magnetite	Non-fibrous (Lizardite) and Fibrous (Chrysotile) Serpentine; Other Soil Minerals	Non-fibrous (Lizardite) and Fibrous (Chrysotile) Serpentine Particles, and Other Soil Minerals
Z2618	NAD	Plant Debris, Asphalt, and Gravel - Including: Quartz, Carbonate, Serpentine (Lizardite), Magnetite	NA	Non-fibrous (Lizardite) and Fibrous (Chrysotile) Serpentine Particles, and Other Soil Minerals
Z2754	Trace Chrysotile	Plant Debris and Gravel - Including: Carbonate, Serpentine (Lizardite), Magnetite	Fibrous Serpentine (Chrysotile) and Other Soil Minerals	Fibrous (Chrysotile) Serpentine and Other Soil Minerals
Z2755	Trace Chrysotile	Plant Debris and Gravel - Including: Carbonate, Serpentine (Lizardite)	Fibrous Serpentine (Chrysotile) and Other Soil Minerals	Fibrous (Chrysotile) Serpentine and Other Soil Minerals

NA – Not Analyzed
NAD – No Asbestos Detected

Table 3. SEM/TEM-EDS Characterization (Elemental Weight %) of Serpentine Structures Detected in Aggregate Samples

	Mg	Al	Si	Fe	O	Ca	S	Type
Z2617	26.2	0.5	24.6	2.3	46.4	---	---	Chrysotile (TEM)
	25.0	1.1	21.9	4.3	45.2	2.5	---	Chrysotile (SEM)
	27.5	0.3	23.3	2.9	45.9	---	---	Lizardite (TEM)
	22.7	2.6	21.4	5.8	45.0	2.6	---	Lizardite (SEM)
Z2618	20.7	0.9	23.8	4.8	46.4	1.6	1.9	Chrysotile (TEM)
	27.9	1.2	23.2	1.5	46.3	---	---	Lizardite (TEM)
Z2754	28.4	---	23.3	2.5	45.9	---	---	Chrysotile (TEM)
	26.1	2.1	23.0	2.5	46.3	---	---	Chrysotile (SEM)
Z2755	27.7	---	25.3	---	47.0	---	---	Chrysotile (TEM)
	25.0	0.8	22.9	3.0	45.6	2.7	---	Chrysotile (SEM)
	25.0	0.7	23.4	2.5	45.8	2.6	---	Chrysotile (SEM)

*TEM structure types confirmed by electron diffraction; SEM data not confirmed by electron diffraction

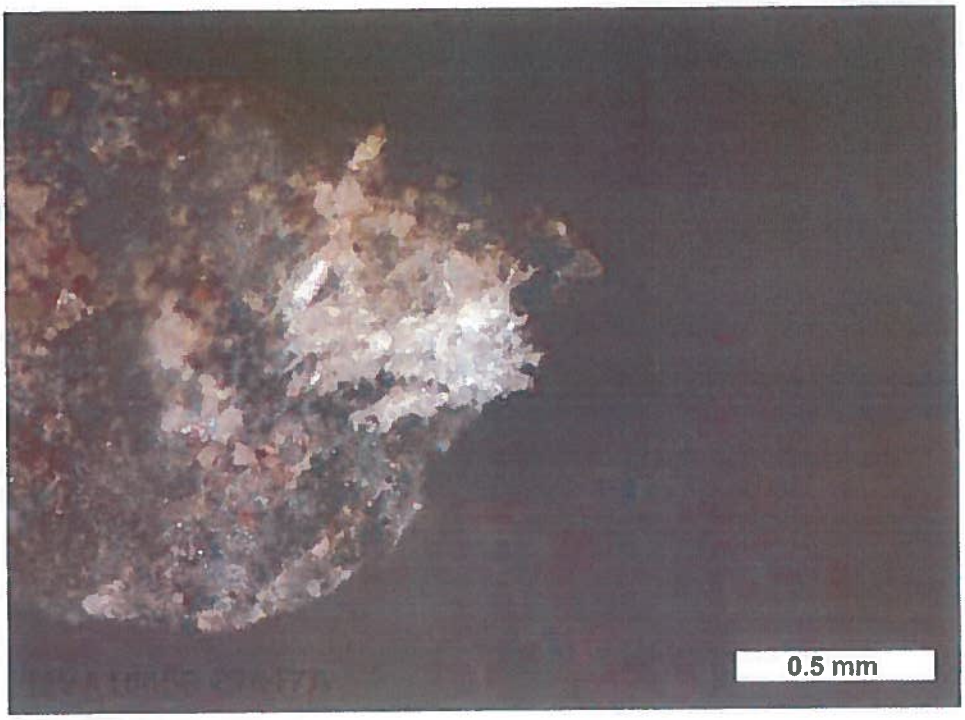


Figure 1. Stereo-micrograph of non-fibrous serpentine mineral (lizardite) with fibrous serpentine intergrowth (chrysotile) observed in aggregate sample S-TEC-ARE-P0006-ER1.

Figure 2. PLM image of chrysotile asbestos observed in aggregate sample S-TEC-ARE-P0006-ER1.

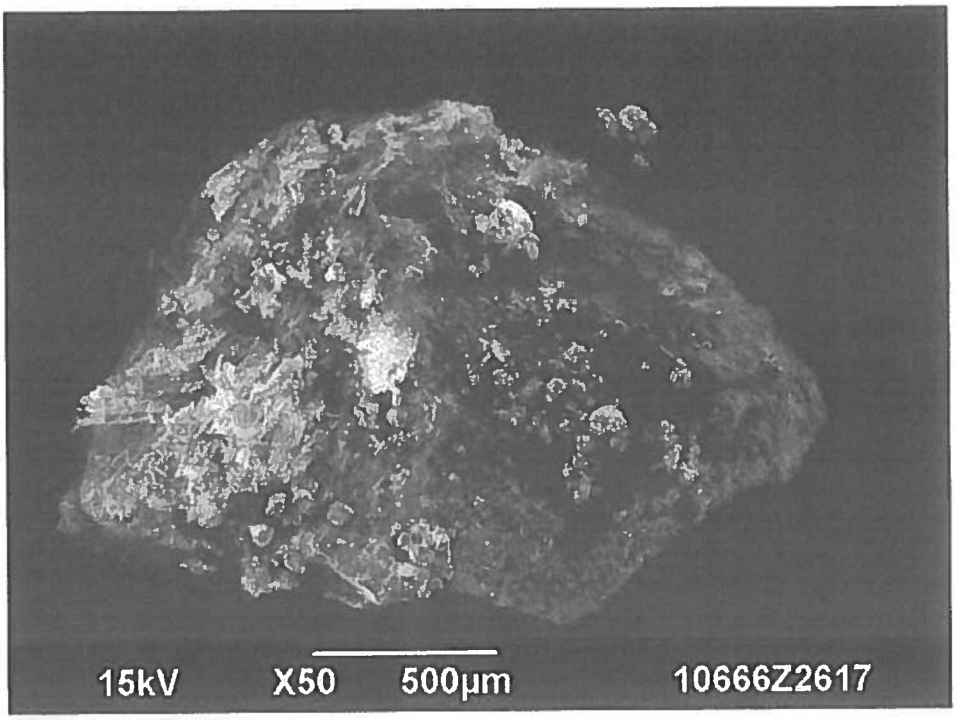
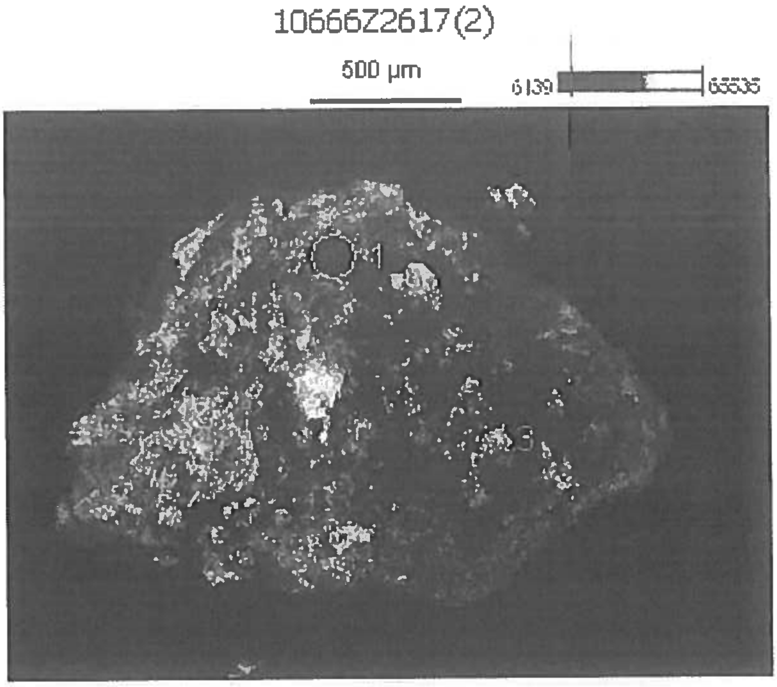


Figure 3. SEM image of serpentine mineral (Figure 1). Note fibrous mineral growth on left side of aggregate particle. Numbers (below) denote areas where EDS spectra were obtained.



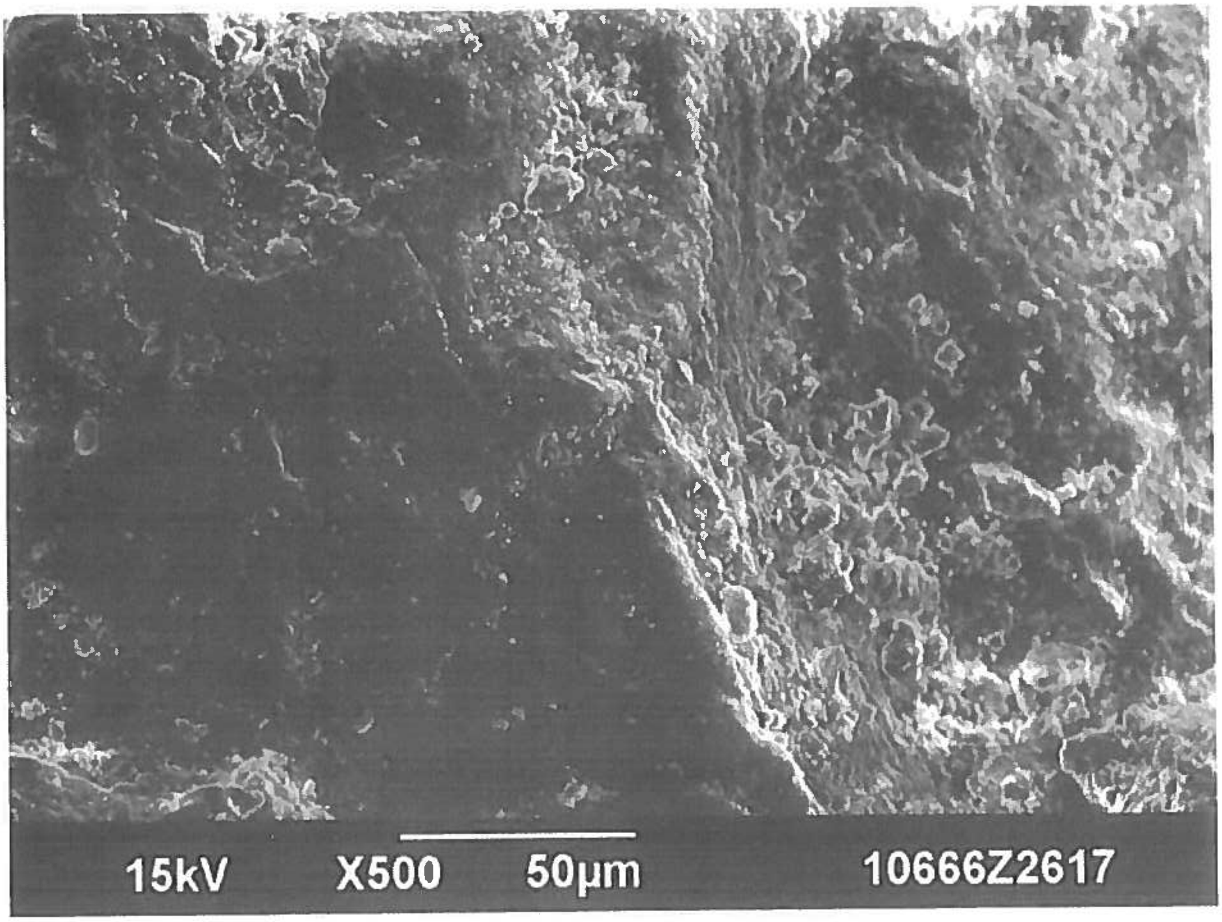
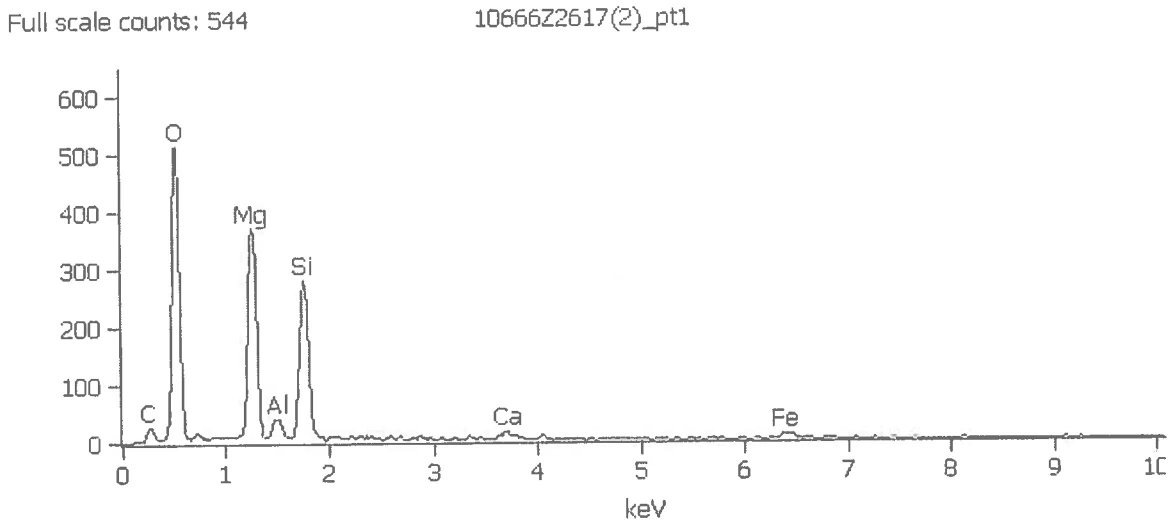


Figure 4. SEM image (above) and EDS spectrum (below) of non-fibrous serpentine (lizardite) mineral surface (Area 1 in Figure 3).



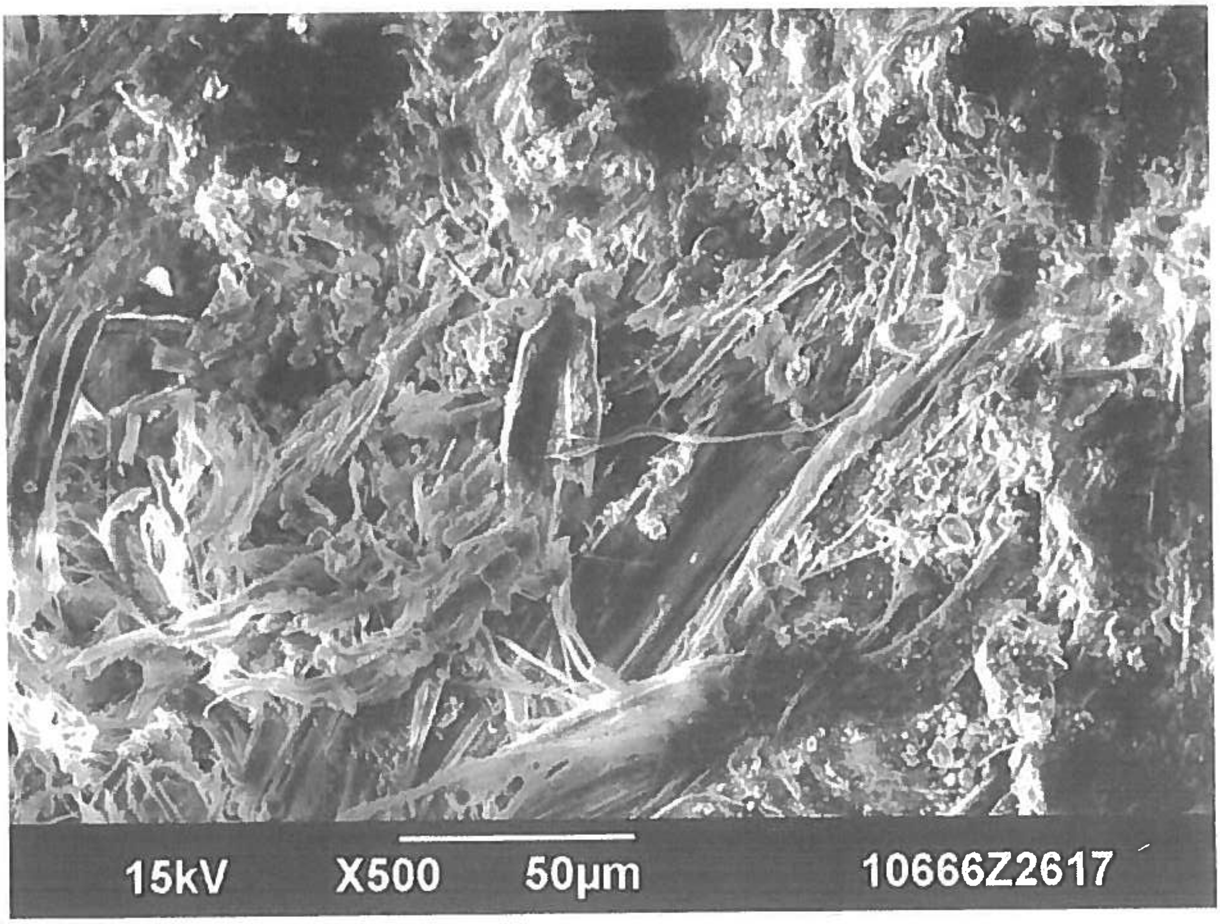
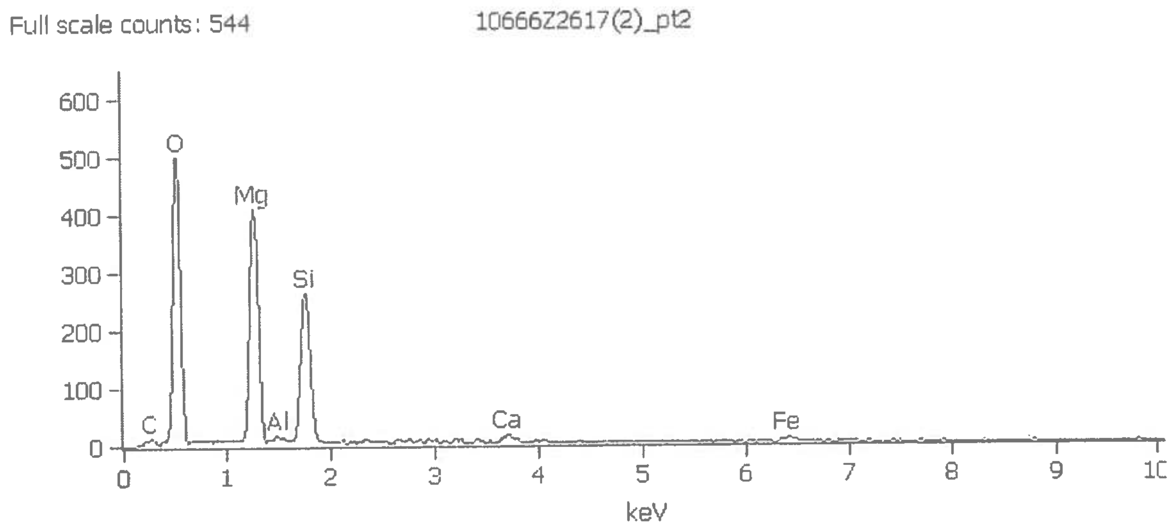


Figure 5. SEM image (above) and EDS spectrum (below) of fibrous serpentine (chrysotile) mineral surface (Area 2 in Figure 3).



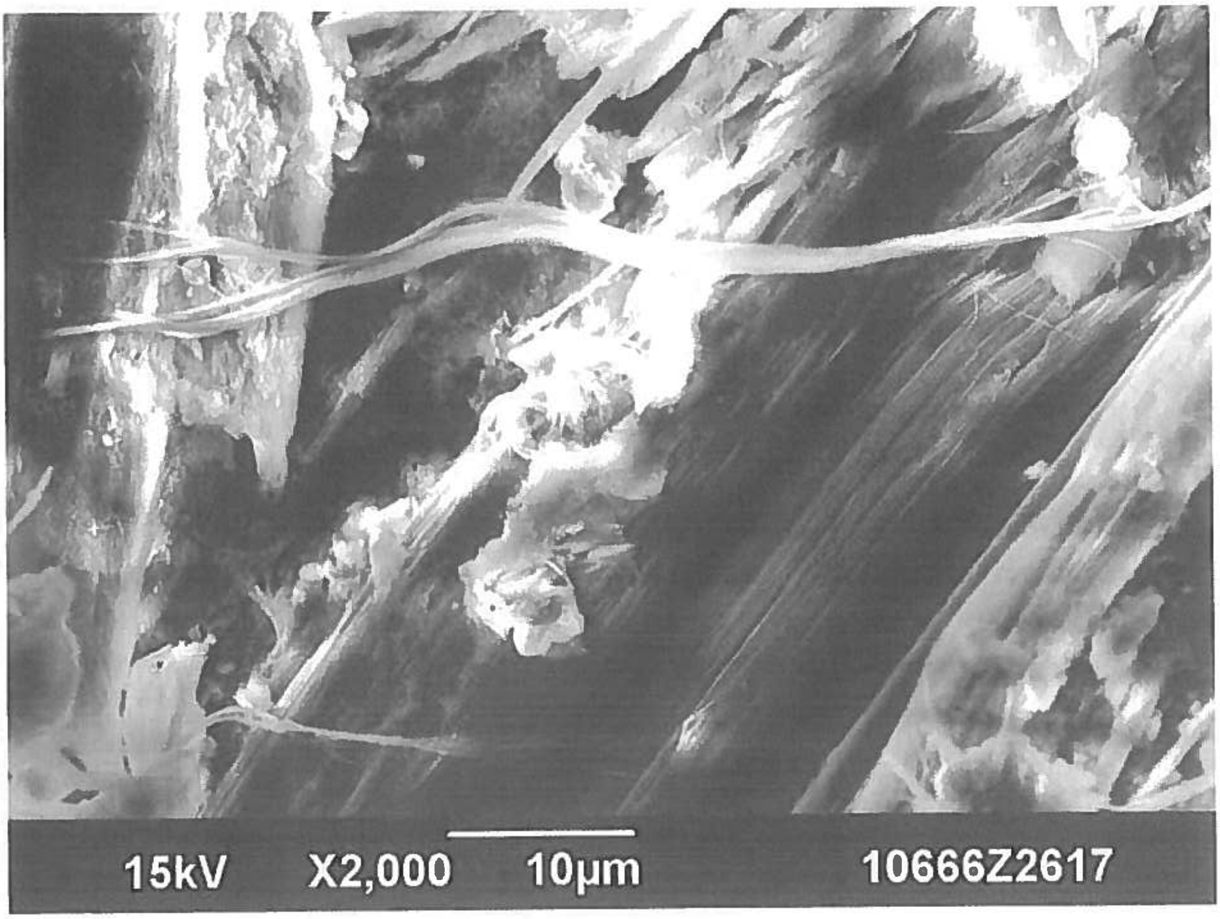
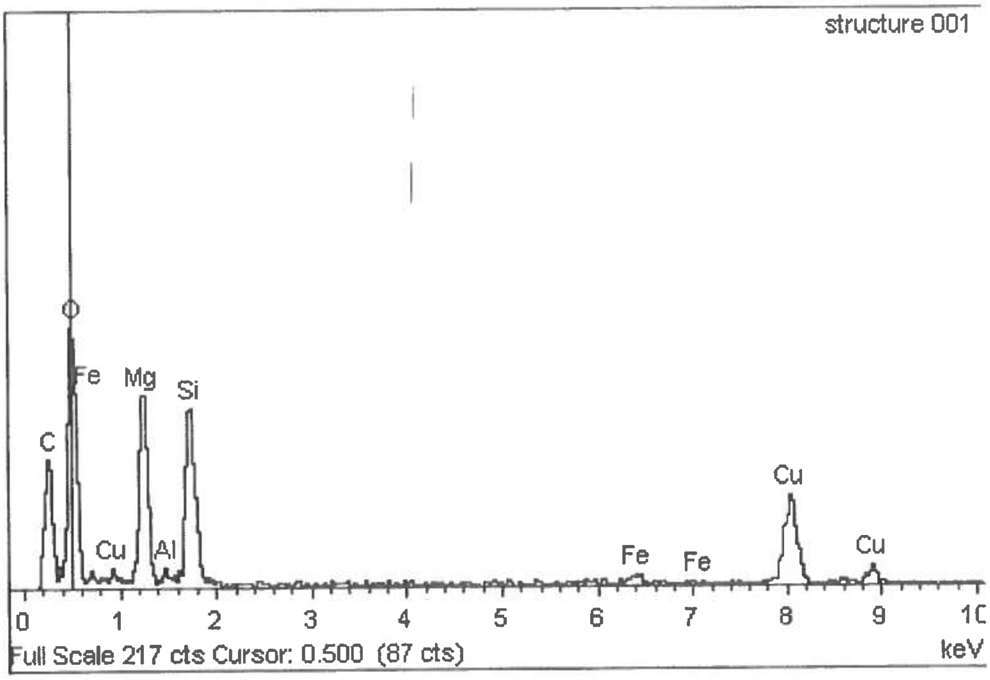


Figure 6. SEM image of chrysotile fibers (Area 2 in Figure 3).

Figure 7. TEM image (above) and EDS spectrum (below) of chrysotile asbestos fiber observed during analysis of aggregate sample S-TEC-ARE-P0006-ER1.



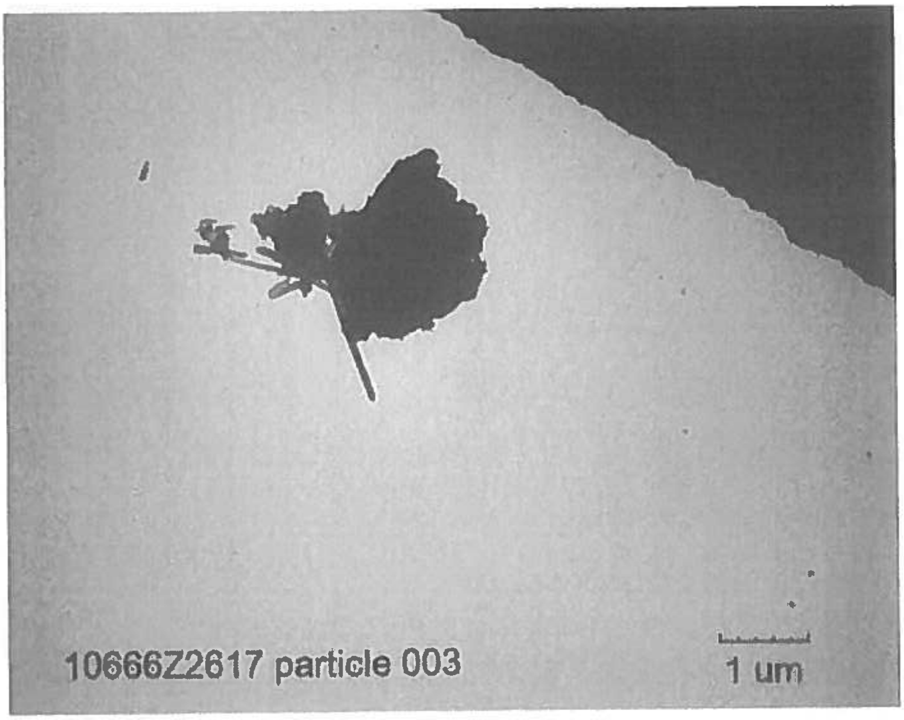
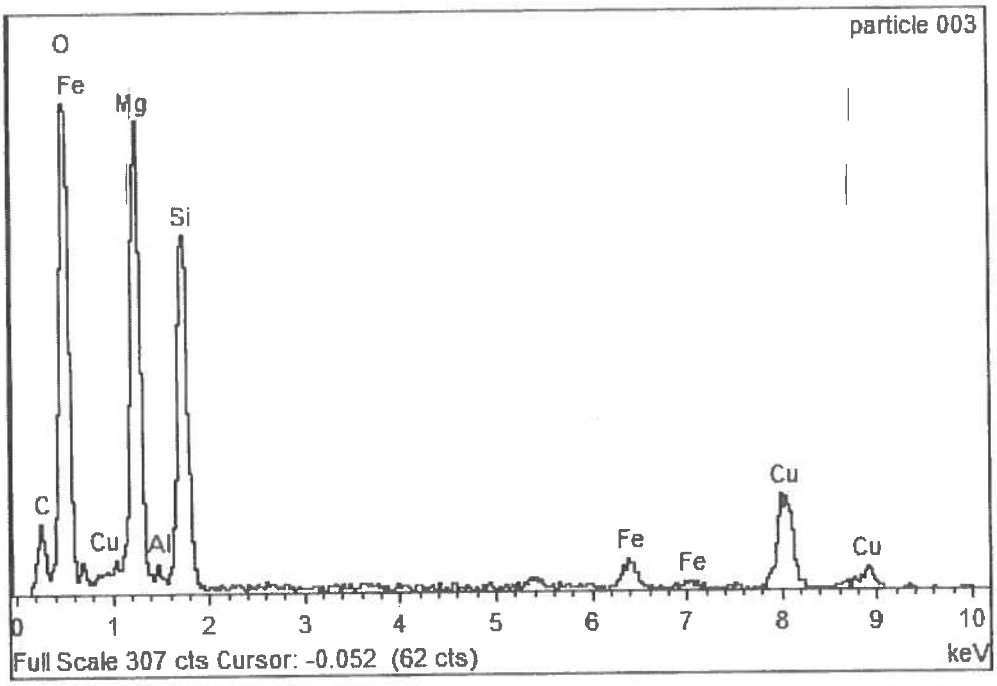


Figure 8. TEM image (above) and EDS spectrum (below) of lizardite particle observed during analysis of aggregate sample S-TEC-ARE-P0006-ER1.



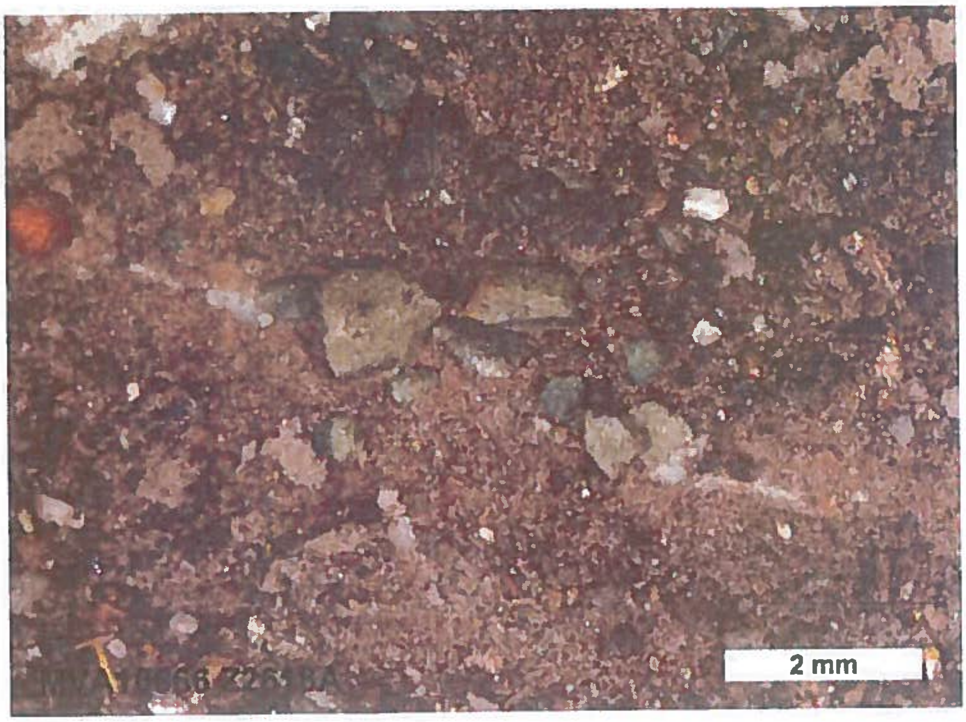


Figure 9. Stereo-micrograph of non-fibrous serpentine mineral (lizardite) observed in aggregate sample S-TEC-MEOL-ER2.

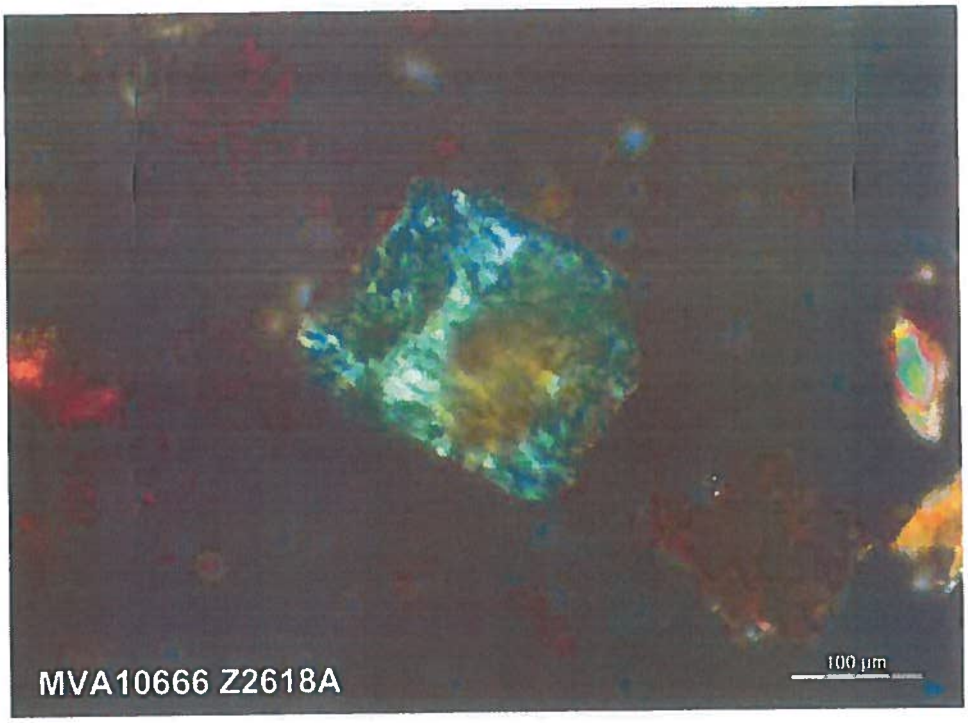


Figure 10. PLM image of non-fibrous serpentine mineral (lizardite) observed in aggregate sample S-TEC-MEOL-ER2.

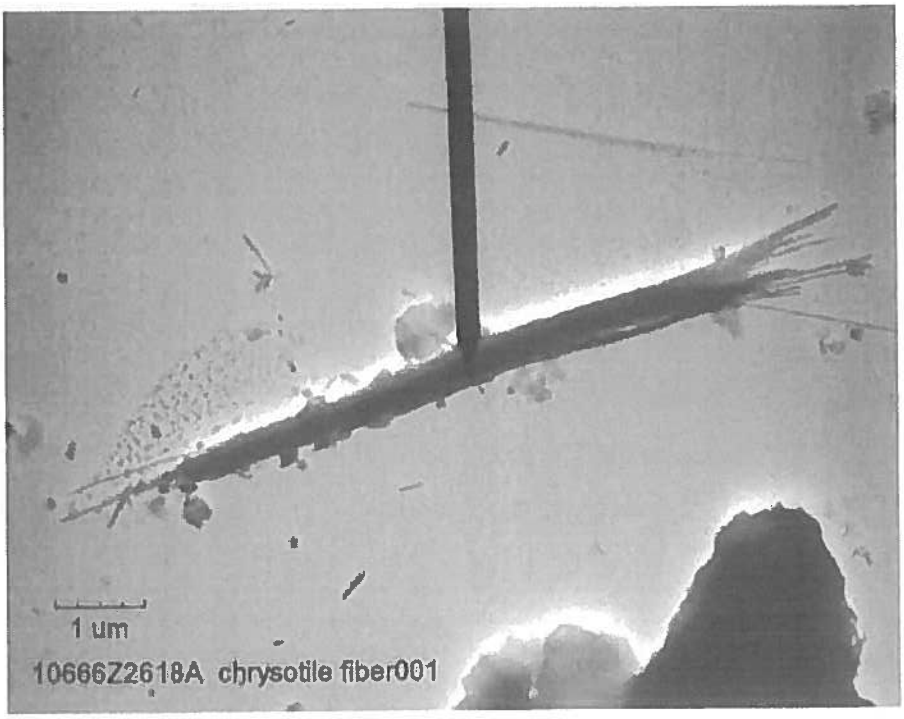
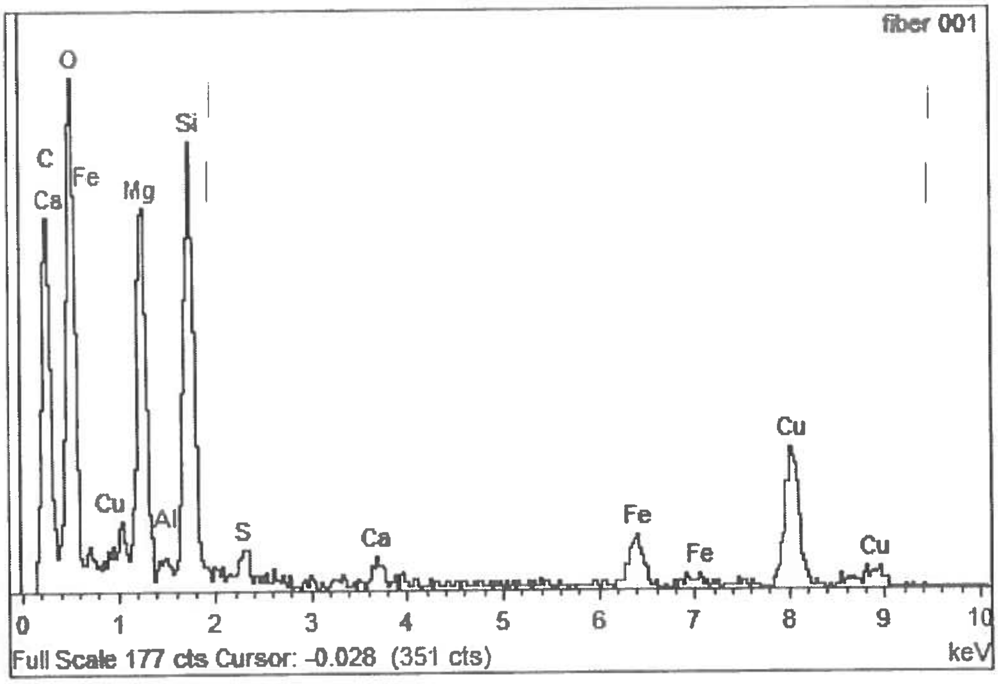


Figure 11. TEM image (above) and EDS spectrum (below) of chrysotile asbestos fiber observed during analysis of aggregate sample S-TEC-MEOL-ER2.



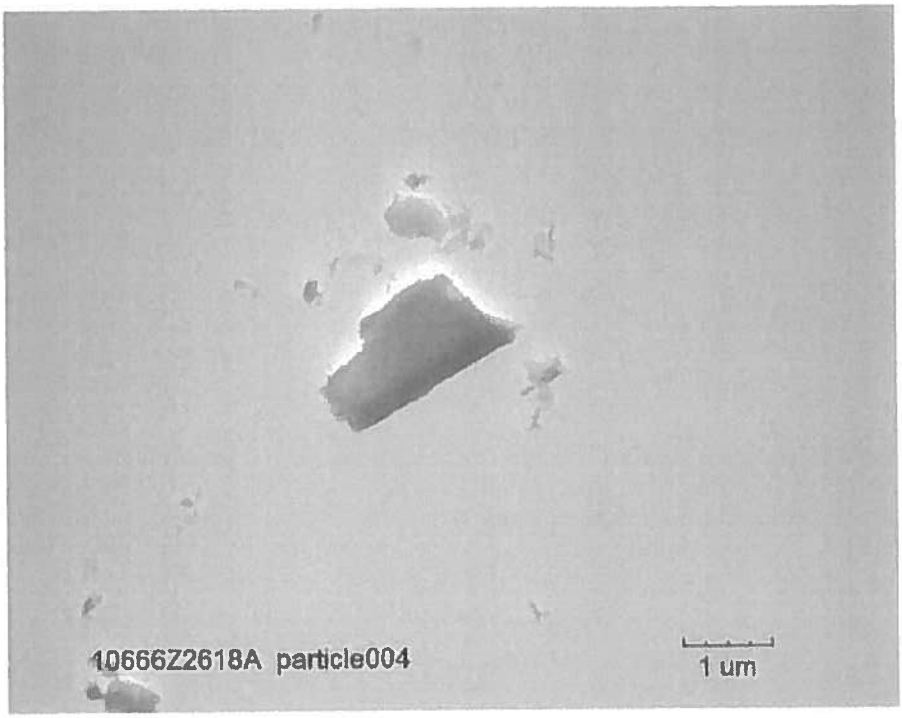


Figure 12. TEM image (above) and EDS spectrum (below) of lizardite particle observed during analysis of aggregate sample S-TEC-MEOL-ER2.

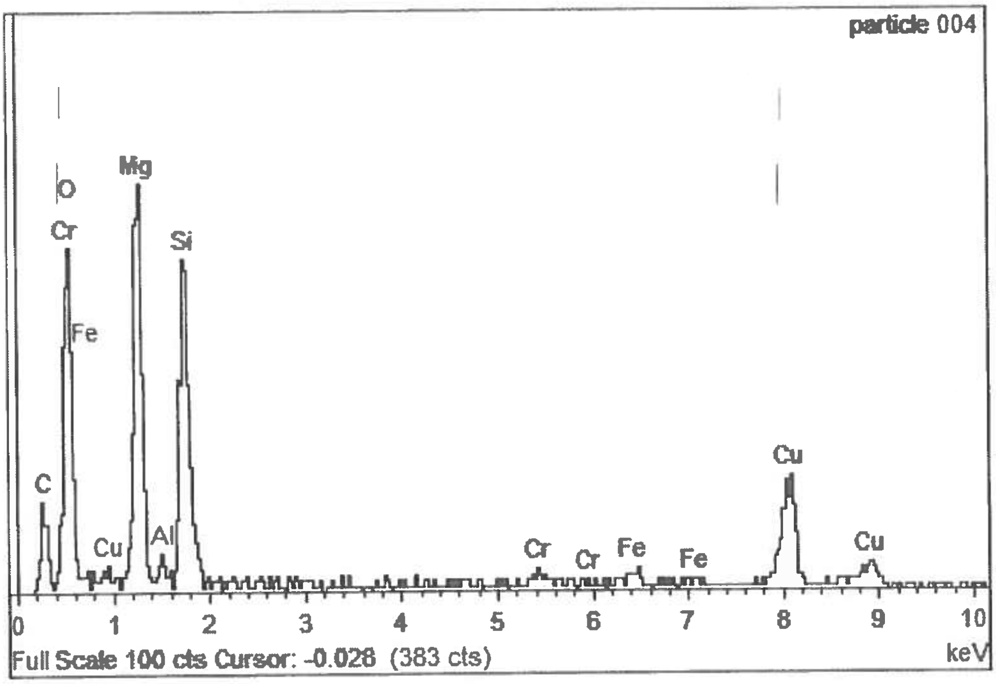


Figure 13. PLM image of chrysotile asbestos observed in aggregate sample S-TEC-TNT-S-ER1.

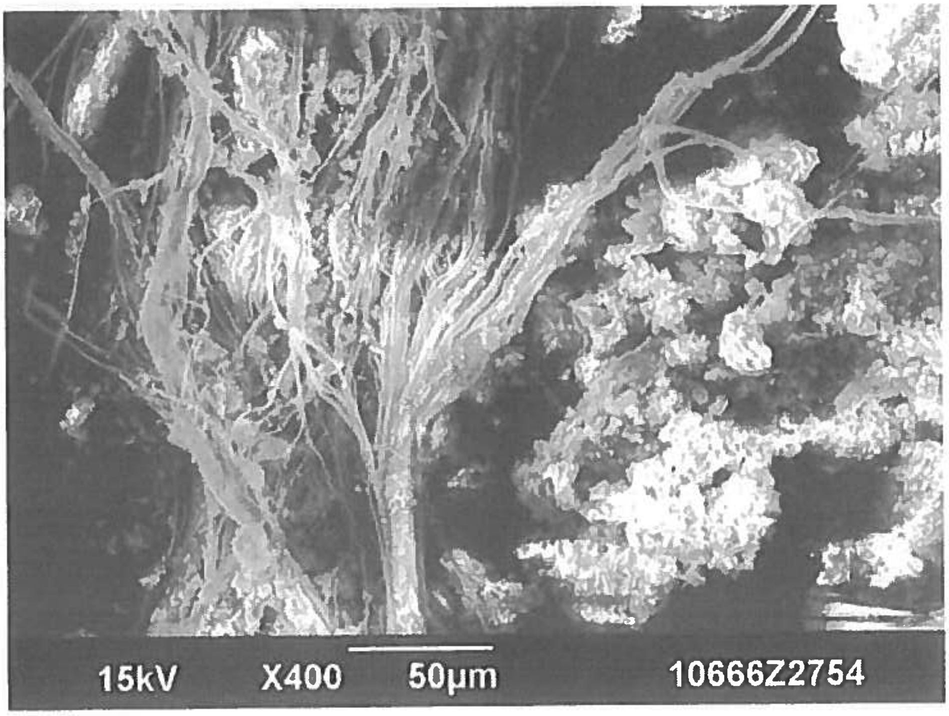
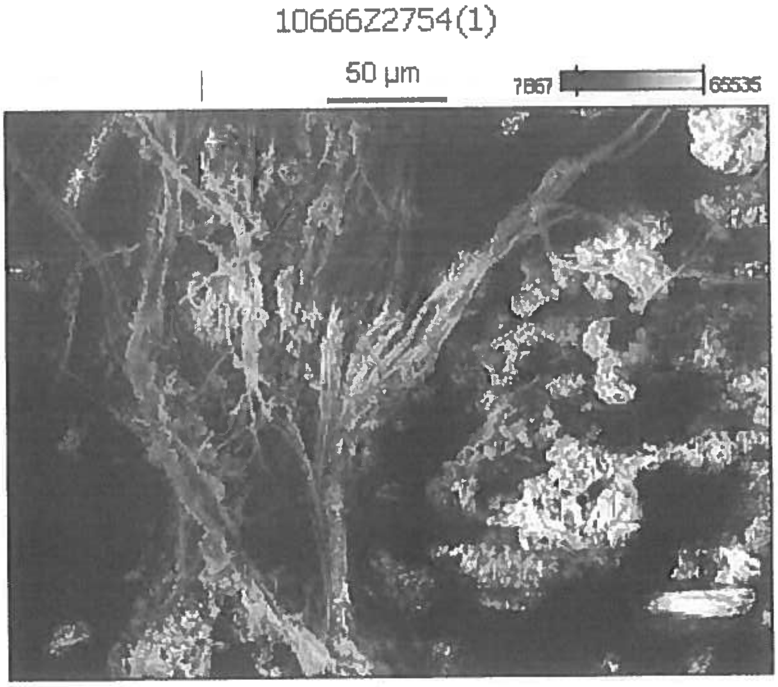


Figure 14. SEM image of debris particles from aggregate sample S-TEC-TNT-S-ER1. Numbers (below) denote areas where EDS spectra were obtained.



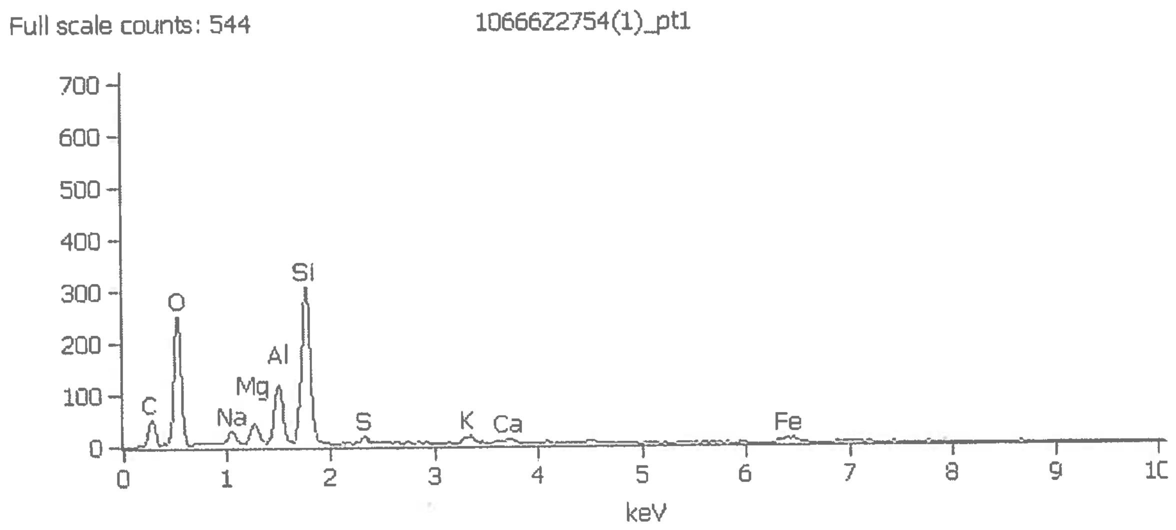


Figure 15. SEM-EDS spectrum of non-fibrous soil mineral (Area 1 in Figure 14).

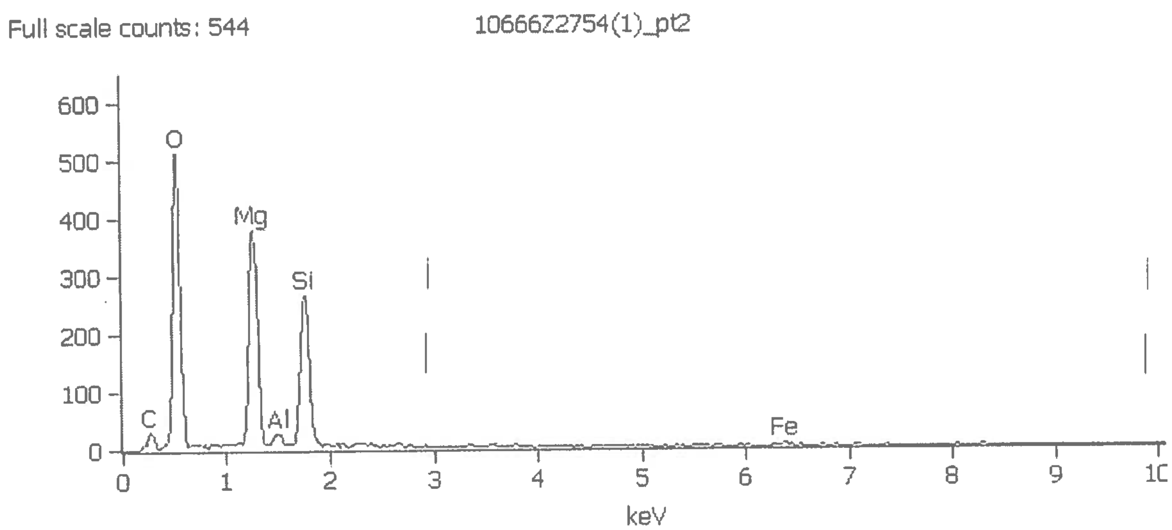


Figure 16. SEM-EDS spectrum of fibrous serpentine (chrysotile) mineral (Area 2 in Figure 14).

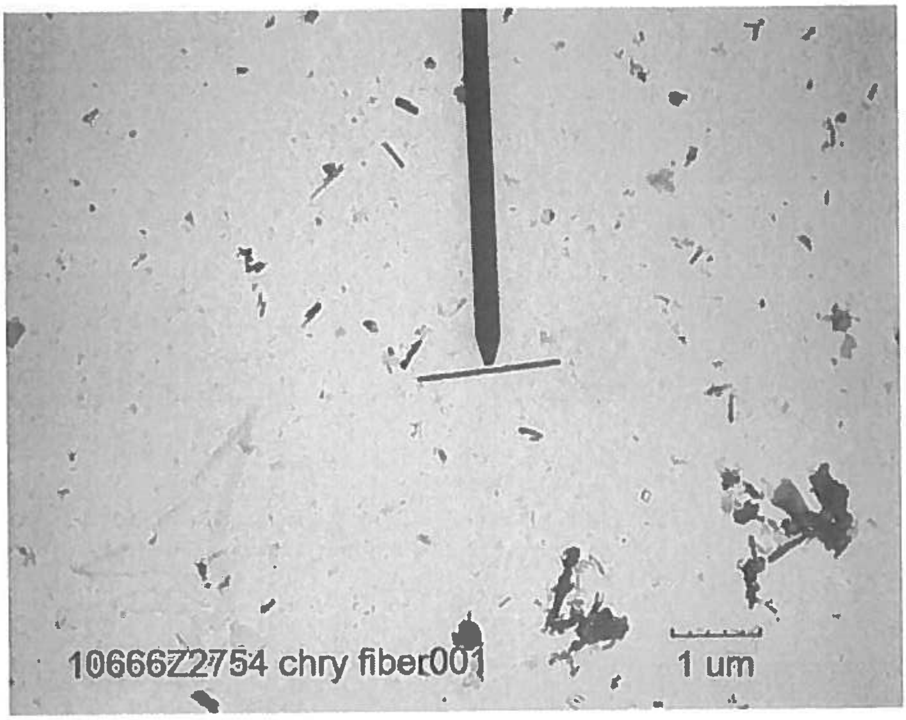


Figure 17. TEM image (above) and EDS spectrum (below) of chrysotile asbestos fiber observed during analysis of aggregate sample S-TEC-TNT-S-ER1.

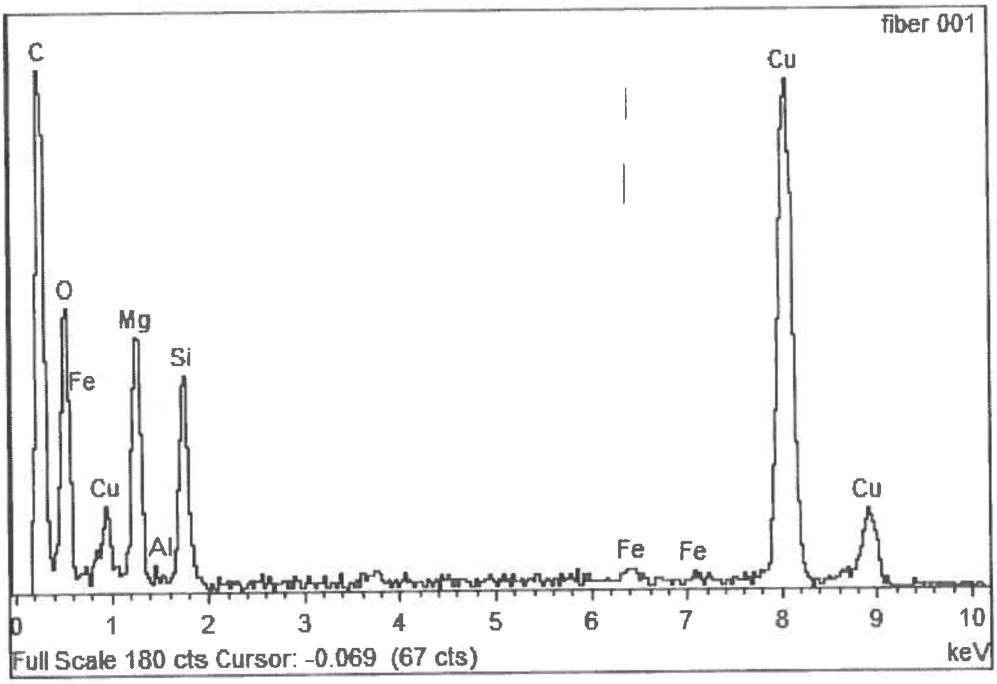


Figure 18. PLM image of chrysotile asbestos (center) observed in aggregate sample S-TEC-BUS-ER2.

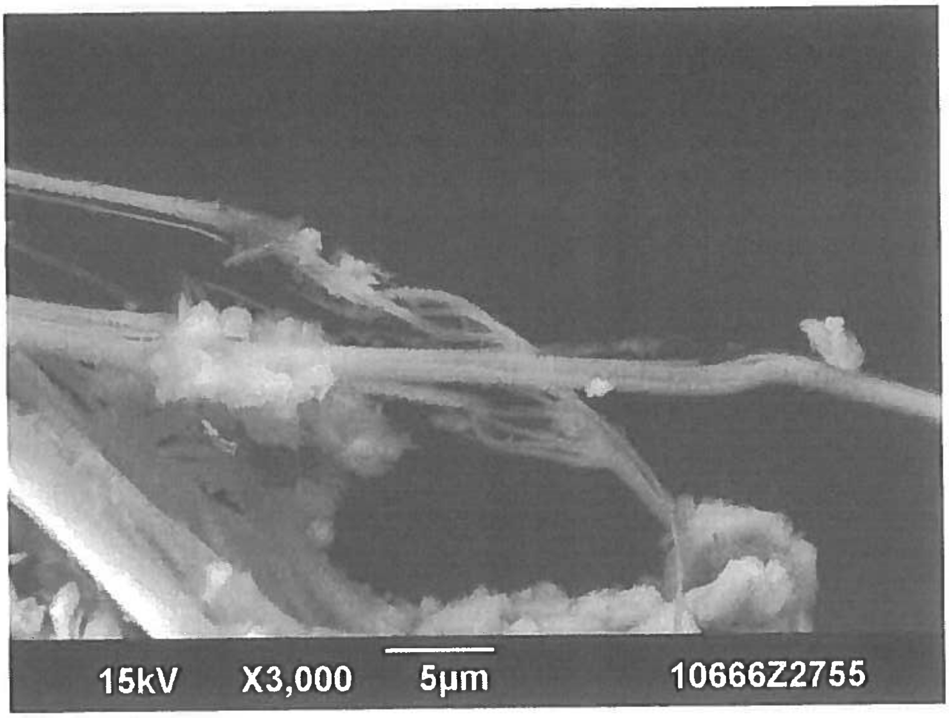
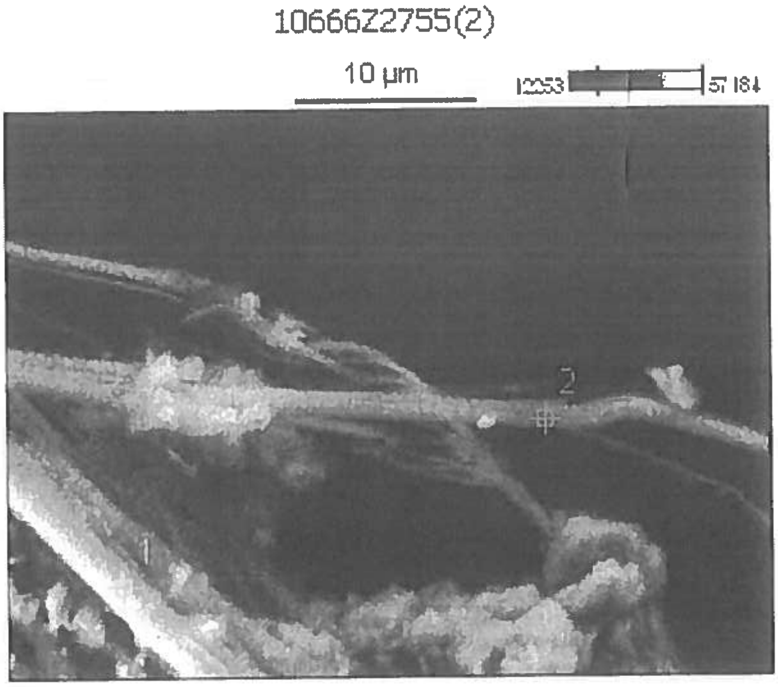


Figure 19. SEM image of debris particles from aggregate sample S-TEC-BUS-ER2. Numbers (below) denote areas where EDS spectra were obtained.



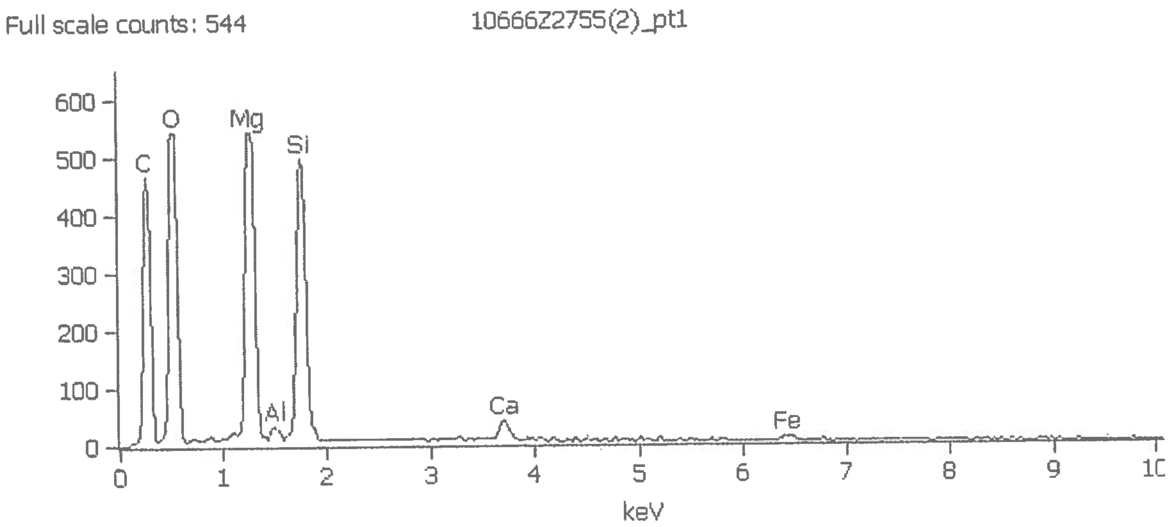


Figure 20. SEM-EDS spectrum of fibrous serpentine (chrysotile) mineral (Area 1 in Figure 19).

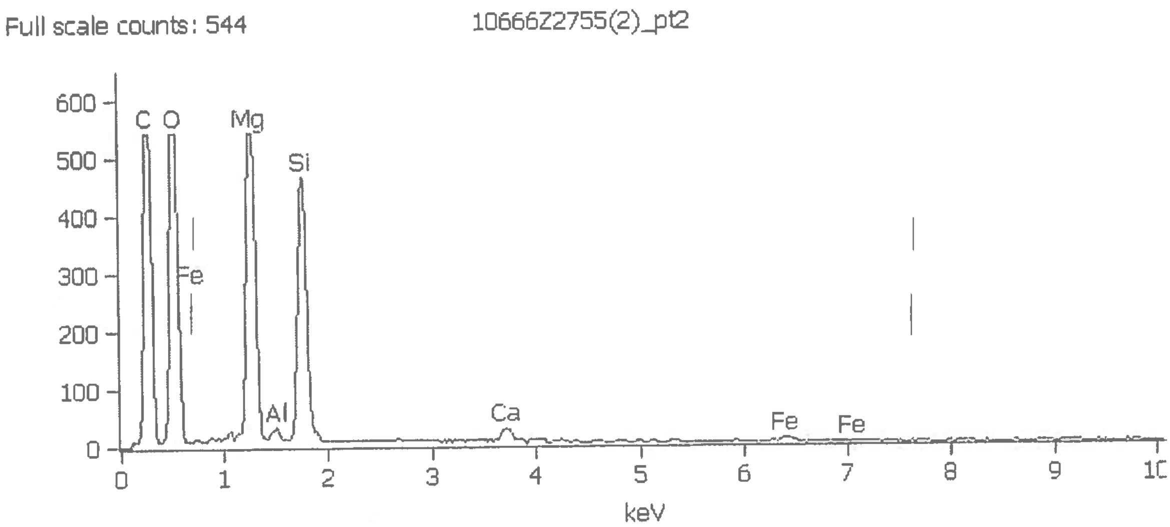


Figure 21. SEM-EDS spectrum of fibrous serpentine (chrysotile) mineral (Area 2 in Figure 19).

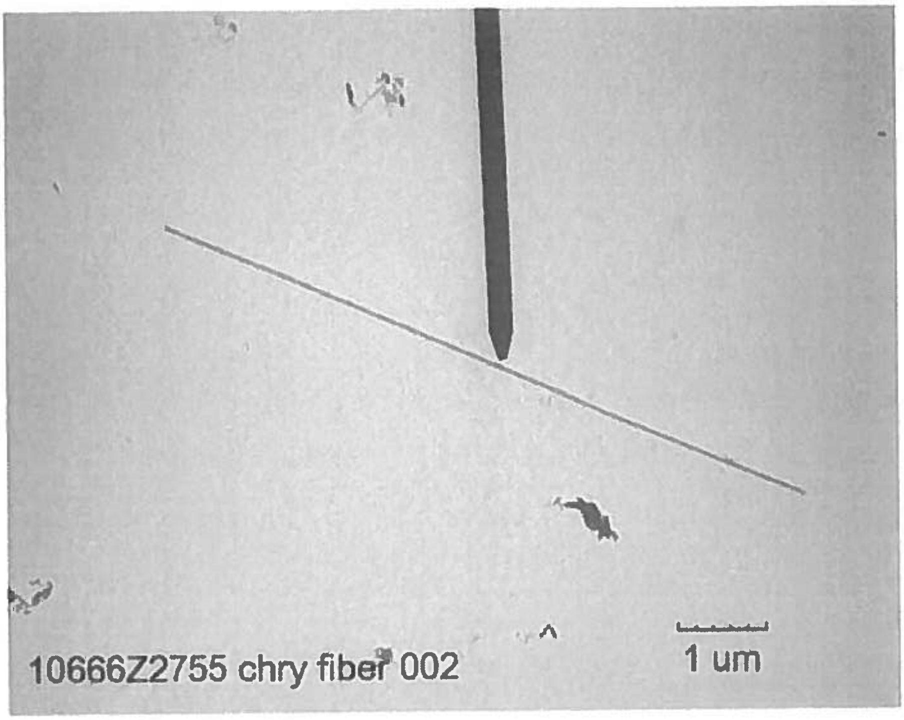
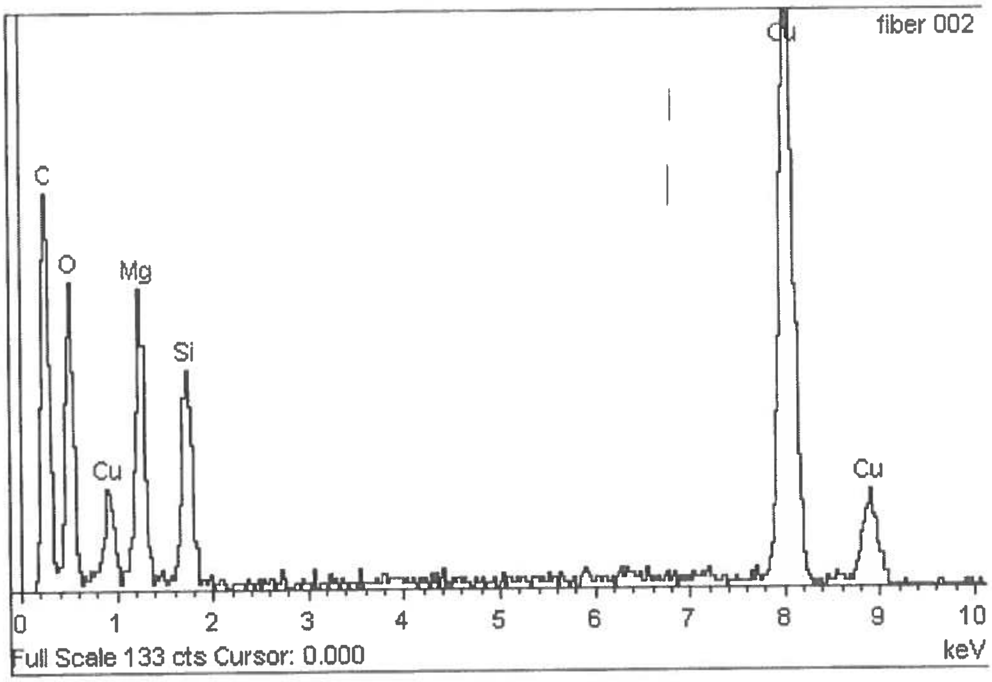


Figure 22. TEM image (above) and EDS spectrum (below) of chrysotile asbestos fiber observed during analysis of aggregate sample S-TEC-BUS-ER2.



10666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	Project Name:	Dust Sampling Studies
Address:		Site Location:	Penuelas
Contact:		Samplers Name:	Elme Rivera
Phone/Fax:		Company:	AES International

Amended Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected		Analysis Required		Comments	Laboratory I.D.
		Date	Time	PLM	Other		
S-TEC-ARE-P0006-ER1A	Gravel from road backfill entrance to AR Exchanger Boiler Specailist (fraction <19mm)	11/10/14				Dust Fingerprint	59039
STEC-MEOL-ER2A	Gravel from road backfill entrance to Olefin (fraction <19mm)	11/10/14				Dust Fingerprint	59040
S-TEC-ARE-P0006-ER1B	Gravel from road backfill entrance to AR Exchanger Boiler Specialist (fraction >19mm)	11/10/14				Dust Fingerprint	59041
S-TEC-MEOL-ER2B	Gravel from raod backfill entrance to Olefin (fraction>19mm)	11/10/14				Dust Fingerprint	59042

Turnaround Time: Normal: X Rush:

Comments: **Do not analyze field blank**

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Date/ Time:	11/12/14 16:00	Method of Shipment:	
Received By:	[signature]		
Date/ Time:	11/14/14 11:00 AM	Lab. Recipient:	
Relinquished By:			
Date/ Time:			
Received By:		Date:	
Date/ Time:			

PLM-65/Rev. 1/ 7-09

106666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name: 1290
Address:
Contact:
Phone/Fax:

Project Name: Dust Sampling Studies
Site Location: Penuelas
Samplers Name: Elme Rivera
Company: AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
BULK-OL-CHM4-ER2	TSI Sample from South Side, Left of Platform of Vessel OV-302	11/21/14			Dust Fingerprint		59133
S-TEC-TNT-S-ER1	Gravel from Dirt Road next to Intersection of the Trail with Road #127, Front of Gulf Entrance	11/21/14			Dust Fingerprint		59134
S-TEC-BUS-ER2	Gravel from Dirt Road approximated 200 feet from Intersection with Road #127 and Dirt Trail	11/21/14			Dust Fingerprint		59135

Turnaround Time: Normal: X Rush:

Comments:

Relinquished By:	Ady Padua
Date/ Time:	12/1/14 13:50
Received By:	[signature] (Steven Compton)
Date/ Time:	12/1/14 13:50
Relinquished By:	
Date/ Time:	
Received By:	
Date/ Time:	

Delivered Directly to Lab: **Shipped:**
Method of Shipment:
Lab. Recipient:
Date:

PLM-65/Rev. 1/ 7-09

5. Characterization of bulk insulation and soil from inside Olefin facilities

Report of Results: MVA10666

Characterization of Pipe Insulation Debris

Prepared for:

AES International, Inc.
611 Monserrate St, 2nd Floor
Santurce, P.R. 00907

Respectfully Submitted by:

EXECUTED BY
ELECTRONIC
SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

MVA Scientific Consultants
3300 Breckinridge Boulevard
Suite 400
Duluth, GA 30096

20 November 2014

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MVA SCIENTIFIC CONSULTANTS
Full Service Analytical Microscopy Laboratory

Report of Results: MVA10666

Characterization of Pipe Insulation Debris

Introduction

This report presents the results of characterization of five samples related to pipe insulation debris. The samples were collected by Elme Rivera of AES International, Inc. on 23 October 2014 and shipped to MVA Scientific Consultants via FedEx. The samples were received on 24 October 2014 and assigned unique MVA sample numbers (see Table 1). The shipment also included dust samples that will be described and reported separately. Four of the five debris samples consisted of bulk insulation debris and one sample was a soil sample from the same area where the debris was recovered.

It was requested that we characterize the samples, both for asbestos content and for any additional characteristics that might be distinct (recognizably different from something else of a similar type) to these samples as a "fingerprint" of the material. The characterization of the properties of dust and this type of "fingerprint" analysis or characterization is often used in establishing a connection between materials in dust samples and potential sources [1-3]. These five samples were analyzed during the period 24 October through 19 November 2014.

Methods

The samples were initially examined under an Olympus SZ-40 stereomicroscope at magnifications from 7X to 40X. Forceps and a tungsten needle were used to collect representative portions of the particulate found in the sample. The particulate was then transferred onto a microscope slide and mounted in Cargille refractive index liquids for analysis by polarized light microscopy (PLM) using an Olympus BH-2 polarized light microscope with a magnification range from 100X to 1,000X. The PLM analysis followed the analytical procedures recommended by the U.S. Environmental Protection Agency [4]. One of the bulk insulation debris samples (Z2373) was a duplicate and was not analyzed.

Additional analysis of a representative insulation sample (Z2372) was performed to supplement the results using a JEOL JSM-6490LV scanning electron microscope (SEM) coupled with a Thermo Scientific Noran System SIX x-ray energy dispersive spectrometry (EDS) system. Debris from the insulation sample was pressed to an adhesive carbon tab on an aluminum SEM planchette (specimen substrate). The sample was gold coated prior to analysis to improve conductivity of the specimen.

The soil sample was ashed in a muffle furnace to remove organic materials and reanalyzed by PLM. A portion of the ashed residue was suspended in alcohol and deposited onto a carbon coated copper grid for analysis by transmission electron microscopy. This analysis was performed using a Philips EM 420 transmission electron microscope (TEM) equipped with an Oxford INCA EDS (energy dispersive spectrometry) x-ray analysis system.

Results and Discussion

A summary of analytical results is provided in Table 2. The three analyzed insulation debris samples all contained approximately 60 to 80% amosite asbestos (by volume) in addition to rust/metal flakes, and a binder material. Two of the three samples (Z2369 and Z2372) contained diatoms.

PLM analysis of the soil sample shows that it is primarily consistent with soil minerals and plant fragments with a minor amount (1 to 10% by volume) of rust/metal flakes and a trace amount (<1% by volume) of insect parts. After ashing, the soil sample was found to contain trace amounts (<1% by volume) of amosite asbestos. No asbestos was detected during the TEM analysis of the ashed residue of the sample. Images of fibers and other materials observed during analysis of the samples are provided in Figures 1 through 10.

Conclusion

The three analyzed insulation samples and the soil sample all contained amosite asbestos. The insulation debris samples consistently contained approximately 60 to 80% amosite in a silicon-rich binder material. Diatoms were detected in two of the three insulation debris samples.

References

1. Locard, E., "The analysis of dust traces," *Amer. Jour. Police Sci.*, 1, 3, 276, 1930.
2. McCrone, W.C., and Delly, J.G., "The Particle Atlas," 2nd Ed., Ann Arbor Science Publishers, Inc., Ann Arbor, MI, 1973.
3. Millette, J., and Brown, R., "Dust Particulate from the World Trade Center Disaster of September 11, 2001," Proceedings of the American Academy of Forensic Sciences, Annual Meeting, Feb. 21-26, 2005.
4. U. S. Environmental Protection Agency, "Test Method EPA/600/R-93/116 -- Method for the Determination of Asbestos in Bulk Building Materials."

Table 1. Summary of Insulation Debris Samples - Collected 23 October 2014

MVA #	Sample I. D.	Sample Description
Z2369	B-OL-OV-409-ER1	Sample from debris of pipe insulation found on floor from area OV409.
Z2370	S-OL-FF-ER3	Soil sample from area covered with grass.
Z2371	B-OL-FF-ER4	Sample from insulation under pipe on the floor. Area front of flare.
Z2372	B-OL-PS408-ER5	Sample from pipe insulation on floor. Debris from area PS408.
Z2373	B-OL-PS408-ER5-dup	Duplicate sample from pipe insulation on floor. Debris from area PS408.

Table 2. Summary of Analytical Results

MVA #	PLM Analysis Results % Asbestos	Additional Materials Observed	TEM Analysis Results	Comments
Z2369	60-80% Amosite	Binder, Rust/Metal Particles, Diatoms	NA	---
Z2370	Trace Amosite	Soil Minerals, Plant Fragments, Rust/Metal Particles, Insect Parts	NAD	---
Z2371	60-80% Amosite	Binder, Rust/Metal Particles	NA	---
Z2372	60-80% Amosite	Binder, Rust/Metal Particles, Diatoms	NA	Amosite with Silicon-rich Binder Confirmed by SEM
Z2373	NA	---	NA	---

NA – Not Analyzed
NAD – No Asbestos Detected

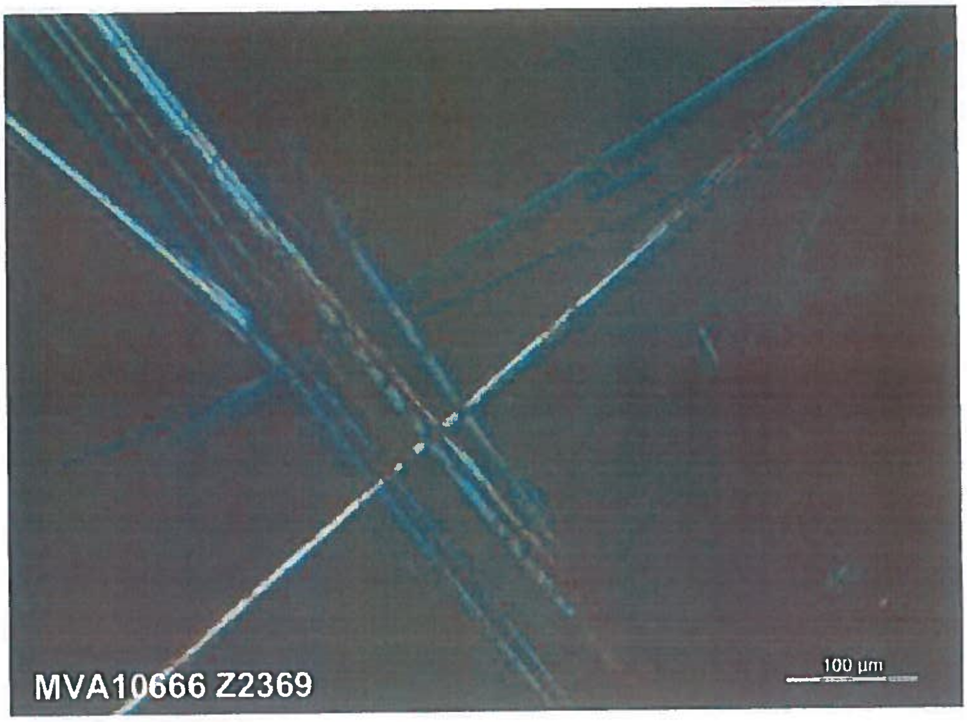

Figure 1. Polarized light microscope image of amosite asbestos fibers detected during analysis of bulk insulation debris, Sample Z2369.

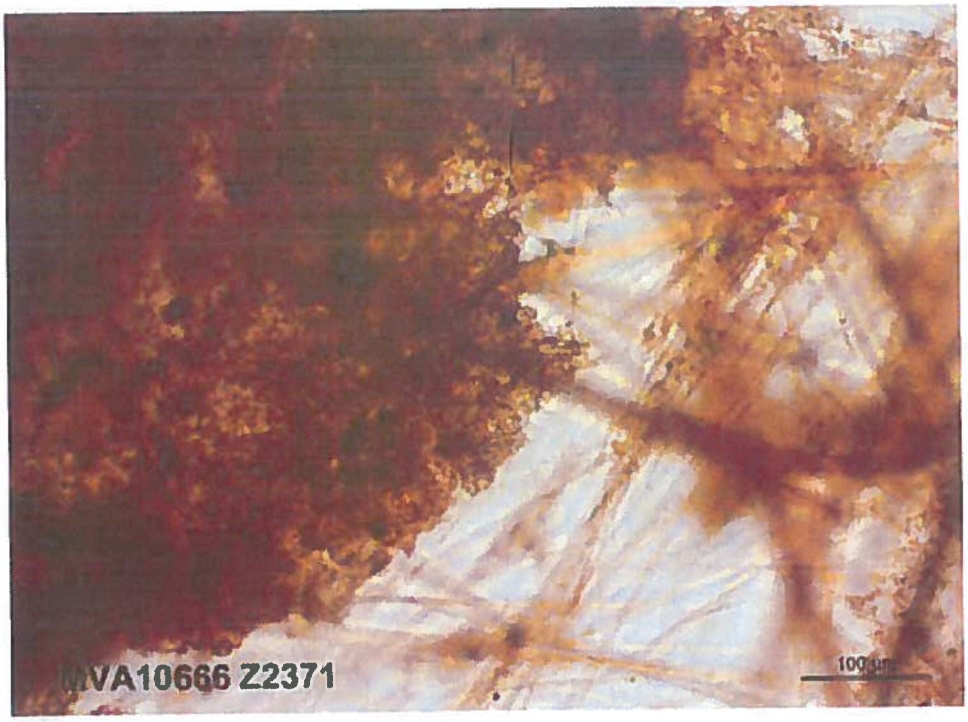

Figure 2. Polarized light microscope image of amosite asbestos fibers and binder material detected during analysis of bulk insulation debris, Sample Z2371.

Figure 3. Polarized light microscope image of amosite asbestos fibers and binder material detected during analysis of bulk insulation debris, Sample Z2372.

Figure 4. Scanning electron micrograph of amosite asbestos fibers and diatoms detected during analysis of bulk insulation debris, Sample Z2372.

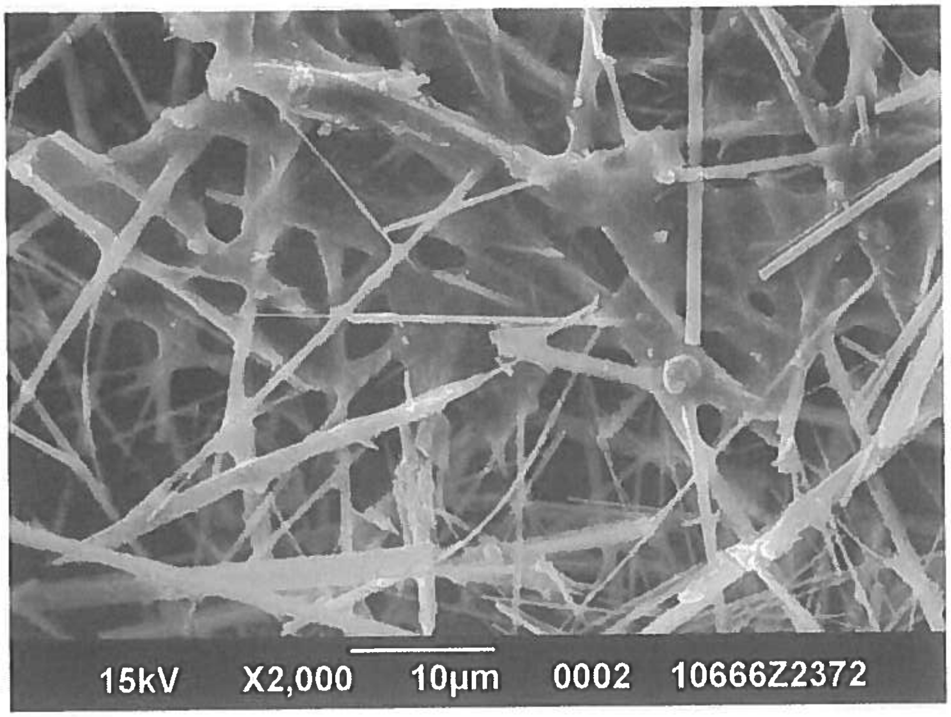

Figure 5. Scanning electron micrograph of amosite asbestos fibers and diatoms detected during analysis of bulk insulation debris, Sample Z2372.

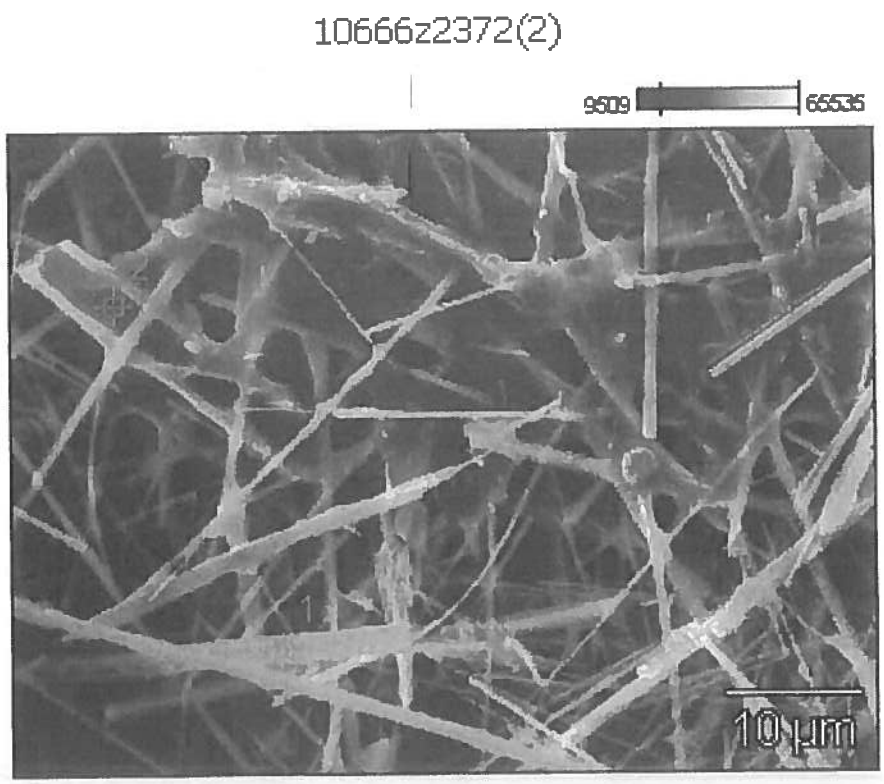

Figure 6. Insulation debris sample Z2372. Same area as Figure 5. Numbers denote areas where EDS spectra were collected.

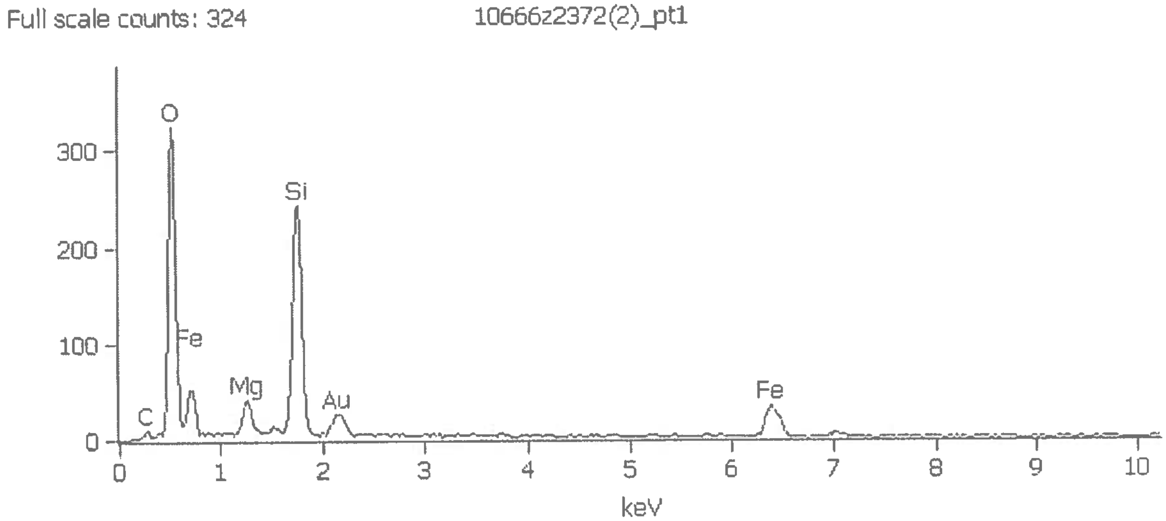

Figure 7. Area 1 from Figure 6. Large amosite bundle. C = Carbon, O = Oxygen, Fe = Iron, Mg = Magnesium, Si = Silicon, Au = Gold. Sample is mounted on adhesive carbon (C) and coated with gold (Au) for conductivity

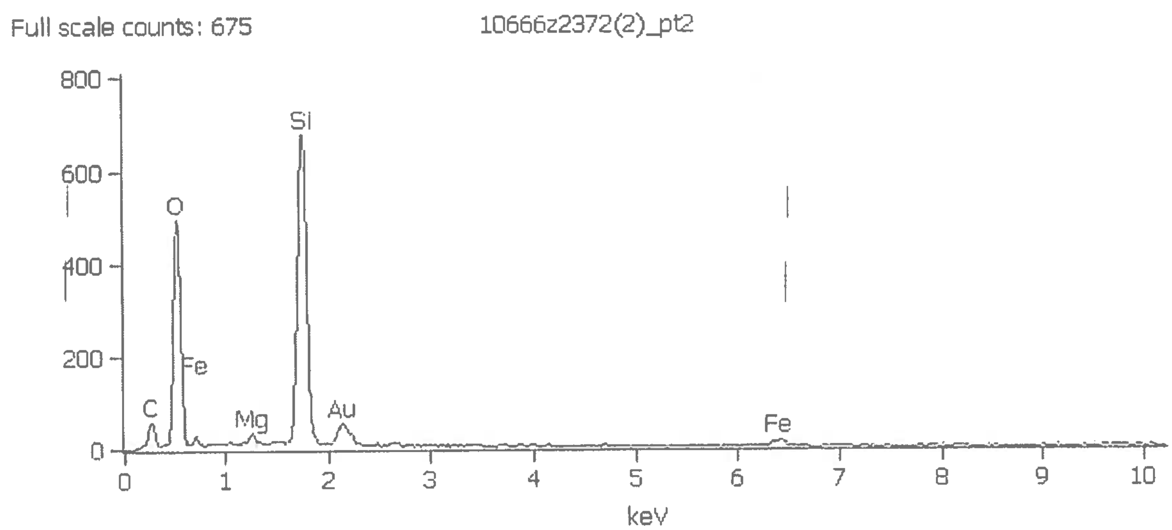

Figure 8. Area 2 from Figure 6. Silicon-rich binder.

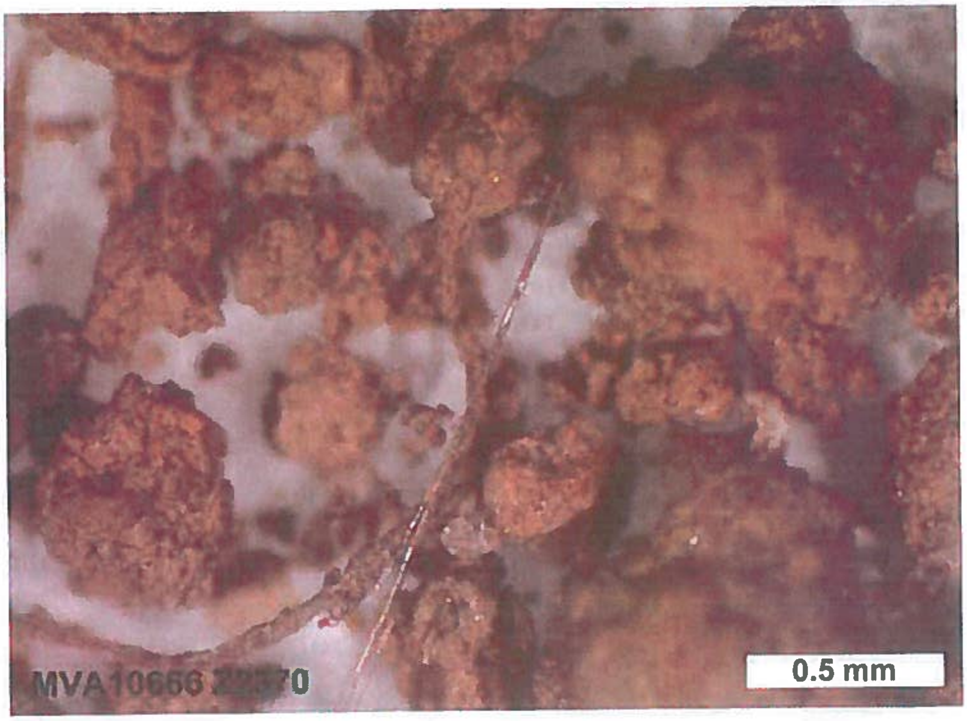

Figure 9. Stereomicroscope image of amosite asbestos fibers detected during analysis of soil, Sample Z2370.

Figure 10. Polarized light microscope image of amosite asbestos fibers detected during analysis of soil, Sample Z2370.

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	**Project Name:**	Dust Sampling Studies
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected Date	Collected Time	Analysis Required PLM	Analysis Required Other	Comments	Laboratory I.D.
B-OL-0V-409-ER1	Sample from debris of pipe insulation found on floor from area OV409	10/23/14	12:10		Dust Fingerprint		58924
S-OL-FF-ER3	Soil sample from area covered with grass. Area front of flare	10/23/14	12:23		Dust Fingerprint		58925
B-OL-FF-ER4	Sample from insulation under pipe on the floor. Area front of flare	10/23/14	12:39		Dust Fingerprint		58926
B-OL-PS408-ER5	Sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:43		Dust Fingerprint	there is still part of pipe on the column	58927
B-OL-PS408-ER5 dup	Duplicate sample from pipe insulation on floor. Debris from area PS408	10/23/14	12:44		Dust Fingerprint	there is still part of pipe on the column	58928
D-385-W-ER1	Dust 10 cm x 10 cm from bench left side bus stop	10/23/14	11:15		Dust Fingerprint		58929
D-FB-385-ER2	Field Blank	10/23/14	11:16		Dust Fingerprint		58930

Turnaround Time: Normal: X Rush:

Comments: Do not analyze blank and duplicate

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Date/ Time:	10/23/14 15:30		
Received By:	[illegible]	**Method of Shipment:**	
Date/ Time:	10/24/14 9:30		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

6. Characterization of TSI insulation from a distillation stock.

Report of Results: MVA10666

Characterization of Thermal System Insulation

Prepared for:

AES International, Inc.
611 Monserrate St, 2nd Floor
Santurce, P.R. 00907

Respectfully Submitted by:

EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

MVA Scientific Consultants
3300 Breckinridge Boulevard
Suite 400
Duluth, GA 30096

09 January 2015

Report of Results: MVA10666

Characterization of Thermal System Insulation

Introduction

This report presents the results of the characterization of a single sample of thermal system insulation. The sample was collected by Elme Rivera of AES International, Inc. on 21 November 2014 and hand delivered by Ady Padan of AES International to MVA Scientific Consultants on 01 December 2014. The sample was assigned the unique MVA sample number Z2753 (see Table 1). The samples received also included two aggregate samples that will be described and reported separately.

It was requested that we characterize the sample, both for asbestos content and for any additional characteristics that might be distinct (recognizably different from something else of a similar type) to these samples as a "fingerprint" of the material. The characterization of the properties of dust and this type of "fingerprint" analysis or characterization is often used in establishing a connection between materials in dust samples and potential sources [1-3]. This sample was analyzed during the period 01 December 2014 through 08 January 2015.

Methods

The sample was initially examined under an Olympus SZ-40 stereomicroscope at magnifications from 7X to 40X. Forceps and a tungsten needle were used to collect representative portions of the particulate found in the sample. The particulate was then transferred onto a microscope slide and mounted in Cargille refractive index liquids for analysis by polarized light microscopy (PLM) using an Olympus BH-2 polarized light microscope with a magnification range from 100X to 1,000X. The PLM analysis followed the analytical procedures recommended by the U.S. Environmental Protection Agency [4].

Additional analysis of the sample was performed to supplement the PLM results using a JEOL JSM-6490LV scanning electron microscope (SEM) coupled with a Thermo Scientific Noran System SIX x-ray energy dispersive spectrometry (EDS) system. Fibers and debris from the insulation sample were pressed to an adhesive carbon tab on an aluminum SEM planchette (specimen substrate).

A subsample of the insulation material was suspended in alcohol and deposited onto a carbon coated copper grid for analysis by transmission electron microscopy. This analysis was performed using a Philips EM 420 transmission electron microscope (TEM) equipped with an Oxford INCA EDS (energy dispersive spectrometry) x-ray analysis system. Fifteen random fibers were characterized for elemental composition as well as aspect ratios.

Results and Discussion

A summary of analytical results for sample "BULK-OL-CHM4-ER2" is provided in Table 2. The insulation sample contained approximately 40 to 60% chrysotile asbestos (by volume) in addition to a binder material detected via PLM analysis. Figure 1 shows a PLM image of a representative chrysotile asbestos bundle. SEM-EDS analysis shows that the fiber bundles consist of long, processed chrysotile bundles (Figures 2 and 3) with a calcium silicate binder material (Figures 4 and 5). Elemental composition of the fibers via SEM-EDS shows trace amounts of aluminum, chlorine, and calcium (Figure 6); however, these peaks are likely from adhering binders and particulate material since these elements are not confirmed in the TEM-EDS data. Based on TEM-EDS, none of the 15 fibers analyzed contained any detectable level of aluminum. The majority of the fibers analyzed contained no detectable level of iron (Figure 7); however, some fibers did contain iron at or below 1.8% (elemental weight percent, Table 3). The average aspect ratio of the 15 fibers analyzed is greater than 100:1 (length:width) with a minimum aspect ratio of 7:1 and a maximum aspect ratio of over 1000:1.

Conclusion

The insulation material consisted of approximately 40 to 60% chrysotile asbestos with a calcium silicate binder. The chrysotile material contained long, thin fibers with no detectable aluminum content and little to no iron content. This population of asbestos fibers is inconsistent with the population of asbestos fibers detected in the dust samples reported 12 December 2014.

References

1. Locard, E., "The analysis of dust traces," *Amer. Jour. Police Sci.*, 1, 3, 276, 1930.
2. McCrone, W.C., and Delly, J.G., "The Particle Atlas," 2nd Ed., Ann Arbor Science Publishers, Inc., Ann Arbor, MI, 1973.
3. Millette, J., and Brown, R., "Dust Particulate from the World Trade Center Disaster of September 11, 2001," Proceedings of the American Academy of Forensic Sciences, Annual Meeting, Feb. 21-26, 2005.
4. U. S. Environmental Protection Agency, "Test Method EPA/600/R-93/116 -- Method for the Determination of Asbestos in Bulk Building Materials."

Table 1. Summary of Insulation Debris Samples - Collected 21 November 2014

MVA #	Sample I. D.	Sample Description
Z2753	BULK-OL-CHM4-ER2	TSI Sample from South Side, Left of Platform of Vessel OV-302

Table 2. Summary of Analytical Results

MVA #	PLM Analysis Results % Asbestos	Additional Materials Observed	TEM Analysis Results	Comments
Z2753	40-60% Chrysotile	Binder	Chrysotile Detected	Chrysotile with Calcium Silicate Binder Confirmed by SEM

Table 3. TEM-EDS Characterization (Elemental Weight %) of Chrysotile Structures Detected in Insulation Sample Z2753

Structure	Mg	Si	Fe	Al
str001	26.2	24.9	0	0
str002	27.7	24.5	0	0
str003	28.0	24.4	0	0
str004	28.5	23.8	0	0
str005	26.0	25.5	0	0
str006	28.4	24.1	0	0
str007	26.9	24.9	1.67	0
str008	28.0	24.9	0	0
str009	27.3	24.8	0	0
str010	24.5	27.0	1.31	0
str011	28.9	23.3	0	0
str012	25.1	26.2	1.82	0
str013	28.2	23.9	1.55	0
str014	27.6	24.4	1.47	0
str015	27.6	24.5	1.45	0

Figure 1. Polarized light microscope image of chrysotile asbestos fibers detected during analysis of insulation sample "BULK-OL-CHM4-ER2" (MVA Z2753).

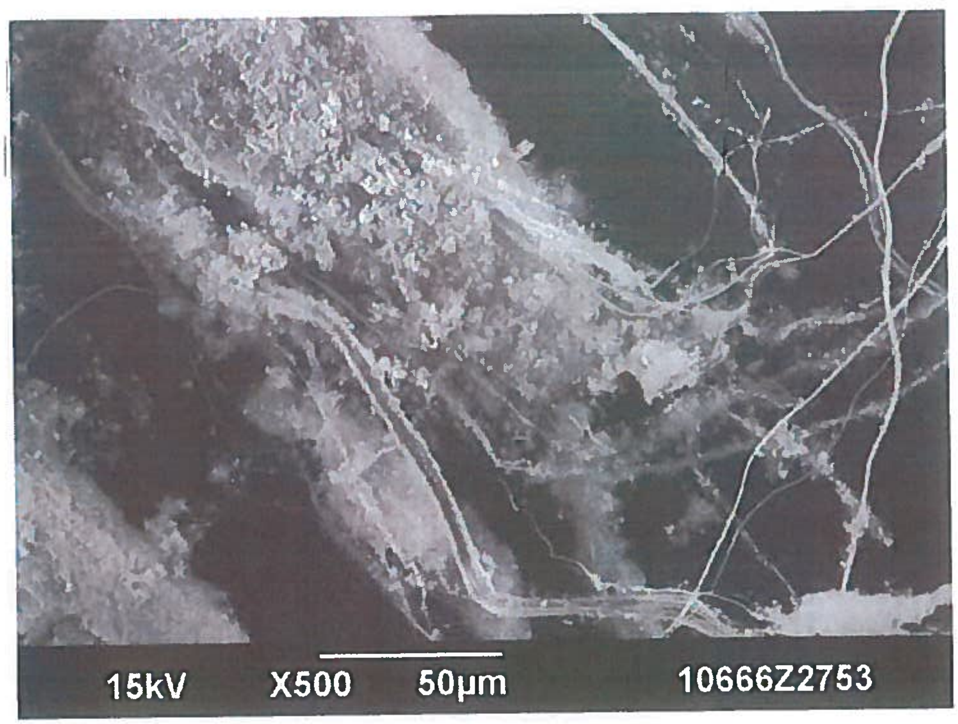


Figure 2. Scanning electron micrograph of chrysotile asbestos fibers and binder detected during analysis of insulation sample "BULK-OL-CHM4-ER2" (MVA Z2753).

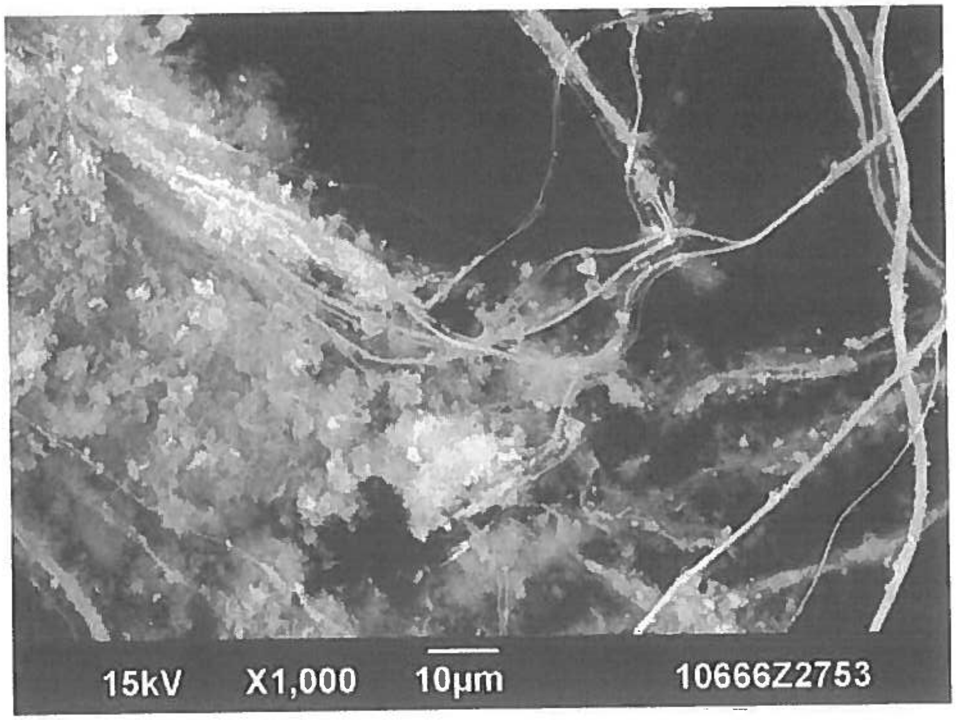


Figure 3. Scanning electron micrograph of chrysotile asbestos fibers and binder detected during analysis of insulation sample "BULK-OL-CHM4-ER2" (MVA Z2753).

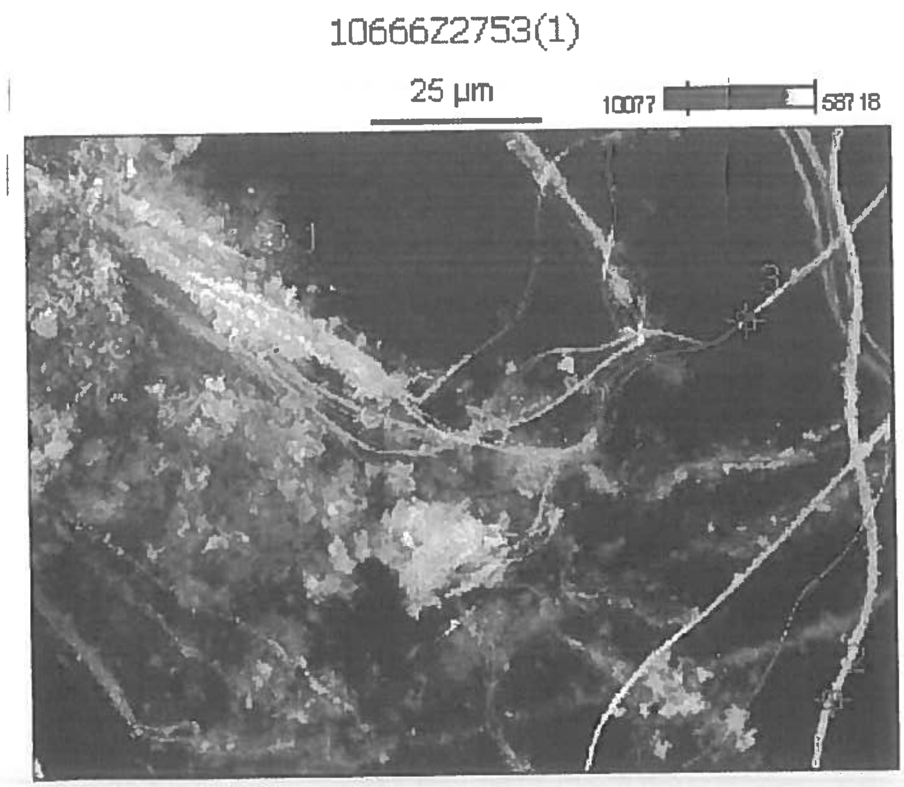


Figure 4. Insulation sample "BULK-OL-CHM4-ER2" (MVA Z2753). Same area as Figure 3. Numbers denote areas where EDS spectra were collected.

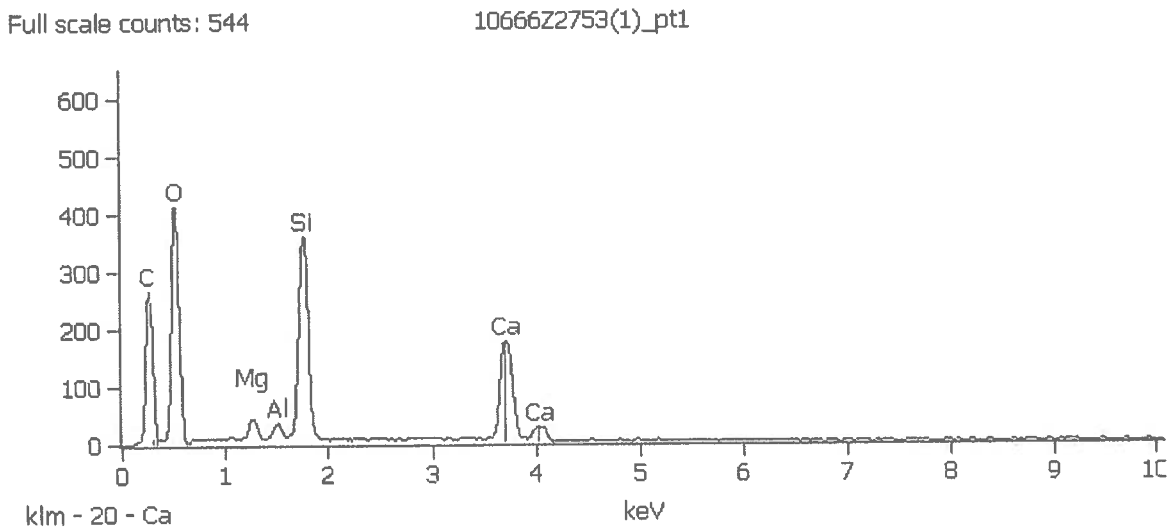


Figure 5. Area 1 from Figure 4. Calcium silicate binder. C = Carbon, O = Oxygen, Mg = Magnesium, Al = Aluminum, Si = Silicon, Ca = Calcium. Sample is mounted on adhesive carbon (C).

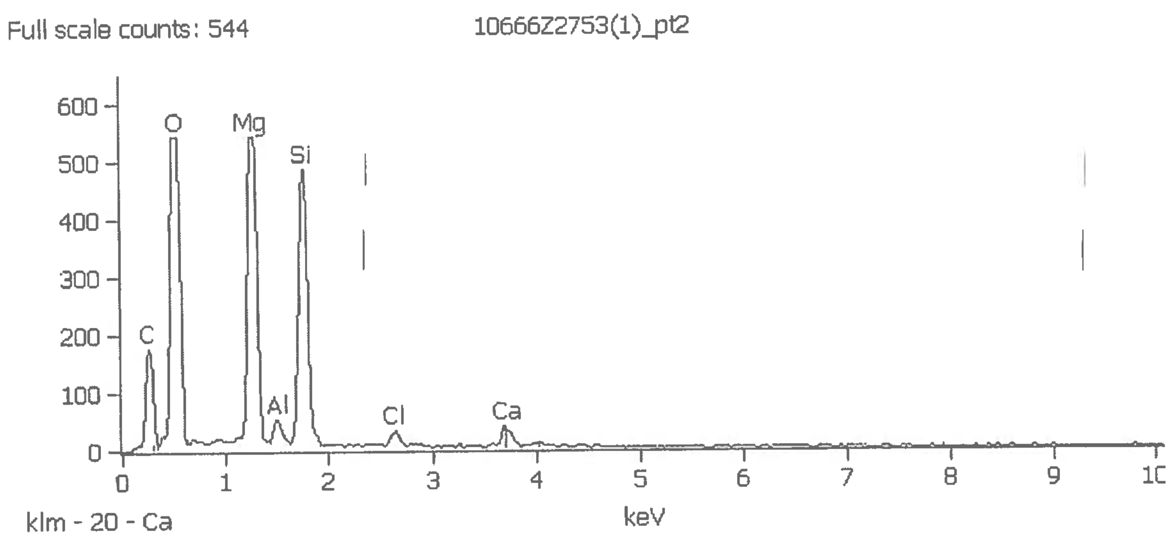


Figure 6. Area 2 from Figure 4. Chrysotile asbestos fiber bundle with particulate material. Spectrum also representative of Area 3.

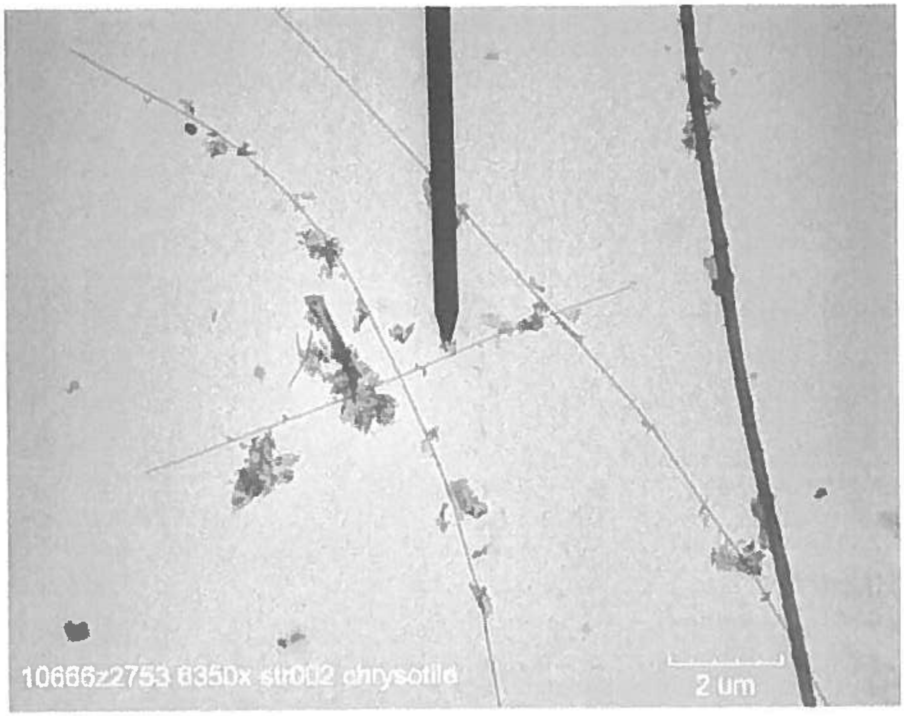
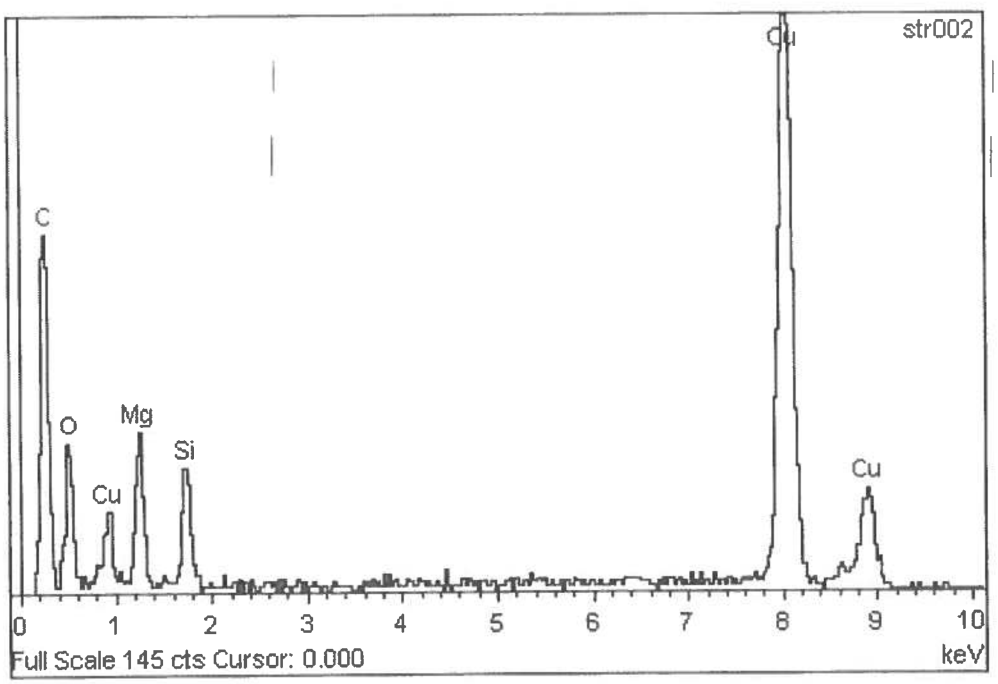


Figure 7. TEM image (above) and EDS spectrum (below) of representative chrysotile asbestos fiber detected during analysis of insulation sample "BULK-OL-CHM4-ER2" (MVA Z2753).



106666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.
611 Monserrate, 2nd. Floor, Santurce, P.R. 00907
Ph: (787) 722-0220 Fax: (787) 724-5788

Transmittal Sheet for Bulk Sample Analysis

Client Name:	1290	**Project Name:**	Dust Sampling Studies
Address:		**Site Location:**	Penuelas
Contact:		**Samplers Name:**	Elme Rivera
Phone/Fax:		**Company:**	AES International

Chain of Custody Record

Sample I. D.	Sample Description (i.e. Location, Name, etc.)	Collected		Analysis Required		Comments	Laboratory I.D.
		Date	Time	PLM	Other		
BULK-OL-CHM4-ER2	TSI Sample from South Side, Left of Platform of Vessel OV-302	11/21/14			Dust Fingerprint		59133
S-TEC-TNT-S-ER1	Gravel from Dirt Road next to Intersection of the Trail with Road #127, Front of Gulf Entrance	11/21/14			Dust Fingerprint		59134
S-TEC-BUS-ER2	Gravel from Dirt Road approximated 200 feet from Intersection with Road #127 and Dirt Trail	11/21/14			Dust Fingerprint		59135

Turnaround Time: Normal: X Rush:

Comments:

Relinquished By:	Ady Padin	**Delivered Directly to Lab:**	**Shipped:**
Date/ Time:	12/1/14 13:50		
Received By:	Steven Compton (Steven Compton)	**Method of Shipment:**	
Date/ Time:	12/1/14 13:50		
Relinquished By:		**Lab. Recipient:**	
Date/ Time:			
Received By:		**Date:**	
Date/ Time:			

7. Results of a dust sample collected from the entrance to quarry #17

MVA SCIENTIFIC CONSULTANTS
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770.662.8509
FAX 770.662.8532
www.mvainc.com

Characterization of Dust (Microvacuum/Wipe) Samples Collected from Quarry Entrances on 31 December 2014

Performed for AES International, Inc.

MVA Project 10666

23 February 2015

Executive Summary

This revised report presents the results of analysis of surface dust samples collected from quarry entrances by either microvacuum sampling or wipe sampling methods. Three microvac samples and three wipe samples were collected by Elme Rivera of AES International, Inc. on 31 December 2014 and were received (along with two field blank samples) via FedEx on 06 January 2015. During this sampling event, it was reported that microvac/wipe samples were taken side-by-side at three different locations.

It was requested that we analyze the surface dust microvac samples D-4-17-ER3 and D-FB-ER4 (field blank) using ASTM test method D5755. This revised report also includes the results of sample D-M-5-ER1 and a corrected concentration for D-4-17-ER3.

Sample D-M-5-ER1 contains approximately 75,000,000 chrysotile asbestos structures per square centimeter. Sample D-4-17-ER3 contains approximately 290,000,000 chrysotile asbestos structures per square centimeter. Lizardite particles were also detected in both samples. All of the serpentine particles (lizardite and chrysotile fibers) analyzed by TEM-EDS contain minor/trace amounts of iron and/or aluminum. No asbestos fibers were detected in the laboratory blanks or field blank.

Respectfully Submitted by: EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

Revised Report of Results: MVA10666

Characterization of Dust (Microvacuum/Wipe) Samples Collected from Quarry Entrances on 31 December 2014

Prepared for:

AES International, Inc.
611 Monserrate St, 2nd Floor
Santurce, P.R. 00907

Respectfully Submitted by:

EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director

MVA Scientific Consultants
3300 Breckinridge Boulevard
Suite 400
Duluth, GA 30096

Supercedes Report Dated 23 January 2015

23 February 2015

Revised Report of Results: MVA10666

Characterization of Dust (Microvacuum/Wipe) Samples Collected from Quarry Entrances on 31 December 2014

Introduction

This revised report presents the results of analysis of surface dust samples collected from quarry entrances by either microvacuum sampling or wipe sampling methods. Three microvac samples and three wipe samples were collected by Elme Rivera of AES International, Inc. on 31 December 2014 and were received (along with two field blank samples) via FedEx on 06 January 2015. During this sampling event, it was reported that the microvac/wipe samples were taken side-by-side at three different locations. Upon receipt, all samples were assigned unique MVA sample numbers (see Table 1).

It was requested that we analyze the surface dust microvac samples D-4-17-ER3 and D-FB-ER4 (field blank) using ASTM test method D5755. These samples were analyzed during the period 19 January through 22 January 2015. This revised report includes the results of sample D-M-5-ER1, which was analyzed on 18 February 2015, and a corrected concentration for sample D-4-17-ER3.

Methods

Microvac samples were analyzed using ASTM method D5755, "Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading" [1]. The samples were prepared and examined using the appropriate ASTM test method using a Philips EM 420 transmission electron microscope (TEM) equipped with an Oxford INCA energy dispersive spectrometry (EDS) x-ray analysis system and capable of selected area electron diffraction (SAED).

Results and Discussion

The analytical results of sample D-M-5-ER1 are summarized along with previously reported results in Table 1. Figures 1 and 2 provide a representative TEM image and EDS spectrum of some of the 75,000,000 chrysotile asbestos structures per square centimeter detected during analysis of sample D-M-5-ER1. Figures 3 through 5 show TEM images and EDS spectra representative of the 290,000,000 chrysotile asbestos structures per square centimeter detected during analysis of sample D-4-17-ER3. It was noted during analysis that lizardite particles were also present in both analyzed samples D-M-5-ER1 and D-4-17-ER3 (Figure 6). All of the serpentine particles (lizardite and chrysotile fibers) analyzed by EDS contain minor/trace amounts of iron and/or aluminum. TEM count sheets are included in the Appendix. No asbestos fibers were detected in the laboratory blanks and field blank.

Reference

1. ASTM-International, D5755-09 (2014) Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading.

Table 1. Summary of Surface Dust Samples Collected on 31 December 2014

MVA #	Sample I. D.	Sample Description	TEM Results [str/cm^2]
AA0002	D-M-5-ER1	Dust, microvacuum, floor, road of main entrance to Quarry #5, next to Juvenile Institution, Mayaguez	75,000,000
AA0003	D-W-M-5-ER1	Dust, wipe, floor, road of main entrance to Quarry #5, next to Juvenile Institution, Mayaguez	NA
AA0004	D-SG-20-ER2	Dust, microvacuum, floor, road of main entrance of old Quarry #20, San German	NA
AA0005	D-W-SG-20-ER2	Dust, wipe, floor, road of main entrance of old Quarry #20, San German	NA
AA0006	D-4-17-ER3	Dust, microvacuum, floor of road to main entrance to Quarry 17, Yauco	290,000,000
AA0007	D-W-4-17-ER3	Dust, wipe, floor of road to main entrance to Quarry 17, Yauco	NA
AA0008	D-FB-ER4	Field blank	NAD (A.S. 250)*
AA0009	D-W-FB-ER4	Field blank	NA

NA = Not Analyzed; NAD = No Asbestos Detected (A.S. = Analytical Sensitivity)

* Field blanks are not actually used to sample a known surface area; therefore, an analytical sensitivity in units of structures per square centimeter of area sampled is not possible. However, in order to provide a relative comparison, an analytical sensitivity has been calculated using the common sampling area of 100 square centimeters.

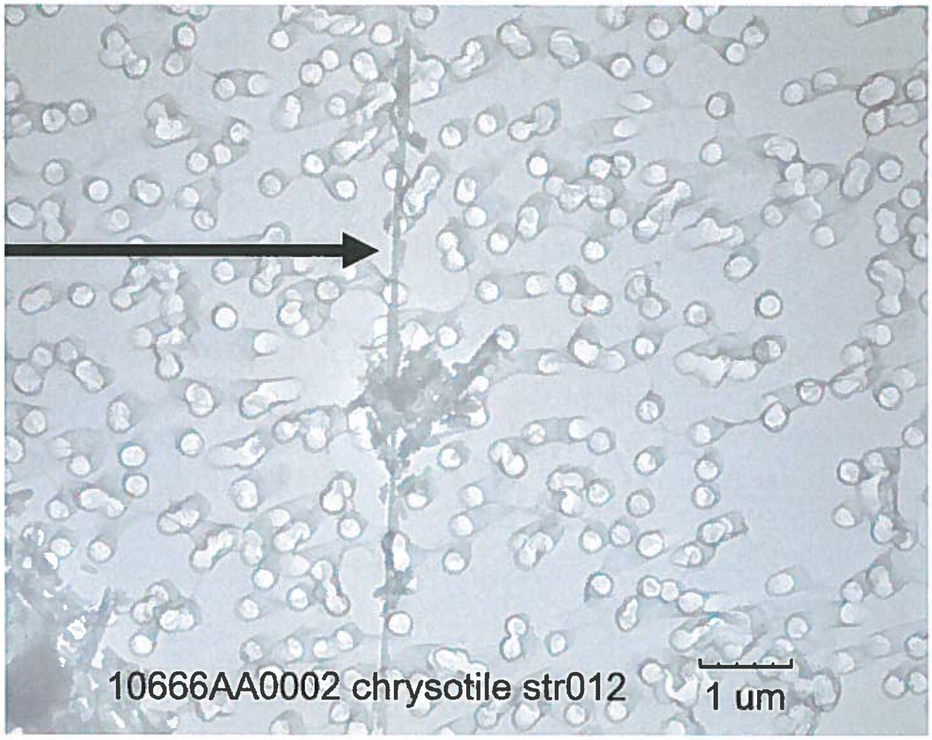

Figure 1. TEM image of chrysotile fiber observed in microvac sample D-M-5-ER1 (MVA AA0002).

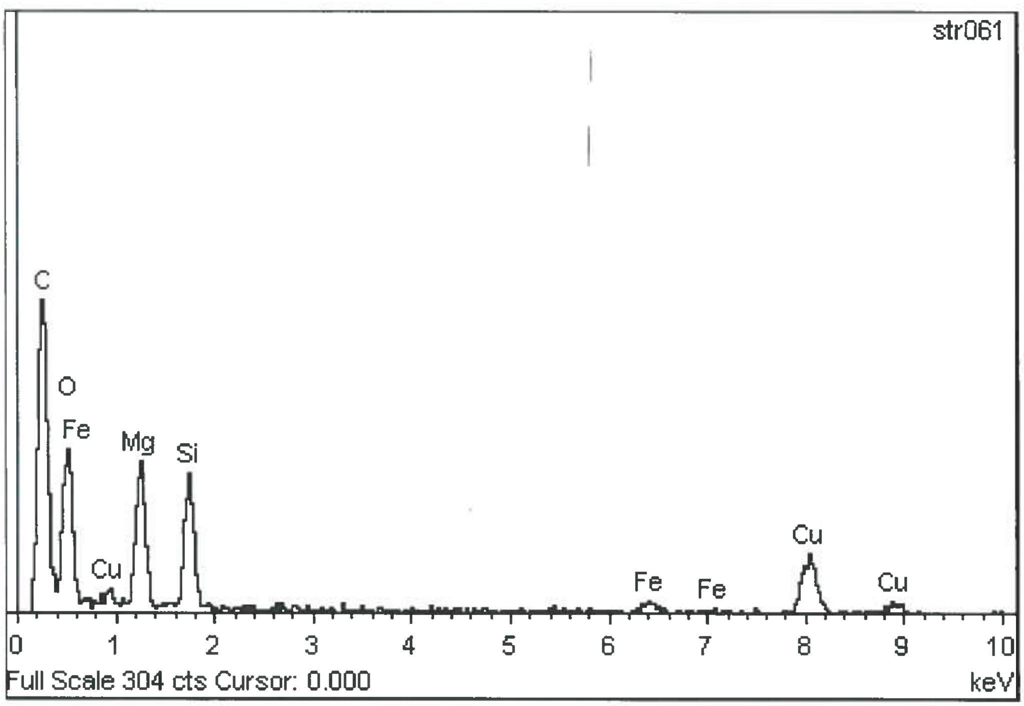

Figure 2. Representative EDS spectrum of a chrysotile bundle observed in microvac sample D-M-5-ER1 (MVA AA0002).

Figure 3. TEM image of chrysotile bundle observed in microvac sample D-4-17-ER3 (MVA AA0006).

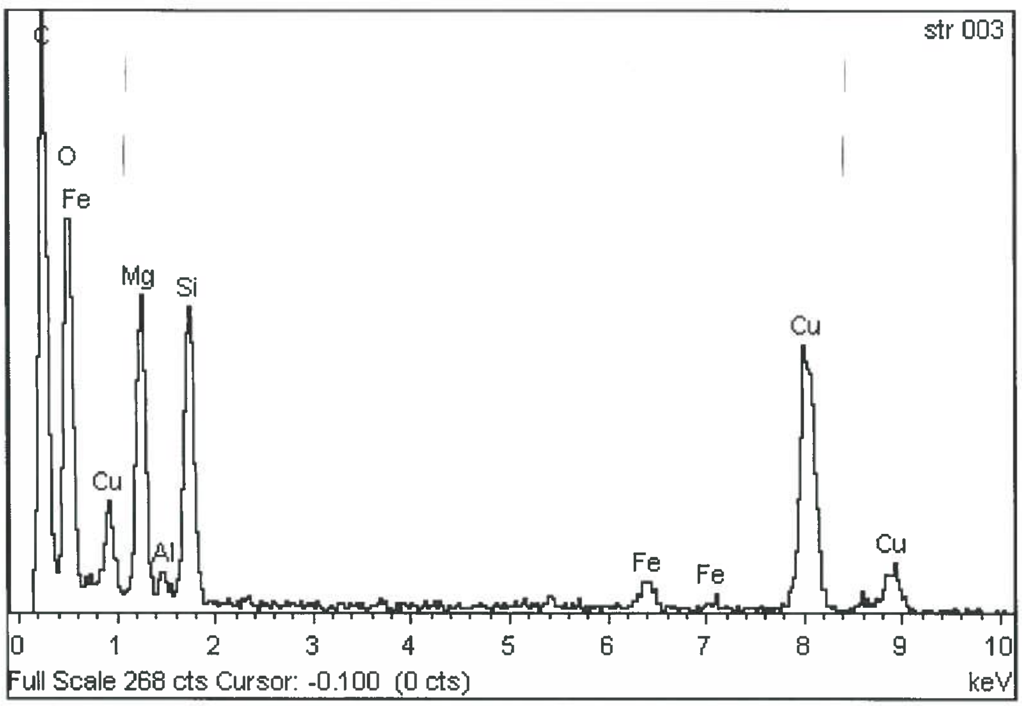

Figure 4. Representative EDS spectrum of a chrysotile structure observed in microvac sample D-4-17-ER3 (MVA AA0006).

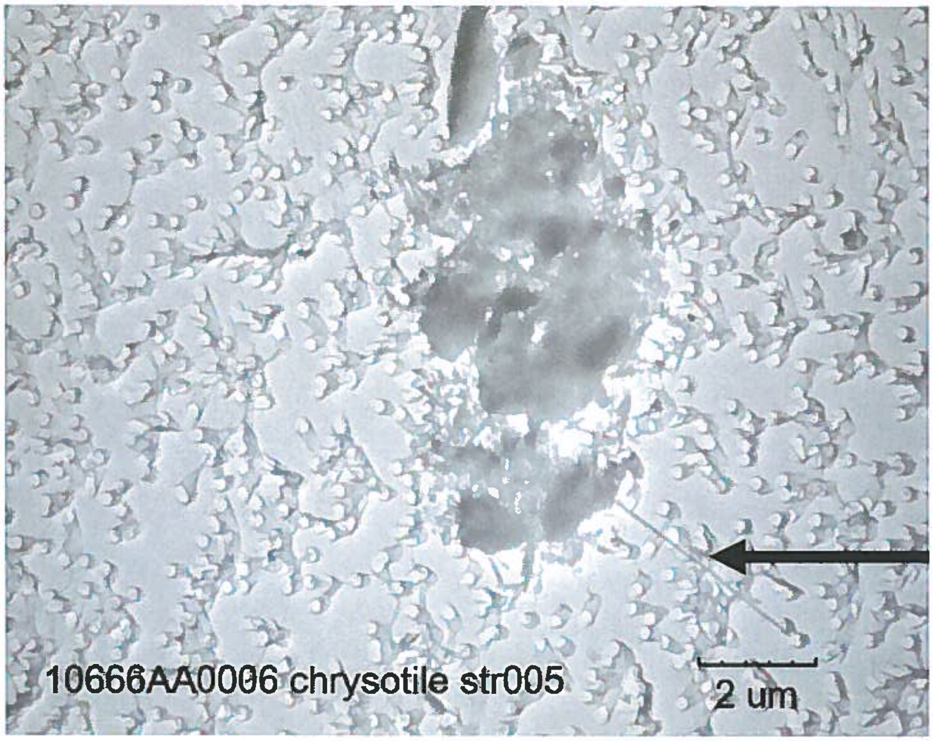

Figure 5. TEM image of chrysotile (indicated by arrow) and matrix (lizardite) observed in microvac sample D-4-17-ER3 (MVA AA0006).

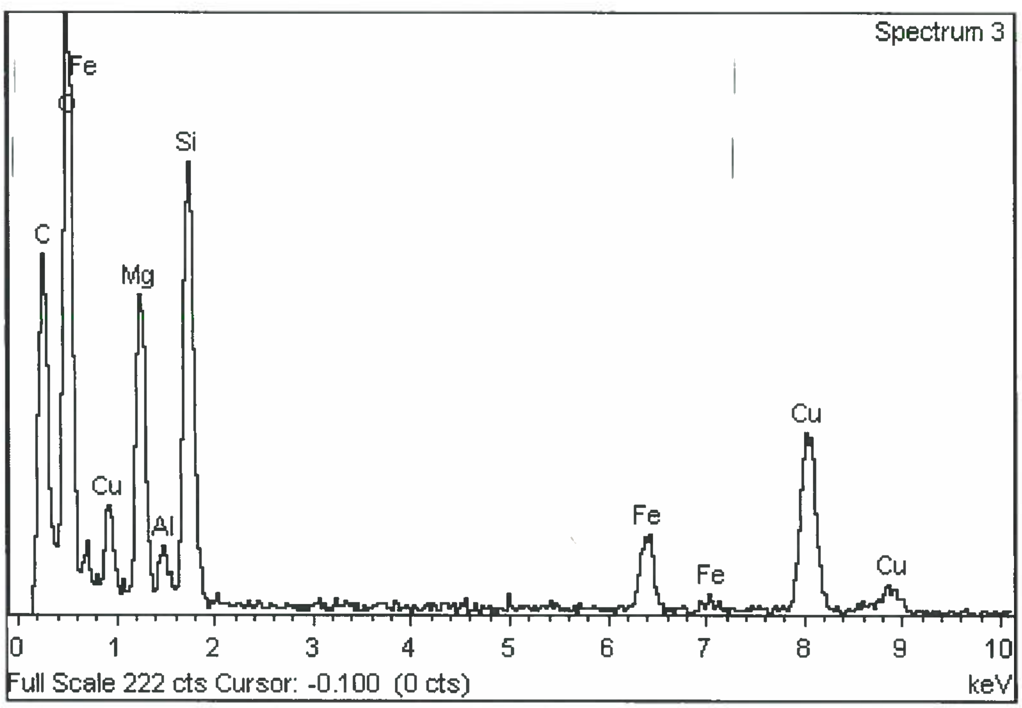

Figure 6. EDS spectrum of lizardite structure (Figure 3) observed in microvac sample D-4-17-ER3 (MVA AA0006). Similar structures were observed in microvac sample D-M-5-ER1 (MVA AA0002).

Appendix

MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	100	Analyst:	AH
MVA Sample#	AA0002	Amt Prepped(cm^2):	0.01	Date:	2/16-17/2015
Client I.D.:	D-M-5-ER1	Filter Area (mm^2):	1256	Page:	1 of 2
Instrument:	Philips420	Filter Type:	PC 0.2	Comments:	0.01 ml analyzed
Magnification:	20,500	Openings Analyzed:	10	ASTM Method:	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	E4-1	1	B	5.5	0.5	C	C	DIF	2.7	0.24
		2	M	18.0	2	C			8.8	0.98
		3	M	26.0	5	C			12.7	2.44
		4	M	8.0	3	C			3.9	1.46
		5	M	14.0	6	C			6.8	2.93
		6	M	16.0	7	C			7.8	3.41
		7	M	17.0	6	C	C	MATRIX EDX	8.3	2.93
		8	M	8.0	4	C			3.9	1.95
		9	B	4.5	0.3	C			2.2	0.15
		10	M	6.0	5	C			2.9	2.44
	F3-6	11	M	10.5	4.5	C			5.1	2.20
		12	M	20.0	4	C			9.8	1.95
		13	M	21.0	12	C	C		10.2	5.85
		14	M	12.0	6	C			5.9	2.93
		15	M	5.0	3	C			2.4	1.46
		16	M	18.0	12	C			8.8	5.85
		17	B	7.0	0.4	C			3.4	0.20
		19	M	20.0	18	C			9.8	8.78
		20	M	13.0	11	C			6.3	5.37
		21	M	22.0	15	C			10.7	7.32
	G3-1	22	B	3.0	0.3	C			1.5	0.15
		23	M	12.0	4	C			5.9	1.95
		24	M	15.0	12	C			7.3	5.85
	G2-4	25	M	9.0	8	C			4.4	3.90
		26	M	14.0	7	C			6.8	3.41
		27	B	6.0	0.3	C			2.9	0.15
		28	M	9.0	3	C			4.4	1.46
		29	M	8.0	5	C			3.9	2.44
	K4--3	30	M	9.0	7	C	C		4.4	3.41
		31	M	14.0	6	C			6.8	2.93
		32	C	9.0	1.5	C			4.4	0.73
		33	M	6.0	4	C			2.9	1.95
2	G3-4	34	M	10.5	2.5	C			5.1	1.22
		35	M	15.0	12	C			7.3	5.85
		36	M	10.0	7	C			4.9	3.41

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#: 10666
MVA Sample#: AA0002
Client I.D.: D-M-5-ER1
Instrument: Philips420
Magnification: 20,500
Acc. Voltage: 100kv

Amt Collected(cm^2): 100
Amt Prepped(cm^2): 0.01
Filter Area (mm^2): 1256
Filter Type: PC 0.2
Openings Analyzed: 10
Grid Opening (mm^2): 0.01

Analyst: AH
Date: 2/16-17/2015
Page: 2 of 2
Comments: 0.01 ml analyzed
ASTM Method:
or D5755

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
2	G3-4	37	M	25	7	C			12.2	3.41
		38	M	6.0	4	C			2.9	1.95
		39	M	21.0	12	C			10.2	5.85
		40	M	15.0	8	C			7.3	3.90
		41	B	6.0	0.4	C			2.9	0.20
	H2-6	42	M	7.0	4	C			3.4	1.95
		43	M	4.0	3	C			2.0	1.46
		44	M	5.0	4	C	C		2.4	1.95
		45	M	25.0	5	C			12.2	2.44
		46	M	9.0	3	C			4.4	1.46
		47	M	28.0	15	C			13.7	7.32
	H4-4	48	M	6.0	2	C			2.9	0.98
		49	B	6.0	0.3	C			2.9	0.15
		50	M	15.0	12	C			7.3	5.85
		51	M	12.0	9	C			5.9	4.39
		52	M	8.0	2	C	C		3.9	0.98
	G4-3	53	M	8.0	2	C			3.9	0.98
		54	M	6.0	5	C			2.9	2.44
		55	M	18.0	11	C			8.8	5.37
		57	M	12.0	7	C			5.9	3.41
		58	B	9.0	0.4	C			4.4	0.20
		59	M	6.0	4	C			2.9	1.95
		60	M	8.0	5	C			3.9	2.44
	F5-3	61	B	7.0	0.4	C	C		3.4	0.20
		62	M	18.0	7	C			8.8	3.41
60 total asbestos fibers due to omission of structures 18 and 56										

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	NA	Analyst:	AH
MVA Sample#	AA0002-LB	Amt Prepped(cm^2):	NA	Date:	2/18/2015
Client I.D.:	lab blank	Filter Area (mm^2):	1256	Page:	1 of 1
Instrument:	Philips420	Filter Type:	PC 0.2	Comments:	50 ml analyzed
Magnification:	20,500	Openings Analyzed:	10	ASTM Method:	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	G4-6	NSD								
	F3-4	NSD								
	E4-3	NSD								
	E3-4	NSD								
	F2-6	NSD								
2	C4-1	NSD								
	F4-3	NSD								
	G4-4	NSD								
	F2-6	NSD								
	C3-1	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	100	Analyst:	AH
MVA Sample#	AA0006	Amt Prepped(cm^2):	0.002	Date:	1/2112015
Client I.D.:	D-4-17-ER3	Filter Area (mm^2):	1256	Page:	1 of 2
Instrument:	Philips420	Filter Type:	PC 0.2	Comments:	0.01 ml of 500 ml
Magnification:	21,000	Openings Analyzed:	10	ASTM Method:	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
1	E3-6	1	B	13	0.5	C	C	DIF	6.2	0.24
	E4-3	2	M	25.0	6	C			11.9	2.86
		3	C	7.0	5	C	C		3.3	2.38
		4	B	5.0	0.8	C			2.4	0.38
		5	M	22.0	8	C	C	MATRIX EDS	10.5	3.81
		6	B	13.0	0.6	C			6.2	0.29
	F3-1	7	B	5.0	0.3	C			2.4	0.14
		8	M	15.0	10	C	C	MATRIX EDS	7.1	4.76
		9	B	9.0	0.5	C			4.3	0.24
	K4-1	10	C	5.0	4	C			2.4	1.90
		11	F	12.0	0.2	C			5.7	0.10
		12	B	4.0	0.6	C			1.9	0.29
		13	B	5.5	0.6	C			2.6	0.29
	H5-6	14	B	2.0	0.5	C			1.0	0.24
		15	M	15.0	5	C			7.1	2.38
		16	M	7.0	4	C			3.3	1.90
		17	M	6.0	3	C			2.9	1.43
		18	M	9.0	5	C			4.3	2.38
		19	B	9.0	0.5	C			4.3	0.24
2	G3-4	20	C	3.0	2	C			1.4	0.95
		21	F	5.0	0.2	C			2.4	0.10
		22	M	6.0	4	C			2.9	1.90
		23	M	3.0	2	C			1.4	0.95
		24	F	4.0	0.2	C			1.9	0.10
	E3-4	25	B	4.4	0.4	C			2.1	0.19
		26	B	5.0	0.6	C	C		2.4	0.29
		27	F	4.0	0.2	C			1.9	0.10
		28	M	27.0	5	C			12.9	2.38
		29	C	4.0	0.6	C			1.9	0.29
		30	C	12.0	4	C			5.7	1.90
		31	F	5.0	0.2	C			2.4	0.10
		32	B	7.0	0.8	C	C		3.3	0.38
		33	B	5.0	0.4	C			2.4	0.19
	C3-6	34	F	3.0	0.3	C			1.4	0.14
		35	F	7.0	0.2	C			3.3	0.10

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	100	Analyst:	AH
MVA Sample#	AA0006	Amt Prepped(cm^2):	0.002	Date:	1/21/2015
Client I.D.:	D-4-17-ER3	Filter Area (mm^2):	1256	Page:	2 of 2
Instrument:	Philips420	Filter Type:	PC 0.2	Comments:	0.01 ml of 500 ml
Magnification:	21,000	Openings Analyzed:	10	ASTM Method:	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (µm)	Width*** (µm)
2	C3-6	37	F	5	0.2	C			2.4	0.10
		38	M	15.0	8	C			7.1	3.81
		39	M	6.0	4	C			2.9	1.90
		40	M	15.0	9	C			7.1	4.29
	E4-6	41	B	6.0	1	C	C		2.9	0.48
		42	F	4.0	0.3	C			1.9	0.14
		43	F	2.0	0.3	C			1.0	0.14
		44	B	5.0	0.5	C			2.4	0.24
		45	B	4.0	0.4	C			1.9	0.19
	H4-1	46	B	4.0	0.4	C			1.9	0.19
		47	F	6.0	0.2	C			2.9	0.10
46 total asbestos fibers due to omission of structure 36										

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#	10666	Amt Collected(cm^2):	n/a	Analyst:	MJ
MVA Sample#	AA0008	Amt Prepped(cm^2):	n/a	Date:	1/15/2015
Client I.D.:	D-FB-ER4	Filter Area (mm^2):	1256	Page:	1 of 1
Instrument:	Philips420	Filter Type:	PC 0.2	Comments:	field blank
Magnification:	21,000	Openings Analyzed:	10	ASTM Method:	
Acc. Voltage:	100kv	Grid Opening (mm^2):	0.01	or D5755	

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (μm)	Width*** (μm)
1	F4-6	NSD								
	E5-1	NSD								
	C4-4	NSD								
	E3-3	NSD								
2	F4-1	NSD								
	G4-3	NSD								
	H5-1	NSD								
3	E4-3	NSD								
	F4-4	NSD								
	G4-4	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected

** On Screen Measurement

*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)

Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix

SAED: C = Chrysotile, A = Amphibole

EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

MVA SCIENTIFIC CONSULTANTS
Surface Dust Sample Analysis Sheet

MVA Project#: 10666
MVA Sample#: AA0006 LB
Client I.D.: n/a
Instrument: Philips420
Magnification: 21,000
Acc. Voltage: 100kv

Amt Collected(cm^2): n/a
Amt Prepped(cm^2): n/a
Filter Area (mm^2): 1256
Filter Type: PC 0.2
Openings Analyzed: 10
Grid Opening (mm^2): 0.01

Analyst: MJ
Date: 1/20/2015
Page: 1 of 1
Comments: Lab Blank
ASTM Method:
or D5755

Grid	Opening	Structure Number*	Structure Type	Length** (cm)	Width** (cm)	SAED	EDS	Comments	Length*** (μm)	Width*** (μm)
1	E4-1	NSD								
	F3-3	NSD								
	F5-6	NSD								
	C5-1	NSD								
2	E4-4	NSD								
	G4-1	NSD								
	F5-4	NSD								
3	C4-4	NSD								
	E3-6	NSD								
	G3-1	NSD								

*NFD or NSD = No Fibers Detected or No Structures Detected
** On Screen Measurement
*** Calculated Actual Measurement (On Screen Measurement X 10,000/Magnification)
Structure Type: B = Bundle, C = Cluster, F = Fiber, M = Matrix
SAED: C = Chrysotile, A = Amphibole
EDS: C = Chrysotile, AM = Amosite, CR = Crocidolite, AC = Actinolite, AN = Anthophyllite, TR = Tremolite, N = Non Asbestos

10666

ANALYTICAL ENVIRONMENTAL SERVICES INTERNATIONAL, INC.

#611 Monserrate, 2nd Floor, Santurce, P.R. 00907

Ph: (787) 722-0220; Fax: (787) 724-5788

Client Name:	Toro & Arzuaga	Project Name:	Olefin Dust Sampling
Address:		Sampling Date:	12/31/2014
Contact:		Collected by:	Elme Rivera
Phone/Fax		Company Name:	AES International

Chain of Custody Record

	Sample Description	Pump	TIME		FLOW RATE				Asbestos in dust Method D5755	Asbestos	Other	LAB ID #
Sample I.D.	(i.e. Location, Name, etc.)	Number	Start	Stop	Initial	Final	Avg.	Volume				
D-M-5-ER1	Dust, microvacuum, floor, road of main entrance to Quarry #5, next to Juvenile Institution, Mayaguez	LV-238	11:04	11:06	2.0	2.0	2.0	4.0	X			59588
D-W-M-5-ER1	Dust, wipe, floor, road of main entrance to Quarry #5, next to Juvenile Institution, Mayaguez	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X			59589
D-SG-20-ER2	Dust, microvacuum, floor, road of main entrance of old Quarry #20, San German	LV-238	13:00	13:02	2.0	2.0	2.0	4.0	X			59590
D-W-SG-20-ER2	Dust, wipe, floor, road of main entrance of old Quarry #20, San German	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X			59591
D-4-17-ER3	Dust, microvacuum, floor of road to main entrance to Quarry 17, Yauco	LV-238	13:45	13:47	2.0	2.0	2.0	4.0	X			59592
D-W-4-17-ER3	Dust, wipe, floor of road to main entrance to Quarry 17, Yauco	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X			59593
D-FB-ER4	Field Blank		—	—					X			59594
D-W-FB-ER4	Field Blank								X			59595

Turnaround Time: Normal: X Rush: Super Rush:

Comments: **Analyze microvacuum samples only. Area sampled is 100 cm2**

Relinquished By:	Kay Mi	Date/Time	1/06/15 1510	Delivered Directly to Lab:	Shipped:
Received By:	Melissa A Holman	Date/Time	1/6/15 1500	Method of Shipment:	
Relinquished By:		Date/Time		Lab. Recipient:	
Received By:		Date/Time		Date:	

8. Chrysotile aspect ratio of selective dust, NOA and TSI samples

Project: MVA 10666
Tables 1 through 3 provide aspect ratios of chrysotile asbestos fibers detected by transmission electron microscope (TEM) for the following samples:
Table 1 (Settled Dust Samples) - Z2124, Z2125, Z2127, Z2130, Z2131, Z2133, Z2135, Z2377;
Table 2 (Mineral Samples) - Z2284/Z2285; and
Table 3 (Bulk Insulation Sample) - Z2753.

EXECUTED BY ELECTRONIC SIGNATURE

Steven P. Compton, Ph.D.
Executive Director
MVA Scientific Consultants
24 February 2015

Table 1. Aspect Ratios of Chrysotile Structures Detected in Settled Dust Samples

	Fiber Aspect Ratio
Z2124	13
	14
Z2125	11
	12
Z2127	11
Z2130	11
Z2131	23
	14
Z2133	4
Z2135	5
	17
	37
	13
Z2377	15
	15

Table 2. Aspect Ratios of Chrysotile Structures Detected via TEM-EDS in Mineral (Composite) Sample R-MC-AP3/R-Q1-AP4 (MVA Z2284/Z2285)

	Fiber Aspect Ratio
Z2284/Z2285	8
	8
	14

Table 3. Aspect Ratios of Chrysotile Structures Detected via TEM-EDS in Insulation Sample BULK-OL-CHM4-ER2 (MVA Z2753)

	Fiber Aspect Ratio
STR 001	230
STR 002	390
STR 003	1060
STR 004	300
STR 005	60
STR 006	104
STR 007	167
STR 008	670
STR 009	267
STR 010	7
STR 011	500
STR 012	11
STR 013	730
STR 014	220
STR 015	370

AES International Inc.

Appendix VI

SERPENTINITE OUTCROPS IN PUERTO RICO

Prepared for Analytical Environmental Services International, Inc.

Leandro Addarich, P.G, M.S
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Las Americas C/7 DD20
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Contents

SERPENTINITE OUTCROPS IN PUERTO RICO

Introduction

This report presents the reconnaissance work performed in the southwestern part of Puerto Rico to identify the Serpentinite quarries and significant outcrops in the area. A total of 20 quarries and 4 significant outcrops were visited and photographs were taken. Field work was performed during the 13 and 14 of December 2014. The work was performed at the request of Dr. Ady Padan from Analytical Services International, Inc.

Geology of the Serpentinite formations of Puerto Rico

Serpentinite is a metamorphic rock composed of manly serpentine minerals. Serpentinite forms from the hydration at low temperature of peridiotite near seafloor. The serpentine minerals that form the rock are mostly lizardite, antigorite and chrysotile but also may contain talc and chlorite.

In Puerto Rico Serpentinite can be found at the west-southwest part of the island in one belt that runs from Mayagüez in an east-southeast direction, through Maricao, San Germán, Sabana Grande and Yauco. Also small belts can be found in Cabo Rojo, north and south of route #2 in San German, Sierra Bermeja, and a small outlier in the Media Quijada on the south area of Yauco. Figure 1 shows a portion of a Google Map™ image showing the location of the Serpentinite formation in the southwest and west part of the Island.

The USGS described the Serpentinite in Puerto Rico (Krushensky et al., 1998) as a: "Sheared light- to dark-green, Serpentinite; chiefly altered harzburgite. Epiclastic serpentinite is poorly sorted, unsheared, and retains a characteristic epiclastic appearance in both clasts and matrix. Exposed in the Mayaguez, Rosario, Maricao, Sabana Grande, Yauco, Punta Verraco, Parguera, Cabo Rojo, San German, and Puerto Real quadrangles", amphibolite floats can also be found in the Serpentinite at Sierra Bermeja.

The mineral composition varies with its location (Goff, et al., 2000): The Serpentinite found in the Monte del Estado (Maricao) has a mineral composition of olivine, orthopyroxene, chromite as its primary minerals. The one found at Rio Guanajibo, near Cabo Rojo is composed of olivine, orthopyroxene, chromite and diopside, and the one found at Sierra Bermeja has Olivine, orthopyroxene and diopside. All locations of the Serpentinite have a lizardite/chrysotile mixture, chlorite and magnesite as secondary minerals. Semi quantitative XRD analysis of samples from the Serpentinite (Goff, et al., 2000) shows that Lizardite, chrysotile are present together with orthopyroxene, chlorite, forsterite, magnetite and clays.

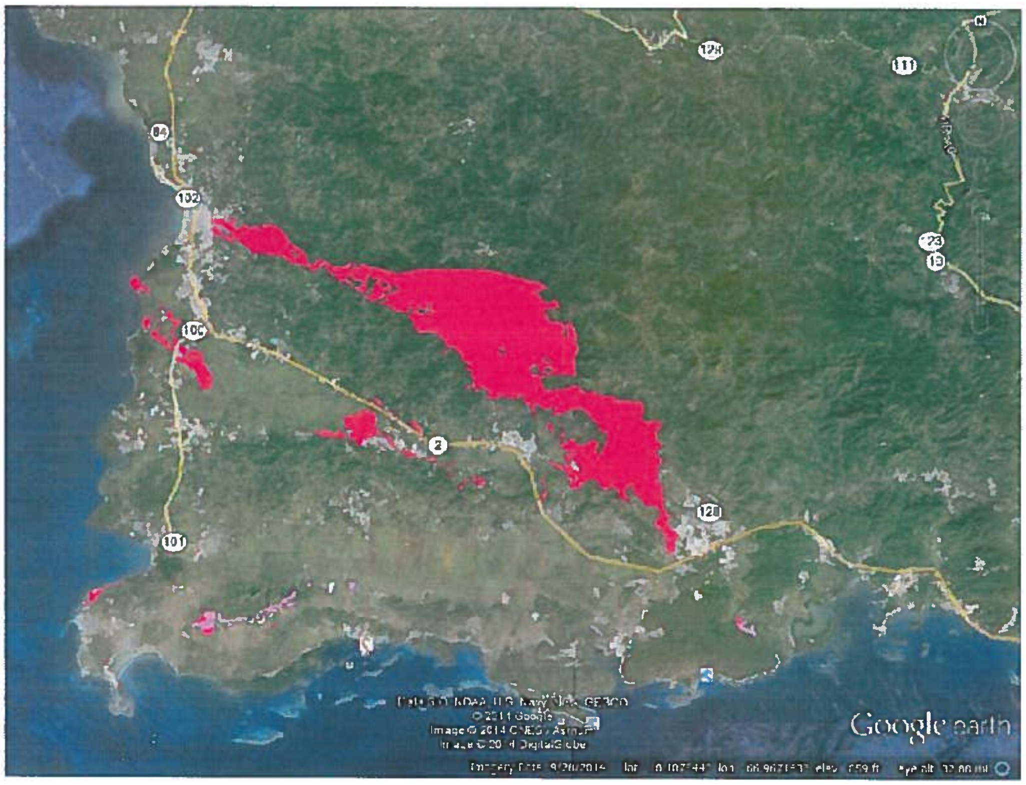

Figure 1. Location of the Serpentinite Formation in the southwest and west part of Puerto Rico.

Quarries and significant outcrops of Serpentinite

Twenty (20) quarries were visited during two days of field work. Four (4) significant outcrops were found on route 119 in San German, route 308 in Sabana Grande, and sector Media Quijada in Yauco. Small cuts and outcrops can be found along almost every route that goes through the Serpentinite Formations, principally along routes 120 and 365. Figure 2, 3, 3, and 5f show the location of the quarries and outcrops found during the reconnaissance with active quarries depicted by a red dot.

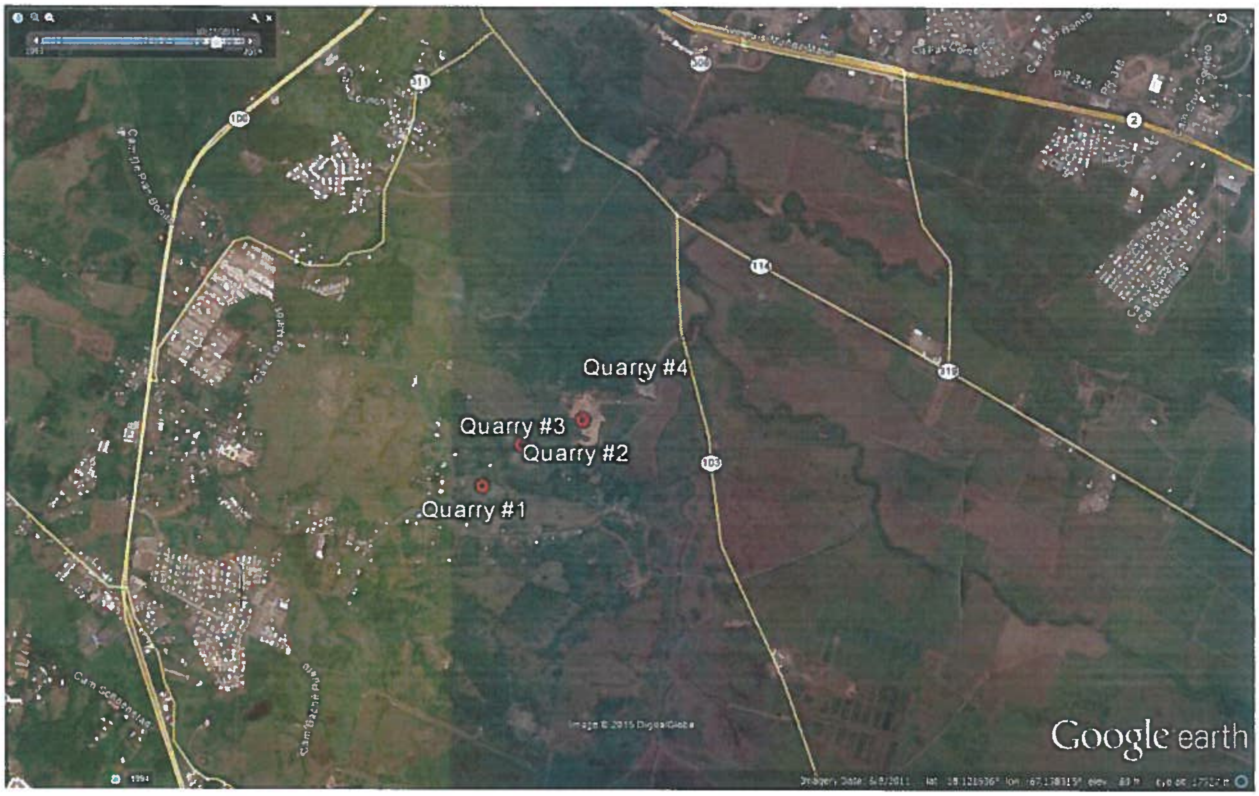

Figure 2a. Location of the quarries found during the reconnaissance.

Figure 3. Location of the quarries found during the reconnaissance.

Figure 4. Location of the quarries found during the reconnaissance.

Figure 5. Location of the quarries found during the reconnaissance.

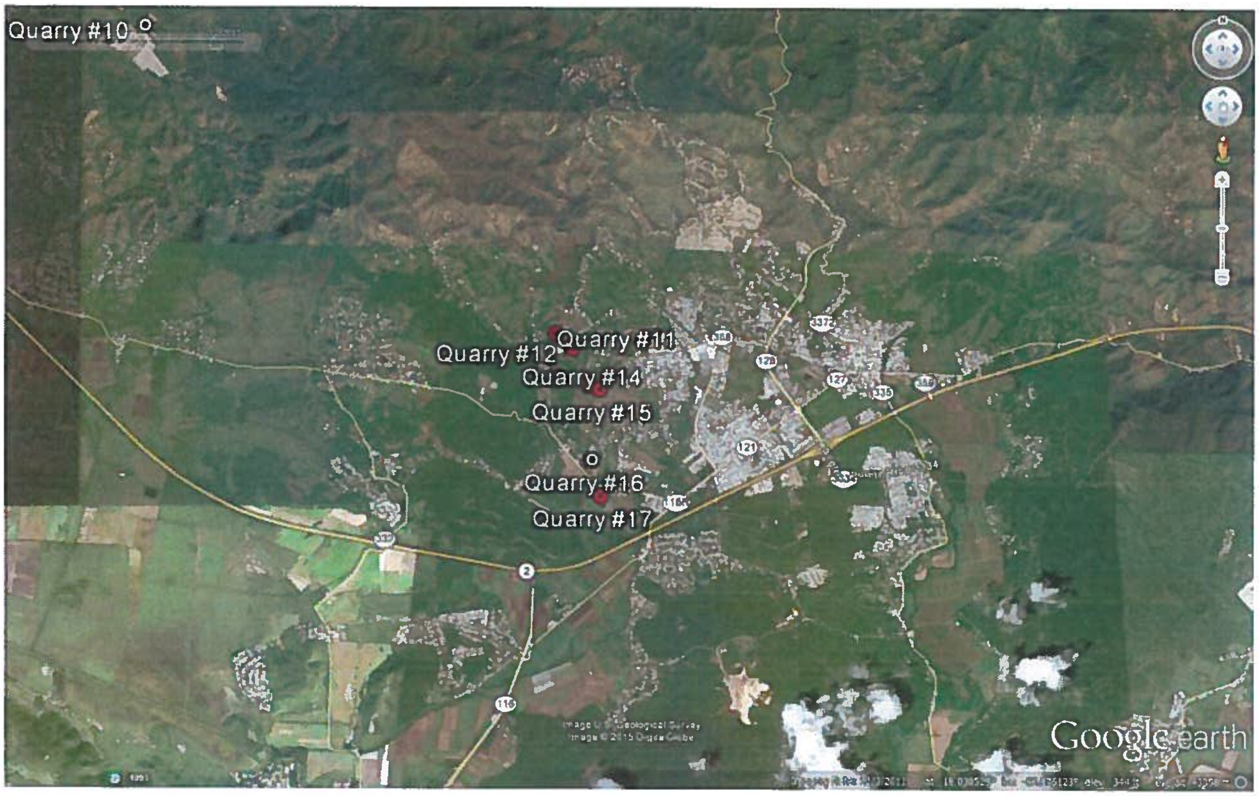

Figure 6. Location of the quarries found during the reconnaissance.

Quarry #1

Quarry #1 is located in the municipality of Cabo Rojo in Camino Oquendo in the municipality of Cabo Rojo. This quarry shows evidence that has been mined recently, the rock outcropping looks recently exposed. Figures 7 shows a photograph of the quarry. A sign indicating the name and permit of this quarry was not located on the site.

Figure 7. Quarry #1

Quarry #2

Quarry #2 is located just north of Quarry #1 and also shows evidence that has been recently mined perhaps as the same operation of #1. A sign indicating the name and permit of this quarry was not located on the site. Due to the location of this quarry a clear picture could not be obtained.

Quarry #3

This quarry is located just north of quarries #1 and #2 at route PR-3311. Mining of this quarry also looks recent, although the Serpentinite has been weathered to a reddish soil. A sign indicating the name and permit of this quarry could not be found but it is located near a Better Roads plant. Figure 8 show photograph of this quarry.

Figure 8. Quarry #3

Quarry #4

This quarry is located behind quarry #3 and it seems that is no longer in use but it has been mined recently. The rock has been weathered to a reddish soil. Figure 9 is a photograph of this quarry. A sign with the name and permit number could not be found in the area.

Figure 9. Quarry #4

Quarry #5

This quarry is located in the municipality of Mayagüez near PR-105 road, KM 105, behind "Centro Juvenil de Mayagüez Aguadilla". Although the rock looks fresh it may have been used for cut and fill for the construction of the project and/or the parking lot. A sign showing the name of permit number of the project or the quarry was not found. Figure 10 shows a photograph of quarry/cut #5.

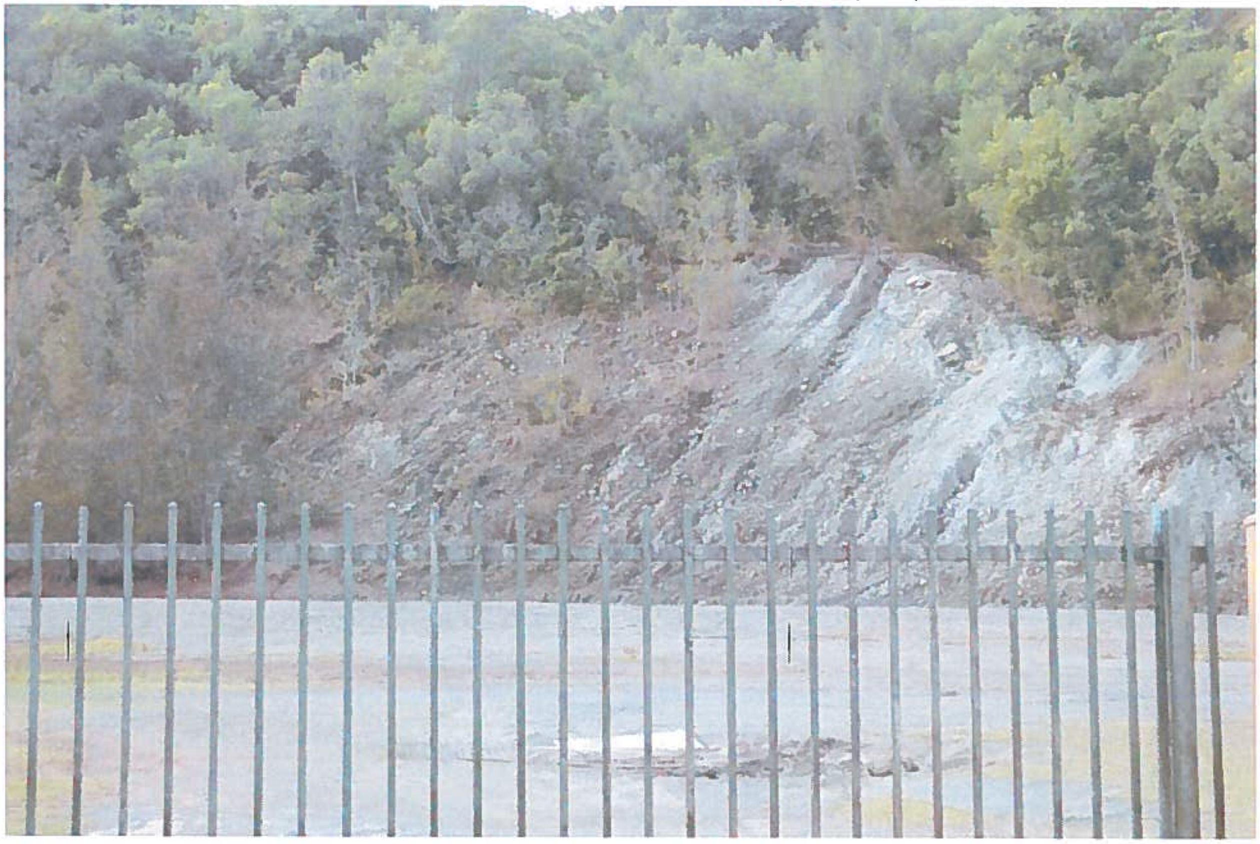

Figure 10. Quarry #5.

Quarry #6

Quarry #6 is abandoned and is located in Calle Húcares near road PR-105 KM 10.5. Access to this quarry was impossible. The quarry is located just behind a house and a picture could not been taken. Figure 11 shows an aerial view of the quarry.

Figure 11. Quarry #6 aerial view.

Quarry #7

Quarry #7 is located about 500 meters east of Quarry #6 and was probably mined as the same operation. The rock is moderately weathered to fresh in some parts and color varies from reddish to a greenish blue. Figure 12 shows a photograph of Quarry #7.

Figure 12. Quarry #7.

Outcrop along PR-119

The first significant outcrop found along route PR-119 KM 68.5 in the municipality of San German. The rocks in this outcrop are fresh, several fragments can be found near its toe and varies in size from a few centimeters up to a meter in diameter. Figure 13 shows photograph of this outcrop.

Figure 13. PR-119 KM 68.5, San German.

Quarry #8

This quarry is located in the municipality of San German in a Department of Natural Resources property along route PR-119. Rock from this quarry appears to be use locally only and not taken from the property. Due to access restriction a picture of this quarry could not be taken. Figure 14 shows an aerial view of this quarry.

Figure 14. Quarry #8 aerial view.

Outcrop along PR-119 KM 70.1

This significant outcrop was found at road PR-119, km 70.1. This outcrop appears to be a cut from the original construction of the road. Rock still looks fresh but with some discoloration. Vegetation covers a great part of the outcrop. Figure 15 shows a photograph of this outcrop.

Figure 15. PR-119 Km 70.1

Outcrop along PR-2 km 172.6

This outcrop is located in the municipality of San Germán and is located in rout PR-2. This cut appears to have been exposed during the expansion of road PR-2 in the past years. The rock looks fresh and only some vegetation is present. Figure 16 shows a photograph of this outcrop.

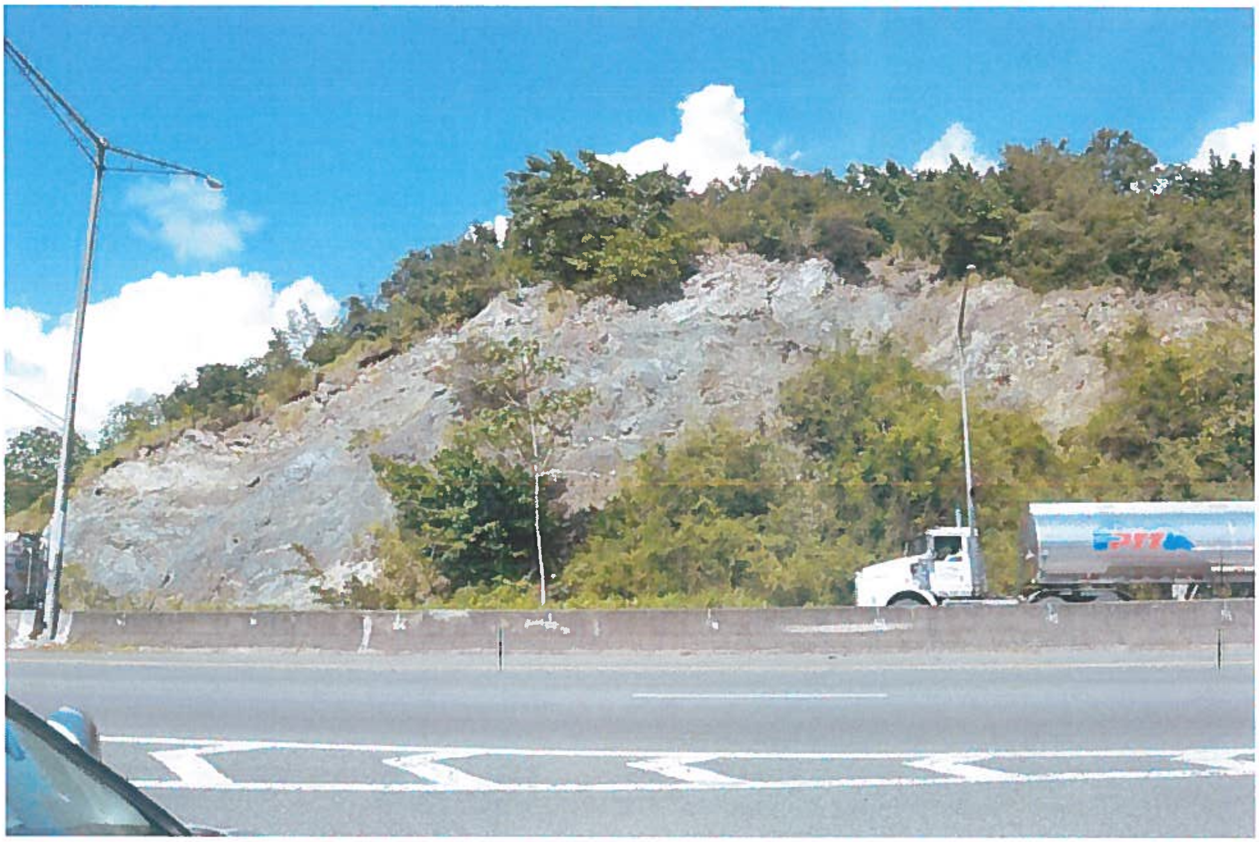

Figure 16. PR-2 km 172.6.

Quarry #9

Quarry #9 is located in the municipality of Sabana Grande on route PR-364,. This is the biggest quarry found in the area and is currently been used. A sign found at the entrance shows the name Monsignor San Products. The quarry was closed the day of the visit. Figure 17 shows a photograph of the quarry.

Figure 17. Quarry #9.

Outcrop Route PR-368 Comunidad La Torre

This new cut has been exposed as part of the La Torre Community. The rock of this outcrop looks fresh and no sign of mining can be found. Figure 18 shows a photograph of this cut.

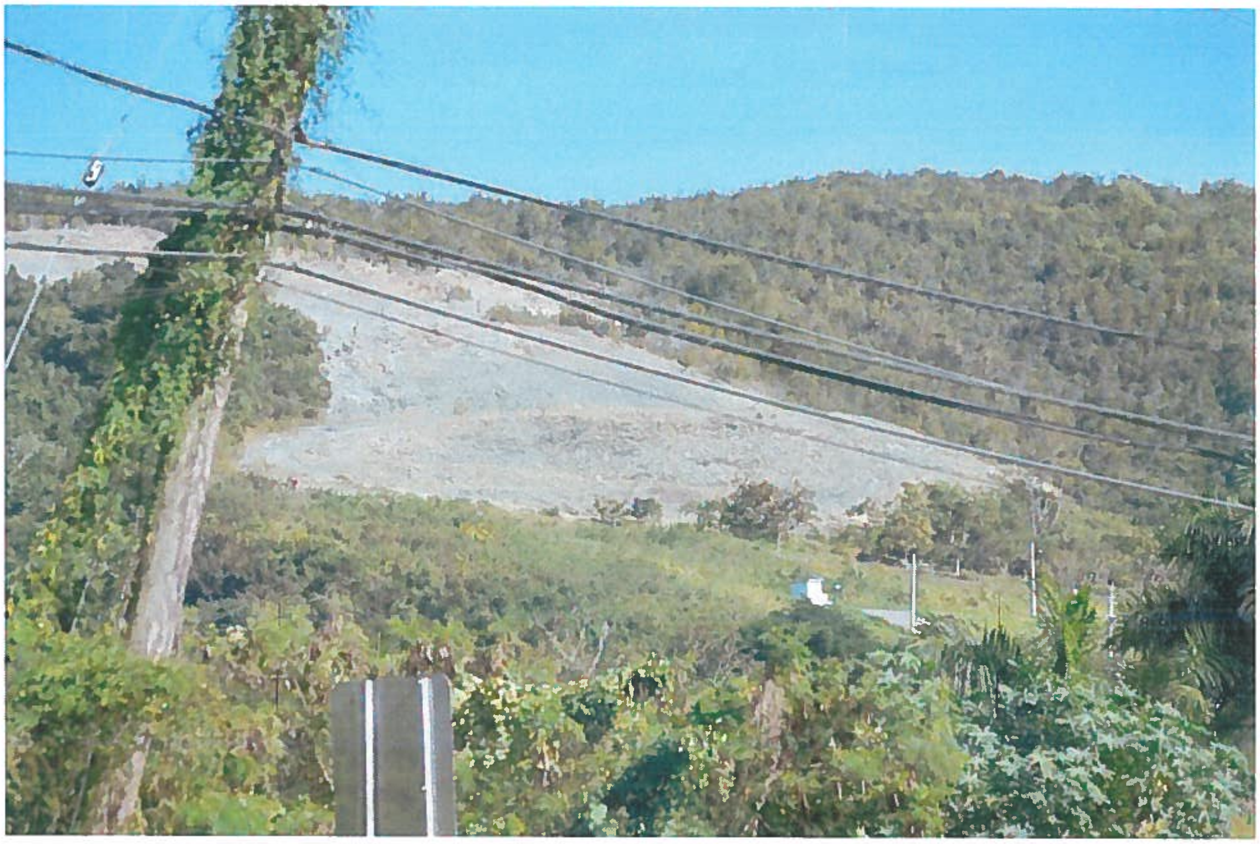

Figure 18. Comunidad La Torre rock cut.

Quarry #10

Quarry #10 is not currently in use but it was probably during the construction of a new development in the municipality of Sabana Grande in Susua ward, on route PR-368. The rocks on this outcrop are fresh and the contact between the Yauco Formation and the Serpentinite can be seen. Figure 19 shows a photograph of this cut.

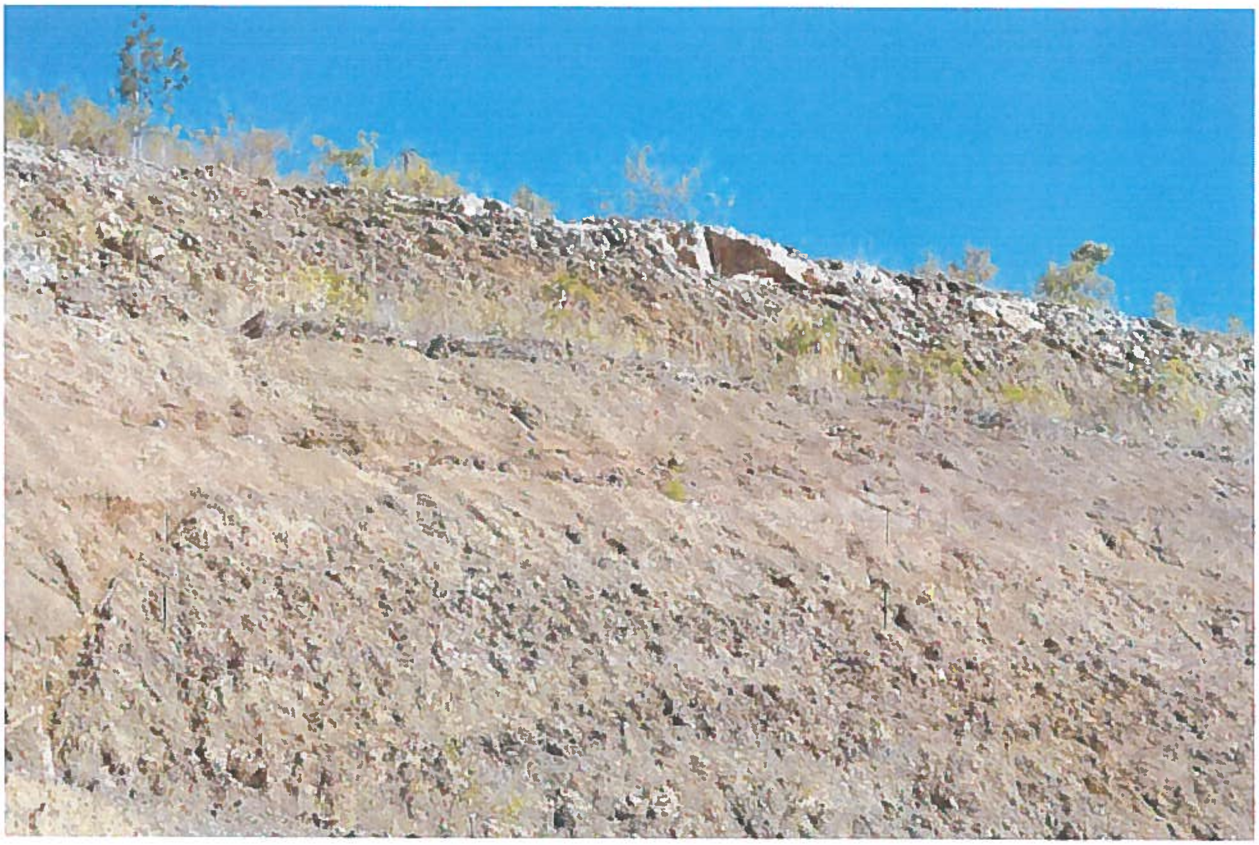

Figure 19. Quarry #10.

Quarry #11

Quarry #11 is located in the municipality of Yauco route PR-368 km just north of Hotel El Cacique and east of Presa Loco. The quarry has been out of production for several years although some new cuts can be seen in its walls. Figure 20 shows a photograph of this quarry.

Figure 20. Quarry #11.

Quarry #12

Quarry #12 appears to be a cut performed during the construction of a house just north of it. Mined material from this quarry appears to be of a very low volume. Figure 21 shows an aerial picture of this quarry.

Figure 21. Quarry #12 aerial view.

Quarry #13

Quarry #13 is located about 500 meters south of quarry #10 and it seems to be a part of several operations near the area. Although some parts of the quarry look like not being mined for several years, some small volume material appears to be cut from the walls. Figure 22 shows a photograph of the quarry.

Figure 22. Quarry #13.

Quarry #14

Quarry #14 is located less than 500 meters from quarry #13 and appears to be from the same operation. Access to this quarry was restricted and picture could not be taken. Figure 23 is a Google earth satellite photo showing the extension of this quarry.

Figure 23. Quarry #14 and Quarry #15 aerial view.

Quarry #15

Quarry #15 appears also to be part of the same operation of #13 and #14. Also access to this quarry was restricted. Figure 23 shows an aerial view of this quarry.

Figure 24. Quarry #14 and Quarry #15 aerial view.

Quarry #16

Quarry #16 is a very small quarry located in Susua Baja sector Cuatro Calles in Yauco, along Ave. Luis Muños Marín. The quarry has been out of production for several years. Figure 24 shows a photograph of this quarry.

Figure 25. Quarry #16.

Quarry #17.

Quarry #17 is a small quarry located along route PR-121 Sector Cuatro Calles in Yauco. This quarry is named Luis A. Gonzalez and has Environmental Quality Board (JCA) and DRNA permits as shown on the sign posted at its entrance. Figure 25 shows a photograph of this quarry.

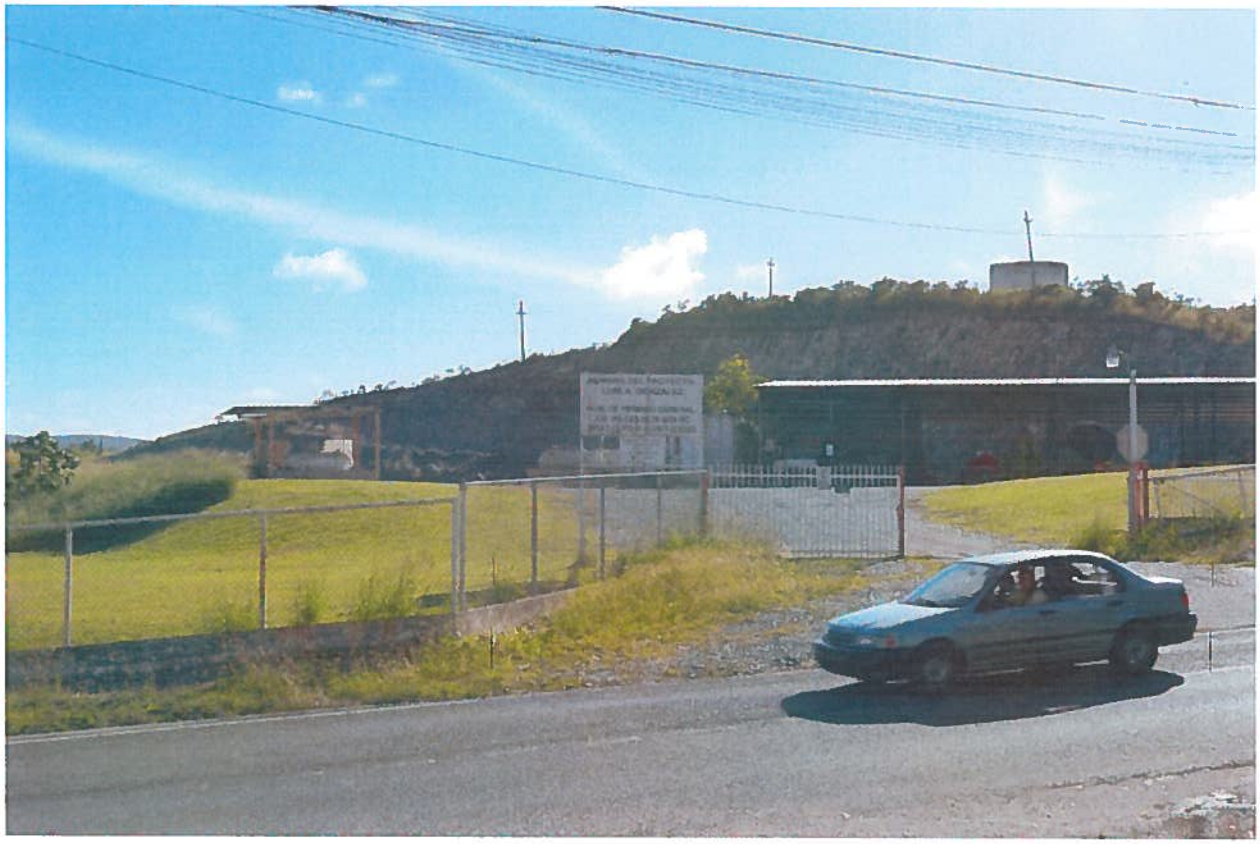

Figure 26. Quarry #17.

Quarry #18

Quarry #18 is located in the municipality of San German, route PR-2 KM 174.9. This quarry has been abandoned for several years. This quarry shows two formations; what appears to be Sabana Grande formation on top of the Serpentinite. Figure 26 shows a photograph of this quarry.

Figure 27. Quarry #18.

Quarry #19

Quarry #19 is located in the municipality of San German in "Comunidad Los García". Access to this quarry is restricted although the rock appears to be Serpentinite this cannot be confirm. The quarry seems to be abandoned for several years. Figure 27 shows a photograph of quarry #19.

Figure 28. Quarry #19.

Quarry #20

Quarry #20 is located in the municipality of San Germán route PR-329 KM 3.2. The quarry is named Cantero y Gravero. Its sign does not show its permit number. The access to the quarry was restricted but the access road is currently paved with Serpentinite aggregate (Figure 28).

Figure 29. General view, entrance to quarry 20 facilities, road paved with Serpentinite aggregates.

Outcrop Route PR-3335

This outcrop is located in Sector Media Quijada in Barrio Barinas de Yauco, where a small cut was made along route PR-3335. The most prominent cut is shown in Figure 29 which is apparently made for a parking lot or a future construction, the material from this cut has been apparently used as pavement in various areas of the sector.

Figure 30. Cut at Media Quijada.

Conclusions

Twenty (20) quarries and several Serpentinite outcrops were found during the field work of the project with a total of eleven (11) quarries which are been currently mined. The active quarries are #1, #2 and #3 in Cabo Rojo; #9 in Sabana Grande; #11, #12, #13, #14 and #15, #17 in Yauco and #20 in San Germán.

During the reconnaissance it was noticed that Serpentinite is the main rock if not the only rock mined in this part of the Island. It is used as pavement in several homes and industries especially near the quarries. Industries as Better Roads, a major asphalt company and several concrete plants used Serpentinite as aggregates.

AES International Inc.

Appendix VII

GEOLOGIC MAP OF THE YAUCO AND PUNTA VERRACO QUADRANGLES, PUERTO RICO

By

Richard D. Krushensky and Watson H. Monroe