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Study of Asbestos Contamination of former Vermiculite Northwest / W.R. Grace Vermiculite Expansion Facility

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Abstract

Ore from the vermiculite mine in Libby, Montana, was shipped to dozens of processing facilities throughout the United States. The vermiculite ore that was mined in Libby is known to be contaminated with asbestiform amphibole minerals such as tremolite, actinolite, winchite and richterite. Several asbestiform amphiboles found in Libby vermiculite have been linked to asbestos related diseases such as asbestosis, pleural fibrosis, mesothelioma, and lung cancer.

The U.S. Environmental Protection Agency (EPA) is responsible for conducting site assessments at the vermiculite expansion facilities which formerly processed ore from Libby. One such site is located in Spokane, Washington. It was formerly owned and operated by Vermiculite Northwest and later W.R. Grace. It operated between 1951 and 1973. This site is currently owned by Spokane County, and has been used as a public works maintenance facility.

In 2002 the EPA Region 10 Office of Environmental Assessment (OEA) was asked by the Region 10 Office of Environmental Cleanup to determine if asbestiform amphibole fibers contaminating soil at this site could become airborne when the soil is disturbed and pose a potential risk to individuals exposed to the site.

OEA conducted a three-phase study at the Spokane site. Bulk soil samples were analyzed to determine if amphibole mineral fibers were present in the soil. Contaminated soil from the site was manipulated in a sealed experimental enclosure while air monitoring samples were collected. Also, simulated property maintenance and excavation activities were conducted on the site while personal and area air monitoring samples were collected.

Asbestiform amphiboles were found in bulk soil samples, air samples collected after disturbance of soils in an experimental enclosure, and in air samples collected from personal and area monitors used during activities on the site. This investigation demonstrates there is a clear pathway for asbestiform amphibole fibers to move from contaminated soil on this site to the air. Thus, individuals can be exposed to potentially hazardous concentrations of airborne asbestos fibers under conditions involving disturbance of soil on this site.

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A great deal of support and assistance was received from several of our co-workers at EPA. We would like to thank the following EPA Region 10 staff who contributed significantly to the quality of this study: Earl Liverman, Julie Wroble, Bruce Woods, Ph.D., David Terpening, and Marion "Doc" Thompson. We also appreciate Aubrey Miller, MD, MPH; of the US EPA Region 8 office in Denver, for providing valuable technical assistance and comments.

We would also like to thank Susan Davis, Washington State Department of Ecology, for analyzing several of my samples by polarized light microscopy and phase contrast microscopy, John Harris, MPH, and his staff at Lab/Cor, Inc., for analyzing my samples by transmission electron microscopy, and David Frank, Ph.D. for analyzing a sample by X-ray diffraction.

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Introduction

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This report presents the results of a study conducted by the EPA Region 10 Office of Environmental Assessment (OEA) intended to determine if a potential imminent or substantial risk exists for individuals exposed to asbestiform mineral fibers which may become airborne under certain conditions at a former vermiculite expansion facility in Spokane, Washington.

In 2000 and 2001, environmental consultants contracted by the EPA Region to Office of Environmental Cleanup (Superfund Program) confirmed the presence of asbestos on this site using traditional polarized light microscopy and transmission electron microscopy methods for determining asbestos in bulk materials. The OEA study described in this report is intended to build on this previous work and determine if a soil to air pathway exists for asbestos found in the soil at this site and to further characterize some of the types of asbestiform amphibole fibers present. This study was composed of three phases; 1) general surveillance of the area including bulk sampling; 2) air monitoring in an experimental enclosure after disturbance of soils obtained from the site; and 3) on-site air monitoring during small scale simulated tasks performed on the site itself. The OEA field work for this study was conducted between May 2002 and October 2002.

Background and Site Location

Between1951 and 1973, Vermiculite Northwest, Inc. and subsequently W.R. Grace and Company exfoliated vermiculite and manufactured, packaged, and stored commercial vermiculite products at this site. Information provided to EPA by W.R. Grace and Company indicates up to 9,785 tons of vermiculite was processed at this site over a three-year period: January 1967 to October 1970. After 1973, the site was occupied by the Wilburt Vault Company, which manufactured concrete products such as septic tanks and burial vaults. In January 2000 the site was acquired by Spokane County Engineers Office, which used the site to store heavy equipment such as dump trucks and other road maintenance equipment.

The site is located at 1318 N. Maple Street, Spokane, Washington. The legal description of the property is Parcel B, Lots 1 through 6, Block 23 of the Chamberlains Addition. The site is bordered by Maple Street to the west, Maxwell Avenue and an alley and private residences to the north, Cedar Street to the east, and Sharp Avenue, an alley, private residences, and Spokane County vehicle maintenance shops to the south.

During the period of study, a portion of the former warehouse building stood on the southwest corner of the site. A concrete slab was located east of the former warehouse, where the vermiculite expansion furnace and vermiculite concentrate storage section of the building formerly were situated. Located north of the warehouse were several metal buildings, a concrete bridge abutment which used to connect north Walnut Street, and a bluff approximately 25 - 35 feet in elevation. Remnants of a railroad spur that serviced the site were observed on the north side parallel to the warehouse. The entire site was surrounded by a chain link fence.

Vermiculite and Vermiculite Processing

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Vermiculite ore expanded at this site was used to manufacture loose-fill insulation, carriers for agricultural chemicals such as pesticides, additives in potting soils, and chemical packaging materials. The desirable properties of expanded vermiculite include its absorbency, light weight, and resistance to combustion.

Vermiculite is a hydrated, or water (H_2O) containing, magnesium-aluminum-iron sheet silicate minerals of various compositions.[1] The formula for vermiculite involved in this study is:

$$Mg_{0.35+/-} (Mg, Fe^{3+})_3 (Si_{4-x}, Al_x) O_{10} (OH)_2 . \mathbf{4H_2O}$$

Vermiculite from Libby was mined from an open pit and beneficiated or crushed, sized, and sorted at the mine site into vermiculite concentrate. The vermiculite concentrate was shipped to various expansion facilities around the United States, including the facility located in Spokane, Washington. Once at the expansion site, the vermiculite concentrate was offloaded on the north side of the warehouse building. The ore was shoveled into a gas-fueled expansion furnace heating the ore to approximately 1000° Fahrenheit (F). Water between the vermiculite sheets expanded as it became steam, forcing the mineral itself to expand between 6 to 30 times its original thickness. This expansion process is also called exfoliation or popping. The exfoliated vermiculite went through a cooling shoot and rock separator, after which it was put through a cyclone device intended to remove dust before the product was packaged.[2] Dust from the vermiculite manufacturing process was often swept off the floor and out the back door of the north side of the warehouse onto the ground.

In addition to processing products containing vermiculite as the only ingredient, asbestos was sometimes added to vermiculite-based insulation products manufactured at the site. The asbestos was mixed with exfoliated vermiculite in a cement type mixer.[3]

"Libby Amphibole"

Analysis done at the vermiculite mine in Libby, Montana, by the U.S. Geological Survey (USGS) identified tremolite, actinolite, winchite and richterite, as well as edinite/ferro-edinite and

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[1] Vermiculite, Bureau of Mines Bulletin #675, 1985.

[2] Interview on February 19, 2000 with Milton McDaniel, former supervisor at the Vermiculite Northwest / W.R. Grace vermiculite expansion plant.

[3] Interview on May 22, 2002 with Tim Groh, former employee at the Vermiculite Northwest / W.R. Grace vermiculite expansion plant.

magnesio-arfvedsnoite, as contaminants of the vermiculite from that source.[4] These silicate minerals, all belonging to the amphibole group, have a common structure consisting of silicon (Si) and oxygen (O) which combine to form chains. The chains are bound together by cations such as Calcium (Ca), Magnesium (Mg), and/or Iron (Fe), and by hydroxyl molecules (OH). The compositions of the primary amphiboles of concern in this study are as follows:

Tremolite - $Ca_2 Mg_5 Si_8 O_{22} (OH)_2$
Actinolite - $Ca_2 (Mg, Fe)_5 Si_8 O_{22} (OH)_2$
Winchite - $(Ca, Na) Mg_4 (Al, Fe^{3+}) Si_8 O_{22} (OH)_2$
Richterite - $Na (Ca, Na) Mg_5 Si_8 O_{22} (OH)_2$

Tremolite and actinolite can form a continuous mineral series in which Mg and Fe can substitute with each other while retaining the same three-dimensional crystal structure. With increased Fe content tremolite, normally a creamy white color, can take on a greenish cast.[5]

The term "Libby Amphibole" is sometimes used to describe the fibrous amphibole group of minerals found in Libby vermiculite. Among the fibrous amphibole contaminants of Libby vermiculite, only the asbestiform varieties of tremolite and actinolite are regulated by the EPA.[6] Most, if not all of, the vermiculite processed at the facility in Spokane was mined in Libby, Montana.

Health Effects of Libby Amphibole

The adverse health effects resulting from inhalation of Libby amphibole present in Libby vermiculite are well documented. Studies have shown that exposure to Libby Amphibole increases the risk of nonmalignant interstitial and pleural lung disease, lung cancer, and mesothelioma individuals working at the Libby mine and mill (occupational exposures) and individuals living in the community (no occupational exposure).[7] Internal correspondence of the W.R. Grace Construction Products Division in 1977 described an in-house study of mortality rates among ex-employees at Libby showing a risk of lung cancer five times the national average. The correspondence stated "...we have experienced asbestosis in 41.5% of the workers (with over 10 years' service) in Libby, as well as in 28% of the workers (with over 10 years' service) exposed to Libby ore in the expanding plants."[8]

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[4]U.S. Geological Survey. The Chemical Composition and Physical Properties of Amphibole from Libby Montana: A Progress Report

[5]ATSDR Toxicological Profile for Asbestos (updated), September 2001.

[6]Title 40 Code of Federal Regulations, part 763. *Asbestos* means the asbestiform varieties of: Chrysotile ...; crocidolite...; amosite ...; anthophyllite; tremolite; and actinolite.

[7]ATSDR Toxicological Profile for Asbestos (updated), September 2001.

[8]W.R. Grace correspondence dated May 24, 1977.

The EPA Region 8 site investigation conducted at the Zonolite Mine in Libby has generated a great deal of information on Libby amphibole contamination of vermiculite from that source. Further the site investigation has resulted in the determination that imminent and substantial endangerment to public health exists in Libby due to this contamination.[9]

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Available information regarding other sites which processed Libby vermiculite, sometimes referred to as "Libby Sister Sites" has also raised concern. In a recently published case reported in the American Journal of Respiratory and Critical Care Medicine, the authors described their findings after analyzing lung tissue of a former employee at a vermiculite expansion plant in California. The worker was exposed to the same fibrous amphiboles as those found in Libby while working two summers at the expansion plant. The worker died of asbestosis fifty years later.[10]

Previous Assessments at the Site

Prior to this study, the EPA Region 10 Superfund Program conducted two site visits at this facility that included sampling and analysis performed by its contractors. The first site visit occurred in April 2000 and the second occurred in September 2001. Samples collected during both visits were initially analyzed using polarized light microscopy (PLM) and transmission electron microscopy (TEM) techniques for detecting asbestos in bulk building materials. Information from these evaluations helped provide a basis for this study with respect to sampling locations.

On April 27, 2000, EPA contractors collected eight samples from locations within and around the warehouse building and the hillside northeast of the warehouse. Four of the eight samples collected revealed tremolite or actinolite when analyzed by PLM (three showed trace levels <1% and one showed levels of 2%). Samples positive by PLM were confirmed with analysis by TEM which revealed two samples having tremolite or actinolite (one showed a trace level <1% and the other showed 1.1%).[11] The locations and results of analysis for these samples are included in Appendix 1.

On September 5-6, 2001, EPA contractors collected twenty-seven samples from various locations around the warehouse building, the hillside northeast of the warehouse, and from properties located to the south and east of the site. The results of analysis showed trace levels (<1%) of tremolite/actinolite by PLM and/or TEM in nine of the samples. Analysis of two

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[9]Fibrous Amphibole Contamination in Soil and Dust at Multiple Locations in Libby Poses an Immanent and Substantial Endangerment to Public Health, Christopher P. Weis, Ph. D. July 9, 2001.

[10]Robert S. Wright, Jerrold L. Abraham, Philip Harber, Bryan Burnett, Peter Morris, and Phil West. Fatal Asbestosis 50 years after Brief High Intensity Exposure in a Vermiculite Expansion Plant. American Journal of Respiratory Critical Care Medicine, Volume 165. Pp 1145-1148, 2002.

[11]Trip Report, TDD: 00-03-0012. Ecology and Environment, Inc.

samples revealed concentrations of chrysotile asbestos at 2% and 3% by PLM. Analysis of another sample contained amosite asbestos at a concentration of 2% by PLM.[12] A map showing the locations of the samples and the analytical results is included in Appendix 2.

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Regulatory Considerations

The EPA and the Occupational Safety and Health Administration (OSHA) are the two primary federal agencies that have promulgated regulations designed to reduce potential exposure to asbestos in the environment and the workspace. EPA's regulations define asbestos containing material as having greater than 1% asbestos by weight. Air concentrations of asbestos at 0.1 fibers per cubic centimeter (f/cc) of air is the OSHA permissible exposure limit for an eight-hour work day.

EPA's response action in Libby was directed by the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and on regulations promulgated in Chapter 40 of the Code of Federal Regulations (CFR), specifically Section 300.415 which indicate it is appropriate for EPA to abate, prevent, minimize, stabilize, mitigate, or eliminate any release or threat of release of hazardous substances or pollutants and contaminants where such release results in a threat to public health or welfare of the United States or the Environment. Among the criteria used to determine if a threat exists include: Actual or potential exposure to nearby populations from hazardous substances or pollutants and contaminants; High levels of hazardous substances or pollutants or contaminants in soils at or near the surface, that may migrate; Weather conditions, such as wind, that may cause hazardous substances or pollutants and contaminants to migrate or be released; or other situations or factors that may pose threats to public health or welfare of the United States or the Environment.

Methods and Materials

In Phase I of the OEA study, EPA investigators reviewed available information and analytical data involving this site. Additional soil samples were collected for analysis using PLM and X-ray diffraction (XRD). In Phase II specimens of soil were disturbed inside a sealed workspace equipped with air monitoring filter cassettes to collect air samples that were analyzed for total asbestiform minerals. The filters were analyzed using both phase contrast microscopy (PCM) and TEM methods. Phase III involved on-site air monitoring while EPA investigators performed simulated property maintenance and excavation activities designed to disturb soil and potentially release asbestiform minerals into the air. The air filters used in Phase III were also analyzed using PCM and TEM methods.

In this study EPA investigators relied heavily on TEM analytical techniques because of its ability to detect smaller fibers and determine crystal structure and chemical composition using

[12]Vermiculite Northwest Removal Site Evaluation Trip Report, Spokane, Washington, TDD:01-07-0014. Ecology and Environment, Inc.

electron diffraction and energy dispersive x-ray analysis. Both PLM and PCM analytical techniques were used primarily for screening purposes.

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A microscopist with the Washington State Department of Ecology at the Manchester Environmental Laboratory in Port Orchard, Washington, analyzed samples by PLM and PCM. A geologist with the EPA Region 10 OEA analyzed one sample by XRD. Samples analyzed by TEM were done by Lab/Cor Inc. located in Seattle, Washington. Lab/Cor, Inc. is accredited through the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the Department of Commerce under the National Institute of Standards and Technology (NIST).[13] NVLAP accreditation certifies the laboratory has met an established level of competence. It does not guarantee the accuracy of the analytical results.

The field methods used for this study were developed by OEA and were detailed in a quality assurance project plan (QAPP) approved by chemists in the EPA Region 10 Quality Assurance and Data Unit. Modification of sampling procedures or methods described in the QAPP were documented in the project notebook.

1. Sampling Methods

Phase I

On May 22 and 23, 2002, EPA investigators collected thirteen specimens of soil from this site for analysis by PLM. Selection of locations where the specimens were collected was based on observations, review of sample analysis data from previous visits by EPA contractors, and other information provided during interviews with former W.R. Grace employees familiar with the site. Three of the soil samples were collected from under the warehouse building, either through the floor boards or through sections of a wall. Ten of the soil samples were collected from several locations around the north and east side of the warehouse, around the concrete bridge abutment, and across the hillside northeast of the warehouse. The soil samples were collected with pre-cleaned stainless steel spoons and were placed in new clean 4 ounce clear glass containers with Teflon® lids. The sample locations were documented using a global positioning system (GPS) device and entered into the project notebook. The samples were delivered under chain of custody to the Manchester Environmental Laboratory for analysis.

Several fiber bundles, suspected to be Libby Amphibole, were isolated from four of the bulk samples and washed with deionized water. The fiber bundles were then observed under a stereo microscope and hand picked for analysis by XRD. The majority of the fiber bundles appeared

[13]NVLAP criteria are published in the Code of Federal Regulations (CFR, Title 15, Part 285)

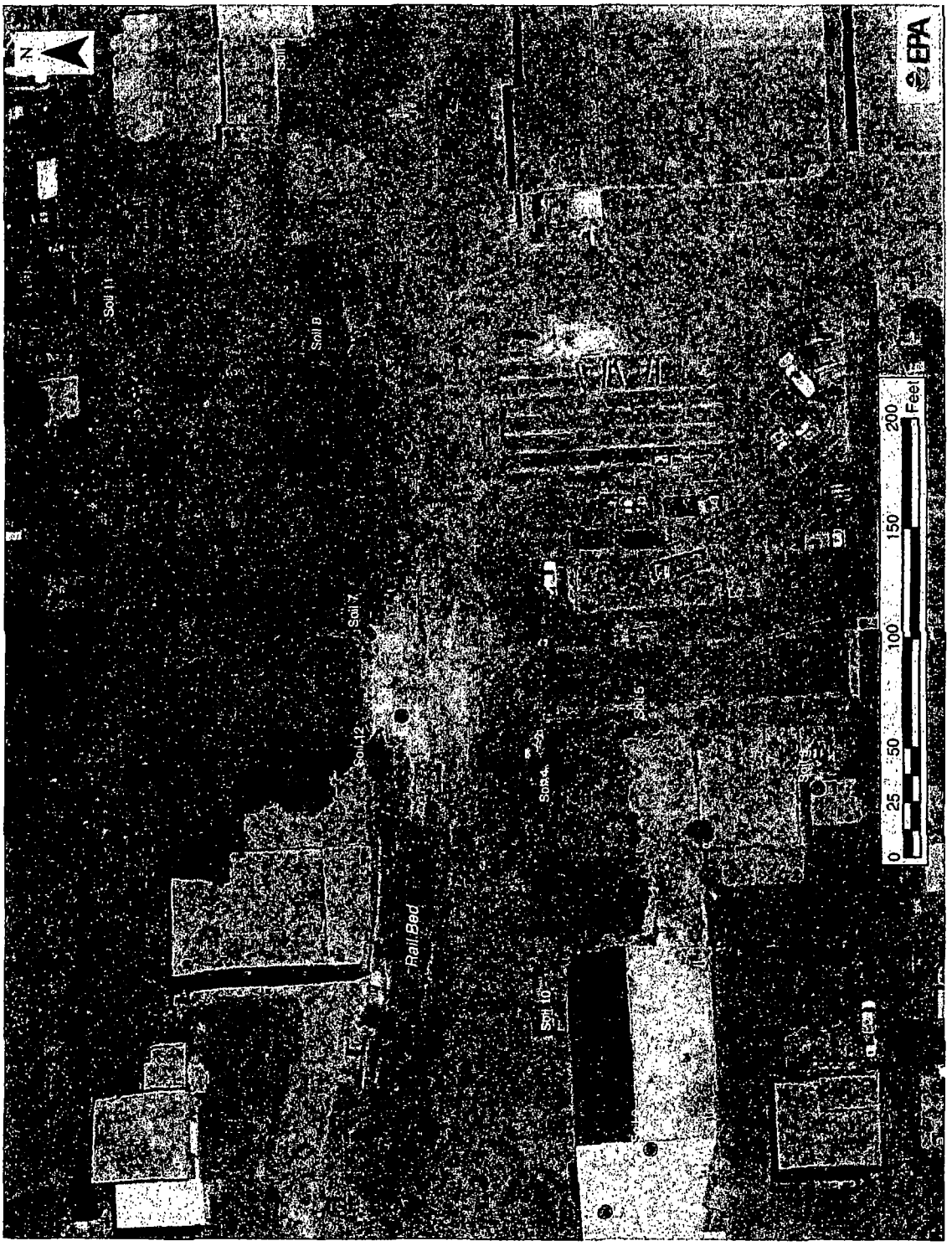

Figure 1 - Phase I and II sample locations for Soils 1 - 12. Aerial Photograph courtesy of Spokane County.

white in color but some also appeared slightly green. When pressure was applied with a steel forceps, the fiber bundles fragmented into long rigid fibers. To assure an adequate sample size (approximately 1 gram) for XRD analysis, the fiber bundles were isolated from Soils 3, 4, 5, and 10 and combined into a clean glass vial and submitted for analysis.

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Phase II

During Phase II, EPA investigators collected twelve specimens of soil which were identified as Soil(s) 1 through12. The twelve soils were excavated from five primary locations designated on the site. Ten of the specimens were collected on May 22 and 23, 2002, and two additional specimens were collected on July 16, 2002. The first location was under the warehouse building (Soil 1 and Soil 2). The second location was the north and east sides of the warehouse (Soil 3, Soil 4, Soil 5, and Soil 10). The third location was on the hillside (Soil 6, Soil 7, Soil 8, and Soil 9). The forth location was on top of the bluff (Soil 11). The fifth location was the old rail road track bed (Soil 12). Figure 1 shows and aerial photograph of the site identifying the locations of Soils 1 through 12.

Each specimen of soil consisted of approximately one cubic foot of soil, which was placed inside clean stainless steel pans. Once delivered to the Manchester Environmental Laboratory, the specimens of soil were placed in a drying oven for a period of 8-12 hours at 60° centigrade (C). After the specimens were removed from the oven, they were allowed to cool for 12 hours.

After drying, each soil specimen was placed inside a sealed work area equipped with air monitoring equipment. The soil was agitated with a stainless steel spoon for a period of several minutes to the point where airborne dust was visible. To reduce the risk of overloading the air monitoring filters, air samples from inside the work area were collected approximately 1 hour after the soil was agitated. Several of the air filters were screened using PCM to roughly estimate the degree of filter loading. Another duplicate set of samples was collected using approximately the same air flow and sampling duration as the samples which appeared optimally loaded when viewed by PCM. The duplicate samples were shipped to a contract laboratory for analysis by TEM.

The work area where the specimens of soil were agitated was inside a sealed stainless steel Kewaunee Scientific Equipment (KSE) glove box. The inside dimensions of the glove box are approximately 4 feet long by 3 feet high with a depth of 21 inches at the top and 27 inches at the bottom (approximately 680 liters). The glove box is equipped with a front glass viewing panel and fluorescent lighting to allow observation of the work area. The air inside the glove box was drawn through 25 millimeter (mm) air monitoring cassettes with 0.45 μm mixed cellulose ester (MCE) filters. The cassettes were suspended inside the glove box approximately 14 inches above the work area and were connected to two Allegro® A-100 Hi Volume sampling pumps with R-3603 Tygon® tubing. Makeup air was introduced into the glove box during sample pump operation by two sections of R-3603 Tygon® tubing. Metal clamps were closed over the tubing to keep air from escaping when the pumps were not operating.

Three types of air samples were taken for each soil sample studied. First a work area background sample was collected by drawing air through a pair of filters for approximately 30 minutes at a pump pressure between 2.5 to 3.5 liters per minute prior to putting the soil into the glove box. The samples collected during the soil agitation exercises were collected by drawing air through a pair of filters for between 12 to 24 minutes at a flow rate of 2.5 to 3.5 liters per minute. Finally, while the work area inside the glove box was being cleaned between exercises, a health and safety sample was collected outside the glove box through a filter connected to a personal pump used by the investigator. The health and safety samples were collected for approximately 30 minutes at a pump pressure of approximately 1.5 liters per minute. The glove box was cleaned with a high efficiency particle arrestance (HEPA) vacuum and washed down with de-ionized water and wiped dry with clean paper towels.

Phase III

On October 22 and 23, 2002, OEA investigators collected air samples from this site as part of the on site monitoring phase of this study. The air samples were collected with both stationary air monitors and personal air monitors at two locations, while activities designed to disturb the soil were conducted. The first location, designated location C, was on top of the bluff on the north boundary of the site. This location was recommended by the Superfund program on scene coordinator because of its close proximity to homes near the north side of the site. The second location, designated location A/B, was between the warehouse (Area A) and the rail bed (Area B). This location was selected because results of analysis for samples collected in Phase II indicated there was a significant concentration of asbestiform amphiboles in the soil. Figure 2 is an aerial photograph showing the locations of Areas A, B, and C as well as the stationary monitoring locations.

The activities performed during monitoring at location C included property maintenance tasks such as mowing, shoveling, raking, tilling, and leaf blowing. A stationary monitoring station was set up on the west side of the location and another was set up on the east side of the location.

The activity performed during monitoring at location A/B consisted of excavating a trench from east to west along the south side of the rail bed and two trenches along the north side of the warehouse. The trenches were excavated using a mid-size Kubota tractor equipped with a back-hoe, shown in Figure 3. The trenches were between 10 and 15 feet in length and approximately 2 - 3 feet in depth and approximately 1.5 and 2 feet in width. A leaf blower was used to simulate wind during this activity, and was also helpful in drying out the damp soil.

The ambient air at both monitoring stations at locations C and A/B was drawn through 25 millimeter (mm) air monitoring cassettes with 0.45 micrometer (μm) mixed cellulose ester (MCE) filters. The cassettes were suspended approximately 4 feet above the ground and were connected to Allegro®A-100 Hi Volume sampling pumps with R-3603 Tygon® tubing. The pumps were

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Figure 2 - Phase III monitoring Areas A, B, and C. Aerial photograph courtesy of Spokane County.

calibrated before and after the sampling using a Gilibrator ® electronic micro processor controlled calibration unit equipped with high flow cell capable of measuring 2 to 30 liters of air/minute.

Figure 3 Personal air monitoring during Phase III excavation at area A/B. Photograph by David Terpening.

One EPA worker operated the power equipment while observers roamed inside the locations and around the perimeter. The worker operating the power equipment wore two personal Gilian HFS-513 air sampling pumps connected with R-3603 Tygon® tubing to either 0.45 μm MCE filters for TEM analysis or 0.8 μm MCE filters for PCM analysis. The observers wore a single Gilian HFS-513 air sampling pump connected with R-3603 Tygon® tubing to a 0.45 μm MCE filter for TEM analysis. The personal monitoring pumps were calibrated before and after the sampling using a Gilibrator ® electronic micro processor controlled calibration unit equipped with a standard flow cell capable of measuring 20 cc to 6 liters of air per minute.

2. Analytical Methods

Asbestiform Fibers by PLM

The soil samples collected during Phase I were analyzed by PLM by Susan Davis of the Washington State Department of Ecology. The method of analysis used was titled Standard Operating Procedure for the Screening Analysis of Soil and Sediment Samples for Asbestos Content SOP: EIA-INGASED2.SOP dated 1/11/99.[14] The analysis involved placing aliquots of the soil samples into a test tube, adding water, then agitating. The contents of the test tube are

[14]Method developed in Boston by Scott Clifford, a chemist with the Investigations and Analysis Unit, OEME U.S. EPA Region I.

poured through a 3-inch inside diameter 60 mesh sieve and the material left on the sieve is transferred to a plastic dish. Then the samples were dried and viewed with a stereo microscope to identify fiber bundles for analysis by PLM.

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Fiber bundles were mounted in 1.605 refractive index oil and analyzed using a Nikon Optiphot Pol microscope at 400X magnification. Straight needle-like fibers, identified as possible asbestos, were checked for diagnostic optical properties such as angle of extinction, sign of elongation, and central stop dispersion staining.

Libby Amphibole by XRD[15]

A specimen was dis-aggregated and lightly crushed to reduce the grain size, using a mortar and pestle, under a hood. Isopropanol was used to prevent modification of the crystal structure during crushing. An XRD mount was prepared by using an eyedropper to place part of the isopropanol slurry with entrained specimen onto a quartz plate and allowed to dry. The XRD mount was also examined by optical microscopy.

Mineral identification was conducted using EPA Region 10 Method XRD-QL for Compound Identification by X-ray Diffraction Analysis. Mineral identification was made by comparison with reference samples and with the Powder Diffraction File (PDF) maintained by the International Centre for Diffraction Data (ICDD).

Total Asbestiform Fibers by PCM and TEM

PCM[16]

Samples obtained during Phases II and III were screened at the Manchester Environmental Laboratory to determine appropriate particulate loading of the filters. The method used is entitled Asbestos by PCM NIOSH 7400.[17]

The filters were prepared by cutting wedges with a surgical steel knife and placing the wedges, particulate side up, on clean glass microscope slides. The slides were then placed into an aluminum hot block and 250 micro liters (μL) of acetone were injected into the inlet port of the hot block which collapses the filter wedges. Then 3-5 μL of triacetin was placed on the filter wedges to fix them to the slides and cover slips were applied. The slides were viewed under Nikon phase contrast microscope at 400X magnification.

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[15]Memo dated 1/30/03 from Dr. David Frank, EPA Region 10 Risk Assessment and Evaluation Unit.

[16]Susan Davis, Microscopist, Washington State Department of Ecology

[17]Asbestos and other fibers by PCM Method 7400 NIOSH Manual of Analytical Methods, Fourth Edition, 8/15/94.

Fibers viewed under PCM were sized using a Walton-Beckett graticule as reference. Only fibers greater than 5.0 µm with a length to width (aspect) ratio of greater that 3:1 were counted.[18] Fiber density is reported by MEL in fibers per square millimeter (f/mm^2). This value has been converted to f/cc for this report.[19]

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TEM[20]

Air monitoring samples collected during Phase II and personal monitoring samples collected during Phase III were analyzed under contract by Lab/Cor, Inc. using the NIOSH 7402 method for asbestos by TEM.[21] In accordance with that analytical method, the sample filters were collapsed in acetone, carbon coated at high vacuum with a thin layer of carbon, and placed on a 200 mesh copper TEM grids and allowed to dissolve in acetone until cleared of filter debris. The analysis was performed with a Philips 410 transmission electron microscope equipped with an EDAX PV9800 X-ray analyzer. The samples were scanned at a magnification of approximately 990X using an accelerating voltage of 100 KV. The magnification was increased to about 10,000X for structure sizing.

Fibers viewed under TEM using the NIOSH 7402 method are counted if they are greater than 5.0 µm in length with an aspect ratio greater that 3:1. Fiber density is reported as f/cc.

For stationary monitoring samples, analysis was done using the ISO 10312 method for direct identification of asbestos in airborne samples.[22] This analysis is similar to the NIOSH 7402 method. Generally the fibers are counted if they are greater than 5.0µm in length with an aspect ratio greater that 5:1. The ISO 10312 method also allows for counting PCM equivalent fibers with an aspect ratio of 3:1 or greater, which are longer than 5.0 µm and with a diameter between 0.2 and 3.0 µm. Fiber density is reported as f/cc.

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[18]The **3:1 aspect ratio** is also included in the EPA reference method published in 40 CFR Part 763.121 appendix A.

[19]Fibers/cc = f/mm^2 x 385 mm^2 divided by V (the average flow rate x sample duration) x 1000.

[20]John Harris, Lab/Cor, Inc., Seattle, Washington

[21]Asbestos by TEM Method 7402 NIOSH Manual of Analytical Methods, Fourth Edition, 8/15/94.

[22]Ambient Air-Determination of asbestos fibres-Direct-transfer transmission electron microscopy method. ISO 10312, First edition 1995-05-01.

Results of Analysis

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Phase I Samples

During OEA's general survey of this site, accumulations of what appeared to be vermiculite concentrate were observed in the soil at several locations on the north and east side of the warehouse in the soil between 7 inches and 14 inches in depth. The suspected vermiculite concentrate observed in the soil appeared as black to dark grey colored irregular plates approximately 0.25 to 0.5 inches in diameter. White colored fragments of a fibrous mineral were observed in soils where the suspected vermiculite concentrate was found as shown in Figure 4.

Figure 4 Weathered vermiculite concentrate and a white colored bundle of fibrous mineral later identified by XRD as amphibole. Photomicrograph by Jed Januch.

It was evident that over time, fill material was applied to several locations within the site. Also the roads running through the site were maintained with a road grader. In addition, OEA investigators observed a fine light brown to grey colored layer of material believed to be weathered ash from the 1980 eruption of Mount Saint Helens above the layer of vermiculite concentrate at a depth of approximately 14 inches located on the north side of the warehouse.

During OEA's initial survey, fourteen soil samples were collected and eleven were analyzed using PLM. Eight samples showed the presence of one or more types of asbestos. Minerals identified included tremolite, actinolite, amosite and anthophyllite. The minerals winchite and richterite were not reported, although these minerals may be present as well.

The PLM analysis in Phase I was intended to aid in the identification of areas where asbestos and other fibrous minerals may have been present. The analysis was not intended to quantify the amounts of asbestos present. Results of analysis for the samples analyzed in Phase I are included in Appendix 3.

Fiber bundles, such as those shown in Figure 5, were isolated from soil samples collected during Phase I and were analyzed by XRD. The analysis of these fiber bundles revealed the diffraction pattern was most similar to that of the sodium bearing tremolite, richterite, winchite, and actinolite group of amphiboles. The diffraction pattern was also compared to a fibrous sample of amphibole mineral obtained from Libby, Montana, and was found to be similar. In addition to the amphiboles, a minor amount of vermiculite and trace amounts of biotite, talc, and calcite were detected in this sample. A narrative report of analysis from Dr. David Frank is included in Appendix 4.

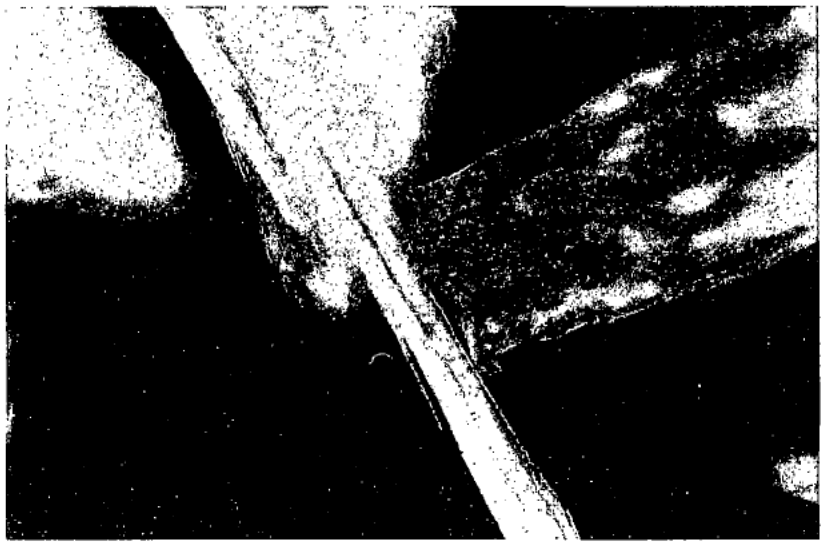

Figure 5 Bundles of amphibole isolated from the Spokane site viewed at 20X with a Stereo Microscope. Photomicrograph by Jed Januch.

Phase II Samples

The data obtained during Phase II demonstrates that if disturbed, most of the soil collected from this site emitted asbestiform amphibole fibers under laboratory conditions. The artificial conditions including decreased soil moisture content and air sampling within an experimental enclosure should be considered when comparing the data to regulatory standards or exposure levels.

Analysis of air samples taken during disturbance of Soil 1 revealed the greatest variety and number of total asbestiform minerals. The majority of fibers identified in Soil 1 were chrysotile and amosite, although actinolite, tremolite, and winchite were also present. The fiber concentration for these samples ranged between 8.861 to 9.404 f/cc for asbestos and between 1.309 and 1.600 f/cc for winchite. Samples taken during disturbance of Soil 1 were exceptionally time consuming to analyze due to the large number of fibers that needed to be counted. Based on the difficulty experienced with Soil 1, EPA investigators decided not to collect air samples for Soil 2.

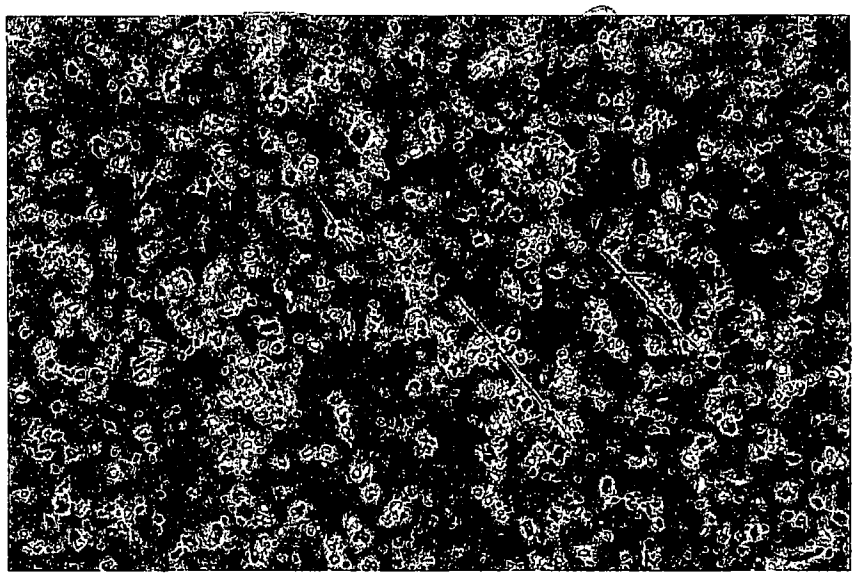

Figure 6 Fibers from Soil 12 observed with PCM at 400X magnification. Photomicrograph by Jed Januch.

Analysis of samples taken during disturbance of Soil 3, 4, 10, and 12 revealed a number of fibers consisting mostly of Libby Amphibole. Fiber concentrations ranged between 0.283 and 2.182 f/cc asbestos and between 0.540 and 4.364 f/cc winchite. In addition, one sample taken during disturbance of Soil 12 showed a fiber concentration of 0.025 f/cc for the mineral richterite.

Analysis of air samples taken during disturbance of Soils 5, 6, and 7, revealed lower levels of asbestiform Libby Amphibole. The fiber concentrations ranged between 0.025 and 0.079 f/cc asbestos and between 0.050 to 0.252 f/cc winchite.

Analysis of air samples taken during disturbance of Soil 8 revealed only one sample having Libby Amphibole present at a fiber concentration of 0.051 f/cc. The other air sample revealed none detected. Both samples resulting from disturbance of Soil 9 revealed none detected.

Analysis of air samples taken during disturbance of Soil 11 revealed between 0.131 and 0.159 f/cc tremolite and actinolite asbestos and between 0.079 and 0.131 f/cc winchite.

No Libby Amphibole, amosite, or chrysotile fibers were detected in any of the work area background samples or the health and safety samples collected during Phase II of this study. Analysis of one health and safety sample obtained when specimens were collected from under the warehouse in Phase I revealed 0.008 f/cc of asbestos and 0.016 f/cc of winchite.

Table 1- Phase II - Airborne fiber concentrations associated with soil disturbance under experimental conditions.
Ac = Actinolite, Tr = Tremolite, Chry = Chrysotile, Am = Amosite,

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Description	Sample Number	Sample collection - Duration (D) - Air Volume (AV)	Total Asbestiform Minerals f/cc Libby Amphiboles plus Amosite and Chrysotile	Minerals Detected	Fibers/cc
Soil 1 Under Warehouse GPS file Q052223a	02244010	D= 15 min AV=2964 cc/min	10.461	Ac, Tr, Am, Chry	8.861
				Winchite	1.600
	02244011	D= 15 min AV= 3065 cc/min	10.713	Ac, Tr, Am, Chry	9.404
				Winchite	1.309
Soil 3 Concrete Pad GPS file Q05315b	02264106	D= 12 min AV= 3034 cc/min	6.546	Ac, Tr, Am	2.182
				Winchite	4.364
	02264107	D= 12 min AV= 3051 cc/min	4.933	Ac, Tr, Am, Chry	1.683
				Winchite	3.250
Soil 4 Area A GPS file Q052223a	02244050	D= 12 min AV= 3003 cc/min	4.818	Ac, Tr	1.286
				Winchite	3.532
	02244051	D= 12 min AV= 3004 cc/min	5.624	Ac, Tr, Chry	2.062
				Winchite	3.562
Soil 5 East edge of Concrete Pad GPS file Q052316a	02244056	D= 12 min AV= 3032 cc/min	0.315	Ac, Tr	0.063
				Winchite	0.252
	02244057	D= 12 min AV = 3033 cc/min	0.205	Ac, Tr	0.079
				Winchite	0.126

Description	Sample Number	Sample collection - Duration (D) - Air Volume (AV)	Total Asbestiform Minerals f/cc Libby Amphiboles plus Amosite and Chrysotile	Minerals Detected	Fibers/cc
Soil 6 West of Concrete Bridge Abutment GPS file Q052318a	02324660	D= 12 min AV= 3123 cc/min	0.153	Ac, Tr	0.051
				Winchite	0.102
	02324661	D= 12 min AV= 3012 cc/min	0.158	Ac, Tr	0.079
				Winchite	0.079
Soil 7 Hillside GPS file Q052318b	02284404	D= 12 min AV= 3310 cc/min	0.096	ND	ND
				Winchite	0.096
	02284405	D= 12 min AV= 3323 cc/min	0.136	Ac, Tr	0.068
				Winchite	0.068
	02284406	D= 24 min AV= 3164 cc/min	0.075	Ac, Tr	0.025
				Winchite	0.050
Soil 8 Hillside GPS file Q052320a	02324654	D= 12 min AV= 3140 cc/min	0.051	Ac, Tr	0.051
				ND	ND
	02324655	D= 24 min AV= 3054 cc/min	ND	ND	ND
				ND	ND
Soil 9 Hillside GPS file Q052320b	02274104	D= 12 min AV= 3159 cc/min	ND	ND	ND
				ND	ND
	02274105	D= 24 min AV= 3150 cc/min	ND	ND	ND
				ND	ND

Draft

Description	Sample Number	Sample collection - Duration (D) - Air Volume (AV)	Total Asbestiform Minerals f/cc Libby Amphiboles plus Amosite and Chrysotile	Minerals Detected	Fibers/cc
Soil 10 Area A GPS file Q052315a	02274111	D= 12 min AV= 3096 cc/min	0.823	Ac, Tr	0.283
				Winchite	0.540
	02274112	D= 24 min AV= 3056 cc/min	1.277	Ac, Tr	0.417
				Winchite	0.860
Soil 11 Area C GPS file Q082622b	02294305	D= 12 min AV= 3051 cc/min	0.262	Ac, Tr	0.131
				Winchite	0.131
	02294306	D= 24 min AV= 3008 cc/min	0.238	Ac, Tr	0.159
				Winchite	0.079
Soil 12 Area B GPS file Q082622a	02314604	D= 12 min AV= 3132 cc/min	1.525	Ac, Tr	0.712
				Winchite	0.788
				Richterite	0.025
	02314605	D= 24 min AV= 3125 cc/min	2.186	Ac, Tr	0.933
				Winchite	1.253

Draft

Data tables and raw data produced by Lab/Cor, Inc. for analysis of samples collected in Phase II are included in Appendix 5.

Figure 7 Winchite fiber on an air filter used to monitor Soil 12 in Phase II viewed by TEM. Photomicrograph by Lab/Cor, Inc.

Phase III Samples

On-site air monitoring samples were collected by investigators on October 22 and 23, 2002. For both Area C and Area A/B one monitoring station was located to the west of the work area and another monitoring station was located on the east side of the work area. The prevailing winds in this area are normally out of the southwest. However during the sampling period, the direction and velocity of the winds fluctuated. It was also noted the surface layer of soil at Location C was somewhat dry but became rather moist below a depth of approximately three to four inches. Similarly, the soil below the gravel layer at location A/B was also rather moist.

The on-site monitoring phase of this study demonstrates that if disturbed, soil at all three locations tested at this site will emit asbestiform Libby Amphibole. By performing simulated property maintenance and excavation tasks on two areas of this site, investigators were able to release measurable amounts of asbestiform amphibole fibers that were captured in some of the area monitors primarily down wind of the activities or in some of the personal monitors worn by EPA workers.

Table 2. Phase III - Personal Monitor Sample Analysis Results showing levels detected by PCM and TEM
(9 detects of 18 personal monitoring samples collected)

Draft

Description	Sample No.	Location	Activity	Sample collection - Duration (D) - Air Volume (AV)	PCM fibers/cc	TEM fibers/cc
Soil #11	02434357	Area C on top of bluff	Observer Equipment operator - roto till	D= 60 minutes AV= 1.5 liters/minute	0.25	NA
Soil #11	02434363	Area C on top of bluff	Equipment operator - leaf blower	D= 60 minutes AV= 2.5 liters/minute	0.11	ND
Soil #11	02434366	Area C on top of bluff	Observer	D= 60 minutes AV= 2.3 liters/minute	0.16	ND
Soil #12	02434370	Area A/B - rail bed	Equipment operator - leaf blower	D= 40 minutes AV= 2.5 liters/minute	NA	0.010
Soil #12	02434372	Area A/B - rail bed	Observer	D= 40 minutes AV= 2.2 liters/minute	0.02	ND
Soil # 4, 10	02434375	Area A/B - north of warehouse	Observer	D= 72 minutes AV= 2.4 liters/minute	NA	0.033
Soil # 4, 10	02434376	Area A/B - north of warehouse	Equipment operator - leaf blower	D= 71 minutes AV= 1.5 liters/minute	0.16	0.045
Soil # 4, 10	02434377	Area A/B - north of warehouse	Observer	D= 45 minutes AV= 1.5 liters/minute	NA	0.014
Soil # 4, 10	02434379	Area A/B - north of warehouse	Equipment operator - backhoe	D= 72 minutes AV= 2.4 liters/minute	0.04	NA

ND = Not Detected
NA = Not Analyzed
NV = No Value

For the two areas studied (Area C and Area A/B), the one which shows the greater potential for fibers to be released during soil disturbance is between the warehouse and the rail bed (Area A/B). The disturbance of soil at the area on top of the bluff (Area C) showed fibers were released to a much lesser extent.

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A total of 32 samples were collected during the on-site monitoring in Phase III. Of these, 12 were personal air monitoring samples for TEM analysis, 6 were personal air monitoring samples for PCM analysis, 7 were area monitoring samples (6 analyzed by TEM and 1 analyzed by PCM) and 7 samples were taken for quality assurance background and blank samples. To allow for comparison of results between TEM and PCM analytical techniques, 5 samples were analyzed using both PCM and TEM.

Analysis of air samples from personal monitors worn by investigators performing property maintenance tasks at Area C using TEM revealed no asbestiform minerals. Analysis by PCM revealed fibers in three air samples from personal monitors. The fiber concentration was between 0.11 f/cc and 0.25 f/cc by PCM. TEM analysis of the air sample collected from the east stationary monitor revealed four total asbestos fibers, one chrysotile, one amosite, and two actinolite in the fields analyzed. One chrysotile fiber was found on the air sample filter from the west stationary monitor.

Analysis of air samples from personal monitors worn by investigators performing excavation tasks in area A/B revealed actinolite and winchite in three samples. The fiber concentrations were between 0.010 and 0.018 f/cc for asbestos and between 0.010 and 0.027 f/cc for winchite. Analysis by PCM revealed fibers in three air samples from personal monitors. The fiber concentration was between 0.02 f/cc and 0.16 f/cc by PCM. Analysis of the air sample filter collected from the area A/B east stationary monitor revealed two actinolite fibers and one winchite fiber using the ISO 10312 method.

Data tables and raw data produced by Lab/Cor, Inc. for analysis of samples collected in Phase III are included in Appendix 6. Data for the samples analyzed by PCM in Phase III are included in Appendix 7.

Fiber Morphology and Chemistry

With multiple analytical techniques employed during this study, OEA had the opportunity to view samples contaminated with Libby Amphiboles under different types of microscopes. The images captured under the stereo microscope, the PLM, the PCM, and the TEM clearly showed fibers which exhibit an acicular, or needle-like shape, such as those shown in photomicrographs in Figures 5, 6, 7, and 8.

The standard (length/width) aspect ratio for the methods used in this study is 3:1 and only fibers over 5.0μm in length are counted. Because of differing opinions expressed in published literature regarding the appropriateness of EPA's use of the 3:1 aspect ratio, OEA investigators

reviewed the results of analysis of samples collected in Phase II and the personal monitoring samples collected in Phase III and analyzed by TEM. Using the average length and width of the fibers counted, investigators determined that approximately 52 % of the total asbestiform mineral fibers had an aspect ratio of ≥20:1. In addition, approximately 15 % of the fibers counted were ≥20 μm in average length.

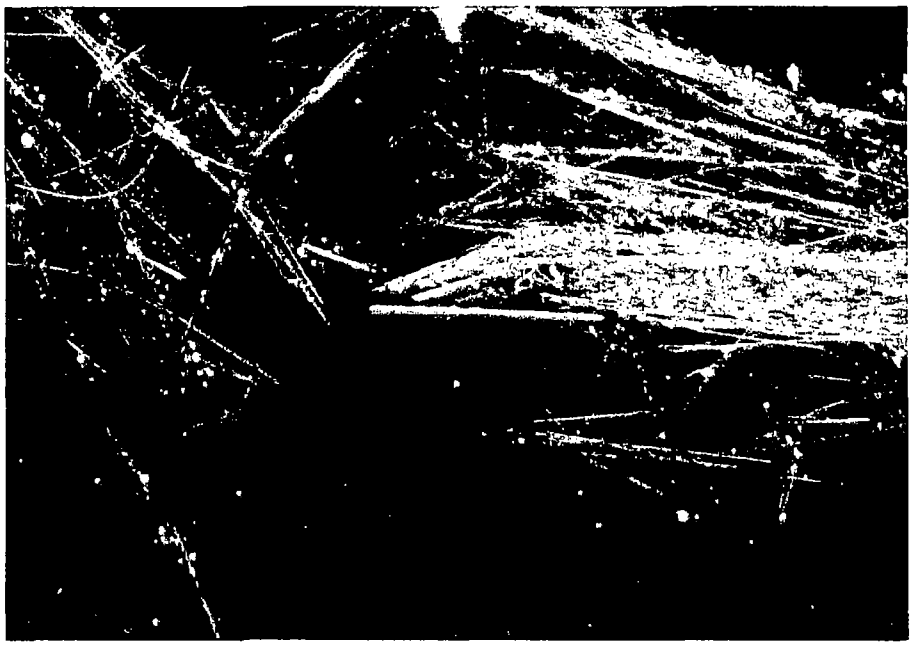

Figure 6 Bundles of fibrous amphibole (identified as tremolite) viewed at 400X by PLM Dispersion Staining Objective in 1.605 refractive index liquid. Photomicrograph by Jed Januch.

The chemical composition of the fibrous amphibole minerals are consistent with published chemical composition of amphiboles found in Libby vermiculite. Table 3 shows representative examples of the weight percent oxide of elements identified in asbestiform Libby Amphiboles detected in samples analyzed for this study.

Analysis of samples collected in Phases II and III of this study revealed that winchite was the predominant mineral detected, followed by actinolite. At least 53% of fibers detected were identified as winchite. Far less common were richterite fibers, which comprised less than 1% of the fibers detected. The 47% remaining fibers detected were regulated asbestos; actinolite, tremolite, amosite, and chrysotile. Of the 47% portion of fibers, 29% of those were chrysolite detected in Soil 1 almost exclusively.

Table 3. Examples of weight percent oxides for Libby Amphiboles analyzed for this study.

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EPA Sample Number: Mineral: Grid # Structure #	02434375 Actinolite 2 1	02434377 Winchite 15 2	02314604 Richterite 38 2	02274111 Tremolite 22 1
Oxide of:	Wt%	Wt%	Wt%	Wt%
Si	60.268	54.28	61.116	63.842
Al	0	2.81	0.515	N/A
Ti	0	0	0.368	0.037
Cr	0.171	0	0.221	0.215
Fe	8.115	8.0	7.299	3.381
Mg	20.585	18.064	17.269	19.240
Mn	0	0	0.172	0.182
Ca	8.419	7.535	5.314	12.009
Na	0.884	2.8	6.970	N/A
K	1.559	0.87	0.756	1.094

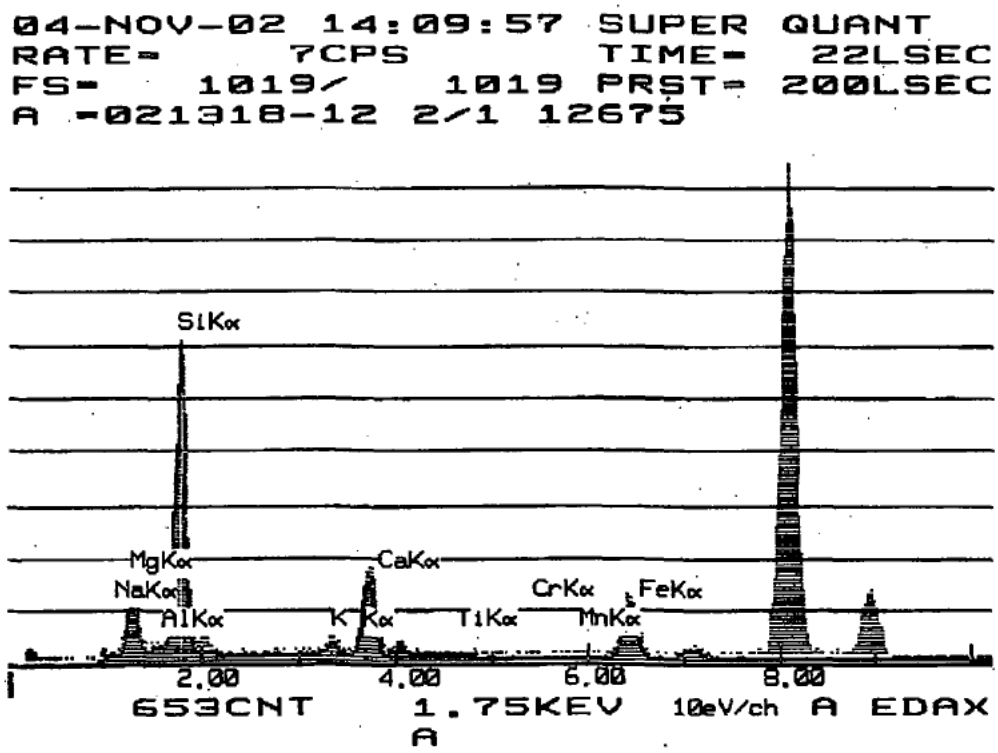


Figure 9 - An example of an Energy Dispersive X-Ray Spectrum for a fiber identified by Lab/Cor, Inc. as Actinolite in EPA sample 02434375.

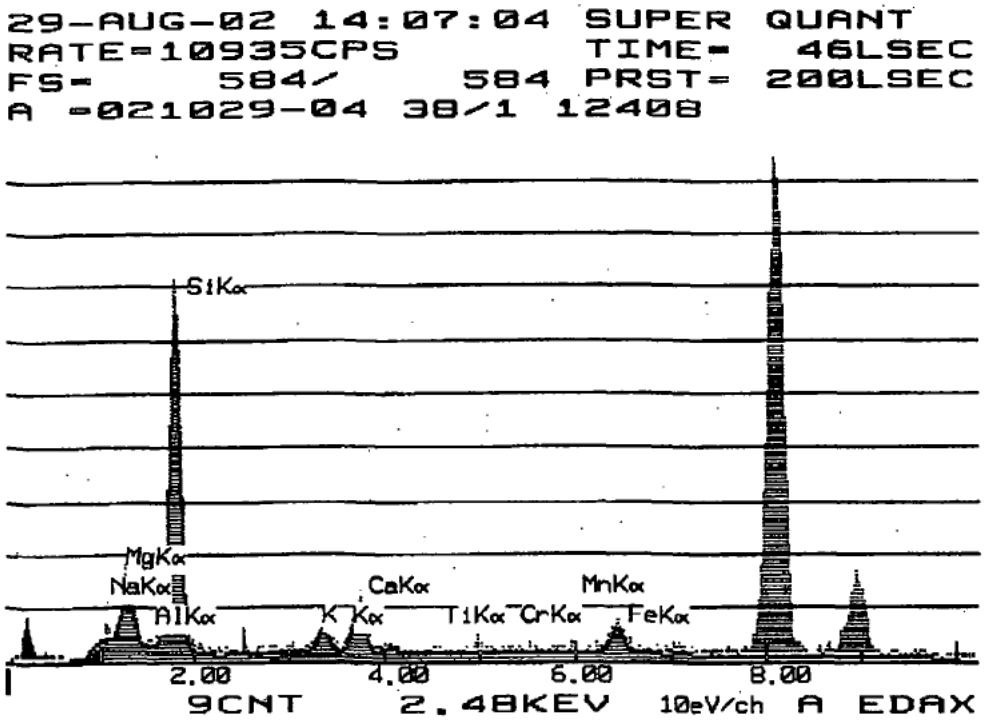


Figure 10 - An example of an Energy Dispersive X-Ray Spectrum for a fiber identified by Lab/Cor, Inc. as Winchite in EPA sample 02314064.

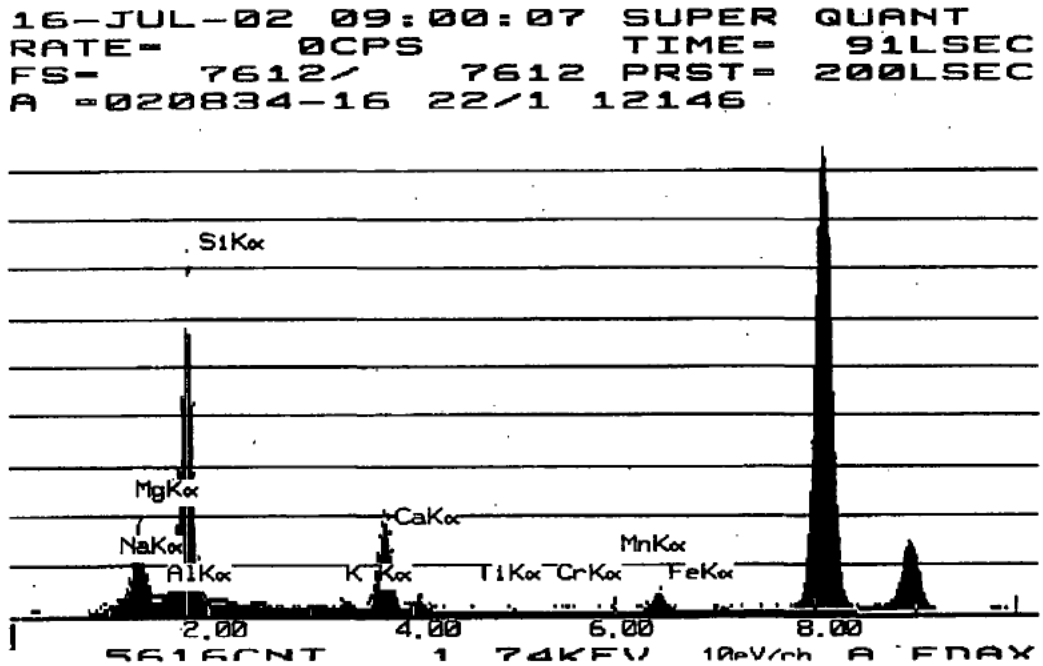


Figure 11 - An example of an Energy Dispersive X-Ray Spectrum for one of the fibers identified by Lab/Cor, Inc. as Tremolite detected in EPA sample 02274111.

Risk Analysis

Data from analysis of samples collected at this site during Phases II and III was used by Julie Wroble, an OEA toxicologist, to perform a risk analysis for potential future on-site residents and workers. Note that this analysis does not address residents that currently live adjacent to the site because no samples were collected from their homes or yards. Using standard conservative assumptions about inhalation rates, exposure frequency and exposure duration, the data suggest elevated risks to these receptors. The physical characteristics (length and diameter) of the Libby Amphibole identified in samples analyzed for this study likely contribute to greater toxicological potency and therefore greater risk than reflected in EPA's current inhalation unit risk value.

While the risk of exposure to Libby Amphibole from this site may be minimized if the soil is left undisturbed, the potential for risk of exposure would likely increase if contaminated soil is exposed to the air through excavation or wind erosion. A copy of the Risk Analysis performed by Julie Wroble is included in Appendix 8.

Conclusion

Soil samples obtained from several locations at the former Vermiculite Northwest / W.R. Grace and Company vermiculite expansion plant in Spokane, Washington, were tested by EPA and found to be contaminated with Libby Amphibole. When agitated under experimental conditions, several soils released significant concentrations asbestiform Libby Amphibole into the

air. Analysis of air samples collected during small scale simulated property maintenance and excavation tasks performed by EPA investigators also revealed the presence of airborne Libby Amphibole fibers, although as predicted, the detectable concentrations were far less, probably due in part to moist soil conditions. The detection of airborne Libby Amphibole fibers under both experimental and simulated field conditions suggests the asbestos contaminated soil at this site may pose a potential health hazard under certain circumstances.

Appendix 1

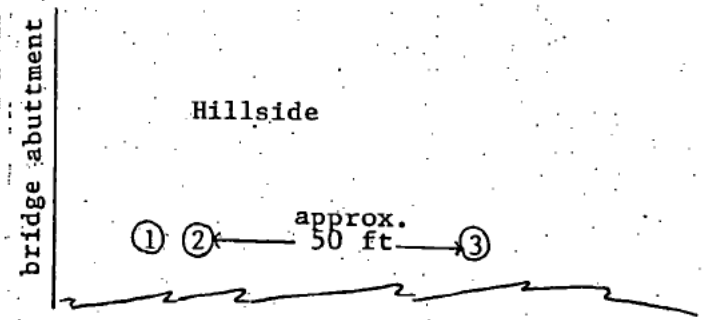
FORMER VERMICULITE NORTHWEST INC.
SPOKANE, WASHINGTON

Sample ID	00080410		00080411		00080412		00080413		00080414		00080415		00080416		00080417	
Location ID	SS-1		SS-2		SS-3		SS-4		SS-5		SS-6		SS-7		SS-8	
Sample Date	04/27/00		04/27/00		04/27/00		04/27/00		04/27/00		04/27/00		04/27/00		04/27/00	
Percentage	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM
Total Asbestos	NAD	TR	NAD	TR	NAD	TR	TR	TR	2	1.1	NAD	TR	NAD	NAD	NAD	NAD
Chrysotile	NAD	TR	NAD	TR	NAD	TR	NAD	TR	TR	TR	NAD	TR	NAD	NAD	NAD	NAD
Amosite	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA
Crocidolite	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA
Tremolite-Actinolite	NAD	NAD	NAD	TR	NAD	NAD	TR	TR	2	1.1	NAD	TR	NAD	NAD	NAD	NAD
Mineral Wool	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	2	NA	NAD	NA	NAD	NA
Fiberglass	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA
Organic	TR	12	TR	12.4	TR	3.9	TR	25.5	NAD	5.8	NAD	13	NAD	7.2	90	92.7
Synthetic	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA	NAD	NA
Acid Soluble	NA	4.2	NA	5.7	NAD	3.5	NA	2.3	NA	4.8	NA	12.6	NA	2.1	NA	2.1
Other	TR	83.7	TR	81.8	NAD	92.5	NAD	71.7	NAD	88.3	NAD	74.2	NAD	90.7	NAD	5.1
Particulate	100	NA	100	NA	100	NA	100	NA	98	NA	98	NA	100	NA	10	NA

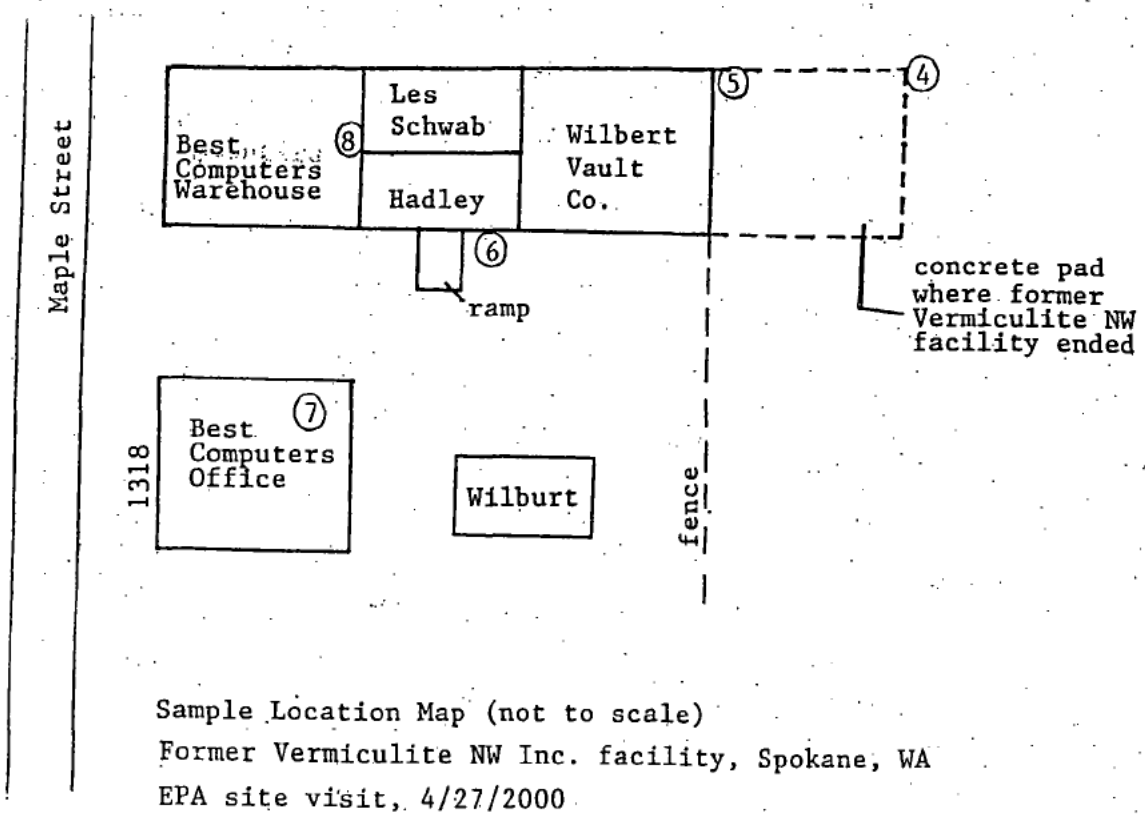
Note: Bold type indicates concentrations above sample detection limits.
Only analytes that were detected in at least one method were reported.

Key:

ID = Identification.
NA = Not applicable.
NAD = No asbestos detected.
PLM = Polarized light microscopy (National Institute for Occupational Safety and Health Method 9002).
TEM = Transmission electron microscopy (as described in EPA 600/R-93/116).
TR = Trace equals less than 1 percent of this component.

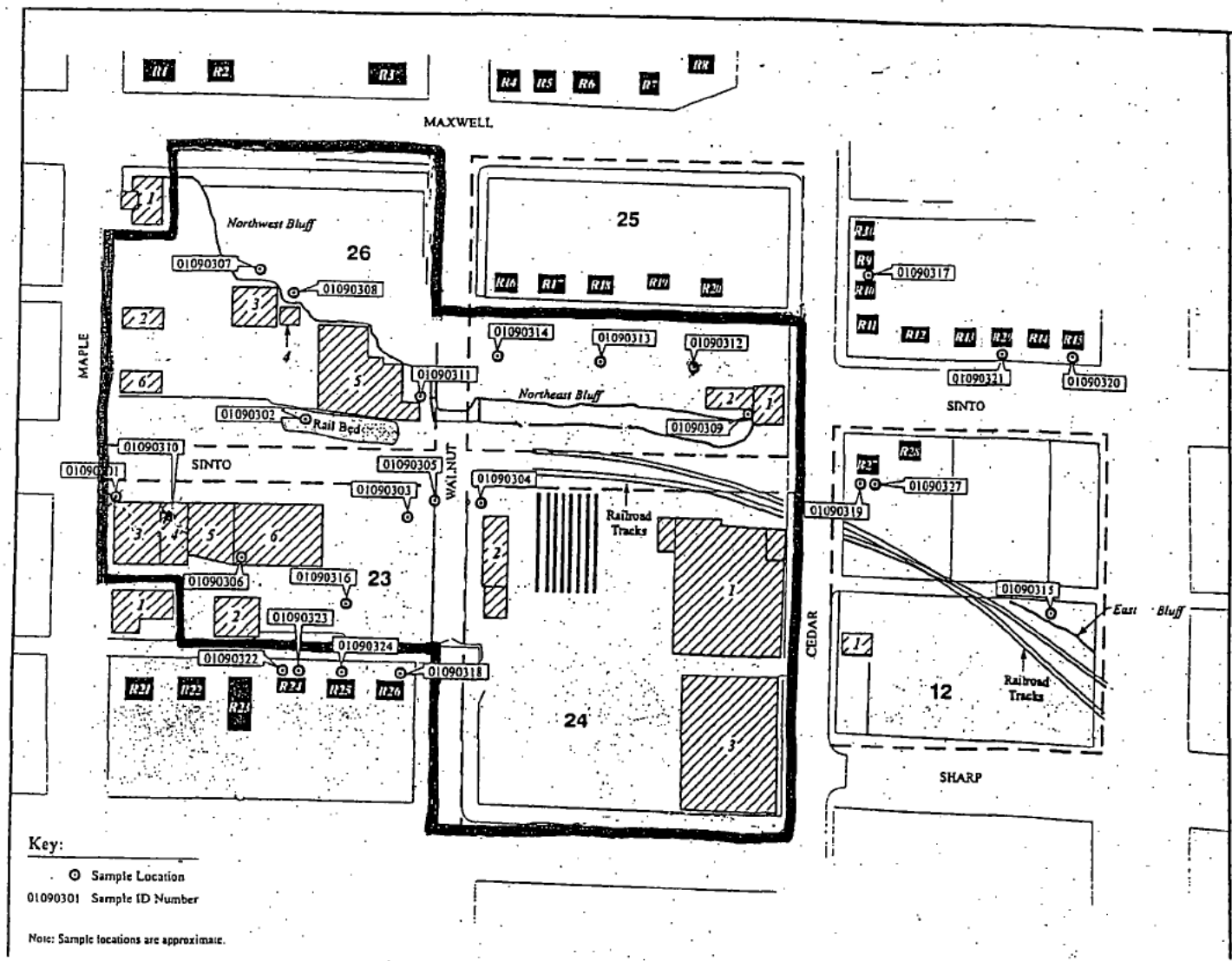


Wilburt Vault Co.



Sample Location Map (not to scale)
Former Vermiculite NW Inc. facility, Spokane, WA
EPA site visit, 4/27/2000

Appendix 2



INDEX TO BUILDINGS

BLK #	BUILDING #	DESCRIPTION
26	1	Office
26	2	Quonset Hut
26	3	Shop
26	4	Office
26	5	Warehouse
26	6	Loading Dock
23	1	Office
23	2	Shop
23	3	Warehouse A
23	4	Warehouse B
23	5	Warehouse C
23	6	Warehouse D
23	R21	Residence 1
23	R22	Residence 2
23	R23	Residence 3
23	R24	Residence 4 (b) (6) Residence)
23	R25	Residence 5 (b) (6) Residence)
23	R26	Residence 6 (b) (6) Residence)
24	1	Warehouse A
24	2	Storage Shed
24	3	Warehouse B
25	1	Office
25	2	Garage
25	R16	Residence 1 (b) (6) Residence)
25	R17	Residence 2
25	R18	Residence 3
25	R19	Residence 4
25	R20	Residence 5
12	1	Rebar Shed
12	R27	Residence 1 (b) (6) Residence)
12	R28	Residence 2

BUILDINGS NORTH OF BLOCK 26, NORTH AND EAST OF BLOCK 25

R1	Residence 1	R10	Residence 10
R2	Residence 2	R11	Residence 11
R3	Residence 3	R12	Residence 12
R4	Residence 4	R13	Residence 13
R5	Residence 5	R14	Residence 14
R6	Residence 6	R15	Residence 15 (b) (6) Residence)
R7	Residence 7	R29	Residence 29
R8	Residence 8	R30	Residence 30
R9	Residence 9		

- 15 SAMPLES W/IN FENCE
- 10 SAMPLES OUTSIDE FENCE

9/26/01

Table 1

ASBESTOS SAMPLE ANALYTICAL RESULTS
VERMICULITE NORTHWEST REMOVAL SITE EVALUATION
SPOKANE, WASHINGTON

Sample ID	01090301		01090302		01090303		01090304		01090305		01090306	
Location ID	ON-01-SS		ON-02-SS		ON-03-SS		ON-04-SS		ON-05-DR		ON-06-SS	
Sample Date	9/5/01		9/5/01		9/5/01		9/5/01		9/5/01		9/5/01	
Appearance	Brown/Gray Fibrous Homogeneous		Brown/Gray Fibrous Homogeneous		Brown/Gray Fibrous Homogeneous		Brown/Gray Fibrous Homogeneous		Various Fibrous Homogeneous		Brown Fibrous Homogeneous	
Percent Type	**PLM**	**TEM**	**PLM**	**TEM**	**PLM**	**TEM**	**PLM**	**TEM**	**PLM**	**TEM**	**PLM**	**TEM**
Chrysotile	<1%	-	<1%	-	ND	-	-	-	ND	-	-	0.66%
Amosite	2%	-	<1%	-	ND	-	-	-	ND	-	-	-
Tremolite-Actinolite	-	-	-	-	ND	-	<1%	-	ND	-	<1%	<0.1%
Mineral Wool	-	-	-	-	-	-	-	-	-	-	5%	-
Cellulose	13%	-	5%	-	2%	-	5%	-	5%	-	-	-

Table 1

ASBESTOS SAMPLE ANALYTICAL RESULTS
VERMICULITE NORTHWEST REMOVAL SITE EVALUATION
SPOKANE, WASHINGTON

Sample ID	01090307		01090308		01090309		01090310		01090311		01090312	
Location ID	OF-01-SS		OF-02-SS		ON-07-SS		ON-08-SS		ON-09-DR		ON-10-SS	
Sample Date	9/5/01		9/5/01		9/5/01		9/5/01		9/6/01		9/6/01	
Appearance	Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Various Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown/White Fibrous Homogeneous	
Percent Type	**PLM**	**TEM**	**PLM**	**TEM**	**PLM**	**TEM**	**PLM**	**TEM**	**PLM**	**TEM**	**PLM**	**TEM**
Chrysotile	-	-	<1%	-	ND	-	3%	.25%	<1%	-	2%	ND
Amosite	-	-	-	-	ND	-	<1%	-	-	-	-	ND
Tremolite-Actinolite	<1%	-	-	-	ND	-	-	-	<1%	-	-	ND
Mineral Wool	5%	-	5%	-	5%	-	5%	-	5%	-	-	-
Cellulose	20%	-	10%	-	5%	-	50%	-	10%	-	8%	-

Table 1

ASBESTOS SAMPLE ANALYTICAL RESULTS
VERMICULITE NORTHWEST REMOVAL SITE EVALUATION
SPOKANE, WASHINGTON

Sample ID	01090313		01090314		010903015		01090316		01090317		01090318	
Location ID	ON-11-SS		ON-12-SS		OF-03-SS		ON-13-SS		OF-04-SS		OF-05-SS	
Sample Date	9/6/01		9/6/01		9/6/01		9/6/01		9/6/01		9/5/01	
Appearance	Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous	
Percent Type	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM
Chrysotile	ND	-	ND	-	ND	-	-	ND	-	-	ND	-
Amosite	ND	-	ND	-	ND	-	-	ND	-	-	ND	-
Tremolite-Actinolite	ND	-	ND	-	ND	-	<1%	ND	<1%	-	ND	-
Mineral Wool	-	-	-	-	-	-	-	-	-	-	5%	-
Cellulose	5%	-	5%	-	20%	-	30%	-	10%	-	20%	-

Table 1

ASBESTOS SAMPLE ANALYTICAL RESULTS
VERMICULITE NORTHWEST REMOVAL SITE EVALUATION
SPOKANE, WASHINGTON

Sample ID	01090319		01090320		01090321		01090322		01090323		01090324	
Location ID	OF-06-SS		OF-07-SS		OF-08-SS		OF-09-SS		OF-10-SS		OF-11-SS	
Sample Date	9/5/01		9/5/01		9/5/01		9/5/01		9/5/01		9/5/01	
Appearance	Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous	
Percent Type	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM	PLM	TEM
Chrysotile	ND	-	ND	-	ND	ND	ND	-	-	ND	<1%	<0.1%
Amosite	ND	-	ND	-	ND	ND	ND	-	-	ND	-	-
Tremolite-Actinolite	ND	-	ND	-	ND	ND	ND	-	<1%	ND	<1%	<0.1%
Mineral Wool	2%	-	2%	-	-	-	5%	-	-	-	5%	-
Cellulose	8%	-	8%	-	5%	-	10%	-	20%	-	15%	-

Table 1

ASBESTOS SAMPLE ANALYTICAL RESULTS
VERMICULITE NORTHWEST
REMOVAL SITE EVALUATION
SPOKANE, WASHINGTON

Sample ID	01090325		01090326		01090327	
Location ID	OF-12-SS		OF-13-SS		OF-14-SS	
Sample Date	9/5/01		9/5/01		9/5/01	
Appearance	Brown Fibrous Homogeneous		Brown Fibrous Homogeneous		Brown Fibrous Homogeneous	
Percent Type	PLM	TEM	PLM	TEM	PLM	TEM
Chrysotile	-	-	-	-	ND	-
Amosite	-	-	-	-	ND	-
Tremolite-Actinolite	<1%	-	<1%	-	ND	-
Mineral Wool	-	-	-	-	5%	-
Cellulose	20%	-	20%	-	20%	-

Note: Bold type and shading indicates concentrations above sample detection limits. Only analytes that were detected in at least one method were reported.

Key:

DR = Storm drain.
ID = Identification.
ND = Nondetect.
OF = Off site.
ON = On site.

3253326 - CHATTAROY, WA

Appendix 3

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : **HWD-174B**
Project Name : **SPOKANE VERMICULITE EXPANS**
Project Officer : **JED JANUCH**
Account Code : **02T10P50102D10ZZLA00**

Sample : **02214100**
Parameter : **Asbestos**
Method :
Matrix : **Solid**

Type : **0**
Collected : **5/22/02**
Received : **5/29/02**
Promised :

Analyzed : 5-8-02 By: [illegible] Reviewed : By :

Gross Sample Description :

Per SOP: EIA-INGASED 2.SOP
Asbestos in Sediments/Soils
1/11/99

Stereoscope Observations :

Suspected asbestos fibers transferred from weigh boat (in water) to dry watch glass and then mounted in R.I. liquid

Polarizing Scope Observations : Oblique ext Positive elong

1670
11 Gold
1 Blue

Cas Number	Name	Avg. % Present	
*200005	Chrysotile	A	
*200006	Amosite	P	
*200007	Anthophyllite	A	
*200008	Tremolite	A	
*200009	Actinolite	A	
*200010	Crocidolite	A	
*200011	Glass Fiber	A	
*200012	Mineral Wool	A	
*200013	Cellulose	A	

Comments :

23°C

Man .ester Environmental Labo. tory

General Asbestos Bench Sheet

Project Code : **HWD-174B**
Project Name : **SPOKANE VERMICULITE EXPANS**
Project Officer : **JED JANUCH**
Account Code : **02T10P50102D10ZZLA00**

Sample : **02214101**
Parameter : **Asbestos**
Method :
Matrix : **Solid**

Type : **0**
Collected : **5/22/02**
Received : **5/29/02**
Promised :

Analyzed : By : Reviewed : By :

Gross Sample Description :

Stereoscope Observations :

Polarizing Scope Observations :

Cas Number	Name	Avg. % Present	
*200005	Chrysotile		
*200006	Amosite		
*200007	Anthophyllite		
*200008	Tremolite		
*200009	Actinolite		
*200010	Crocidolite		
*200011	Glass Fiber		
*200012	Mineral Wool		
*200013	Cellulose		

Comments :

No analysis

Man .ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214102
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/22/02
Received : 5/29/02
Promised :

Analyzed : By : Reviewed : By :

Gross Sample Description :

Stereoscope Observations :

Polarizing Scope Observations :

Cas Number	Name	Avg. % Present
*200005	Chrysotile	
*200006	Amosite	
*200007	Anthophyllite	
*200008	Tremolite	
*200009	Actinolite	
*200010	Crocidolite	
*200011	Glass Fiber	
*200012	Mineral Wool	
*200013	Cellulose	

Comments :

Not analyzed

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214103
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/22/02
Received : 5/29/02
Promised :

Analyzed : 9-10-02 By : Susan Reviewed : By :

Gross Sample Description :

See sample 02214100

Stereoscope Observations :

Polarizing Scope Observations :

+ along (H) ext

1.605

// Yellow-Gold

⊥ Blue-mag

Cas Number	Name	Avg. % Present
*200005	Chrysotile	A
*200006	Amosite	A
*200007	Anthophyllite	A
*200008	Tremolite	P
*200009	Actinolite	A
*200010	Crocidolite	A
*200011	Glass Fiber	A
*200012	Mineral Wool	A
*200013	Cellulose	A

Comments :

(H) = oblique SL

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214104
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/22/02
Received : 5/29/02
Promised :

Analyzed : By : Reviewed : By :

Gross Sample Description :

Stereoscope Observations :

Polarizing Scope Observations :

Cas Number	Name	Avg. % Present	
*200005	Chrysotile		
*200006	Amosite		
*200007	Anthophyllite		
*200008	Tremolite		
*200009	Actinolite		
*200010	Crocidolite		
*200011	Glass Fiber		
*200012	Mineral Wool		
*200013	Cellulose		

Comments :

Not analyzed

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214105
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/22/02
Received : 5/29/02
Promised :

Analyzed : By : Reviewed : By :

Gross Sample Description :

Stereoscope Observations :

Polarizing Scope Observations :

Cas Number	Name	Avg. % Present	
*200005	Chrysotile		
*200006	Amosite		
*200007	Anthophyllite		
*200008	Tremolite		
*200009	Actinolite		
*200010	Crocidolite		
*200011	Glass Fiber		
*200012	Mineral Wool		
*200013	Cellulose		

Comments :

Not analyzed

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214106
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/23/02
Received : 5/29/02
Promised :

Analyzed : 8-23-02 By : Susan Davis Reviewed : By :

Gross Sample Description :

See # 02214100

Stereoscope Observations :

Polarizing Scope Observations :

(+) Ext + Elong

1.605

// Gold

⊥ mag/blue

Cas Number	Name	Avg. % Present
*200005	Chrysotile	A
*200006	Amosite	A
*200007	Anthophyllite	A
*200008	Tremolite	P
*200009	Actinolite	A
*200010	Crocidolite	A
*200011	Glass Fiber	A
*200012	Mineral Wool	A
*200013	Cellulose	P

Comments :

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : **HWD-174B**
Project Name : **SPOKANE VERMICULITE EXPANS**
Project Officer : **JED JANUCH**
Account Code : **02T10P50102D10ZZLA00**

Sample : **02214107**
Parameter : **Asbestos**
Method :
Matrix : **Solid**

Type : **0**
Collected : **5/23/02**
Received : **5/29/02**
Promised :

Analyzed : 8.23.02 By : Susan Davis Reviewed : By :

Gross Sample Description :

See #02214100

Stereoscope Observations :

Polarizing Scope Observations :

Oblique ~~Parallel~~ SF ext Positive along

1.605

// Gold

⊥ mag/blue

Cas Number	Name	Avg. % Present
*200005	Chrysotile	A
*200006	Amosite	A
*200007	Anthophyllite	A
*200008	Tremolite	P
*200009	Actinolite	A
*200010	Crocidolite	A
*200011	Glass Fiber	P
*200012	Mineral Wool	A
*200013	Cellulose	P

Comments :

Man .ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214108
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/23/02
Received : 5/29/02
Promised :

Analyzed : 9-10-02 By: [illegible] Reviewed : By :

Gross Sample Description :

Dup #02214100

Stereoscope Observations :

Polarizing Scope Observations :

(+) Ext + Elong

1.605

// Gold

⊥ Mag / Blue

Cas Number	Name	Avg. % Present
*200005	Chrysotile	A
*200006	Amosite	A
*200007	Anthophyllite	P
*200008	Tremolite	A
*200009	Actinolite	A
*200010	Crocidolite	A
*200011	Glass Fiber	A
*200012	Mineral Wool	A
*200013	Cellulose	P

Comments :

Man ester Environmental Labo :ory

General Asbestos Bench Sheet

Project Code : **HWD-174B**
Project Name : **SPOKANE VERMICULITE EXPANS**
Project Officer : **JED JANUCH**
Account Code : **02T10P50102D10ZZLA00**

Sample : **02214109**
Parameter : **Asbestos**
Method :
Matrix : **Solid**

Type : **0**
Collected : **5/23/02**
Received : **5/29/02**
Promised :

Analyzed : 9-10-02 By: Dawn Stein Reviewed : By :

Gross Sample Description :

See #02214100

Stereoscope Observations :

Polarizing Scope Observations :

Oblique ~~Parallel~~ ext Positive along
1.605
" Gold-yellow
1 Blue/mag

Cas Number	Name	Avg. % Present
*200005	Chrysotile	A
*200006	Amosite	A
*200007	Anthophyllite	A
*200008	Tremolite	P
*200009	Actinolite	A
*200010	Crocidolite	A
*200011	Glass Fiber	A
*200012	Mineral Wool	A
*200013	Cellulose	~~A~~ SE P

Comments :

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : **HWD-174B**
Project Name : **SPOKANE VERMICULITE EXPANS**
Project Officer : **JED JANUCH**
Account Code : **02T10P50102D10ZZLA00**

Sample : **02214110**
Parameter : **Asbestos**
Method :
Matrix : **Solid**

Type : **0**
Collected : **5/23/02**
Received : **5/29/02**
Promised :

Analyzed : By : Reviewed : By :

Gross Sample Description :

Stereoscope Observations :

Polarizing Scope Observations :

Cas Number	Name	Avg. % Present
*200005	Chrysotile	
*200006	Amosite	
*200007	Anthophyllite	
*200008	Tremolite	
*200009	Actinolite	
*200010	Crocidolite	
*200011	Glass Fiber	
*200012	Mineral Wool	
*200013	Cellulose	

Comments :

Not analyzed

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214111
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/23/02
Received : 5/29/02
Promised :

Analyzed : 9-10-02 By : [illegible] Reviewed : By :

Gross Sample Description :

See # 02214100

Stereoscope Observations :

Polarizing Scope Observations :

(A) Ext +Elong

1.605

// Gold

⊥ Mag/Blue

Cas Number	Name	Avg. % Present
*200005	Chrysotile	A
*200006	Amosite	A
*200007	Anthophyllite	A
*200008	Tremolite	P
*200009	Actinolite	A
*200010	Crocidolite	A
*200011	Glass Fiber	A
*200012	Mineral Wool	A
*200013	Cellulose	A

Comments :

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214112
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/23/02
Received : 5/29/02
Promised :

Analyzed : By : Reviewed : By :

Gross Sample Description :

Stereoscope Observations :

Polarizing Scope Observations :

Cas Number	Name	Avg. % Present
*200005	Chrysotile	
*200006	Amosite	
*200007	Anthophyllite	
*200008	Tremolite	
*200009	Actinolite	
*200010	Crocidolite	
*200011	Glass Fiber	
*200012	Mineral Wool	
*200013	Cellulose	

Comments :

Not analyzed

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214113
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/23/02
Received : 5/29/02
Promised :

Analyzed : By : Reviewed : By :

Gross Sample Description :

Stereoscope Observations :

Polarizing Scope Observations :

Cas Number	Name	Avg. % Present
*200005	Chrysotile	
*200006	Amosite	
*200007	Anthophyllite	
*200008	Tremolite	
*200009	Actinolite	
*200010	Crocidolite	
*200011	Glass Fiber	
*200012	Mineral Wool	
*200013	Cellulose	

Comments :

Not analyzed

Man ester Environmental Labo tory

General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214114
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/23/02
Received : 5/29/02
Promised :

Analyzed : 9-10-02 By : [illegible] Reviewed : By :

Gross Sample Description :

See # 02214100

Stereoscope Observations :

Polarizing Scope Observations :

Some // ext; Some oblique ext. Positive along

1605

// Yellow

⊥ Gold or Blue/mag

Cas Number	Name	Avg. % Present
*200005	Chrysotile	A
*200006	Amosite	A
*200007	Anthophyllite	A
*200008	Tremolite	P
*200009	Actinolite	P
*200010	Crocidolite	A
*200011	Glass Fiber	A
*200012	Mineral Wool	A
*200013	Cellulose	P

Comments :

Man ester Environmental Labo tory
General Asbestos Bench Sheet

Project Code : HWD-174B
Project Name : SPOKANE VERMICULITE EXPANS
Project Officer : JED JANUCH
Account Code : 02T10P50102D10ZZLA00

Sample : 02214115
Parameter : Asbestos
Method :
Matrix : Solid

Type : 0
Collected : 5/23/02
Received : 5/29/02
Promised :

Analyzed : 9-10-02 By : Susan Lewis Reviewed : By :

Gross Sample Description :

See #02214100

Stereoscope Observations :

Polarizing Scope Observations :

Some // ext ; some (H) ext ; + along

1605
// yellow-gold
⊥ mag/blue

1670
// Blue
⊥ Gold

Cas Number	Name	Avg. % Present
*200005	Chrysotile	A
*200006	Amosite	P
*200007	Anthophyllite	A
*200008	Tremolite	P
*200009	Actinolite	A
*200010	Crocidolite	A
*200011	Glass Fiber	A
*200012	Mineral Wool	A
*200013	Cellulose	P

Comments :

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/22/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214100
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	SOIL/DEBRIS UNDER NOISE CONTROL ROOM		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			A
	*200006	Amosite			P
	*200007	Anthophyllite			A
	*200013	Cellulose			A
	*200005	Chrysotile			A
	*200010	Crocidolite			A
	*200011	Glass Fiber			A
	*200012	Mineral Wool			A
	*200008	Tremolite			A

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/22/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214101
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	FIELD BLANK- EMPTY JAR		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			NA
	*200006	Amosite			NA
	*200007	Anthophyllite			NA
	*200013	Cellulose			NA
	*200005	Chrysotile			NA
	*200010	Crocidolite			NA
	*200011	Glass Fiber			NA
	*200012	Mineral Wool			NA
	*200008	Tremolite			NA

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/22/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214102
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	WALL-NOISE CONTROL ROOM		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			NA
	*200006	Amosite			NA
	*200007	Anthophyllite			NA
	*200013	Cellulose			NA
	*200005	Chrysotile			NA
	*200010	Crocidolite			NA
	*200011	Glass Fiber			NA
	*200012	Mineral Wool			NA
	*200008	Tremolite			NA

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/22/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214103
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	SOIL/DEBRIS UNDER STORAGE RM S-SIDE		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			A
	*200006	Amosite			A
	*200007	Anthophyllite			A
	*200013	Cellulose			A
	*200005	Chrysotile			A
	*200010	Crocidolite			A
	*200011	Glass Fiber			A
	*200012	Mineral Wool			A
	*200008	Tremolite			P

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/22/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214104
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	DEBRIS UNDER STORAGE RM E-SIDE		

GEN

Parameter : Bulk Asbestos Analysis
Method :
Prep Method:

Analytes		Result	Units	Qlfr
*200009	Actinolite			NA
*200006	Amosite			NA
*200007	Anthophyllite			NA
*200013	Cellulose			NA
*200005	Chrysotile			NA
*200010	Crocidolite			NA
*200011	Glass Fiber			NA
*200012	Mineral Wool			NA
*200008	Tremolite			NA

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/22/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214105
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	GARAGE WALL MATERIAL		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			NA
	*200006	Amosite			NA
	*200007	Anthophyllite			NA
	*200013	Cellulose			NA
	*200005	Chrysotile			NA
	*200010	Crocidolite			NA
	*200011	Glass Fiber			NA
	*200012	Mineral Wool			NA
	*200008	Tremolite			NA

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214106
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	Q052315B GPS		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			A
	*200006	Amosite			A
	*200007	Anthophyllite			A
	*200013	Cellulose			P
	*200005	Chrysotile			A
	*200010	Crocidolite			A
	*200011	Glass Fiber			A
	*200012	Mineral Wool			A
	*200008	Tremolite			P

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214107
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	Q052315C GPS		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			A
	*200006	Amosite			A
	*200007	Anthophyllite			A
	*200013	Cellulose			P
	*200005	Chrysotile			A
	*200010	Crocidolite			A
	*200011	Glass Fiber			P
	*200012	Mineral Wool			A
	*200008	Tremolite			P

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214108
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	Q052316A GPS		

GEN

Parameter : Bulk Asbestos Analysis
Method :
Prep Method:

Analytes		Result	Units	Qlfr
*200009	Actinolite			A
*200006	Amosite			A
*200007	Anthophyllite			P
*200013	Cellulose			P
*200005	Chrysotile			A
*200010	Crocidolite			A
*200011	Glass Fiber			A
*200012	Mineral Wool			A
*200008	Tremolite			A

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214109
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	Q052318A GPS		

			Result	Units	Qlfr
GEN					
Parameter	: Bulk Asbestos Analysis				
Method	:				
Prep Method	:				
Analytes	: *200009	Actinolite			A
	*200006	Amosite			A
	*200007	Anthophyllite			A
	*200013	Cellulose			P
	*200005	Chrysotile			A
	*200010	Crocidolite			A
	*200011	Glass Fiber			A
	*200012	Mineral Wool			A
	*200008	Tremolite			P

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214110
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	Q052318B GPS		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			NA
	*200006	Amosite			NA
	*200007	Anthophyllite			NA
	*200013	Cellulose			NA
	*200005	Chrysotile			NA
	*200010	Crocidolite			NA
	*200011	Glass Fiber			NA
	*200012	Mineral Wool			NA
	*200008	Tremolite			NA

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214111
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	TG		

GEN

Parameter : Bulk Asbestos Analysis
Method :
Prep Method:

		Result	Units	Qlfr
Analytes : *200009	Actinolite			A
*200006	Amosite			A
*200007	Anthophyllite			A
*200013	Cellulose			A
*200005	Chrysotile			A
*200010	Crocidolite			A
*200011	Glass Fiber			A
*200012	Mineral Wool			A
*200008	Tremolite			P

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214112
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	Q052320A GPS		

			Result	Units	Qlfr
GEN					
Parameter :	Bulk Asbestos Analysis				
Method :					
Prep Method:					
Analytes :	*200009	Actinolite			NA
	*200006	Amosite			NA
	*200007	Anthophyllite			NA
	*200013	Cellulose			NA
	*200005	Chrysotile			NA
	*200010	Crocidolite			NA
	*200011	Glass Fiber			NA
	*200012	Mineral Wool			NA
	*200008	Tremolite			NA

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214113
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	Q052320B GPS		

GEN

Parameter : Bulk Asbestos Analysis
Method :
Prep Method:

			Result	Units	Qlfr
Analytes :	*200009	Actinolite			NA
	*200006	Amosite			NA
	*200007	Anthophyllite			NA
	*200013	Cellulose			NA
	*200005	Chrysotile			NA
	*200010	Crocidolite			NA
	*200011	Glass Fiber			NA
	*200012	Mineral Wool			NA
	*200008	Tremolite			NA

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/23/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214114
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	Q052315A GPS		

			Result	Units	Qlfr
GEN					
Parameter	: Bulk Asbestos Analysis				
Method	:				
Prep Method	:				
Analytes	: *200009	Actinolite			P
	*200006	Amosite			A
	*200007	Anthophyllite			A
	*200013	Cellulose			P
	*200005	Chrysotile			A
	*200010	Crocidolite			A
	*200011	Glass Fiber			A
	*200012	Mineral Wool			A
	*200008	Tremolite			P

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174B

Project Code:	HWD-174B	**Collected:**	5/22/02
Project Name:	SPOKANE VERMICULITE EXPANSION	**Matrix:**	Solid
Project Officer:	JED JANUCH	**Sample Number:**	02214115
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	SOIL UNDER STORAGE ROOM E SIDE		

			Result	Units	Qlfr
GEN					
Parameter	: Bulk Asbestos Analysis				
Method	:				
Prep Method	:				
Analytes	: *200009	Actinolite			A
	*200006	Amosite			P
	*200007	Anthophyllite			A
	*200013	Cellulose			P
	*200005	Chrysotile			A
	*200010	Crocidolite			A
	*200011	Glass Fiber			A
	*200012	Mineral Wool			A
	*200008	Tremolite			P

Appendix 4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn of OEA-095

April 22, 2003

MEMORANDUM

SUBJECT: X-ray diffraction analysis of fibrous material

FROM: David Frank
Risk Evaluation Unit

TO: Jed Januch
Investigation and Engineering Unit

This memorandum documents the analysis of a sample submitted for X-ray diffraction (XRD) analysis January 16, 2003. The sample consisted of a vial containing a hand-picked composite of fibrous material which was given a laboratory sample designation of sv. The objective of the analysis was to identify the minerals present in the sample, with an emphasis on the fibrous minerals.

Table 1 lists the minerals identified by XRD. A description of the methods, results and discussion follows Table 1.

Table 1. Minerals identified by x-ray diffraction.

Sample - sv

Minerals	Ideal Formula	Abundance*
Chain Silicate		
Amphibole	$(Na,K)(CaNa)Mg_5Si_8O_{22}(OH)_2$	M
Layer Silicate		
Vermiculite	$Mg_{0.35+/-}(Mg,Fe^{3+})_3(Si_{4-x}Al_x)O_{10}(OH)_2.4H_2O$	X
Smectite	$Na_{0.33}(Mg_{2.67},Fe_{0.33}{}^{3+})_3(Si_{3.34}Al_{0.66})O_{10}(OH)_2.nH_2O$	X
Biotite	$K(Fe^{2+},Mg)_3AlSi_3O_{10}(F,OH)_2$	T
Talc	$Mg_3Si_4O_{10}(OH)_2$	T

* Qualitative abundance designated by M-major, X-minor, T-trace. Other unidentified phases were present in minor to trace amounts.

METHODS

The sample was first examined by low-power microscopy under incident light with a Wild M5-A stereomicroscope to provide a physical description and to aid in preparation of XRD specimen mounts. X-ray diffraction analysis was by Method XRD-QL (USEPA Manchester Laboratory, version October 1, 1997) which consists of qualitative identification of minerals and other compounds with a Scintag X1 X-ray diffractometer. Mineral identification was made by comparison of measured diffraction patterns of the sample with patterns of reference materials, by comparison with the Powder Diffraction File (PDF) database maintained by the International Center for Diffraction Data (ICDD, 2002), and by comparison of XRD data found in peer-reviewed literature.

A representative portion of the sample was disaggregated with tweezers and lightly ground to reduce the particle size using a mortar and pestle under a hood. Isopropyl alcohol was used in the mortar to prevent modification of the crystal structure during grinding and to minimize air suspension of fibers. An oriented XRD mount was prepared by using an eyedropper to place part of the alcohol slurry with entrained specimen onto a low-background quartz plate and allowed to dry. An additional specimen on a glass slide was also prepared, and both the quartz plate and glass slide were examined by optical microscopy. Subsequently, additional mounts were prepared in the same manner for examination of expandable minerals by pre-treatment with ethylene glycol and glycerol, and of collapsible minerals by heating to 375° C. A less oriented mount was also examined by placing an alcohol slurry in a shallow low-background quartz dish.

Diffraction patterns were acquired using Co$K\alpha$ radiation at a wavelength of 1.78897 angstroms (Å), generated at 36 mA and 45 kV. Patterns were recorded at scan speeds of 0.5-15 degrees of two-theta (°2θ) units per minute over a 2-76 degree range.

Quality control checks for the XRD analysis include the following:

1. Prior to beginning the project, the diffractometer's goniometer was aligned with an NIST Standard Reference Material SRM 1976, a flat plate of sintered alumina provided by the National Institute of Standards and Technology.

2. At the beginning of each day of data collection, the alignment of the goniometer and stability of the X-ray intensity was checked by measuring the position and peak height of the 3.34 Å (101) peak of a fine-grained quartz reference plate.

3. During sample analysis, the alignment of the goniometer was checked against the peaks for a diagnostic mineral that provided an internal reference. Talc was abundant enough in this sample to provide a suitable low-angle internal reference for the alignment check.

RESULTS

Microscopic Observation

The material consisted primarily of beige to light grey fibers and fiber bundles with a small amount of other entrained fine-grained light grey granular material.

XRD Analysis

Table 1 above lists the minerals and mineral groups identified by XRD. The abundance of each mineral is denoted in a qualitative manner as a major (M), minor (X), or trace (T) amount based on the intensity of diagnostic diffraction peaks. Corresponding numerical values are approximately greater than 20% by weight for major, 5-20% for minor, and less than 5% for trace. Phases less than 1-5% in this sample were not identifiable by the method.

The mineral or mineral group names are accompanied in Table 1 by the ideal chemical formulae. The ideal formulae represent the chemical composition of minerals in their end-member states. Naturally occurring minerals are generally not ideal end-members, in that the actual chemical compositions of each phase may differ somewhat from the ideal formulae listed. The differences occur because of solid solution of additional minor and trace elements, and somewhat different proportions of major elements incorporated into the crystal structure of the minerals.

X-ray diffraction and microscopic observations show that the sample consists primarily of fibrous amphibole accompanied by minor to trace amounts of other non-fibrous minerals. In addition to the major amphibole, a minor amount of vermiculite and smectite, and trace amounts of biotite and talc were also present. All of these minerals are silicates.

DISCUSSION

Amphibole, biotite, and talc are minerals that can occur in common association with vermiculite ores and products. Smectite is a layered clay mineral group similar in structure and composition to vermiculite, but differing by having a greater ability to expand its crystal structure by taking up water or other liquids between layers. The diffraction characteristics of the vermiculite and smectite and their close association in this sample indicate that the vermiculite has undergone alteration probably by weathering, and that the smectite is a weathering product of the vermiculite.

Amphibole is a mineral group that comprises minerals with similar crystalline structure, but a variety of chemical compositions. Amphibole nomenclature assigns names to individual mineral species based on a scheme that uses not just crystal structure, but also chemical composition (Leake and others, 1997). Although the XRD results clearly show the presence of predominantly amphibole in this sample based on an X-ray diffraction pattern unique to amphibole structure, the identity of a single amphibole species based on chemical composition could not be uniquely determined by the method used. Two common characteristics of

amphibole-bearing materials can cause enough variation in X-ray diffraction patterns of mixed-mineral samples that may preclude identification of a single amphibole species. First, naturally occurring amphiboles typically have element substitutions in their structure that cause XRD patterns to differ somewhat from natural or synthetic minerals found in the PDF database. Second, amphibole-bearing materials may contain a mixture of two or more amphiboles with somewhat different compositions that yield an XRD diffraction pattern with overlapping peaks that prevent discrimination of individual species. Consequently unless the amphibole present is sufficiently pure and ideal, a unique amphibole composition may not be determinable by the XRD method used. Nonetheless, the XRD data for this sample do allow some inferences as to the most likely amphibole species present.

A comparison of the sample with reference materials, the PDF diffraction database, and peer-reviewed literature for a wide range of amphiboles indicated that the diffraction pattern of the amphibole in the sample sv is most similar to members of the calcic and sodic-calcic groups of amphiboles that include respectively tremolite and actinolite, and richterite and winchite. A detailed evaluation of diagnostic diffraction peaks for these four amphibole minerals using a compilation of 81 comparative sets of XRD data indicated that the amphibole in the sample was most consistent with data for richterite. Although richterite was the best match, the resolution of the data did not exclude a match with winchite. Sources of data for the comparative evaluation include the PDF file (ICDD, 2002), Deer and others (1997), Verkouteren and Wylie (2000), Wylie and Huggins (1980), and Wylie and Verkouteren (2000).

For your records, an attachment provides laboratory data documentation of the XRD analysis.

REFERENCES

Deer, W.A., Howie, R.A., and Zussman, J., 1997, Rock-forming minerals, Volume 2B, Double-chain silicates (second edition): London, The Geological Society, 764 p.

ICDD, 2002, Powder diffraction file, release 2002: Newtown Sqaure, Pennsylavania, International Centre for Diffraction Data, cd-rom.

Leake, B.E.(chairman), Wooley, A.R., Arps, C.E.S., Birch, W.D., Gilbert, M.C., Grice, J.D., Hawthorne, F.C., Kato, A., Kisch, H.J., Krivovichev, V.G., Linthout, K., Laird, J., Mandarino, J., Maresch, W.V., Nickel, E.H., Rock, N.M.S., Schumacher, J.C., Smith, D.C., Stephenson, N.C.N., Ungaretti, L., Whittaker, E.J.W., and Youzhi, G., 1997, Nomenclature of amphiboles: report of the subcommittee on amphiboles of the International Mineralogical Association Commission on New Minerals and Mineral Names: Mineralogical Magazine, v. 61, p. 295-321.

Verkouteren, J.R. and Wylie, A.G., 2000, the tremolite-actinolite-ferro-actinolite series: systematic relationships among cell parameters, composition, optical properties, and habit, and evidence of discontinuities: American Mineralogist, v. 85, p. 1239-1254.

Wylie, A.G. and Huggins, C.W., 1980, Characteristics of potassian winchite-asbestos from the Allamoore talc district, Texas: Canadian Mineralogist, v. 18, p. 101-107.

Wylie, A.G., and Verkouteren, J. R., 2000, Amphibole asbestos from Libby, Montana: aspects of nomenclature: American Mineralogist, v. 85, p. 1540-1542.

Table A2. List of ICDD reference cards from PDF file.

Symbol	Phase	ICDD Card	Ideal Formula
CHAIN SILICATE			
A	AMPHIBOLE		$(Na,K)(CaNa)Mg_5Si_8O_{22}(OH)_2$
	Tremolite	44-1402	$Ca_2Mg_5Si_8O_{22}(OH)_2$
	Actinolite	41-1366	$Ca_2MgFe_5Si_8O_{22}(OH)_2$
	Richterite	25-0808	$Na_2CaMg_5Si_8O_{22}(OH)_2$
	Winchite	20-1390	$NaCa(Mg,Fe,Mn,Al)_5Si_8O_{22}(OH)_2$
LAYER SILICATE			
S	Smectite		$Na_{0.33}(Mg_{2.67},Fe_{0.33}{}^{3+})_3(Si_{3.34}Al_{0.66})O_{10}(OH)_2.nH_2O$
V	Vermiculite		$Mg_{0.35+/-}(Mg,Fe^{3+})_3(Si_{4-x}Al_x)O_{10}(OH)_2.4H_2O$
B	Biotite-1M	42-1437	$K(Mg,Fe^{2+})_3(Al,Fe^{3+})Si_3O_{10}(OH,F)_2$
Ta	Talc	29-1493	$Mg_3Si_4O_{10}(OH)_2$

Attachment. XRD Laboratory Data Documentation for sample sv.

Contents of Attachment.
A. Annotated Diffractograms.
B. Amphibole Evaluation.

A. Annotated Diffractograms.

Figures A1 through A4 are diffractograms, which are x-y plots of the diffraction patterns in units of diffraction angle in degrees of 2-theta angle (x-axis) versus X-ray intensity in counts per second (y-axis). The diffraction patterns were measured with Co$K\alpha$ radiation at a wavelength of 1.78897 angstroms (Å) generated at 36 mA and 45 kV, and using divergence and receiving slits of 2.0 and 0.3 degrees respectively. Step sizes were 0.02 degrees of two-theta angle and goniometer speeds were 0.5 degrees of two-theta.

Table A1 lists the diffraction patterns and the relevant annotated features for Figures A1 through A4. The numerical values noted for selected peaks in the diffraction patterns are structural d-spacings in angstroms as calculated from the diffraction angle and the X-ray wavelength. The d-spacings and relative intensities of diffraction peaks are the criteria used for identification of minerals and other cryatalline materials. The letter symbols mark matching peaks for particular minerals. The circled d-spacings denote diagnostic peaks used for abundance estimates for this sample.

Table A2 provides a key to symbols used for mineral designations on the annotated diffractograms. The ICDD numbers refer to data base entries (cards) used for matching mineral identifications with the Powder Diffraction File (PDF) maintained by the International Centre for Diffraction Data (2002). Amphibole and layer silicate reference materials were used as an aid in mineral identification. The layered minerals, smectite and vermiculite, were differentiated by means of diagnostic expansion and heating tests.

Table A1. List of annotated diffractograms.

Figure	Pattern File	Preparation*	Diagnostic Labels
A1	sv5b	partly unoriented	amphibole
A2	sv5b	partly unoriented	talc
A3	sv5b	partly unoriented	biotite
A4	svega	oriented, glycolated	expanded smectite, vermiculite, biotite, talc
A4	sv1a	oriented, air dry	smectite, vermiculite
A4	sveg300a	oriented, heated to 300 C	partly collapsed smectite and vermiculite
A4	sv4a375a	oriented, heated to 375 C	collapsed smectite, collapsed vermiculite

* Specimens were lightly ground, mixed with isopropyl alcohol, and deposited in either a quartz dish (Figures A1-A3) or a quartz plate (Figure A-4).

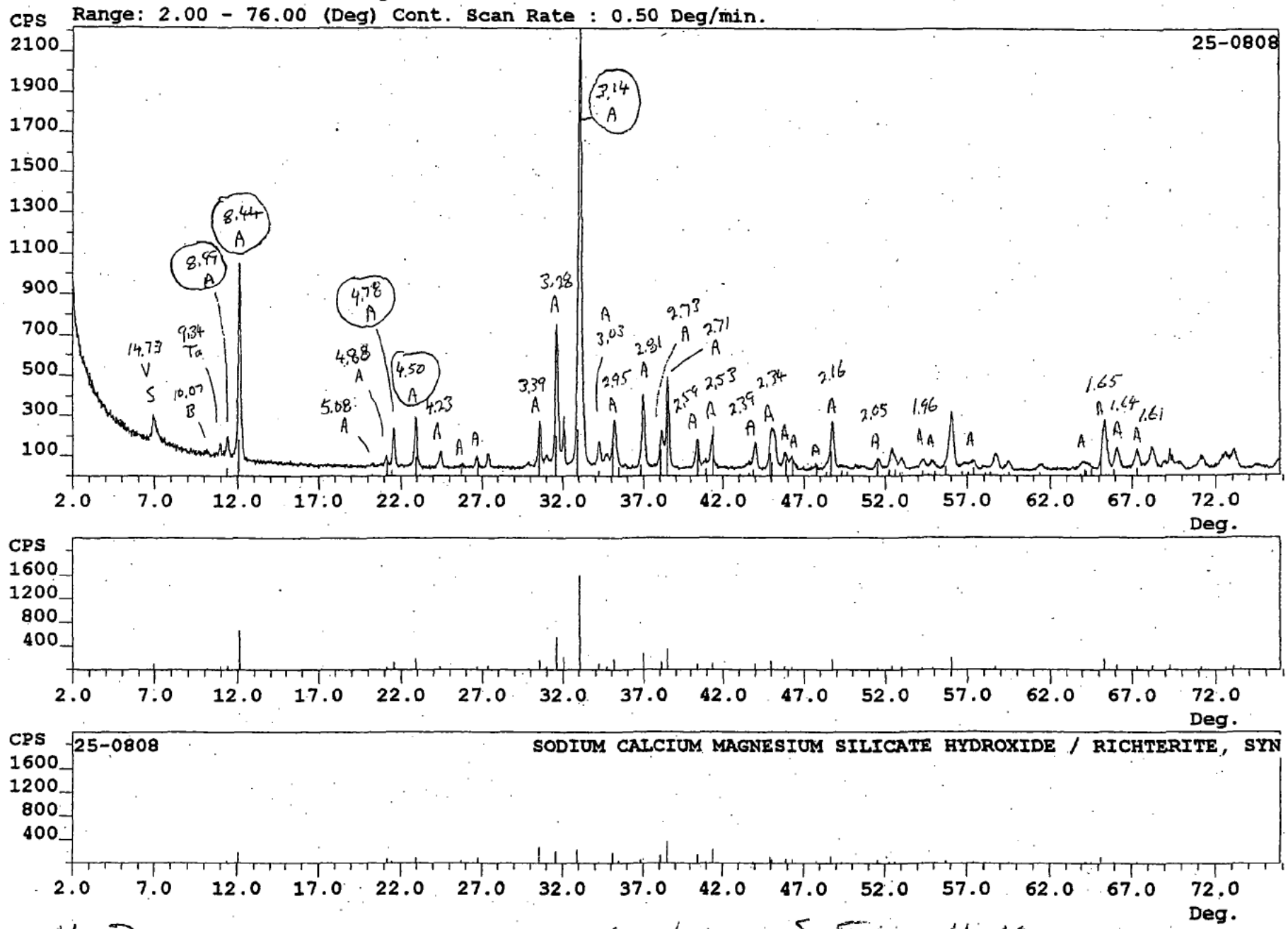


Figure A1. D-spacings of diagnostic peaks in ångströms, See Tables A1-A2.

File: sv5b, ID: 2.0/4.0//0.5/0.3
Date: 04/09/03 11:19 Step : 0.020° Cnt Time: 2.400 Sec.
Range: 2.00 - 76.00 (Deg) Cont. Scan Rate : 0.50 Deg/min.

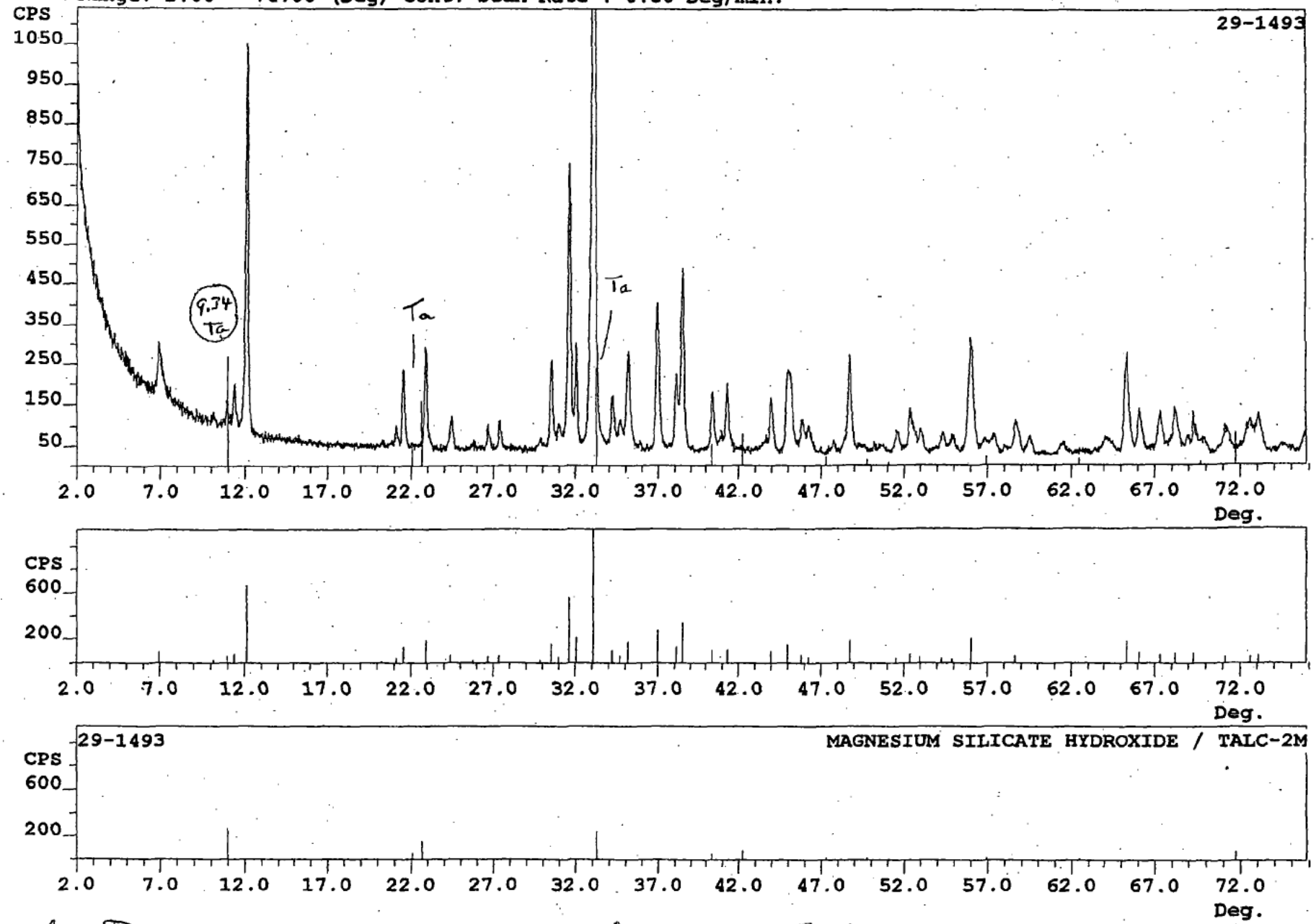


Figure A2. D-spacing of diagnostic peak in ångströms. See Tables A1-A2,

File: sv5b, ID: 2.0/4.0//0.5/0.3
Date: 04/09/03 11:19 Step : 0.020° Cnt Time: 2.400 Sec.
Range: 2.00 - 76.00 (Deg) Cont. Scan Rate : 0.50 Deg/min.

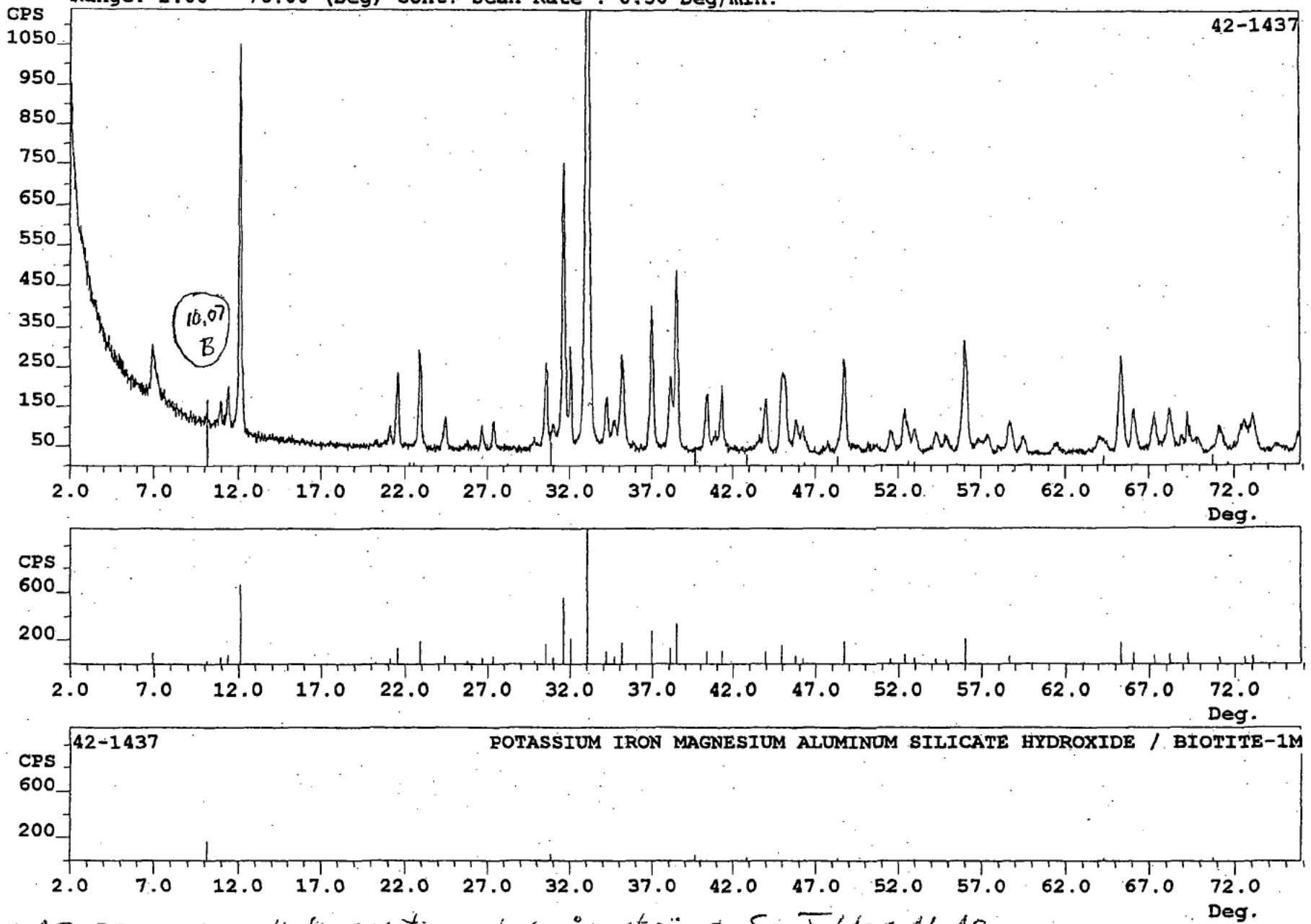


Figure A3. D-spacing of diagnostic peak in ångströms. See Tables A1-A2.

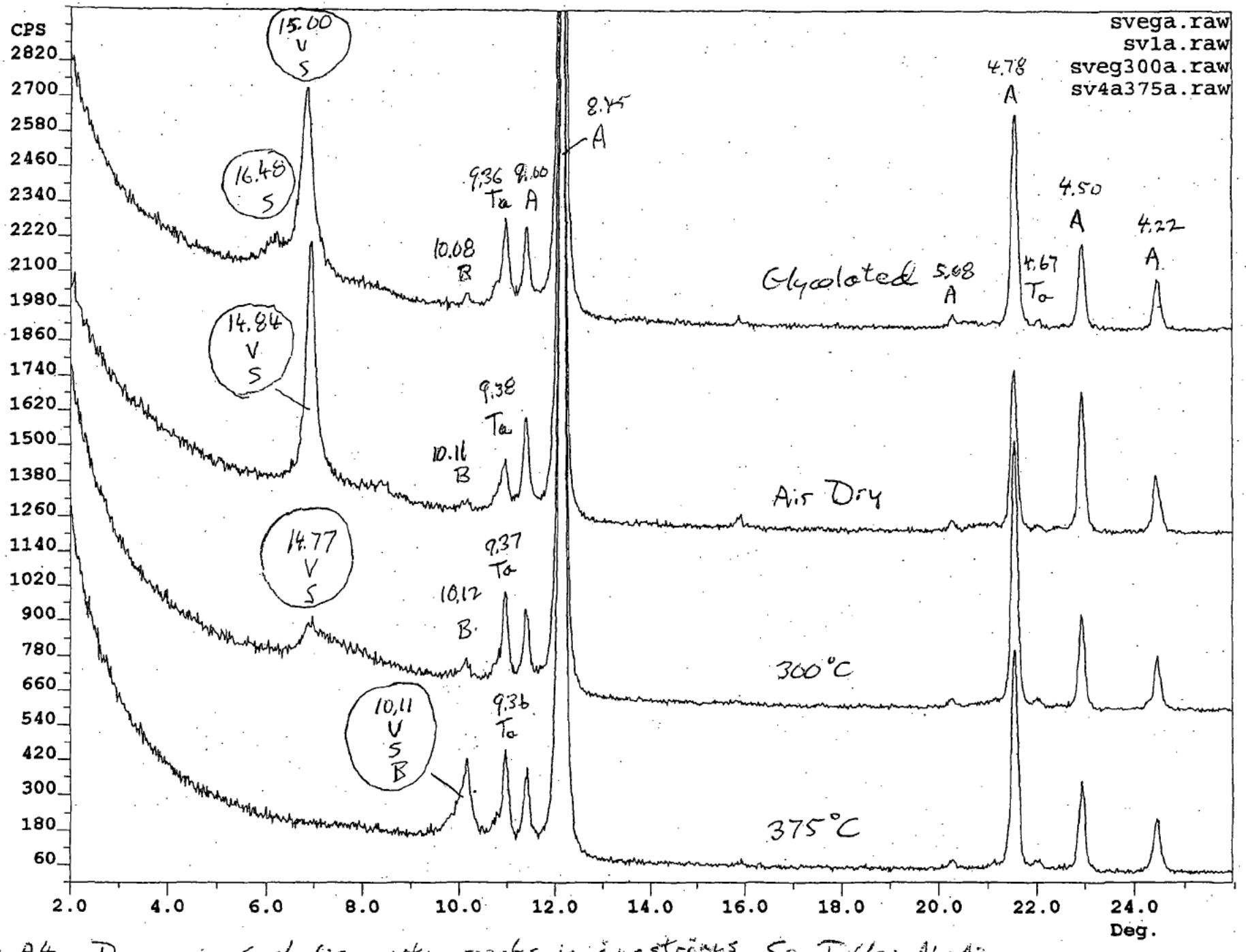


Figure A4. D-spacings of diagnostic peaks in ångströms. See Tables A1-A2.

B. Amphibole Evaluation.

A comparison of the XRD patterns for sample sv with amphibole reference data indicates that the amphibole in is most similar to members of the calcic and sodic-calcic groups of amphiboles that include respectively tremolite and actinolite, and richterite and winchite. A detailed evaluation of diagnostic diffraction peaks for this subset of amphiboles using 81 sets of XRD data derived from the PDF file (ICDD, 2002), Deer and others (1997), Verkouteren and Wylie (2000), Wylie and Huggins (1980), and Wylie and Verkouteren (2000) indicated that the amphibole in the sample was most consistent with data for richterite. Although richterite was the best match, the resolution of the data did not exclude a match with winchite.

Figure B1 shows the variation of XRD d-spacings and peak positions for three amphibole samples (1,2,3) in comparison with reference data for the four species of calcic and sodic-calcic amphiboles (tremolite, actinolite, richterite, and winchite). Table B1 lists the sources of data shown in Figure B1 for points plotted in order from left to right.

The parameters that are plotted include the d-spacings in angstroms (Å) for the diffraction planes designated by Miller indices (020), (110), (200), and (310), and the 2-theta angle separations between the planes for (110)-(020), (040)-(200), and (310)-(110). The measured d-spacings have not been corrected for experimental error in 2-theta angle that results from sample height variations. This error cancels out, however, when calculating the 2-theta angle difference between two diffraction peaks. Therefore, the three plots of 2-theta angle separations (bottom of Figure B1) are the diagnostic parameters of most interest.

The scatter of points for each amphibole species in Figure B1 is generally related to the variability in chemical composition. The measured values for reference materials are shown on the left side of the respective strings of points for each amphibole, followed by data derived from the PDF file and peer-reviewed literature. Values plotted for tremolite show the least variation compared to the other amphiboles, consistent with amphibole nomenclature that limits the designation of tremolite to a relatively narrow compositional range. Actinolite is similar to tremolite (Figure B1), but shows more variability primarily as a result of increasing iron solid solution extending into the range of ferroactinolite. Values plotted for richterite and winchite show the greatest variability largely as a result of both potassium and iron solid solution.

The three groups of points plotted to the right in Figure B1 represent amphibole samples from three different localities. Samples 1 and 3 are fibrous amphiboles from vermiculite deposits. Sample 2 represents the data for sample sv. The shaded horizontal bars delimit the range of values measured for sample sv. Sample sv can be seen to be most similar to richterite and winchite, with richterite being the best match. Although richterite was the best match, the resolution of the data do not exclude a match with winchite.

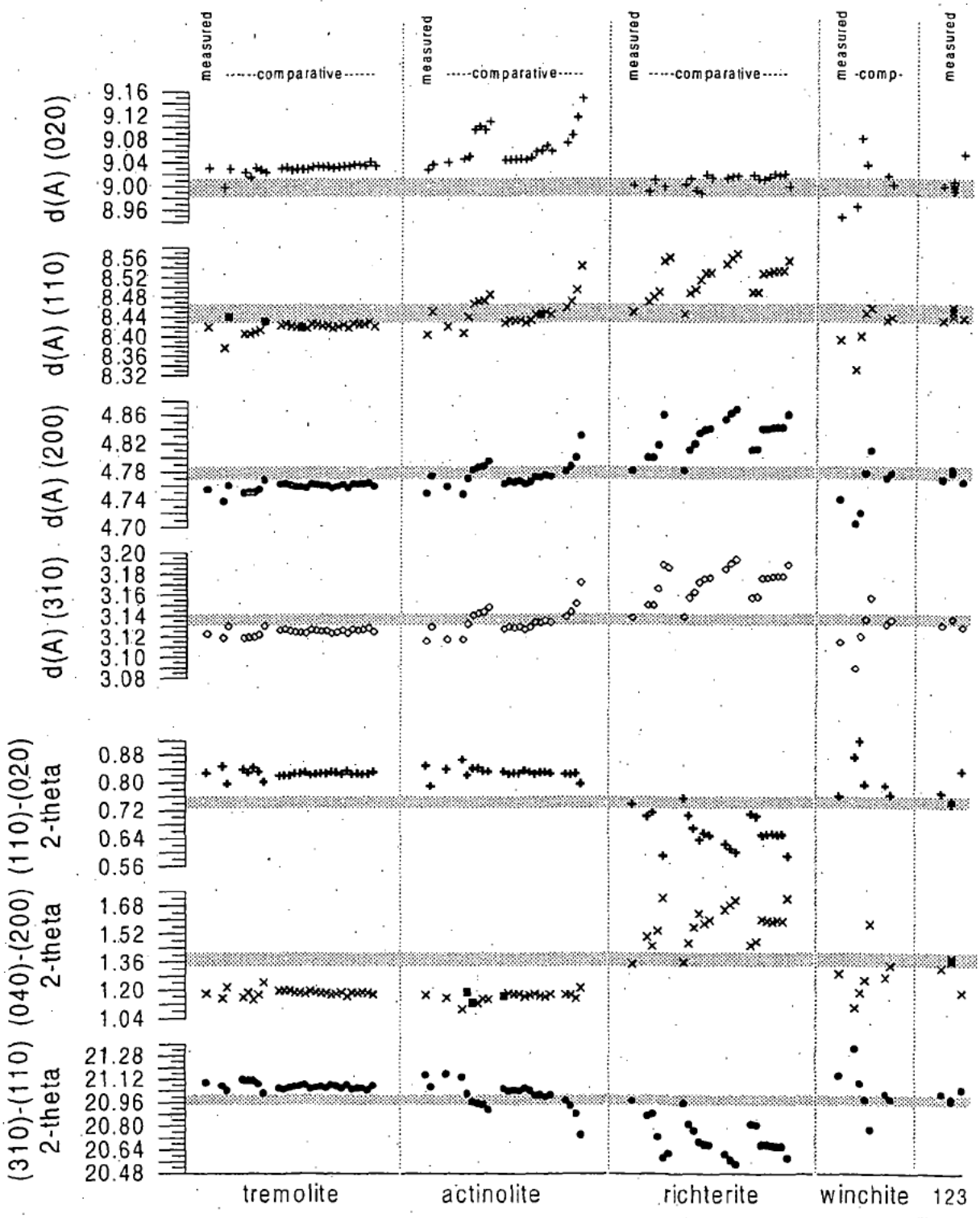


Figure B1.

Figure B1. Graph of measured and comparative XRD data, including d-spacings for selected peaks and 2-theta angle separations between peaks. Shading delimits the range of values bounding sample 2. Co*K*α radiation.

Table B1. Powder diffraction data for amphiboles, including reference materials, PDF cards (ICDD, 2002), and site samples.

Data Source	Data Type	Mineral	Sample Source	Miller Indices, d-spacing					2-theta Angle Separations		
				(020)	(110)	(200)	(040)	(310)	(110)-(020)	(040)-(200)	(310)-(110)
				d(A)	d(A)	d(A)	d(A)	d(A)	degress of 2-theta		
vmtrem	measured	tremolite	conda barstow, california	9.031	8.420	4.755	4.512	3.123	0.828	1.180	21.094
icdd	44-1402	tremolite	east canaan,connecticut	8.998	8.377	4.737	4.502	3.119	0.848	1.154	21.073
icdd	31-1285	tremolite, sodian na.50	synthetic	9.030	8.440	4.760	4.510	3.130	0.797	1.216	21.044
icdd	71-1058	tremolite	gouverneur, new york	9.024	8.406	4.749	4.512	3.119	0.839	1.159	21.118
icdd	86-1318	tremolite na.016	u edinburgh	9.015	8.406	4.751	4.508	3.119	0.829	1.185	21.111
icdd	85-0876	tremolite na.11	ochsenkogel, austria	9.032	8.410	4.751	4.516	3.120	0.844	1.147	21.110
icdd	86-1319	tremolite na.016	u edinburgh	9.028	8.414	4.755	4.514	3.122	0.833	1.174	21.090
icdd	85-0877	tremolite na .38 k .12	gouverneur, new york	9.024	8.432	4.768	4.512	3.131	0.803	1.244	21.025
verkwylie	literature	tremolite (ferroact .006)	gugeris quarry, lancaster pa	9.030	8.423	4.761	4.515	3.126	0.821	1.198	21.060
verkwylie	literature	tremolite (ferroact .007)	india	9.032	8.425	4.762	4.516	3.127	0.821	1.198	21.054
verkwylie	literature	tremolite (ferroact .011)	easton pennsylvania	9.028	8.421	4.760	4.514	3.126	0.821	1.199	21.064
verkwylie	literature	tremolite (ferroact .015)	korea	9.030	8.420	4.759	4.515	3.125	0.827	1.186	21.072
verkwylie	literature	tremolite (ferroact .026)	parkton maryland	9.029	8.419	4.758	4.514	3.124	0.827	1.186	21.075
verkwylie	literature	tremolite (ferroact .030)	california	9.029	8.417	4.757	4.515	3.123	0.830	1.179	21.082
verkwylie	literature	tremolite (ferroact .033)	bastica corsica	9.032	8.425	4.762	4.516	3.127	0.822	1.196	21.056
verkwylie	literature	tremolite (ferroact .035)	pusterthol tyrol austria	9.033	8.424	4.761	4.517	3.126	0.825	1.188	21.062
verkwylie	literature	tremolite (ferroact .042)	conda barstow california	9.032	8.421	4.759	4.516	3.125	0.827	1.184	21.070
verkwylie	literature	tremolite (ferroact .047)	maryland	9.034	8.423	4.760	4.517	3.126	0.827	1.184	21.065
verkwylie	literature	tremolite (ferroact .054)	california	9.031	8.417	4.757	4.515	3.123	0.832	1.174	21.083
verkwylie	literature	tremolite (ferroact .055)	montgomery county maryland	9.032	8.420	4.758	4.516	3.125	0.829	1.179	21.074
verkwylie	literature	tremolite (ferroact .055)	val d'isere france	9.034	8.424	4.761	4.517	3.126	0.825	1.188	21.061
verkwylie	literature	tremolite (ferroact .065)	udaipur india	9.034	8.418	4.757	4.517	3.123	0.835	1.165	21.084
verkwylie	literature	tremolite (ferroact .066)	montgomery county maryland	9.037	8.427	4.763	4.518	3.127	0.825	1.187	21.054
verkwylie	literature	tremolite (ferroact .078)	rockville maryland	9.036	8.425	4.761	4.518	3.126	0.827	1.183	21.060
verkwylie	literature	tremolite (ferroact .079)	jamestown california	9.034	8.425	4.762	4.517	3.127	0.825	1.189	21.058
verkwylie	literature	tremolite (ferroact .086)	loudin county virginia	9.041	8.430	4.764	4.520	3.128	0.826	1.184	21.047
verkwylie	literature	tremolite (ferroact .089)	darnestown virginia	9.035	8.421	4.759	4.517	3.125	0.831	1.173	21.074
vmactin	measured	actinolite	wenatchee lk-cannon	9.028	8.403	4.748	4.508	3.116	0.848	1.172	21.149
vmactinw2	measured	actinolite	stanislaus mountain leather-wards	9.036	8.450	4.774		3.129	0.790		21.067
icdd	41-1366	actinolite na.14	wrightwood ca	9.040	8.420	4.758	4.520	3.117	0.839	1.156	21.157
icdd	85-2157	actinolite na.11 k.04	punta falcone, sardinia	9.046	8.407	4.747	4.523	3.117	0.866	1.092	21.133
icdd	89-5366	actinolite na.17 k.05	carr fork, bingham, utah	9.049	8.439	4.770	4.525	3.132	0.822	1.188	21.021
icdd	89-5376	actinolite na.12 k.01	cumberland, rhode island	9.095	8.466	4.782	4.547	3.140	0.841	1.129	20.968
icdd	73-2339	actinolite na.08	cumberland, rhode island	9.100	8.470	4.785	4.550	3.142	0.842	1.127	20.956
icdd	89-5370	actinolite na.04	luce lake, labrador	9.095	8.472	4.787	4.548	3.143	0.833	1.150	20.944
icdd	89-5378	actinolite.018	isua belt, greenland	9.109	8.485	4.794	4.555	3.148	0.832	1.147	20.911

Table B1 (cont.). Powder diffraction data for amphiboles, including reference materials, PDF cards (ICDD, 2002), and samples.

Data Source	Data Type	Mineral	Sample Source	Miller Indices, d-spacing					2-theta Angle Separations		
				(020)	(110)	(200)	(040)	(310)	(110)-(020)	(040)-(200)	(310)-(110)
				d(A)	d(A)	d(A)	d(A)	d(A)	degress of 2-theta		
verkwylie	literature	actinolite (ferroact .147)	fairfax virginia	9.044	8.428	4.763	4.522	3.127	0.833	1.167	21.056
verkwylie	literature	actinolite (ferroact .156)	catoctin formation vermont	9.044	8.433	4.766	4.522	3.129	0.826	1.183	21.039
verkwylie	literature	actinolite (ferroact .157)	fairfax county virginia	9.044	8.431	4.765	4.522	3.129	0.828	1.178	21.044
verkwylie	literature	actinolite (ferroact .174)	unknown	9.045	8.433	4.766	4.523	3.129	0.827	1.179	21.041
verkwylie	literature	actinolite (ferroact .176)	fair oaks commons fairfax virginia	9.045	8.427	4.762	4.522	3.127	0.834	1.163	21.059
verkwylie	literature	actinolite (ferroact .193)	roanoke virginia	9.048	8.433	4.765	4.524	3.129	0.830	1.171	21.043
verkwylie	literature	actinolite (ferroact .211)	mexico	9.058	8.445	4.773	4.529	3.134	0.826	1.179	21.009
verkwylie	literature	actinolite (ferroact .356)	unknown	9.060	8.444	4.772	4.530	3.133	0.830	1.169	21.013
verkwylie	literature	actinolite (ferroact .371)	skyline drive virginia	9.068	8.450	4.775	4.534	3.136	0.831	1.164	20.998
verkwylie	literature	actinolite (ferroact .385)	st gothard mine nevada city california	9.058	8.444	4.772	4.529	3.134	0.827	1.176	21.011
verkwylie	literature	ferroactinolite (.517)	transvall south africa	9.073	8.458	4.780	4.536	3.139	0.825	1.175	20.974
verkwylie	literature	ferroactinolite (.571)	virginia?	9.087	8.471	4.788	4.543	3.144	0.824	1.173	20.940
verkwylie	literature	ferroactinolite (.718)	south africa	9.116	8.494	4.800	4.558	3.152	0.827	1.154	20.886
verkwylie	literature	ferroactinolite (.875)	tilly foster putnam county ny	9.148	8.543	4.831	4.574	3.172	0.797	1.212	20.743
vmrichter	measured	richterite	wilburforce, ontario-wards	9.001	8.449	4.780	4.502	3.138	0.739	1.349	20.973
icdd	25-0808	richterite na2.0	synthetic	8.990	8.470	4.800	4.490	3.150	0.703	1.502	20.870
icdd	31-1284	richterite calcian na1.5	synthetic	9.010	8.480	4.800	4.500	3.150	0.715	1.451	20.884
icdd	51-1496	potassic-fluororichterite na1.25 k .67	monte somma. campania		8.490	4.817	4.498	3.166		1.538	20.726
icdd	42-1481	richterite potassian na1.0	synthetic	8.999	8.552	4.860	4.499	3.189	0.591	1.723	20.583
icdd	31-1082	richterite potassian na1.0	west kimberly, australia		8.560		4.520	3.186			20.615
icdd	85-1760	richterite na1.43		9.003	8.445	4.781	4.501	3.139	0.755	1.359	20.956
icdd	85-1763	richterite na1.95	cancarix spain	9.013	8.488	4.811	4.506	3.158	0.706	1.467	20.814
icdd	85-1762	richterite na1.90	monte somma. campania	8.993	8.496	4.819	4.496	3.163	0.670	1.558	20.769
icdd	85-1761	richterite na1.99	val d'aosta italy	8.988	8.515	4.834	4.494	3.172	0.637	1.636	20.696
icdd	85-0391	richterite-(k) na k	west kimberly, australia	9.018	8.528	4.839	4.509	3.176	0.656	1.580	20.678
icdd	85-1764	richterite na.96 k.99	west kimberly, australia	9.013	8.528	4.840	4.507	3.176	0.650	1.598	20.672
icdd	82-0603	richterite, syn na k	synthetic ti.48	9.013	8.546	4.853	4.506	3.184	0.624	1.656	20.610
icdd	82-0602	richterite, syn na k	synthetic ti.56	9.016	8.558	4.862	4.508	3.190	0.611	1.685	20.570
icdd	82-0601	richterite, titaniferous potassian syn na k	synthetic ti.60	9.017	8.567	4.868	4.508	3.194	0.601	1.710	20.541
icdd	81-0724	richterite na1.98	cancarix spain	9.018	8.489	4.811	4.509	3.158	0.711	1.455	20.814
icdd	81-0723	richterite, na k	cancarix spain	9.011	8.489	4.812	4.506	3.158	0.703	1.475	20.809
icdd	81-0727	richterite, na k	cancarix spain	9.011	8.527	4.840	4.505	3.176	0.649	1.602	20.674
icdd	81-0725	richterite na.94 k	west kimberly, australia	9.015	8.529	4.840	4.507	3.176	0.652	1.593	20.673
icdd	81-0728	richterite, na k	cancarix spain	9.020	8.532	4.841	4.510	3.177	0.653	1.586	20.667
icdd	81-0726	richterite na.94 k	west kimberly, australia	9.017	8.532	4.842	4.509	3.178	0.650	1.596	20.663

Table B1 (cont.). Powder diffraction data for amphiboles, including reference materials, PDF cards (ICDD, 2002), and samples.

Data Source	Data Type	Mineral	Sample Source	Miller Indices, d-spacing					2-theta Angle Separations		
				(020)	(110)	(200)	(040)	(310)	(110)-(020)	(040)-(200)	(310)-(110)
				d(A)	d(A)	d(A)	d(A)	d(A)	degress of 2-theta		
icdd	81-0729	richterite na.92 k.97	west kimberly, australia	9.020	8.533	4.842	4.510	3.178	0.652	1.590	20.663
icdd	81-2007	richterite, syn na k	synthetic	8.999	8.552	4.860	4.499	3.189	0.590	1.722	20.583
vmwinch	measured	winchite	braunite ore, India-wards	8.946	8.392	4.739	4.476	3.114	0.761	1.293	21.146
deerhowzuss	literature	winchite	margarita island, venezuela	8.965	8.332	4.705	4.483	3.089	0.874	1.100	21.333
icdd	20-1390	winchite	katlidongri, india	9.080	8.400	4.720	4.480	3.120	0.919	1.186	21.094
deerhowzuss	literature	winchite	kivu, congo	9.035	8.446	4.777	4.518	3.136	0.795	1.257	20.982
icdd	35-0460	winchite, potassian	allamore talc, texas		8.457	4.809	4.484	3.157		1.575	20.776
wylieverk	literature	winchite	libby, montana	9.016	8.432	4.770	4.508	3.131	0.791	1.271	21.016
wylieverk	literature	winchite	libby, montana	9.002	8.438	4.776	4.501	3.135	0.764	1.339	20.981
vmlm1b	measured		lm	8.999	8.432	4.768	4.496	3.131	0.771	1.325	21.019
sv1a	measured		sv1	9.007	8.458	4.783	4.497	3.138	0.742	1.389	20.988
svega	measured		sv1	8.997	8.449	4.779	4.497	3.137	0.744	1.372	20.982
svegega	measured		sv1	9.002	8.449	4.780	4.496	3.137	0.749	1.377	20.983
sveg300a	measured		sv1	9.001	8.450	4.780	4.497	3.137	0.748	1.376	20.984
sv4a375a	measured		sv1	8.996	8.450	4.779	4.497	3.137	0.741	1.375	20.984
sv5b	measured		sv1	8.991	8.439	4.777	4.497	3.136	0.749	1.364	20.974
vmlvbpilea	measured		lv	9.054	8.436	4.765	4.520	3.129	0.833	1.186	21.048
Data Sources:											
deerhowzuss	Derr, Howie, and Zussman (1997)										
icdd	ICDD (2002)										
verkwylie	Verkouteren and Wylie (2000)										
wylieverk	Wylie and Verkouteren (2000)										

Appendix 5

Lab/Cor, Inc.
A Professional Service Corporation in the Northwest

July 22, 2002

Ecology and Environment, Inc.
2101 Fourth Avenue
Suite 1900
Seattle, WA 98121

RE: REVISION TO LABCOR REPORT 020772, ISSUED JULY 11, 2002

Attn: Jeff Fowlow

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Project Number: TDD# 01070014
P. O. Number: 124969-S10

Lab/Cor Batch Number: 020772

Revision The previous report for LabCor report 020772, dated July 11, 2002, has been revised to reflect the separation of winchite and/or richterite amphibole species as sub-components within the nonasbestos group in the summary tables for each sample analyzed. No other data has not been changed.

Conditions Enclosed please find results for samples submitted to our laboratory on June 20, 2002. A list of samples received follows, with limitation or rejection criteria noted where applicable.

Lab/Cor Sample No.	Client Sample No.	Limitation/Rejection Criteria
020772-01	2244000	No special conditions were noted
020772-02	2244001	No special conditions were noted
020772-03	2244002	No special conditions were noted
020772-04	2244007	No special conditions were noted
020772-05	2244010	No special conditions were noted
020772-06	2244011	No special conditions were noted
020772-07	2244012	No special conditions were noted
020772-08	2244013	No special conditions were noted
020772-09	2244014	No special conditions were noted
020772-10	2244050	No special conditions were noted
020772-11	2244051	No special conditions were noted
020772-12	2244052	No special conditions were noted
020772-13	2244053	No special conditions were noted
020772-14	2244054	No special conditions were noted
020772-15	2244056	No special conditions were noted
020772-16	2244057	No special conditions were noted

Method Preparation and analysis of the above samples was conducted in accordance with the Niosh method 7402 for the identification of asbestos. The samples were collapsed with acetone, carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in acetone until cleared of filter debris.

TEM analysis was performed using a Philips 410 transmission electron microscope equipped with an EDAX PV9800 X-ray analyzer. The air samples were scanned at a magnification of approximately 990X using an accelerating voltage of 100 KV. The magnification was increased to about 10,000X for structure sizing.

Counting Rules

Minimum Aspect Ratio	Minimum Length	Minimum Width	Minimum Required Analytical Sensitivity	Stopping Rules
3:1	5 µm	0.25 µm	NA	100 Fibers

7619 6th Avenue NW, Seattle, WA 98117 (206) 781-0155 (206) 789-8424 (FAX)

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Disclaimer This test report relates only to the items tested in this report. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please do not hesitate to call me. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with analytical services.

Sincerely,

John Harper Weeks

Laboratory Director

7619 6th Avenue NW, Seattle, WA 98117 (206) 781-0155 (206) 789-8424 (FAX)

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772

Report Date: July 11, 2002

Client Information	
Project Name:	Asbestos/Vermiculite - WR Grace, Spokane, WA
Project No.:	TDD# 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information			
Login:	Jun 20, 2002	*By:*	BAR
Prep:	Jun 20, 2002	*By:*	DW
Verified:	Jun 20, 2002	*By:*	DW
Reviewed:	Jul 10, 2002	*By:*	DW
Final Review:	Jul 11, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020772-01	02244000	Blank	ASBESTOS	NA	NA - NA	0	NA	NA	0.0	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	NA	NA - NA	0								
Test			Winchite	NA	NA - NA	0								
			Richterite	NA	NA - NA	0								
			TOTAL	NA	NA - NA	0								
020772-02	02244001	WAB - Pump #1	ASBESTOS	<0.010	0 - 0.037	0	0	0.010	94.2	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	0.010	0.000 - 0.057	1								
Test			Winchite	<0.010	0 - 0.037	0								
			Richterite	<0.010	0 - 0.037	0								
			TOTAL	0.010	0.000 - 0.057	1								
020772-03	02244002	WAB - Pump #2	ASBESTOS	<0.010	0 - 0.037	0	0	0.010	95.0	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	0.020	0.002 - 0.073	2								
Test			Winchite	<0.010	0 - 0.037	0								
			Richterite	<0.010	0 - 0.037	0								
			TOTAL	0.020	0.002 - 0.073	2								
020772-04	02244007	H&S - Pump #3	ASBESTOS	<0.003	0 - 0.010	0	0	0.003	347.0	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	0.006	0.001 - 0.020	2								
Test			Winchite	<0.003	0 - 0.010	0								
			Richterite	<0.003	0 - 0.010	0								
			TOTAL	0.006	0.001 - 0.020	2								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 020772

Report Date: July 11, 2002

Client Information	
Project Name:	Asbestos/Vermiculite - WR Grace, Spokane, WA
Project No.:	TDD# 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information		
Login:	Jun 20, 2002	*By:* BAR
Prep:	Jun 20, 2002	*By:* DW
Verified:	Jun 20, 2002	*By:* DW
Reviewed:	Jul 10, 2002	*By:* DW
Final Review:	Jul 11, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020772-05	02244010	Soil #1 - Pump#1	ASBESTOS	8.861	6.814 - 10.907	72	72	0.123	44.4	7	385	0.0705	DW	6/21/02
			NON-ASBESTOS	1.969	1.126 - 3.197	16								
Test			Winchite	1.600	0.852 - 2.736	13								
			Richterite	<0.123	0.0 - 0.454	0								
			TOTAL	12.430	10.005 - 14.854	101								
020772-06	02244011	Soil #1 - Pump#2	ASBESTOS	9.404	7.331 - 11.478	79	69	0.119	45.9	7	385	0.0705	JH	6/28/02
			NON-ASBESTOS	2.976	1.809 - 4.143	25								
Test			Winchite	1.309	0.654 - 2.343	11								
			Richterite	<0.119	0.0 - 0.439	0								
			TOTAL	13.689	11.188 - 16.192	115								
020772-07	02244012	H&S Pump #3	ASBESTOS	<0.009	0 - 0.032	0	0	0.009	108.9	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	0.009	0.000 - 0.049	1								
Test			Winchite	<0.009	0 - 0.032	0								
			Richterite	<0.009	0 - 0.032	0								
			TOTAL	0.009	0.000 - 0.049	1								
020772-08	02244013	WAB - Pump #1	ASBESTOS	<0.010	0 - 0.037	0	0	0.010	95.1	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	0.020	0.002 - 0.073	2								
Test			Winchite	<0.010	0 - 0.037	0								
			Richterite	<0.010	0 - 0.037	0								
			TOTAL	0.020	0.002 - 0.073	2								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 020772 *Report Date:* July 11, 2002

Client Information	
Project Name:	Asbestos/Vermiculite - WR Grace, Spokane, WA
Project No.:	TDD# 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information			
Login:	Jun 20, 2002	*By:*	BAR
Prep:	Jun 20, 2002	*By:*	DW
Verified:	Jun 20, 2002	*By:*	DW
Reviewed:	Jul 10, 2002	*By:*	DW
Final Review:	Jul 11, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020772-09	02244014	WAB - Pump #2	ASBESTOS	<0.010	0 - 0.037	0	NA	0.010	95.6	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	<0.010	0 - 0.037	0								
Test			Winchite	<0.010	0 - 0.037	0								
			Richterite	<0.010	0 - 0.037	0								
			TOTAL	<0.010	0 - 0.037	0								
020772-10	02244050	Soil #4 - Pump #1	ASBESTOS	1.286	0.761 - 1.812	23	22	0.056	36.0	19	385	0.1912	DW	6/30/02
			NON-ASBESTOS	1.062	0.640 - 1.659	19								
Test			Winchite	3.523	2.653 - 4.393	63								
			Richterite	<0.056	0.0 - 0.0206	0								
			TOTAL	5.871	4.748 - 6.995	105								
020772-11	02244051	Soil #4 - Pump #2	ASBESTOS	2.062	1.359 - 2.766	33	32	0.062	36.0	17	385	0.1711	DW	7/2/02
			NON-ASBESTOS	0.875	0.478 - 1.468	14								
Test			Winchite	3.562	2.638 - 4.487	57								
			Richterite	<0.062	0.0 - 0.231	0								
			TOTAL	6.499	5.251 - 7.749	104								
020772-12	02244052	H&S - Pump #3	ASBESTOS	<0.021	0 - 0.078	0	NA	0.021	45.2	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	<0.021	0 - 0.078	0								
Test			Winchite	<0.021	0 - 0.078	0								
			Richterite	<0.021	0 - 0.078	0								
			TOTAL	<0.021	0 - 0.078	0								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 020772

Report Date: July 11, 2002

Client Information	
Project Name:	Asbestos/Vermiculite - WR Grace, Spokane, WA
Project No.:	TDD# 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information			
Login:	Jun 20, 2002	*By:*	BAR
Prep:	Jun 20, 2002	*By:*	DW
Verified:	Jun 20, 2002	*By:*	DW
Reviewed:	Jul 10, 2002	*By:*	DW
Final Review:	Jul 11, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concentration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020772-13	02244053	WAB - Pump #1	ASBESTOS	<0.010	0 - 0.039	0	0	0.010	91.1	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	0.010	0.000 - 0.058	1								
Test			Winchite	<0.010	0 - 0.039	0								
			Richterite	<0.010	0 - 0.039	0								
			TOTAL	0.010	0.000 - 0.058	1								
020772-14	02244054	WAB - Pump #2	ASBESTOS	<0.011	0 - 0.039	0	NA	0.011	90.9	40	385	0.4026	DW	6/21/02
			NON-ASBESTOS	<0.011	0 - 0.039	0								
Test			Winchite	<0.011	0 - 0.039	0								
			Richterite	<0.011	0 - 0.039	0								
			TOTAL	<0.011	0 - 0.039	0								
020772-15	02244056	Soil #5 - Pump #1	ASBESTOS	0.063	0.017 - 0.162	4	17	0.016	60.6	40	385	0.4026	DW	6/23/02
			NON-ASBESTOS	0.047	0.010 - 0.138	3								
Test			Winchite	0.252	0.144 - 0.410	16								
			Richterite	<0.016	0.0 - 0.058	0								
			TOTAL	0.362	0.215 - 0.511	23								
020772-16	02244057	Soil #5 - Pump #2	ASBESTOS	0.079	0.026 - 0.184	5	26	0.016	60.6	40	385	0.4026	DW	6/23/02
			NON-ASBESTOS	0.095	0.035 - 0.206	6								
Test			Winchite	0.126	0.054 - 0.249	8								
			Richterite	<0.016	0.0 - 0.058	0								
			TOTAL	0.300	0.181 - 0.468	19								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-01

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244000 | *Analysis Date:* Jun 21, 2002

Description: Blank

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 24	NSD**																
	2	B 14	NSD																
	3	B 4	NSD																
	4	C 4	NSD																
	5	C 14	NSD																
	6	C 24	NSD																
	7	C 34	NSD																
	8	C 44	NSD																
	9	C 23	NSD																
	10	C 13	NSD																
	11	C 3	NSD																
	12	B 3	NSD																
	13	B 13	NSD																
	14	B 23	NSD																
	15	B 32	NSD																
	16	B 22	NSD																
	17	B 12	NSD																
	18	B 2	NSD																
	19	C 2	NSD																
	20	C 12	NSD																
	21	C 22	NSD																
	22	C 32	NSD																
B	23	A 40	NSD																
	24	A 41	NSD																
	25	A 31	NSD																
	26	A 21	NSD																
	27	A 11	NSD																
	28	A 1	NSD																
	29	D 1	NSD																
	30	D 11	NSD																
	31	D 21	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-01

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244000 | *Analysis Date:* Jun 21, 2002

Description: Blank

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 31	NSD																
	33	D 42	NSD																
	34	D 22	NSD																
	35	D 12	NSD																
	36	D 2	NSD																
	37	A 2	NSD																
	38	A 12	NSD																
	39	A 22	NSD																
	40	A 32	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-02

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244001 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 4	NSD																
	3	C 4	NSD																
	4	C 33	NSD																
	5	C 23	NSD																
	6	C 13	NSD																
	7	C 3	NSD																
	8	B 3	NSD																
	9	B 2	NSD																
	10	C 2	NSD																
	11	C 12	NSD																
	12	C 22	NSD																
	13	C 32	NSD																
	14	C 31	NSD																
	15	C 21	NSD																
	16	C 11	NSD																
	17	C 1	NSD																
	18	B 1	NSD																
	19	B 11	NSD																
	20	B 21	1	Fiber	7.5	0.65							✓			Al, Si, P			
	21	B 20	NSD																
	22	B 10	NSD																
B	23	B 24	NSD																
	24	B 14	NSD																
	25	B 4	NSD																
	26	C 44	NSD																
	27	C 34	NSD																
	28	C 33	NSD																
	29	C 23	NSD																
	30	C 13	NSD																
	31	C 3	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-02
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244001
Analysis Date: Jun 21, 2002
Description: WAB - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 13	NSD																
	33	B 23	NSD																
	34	B 33	NSD																
	35	B 22	NSD																
	36	B 12	NSD																
	37	B 2	NSD																
	38	C 2	NSD																
	39	C 22	NSD																
	40	C 12	NSD																
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-03

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244002 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 14	NSD**																
	2	B 4	NSD																
	3	C 4	NSD																
	4	C 14	NSD																
	5	C 24	NSD																
	6	C 34	NSD																
	7	C 44	NSD																
	8	C 43	NSD																
	9	C 33	NSD																
	10	C 23	NSD																
	11	C 13	NSD																
	12	C 3	NSD																
	13	B 3	NSD																
	14	B 13	NSD																
	15	B 23	NSD																
	16	B 42	NSD																
	17	B 32	1	Fiber	5	0.65							✓			Al, Si, P			
	18	B 22	NSD																
	19	B 12	NSD																
	20	B 2	NSD																
	21	C 2	NSD																
	22	C 12	NSD																
	23	C 22	NSD																
	24	C 32	NSD																
B	25	B 10	NSD																
	26	B 11	NSD																
	27	B 12	NSD																
	28	B 13	NSD																
	29	B 14	NSD																
	30	B 24	NSD																
	31	B 23	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-03
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244002
Analysis Date: Jun 21, 2002
Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 22	NSD																
	33	B 21	NSD																
	34	B 20	NSD																
	35	A 10	NSD																
	36	D 10	NSD																
	37	D 20	NSD																
	38	D 30	NSD																
	39	D 1	NSD																
	40	A 1	1	Fiber	5.5	0.75							✓			Al, Si, P			
	40						0	0	0	0	0	0	2						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-04

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244007 | *Analysis Date:* Jun 21, 2002

Description: H&S - Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	D 42	NSD**																
	2	D 32	NSD																
	3	D 22	NSD																
	4	D 12	NSD																
	5	D 2	NSD																
	6	A 2	NSD																
	7	A 12	NSD																
	8	A 22	NSD																
	9	A 32	NSD																
	10	A 42	NSD																
	11	A 41	NSD																
	12	A 31	NSD																
	13	A 21	NSD																
	14	A 11	NSD																
	15	A 1	NSD																
	16	D 1	NSD																
	17	D 11	NSD																
	18	D 21	NSD																
	19	D 31	1	Fiber	10	2.5							✓			Mg, Al, Si, K, Ca, Fe	POSSIBLE HORNEBLENDE		
	20	D 41	1	Fiber	40	1							✓			Al, Si, P			
	21	D 40	NSD																
	22	D 30	NSD																
	23	D 20	NSD																
	24	D 10	NSD																
B	25	C 41	NSD																
	26	C 31	NSD																
	27	C 21	NSD																
	28	C 11	NSD																
	29	C 1	NSD																
	30	B 1	NSD																
	31	B 11	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-04
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244007
Analysis Date: Jun 21, 2002
Description: H&S - Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 21	NSD																
	33	B 31	NSD																
	34	B 41	NSD																
	35	B 40	NSD																
	36	B 30	NSD																
	37	B 20	NSD																
	38	B 10	NSD																
	39	C 10	NSD																
	40	C 20	NSD																
	40						0	0	0	0	0	0	2						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-05
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW
Sample No.: 02244010 | *Analysis Date:* Jun 21, 2002
Description: Soil #1 - Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	20	0.25	✓							2305	11562	Mg, Si			
			2	Fiber	9	1	✓									Mg, Si			
			3	Fiber	7.5	0.3		✓							11563	Mg, Si, Mn, Fe			
			4	Fiber	6	0.25	✓									Mg, Si			
			5	Fiber	20	0.5							✓		11654	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	8	0.75	✓									Mg, Si			
			7	Fiber	25	1							✓	2347	11655	Na, Mg, Si, K, Ca, Fe	WINCHITE, [3 0 1] ZONE AXIS	JH	7/11/02
			8	Fiber	7.5	0.5		✓								Mg, Si, Mn, Fe			
			9	Fiber	10	0.25	✓									Mg, Si			
			10	Fiber	9	0.75							✓		11656	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			11	Fiber	8	0.75							✓		11657	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			12	Fiber	7.5	0.8							✓			Si, Ca			
			13	Fiber	15	0.3	✓									Mg, Si			
			14	Fiber	15	0.25	✓									Mg, Si			
			15	Fiber	18	0.25	✓									Mg, Si			
			16	Fiber	5	0.25		✓								Mg, Si, Mn, Fe			
	2	A 10	1	Fiber	60	0.6		✓						2345	11618	Mg, Si, Mn, Fe	[3 0 1] ZONE AXIS	JH	7/11/02
			2	Fiber	10	2							✓			Si			
			3	Fiber	13	0.3		✓							11619	Mg, Si, Mn, Fe			
			4	Fiber	20	0.4		✓							11620	Mg, Si, Mn, Fe			
			5	Fiber	15	0.3	✓							2315	11621	Mg, Si		JH	7/11/02
			6	Fiber	10	0.5							✓			S, Ca, Fe			
			7	Fiber	6	0.5	✓									Mg, Si			
			8	Fiber	10	0.5		✓							11622	Mg, Si, Mn, Fe			
			9	Fiber	8	0.5							✓		11623	Na, Mg, Si, K, Ca, Fe			
	3	D 20	1	Fiber	8	0.5							✓		11624	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	13	0.6							✓		11625	Na, Mg, Si, K, Ca, Ti, Cr, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-05

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244010 | *Analysis Date:* Jun 21, 2002

Description: Soil #1 - Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			3	Fiber	8	0.4		✓							11626	Mg, Si, Mn, Fe			
			4	Fiber	8	0.3							✓		11627	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	15	0.4	✓								11628	Mg, Si			
			6	Fiber	11	0.4		✓							11629	Mg, Si, Fe			
			7	Fiber	6	0.7							✓			Si			
	4	C 40	1	Fiber	20	0.25	✓									Mg, Si			
			2	Fiber	6	0.3	✓									Mg, Si			
			3	Fiber	5.5	0.6			✓						11630	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	8	1							✓			Si			
			5	Fiber	13	0.4		✓							11631	Mg, Si, Mn, Fe			
			6	Fiber	12	0.4	✓									Mg, Si			
			7	Fiber	9	2							✓			Si			
			8	Fiber	10	0.3	✓									Mg, Si			
			9	Fiber	8	0.6							✓		11632	Na, Mg, Al, Si, S, K, Ca, Fe, Zn	PROBABLE GLASS		
			10	Fiber	14	0.5							✓			Si			
			11	Fiber	14	0.4							✓		11633	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	5	C 10	1	Fiber	16	0.7			✓					2346	11634	Na, Mg, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	7/11/02
			2	Fiber	76	0.4		✓							11635	Mg, Si, Fe			
			3	Fiber	8	0.4		✓							11636	Mg, Si, Fe			
			4	Fiber	10	0.5	✓									Mg, Si			
			5	Fiber	15	1							✓			Si			
			6	Fiber	12	1	✓									Mg, Si			
			7	Fiber	20	1.5	✓									Mg, Si			
			8	Fiber	18	2.5							✓			Si			
			9	Fiber	12	0.5		✓							11637	Mg, Si, Fe			
			10	Fiber	5.5	0.3		✓							11638	Mg, Si, Fe			
B	6	A 10	1	Fiber	9	0.5	✓									Mg, Si			

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-05

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244010 | *Analysis Date:* Jun 21, 2002

Description: Soil #1 - Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	10	0.25	✓									Mg, Si			
			3	Fiber	7.5	1							✓		11640	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	7.5	0.25	✓									Mg, Si			
			5	Fiber	22	0.25	✓									Mg, Si			
			6	Fiber	11	0.3	✓									Mg, Si			
			7	Fiber	7	0.35	✓									Mg, Si			
			8	Fiber	7.5	0.5	✓									Mg, Si			
			9	Fiber	14	0.35	✓									Mg, Si			
			10	Fiber	15	0.35	✓									Mg, Si			
			11	Fiber	30	0.6	✓									Mg, Si			
			12	Fiber	7.5	1	✓									Mg, Si			
			13	Fiber	8	0.75	✓									Mg, Si			
			14	Fiber	29	1	✓									Mg, Si			
			15	Fiber	40	0.5	✓									Mg, Si			
			16	Fiber	20	2							✓		11639	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			17	Fiber	11	0.25		✓							11641	Mg, Si, Mn, Fe			
			18	Fiber	20	0.75	✓									Mg, Si			
			19	Fiber	20	0.35	✓									Mg, Si			
			20	Fiber	17	0.5	✓									Mg, Si			
			21	Fiber	10	0.5	✓									Mg, Si			
			22	Fiber	6	0.5		✓							11642	Mg, Si, Mn, Fe			
			23	Fiber	12	0.35	✓									Mg, Si			
			24	Fiber	6	0.3	✓									Mg, Si			
			25	Fiber	13	0.4		✓							11643	Mg, Si, Mn, Fe			
			26	Fiber	15	0.5		✓							11644	Mg, Si, Mn, Fe			
			27	Fiber	6	0.35	✓									Mg, Si			
			28	Fiber	18	0.65							✓			Al, Si, P			
	7	A 20	1	Fiber	10	0.25	✓									Mg, Si			
			2	Fiber	7.5	0.75							✓			Si, K, Ca			
			3	Fiber	15	0.25	✓									Mg, Si			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-05
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244010
Analysis Date: Jun 21, 2002
Description: Soil #1 - Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			4	Fiber	10	0.4	✓									Mg, Si			
			5	Fiber	10	1.5	✓									Mg, Si			
			6	Fiber	20	0.25	✓									Mg, Si			
			7	Fiber	7.5	0.45		✓							11645	Mg, Si, Mn, Fe			
			8	Fiber	10	0.3							✓		11646	Na, Mg, Al, Si, K, Ca, Fe			
			9	Fiber	5.5	0.65							✓		11647	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			10	Fiber	11	0.65			✓						11648	Mg, Si, K, Ca, Fe			
			11	Fiber	5.5	0.65							✓		11649	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			12	Fiber	13	0.25	✓									Mg, Si			
			13	Fiber	6	0.3	✓									Mg, Si			
			14	Fiber	20	0.3	✓									Mg, Si			
			15	Fiber	6	0.75							✓			Si, K, Ca			
			16	Fiber	7.5	0.4							✓		11650	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			17	Fiber	10.5	0.35	✓									Mg, Si			
			18	Fiber	6	1.2	✓									Mg, Si			
			19	Fiber	14	0.25	✓									Mg, Si			
			20	Fiber	5.5	1							✓		11651	Mg, Al, Si, Fe			
	7						50	19	3	0	0	0	29						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-06

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* JH

Sample No.: 02244011 | *Analysis Date:* Jun 28, 2002

Description: Soil #1 - Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	A 10	1	Fiber	30	0.5		✓						2348	11659	Mg, Si, Mn, Fe	[2 0 1] ZONE AXIS	JH	7/11/02
			2	Fiber	10	0.8							✓			Al, Si, S, Ca			
			3	Fiber	9	0.4	✓								11660	Mg, Si			
			4	Fiber	7	0.4							✓			Mg, Al, Si			
			5	Fiber	7	0.4	✓								11661	Mg, Si			
			6	Fiber	5.5	0.5	✓								11662	Mg, Si			
			7	Fiber	6	0.7	✓								11663	Mg, Si			
			8	Fiber	18	0.4		✓							11664	Mg, Si, Mn, Fe			
			9	Fiber	10	0.4	✓									Mg, Si			
			10	Fiber	7	0.3		✓							11665	Mg, Si, Mn, Fe			
			11	Fiber	12	0.3		✓							11666	Mg, Si, Fe			
			12	Fiber	11	0.3	✓									Mg, Si			
	2	A 20	1	Fiber	10	0.6			✓					2349	11667	Na, Mg, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	7/11/02
			2	Fiber	14	0.6	✓									Mg, Si			
			3	Fiber	7	0.3							✓			Si			
			4	Fiber	20	0.8							✓			Si			
			5	Fiber	5	0.6							✓			Mg, Al, Si			
			6	Fiber	9	0.6							✓		11668	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	12	0.5		✓							11669	Mg, Si, Mn, Fe			
			8	Fiber	7	0.4		✓							11670	Mg, Si, Mn, Fe			
			9	Fiber	14	0.8							✓			Si			
	3	A 30	1	Fiber	20	0.4	✓									Mg, Si			
			2	Fiber	7	0.5							✓		11671	Na, Mg, Al, Si, K, Ca, Fe	PIGEONITE?, INTERFERENCES?		
			3	Fiber	9	0.6							✓			Si			
			4	Fiber	5	0.4	✓									Mg, Si			
			5	Fiber	5	0.4			✓						11672	Mg, Al, Si, Ca, Fe			
			6	Fiber	7	0.6	✓									Mg, Si			
			7	Fiber	26	8							✓			None			

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**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-06

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* JH

Sample No.: 02244011 | *Analysis Date:* Jun 28, 2002

Description: Soil #1 - Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			8	Fiber	6	0.4							✓		11673	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	10	0.4	✓									Mg, Si			
			10	Fiber	25	0.4							✓		11674	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	4	D 10	1	Fiber	20	0.5					✓			2350	11675	Mg, Si, Ca, Fe	[1 0 0] ZONE AXIS	JH	7/11/02
			2	Fiber	12	1		✓							11676	Mg, Si, Mn, Fe			
			3	Fiber	9	1							✓			Si, K, Ca			
			4	Fiber	14	0.4	✓									Mg, Si			
			5	Fiber	7.5	0.3	✓									Mg, Si			
			6	Fiber	16	0.75	✓									Mg, Si			
			7	Fiber	13	0.65	✓									Mg, Si			
			8	Fiber	10	0.35	✓									Mg, Si			
			9	Fiber	9	1							✓			Si			
			10	Fiber	10	0.75	✓									Mg, Si			
			11	Fiber	10	0.3	✓									Mg, Si			
			12	Fiber	15	0.3	✓									Mg, Si			
			13	Fiber	14	0.65							✓			Si			
			14	Fiber	5	1							✓			Si, K, Ca			
			15	Fiber	6	0.85	✓									Mg, Si			
			16	Fiber	7.5	0.9							✓			Si			
			17	Fiber	5	0.9							✓			Si			
			18	Fiber	20	0.75	✓									Mg, Si			
	5	D 20	1	Fiber	14	0.65	✓									Mg, Si			
			2	Fiber	5	0.5	✓									Mg, Si			
			3	Fiber	30	1	✓									Mg, Si			
			4	Fiber	24	0.5	✓									Mg, Si			
			5	Fiber	14	0.65	✓									Mg, Si			
			6	Fiber	8	0.35							✓		11677	Mg, Al, Si, K, Fe			
			7	Fiber	42	0.3		✓							11682	Mg, Si, Mn, Fe			
			8	Fiber	5	0.4							✓			Al, Si, P			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-06

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* JH

Sample No.: 02244011 | *Analysis Date:* Jun 28, 2002

Description: Soil #1 - Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			9	Fiber	5.5	0.3		✓							11683	Mg, Si, Mn, Fe			
			10	Fiber	9	0.45							✓		11684	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			11	Fiber	15.5	0.75										Al, Si, P, Fe			
			12	Fiber	6	1	✓									Mg, Si			
			13	Fiber	19	0.4	✓									Mg, Si			
			14	Fiber	9	0.5							✓		11685	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			15	Fiber	10	0.5							✓		11686	Mg, Al, Si, Fe			
			16	Fiber	12.5	0.35							✓	2351	11687	Na, Mg, Si, K, Ca, Fe	WINCHITE, [3 1 0] ZONE AXIS	JH	7/11/02
			17	Fiber	7.5	0.65							✓			Al, Si, Fe			
			18	Fiber	10	0.5	✓									Mg, Si			
			19	Fiber	14	0.85							✓		11688	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			20	Fiber	9	0.35	✓									Mg, Si			
			21	Fiber	11	0.75	✓									Mg, Si			
B	6	D 41	1	Fiber	16	0.75							✓		11689	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	7	0.45							✓		11690	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	9	0.35		✓							11691	Mg, Al, Si, Fe			
			4	Fiber	5	0.35	✓									Mg, Si			
			5	Fiber	20.5	0.3	✓									Mg, Si			
			6	Fiber	5.5	1	✓									Mg, Si			
			7	Fiber	11	0.35	✓									Mg, Si			
			8	Fiber	9	0.5	✓									Mg, Si			
			9	Fiber	11	0.25	✓									Mg, Si			
			10	Fiber	6	0.75							✓			Al, Si, S, Ca, Fe			
			11	Fiber	8	0.75							✓		11692	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			12	Fiber	5	0.85	✓									Mg, Si			
			13	Fiber	8.5	0.65	✓									Mg, Si			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-06
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: JH
Sample No.: 02244011
Analysis Date: Jun 28, 2002
Description: Soil #1 - Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			14	Fiber	15	0.25	✓									Mg, Si			
			15	Fiber	7.5	0.5	✓									Mg, Si			
			16	Fiber	7.5	0.3			✓						11693	Na, Mg, Si, Ca, Fe			
			17	Fiber	15	1.6	✓									Mg, Si			
			18	Fiber	10	0.5							✓			Al, Si, P			
			19	Fiber	9	0.65							✓			None	INSECT HAIR		
			20	Fiber	15	0.3	✓									Mg, Si			
			21	Fiber	25	0.5	✓									Mg, Si			
			22	Fiber	7.5	0.35	✓									Mg, Si			
			23	Fiber	5.5	0.65	✓									Mg, Si			
			24	Fiber	10	0.65	✓									Mg, Si			
			25	Fiber	6	0.55	✓									Mg, Si			
			26	Fiber	5.5	0.35		✓							11694	Na, Mg, Si, K, Ca, Fe			
			27	Fiber	14	0.35		✓							11695	Mg, Al, Si, Fe			
			28	Fiber	7.5	0.35	✓									Mg, Si			
			29	Fiber	6	1					✓				11696	Mg, Al, Si, Ca, Fe			
	7	D 10	1	Fiber	5	0.5	✓									Mg, Si			
			2	Fiber	6	0.35	✓									Mg, Si			
			3	Fiber	11	0.75							✓			Al, Si, P			
			4	Fiber	5.5	0.35	✓									Mg, Si			
			5	Fiber	8	0.25	✓									Mg, Si			
			6	Fiber	6	0.75					✓				11761	Mg, Si, Ca, Fe			
			7	Fiber	7	0.25	✓									Mg, Si			
			8	Fiber	5	0.25	✓									Mg, Si			
			9	Fiber	11	1	✓									Mg, Si			
			10	Fiber	10	0.65	✓									Mg, Si			
			11	Fiber	8	1	✓									Mg, Si			
			12	Fiber	9	0.75	✓									Mg, Si			
			13	Fiber	11	1	✓									Mg, Si			

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-06

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* JH

Sample No.: 02244011 | *Analysis Date:* Jun 28, 2002

Description: Soil #1 - Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			14	Fiber	5	1							✓			Si			
			15	Fiber	13	0.5							✓			Al, Si, K, Ca			
			16	Fiber	10	1.3							✓		11762	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			17	Fiber	15	0.4	✓									Mg, Si			
	7						61	12	3	0	3	0	36						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002

Client: EPA - Region 10
Lab/Cor Sample No.: 020772-07
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244012
Analysis Date: Jun 21, 2002
Description: H&S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	1	Fiber	6	0.35							✓			Al, Si, P			
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
B	26	A 30	NSD																
	27	A 40	NSD																
	28	A 41	NSD																
	29	A 31	NSD																
	30	A 32	NSD																
	31	A 42	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-07
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW
Sample No.: 02244012 | *Analysis Date:* Jun 21, 2002
Description: H&S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 33	NSD																
	33	A 23	NSD																
	34	A 13	NSD																
	35	A 14	NSD																
	36	A 24	NSD																
	37	A 34	NSD																
	38	A 44	NSD																
	39	D 43	NSD																
	40	D 42	NSD																
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-08

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244013 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 23	1	Fiber	11	0.5							✓			Al, Si, P			
	12	C 13	NSD																
	13	C 3	NSD																
	14	B 3	NSD																
	15	B 13	NSD																
	16	B 23	NSD																
	17	B 33	NSD																
	18	B 43	NSD																
	19	B 42	NSD																
	20	B 32	NSD																
	21	B 22	NSD																
	22	B 12	NSD																
	23	B 2	NSD																
	24	C 2	NSD																
	25	C 12	NSD																
	26	C 22	NSD																
	27	C 32	NSD																
B	28	B 14	NSD																
	29	B 4	NSD																
	30	C 4	NSD																
	31	C 14	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-08
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244013
Analysis Date: Jun 21, 2002
Description: WAB - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 24	NSD																
	33	C 34	1	Fiber	12	0.5							✓			Al, Si, P, S			
	34	C 44	NSD																
	35	C 43	NSD																
	36	C 33	NSD																
	37	C 23	NSD																
	38	C 13	NSD																
	39	C 3	NSD																
	40	B 3	NSD																
	40						0	0	0	0	0	0	2						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-09

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244014 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 13	NSD																
	9	C 3	NSD																
	10	B 3	NSD																
	11	B 13	NSD																
	12	B 23	NSD																
	13	B 33	NSD																
	14	B 43	NSD																
	15	B 42	NSD																
	16	B 32	NSD																
	17	B 22	NSD																
	18	B 12	NSD																
	19	B 2	NSD																
	20	C 2	NSD																
	21	C 12	NSD																
	22	C 11	NSD																
	23	C 1	NSD																
	24	B 1	NSD																
	25	B 11	NSD																
B	26	D 41	NSD																
	27	D 31	NSD																
	28	D 21	NSD																
	29	D 11	NSD																
	30	D 1	NSD																
	31	A 1	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-09

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244014 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 11	NSD																
	33	B 41	NSD																
	34	B 31	NSD																
	35	B 21	NSD																
	36	B 11	NSD																
	37	B 1	NSD																
	38	C 1	NSD																
	39	C 11	NSD																
	40	C 12	NSD																
	40						0	0	0	0	0	0	0						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-10
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244050
Analysis Date: Jun 21, 2002
Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	9.5	0.5							✓		11697	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5	0.75							✓		11698	Na, Mg, Al, Si, K, Ca, Fe			
	2	B 34	1	Fiber	14	0.5							✓		11699	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	20	0.3							✓		11700	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	14	0.65							✓		11701	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	14	0.75							✓		11702	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	3	B 24	1	Fiber	10.5	0.75							✓		11703	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	4	B 14	1	Fiber	20	0.4			✓					2352	11704	Na, Mg, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	7/11/02
			2	Fiber	15	0.9							✓	2353	11705	Na, Mg, Si, K, Ca, Fe	WINCHITE, [2 0 1] ZONE AXIS	JH	7/11/02
			3	Fiber	20	0.4			✓						11706	Mg, Al, Si, K, Ca, Fe			
			4	Fiber	6.5	0.5							✓		11707	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	7.5	0.25			✓						11708	Na, Mg, Si, K, Ca, Fe			
	5	B 4	1	Fiber	15	0.65							✓		11709	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	12	0.5							✓		11710	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	7.5	1							✓		11711	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	60	0.55							✓		11712	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	15	0.85							✓			Rotates Off Screen			
			6	Fiber	8	0.85							✓		11714	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	15	1							✓		11713	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	8	0.75							✓		11715	Na, Mg, Si, K, Ca, Fe	WINCHITE		

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-10

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244050 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	6	C 4	1	Fiber	22	0.4			✓						11716	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	13	0.25			✓						11717	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	10	0.3			✓						11718	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	7.5	0.85			✓						11719	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	7.5	0.35							✓		11720	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	9	0.5							✓		11721	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	15	0.75							✓		11722	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	9	0.35							✓		11723	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	7	C 14	1	Fiber	14	0.45							✓		11724	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	22	0.6							✓		11725	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	5	0.6							✓		11726	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	10.5	0.65			✓						11727	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	23	0.6							✓		11728	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	7.5	0.85							✓			Si			
			7	Fiber	5.5	0.5							✓		11729	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	7.5	0.75							✓		11730	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	5	0.5							✓		11731	Na, Mg, Si, K, Ca, Fe			
			10	Fiber	14	0.5							✓		11732	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			11	Fiber	9.5	0.85					✓			2354	11733	Mg, Si, Ca, Fe	[2 0 1] ZONE AXIS	JH	7/11/02
			12	Fiber	10	0.7			✓						11734	Na, Mg, Si, K, Ca, Fe			

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-10
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244050
Analysis Date: Jun 21, 2002
Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	8	C 24	1	Fiber	18	0.35			✓						11735	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	16	0.35							✓		11736	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	7.5	0.35			✓						11737	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	10.5	0.5							✓		11738	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	7.5	0.25							✓		11739	Na, Mg, Si, K, Ca, Fe			
			6	Fiber	5.5	0.25							✓		11740	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	10.5	0.85							✓		11741	Na, Mg, Si, K, Ca, Fe			
			8	Fiber	8	1			✓						11742	Na, Mg, Si, K, Ca, Fe			
	9	C 34	1	Fiber	26	0.75			✓						11743	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	5.5	0.35							✓		11744	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	9.5	0.3							✓		11745	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	8	0.35			✓						11746	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	10	0.5							✓		11747	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	8	1.5							✓		11748	Mg, Si, Ca, Fe	WINCHITE		
			7	Fiber	10	0.75					✓				11749	Na, Mg, Si, K, Ca, Fe			
			8	Fiber	11	0.5			✓						11750	Na, Mg, Si, K, Ca, Fe			
	10	C 44	1	Fiber	6	0.85							✓		11751	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	6	1.5							✓		11752	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	14.5	0.85							✓		11753	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	11	C 43	1	Fiber	7.5	0.85							✓		11754	Na, Mg, Si, K, Ca, Fe	WINCHITE		

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-10

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244050 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	8	0.3							✓		11755	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	31	1							✓		11756	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	9.5	0.85							✓		11760	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	6	0.25							✓		11757	Na, Mg, Si, K, Ca, Fe			
			6	Fiber	7.5	0.3							✓		11758	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	15.5	0.5							✓		11759	Na, Mg, Si, K, Ca, Fe	WINCHITE		
B	12	D 1	1	Fiber	5.5	0.7							✓		11763	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	7.5	0.6							✓		11764	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	15.5	0.35							✓		11765	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	13	D 11	1	Fiber	5	0.65							✓		11766	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	15	0.25							✓		11767	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	11	0.75							✓		11768	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	6	0.4							✓		11769	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	16	0.75							✓		11770	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	5.5	0.75			✓						11771	Na, Mg, Si, K, Ca, Fe			
	14	D 21	1	Fiber	11	0.3			✓						11772	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	11.5	0.5			✓						11773	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	8.5	0.75							✓		11774	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	19	0.5							✓		11775	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	15	D 31	1	Fiber	5.5	0.65							✓		11776	Na, Mg, Si, K, Ca, Fe	UNKNOWN		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-10
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244050
Analysis Date: Jun 21, 2002
Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	6	0.3							✓		11777	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	11	0.3							✓		11778	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	10	0.3							✓		11779	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	7.5	0.75							✓		11780	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	16	D 41	1	Fiber	90	1			✓						11781	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	15	0.35							✓				FIBER ROTATED FROM VIEW		
			3	Fiber	8	0.65					✓				11782	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	7.5	2							✓			Al, Si, Fe			
			5	Fiber	14	0.75							✓		11783	Na, Mg, Si, K, Ca, Fe			
	17	B 40	1	Fiber	21	0.75							✓		11784	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	7.5	0.5							✓		11785	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	8	0.35							✓				FIBER ROTATED FROM VIEW		
			4	Fiber	6	0.6							✓		11786	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	17.5	0.25							✓		11787	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	18	B 30	1	Fiber	6	0.4							✓		11788	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	13	0.85							✓		11789	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	0.5							✓		11790	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	26	0.3							✓		11791	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	9	0.75							✓		11792	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	39	0.7							✓		11793	Na, Mg, Si, K, Ca, Fe	WINCHITE		

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-10
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW
Sample No.: 02244050 | *Analysis Date:* Jun 21, 2002
Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	19	B 20	1	Fiber	11	0.3			✓						11794	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	14.5	0.4							✓		11795	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	6	0.6							✓		11796	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	26	0.6							✓		11797	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	5.5	0.3							✓		11798	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	19						0	0	20	0	3	0	82						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-11

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244051 | *Analysis Date:* Jul 2, 2002

Description: Soil #4 - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	11	0.75							✓	2355	11802	Na, Mg, Si, K, Ca, Fe	WINCHITE, [4 0 1] ZONE AXIS	JH	7/11/02
			2	Fiber	13	0.65			✓					2356	11803	Na, Mg, Si, K, Ca, Fe	[4 0 3] ZONE AXIS	JH	7/11/02
			3	Fiber	10.5	0.5							✓		11804	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	5.5	0.25			✓						11805	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	50	0.65							✓		11806	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	2	B 34	1	Fiber	8	0.35					✓			2357	11807	Na, Mg, Si, K, Ca, Fe	[1 0 1] ZONE AXIS	JH	7/11/02
			2	Fiber	16	0.85							✓		11808	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	15	0.65			✓						11809	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	5	0.5							✓			Al, Si, P			
			5	Fiber	6	0.35							✓		11810	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	7.5	0.35							✓		11811	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	6	0.5							✓		11812	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	5.5	0.5							✓		11813	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	3	B 24	1	Fiber	16	0.35			✓						11814	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	9	0.25			✓						11815	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	20	1			✓						11816	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	7.5	0.35			✓						11817	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	10	0.25			✓						11818	Na, Mg, Si, K, Ca, Fe			
			6	Fiber	5.5	0.85							✓		11819	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	4	B 14	1	Fiber	9.5	0.65			✓						11820	Na, Mg, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-11

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244051 | *Analysis Date:* Jul 2, 2002

Description: Soil #4 - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	10	0.35							✓		11821	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	9.5	0.35							✓		11822	Na, Mg, Si, K, Ca, Fe	MAGNESIO-REIBECKITE		
			4	Fiber	6	0.35							✓		11823	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	10.5	0.5			✓						11824	Na, Mg, Si, K, Ca, Fe			
			6	Fiber	18	0.65			✓						11825	Na, Mg, Si, K, Ca, Fe			
			7	Fiber	5.5	0.3							✓		11826	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	8.5	0.4							✓		11827	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	15	3							✓		11828	Mg, Al, Si, K, Ca, Fe			
	5	C 24	1	Fiber	11.5	0.65					✓				11829	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	7.5	0.5			✓						11830	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	25	0.5							✓		11831	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	35	0.25							✓		11832	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	10.5	0.75							✓		11833	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	16	0.75							✓		11834	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	6	C 34	1	Fiber	6	0.35			✓						11835	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	15	0.35							✓		11836	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	7	C 44	1	Fiber	9	0.4							✓		11837	Ti			
			2	Fiber	7.5	0.35			✓						11838	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	10	2.5	✓							2329	11839			JH	7/11/02
			4	Fiber	19	1							✓		11840	Na, Mg, Si, K, Ca, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-11

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244051 | *Analysis Date:* Jul 2, 2002

Description: Soil #4 - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			5	Fiber	13	0.25							✓		11841	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	10.5	0.5			✓						11842	Na, Mg, Si, K, Ca, Fe			
			7	Fiber	10.5	0.5							✓		11843	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	12.5	0.65							✓		11844	Na, Mg, Si, K, Ca, Fe			
			9	Fiber	10	1			✓						11845	Na, Mg, Si, K, Ca, Fe			
	8	C 43	1	Fiber	30	0.5			✓						11846	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	12	0.5							✓		11847	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	8	0.5							✓		11848	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	9	C 33	1	Fiber	30	0.4					✓				11849	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	15	0.85							✓		11850	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	1							✓		11851	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	10	C 23	1	Fiber	38	0.5			✓						11852	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	10	0.5			✓						18853	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	6.5	0.65							✓		11854	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	5	0.65							✓		11855	Mg, Al, Si, K, Fe			
			5	Fiber	12.5	1.2							✓		11856	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	11	C 13	1	Fiber	10	0.5			✓						11857	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	6	0.4							✓		11858	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	32	0.75							✓		11859	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	11	1			✓						11860	Na, Mg, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-11

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244051 | *Analysis Date:* Jul 2, 2002

Description: Soil #4 - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			5	Fiber	5	0.6			✓						11861	Na, Mg, Si, K, Ca, Fe			
	12	C 3	1	Fiber	34	0.65							✓		11862	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	0.45							✓		11863	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	18	1							✓		11864	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	44	0.55							✓		11865	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	12	1							✓		11866	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	12.5	1							✓		11867	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	20	0.85							✓		11868	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	13	C 2	1	Fiber	18	0.55							✓		11869	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	0.35			✓						11870	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	9	0.85							✓		11871	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	9	0.65							✓		11872	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	9	0.25							✓		11873	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	7.5	0.25							✓		11874	Na, Mg, Si, K, Ca, Fe			
B	14	D 22	1	Fiber	6	0.5							✓		11875	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	2.5							✓		11876	Mg, Al, Si, K, Ca, Fe			
			3	Fiber	5.5	0.35							✓		11877	Na, Mg, Si, K, Ca, Fe			
	15	D 12	1	Fiber	13	0.4							✓		11878	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	38	0.4							✓		11879	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	14	0.75			✓						11880	Na, Mg, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-11

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244051 | *Analysis Date:* Jul 2, 2002

Description: Soil #4 - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			4	Fiber	14	0.85							✓		11881	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	5	0.5							✓			Al, Si, P			
	16	D 2	1	Fiber	15	0.5			✓						11882	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	10.5	0.35							✓		11883	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	12.5	0.35							✓		11884	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	10	0.5							✓		11885	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	5.5	0.85							✓		11886	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	10	0.75							✓		11887	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	7.5	0.45							✓		11888	Na, Mg, Si, K, Ca, Fe			
			8	Fiber	15.5	1							✓		11889	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	5.5	0.5							✓		11890	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			10	Fiber	7	0.3							✓		11891	Si			
			11	Fiber	15	0.5							✓		11892	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			12	Fiber	13	0.5							✓		11893	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			13	Fiber	7.5	0.3							✓		11894	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			14	Fiber	6	1.2							✓		11895	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	17	A 2	1	Fiber	10	0.25			✓						11896	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	7.5	0.5			✓						11897	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	20	1							✓		11898	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	6	0.25					✓				11899	Na, Mg, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-11

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244051 | *Analysis Date:* Jul 2, 2002

Description: Soil #4 - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			5	Fiber	20	0.25			✓						11900	Na, Mg, Si, K, Ca, Fe			
			6	Fiber	6	1							✓		11901	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	13	0.65							✓		11902	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	27	1							✓		11903	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	17						1	0	28	0	4	0	71						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-12
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244052
Analysis Date: Jun 21, 2002
Description: H&S - Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 32	NSD																
	22	B 22	NSD																
	23	B 12	NSD																
	24	B 2	NSD																
B	25	B 24	NSD																
	26	B 14	NSD																
	27	B 4	NSD																
	28	C 4	NSD																
	29	C 14	NSD																
	30	C 24	NSD																
	31	C 13	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-12

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244052 | *Analysis Date:* Jun 21, 2002

Description: H&S - Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 3	NSD																
	33	B 3	NSD																
	34	B 13	NSD																
	35	B 42	NSD																
	36	B 12	NSD																
	37	B 2	NSD																
	38	C 2	NSD																
	39	C 12	NSD																
	40	C 11	NSD																
	40						0	0	0	0	0	0	0						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002

Client: EPA - Region 10
Lab/Cor Sample No.: 020772-13
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244053
Analysis Date: Jun 21, 2002
Description: WAB - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 4	NSD**																
	2	C 4	NSD																
	3	C 14	NSD																
	4	C 24	NSD																
	5	C 34	NSD																
	6	C 44	NSD																
	7	C 33	NSD																
	8	B 23	NSD																
	9	B 33	NSD																
	10	B 22	NSD																
	11	B 12	NSD																
	12	B 2	NSD																
	13	C 2	NSD																
	14	C 12	NSD																
	15	C 41	NSD																
	16	C 31	NSD																
	17	C 21	NSD																
	18	C 11	NSD																
	19	C 1	NSD																
	20	B 1	NSD																
	21	B 11	NSD																
	22	B 21	NSD																
	23	B 31	NSD																
	24	B 41	NSD																
	25	B 30	NSD																
B	26	C 43	NSD																
	27	C 23	NSD																
	28	C 13	NSD																
	29	C 3	NSD																
	30	B 3	NSD																
	31	B 13	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-13

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244053 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 23	NSD																
	33	B 34	NSD																
	34	B 24	NSD																
	35	B 14	NSD																
	36	B 4	NSD																
	37	C 4	NSD																
	38	C 14	1	Fiber	6	0.5							✓			Al, Si, P			
	39	C 24	NSD																
	40	C 34	NSD																
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-14

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244054 | *Analysis Date:* Jun 21, 2002

Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	C 4	NSD																
	4	C 14	NSD																
	5	C 24	NSD																
	6	C 34	NSD																
	7	C 44	NSD																
	8	C 43	NSD																
	9	C 33	NSD																
	10	C 23	NSD																
	11	C 13	NSD																
	12	C 3	NSD																
	13	B 3	NSD																
	14	B 23	NSD																
	15	B 33	NSD																
	16	B 43	NSD																
	17	B 42	NSD																
	18	B 32	NSD																
	19	B 22	NSD																
	20	B 12	NSD																
	21	B 2	NSD																
	22	C 42	NSD																
	23	C 32	NSD																
	24	C 22	NSD																
	25	C 12	NSD																
B	26	B 44	NSD																
	27	B 34	NSD																
	28	B 24	NSD																
	29	B 14	NSD																
	30	B 4	NSD																
	31	C 4	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002
Client: EPA - Region 10
Lab/Cor Sample No.: 020772-14
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244054
Analysis Date: Jun 21, 2002
Description: WAB - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 14	NSD																
	33	C 24	NSD																
	34	C 34	NSD																
	35	C 44	NSD																
	36	B 43	NSD																
	37	B 33	NSD																
	38	B 23	NSD																
	39	B 13	NSD																
	40	B 3	NSD																
	40						0	0	0	0	0	0	0						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-15
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW
Sample No.: 02244056 | *Analysis Date:* Jun 23, 2002
Description: Soil #5 - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	1	Fiber	7.5	0.75							✓		11583	Na, Mg, Si, K, C, A, Fe	WINCHITE		
	4	B 14	1	Fiber	37	0.5							✓	2358	11584	Na, Mg, Si, K, C, A, Fe	WINCHITE, [5 1 0] ZONE AXIS	JH	7/11/02
			2	Fiber	7.5	0.85							✓		11585	Mg, Al, Si, K, Ca, Ti, Fe			
	5	C 34	NSD																
	6	C 23	NSD																
	7	B 13	1	Fiber	10	0.85							✓		11586	Na, Mg, Si, K, C, A, Fe	WINCHITE		
			2	Fiber	13	0.75			✓					2359	11587	Na, Mg, Si, K, C, A, Fe	[3 0 2] ZONE AXIS	JH	7/11/02
	8	B 23	1	Fiber	5	0.5							✓		11588	Na, Mg, Si, K, C, A, Fe	WINCHITE		
	9	B 33	NSD																
	10	B 43	1	Fiber	20	0.5							✓		11590	Na, Mg, Si, K, C, A, Fe	WINCHITE		
	11	B 42	1	Fiber	5.5	0.95			✓						11591	Na, Mg, Si, K, C, A, Fe			
	12	B 32	1	Fiber	5.5	0.65							✓		11589	Na, Mg, Si, K, C, A, Fe	WINCHITE		
	13	B 22	NSD																
	14	B 12	NSD																
	15	C 2	1	Fiber	5	0.35							✓		11592	Na, Mg, Si, K, C, A, Fe	WINCHITE		
			2	Fiber	5	0.65							✓		11593	Na, Mg, Si, K, C, A, Fe	WINCHITE		
	16	C 12	NSD																
	17	C 22	NSD																
	18	C 21	NSD																
	19	C 11	NSD																
	20	C 1	NSD																
	21	B 1	1	Fiber	5.5	0.75							✓		11594	Na, Mg, Si, K, C, A, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-15

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244056 | *Analysis Date:* Jun 23, 2002

Description: Soil #5 - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	9	0.5			✓						11595	Na, Mg, Si, K, C, A, Fe			
			3	Fiber	10	0.6							✓		11596	Na, Mg, Si, K, C, A, Fe	WINCHITE		
	22	B 11	NSD																
	23	B 21	NSD																
	24	B 31	1	Fiber	9	0.85							✓		11597	Na, Mg, Si, K, C, A, Fe	WINCHITE		
			2	Fiber	11	0.45							✓		11598	Na, Mg, Si, K, C, A, Fe	WINCHITE		
			3	Fiber	17.5	0.85							✓		11599	Na, Mg, Si, K, C, A, Fe	WINCHITE		
B	25	C 1	1	Fiber	8	0.5							✓		11600	Na, Mg, Si, K, C, A, Fe	WINCHITE		
	26	C 11	NSD																
	27	C 21	1	Fiber	13	0.75			✓					2360	11601	Na, Mg, Si, K, C, A, Fe	[2 0 3] ZONE AXIS	JH	7/11/02
	28	C 31	NSD																
	29	C 41	NSD																
	30	C 42	NSD																
	31	C 32	NSD																
	32	C 22	NSD																
	33	C 12	NSD																
	34	C 2	1	Fiber	6	0.25							✓		11602	Na, Mg, Si, K, C, A, Fe			
	35	B 2	NSD																
	36	B 12	1	Fiber	17	0.5							✓		11603	Na, Mg, Si, K, C, A, Fe			
			2	Fiber	15.5	0.5							✓		11604	Na, Mg, Si, K, C, A, Fe	WINCHITE		
			3	Fiber	30	0.4							✓		11605	Na, Mg, Si, K, C, A, Fe	WINCHITE		
	37	B 13	NSD																
	38	C 3	NSD																
	39	C 13	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772
Report Date: Jul 11, 2002

Client: EPA - Region 10
Lab/Cor Sample No.: 020772-15
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA
Analyst: DW
Sample No.: 02244056
Analysis Date: Jun 23, 2002
Description: Soil #5 - Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	40	C 23	NSD																
	40						0	0	4	0	0	0	19						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-16
Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW
Sample No.: 02244057 | *Analysis Date:* Jun 23, 2002
Description: Soil #5 - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	7.5	0.75							✓		11565	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	2	B 34	NSD**																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	1	Fiber	47	1							✓		11566	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	9	C 34	NSD																
	10	C 44	1	Fiber	9	0.45			✓					2361	11567	Na, Mg, Al, Si, K, Ca, Fe	[2 0 5] ZONE AXIS	JH	7/11/02
			2	Fiber	20	0.35							✓		11568	Na, Mg, Al, Si, K, Ca, Fe			
	11	C 43	1	Fiber	7	0.65							✓	2363	11569	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE, [2 0 1] ZONE AXIS	JH	7/11/02
	12	C 33	NSD																
	13	C 23	1	Fiber	7.5	0.5							✓		11570	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 23	NSD																
	18	B 13	1	Fiber	5	0.5							✓		11571	Na, Mg, Al, Si, K, Ca, Fe			
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 12	NSD																
	23	B 2	NSD																
	24	C 2	1	Fiber	10	0.65							✓		11572	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	25	C 12	1	Fiber	13	0.5							✓		11573	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020772 | *Report Date:* Jul 11, 2002

Client: EPA - Region 10 | *Lab/Cor Sample No.:* 020772-16

Project Name: Asbestos/Vermiculite - WR Grace, Spokane, WA | *Analyst:* DW

Sample No.: 02244057 | *Analysis Date:* Jun 23, 2002

Description: Soil #5 - Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
B	26	B 10	NSD																
	27	B 20	NSD																
	28	B 30	NSD																
	29	B 40	1	Fiber	11	3							✓		11574	Mg, Al, Si, Ca, Fe			
			2	Fiber	24	0.75							✓		11575	Na, Mg, Al, Si, K, Ca, Fe			
	30	B 41	NSD																
	31	B 31	NSD																
	32	B 21	1	Fiber	5	0.25			✓						11576	Na, Mg, Al, Si, K, Ca, Fe			
	33	B 11	1	Fiber	5	0.3							✓		11577	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	34	B 1	NSD																
	35	C 1	NSD																
	36	C 11	1	Fiber	11	0.65							✓			Al, Si, P			
	37	C 21	1	Fiber	5.5	0.75					✓				11578	Na, Mg, Al, Si, K, Ca, Fe			
	38	C 31	1	Fiber	7	0.5					✓			2364	11579	Na, Mg, Al, Si, K, Ca, Fe	[5 1 2] ZONE AXIS	JH	7/11/02
			2	Fiber	15	0.4			✓						11580	Na, Mg, Al, Si, K, Ca, Fe			
	39	C 41	1	Fiber	20	0.6							✓		11581	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	1.2							✓		11582	Na, Mg, Al, Si, K, Ca, Fe			
	40	C 42	NSD																
	40						0	0	3	0	2	0	14						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

GRID MAP

A69	A68	A67	A66	A65	A64	A63	A62	A61	A60	B60	B61	B62	B63	B64	B65	B66	B67	B68	B69
A59	A58	A57	A56	A55	A54	A53	A52	A51	A50	B50	B51	B52	B53	B54	B55	B56	B57	B58	B59
A49	A48	A47	A46	A45	A44	A43	A42	A41	A40	B40	B41	B42	B43	B44	B45	B46	B47	B48	B49
A39	A38	A37	A36	A35	A34	A33	A32	A31	A30	B30	B31	B32	B33	B34	B35	B36	B37	B38	B39
A29	A28	A27	A26	A25	A24	A23	A22	A21	A20	B20	B21	B22	B23	B24	B25	B26	B27	B28	B29
A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
A9	A8	A7	A6	A5	A4	A3	A2	A1			B1	B2	B3	B4	B5	B6	B7	B8	B9
D9	D8	D7	D6	D5	D4	D3	D2	D1			C1	C2	C3	C4	C5	C6	C7	C8	C9
D19	D18	D17	D16	D15	D14	D13	D12	D11	D10	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19
D29	D28	D27	D26	D25	D24	D23	D22	D21	D20	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29
D39	D38	D37	D36	D35	D34	D33	D32	D31	D30	C30	C31	C32	C33	C34	C35	C36	C37	C38	C39
D49	D48	D47	D46	D45	D44	D43	D42	D41	D40	C40	C41	C42	C43	C44	C45	C46	C47	C48	C49
D59	D58	D57	D56	D55	D54	D53	D52	D51	D50	C50	C51	C52	C53	C54	C55	C56	C57	C58	C59
D69	D68	D67	D66	D65	D64	D63	D62	D61	D60	C60	C61	C62	C63	C64	C65	C66	C67	C68	C69

To be used as a reference for grid coordinates from each raw data sheet.

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

July 29, 2002

Ecology and Environment, Inc.
2101 Fourth Avenue
Suite 1900
Seattle, WA 98121

Attn: Jeff Fowlow

Project Name: Asbestos/Vermiculite WR Grace
Project Number: TDD 01070014
P. O. Number: 124969-S10

Lab/Cor Batch Number: 020834

Conditions Enclosed please find results for samples submitted to our laboratory on July 5, 2002. A list of samples received follows, with limitation or rejection criteria noted where applicable.

Lab/Cor Sample No.	Client Sample No.	Limitation/Rejection Criteria
020834-01	2264100	No special conditions were noted
020834-02	2264101	No special conditions were noted
020834-03	2264102	No special conditions were noted
020834-04	2264103	No special conditions were noted
020834-05	2264106	No special conditions were noted
020834-06	2264107	No special conditions were noted
020834-07	2264108	No special conditions were noted
020834-08	2274100	No special conditions were noted
020834-09	2274101	No special conditions were noted
020834-10	2274104	No special conditions were noted
020834-11	2274105	No special conditions were noted
020834-12	2274106	No special conditions were noted
020834-13	2274107	No special conditions were noted
020834-14	2274108	No special conditions were noted
020834-15	2274109	No special conditions were noted
020834-16	2274111	No special conditions were noted
020834-17	2274112	No special conditions were noted
020834-18	2274113	No special conditions were noted

Method Preparation and analysis of the above samples was conducted in accordance with the Niosh method 7402 for the identification of asbestos. The samples were collapsed with acetone, carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in acetone until cleared of filter debris.

TEM analysis was performed using a Philips 410 transmission electron microscope equipped with an EDAX PV9800 X-ray analyzer. The air samples were scanned at a magnification of approximately 990X using an accelerating voltage of 100 KV. The magnification was increased to about 10,000X for structure sizing.

Counting Rules

Minimum Aspect Ratio	Minimum Length	Minimum Width	Minimum Required Analytical Sensitivity	Stopping Rules
3:1	5 µm	0.25 µm	NA	100 Fibers

Disclaimer This test report relates only to the items tested in this report. Interpretation of these results is the sole responsibility of the client.

7619 6th Avenue NW, Seattle, WA 98117 (206) 781-0155 (206) 789-8424 (FAX)

If further clarification of these results is needed, please do not hesitate to call me. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with analytical services.

Sincerely,

John Harris
Laboratory Director

7619 6th Avenue NW, Seattle, WA 98117 **(206) 781-0155** **(206) 789-8424 (FAX)**

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 *Report Date:* July 29, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information		
Login:	Jul 5, 2002	*By:* JJ
Prep:	Jul 5, 2002	*By:* MW
Verified:	Jul 5, 2002	*By:* MW
Reviewed:	Jul 21, 2002	*By:* JH
Final Review:	Jul 29, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020834-01	02264100	H & S Pump#3	ASBESTOS	<0.023	0 - 0.087	0	0	0.023	40.8	40	385	0.4026	DW	7/9/02
			NON-ASBESTOS	0.023	0.001 - 0.131	1								
Test			Winchite	<0.023	0 - 0.087	0								
			Richterite	<0.023	0 - 0.087	0								
			TOTAL	0.023	0.001 - 0.131	1								
020834-02	02264101	WAB Pump#1	ASBESTOS	<0.011	0 - 0.040	0	NA	0.011	89.3	40	385	0.4026	DW	7/9/02
			NON-ASBESTOS	<0.011	0 - 0.040	0								
Test			Winchite	<0.011	0 - 0.040	0								
			Richterite	<0.011	0 - 0.040	0								
			TOTAL	<0.011	0 - 0.040	0								
020834-03	02264102	WAB Pump#2	ASBESTOS	<0.011	0 - 0.039	0	NA	0.011	90.1	40	385	0.4026	DW	7/9/02
			NON-ASBESTOS	<0.011	0 - 0.039	0								
Test			Winchite	<0.011	0 - 0.039	0								
			Richterite	<0.011	0 - 0.039	0								
			TOTAL	<0.011	0 - 0.039	0								
020834-04	02264103	QC - Blank	ASBESTOS	NA	NA - NA	0	NA	NA		40	385	0.4026	DW	7/9/02
			NON-ASBESTOS	NA	NA - NA	0								
Test			Winchite	NA	NA - NA	0								
			Richterite	NA	NA - NA	0								
			TOTAL	NA	NA - NA	0								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 020834

Report Date: July 29, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information		
Login:	Jul 5, 2002	*By:* JJ
Prep:	Jul 5, 2002	*By:* MW
Verified:	Jul 5, 2002	*By:* MW
Reviewed:	Jul 21, 2002	*By:* JH
Final Review:	Jul 29, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE
Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020834-05	02264106	Soil#3 Pump#1	ASBESTOS	2.182	1.359 - 3.005	27	26	0.081	36.4	13	385	0.1309	DW	7/10/02
			NON-ASBESTOS	1.374	0.800 - 2.200	17								
Test			Winchite	4.364	3.200 - 5.528	54								
			Richterite	0.162	0.020 - 0.583	2								
			TOTAL	8.082	6.497 - 9.665	100								
020834-06	02264107	Soil#3 Pump#2	ASBESTOS	1.683	1.071 - 2.296	29	28	0.058	36.6	18	385	0.1812	DW	7/13/02
			NON-ASBESTOS	1.103	0.664 - 1.722	19								
Test			Winchite	3.250	2.399 - 4.101	56								
			Richterite	<0.058	0 - 0.214	0								
			TOTAL	6.036	4.876 - 7.196	104								
020834-07	02264108	H & S Pump#3	ASBESTOS	<0.022	0 - 0.081	0	NA	0.022	43.5	40	385	0.4026	DW	7/9/02
			NON-ASBESTOS	<0.022	0 - 0.081	0								
Test			Winchite	<0.022	0 - 0.081	0								
			Richterite	<0.022	0 - 0.081	0								
			TOTAL	<0.022	0 - 0.081	0								
020834-08	02274100	WAB Pump#1	ASBESTOS	<0.011	0 - 0.039	0	0	0.011	90.1	40	385	0.4026	DW	7/10/02
			NON-ASBESTOS	0.011	0.000 - 0.059	1								
Test			Winchite	<0.011	0 - 0.039	0								
			Richterite	<0.011	0 - 0.039	0								
			TOTAL	0.011	0.000 - 0.059	1								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 020834

Report Date: July 29, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information		
Login:	Jul 5, 2002	*By:* JJ
Prep:	Jul 5, 2002	*By:* MW
Verified:	Jul 5, 2002	*By:* MW
Reviewed:	Jul 21, 2002	*By:* JH
Final Review:	Jul 29, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020834-09	02274101	WAB Pump#2	ASBESTOS	<0.011	0 - 0.039	0	NA	0.011	89.6	40	385	0.4026	DW	7/10/02
			NON-ASBESTOS	<0.011	0 - 0.039	0								
Test			Winchite	<0.011	0 - 0.039	0								
			Richterite	<0.011	0 - 0.039	0								
			TOTAL	<0.011	0 - 0.039	0								
020834-10	02274104	Soil#9 Pump#1	ASBESTOS	<0.025	0 - 0.093	0	0	0.025	37.9	40	385	0.4026	JH	7/14/02
			NON-ASBESTOS	0.252	0.121 - 0.464	10								
Test			Winchite	<0.025	0 - 0.093	0								
			Richterite	<0.025	0 - 0.093	0								
			TOTAL	0.252	0.121 - 0.464	10								
020834-11	02274105	Soil#9 Pump#2	ASBESTOS	<0.025	0 - 0.093	0	0	0.025	37.8	40	385	0.4026	JH	7/14/02
			NON-ASBESTOS	0.177	0.071 - 0.365	7								
Test			Winchite	<0.025	0 - 0.093	0								
			Richterite	<0.025	0 - 0.093	0								
			TOTAL	0.177	0.071 - 0.365	7								
020834-12	02274106	H & S Pump#3	ASBESTOS	<0.022	0 - 0.081	0	NA	0.022	43.8	40	385	0.4026	DW	7/9/02
			NON-ASBESTOS	<0.022	0 - 0.081	0								
Test			Winchite	<0.022	0 - 0.081	0								
			Richterite	<0.022	0 - 0.081	0								
			TOTAL	<0.022	0 - 0.081	0								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 020834

Report Date: July 29, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information			
Login:	Jul 5, 2002	*By:*	JJ
Prep:	Jul 5, 2002	*By:*	MW
Verified:	Jul 5, 2002	*By:*	MW
Reviewed:	Jul 21, 2002	*By:*	JH
Final Review:	Jul 29, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020834-13	02274107	WAB Pump#1	ASBESTOS	<0.011	0 - 0.040	0	0	0.011	88.5	40	385	0.4026	DW	7/10/02
			NON-ASBESTOS	0.011	0.000 - 0.060	1								
Test			Winchite	<0.011	0 - 0.040	0								
			Richterite	<0.011	0 - 0.040	0								
			TOTAL	0.011	0.000 - 0.060	1								
020834-14	02274108	WAB Pump#2	ASBESTOS	<0.011	0 - 0.040	0	0	0.011	88.1	40	385	0.4026	DW	7/10/02
			NON-ASBESTOS	0.011	0.000 - 0.060	1								
Test			Winchite	<0.011	0 - 0.040	0								
			Richterite	<0.011	0 - 0.040	0								
			TOTAL	0.011	0.000 - 0.060	1								
020834-15	02274109	QC	ASBESTOS	NA	NA - NA	0	NA	NA		40	385	0.4026	DW	7/10/02
			NON-ASBESTOS	NA	NA - NA	0								
Test			Winchite	NA	NA - NA	0								
			Richterite	NA	NA - NA	0								
			TOTAL	NA	NA - NA	0								
020834-16	02274111	Soil#10 Pump#1	ASBESTOS	0.283	0.141 - 0.507	11	26	0.026	37.2	40	385	0.4026	JH	7/14/02
			NON-ASBESTOS	0.283	0.141 - 0.507	11								
Test			Winchite	0.540	0.309 - 0.772	21								
			Richterite	<0.026	0 - 0.037	0								
			TOTAL	1.106	0.776 - 1.438	43								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834

Report Date: July 29, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD 01070014
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information			
Login:	Jul 5, 2002	*By:*	JJ
Prep:	Jul 5, 2002	*By:*	MW
Verified:	Jul 5, 2002	*By:*	MW
Reviewed:	Jul 21, 2002	*By:*	JH
Final Review:	Jul 29, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020834-17	02274112	Soil#10 Pump#2	ASBESTOS	0.417	0.239 - 0.677	16	29	0.026	36.7	40	385	0.4026	DW	7/15/02
			NON-ASBESTOS	0.156	0.057 - 0.341	6								
Test			Winchite	0.860	0.567 - 1.154	33								
			Richterite	<0.026	0 - 0.037	0								
			TOTAL	1.433	1.055 - 1.813	55								
020834-18	02274113	H & S Pump#3	ASBESTOS	<0.022	0 - 0.081	0	0	0.022	43.4	40	385	0.4026	DW	7/9/02
			NON-ASBESTOS	0.022	0.001 - 0.123	1								
Test			Winchite	<0.022	0 - 0.081	0								
			Richterite	<0.022	0 - 0.081	0								
			TOTAL	0.022	0.001 - 0.123	1								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-01

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264100 | *Analysis Date:* Jul 9, 2002

Description: H & S Pump#3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 24	NSD**																
	2	B 14	NSD																
	3	B 4	NSD																
	4	C 4	NSD																
	5	C 14	NSD																
	6	C 33	NSD																
	7	C 23	NSD																
	8	C 13	NSD																
	9	C 3	NSD																
	10	B 3	NSD																
	11	B 13	NSD																
	12	B 23	NSD																
	13	B 33	NSD																
	14	B 43	NSD																
	15	B 42	NSD																
	16	B 32	NSD																
	17	B 22	NSD																
	18	B 12	NSD																
	19	B 2	NSD																
	20	C 2	NSD																
	21	C 12	NSD																
	22	C 22	NSD																
	23	C 32	NSD																
	24	C 42	1	Fiber	20	2							✓			P, S, K			
	25	C 41	NSD																
	26	C 1	NSD																
	27	B 1	NSD																
B	28	D 1	NSD																
	29	D 11	NSD																
	30	D 21	NSD																
	31	D 40	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-01
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02264100 | *Analysis Date:* Jul 9, 2002
Description: H & S Pump#3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No:	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 30	NSD																
	33	D 20	NSD																
	34	D 10	NSD																
	35	C 10	NSD																
	36	C 20	NSD																
	37	C 30	NSD																
	38	C 40	NSD																
	39	C 31	NSD																
	40	C 21	NSD																
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-02

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264101 | *Analysis Date:* Jul 9, 2002

Description: WAB Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 33	NSD																
	10	C 23	NSD																
	11	C 13	NSD																
	12	C 3	NSD																
	13	B 3	NSD																
	14	B 13	NSD																
	15	B 23	NSD																
	16	B 33	NSD																
	17	B 43	NSD																
	18	B 42	NSD																
	19	B 32	NSD																
	20	B 22	NSD																
	21	B 12	NSD																
	22	B 2	NSD																
	23	C 2	NSD																
	24	C 12	NSD																
	25	C 22	NSD																
	26	C 32	NSD																
B	27	D 11	NSD																
	28	D 1	NSD																
	29	A 1	NSD																
	30	A 11	NSD																
	31	A 21	NSD																

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020834-02
Project Name: Asbestos/Vermiculite WR Grace
Analyst: DW
Sample No.: 02264101
Analysis Date: Jul 9, 2002
Description: WAB Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 31	NSD																
	33	A 30	NSD																
	34	A 20	NSD																
	35	A 10	NSD																
	36	B 10	NSD																
	37	B 20	NSD																
	38	B 30	NSD																
	39	B 40	NSD																
	40	B 31	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020834-03
Project Name: Asbestos/Vermiculite WR Grace
Analyst: DW
Sample No.: 02264102
Analysis Date: Jul 9, 2002
Description: WAB Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
B	27	A 11	NSD																
	28	A 1	NSD																
	29	D 1	NSD																
	30	D 11	NSD																
	31	D 21	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-03
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02264102 | *Analysis Date:* Jul 9, 2002
Description: WAB Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No..	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 31	NSD																
	33	D 41	NSD																
	34	D 40	NSD																
	35	D 30	NSD																
	36	D 20	NSD																
	37	D 10	NSD																
	38	C 10	NSD																
	39	C 20	NSD																
	40	C 30	NSD																
	40						0	0	0	0	0	0	0						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-04

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264103 | *Analysis Date:* Jul 9, 2002

Description: QC - Blank

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 24	NSD**																
	2	B 14	NSD																
	3	B 4	NSD																
	4	C 4	NSD																
	5	C 14	NSD																
	6	C 24	NSD																
	7	C 34	NSD																
	8	C 44	NSD																
	9	C 43	NSD																
	10	C 33	NSD																
	11	C 23	NSD																
	12	C 13	NSD																
	13	C 3	NSD																
	14	B 3	NSD																
	15	B 13	NSD																
	16	B 23	NSD																
	17	B 33	NSD																
	18	B 32	NSD																
	19	B 22	NSD																
	20	B 12	NSD																
	21	B 2	NSD																
	22	C 2	NSD																
	23	C 12	NSD																
	24	C 22	NSD																
	25	C 32	NSD																
	26	C 42	NSD																
B	27	D 11	NSD																
	28	D 21	NSD																
	29	D 31	NSD																
	30	D 30	NSD																
	31	D 20	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-04
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02264103 | *Analysis Date:* Jul 9, 2002
Description: QC - Blank

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 10	NSD																
	33	C 10	NSD																
	34	C 20	NSD																
	35	C 30	NSD																
	36	C 40	NSD																
	37	C 41	NSD																
	38	C 31	NSD																
	39	C 21	NSD																
	40	C 11	NSD																
	40						0	0	0	0	0	0	0						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-05
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02264106 | *Analysis Date:* Jul 10, 2002
Description: Soil#3 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	27.5	0.5							✓		11916	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5.5	0.75			✓						12222	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	5.5	0.4			✓					2370	11917	Na, Mg, Si, K, Ca, Fe	[3 1 2] ZONE AXIS	JH	7/28/02
			4	Fiber	7.5	0.25							✓		11918	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	9	0.4							✓		11919	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	5.5	0.5			✓						11920	Na, Mg, Si, K, Ca, Fe			
			7	Fiber	5.5	1					✓			2371	11921	Na, Mg, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	7/28/02
	2	B 34	1	Fiber	12	0.4			✓						12223	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	28	0.5			✓						11922	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	5.5	0.4							✓		11923	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	5.5	0.35							✓		11924	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	7.5	1							✓		11925	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	28	0.85							✓		11926	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	7.5	0.35							✓		11927	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	5	0.3							✓		11928	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	10.5	0.35							✓		11929	Na, Mg, Si, K, Ca, Fe			
			10	Fiber	15	1.2			✓						11930	Na, Mg, Si, K, Ca, Fe			
			11	Fiber	11	0.4							✓		11931	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			12	Fiber	17	0.4							✓		11932	Na, Mg, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite WR Grace
Sample No.: 02264106
Description: Soil#3 Pump#1

Lab/Cor Sample No.: 020834-05
Analyst: DW
Analysis Date: Jul 10, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			13	Fiber	5.5	0.65							✓		11933	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	3	B 24	1	Fiber	12	0.5							✓		12224	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5	0.5							✓		12225	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	5.5	0.75							✓		11934	Na, Al, Si, K, Ca, Fe			
			4	Fiber	9	0.3							✓		11935	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	7.5	0.85							✓		11936	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	5	1.5			✓						11937	Na, Mg, Si, K, Ca, Fe			
			7	Fiber	6	0.45			✓						11938	Na, Mg, Si, K, Ca, Fe			
			8	Fiber	11	0.45							✓		11939	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	5	0.65			✓						11940	Na, Mg, Si, K, Ca, Fe			
			10	Fiber	7.5	0.5							✓		11941	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			11	Fiber	6	0.4							✓		11942	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			12	Fiber	26	2.5							✓		11943	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	4	B 14	1	Fiber	8	0.35							✓		11944	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5.5	0.35							✓		11945	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	0.25							✓		11946	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	5	0.85							✓		11947	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	8	1.2							✓		11948	Mg, Al, Si, K, Ca, Fe			
			6	Fiber	15	1.2							✓		11949	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	10	0.35							✓		11950	Na, Mg, Si, K, Ca, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-05

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264106 | *Analysis Date:* Jul 10, 2002

Description: Soil#3 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			8	Fiber	10.5	0.5							✓		11951	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	9	0.75							✓		11952	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			10	Fiber	9	0.85							✓		11953	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			11	Fiber	5.5	0.75							✓		11954	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			12	Fiber	6	0.5			✓						11955	Na, Mg, Si, K, Ca, Fe			
	5	B 4	1	Fiber	6	0.65							✓		11956	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	80	0.75							✓		11957	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	8.5	0.65			✓						11958	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	9	0.75							✓		11959	Na, Mg, Si, K, Ca, Fe			
	6	C 4	1	Fiber	18	0.5							✓		11960	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	6.5	0.5							✓		11961	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	30	1.2			✓						11962	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	10.5	0.65			✓						11963	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	5	0.4							✓		11964	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	6	0.25							✓		11965	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	5	0.7							✓		11966	Mg, Al, Si, K, Ca, Fe			
	7	C 14	1	Fiber	6.5	1							✓	2372	11967	Na, Mg, Si, K, Ca, Ti, Cr, Fe	RICHTERITE, [3 1 0] ZONE AXIS	JH	7/28/02
			2	Fiber	19	0.75					✓				11968	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	40	0.65							✓		11969	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	5	0.65							✓		11970	Na, Mg, Si, K, Ca, Fe			

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-05

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264106 | *Analysis Date:* Jul 10, 2002

Description: Soil#3 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			5	Fiber	17	0.65							✓		11971	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	5	0.5			✓						11972	Na, Mg, Si, K, Ca, Fe			
			7	Fiber	16	4			✓						11973	Na, Mg, Si, K, Ca, Fe			
			8	Fiber	5.5	0.75							✓		11974	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	13	0.35							✓	2373	11975	Na, Mg, Si, K, Ca, Fe	WINCHITE, [2 0 1] ZONE AXIS	JH	7/28/02
	8	C 24	1	Fiber	11	0.5							✓		11976	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	8.5	0.4					✓				11977	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	18	0.5							✓		12226	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	12	0.75							✓		12227	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	6	0.35							✓		11978	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	36	0.85							✓		11979	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	6	0.65		✓						2374	11980	Mg, Si, Mn, Fe	[2 0 1] ZONE AXIS	JH	7/28/02
			8	Fiber	15	0.65							✓		11981	Na, Mg, Si, K, Ca, Fe	WINCHITE		
B	9	B 1	1	Fiber	10	2			✓						11986	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	19	0.5							✓		11987	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	0.85							✓		11988	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	5	0.3							✓		11989	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	10	0.85							✓		11990	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	10	B 11	1	Fiber	14	1.5							✓		11991	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	8.5	0.65			✓						11992	Na, Mg, Si, K, Ca, Fe			

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-05
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02264106 | *Analysis Date:* Jul 10, 2002
Description: Soil#3 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			3	Fiber	8.5	0.65							✓		11993	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	5.5	0.3							✓		11994	Na, Mg, Si, K, Ca, Fe	RICHTERITE		
			5	Fiber	6	1							✓		11995	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	7.5	0.75							✓		11996	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	11	B 21	1	Fiber	10	0.5					✓				12228	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	8	0.35							✓		11997	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	11	0.65			✓						11998	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	5	0.5							✓		11999	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	7.5	0.75			✓						12000	Na, Mg, Si, K, Ca, Fe			
			6	Fiber	10	1.2							✓		12001	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	7.5	1							✓		12002	Mg, Al, Si, K, Fe			
	12	B 31	1	Fiber	40	1			✓						12003	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	12	0.8			✓						12004	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	6.5	0.75							✓		12005	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	8.5	0.65							✓		12006	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	13	B 41	1	Fiber	9.5	0.65							✓		12007	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	12	0.65							✓		12008	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	11	0.65							✓		12009	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	12.5	0.55							✓		12010	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	15	0.65			✓						12011	Na, Mg, Si, K, Ca, Fe			

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-05

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264106 | *Analysis Date:* Jul 10, 2002

Description: Soil#3 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			6	Fiber	9	0.25							✓		12012	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	13						0	1	22	0	4	0	73						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite WR Grace
Sample No.: 02264107
Description: Soil#3 Pump#2

Lab/Cor Sample No.: 020834-06
Analyst: DW
Analysis Date: Jul 13, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 24	1	Fiber	12	0.65			✓						12019	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	10	0.85							✓		12020	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	9	0.85			✓						12021	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	7.5	1							✓		12022	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	5	0.75							✓		12023	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	22	0.55							✓		12024	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	10.5	1							✓		12025	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			8	Fiber	40	3							✓		12026	Na, Mg, Si, K, Ca, Fe			
			9	Fiber	5	0.4							✓		12027	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	2	B 14	1	Fiber	8	1.8							✓		12028	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	10	0.3			✓						12029	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	28	0.75							✓		12030	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	11	0.3							✓			P, S, K			
	3	B 4	1	Fiber	8	0.5							✓		12031	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5.5	0.3			✓						12032	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	11	0.5			✓						12033	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	7.5	1			✓						12034	Na, Mg, Si, K, Ca, Fe			
	4	C 4	1	Fiber	10	0.65							✓		12035	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	0.5			✓						12036	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	5	0.75							✓		12037	Na, Mg, Si, K, Ca, Fe	WINCHITE		

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-06
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02264107 | *Analysis Date:* Jul 13, 2002
Description: Soil#3 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			4	Fiber	7.5	0.8							✓		12038	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	15	1.2							✓		12039	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	7.5	0.65							✓		12040	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	5	0.5							✓		12041	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	5	C 14	1	Fiber	20	0.5			✓					2389	12042	Na, Mg, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	7/28/02
			2	Fiber	10	0.85							✓		12043	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	25	2							✓		12044	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	5	0.5							✓		12045	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	7.5	1.2							✓		12046	Mg, Al, Si, K, Ti, Fe			
	6	C 34	1	Fiber	12	0.55							✓		12047	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	10	0.25		✓						2390	12048	Na, Mg, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	7/28/02
			3	Fiber	8	0.85							✓		12049	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	7	C 33	1	Fiber	9	0.25			✓						12050	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	6	1			✓						12051	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	5	0.25							✓		12052	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	10	0.65							✓		12053	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	6	0.65							✓		12054	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	8	0.65							✓		12055	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	10.5	0.5							✓		12056	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	8	B 13	1	Fiber	12	0.35							✓		12057	Na, Mg, Si, K, Ca, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-06
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02264107 | *Analysis Date:* Jul 13, 2002
Description: Soil#3 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	18	1							✓		12058	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	14	0.4			✓						12059	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	13	0.65							✓		12060	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	9	0.65							✓		12061	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	10	0.5							✓		12062	Mg, Al, Si, K, Ti, Fe			
	9	C 2	1	Fiber	10	0.75			✓						12063	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	9	0.5			✓						12064	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	12.5	0.5			✓						12065	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	8	1							✓		12066	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	30	0.85							✓		12067	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	5	0.25							✓		12068	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	10	C 42	1	Fiber	6	0.65							✓		12069	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5	0.25							✓		12070	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	5	0.25							✓		12071	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	12	0.75							✓		12072	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	7.5	0.3							✓		12073	Mg, Al, Si, K, Fe			
			6	Fiber	5	0.5							✓		12074	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	8	0.85							✓		12075	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	11	C 41	1	Fiber	7	0.85							✓		12076	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	8	0.25							✓		12077	Na, Mg, Si, K, Ca, Fe	WINCHITE		

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite WR Grace
Sample No.: 02264107
Description: Soil#3 Pump#2

Lab/Cor Sample No.: 020834-06
Analyst: DW
Analysis Date: Jul 13, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			3	Fiber	11	0.75							✓		12078	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	12	C 1	1	Fiber	5.5	0.5							✓		12079	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	5	1.2							✓		12080	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	5	0.75					✓				12081	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	5	0.65							✓		12082	Al, Si, K			
			5	Fiber	14	0.75					✓			2391	12083	Mg, Si, Ca, Fe	[1 0 0] ZONE AXIS	JH	7/28/02
			6	Fiber	12	0.5							✓	2392	12084	Na, Mg, Si, K, Ca, Fe	WINCHITE, [3 0 1] ZONE AXIS	JH	7/28/02
	13	B 1	1	Fiber	10	0.25							✓		12085	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	9.5	0.5			✓						12086	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	14	0.75							✓		12087	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	16	1			✓						12088	Na, Mg, Si, K, Ca, Fe			
			5	Fiber	7.5	0.25							✓		12089	Mg, Al, Si, K, Ti, Fe			
			6	Fiber	5	0.85							✓		12090	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	30	1.5			✓						12091	Na, Mg, Si, K, Ca, Fe			
			8	Fiber	9	2							✓		12092	Mg, Al, Si, K, Fe			
			9	Fiber	11	0.5			✓						12093	Na, Mg, Si, K, Ca, Fe			
B	14	A 1	1	Fiber	6	0.3			✓						12094	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	12	0.6							✓			Al, Si, K, Ca			
			3	Fiber	13	0.7							✓		12095	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	15	A 21	1	Fiber	22	0.6							✓		12096	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	6	0.4							✓		12097	Na, Mg, Si, K, Ca, Fe	WINCHITE		

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-06

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264107 | *Analysis Date:* Jul 13, 2002

Description: Soil#3 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			3	Fiber	7	0.6							✓		12098	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	9	0.6							✓			Si			
	16	B 12	1	Fiber	8	0.4							✓		12099	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	22	0.25		✓							12100	Mg, Si, Fe			
			3	Fiber	5.5	0.4			✓						12101	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	17	0.8							✓		12102	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	10	0.4							✓		12103	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	8	0.8							✓			Al, Si, Fe			
			7	Fiber	10	0.4			✓						12104	Na, Mg, Si, K, Ca, Fe			
			8	Fiber	9	0.9							✓			Al, Si, K, Fe			
			9	Fiber	12	0.4			✓						12105	Na, Mg, Si, K, Ca, Fe			
	17	C 2	1	Fiber	6	0.4			✓						12106	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	12	0.3							✓		12107	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	5.5	0.3	✓								12108	Mg, Si			
	18	C 14	1	Fiber	36	0.6							✓		12109	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	28	0.5							✓		12110	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	8	0.5							✓		12111	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	11	0.4							✓			Na, Mg, Si, K, Ca, Fe			
			5	Fiber	8	0.25							✓		12113	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			6	Fiber	9	0.3			✓						12114	Na, Mg, Si, K, Ca, Fe			
			7	Fiber	5.5	0.3							✓		12115	Na, Mg, Si, K, Ca, Fe	WINCHITE		

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020834-06
Project Name: Asbestos/Vermiculite WR Grace
Analyst: DW
Sample No.: 02264107
Analysis Date: Jul 13, 2002
Description: Soil#3 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			8	Fiber	6	0.5							✓		12116	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			9	Fiber	6	0.3							✓		12117	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	18						1	2	24	0	2	0	75						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-07

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264108 | *Analysis Date:* Jul 9, 2002

Description: H & S Pump#3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
B	26	C 4	NSD																
	27	C 14	NSD																
	28	C 24	NSD																
	29	C 44	NSD																
	30	C 43	NSD																
	31	C 33	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-07

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02264108 | *Analysis Date:* Jul 9, 2002

Description: H & S Pump#3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 23	NSD																
	33	C 13	NSD																
	34	C 3	NSD																
	35	C 2	NSD																
	36	C 12	NSD																
	37	C 22	NSD																
	38	C 32	NSD																
	39	C 42	NSD																
	40	C 31	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-08

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274100 | *Analysis Date:* Jul 10, 2002

Description: WAB Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 13	NSD																
	6	B 23	NSD																
	7	B 33	NSD																
	8	B 43	NSD																
	9	B 42	NSD																
	10	B 32	NSD																
	11	B 22	NSD																
	12	B 12	NSD																
	13	B 2	NSD																
	14	C 2	NSD																
	15	C 21	NSD																
	16	C 11	NSD																
	17	C 1	NSD																
	18	B 1	NSD																
	19	B 11	NSD																
	20	B 21	NSD																
	21	B 31	NSD																
	22	A 31	NSD																
	23	A 21	NSD																
	24	A 11	NSD																
	25	D 11	NSD																
	26	D 21	NSD																
B	27	A 31	NSD																
	28	A 21	NSD																
	29	A 11	NSD																
	30	A 1	1	Fiber	5	0.65							✓			Al, Si, P			
	31	D 1	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-08
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02274100 | *Analysis Date:* Jul 10, 2002
Description: WAB Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 11	NSD																
	33	D 21	NSD																
	34	D 31	NSD																
	35	D 41	NSD																
	36	D 40	NSD																
	37	D 30	NSD																
	38	D 20	NSD																
	39	D 10	NSD																
	40	C 10	NSD																
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-09

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274101 | *Analysis Date:* Jul 10, 2002

Description: WAB Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
B	27	C 10	NSD																
	28	C 20	NSD																
	29	C 30	NSD																
	30	C 40	NSD																
	31	C 41	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-09

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274101 | *Analysis Date:* Jul 10, 2002

Description: WAB Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 31	NSD																
	33	C 21	NSD																
	34	C 11	NSD																
	35	C 1	NSD																
	36	B 1	NSD																
	37	B 2	NSD																
	38	C 2	NSD																
	39	C 12	NSD																
	40	C 22	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-10

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* JH

Sample No.: 02274104 | *Analysis Date:* Jul 14, 2002

Description: Soil#9 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 10	1	Fiber	6	0.4							✓			Al, Si, Ca, Fe			
	2	B 20	2	Fiber	8	0.4							✓			P, S, Ca			
	3	B 30	NSD**																
	4	B 40	NSD																
	5	A 40	NSD																
	6	A 41	NSD																
	7	A 42	NSD																
	8	B 41	NSD																
	9	B 42	NSD																
	10	B 43	NSD																
	11	B 33	NSD																
	12	B 23	NSD																
	13	B 13	NSD																
	14	B 3	1	Fiber	6	0.5							✓			Na, Al, Si, Ca, Fe			
	15	C 3	NSD																
	16	C 13	NSD																
	17	C 23	NSD																
	18	C 33	1	Fiber	8	1							✓			Mg, Al, Si			
	19	C 42	NSD																
	20	C 41	NSD																
B	21	D 1	NSD																
	22	D 2	NSD																
	23	D 12	NSD																
	24	D 22	1	Fiber	6	0.4							✓			P, S, Ca			
	25	D 32	NSD																
	26	D 42	NSD																
	27	D 41	1	Fiber	9	0.3							✓			P, S, Ca			
	28	D 40	NSD																
	29	C 40	NSD																
	30	C 41	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020834-10
Project Name: Asbestos/Vermiculite WR Grace
Analyst: JH
Sample No.: 02274104
Analysis Date: Jul 14, 2002
Description: Soil#9 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	C 42	1	Fiber	10	2							✓			Mg, Al, Si, P, S, K, Ca, Ti, Fe			
			2	Fiber	8	2							✓			Na, Mg, Si, K, Ca	PROBABLE GLASS		
	32	C 32	1	Fiber	9	2							✓			Al, Si, K, Ca, Fe			
	33	C 22	1	Fiber	7	1.5							✓			Al, Si, S, Ca, Ti, Fe			
	34	C 12	NSD																
	35	C 3	NSD																
	36	B 3	NSD																
	37	B 12	NSD																
	38	B 22	NSD																
	39	B 32	NSD																
	40	B 42	NSD																
	40						0	0	0	0	0	0	10						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-11

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* JH

Sample No.: 02274105 | *Analysis Date:* Jul 14, 2002

Description: Soil#9 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	A 10	NSD**																
	2	A 20	1	Fiber	5	0.7							✓			Na, Al, Si, K, Fe			
	3	A 30	NSD																
	4	A 40	1	Fiber	6	0.6							✓		12118	Mg, Al, Si, K, Ca, Fe	UNKNOWN		
	5	B 40	NSD																
	6	B 41	NSD																
	7	B 42	NSD																
	8	B 43	NSD																
	9	B 33	NSD																
	10	B 23	NSD																
	11	B 13	NSD																
	12	B 3	NSD																
	13	C 3	NSD																
	14	C 13	1	Fiber	11	3							✓			Si			
	15	C 23	1	Fiber	6	0.5							✓			Na, Mg, Al, Si, P, S, K, Ca, Fe			
	16	C 33	NSD																
	17	C 43	NSD																
	18	C 42	1	Fiber	5	1.5							✓			Mg, Al, Si, P, K, Ca, Fe			
	19	C 41	NSD																
	20	C 40	NSD																
B	21	D 1	NSD																
	22	D 2	NSD																
	23	D 12	NSD																
	24	D 22	NSD																
	25	D 32	NSD																
	26	D 41	NSD																
	27	D 40	1	Fiber	12	4							✓			Mg, Al, Si, C, Fe			
	28	C 40	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite WR Grace
Sample No.: 02274105
Description: Soil#9 Pump#2

Lab/Cor Sample No.: 020834-11
Analyst: JH
Analysis Date: Jul 14, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	29	C 41	NSD																
	30	C 42	NSD																
	31	C 43	NSD																
	32	C 33	NSD																
	33	C 23	NSD																
	34	C 13	NSD																
	35	C 3	1	Fiber	9	2							✓			None	PROBABLE ORGANIC		
	36	B 3	NSD																
	37	B 13	NSD																
	38	B 23	NSD																
	39	B 33	NSD																
	40	B 43	NSD																
	40						0	0	0	0	0	0	7						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-12

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274106 | *Analysis Date:* Jul 9, 2002

Description: H & S Pump#3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
B	27	B 44	NSD																
	28	B 34	NSD																
	29	B 24	NSD																
	30	B 14	NSD																
	31	B 4	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-12
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02274106 | *Analysis Date:* Jul 9, 2002
Description: H & S Pump#3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 4	NSD																
	33	C 14	NSD																
	34	C 24	NSD																
	35	C 34	NSD																
	36	C 13	NSD																
	37	C 3	NSD																
	38	B 3	NSD																
	39	B 13	NSD																
	40	B 23	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-13

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274107 | *Analysis Date:* Jul 10, 2002

Description: WAB Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	1	Fiber	8	0.55							✓			Al, Si, P			
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
B	27	B 44	NSD																
	28	B 34	NSD																
	29	B 24	NSD																
	30	B 14	NSD																
	31	B 4	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-13

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274107 | *Analysis Date:* Jul 10, 2002

Description: WAB Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 4	NSD																
	33	C 14	NSD																
	34	C 24	NSD																
	35	C 23	NSD																
	36	C 13	NSD																
	37	C 3	NSD																
	38	B 3	NSD																
	39	B 13	NSD																
	40	B 23	NSD																
	40						0	0	0	0	0	0	1						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-14

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274108 | *Analysis Date:* Jul 10, 2002

Description: WAB Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	C 22	NSD**																
	2	C 12	NSD																
	3	C 2	NSD																
	4	B 2	NSD																
	5	B 12	NSD																
	6	B 22	NSD																
	7	B 32	NSD																
	8	B 42	NSD																
	9	B 41	NSD																
	10	B 31	NSD																
	11	B 21	NSD																
	12	B 11	NSD																
	13	B 1	NSD																
	14	C 1	NSD																
	15	C 11	NSD																
	16	C 21	NSD																
	17	C 31	NSD																
	18	C 41	NSD																
	19	C 40	NSD																
	20	C 30	NSD																
	21	C 20	NSD																
	22	C 10	NSD																
	23	B 10	NSD																
	24	B 20	NSD																
	25	B 30	NSD																
	26	B 40	NSD																
B	27	A 41	NSD																
	28	A 31	1	Fiber	15	0.3							✓			Al, Si, P			
	29	A 21	NSD																
	30	A 11	NSD																
	31	A 1	NSD																

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-14

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274108 | *Analysis Date:* Jul 10, 2002

Description: WAB Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 1	NSD																
	33	D 11	NSD																
	34	D 21	NSD																
	35	D 31	NSD																
	36	D 41	NSD																
	37	D 40	NSD																
	38	D 30	NSD																
	39	D 20	NSD																
	40	D 10	NSD																
	40						0	0	0	0	0	0	1						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-15

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274109 | *Analysis Date:* Jul 10, 2002

Description: QC

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	A 42	NSD**																
	2	A 32	NSD																
	3	A 22	NSD																
	4	A 12	NSD																
	5	A 2	NSD																
	6	D 2	NSD																
	7	D 12	NSD																
	8	D 22	NSD																
	9	D 32	NSD																
	10	D 42	NSD																
	11	D 41	NSD																
	12	D 31	NSD																
	13	D 21	NSD																
	14	D 11	NSD																
	15	D 1	NSD																
	16	A 1	NSD																
	17	A 11	NSD																
	18	A 21	NSD																
	19	A 31	NSD																
	20	A 41	NSD																
	21	A 40	NSD																
	22	A 30	NSD																
	23	A 20	NSD																
	24	A 10	NSD																
	25	D 10	NSD																
	26	D 20	NSD																
B	27	C 43	NSD																
	28	C 33	NSD																
	29	C 23	NSD																
	30	C 13	NSD																
	31	C 3	NSD																

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-15

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274109 | *Analysis Date:* Jul 10, 2002

Description: QC

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 3	NSD																
	33	B 13	NSD																
	34	B 23	NSD																
	35	B 33	NSD																
	36	B 43	NSD																
	37	B 42	NSD																
	38	B 32	NSD																
	39	B 22	NSD																
	40	B 12	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-16

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* JH

Sample No.: 02274111 | *Analysis Date:* Jul 14, 2002

Description: Soil#10 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	A 10	NSD**																
	2	A 20	NSD																
	3	A 30	NSD																
	4	B 30	NSD																
	5	B 31	1	Fiber	7	0.3							✓		12119	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	6	0.3							✓		12120	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	6	B 32	1	Fiber	12	0.3							✓		12121	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5	0.4			✓						12122	Na, Mg, Si, K, Ca, Fe			
	7	B 33	1	Fiber	8	0.3							✓		12123	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	6	0.3							✓		12124	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	12	0.5							✓		12125	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	8	B 23	NSD																
	9	B 13	1	Fiber	12	0.25							✓		12126	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	8	0.3							✓		12127	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	7	0.6							✓		12128	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	10	B 14	1	Fiber	9	0.3					✓			2379	12129	Na, Mg, Si, K, Ca, Fe	[3 1 0] ZONE AXIS	JH	7/28/02
	11	B 4	1	Fiber	10	0.3							✓	2380	12130	Na, Mg, Si, K, Ca, Fe	WINCHITE, [1 0 0] ZONE AXIS	JH	7/28/02
			2	Fiber	5.5	0.3							✓		12131	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	8	0.4							✓		12132	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	12	C 4	1	Fiber	10	0.3							✓		12133	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	20	0.4							✓		12134	Na, Mg, Si, K, Ca, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020834-16
Project Name: Asbestos/Vermiculite WR Grace
Analyst: JH
Sample No.: 02274111
Analysis Date: Jul 14, 2002
Description: Soil#10 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	13	C 2	1	Fiber	12	0.4							✓		12135	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	14	C 12	1	Fiber	5.5	0.5							✓			Mg, Al, Si, K, Ti, Fe			
			2	Fiber	6	0.25							✓		12136	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	15	C 22	NSD																
	16	C 32	1	Fiber	8	0.4			✓						12137	Na, Mg, Si, K, Ca, Fe			
	17	C 42	1	Fiber	5.5	0.3							✓		12138	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	18	C 41	1	Fiber	13	0.4							✓		12139	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	11	0.4			✓					2381	12140	Na, Mg, Si, K, Ca, Fe	[2 0 3] ZONE AXIS	JH	7/28/02
	19	C 40	1	Fiber	16	0.4							✓		12141	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	20	D 40	1	Fiber	5.5	0.5							✓		12142	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	46	0.6							✓		12143	Na, Mg, Si, K, Ca, Fe	WINCHITE		
B	21	D 1	1	Fiber	10	0.4							✓		12144	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	13	0.4							✓		12145	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	22	D 11	1	Fiber	16	0.5					✓				12146	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	11	0.4							✓		12147	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	12	0.4			✓						12148	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	11	0.4							✓		12149	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	23	D 21	1	Fiber	9	0.5			✓						12150	Na, Mg, Si, K, Ca, Fe			
	24	A 1	1	Fiber	6	1			✓						12151	Na, Mg, Si, K, Ca, Fe			
	25	A 2	NSD																
	26	A 11	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020834-16
Project Name: Asbestos/Vermiculite WR Grace
Analyst: JH
Sample No.: 02274111
Analysis Date: Jul 14, 2002
Description: Soil#10 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	27	A 21	1	Fiber	18	0.4							✓		12152	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	28	A 31	NSD																
	29	A 41	NSD																
	30	A 40	NSD																
	31	B 40	NSD																
	32	B 41	1	Fiber	9	0.3							✓		12153	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	33	B 42	1	Fiber	10	0.4			✓						12154	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	6	0.25			✓						12155	Na, Mg, Si, K, Ca, Fe			
	34	B 43	1	Fiber	9	0.25			✓						12156	Na, Mg, Si, K, Ca, Fe			
	35	B 44	1	Fiber	6	0.4							✓		12157	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	36	B 34	1	Fiber	6	0.25							✓		12158	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	9	0.3							✓		12159	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	9	0.5							✓		12160	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	37	B 24	NSD																
	38	B 14	NSD																
	39	B 4	NSD																
	40	C 4	NSD																
	40						0	0	9	0	2	0	32						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-17
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02274112 | *Analysis Date:* Jul 15, 2002
Description: Soil#10 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	18	1							✓		12161	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	2	B 34	1	Fiber	12	1			✓						12162	Na, Mg, Si, K, Ca, Fe			
	3	B 24	1	Fiber	11	0.65			✓						12163	Na, Mg, Si, K, Ca, Fe			
	4	B 14	1	Fiber	6	0.35			✓						12229	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	18	0.75			✓						12164	Na, Mg, Si, K, Ca, Fe			
	5	B 4	1	Fiber	7.5	0.5			✓					2382	12165	Na, Mg, Si, K, Ca, Fe	[2 0 5] ZONE AXIS	JH	7/28/02
	6	C 4	NSD**																
	7	C 14	1	Fiber	13	1			✓						12166	Na, Mg, Si, K, Ca, Fe			
	8	C 24	1	Fiber	11	0.35			✓						12167	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	12	0.55			✓						12168	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	12	0.85							✓		12169	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	20	0.55							✓		12170	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	9	C 34	NSD																
	10	C 44	1	Fiber	8	1							✓		12171	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	11	C 43	1	Fiber	10	0.5							✓		12172	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	20	0.65							✓		12173	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	9	0.5							✓		12174	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	12	C 33	1	Fiber	5	0.35							✓		12175	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	1.8							✓		12176	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	13	C 23	1	Fiber	8	0.5							✓	2383	12177	Na, Mg, Si, K, Ca, Fe	WINCHITE, [1 1 1] ZONE AXIS	JH	7/28/02

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-17

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274112 | *Analysis Date:* Jul 15, 2002

Description: Soil#10 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	14	C 13	1	Fiber	10	0.75					✓			2384	12178	Na, Mg, Si, K, Ca, Fe	[3 1 0] ZONE AXIS	JH	7/28/02
	15	C 3	1	Fiber	22	0.85							✓		12179	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	16	B 3	NSD																
	17	B 13	1	Fiber	13	0.75			✓						12180	Na, Mg, Si, K, Ca, Fe			
	18	B 23	1	Fiber	7.5	1.2							✓		12181	Mg, Al, Si, K, Fe			
			2	Fiber	14	0.45							✓		12182	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	19	B 33	1	Fiber	13	2							✓		12183	Al, Si, P			
	20	B 43	1	Fiber	5	0.75							✓		12184	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	21	B 42	1	Fiber	5	0.75							✓		12185	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5	0.85							✓		12186	P, Ca			
	22	B 32	1	Fiber	7.5	0.75							✓		12187	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	116	0.85							✓		12188	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	11	1							✓		12189	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	23	B 22	1	Fiber	5	0.25			✓						12230	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	9	0.65							✓		12190	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	16	0.65							✓		12191	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	7.5	0.7			✓						12192	Na, Mg, Si, K, Ca, Fe			
	24	B 12	1	Fiber	8	0.85							✓		12193	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	30	0.5							✓		12194	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	25	B 2	1	Fiber	6	0.5							✓		12195	Na, Mg, Si, K, Ca, Fe	WINCHITE		
B	26	B 43	1	Fiber	6.5	0.65							✓		12196	Na, Mg, Si, K, Ca, Fe	WINCHITE		

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite WR Grace
Sample No.: 02274112
Description: Soil#10 Pump#2

Lab/Cor Sample No.: 020834-17
Analyst: DW
Analysis Date: Jul 15, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	27	B 33	1	Fiber	10	0.5							✓		12197	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	20	0.5							✓		12198	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	5.5	0.5			✓						12199	Na, Mg, Si, K, Ca, Fe			
	28	B 23	1	Fiber	8.5	0.5							✓		12200	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	29	B 13	NSD																
	30	B 3	1	Fiber	49	1							✓		12201	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	31	C 3	1	Fiber	8.5	0.65							✓		12202	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	32	C 13	NSD																
	33	C 23	1	Fiber	12	0.65							✓		12203	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	8.5	0.65							✓		12204	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	34	C 33	NSD																
	35	C 32	1	Fiber	5	0.7			✓						12205	Na, Mg, Si, K, Ca, Fe			
	36	C 22	1	Fiber	20	0.65							✓		12206	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10.5	1							✓		12207	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	37	C 12	NSD																
	38	C 2	NSD																
	39	B 2	1	Fiber	5.5	0.3							✓		12208	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	8	0.35							✓		12209	Na, Mg, Si, K, Ca, Fe			
	40	B 12	1	Fiber	28	0.75			✓						12210	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	28	0.65							✓		12211	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	0.5							✓		12212	Na, Mg, Si, K, Ca, Fe	WINCHITE		

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-17

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02274112 | *Analysis Date:* Jul 15, 2002

Description: Soil#10 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			4	Fiber	12.5	0.25			✓						12213	Na, Mg, Si, K, Ca, Fe			
	40						0	0	15	0	1	0	39						

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834 | *Report Date:* Jul 29, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020834-17
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02274112 | *Analysis Date:* Jul 15, 2002
Description: Soil#10 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 13	NSD																
	17	B 23	NSD																
	18	B 33	NSD																
	19	B 43	NSD																
	20	B 42	NSD																
	21	B 32	NSD																
	22	B 22	NSD																
	23	B 12	NSD																
	24	C 22	NSD																
	25	C 32	NSD																
	26	C 42	NSD																
B	27	C 41	NSD																
	28	C 31	NSD																
	29	C 21	1	Fiber	7.5	0.5							✓			P, S, K			
	30	C 11	NSD																
	31	C 1	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020834
Report Date: Jul 29, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite WR Grace
Sample No.: 02274112
Description: Soil#10 Pump#2

Lab/Cor Sample No.: 020834-17
Analyst: DW
Analysis Date: Jul 15, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 1	NSD																
	33	B 11	NSD																
	34	B 21	NSD																
	35	B 31	NSD																
	36	B 41	NSD																
	37	B 40	NSD																
	38	B 30	NSD																
	39	B 20	NSD																
	40	B 10	NSD																
	40						0	0	0	0	0	0	1						

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

August 8, 2002

Ecology and Environment, Inc.
2101 Fourth Avenue
Suite 1900
Seattle, WA 98121

Attn: Jeff Fowlow

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace
Project Number: 124969-S10/ TDD# 01070014
P. O. Number: 124969

Lab/Cor Batch Number: 020891

Conditions Enclosed please find results for samples submitted to our laboratory on July 19, 2002. A list of samples received follows, with limitation or rejection criteria noted where applicable.

Lab/Cor Sample No.	Client Sample No.	Limitation/Rejection Criteria
020891-01	2284400	No special conditions were noted
020891-02	2284401	No special conditions were noted
020891-03	2284404	No special conditions were noted
020891-04	2284405	No special conditions were noted
020891-05	2284406	No special conditions were noted
020891-06	2284407	No special conditions were noted
020891-07	2294300	No special conditions were noted
020891-08	2294301	No special conditions were noted
020891-09	2294302	No special conditions were noted
020891-10	2294303	No special conditions were noted
020891-11	2294305	No special conditions were noted
020891-12	2294306	No special conditions were noted

Method Preparation and analysis of the above samples was conducted in accordance with the NIOSH method 7402 for the identification of asbestos. The samples were collapsed with acetone, carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in acetone until cleared of filter debris.

TEM analysis was performed using a Philips 410 transmission electron microscope equipped with an EDAX PV9800 X-ray analyzer. The air samples were scanned at a magnification of approximately 990X using an accelerating voltage of 100 KV. The magnification was increased to about 10,000X for structure sizing.

Counting Rules

Minimum Aspect Ratio	Minimum Length	Minimum Width	Minimum Required Analytical Sensitivity	Stopping Rules
3:1	5 µm	0.25 µm	NA	100 Structures

Disclaimer This test report relates only to the items tested in this report. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please do not hesitate to call me. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with analytical services.

Sincerely,

Johannes Frank
Laboratory Director

7619 6th Avenue NW, Seattle, WA 98117 (206) 781-0155 (206) 789-8424 (FAX)

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891

Report Date: August 8, 2002

Client Information	
Project Name:	Asbestos/Vermiculite NorthWest W.R.Grace
Project No.:	124969-S10/ TDD# 01070014
P. O. No.:	124969
Sample Type:	Air

Tracking Information			
Login:	Jul 19, 2002	*By:*	JJ
Prep:	Jul 22, 2002	*By:*	MW
Verified:	Jul 22, 2002	*By:*	MW
Reviewed:	Aug 1, 2002	*By:*	DW
Final Review:	Aug 8, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020891-01	02284400	WAB Pump #1	ASBESTOS	<0.010	0 - 0.038	0	0	0.010	93.6	40	385	0.4026	DW	7/26/02
			NON-ASBESTOS	0.041	0.011 - 0.105	4								
Test			Winchite	<0.010	0 - 0.038	0								
			Richterite	<0.010	0 - 0.038	0								
			TOTAL	0.041	0.011 - 0.105	4								
020891-02	02284401	WAB Pump #2	ASBESTOS	<0.010	0 - 0.038	0	NA	0.010	93.4	40	385	0.4026	DW	7/27/02
			NON-ASBESTOS	<0.010	0 - 0.038	0								
Test			Winchite	<0.010	0 - 0.038	0								
			Richterite	<0.010	0 - 0.038	0								
			TOTAL	<0.010	0 - 0.038	0								
020891-03	02284404	Soil #7 Pump #1	ASBESTOS	<0.048	0 - 0.178	0	0	0.048	39.7	20	385	0.2013	DW	7/31/02
			NON-ASBESTOS	5.010	4.047 - 5.973	104								
Test			Winchite	0.096	0.012 - 0.348	2								
			Richterite	<0.048	0 - 0.178	0								
			TOTAL	5.106	4.134 - 6.078	106								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891

Report Date: August 8, 2002

Client Information	
Project Name:	Asbestos/Vermiculite NorthWest W.R.Grace
Project No.:	124969-S10/ TDD# 01070014
P. O. No.:	124969
Sample Type:	Air

Tracking Information			
Login:	Jul 19, 2002	*By:*	JJ
Prep:	Jul 22, 2002	*By:*	MW
Verified:	Jul 22, 2002	*By:*	MW
Reviewed:	Aug 1, 2002	*By:*	DW
Final Review:	Aug 8, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE
Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020891-04	02284405	Soil #7 Pump #2	ASBESTOS	0.068	0.002 - 0.381	1	1	0.068	39.9	14	385	0.1309	DW	7/31/02
			NON-ASBESTOS	7.053	5.691 - 8.415	103								
Test			Winchite	0.068	0.002 - 0.381	1								
			Richterite	<0.068	0 - 0.272	0								
			TOTAL	7.189	5.814 - 8.565	105								
020891-05	02284406	Soil #7 Pump #1	ASBESTOS	0.025	0.003 - 0.091	2	3	0.013	75.9	40	385	0.4026	DW	7/31/02
			NON-ASBESTOS	0.680	0.499 - 0.862	54								
Test			Winchite	0.050	0.014 - 0.129	4								
			Richterite	<0.013	0 - 0.046	0								
			TOTAL	0.755	0.565 - 0.947	60								
020891-06	02284407	H & S Pump #3	ASBESTOS	<0.022	0 - 0.080	0	NA	0.022	43.9	40	385	0.4026	DW	7/26/02
			NON-ASBESTOS	<0.022	0 - 0.080	0								
Test			Winchite	<0.022	0 - 0.080	0								
			Richterite	<0.022	0 - 0.080	0								
			TOTAL	<0.022	0 - 0.080	0								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 020891 *Report Date:* August 8, 2002

Client Information	
Project Name:	Asbestos/Vermiculite NorthWest W.R.Grace
Project No.:	124969-S10/ TDD# 01070014
P. O. No.:	124969
Sample Type:	Air

Tracking Information		
Login:	Jul 19, 2002	*By:* JJ
Prep:	Jul 22, 2002	*By:* MW
Verified:	Jul 22, 2002	*By:* MW
Reviewed:	Aug 1, 2002	*By:* DW
Final Review:	Aug 8, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE
Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020891-07	02294300	H & S On Site - Pump #3	ASBESTOS	<0.034	0 - 0.125	0	NA	0.034	28.2	40	385	0.4026	DW	7/26/02
			NON-ASBESTOS	<0.034	0 - 0.125	0								
Test			Winchite	<0.034	0 - 0.125	0								
			Richterite	<0.034	0 - 0.125	0								
			TOTAL	<0.034	0 - 0.125	0								
020891-08	02294301	H & S On Site - Pump #4	ASBESTOS	<0.021	0 - 0.079	0	0	0.021	44.7	40	385	0.4026	DW	7/26/02
			NON-ASBESTOS	0.021	0.001 - 0.119	1								
Test			Winchite	<0.021	0 - 0.079	0								
			Richterite	<0.021	0 - 0.079	0								
			TOTAL	0.021	0.001 - 0.119	1								
020891-09	02294302	WAB Pump #1	ASBESTOS	<0.010	0 - 0.038	0	NA	0.010	93.0	40	385	0.4026	DW	7/26/02
			NON-ASBESTOS	<0.010	0 - 0.038	0								
Test			Winchite	<0.010	0 - 0.038	0								
			Richterite	<0.010	0 - 0.038	0								
			TOTAL	<0.010	0 - 0.038	0								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 *Report Date:* August 8, 2002

Client Information	
Project Name:	Asbestos/Vermiculite NorthWest W.R.Grace
Project No.:	124969-S10/ TDD# 01070014
P. O. No.:	124969
Sample Type:	Air

Tracking Information		
Login:	Jul 19, 2002	*By:* JJ
Prep:	Jul 22, 2002	*By:* MW
Verified:	Jul 22, 2002	*By:* MW
Reviewed:	Aug 1, 2002	*By:* DW
Final Review:	Aug 8, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
020891-10	02294303	WAB Pump #2	ASBESTOS	<0.010	0 - 0.038	0	0	0.010	92.2	40	385	0.4026	DW	7/26/02
			NON-ASBESTOS	0.010	0.000 - 0.058	1								
Test			Winchite	<0.010	0 - 0.038	0								
			Richterite	<0.010	0 - 0.038	0								
			TOTAL	0.010	0.000 - 0.058	1								
020891-11	02294305	Soil #11 Pump #1	ASBESTOS	0.131	0.042 - 0.305	5	36	0.026	36.6	40	385	0.4026	DW	7/27/02
			NON-ASBESTOS	0.105	0.028 - 0.268	4								
Test			Winchite	0.131	0.042 - 0.305	5								
			Richterite	<0.026	0 - 0.096	0								
			TOTAL	0.367	0.200 - 0.614	14								
020891-12	02294306	Soil #11 Pump #2	ASBESTOS	0.159	0.058 - 0.346	6	50	0.026	36.1	40	385	0.4026	DW	7/26/02
			NON-ASBESTOS	0.079	0.016 - 0.232	3								
Test			Winchite	0.079	0.016 - 0.232	3								
			Richterite	<0.026	0 - 0.098	0								
			TOTAL	0.317	0.164 - 0.555	12								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-01
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284400 | *Analysis Date:* Jul 26, 2002
Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	A 4	NSD**																
	2	D 4	NSD																
	3	D 13	NSD																
	4	D 3	NSD																
	5	A 3	NSD																
	6	A 42	NSD																
	7	A 32	NSD																
	8	A 22	NSD																
	9	D 2	NSD																
	10	D 12	NSD																
	11	D 22	NSD																
	12	D 41	NSD																
	13	D 31	NSD																
	14	D 21	NSD																
	15	D 11	NSD																
	16	A 1	NSD																
	17	A 11	NSD																
	18	A 21	NSD																
	19	A 31	NSD																
	20	A 20	NSD																
	21	A 10	NSD																
	22	D 20	1	Fiber	25	8							✓			Mg, Al, Si			
	23	D 30	1	Fiber	52	0.65							✓			Al, Si, P			
			2	Fiber	40	0.5							✓			Al, Si, P			
	24	C 30	NSD																
	25	C 20	NSD																
	26	C 10	NSD																
	27	B 10	NSD																
B	28	B 44	NSD																
	29	B 34	NSD																
	30	B 24	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-01
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284400 | *Analysis Date:* Jul 26, 2002
Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	B 14	NSD																
	32	B 4	NSD																
	33	C 4	NSD																
	34	B 3	1	Fiber	12	0.35							✓			Al, Si, P			
	35	B 13	NSD																
	36	B 23	NSD																
	37	B 33	NSD																
	38	B 43	NSD																
	39	B 42	NSD																
	40	B 32	NSD																
	40						0	0	0	0	0	0	4						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-02
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284401 | *Analysis Date:* Jul 27, 2002
Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 24	NSD																
	3	B 14	NSD																
	4	B 4	NSD																
	5	C 4	NSD																
	6	C 14	NSD																
	7	C 24	NSD																
	8	C 34	NSD																
	9	C 44	NSD																
	10	C 43	NSD																
	11	C 33	NSD																
	12	C 23	NSD																
	13	C 13	NSD																
	14	C 3	NSD																
	15	B 3	NSD																
	16	B 13	NSD																
	17	B 23	NSD																
	18	B 33	NSD																
	19	B 43	NSD																
	20	B 42	NSD																
	21	B 32	NSD																
	22	B 22	NSD																
	23	B 12	NSD																
	24	B 2	NSD																
	25	C 2	NSD																
	26	C 12	NSD																
	27	C 22	NSD																
B	28	D 31	NSD																
	29	D 21	NSD																
	30	D 11	NSD																
	31	D 1	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-02
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284401 | *Analysis Date:* Jul 27, 2002
Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 1	NSD																
	33	A 11	NSD																
	34	A 21	NSD																
	35	A 31	NSD																
	36	A 41	NSD																
	37	A 40	NSD																
	38	A 30	NSD																
	39	A 20	NSD																
	40	A 10	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-03

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 02284404 | *Analysis Date:* Jul 31, 2002

Description: Soil #7 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	7.5	0.25							✓			Ca			
			2	Fiber	5.5	0.35							✓			Ca			
			3	Fiber	8	0.25							✓			Ca			
			4	Fiber	5.5	0.25							✓			Ca			
	2	B 34	1	Fiber	5.5	0.25							✓			Ca			
			2	Fiber	9.5	0.35							✓			Ca			
	3	B 24	1	Fiber	5.5	0.35							✓			Ca			
			2	Fiber	8	0.3							✓			Ca			
			3	Fiber	6	0.4							✓			Ca			
			4	Fiber	24	1.2							✓			Al, Si, K, Ca, Fe			
	4	B 4	1	Fiber	6	0.25							✓			Ca			
			2	Fiber	6	1.5							✓			Ca			
			3	Fiber	5	0.25							✓			Ca			
			4	Fiber	6.5	0.25							✓			Ca			
			5	Fiber	6	0.25							✓			Ca			
	5	C 4	1	Fiber	15	1.5							✓			Al, Si, K			
			2	Fiber	6	0.4							✓			Ca			
			3	Fiber	6	0.5							✓			Ca			
	6	C 14	1	Fiber	12	1							✓			Al, Si, K			
			2	Fiber	5	0.25							✓			Ca			
			3	Fiber	7.5	0.25							✓			Ca			
			4	Fiber	11	0.3							✓	2404	12275	Na, Mg, Si, K, Ca, Fe	WINCHITE, [4 0 1] ZONE AXIS	JH	8/8/02
	7	C 24	1	Fiber	5.5	0.25							✓			Ca			
			2	Fiber	6.5	0.25							✓			Ca			
			3	Fiber	10	0.25							✓			Ca			
			4	Fiber	7.5	0.25							✓			Ca			
	8	C 34	1	Fiber	7.5	0.25							✓			Ca			
			2	Fiber	7.5	0.25							✓			Ca			
			3	Fiber	5.5	0.35							✓			Ca			
			4	Fiber	5	0.4							✓			Ca			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-03
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284404 | *Analysis Date:* Jul 31, 2002
Description: Soil #7 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	9	C 43	1	Fiber	10	0.3							✓			Ca			
			2	Fiber	5.5	0.45							✓			Ca			
			3	Fiber	5.5	0.35							✓			Ca			
			4	Fiber	5	0.85							✓			Al, Si, K, Fe			
	10	C 33	1	Fiber	5	0.35							✓			Ca			
			2	Fiber	5.5	0.75							✓			Ca			
			3	Fiber	5	0.25							✓			Ca			
			4	Fiber	15	0.5							✓			Al, P, Ca			
			5	Fiber	6	0.25							✓			Ca			
	11	C 23	1	Fiber	20	0.25							✓			Ca			
			2	Fiber	5.5	0.25							✓			Ca			
			3	Fiber	6	0.25							✓			Ca			
	12	C 13	1	Fiber	5	0.25							✓			Ca			
			2	Fiber	10	0.35							✓			Ca			
			3	Fiber	5.5	0.35							✓			Ca			
			4	Fiber	5	0.25							✓			Ca			
	13	C 3	1	Fiber	10	0.25							✓			Ca			
			2	Fiber	6	0.35							✓			Ca			
			3	Fiber	5.5	0.35							✓			Ca			
			4	Fiber	5	0.25							✓			Ca			
			5	Fiber	5	0.4							✓			Ca			
	14	B 3	1	Fiber	5	0.5							✓			Ca			
			2	Fiber	6	0.35							✓			Ca			
			3	Fiber	6	0.25							✓			Ca			
			4	Fiber	5	0.35							✓			Ca			
			5	Fiber	5	0.25							✓			Ca			
	15	B 13	1	Fiber	5	0.85							✓			Ca			
			2	Fiber	5	0.3							✓			Ca			
			3	Fiber	12	0.35							✓			Ca			
			4	Fiber	10	2.5							✓			Al, Si, K, Fe			
			5	Fiber	7.5	0.3							✓			Ca			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-03

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 02284404 | *Analysis Date:* Jul 31, 2002

Description: Soil #7 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			6	Fiber	7.5	0.25							✓			Ca			
			7	Fiber	5.5	0.25							✓			Ca			
			8	Fiber	5	0.5							✓			Ca			
			9	Fiber	5.5	0.25							✓			Ca			
			10	Fiber	11	0.85							✓			Ca			
	16	B 23	1	Fiber	5	0.25							✓			Ca			
			2	Fiber	9	0.25							✓			Ca			
			3	Fiber	6	0.35							✓			Ca			
			4	Fiber	8	0.4							✓			Ca			
			5	Fiber	10	0.25							✓			Ca			
			6	Fiber	13	0.25							✓			Ca			
	17	B 33	1	Fiber	5	0.25							✓			Ca			
			2	Fiber	5.5	0.35							✓			Ca			
			3	Fiber	5.5	0.35							✓			Ca			
			4	Fiber	5	0.25							✓			Ca			
			5	Fiber	10	0.5							✓			Al, P, Ca, K			
B	18	B 44	1	Fiber	6	0.3							✓			Ca			
			2	Fiber	5	0.25							✓			Ca			
			3	Fiber	6	1.2							✓			Al, Si, K, Fe			
			4	Fiber	5.5	0.5							✓			Ca			
			5	Fiber	7.5	0.25							✓			Ca			
			6	Fiber	7.5	0.25							✓			Ca			
			7	Fiber	5.5	0.35							✓			Ca			
	19	B 34	1	Fiber	6	0.5							✓			Ca			
			2	Fiber	18	1							✓			Ca			
			3	Fiber	6	0.3							✓			Ca			
			4	Fiber	5	0.25							✓			Ca			
			5	Fiber	12	0.25							✓			Ca			
			6	Fiber	5	0.25							✓			Ca			
			7	Fiber	9	0.4							✓			Ca			
	20	B 24	1	Fiber	6	0.25							✓			Ca			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-03
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284404 | *Analysis Date:* Jul 31, 2002
Description: Soil #7 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	5.5	0.35							✓		12277	Ca			
			3	Fiber	6	0.25							✓			Ca			
			4	Fiber	5	0.3							✓			Ca			
			5	Fiber	7.5	0.25							✓			Ca			
			6	Fiber	6	0.4							✓			Ca			
			7	Fiber	5.5	0.25							✓			Ca			
			8	Fiber	6	0.25							✓			Ca			
			9	Fiber	6	0.25							✓			Ca			
			10	Fiber	11	0.35							✓			Ca			
			11	Fiber	5.5	0.25							✓			Ca			
			12	Fiber	5.5	0.3							✓			Ca			
			13	Fiber	10	0.25							✓			Ca			
			14	Fiber	10.5	0.35							✓		12276	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			15	Fiber	6	1.2							✓			Si			
	20						0	0	0	0	0	0	106						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-04
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284405 | *Analysis Date:* Jul 31, 2002
Description: Soil #7 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	8	0.4							✓			Ca			
			2	Fiber	9	0.25							✓			Ca			
			3	Fiber	5	0.3							✓			Ca			
			4	Fiber	6.5	0.25							✓			Ca			
			5	Fiber	6	0.75							✓			Al, Si, K, Fe			
	2	B 34	1	Fiber	9	0.3							✓			Ca			
			2	Fiber	5	0.25							✓			Ca			
			3	Fiber	7.5	0.4							✓			Ca			
			4	Fiber	5	0.25							✓			Ca			
			5	Fiber	5.5	0.4							✓			Ca			
			6	Fiber	5	0.25							✓			Ca			
			7	Fiber	5.5	0.25							✓			Ca			
			8	Fiber	10	0.25							✓			Ca			
			9	Fiber	5.5	0.25							✓			Ca			
			10	Fiber	5.5	0.25							✓			Ca			
			11	Fiber	8	0.25							✓			Ca			
	3	B 24	1	Fiber	8	0.4							✓			Ca			
			2	Fiber	5	0.3							✓			Ca			
			3	Fiber	5.5	0.25							✓			Ca			
			4	Fiber	5	0.25							✓			Ca			
			5	Fiber	5	0.35							✓			Ca			
			6	Fiber	5.5	0.3							✓			Ca			
			7	Fiber	8	0.25							✓			Ca			
			8	Fiber	7.5	0.25							✓			Ca			
	4	B 14	1	Fiber	5	0.4							✓			Ca			
			2	Fiber	10	0.4							✓		12278	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	7.5	0.35							✓			Ca			
			4	Fiber	5.5	0.3							✓			Ca			
			5	Fiber	14	0.35							✓			Ca			
			6	Fiber	6	0.25							✓			Ca			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-04
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284405 | *Analysis Date:* Jul 31, 2002
Description: Soil #7 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			7	Fiber	7	1.2							✓			Al, Si, K, Fe			
	5	B 4	1	Fiber	8	0.35							✓			Ca			
			2	Fiber	10.5	0.35							✓			Ca			
			3	Fiber	7.5	0.3							✓			Ca			
			4	Fiber	8	0.3							✓			Ca			
			5	Fiber	10	0.3							✓			Ca			
			6	Fiber	5	0.25							✓			Ca			
			7	Fiber	10	0.4							✓			Ca			
			8	Fiber	20	0.4							✓			Ca			
			9	Fiber	6	0.4							✓			Ca			
			10	Fiber	12	0.35							✓			Ca			
			11	Fiber	6	0.25							✓			Ca			
			12	Fiber	5.5	0.25							✓			Ca			
			13	Fiber	6	0.4							✓			Ca			
			14	Fiber	5.2	0.3							✓			Ca			
			15	Fiber	5	0.3							✓			Ca			
	6	C 4	1	Fiber	6	0.25							✓			Ca			
			2	Fiber	13	0.35							✓			Ca			
			3	Fiber	7.5	0.35							✓			Ca			
	7	C 14	1	Fiber	6.5	0.5					✓			2405	12279	Na, Mg, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	8/8/02
			2	Fiber	5	0.35							✓			Ca			
			3	Fiber	5	0.3							✓			Ca			
			4	Fiber	5.5	0.4							✓			Ca			
	8	C 24	1	Fiber	6	0.25							✓			Ca			
			2	Fiber	5	0.3							✓			Ca			
			3	Fiber	10	0.25							✓			Ca			
			4	Fiber	8	1							✓			Al, Si, K, Ca, Fe			
			5	Fiber	5.5	0.25							✓			Ca			
			6	Fiber	5	0.25							✓			Ca			
			7	Fiber	6	0.5							✓			Ca			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-04

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 02284405 | *Analysis Date:* Jul 31, 2002

Description: Soil #7 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			8	Fiber	5	0.4							✓			Ca			
			9	Fiber	10	0.3							✓			Ca			
	9	C 34	1	Fiber	5.5	0.25							✓			Ca			
			2	Fiber	5	0.75							✓			Ca			
			3	Fiber	6	0.4							✓			Ca			
			4	Fiber	6	0.25							✓			Ca			
	10	C 44	1	Fiber	12	0.65							✓			Ca			
			2	Fiber	5.5	0.3							✓			Ca			
			3	Fiber	5	0.25							✓			Ca			
			4	Fiber	6	0.3							✓			Ca			
			5	Fiber	6	0.35							✓			Ca			
			6	Fiber	5.5	0.445							✓			Ca			
			7	Fiber	5	0.3							✓			Ca			
			8	Fiber	6.5	0.35							✓			Ca			
			9	Fiber	5.5	0.3							✓			Ca			
B	11	B 24	1	Fiber	6	0.35							✓			Ca			
			2	Fiber	5.5	0.3							✓			Ca			
			3	Fiber	5	0.4							✓			Ca			
			4	Fiber	5	0.35							✓			Ca			
			5	Fiber	5.5	0.3							✓			Ca			
			6	Fiber	6	0.35							✓			Ca			
			7	Fiber	6.5	0.4							✓			Ca			
			8	Fiber	9	2.5							✓			A, Si, K, Ca, Fe			
	12	B 14	1	Fiber	6	0.445							✓			Ca			
			2	Fiber	7	0.25							✓			Ca			
			3	Fiber	5	0.4							✓			Ca			
			4	Fiber	5.5	0.25							✓			Ca			
			5	Fiber	11	0.25							✓			Ca			
			6	Fiber	5	0.25							✓			Ca			
			7	Fiber	5.5	0.4							✓		12289	Ca			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-04

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 02284405 | *Analysis Date:* Jul 31, 2002

Description: Soil #7 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	13	B 4	1	Fiber	11	1.5							✓			Al, Si, K, Ca, Fe			
			2	Fiber	8	0.75							✓	2406	12280	Na, Mg, Si, K, Ca, Fe	WINCHITE, [3 0 2] ZONE AXIS	JH	8/8/02
			3	Fiber	5	0.25							✓			Ca			
			4	Fiber	5.5	0.25							✓			Ca			
			5	Fiber	5	0.65							✓			Ca			
			6	Fiber	7.5	0.25							✓			Ca			
			7	Fiber	8	2							✓			Si			
	14	C 4	1	Fiber	8	0.25							✓			Ca			
			2	Fiber	6	1.2							✓			Al, Si, K, Ca, Fe			
			3	Fiber	6	0.3							✓			Ca			
			4	Fiber	5	0.65							✓			Si, Ca			
			5	Fiber	6	0.3							✓			Ca			
			6	Fiber	5.5	0.3							✓			Ca			
			7	Fiber	9	0.3							✓			Ca			
			8	Fiber	10	0.5							✓			Ca			
	14						0	0	0	0	1	0	104						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-05

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 02284406 | *Analysis Date:* Jul 31, 2002

Description: Soil #7 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	1	Fiber	5	0.25							✓			Ca			
			2	Fiber	5	0.3							✓			Ca			
			3	Fiber	8	2.5							✓			Al, Si, K, Ca, Fe			
	3	B 24	1	Fiber	5	0.35							✓			Ca			
			2	Fiber	11	1.2							✓			Al, Si, K, Ca, Fe			
			3	Fiber	5	0.25							✓			Ca			
	4	B 14	1	Fiber	8	0.3							✓			Ca			
	5	B 4	1	Fiber	5.5	0.3							✓			Ca			
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	1	Fiber	6	0.25							✓			Ca			
			2	Fiber	11	0.3							✓			Ca			
			3	Fiber	5	0.25							✓			Ca			
	9	C 34	1	Fiber	5.5	0.25							✓			Ca			
			2	Fiber	5.5	0.25							✓			Ca			
			3	Fiber	5	0.3							✓			Ca			
	10	C 44	1	Fiber	15	1			✓					2408	12281	Na, Mg, Si, Ca, K, Fe	[5 1 2] ZONE AXIS	JH	8/8/02
	11	C 43	1	Fiber	9	0.25							✓			Ca			
	12	C 33	1	Fiber	25	0.85							✓	2407	12282	Na, Mg, Si, Ca, K, Fe	WINCHITE, [2 0 1] ZONE AXIS	JH	8/8/02
			2	Fiber	6	0.65							✓			Al, Si, K, Ca, Fe			
			3	Fiber	5	0.25							✓			Ca			
			4	Fiber	10	0.3							✓			Ca			
	13	C 23	1	Fiber	5.5	0.85							✓			Al, Si, K, Ca, Fe			
			2	Fiber	5	0.3							✓			Ca			
	14	C 13	1	Fiber	8	0.4							✓			Ca			
	15	C 3	1	Fiber	5	0.35							✓			Ca			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-05
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284406 | *Analysis Date:* Jul 31, 2002
Description: Soil #7 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	5.5	0.4							✓			Ca			
			3	Fiber	5.5	0.25							✓			Ca			
			4	Fiber	9	2							✓			Al, Si, K, Ca, Fe			
			5	Fiber	35	0.75							✓		12283	Na, Mg, Si, Ca, K, Fe	WINCHITE		
	16	B 3	1	Fiber	6	0.25							✓			Ca			
			2	Fiber	5.5	0.85							✓			Ca			
			3	Fiber	5.5	0.35							✓			Ca			
			4	Fiber	5	0.4							✓			Ca			
			5	Fiber	9	0.3							✓			Ca			
	17	B 13	1	Fiber	6	0.45							✓			Ca			
			2	Fiber	6	1.5							✓			Al, Si, K, Ca, Fe			
	18	B 23	NSD																
	19	B 33	1	Fiber	6	0.5							✓			Ca			
			2	Fiber	5.5	0.3							✓			Ca			
	20	B 43	1	Fiber	31	0.65							✓		12284	Na, Mg, Si, Ca, K, Fe			
	21	B 42	NSD																
	22	B 32	1	Fiber	6	0.25							✓			Ca			
			2	Fiber	6	0.4							✓			Ca			
	23	B 22	1	Fiber	5	0.4							✓			Ca			
	24	B 12	1	Fiber	6	0.3							✓			Ca			
	25	B 2	1	Fiber	5.5	0.5							✓			Al, P, Ca			
			2	Fiber	10	1							✓			Al, Si, K, Ca, Fe			
	26	C 2	NSD																
	27	C 12	1	Fiber	6	0.35							✓			Ca			
			2	Fiber	5.5	0.25							✓			Ca			
B	28	B 44	NSD																
	29	B 34	1	Fiber	5	0.35							✓		12288	Ca			
	30	B 24	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-05
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284406 | *Analysis Date:* Jul 31, 2002
Description: Soil #7 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	B 14	NSD																
	32	B 4	1	Fiber	8	0.25							✓		12285	Na, Mg, Si, Ca, K, Fe	WINCHITE		
			2	Fiber	18	0.5			✓						12286	Na, Mg, Si, Ca, K, Fe			
	33	C 4	1	Fiber	9	0.85							✓			Al, Si, Kca, Fe			
	34	C 14	1	Fiber	10	0.85							✓			Ca			
			2	Fiber	5	0.4							✓			Ca			
	35	C 24	1	Fiber	8	1							✓			Ca			
			2	Fiber	9	2.5							✓			Ca			
	36	C 34	1	Fiber	5.5	0.85							✓			Al, Si, Kca, Fe			
	37	C 44	1	Fiber	25	0.5							✓			Al, P, Ca			
	38	C 40	1	Fiber	5.5	0.3							✓			Ca			
			2	Fiber	8	0.5							✓			Ca			
			3	Fiber	14	1							✓			Al, Si, Kc, Afe			
	39	C 30	NSD																
	40	C 20	1	Fiber	11	0.65							✓		12287	Na, Mg, Si, Ca, K, Fe	WINCHITE		
	40						0	0	2	0	0	0	58						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-06
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 02284407 | *Analysis Date:* Jul 26, 2002
Description: H & S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 24	NSD**																
	2	B 14	NSD																
	3	B 4	NSD																
	4	C 4	NSD																
	5	C 14	NSD																
	6	C 24	NSD																
	7	C 34	NSD																
	8	C 44	NSD																
	9	C 43	NSD																
	10	C 33	NSD																
	11	C 23	NSD																
	12	C 13	NSD																
	13	C 3	NSD																
	14	B 3	NSD																
	15	B 13	NSD																
	16	B 23	NSD																
	17	B 22	NSD																
	18	B 12	NSD																
	19	B 2	NSD																
	20	C 2	NSD																
	21	C 12	NSD																
	22	C 22	NSD																
	23	C 32	NSD																
	24	C 42	NSD																
	25	C 41	NSD																
	26	C 31	NSD																
	27	C 21	NSD																
	28	C 11	NSD																
B	29	D 1	NSD																
	30	A 1	NSD																
	31	A 11	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891
Report Date: Aug 8, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace
Sample No.: 02284407
Description: H & S Pump #3

Lab/Cor Sample No.: 020891-06
Analyst: DW
Analysis Date: Jul 26, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 21	NSD																
	33	A 31	NSD																
	34	A 41	NSD																
	35	A 40	NSD																
	36	A 30	NSD																
	37	A 20	NSD																
	38	A 10	NSD																
	39	C 10	NSD																
	40	D 20	NSD																
	40						0	0	0	0	0	0	0						

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-07
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 2294300 | *Analysis Date:* Jul 26, 2002
Description: H & S On Site - Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 34	NSD**																
	2	B 24	NSD																
	3	B 14	NSD																
	4	B 42	NSD																
	5	B 32	NSD																
	6	B 22	NSD																
	7	B 12	NSD																
	8	B 2	NSD																
	9	C 2	NSD																
	10	C 12	NSD																
	11	C 22	NSD																
	12	C 21	NSD																
	13	C 11	NSD																
	14	C 1	NSD																
	15	B 1	NSD																
	16	B 11	NSD																
	17	B 21	NSD																
	18	B 31	NSD																
	19	B 30	NSD																
	20	B 20	NSD																
	21	B 10	NSD																
	22	C 10	NSD																
	23	C 20	NSD																
	24	C 30	NSD																
	25	C 40	NSD																
	26	D 40	NSD																
	27	D 30	NSD																
	28	D 20	NSD																
	29	D 10	NSD																
B	30	A 40	NSD																
	31	A 30	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891
Report Date: Aug 8, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020891-07
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace
Analyst: DW
Sample No.: 2294300
Analysis Date: Jul 26, 2002
Description: H & S On Site - Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 20	NSD																
	33	A 10	NSD																
	34	C 22	NSD																
	35	C 12	NSD																
	36	C 2	NSD																
	37	B 2	NSD																
	38	B 30	NSD																
	39	B 20	NSD																
	40	B 10	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace
Sample No.: 2294301
Description: H & S On Site - Pump #4

Lab/Cor Sample No.: 020891-08
Analyst: DW
Analysis Date: Jul 26, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	A 32	NSD**																
	2	A 22	NSD																
	3	A 12	NSD																
	4	D 41	NSD																
	5	A 1	NSD																
	6	A 11	NSD																
	7	A 21	NSD																
	8	A 31	NSD																
	9	A 41	NSD																
	10	A 40	NSD																
	11	A 30	NSD																
	12	A 20	NSD																
	13	A 10	NSD																
	14	B 10	NSD																
	15	B 20	NSD																
	16	B 30	NSD																
	17	B 40	NSD																
	18	B 41	NSD																
	19	B 31	NSD																
	20	B 21	NSD																
	21	C 1	NSD																
	22	C 11	NSD																
	23	C 31	NSD																
	24	C 41	NSD																
	25	C 42	NSD																
	26	C 32	NSD																
	27	C 2	NSD																
B	28	A 31	NSD																
	29	A 21	NSD																
	30	A 11	NSD																
	31	A 1	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-08

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 2294301 | *Analysis Date:* Jul 26, 2002

Description: H & S On Site - Pump #4

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 1	NSD																
	33	D 11	NSD																
	34	D 21	NSD																
	35	D 31	NSD																
	36	D 41	NSD																
	37	D 31	NSD																
	38	D 21	NSD																
	39	D 11	NSD																
	40	B 41	1	Fiber	25	1							✓			Al, Si, P			
	40						0	0	0	0	0	0	1						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-09

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 2294302 | *Analysis Date:* Jul 26, 2002

Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 11	NSD**																
	2	B 10	NSD																
	3	B 20	NSD																
	4	A 20	NSD																
	5	A 10	NSD																
	6	A 1	NSD																
	7	A 11	NSD																
	8	A 21	NSD																
	9	A 31	NSD																
	10	A 41	NSD																
	11	A 42	NSD																
	12	A 32	NSD																
	13	A 22	NSD																
	14	A 12	NSD																
	15	A 2	NSD																
	16	D 13	NSD																
	17	D 3	NSD																
	18	A 3	NSD																
	19	A 13	NSD																
	20	A 23	NSD																
	21	A 33	NSD																
	22	D 24	NSD																
	23	D 14	NSD																
	24	C 23	NSD																
	25	C 13	NSD																
	26	C 3	NSD																
	27	B 3	NSD																
B	28	B 23	NSD																
	29	B 13	NSD																
	30	B 3	NSD																
	31	C 2	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891
Report Date: Aug 8, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020891-09
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace
Analyst: DW
Sample No.: 2294302
Analysis Date: Jul 26, 2002
Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 2	NSD																
	33	B 12	NSD																
	34	B 22	NSD																
	35	B 32	NSD																
	36	B 1	NSD																
	37	C 1	NSD																
	38	D 40	NSD																
	39	D 30	NSD																
	40	D 20	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace
Sample No.: 2294303
Description: WAB Pump #2

Lab/Cor Sample No.: 020891-10
Analyst: DW
Analysis Date: Jul 26, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	D 34	NSD**																
	2	D 24	NSD																
	3	D 14	NSD																
	4	D 4	NSD																
	5	A 34	NSD																
	6	A 44	NSD																
	7	A 33	NSD																
	8	A 13	NSD																
	9	A 3	NSD																
	10	D 3	NSD																
	11	D 13	NSD																
	12	D 23	NSD																
	13	D 33	NSD																
	14	D 43	NSD																
	15	D 22	NSD																
	16	D 12	NSD																
	17	D 2	NSD																
	18	A 2	NSD																
	19	A 12	NSD																
	20	A 11	NSD																
	21	A 1	NSD																
	22	D 1	NSD																
	23	D 11	NSD																
	24	D 21	NSD																
	25	D 20	NSD																
	26	D 10	NSD																
	27	A 10	NSD																
B	28	D 10	NSD																
	29	D 20	NSD																
	30	D 30	NSD																
	31	D 31	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891
Report Date: Aug 8, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 020891-10
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace
Analyst: DW
Sample No.: 2294303
Analysis Date: Jul 26, 2002
Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 21	NSD																
	33	D 11	1	Fiber	14	1							✓			Al, Si, P			
	34	D 1	NSD																
	35	D 10	NSD																
	36	D 20	NSD																
	37	D 30	NSD																
	38	D 43	NSD																
	39	D 33	NSD																
	40	A 3	NSD																
	40						0	0	0	0	0	0	1						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-11
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 2294305 | *Analysis Date:* Jul 27, 2002
Description: Soil #11 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 24	NSD**																
	2	B 14	NSD																
	3	B 4	1	Fiber	9	0.3							✓	2410	12253	Na.Mg, Al, Si, K, Ca, Fe	WINCHITE, [1 0 1] ZONE AXIS	JH	8/8/02
	4	C 4	1	Fiber	20.5	0.65			✓					2411	12254	Na, Mg, Si, K, Ca, Fe	WINCHITE, [1 0 1] ZONE AXIS	JH	8/8/02
	5	C 14	NSD																
	6	C 24	NSD																
	7	C 34	1	Fiber	15	0.65							✓			P, S, K			
	8	C 44	1	Fiber	10	1							✓		12255	Na.Mg, Al, Si, K, Ca, Fe			
	9	C 43	NSD																
	10	C 33	NSD																
	11	C 23	NSD																
	12	C 13	NSD																
	13	C 3	NSD																
	14	B 3	NSD																
	15	B 13	NSD																
	16	B 23	NSD																
	17	B 33	NSD																
	18	B 32	1	Fiber	14	0.4			✓						12256	Na, Mg, Si, K, Ca, Fe			
	19	B 22	NSD																
	20	B 12	NSD																
	21	B 2	NSD																
	22	C 2	NSD																
	23	C 12	1	Fiber	21	0.35							✓		12257	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	24	C 22	1	Fiber	18	1.2							✓			Si			
			2	Fiber	11	0.75			✓					2412	12258	Na, Mg, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	8/8/02
	25	C 32	1	Fiber	10	0.65			✓						12259	Na, Mg, Si, K, Ca, Fe			
	26	C 42	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-11

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 2294305 | *Analysis Date:* Jul 27, 2002

Description: Soil #11 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
B	27	D 41	NSD																
	28	D 31	1	Fiber	20	0.65							✓		12260	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	29	D 11	1	Fiber	5	0.85							✓			Ti			
	30	D 21	NSD																
	31	D 1	NSD																
	32	A 1	1	Fiber	18	0.4			✓						12261	Na, Mg, Si, K, Ca, Fe			
	33	A 11	NSD																
	34	A 21	1	Fiber	10	0.3							✓		12262	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	35	A 31	NSD																
	36	A 41	NSD																
	37	A 42	NSD																
	38	A 32	NSD																
	39	A 22	1	Fiber	14	0.25							✓		12263	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	40	A 12	NSD																
	40						**0**	**0**	**5**	**0**	**0**	**0**	**9**						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-12
Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW
Sample No.: 2294306 | *Analysis Date:* Jul 26, 2002
Description: Soil #11 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 34	NSD**																
	2	B 24	1	Fiber	7.5	0.5							✓		12244	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	3	B 14	NSD																
	4	B 4	NSD																
	5	C 4	NSD																
	6	C 14	NSD																
	7	C 24	1	Fiber	5	0.65							✓			Si			
			2	Fiber	22.5	0.65			✓						12245	Mg, Si, K, Ca, Fe			
	8	C 43	1	Fiber	15.5	0.65							✓		12246	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	9	C 33	NSD																
	10	C 23	NSD																
	11	C 13	NSD																
	12	C 3	NSD																
	13	B 3	NSD																
	14	B 13	NSD																
	15	B 23	NSD																
	16	B 33	1	Fiber	5.5	0.35			✓					2413	12247	Na, Mg, Si, K, Ca, Fe	[3 1 0] ZONE AXIS	JH	8/8/02
	17	B 42	1	Fiber	7.5	0.5			✓						12248	Mg, Al, Si, Ca, Fe			
	18	B 32	NSD																
	19	B 22	1	Fiber	9	0.65							✓			P, S, K			
			2	Fiber	9	0.25							✓	2414	12249	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE, [1 0 1] ZONE AXIS	JH	8/8/02
	20	B 12	NSD																
	21	B 2	NSD																
	22	C 2	1	Fiber	9	0.5			✓						12250	Na, Mg, Si, K, Ca, Fe			
	23	C 12	NSD																
	24	C 22	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 020891 | *Report Date:* Aug 8, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 020891-12

Project Name: Asbestos/Vermiculite NorthWest W.R.Grace | *Analyst:* DW

Sample No.: 2294306 | *Analysis Date:* Jul 26, 2002

Description: Soil #11 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	25	C 32	1	Fiber	15	1.5					✓			2415	12251	Na, Mg, Si, K, Ca, Fe	[5 1 8] ZONE AXIS	JH	8/8/02
	26	C 42	NSD																
	27	C 41	NSD																
B	28	D 1	NSD																
	29	D 11	NSD																
	30	D 21	NSD																
	31	D 31	NSD																
	32	D 41	NSD																
	33	D 40	NSD																
	34	D 30	NSD																
	35	D 20	NSD																
	36	D 10	NSD																
	37	A 10	NSD																
	38	A 20	NSD																
	39	A 30	1	Fiber	7	0.35					✓				12252	Na, Mg, Si, K, Ca, Fe			
	40	A 40	1	Fiber	5	0.65							✓			Al, Si, Ti			
	40						0	0	4	0	2	0	6						

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

September 9, 2002

Ecology and Environment, Inc.
2101 Fourth Avenue
Suite 1900
Seattle, WA 98121

Attn: Jeff Fowlow

Project Name: Asbestos/Vermiculite W.R.Grace
Project Number: TDD#01070014/124969-510
P. O. Number: 124969-S10

Lab/Cor Batch Number: 021029

Conditions Enclosed please find results for samples submitted to our laboratory on August 16, 2002. A list of samples received follows, with limitation or rejection criteria noted where applicable.

Lab/Cor Sample No.	Client Sample No.	Limitation/Rejection Criteria
021029-01	2314600	No special conditions were noted
021029-02	2314601	No special conditions were noted
021029-03	2314602	No special conditions were noted
021029-04	2314604	No special conditions were noted
021029-05	2314605	No special conditions were noted
021029-06	2324650	No special conditions were noted
021029-07	2324651	No special conditions were noted
021029-08	2324652	No special conditions were noted
021029-09	2324654	No special conditions were noted
021029-10	2324655	No special conditions were noted
021029-11	2324656	No special conditions were noted
021029-12	2324657	No special conditions were noted
021029-13	2324658	No special conditions were noted
021029-14	2324660	No special conditions were noted
021029-15	2324661	No special conditions were noted
021029-16	JED 1	No special conditions were noted

Method Preparation and analysis of the above samples was conducted in accordance with the Niosh method 7402 for the identification of asbestos. The samples were collapsed with dimethylformamide (DMF) / acetic acid, carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in (DMF) / acetone until cleared of filter debris.

TEM analysis was performed using a Philips 410 transmission electron microscope equipped with an EDAX PV9800 X-ray analyzer. The air samples were scanned at a magnification of approximately 990X using an accelerating voltage of 100 KV. The magnification was increased to about 10,000X for structure sizing.

Counting Rules

Minimum Aspect Ratio	Minimum Length	Minimum Width	Minimum Required Analytical Sensitivity	Stopping Rules
3:1	5 µm	0.25 µm	NA	100 Fibers

Disclaimer This test report relates only to the items tested in this report. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please do not hesitate to call me. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with analytical services.

Sincerely,

John Harris
Laboratory Director

7619 6th Avenue NW, Seattle, WA 98117 **(206) 781-0155** **(206) 789-8424 (FAX)**

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029

Report Date: September 9, 2002

Client Information	
Project Name:	Asbestos/Vermiculite W.R.Grace
Project No.:	TDD#01070014/124969-510
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information			
Login:	Aug 16, 2002	*By:*	JJ
Prep:	Aug 19, 2002	*By:*	MW
Verified:	Aug 19, 2002	*By:*	MW
Reviewed:	Aug 30, 2002	*By:*	JH
Final Review:	Sep 9, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE
Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm^2)	Area Analyzed (mm^2)	Analyst	Analysis Date
021029-01	02314600	H & S Pump #3	ASBESTOS	<0.024	0 - 0.090	0	0	0.024	39.2	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	0.049	0.006 - 0.176	2								
Test			Winchite	<0.024	0 - 0.090	0								
			Richterite	<0.024	0 - 0.090	0								
			TOTAL	0.049	0.006 - 0.176	2								
021029-02	02314601	WAB Pump #1	ASBESTOS	<0.010	0 - 0.038	0	0	0.010	92.6	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	0.010	0.000 - 0.058	1								
Test			Winchite	<0.010	0 - 0.038	0								
			Richterite	<0.010	0 - 0.038	0								
			TOTAL	0.010	0.000 - 0.058	1								
021029-03	02314602	WAB Pump #2	ASBESTOS	<0.010	0 - 0.039	0	0	0.010	91.3	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	0.010	0.000 - 0.058	1								
Test			Winchite	<0.010	0 - 0.039	0								
			Richterite	<0.010	0 - 0.039	0								
			TOTAL	0.010	0.000 - 0.058	1								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029

Report Date: September 9, 2002

Client Information	
Project Name:	Asbestos/Vermiculite W.R.Grace
Project No.:	TDD#01070014/124969-510
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information			
Login:	Aug 16, 2002	*By:*	JJ
Prep:	Aug 19, 2002	*By:*	MW
Verified:	Aug 19, 2002	*By:*	MW
Reviewed:	Aug 30, 2002	*By:*	JH
Final Review:	Sep 9, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

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Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
021029-04	02314604	Soil #12 Pump #1	ASBESTOS	0.712	0.448 - 0.976	28	35	0.025	37.6	40	385	0.4026	DW	8/26/02
			NON-ASBESTOS	0.534	0.306 - 0.762	21								
Test			Winchite	0.788	0.511 - 1.066	31								
			Richterite	0.025	0.001 - 0.142	1								
			TOTAL	2.060	1.611 - 2.509	81								
021029-05	02314605	Soil #12 Pump #2	ASBESTOS	0.933	0.609 - 1.256	32	32	0.029	37.5	35	385	0.3523	DW	8/27/02
			NON-ASBESTOS	1.982	1.511 - 2.453	25								
Test			Winchite	1.253	0.879 - 1.628	43								
			Richterite	<0.029	0 - 0.108	0								
			TOTAL	2.914	2.343 - 3.485	100								
021029-06	02324650	H & S Pump #3	ASBESTOS	<0.024	0 - 0.089	0	0	0.024	39.6	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	0.072	0.015 - 0.212	3								
Test			Winchite	<0.024	0 - 0.089	0								
			Richterite	<0.024	0 - 0.089	0								
			TOTAL	0.072	0.015 - 0.212	3								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

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Client Information	
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Project No.:	TDD#01070014/124969-510
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information		
Login:	Aug 16, 2002	*By:* JJ
Prep:	Aug 19, 2002	*By:* MW
Verified:	Aug 19, 2002	*By:* MW
Reviewed:	Aug 30, 2002	*By:* JH
Final Review:	Sep 9, 2002	*By:* JH

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Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

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Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
021029-07	02324651	WAB Pump #1	ASBESTOS	<0.010	0 - 0.038	0	0	0.010	92.6	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	0.010	0.000 - 0.058	1								
Test			Winchite	<0.010	0 - 0.038	0								
			Richterite	<0.010	0 - 0.038	0								
			TOTAL	0.010	0.000 - 0.058	1								
021029-08	02324652	WAB Pump #2	ASBESTOS	<0.010	0 - 0.039	0	NA	0.010	91.1	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	<0.010	0 - 0.039	0								
Test			Winchite	<0.010	0 - 0.039	0								
			Richterite	<0.010	0 - 0.039	0								
			TOTAL	<0.010	0 - 0.039	0								
021029-09	02324654	Soil #8 Pump #1	ASBESTOS	0.051	0.006 - 0.183	2	17	0.025	37.7	40	385	0.4026	DW	8/26/02
			NON-ASBESTOS	0.254	0.122 - 0.466	10								
Test			Winchite	<0.025	0 - 0.094	0								
			Richterite	<0.025	0 - 0.094	0								
			TOTAL	0.305	0.157 - 0.532	12								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

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Project No.:	TDD#01070014/124969-510
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information		
Login:	Aug 16, 2002	*By:* JJ
Prep:	Aug 19, 2002	*By:* MW
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Final Review:	Sep 9, 2002	*By:* JH

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Reference No.:	7402
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Min. Length:	5 µm
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Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
021029-10	02324655	Soil #8 Pump #2	ASBESTOS	<0.026	0 - 0.096	0	8	0.026	36.6	40	385	0.4026	DW	8/27/02
			NON-ASBESTOS	0.340	0.181 - 0.581	13								
Test			Winchite	<0.026	0 - 0.096	0								
			Richterite	<0.026	0 - 0.096	0								
			TOTAL	0.340	0.181 - 0.581	13								
021029-11	02324656	H &S Pump #3	ASBESTOS	<0.023	0 - 0.086	0	NA	0.023	40.8	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	<0.023	0 - 0.086	0								
Test			Winchite	<0.023	0 - 0.086	0								
			Richterite	<0.023	0 - 0.086	0								
			TOTAL	<0.023	0 - 0.086	0								
021029-12	02324657	WAB Pump #1	ASBESTOS	<0.011	0 - 0.039	0	NA	0.011	89.6	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	<0.011	0 - 0.039	0								
Test			Winchite	<0.011	0 - 0.039	0								
			Richterite	<0.011	0 - 0.039	0								
			TOTAL	<0.011	0 - 0.039	0								

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P. O. No.:	124969-S10
Sample Type:	Air

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Login:	Aug 16, 2002	*By:*	JJ
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Analysis Type:	NIOSH
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Min. Length:	5 µm
Min. Width:	0.25 µm

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Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm^2)	Area Analyzed (mm^2)	Analyst	Analysis Date
021029-13	02324658	WAB Pump #2	ASBESTOS	<0.011	0 - 0.040	0	0	0.011	87.6	40	385	0.4026	DW	8/26/02
			NON-ASBESTOS	0.011	0.000 - 0.061	1								
Test			Winchite	<0.011	0 - 0.040	0								
			Richterite	<0.011	0 - 0.040	0								
			TOTAL	0.011	0.000 - 0.061	1								
021029-14	02324660	Soil #6 Pump#1	ASBESTOS	0.051	0.006 - 0.184	2	25	0.025	37.5	40	385	0.4026	DW	8/27/02
			NON-ASBESTOS	0.051	0.006 - 0.184	2								
Test			Winchite	0.102	0.028 - 0.261	4								
			Richterite	<0.025	0 - 0.094	0								
			TOTAL	0.204	0.088 - 0.402	8								
021029-15	02324661	Soil #6 Pump#2	ASBESTOS	0.079	0.016 - 0.232	3	43	0.026	36.1	40	385	0.4026	DW	8/27/02
			NON-ASBESTOS	0.026	0.001 - 0.148	1								
Test			Winchite	0.079	0.016 - 0.232	3								
			Richterite	<0.026	0 - 0.098	0								
			TOTAL	0.184	0.074 - 0.382	7								

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Client Information	
Project Name:	Asbestos/Vermiculite W.R.Grace
Project No.:	TDD#01070014/124969-510
P. O. No.:	124969-S10
Sample Type:	Air

Tracking Information			
Login:	Aug 16, 2002	*By:*	JJ
Prep:	Aug 19, 2002	*By:*	MW
Verified:	Aug 19, 2002	*By:*	MW
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Analysis Type:	NIOSH
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Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (Fibs/cc)	95% Confidence Interval (Fibs/cc)	Fiber Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (Fibs/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm^2)	Area Analyzed (mm^2)	Analyst	Analysis Date
021029-16	JED 1	5/22/02 Pump #3	ASBESTOS	0.008	0.000 - 0.044	1	33	0.008	121.5	40	385	0.4026	DW	8/23/02
			NON-ASBESTOS	0.024	0.005 - 0.069	3								
Test			Winchite	0.016	0.002 - 0.057	2								
			Richterite	<0.008	0 - 0.029	0								
			TOTAL	0.048	0.017 - 0.103	6								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

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Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-01
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314600 | *Analysis Date:* Aug 23, 2002
Description: H & S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	6	0.25							✓			P, S, K			
	2	B 34	NSD**																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 43	NSD																
	11	C 33	NSD																
	12	C 23	NSD																
	13	C 13	1	Fiber	5	0.65							✓			P, S, K			
	14	C 3	NSD																
	15	B 3	NSD																
	16	B 13	NSD																
	17	B 23	NSD																
	18	B 33	NSD																
	19	B 12	NSD																
	20	B 2	NSD																
	21	C 2	NSD																
	22	C 12	NSD																
	23	C 22	NSD																
	24	C 32	NSD																
	25	C 42	NSD																
	26	C 41	NSD																
	27	C 31	NSD																
B	28	B 41	NSD																
	29	B 31	NSD																
	30	B 21	NSD																
	31	B 11	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-01
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314600 | *Analysis Date:* Aug 23, 2002
Description: H & S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 1	NSD																
	33	C 1	NSD																
	34	C 11	NSD																
	35	C 21	NSD																
	36	C 31	NSD																
	37	C 41	NSD																
	38	C 42	NSD																
	39	C 32	NSD																
	40	C 22	NSD																
	40						0	0	0	0	0	0	2						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite W.R.Grace
Sample No.: 02314601
Description: WAB Pump #1

Lab/Cor Sample No.: 021029-02
Analyst: DW
Analysis Date: Aug 23, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	1	Fiber	15	0.25							✓			P, S, K			
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
B-	27	B 42	NSD																
	28	B 32	NSD																
	29	B 22	NSD																
	30	B 12	NSD																
	31	B 2	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

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Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314601 | *Analysis Date:* Aug 23, 2002
Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 2	NSD																
	33	C 12	NSD																
	34	C 22	NSD																
	35	C 32	NSD																
	36	C 42	NSD																
	37	C 41	NSD																
	38	C 31	NSD																
	39	C 21	NSD																
	40	C 11	NSD																
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-03
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314602 | *Analysis Date:* Aug 23, 2002
Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
B	27	B 44	NSD																
	28	B 34	NSD																
	29	B 24	NSD																
	30	B 14	NSD																
	31	B 4	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-03
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314602 | *Analysis Date:* Aug 23, 2002
Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 4	NSD																
	33	C 14	NSD																
	34	C 13	NSD																
	35	C 3	NSD																
	36	B 3	1	Fiber	25	0.65							✓			P, S, K			
	37	B 13	NSD																
	38	B 23	NSD																
	39	B 33	NSD																
	40	B 43	NSD																
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite W.R.Grace
Sample No.: 02314604
Description: Soil #12 Pump #1

Lab/Cor Sample No.: 021029-04
Analyst: DW
Analysis Date: Aug 26, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	15	0.5			✓						12340	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	20	2.5							✓		12341	Mg, Al, Si, Kca, Fe			
	2	B 34	1	Fiber	22	1							✓		12342	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	9	0.3			✓						12343	Na, Mg, Si, K, Ca, Fe			
	3	B 24	1	Fiber	18	1.2							✓		12344	Al, Si, K, Ca, Fe			
			2	Fiber	11	0.75							✓		12345	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	4	B 4	NSD**																
	5	C 4	NSD																
	6	C 14	NSD																
	7	C 24	1	Fiber	20	0.6							✓		12346	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	25	1.2							✓		12347	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	25.5	0.35							✓		12348	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	7.5	0.35			✓					2491	12349	Na, Mg, Si, K, Ca, Fe	[-5-1 2] ZONE AXIS	JH	9/6/02
			5	Fiber	13	0.75			✓						12350	Mg, Si, K, Ca, Fe			
	8	C 34	NSD																
	9	C 44	1	Fiber	18	1							✓		12351	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	30	1.2							✓		12352	Na, Mg, Si, K, Ca, Fe			
	10	C 43	1	Fiber	21	0.3							✓		12353	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	14	0.35							✓		12354	Na, Mg, Si, K, Ca, Fe			
	11	C 33	1	Fiber	11	0.5			✓						12355	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	15	2							✓		12356	Na, Mg, Si, K, Ca, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-04
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314604 | *Analysis Date:* Aug 26, 2002
Description: Soil #12 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			3	Fiber	6	0.35							✓		12357	Na, Mg, Si, K, Ca, Fe	WINCHITE	JH	9/9/02
	12	C 23	NSD																
	13	C 13	1	Fiber	20	0.7							✓	2499	12358	Na, Mg, Si, K, Ca, Fe	WINCHITE, [1 0-1] ZONE AXIS	JH	9/9/02
			2	Fiber	10	0.6			✓						12359	Na, Mg, Si, K, Ca, Fe			
	14	C 3	1	Fiber	27	1.2					✓			2493	12360	Mg, Si, Ca, Fe	[5 1 0] ZONE AXIS	JH	9/6/02
			2	Fiber	19	0.85							✓		12361	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	8	0.3							✓		12362	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	6	1.2							✓		12363	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	15	B 3	1	Fiber	10	1.2			✓						12364	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	15	0.3							✓		12365	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	16	B 13	NSD																
	17	B 23	1	Fiber	14	1.2							✓		12366	Na, Mg, Si, K, Ca, Fe			
	18	B 33	1	Fiber	11	0.6					✓				12367	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	9	2.5							✓		12368	Al, Si, K, Ca			
			3	Fiber	9	0.5							✓		12369	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	19	B 43	1	Fiber	6	0.5			✓						12370	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	5.5	0.3							✓		12371	Al, Si, K, Fe			
			3	Fiber	7	0.8							✓		12372	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	20	B 42	1	Fiber	70	0.8							✓		12373	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	20	2			✓						12374	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	18	0.4							✓		12375	Na, Mg, Si, K, Ca, Fe	WINCHITE		

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-04
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314604 | *Analysis Date:* Aug 26, 2002
Description: Soil #12 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			4	Fiber	10	0.3							✓		12376	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	21	B 32	1	Fiber	80	0.7			✓						12377	Na, Mg, Si, K, Ca, Fe			
	22	B 22	1	Fiber	10	0.6							✓		12378	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	23	B 12	1	Fiber	16	0.75			✓						12379	Na, Mg, Si, K, Ca, Fe			
	24	B 2	NSD																
	25	C 2	1	Fiber	10	0.25							✓			Na, Mg, Si, K, Ca, Fe			
			2	Fiber	6	0.25			✓						12380	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	8.5	0.4			✓						12381	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	10	0.6			✓						12382	Na, Mg, Si, K, Ca, Fe			
	26	C 12	1	Fiber	14	0.8							✓		12383	Mg, Al, Si, K, Ca, Fe			
			2	Fiber	11	0.35							✓		12384	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	27	C 2	1	Fiber	24	0.5							✓		12385	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	30	0.6							✓		12386	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	5.5	0.3			✓						12387	Na, Mg, Si, K, Ca, Fe			
B	28	B 44	1	Fiber	24	1.2							✓		12388	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	29	B 34	1	Fiber	18	0.5							✓			Na, Mg, Si, K, Ca, Fe			
			2	Fiber	7.5	0.5							✓		12389	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	12	0.85							✓		12390	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	5.5	0.4			✓						12391	Na, Mg, Si, K, Ca, Fe			
	30	B 24	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-04
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314604 | *Analysis Date:* Aug 26, 2002
Description: Soil #12 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	B 14	1	Fiber	21	0.5							✓		12392	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	32	B 4	1	Fiber	10	1			✓						12393	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	8	0.3			✓						12394	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	6	1			✓						12395	Na, Mg, Si, K, Ca, Fe			
	33	C 4	1	Fiber	20	0.3							✓		12396	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10.5	0.4			✓						12397	Na, Mg, Si, K, Ca, Fe			
			3	Fiber	22	0.75							✓		12398	Na, Mg, Si, K, Ca, Fe			
	34	C 14	1	Fiber	12	0.75							✓			Na, Mg, Si, K, Ca, Fe			
			2	Fiber	18	0.65			✓						12399	Na, Mg, Si, K, Ca, Fe			
	35	C 24	1	Fiber	10	0.7							✓		12400	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	17.5	1							✓		12401	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	36	C 34	1	Fiber	7.5	0.4			✓						12402	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	10	0.25					✓				12403	Na, Mg, Si, K, Ca, Fe			
	37	C 44	1	Fiber	27	0.6							✓		12404	Na, Mg, Si, K, Ca, Fe			
			2	Fiber	5	0.75							✓		12405	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	25	0.3			✓						12406	Na, Mg, Si, K, Ca, Fe			
			4	Fiber	10.5	1							✓		12407	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	38	C 33	1	Fiber	13	0.4							✓		12408	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	11	0.4							✓	2494	12409	Na, Mg, Si, K, Ca, Fe	RICHTERITE, [3 0 1] ZONE AXIS	JH	9/6/02
			3	Fiber	8	0.4							✓		12410	Na, Mg, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-04

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02314604 | *Analysis Date:* Aug 26, 2002

Description: Soil #12 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			4	Fiber	8	0.65							✓		12411	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	39	C 23	1	Fiber	9	0.4							✓		12412	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	0.4			✓						12413	Na, Mg; Si, K, Ca, Fe			
			3	Fiber	15	0.8			✓						12414	Na, Mg, Si, K, Ca, Fe			
	40	C 13	1	Fiber	5.5	0.6							✓		12415	A, Si, K, Fe			
			2	Fiber	11	0.85							✓		12416	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	8	0.7							✓		12417	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	40						0	0	25	0	3	0	53						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-05
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314605 | *Analysis Date:* Aug 27, 2002
Description: Soil #12 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	5.5	0.3							✓		12438	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	6	2							✓			Al, Si, K, Fe			
			3	Fiber	10.5	0.4							✓		12439	Na, Mg, Al, Si, K, Ca, Fe			
			4	Fiber	5	0.25							✓		12440	Na, Mg, Al, Si, K, Ca, Fe			
	2	B 34	1	Fiber	19	0.5					✓				12441	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	8	0.75			✓						12442	Na, Mg, Al, Si, K, Ca, Fe			
			3	Fiber	8	0.65							✓		12443	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	11	0.35							✓		12444	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	3	C 24	1	Fiber	20	0.65			✓						12445	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	9	1.5							✓		12446	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	15	0.65					✓				12447	Na, Mg, Al, Si, K, Ca, Fe			
			4	Fiber	12	0.75			✓						12448	Na, Mg, Al, Si, K, Ca, Fe			
	4	C 14	1	Fiber	10	0.5							✓		12449	Na, Mg, Al, Si, K, Ca, Fe			
	5	C 24	1	Fiber	9	1.2							✓		12450	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	10	0.65							✓		12451	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	9	0.35							✓		12452	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	8	2							✓			Na, Al, Si, K			
			5	Fiber	5	0.65							✓			Mg, Al, Si, K, Ti, Fe			
			6	Fiber	11	0.5							✓		12453	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			7	Fiber	38	0.4							✓		12454	Na, Mg, Al, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-05
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314605 | *Analysis Date:* Aug 27, 2002
Description: Soil #12 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			8	Fiber	5	0.25			✓						12455	Na, Mg, Al, Si, K, Ca, Fe			
			9	Fiber	6	0.65							✓		12456	Na, Mg, Al, Si, K, Ca, Fe			
	6	C 34	1	Fiber	20	0.25							✓		12457	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	8	0.75							✓		12458	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	13	0.75							✓		12459	Na, Mg, Al, Si, K, Ca, Fe			
			4	Fiber	5.5	0.3			✓						12460	Na, Mg, Al, Si, K, Ca, Fe			
	7	C 44	1	Fiber	9	0.5			✓						12461	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	9	0.35					✓				12462	Na, Mg, Al, Si, K, Ca, Fe			
			3	Fiber	15	2.5							✓			Mg, Al, Si, K, Fe			
			4	Fiber	5	0.65			✓						12463	Na, Mg, Al, Si, K, Ca, Fe			
			5	Fiber	7	0.4			✓						12464	Na, Mg, Al, Si, K, Ca, Fe			
			6	Fiber	8	0.25			✓						12465	Na, Mg, Al, Si, K, Ca, Fe			
	8	C 43	1	Fiber	9	0.5							✓		12466	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	0.85							✓		12467	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	0.5							✓		12468	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	20	0.6					✓				12469	Na, Mg, Al, Si, K, Ca, Fe			
	9	C 33	1	Fiber	30	1							✓		12470	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	7	0.65							✓		12471	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	9	1					✓				12472	Na, Mg, Al, Si, K, Ca, Fe			
			4	Fiber	17	0.5			✓						12473	Na, Mg, Al, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-05
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314605 | *Analysis Date:* Aug 27, 2002
Description: Soil #12 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			5	Fiber	21	0.75							✓		12474	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	10	C 23	1	Fiber	15	0.85							✓		12475	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	8	0.4							✓		12476	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	13	0.4							✓		12477	Na, Mg, Al, Si, K, Ca, Fe			
			4	Fiber	7.5	0.4							✓		12478	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	11	C 13	1	Fiber	20	0.5			✓						12479	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	30	0.65							✓		12480	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	28	0.65							✓		12481	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	10	0.65							✓		12482	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	12	B 13	1	Fiber	8	0.65							✓			Mg, Al, Si, K, Ti, Fe			
			2	Fiber	19	0.75							✓		12483	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	0.6							✓		12484	Na, Mg, Al, Si, K, Ca, Fe			
	13	B 23	1	Fiber	25	0.55					✓				12485	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	22	0.5							✓		12486	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	14	0.65							✓		12487	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	14	B 33	NSD**																
	15	B 43	1	Fiber	18	0.4							✓		12488	Na, Mg, Al, Si, K, Ca, Fe			
	16	B 12	1	Fiber	11	0.5							✓		12489	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	10	1			✓						12490	Na, Mg, Al, Si, K, Ca, Fe			
			3	Fiber	9	0.5			✓						12491	Na, Mg, Al, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-05

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02314605 | *Analysis Date:* Aug 27, 2002

Description: Soil #12 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			4	Fiber	18	0.65							✓		12492	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			5	Fiber	17	0.65							✓		12493	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	17	B 2	1	Fiber	10	0.3							✓		12494	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	15	1.2							✓		12495	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	22	0.4							✓	2495	12496	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE, [3 0 1] ZONE AXIS	JH	9/6/02
			4	Fiber	6	0.65			✓						12497	Na, Mg, Al, Si, K, Ca, Fe			
			5	Fiber	5.5	0.25							✓		12498	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	18	C 22	1	Fiber	15	0.25			✓					2496	12499	Na, Mg, Al, Si, K, Ca, Fe	[2 0 3] ZONE AXIS	JH	9/6/02
			2	Fiber	28	0.75			✓						12501	Na, Mg, Al, Si, K, Ca, Fe			
			3	Fiber	18	0.65							✓		12500	Na, Mg, Al, Si, K, Ca, Fe			
			4	Fiber	20	0.5							✓		12502	Na, Mg, Al, Si, K, Ca, Fe			
			5	Fiber	12	0.35			✓					2497	12503	Na, Mg, Al, Si, K, Ca, Fe	[2 1 2] ZONE AXIS	JH	9/6/02
B	19	B 34	1	Fiber	6	0.5					✓			2500	12504	Na, Mg, Al, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	9/6/02
	20	B 24	1	Fiber	28	0.65					✓				12505	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	12	0.25							✓		12506	Na, Mg, Al, Si, K, Ca, Fe			
	21	C 4	1	Fiber	15	0.5			✓						12507	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	23	0.85							✓		12508	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	0.4					✓				12509	Na, Mg, Al, Si, K, Ca, Fe			
	22	C 14	1	Fiber	8	0.5							✓		12510	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	23	C 24	1	Fiber	10	1.2			✓						12511	Na, Mg, Al, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-05

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02314605 | *Analysis Date:* Aug 27, 2002

Description: Soil #12 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	10	0.25							✓		12512	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	24	C 34	1	Fiber	12	1							✓		12513	Na, Mg, Al, Si, K, Ca, Fe			
	25	C 44	1	Fiber	10	0.55							✓		12514	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	11	0.25							✓		12515	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			3	Fiber	10	0.5							✓		12516	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	26	C 43	1	Fiber	11	2							✓			Mg, Al, Si, K, Fe			
			2	Fiber	11	0.3							✓		12517	Na, Mg, Al, Si, K, Ca, Fe			
			3	Fiber	5	1							✓		12518	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			4	Fiber	5.5	0.45							✓		12519	Na, Mg, Al, Si, K, Ca, Fe			
	27	C 33	1	Fiber	9	0.75							✓		12520	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	28	C 23	1	Fiber	15	1							✓		12521	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	7.5	0.4							✓			Al, Si, K, Ti, Fe			
			3	Fiber	8	0.5			✓						12522	Na, Mg, Al, Si, K, Ca, Fe			
	29	C 13	1	Fiber	10	1			✓						12523	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	8	0.4							✓		12524	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	30	C 3	1	Fiber	7.5	0.4							✓		12525	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	31	B 3	NSD																
	32	B 13	1	Fiber	9	0.5			✓						12526	Na, Mg, Al, Si, K, Ca, Fe			
			2	Fiber	11	0.25							✓		12527	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	33	B 23	NSD																
	34	B 33	1	Fiber	15	0.5			✓						12528	Na, Mg, Al, Si, K, Ca, Fe			

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-05
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02314605 | *Analysis Date:* Aug 27, 2002
Description: Soil #12 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	10	0.75							✓		12529	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	35	B 43	1	Fiber	7.5	0.3							✓		12530	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	35						0	0	23	0	9	0	68						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-06
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02324650 | *Analysis Date:* Aug 23, 2002
Description: H & S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	1	Fiber	60	0.35							✓			P, S, K			
	9	C 34	NSD																
	10	C 43	NSD																
	11	C 33	NSD																
	12	C 23	NSD																
	13	C 13	NSD																
	14	C 3	NSD																
	15	B 3	NSD																
	16	B 13	NSD																
	17	B 23	1	Fiber	30	0.75							✓			P, S, K			
	18	B 33	NSD																
	19	B 43	NSD																
	20	B 42	NSD																
	21	B 32	NSD																
	22	B 22	1	Fiber	25	0.25							✓			P, S, K			
	23	B 12	NSD																
	24	B 2	NSD																
	25	C 2	NSD																
	26	C 12	NSD																
B	27	B 31	NSD																
	28	B 21	NSD																
	29	B 11	NSD																
	30	B 1	NSD																
	31	C 1	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-06
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02324650 | *Analysis Date:* Aug 23, 2002
Description: H & S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 11	NSD																
	33	D 10	NSD																
	34	D 20	NSD																
	35	D 30	NSD																
	36	D 40	NSD																
	37	D 41	NSD																
	38	D 31	NSD																
	39	D 21	NSD																
	40	D 11	NSD																
	40						0	0	0	0	0	0	3						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-07

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02324651 | *Analysis Date:* Aug 23, 2002

Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
B	27	B 41	NSD																
	28	B 31	NSD																
	29	B 21	NSD																
	30	B 11	NSD																
	31	B 1	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-07

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02324651 | *Analysis Date:* Aug 23, 2002

Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 1	NSD																
	33	C 11	NSD																
	34	C 21	NSD																
	35	C 31	NSD																
	36	C 41	NSD																
	37	C 42	NSD																
	38	C 32	NSD																
	39	C 22	NSD																
	40	C 12	1	Fiber	34	6							✓			Mg, Al, Si			
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-08
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02324652 | *Analysis Date:* Aug 23, 2002
Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 4	NSD																
	4	C 14	NSD																
	5	C 24	NSD																
	6	C 34	NSD																
	7	C 44	NSD																
	8	C 43	NSD																
	9	C 33	NSD																
	10	C 23	NSD																
	11	C 13	NSD																
	12	C 3	NSD																
	13	B 3	NSD																
	14	B 13	NSD																
	15	B 23	NSD																
	16	B 33	NSD																
	17	B 43	NSD																
	18	B 42	NSD																
	19	B 32	NSD																
	20	B 22	NSD																
	21	B 12	NSD																
	22	B 2	NSD																
	23	C 2	NSD																
	24	C 12	NSD																
	25	C 22	NSD																
	26	C 32	NSD																
B	27	B 41	NSD																
	28	B 31	NSD																
	29	B 21	NSD																
	30	B 11	NSD																
	31	B 1	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-08
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02324652 | *Analysis Date:* Aug 23, 2002
Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 1	NSD																
	33	C 11	NSD																
	34	C 21	NSD																
	35	C 31	NSD																
	36	C 41	NSD																
	37	C 42	NSD																
	38	C 32	NSD																
	39	C 22	NSD																
	40	C 12	NSD																
	40						0	0	0	0	0	0	0						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-09

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02324654 | *Analysis Date:* Aug 26, 2002

Description: Soil #8 Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	1	Fiber	8	0.75							✓			Mg, Al, Si, K, Fe			
	3	B 24	1	Fiber	8	0.8							✓			Mg, Al, Si, K, Fe			
	4	B 14	1	Fiber	9	1.2							✓			Mg, Al, Si, Ca, Fe			
	5	B 4	NSD																
	6	C 4	1	Fiber	5	0.8							✓			Al, Si, K, Ti			
			2	Fiber	5	0.75			✓					2472	12418	Mg, Al, Si, Ca, Fe	[2.1 2] ZONE AXIS	JH	9/5/02
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	1	Fiber	10	2.5							✓		12419	Mg, Si, Ca, Fe			
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	1	Fiber	9	2.5							✓			Al, Si, Ca			
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	1	Fiber	13	1.8							✓			Mg, Al, Si, K, Ca, Fe			
			2	Fiber	5.5	1.5							✓			Ti			
	22	B 32	NSD																
	23	B 22	1	Fiber	9	2							✓			Na, Al, Si, K, Ca, Fe			
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite W.R.Grace
Sample No.: 02324654
Description: Soil #8 Pump #1

Lab/Cor Sample No.: 021029-09
Analyst: DW
Analysis Date: Aug 26, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	27	C 12	NSD																
B	28	B 44	NSD																
	29	B 34	NSD																
	30	B 24	NSD																
	31	B 14	NSD																
	32	B 4	NSD																
	33	C 4	NSD																
	34	C 14	1	Fiber	6	1.2			✓						12420	Mg, Al, Si, Ca, Fe			
	35	C 24	NSD																
	36	C 34	NSD																
	37	C 44	NSD																
	38	C 43	NSD																
	39	C 33	NSD																
	40	C 23	1	Fiber	9	1							✓			Na, Al, Si, K, Ca, Fe			
	40						0	0	2	0	0	0	10						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-10

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02324655 | *Analysis Date:* Aug 27, 2002

Description: Soil #8 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	1	Fiber	7.5	0.1							✓			P, S, K			
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	1	Fiber	14	4							✓			Mg, Al, Si, Fe			
	8	C 24	1	Fiber	5.5	1							✓			Al, Si, Fe			
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	1	Fiber	9	0.4							✓			Si, Fe			
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	1	Fiber	16	1.5							✓			Fe			
	19	B 33	1	Fiber	6	0.65							✓			Al, Si, K			
	20	B 43	NSD																
	21	B 42	1	Fiber	15	0.75							✓			Al, Si, K, Fe			
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	1	Fiber	9.5	0.65							✓			None	PROBABLE-ORGANIC		
	27	C 12	NSD																
B	28	B 44	NSD																
	29	B 34	1	Fiber	10	1.5							✓			Al, Si			
	30	B 24	1	Fiber	13	1.2							✓	2473	12421	Mg, Al, Si, Ca, Fe	FERRI-ACTINOLITE (FERRO), [3 1 2] ZONE AXIS	JH	9/5/02

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-10

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02324655 | *Analysis Date:* Aug 27, 2002

Description: Soil #8 Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	B 14	NSD																
	32	B 4	NSD																
	33	C 4	1	Fiber	6	0.75							✓			Mg, Al, Si, Fe			
	34	C 14	1	Fiber	10	1.8							✓		12422	Mg, Al, Si, Ca, Fe			
	35	C 24	NSD																
	36	C 34	1	Fiber	6	1.5							✓			Na, Sl, Si, Ca			
	37	C 44	NSD																
	38	C 43	NSD																
	39	C 33	NSD																
	40	C 23	NSD																
	40						0	0	0	0	0	0	13						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-11
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02324656 | *Analysis Date:* Aug 23, 2002
Description: H &S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 33	NSD																
	9	C 23	NSD																
	10	C 13	NSD																
	11	C 3	NSD																
	12	B 13	NSD																
	13	B 23	NSD																
	14	B 33	NSD																
	15	B 43	NSD																
	16	B 42	NSD																
	17	B 32	NSD																
	18	B 2	NSD																
	19	C 2	NSD																
	20	C 12	NSD																
	21	C 22	NSD																
	22	C 32	NSD																
	23	C 42	NSD																
	24	C 41	NSD																
	25	C 31	NSD																
	26	C 21	NSD																
B	27	B 10	NSD																
	28	B 20	NSD																
	29	B 30	NSD																
	30	B 40	NSD																
	31	B 41	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-11
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02324656 | *Analysis Date:* Aug 23, 2002
Description: H &S Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 31	NSD																
	33	B 21	NSD																
	34	B 11	NSD																
	35	B 12	NSD																
	36	B 22	NSD																
	37	B 32	NSD																
	38	B 42	NSD																
	39	B 43	NSD																
	40	B 33	NSD																
	40						0	0	0	0	0	0	0						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-12

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02324657 | *Analysis Date:* Aug 23, 2002

Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 34	NSD**																
	2	B 24	NSD																
	3	B 14	NSD																
	4	B 4	NSD																
	5	C 4	NSD																
	6	C 14	NSD																
	7	C 24	NSD																
	8	C 34	NSD																
	9	C 44	NSD																
	10	C 43	NSD																
	11	C 33	NSD																
	12	C 23	NSD																
	13	C 13	NSD																
	14	C 3	NSD																
	15	B 3	NSD																
	16	B 13	NSD																
	17	B 23	NSD																
	18	B 33	NSD																
	19	B 42	NSD																
	20	B 32	NSD																
	21	B 22	NSD																
	22	B 12	NSD																
	23	B 2	NSD																
	24	C 2	NSD																
	25	C 12	NSD																
	26	C 22	NSD																
B	27	C 41	NSD																
	28	C 31	NSD																
	29	C 21	NSD																
	30	C 11	NSD																
	31	C 1	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029
Report Date: Sep 9, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 021029-12
Project Name: Asbestos/Vermiculite W.R.Grace
Analyst: DW
Sample No.: 02324657
Analysis Date: Aug 23, 2002
Description: WAB Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 1	NSD																
	33	B 11	NSD																
	34	B 21	NSD																
	35	B 31	NSD																
	36	B 41	NSD																
	37	B 42	NSD																
	38	B 32	NSD																
	39	B 22	NSD																
	40	B 12	NSD																
	40						0	0	0	0	0	0	0						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-13
Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW
Sample No.: 02324658 | *Analysis Date:* Aug 26, 2002
Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 34	NSD																
	9	C 44	1	Fiber	10	0.4							✓			P, S, K			
	10	C 43	NSD																
	11	C 33	NSD																
	12	C 23	NSD																
	13	C 13	NSD																
	14	C 3	NSD																
	15	B 3	NSD																
	16	B 13	NSD																
	17	B 23	NSD																
	18	B 33	NSD																
	19	B 43	NSD																
	20	B 32	NSD																
	21	B 22	NSD																
	22	B 12	NSD																
	23	B 2	NSD																
	24	C 2	NSD																
	25	C 12	NSD																
	26	C 22	NSD																
	27	C 32	NSD																
B	28	B 44	NSD																
	29	B 34	NSD																
	30	B 24	NSD																
	31	B 14	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-13

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02324658 | *Analysis Date:* Aug 26, 2002

Description: WAB Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 4	NSD																
	33	C 34	NSD																
	34	C 44	NSD																
	35	C 43	NSD																
	36	C 23	NSD																
	37	C 13	NSD																
	38	C 3	NSD																
	39	B 3	NSD																
	40	B 13	NSD																
	40						0	0	0	0	0	0	1						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-14

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: 02324660 | *Analysis Date:* Aug 27, 2002

Description: Soil #6 Pump#1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	D 44	NSD**																
	2	D 43	NSD																
	3	D 42	NSD																
	4	D 41	1	Fiber	12	0.75							✓		12423	Na, Mg, Si, Ca, K, Fe	WINCHITE		
	5	D 40	NSD																
	6	C 40	NSD																
	7	C 41	1	Fiber	9	0.25							✓	2474	12424	Na, Mg, Si, Ca, K, Fe	WINCHITE, [3 1 4] ZONE AXIS	JH	9/5/02
	8	C 42	NSD																
	9	C 43	NSD																
	10	C 44	NSD																
	11	C 34	NSD																
	12	C 33	NSD																
	13	C 32	NSD																
	14	C 31	NSD																
	15	C 30	NSD																
	16	D 30	NSD																
	17	D 31	NSD																
	18	D 32	NSD																
	19	D 33	NSD																
	20	D 34	NSD																
	21	D 24	1	Fiber	37	0.4			✓					2475	12425	Na, Mg, Si, Ca, K, Fe	[2 0 1] ZONE AXIS	JH	9/5/02
	22	D 23	1	Fiber	10	0.35							✓		12426	Na, Mg, Si, Ca, K, Fe	WINCHITE		
	23	D 22	NSD																
	24	D 21	1	Fiber	30	4							✓			Na, Al, Si, K, Ca, Fe			
	25	D 20	NSD																
	26	C 20	NSD																
	27	C 21	NSD																
B	28	C 42	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029
Report Date: Sep 9, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite W.R.Grace
Sample No.: 02324660
Description: Soil #6 Pump#1

Lab/Cor Sample No.: 021029-14
Analyst: DW
Analysis Date: Aug 27, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	29	C 32	NSD																
	30	C 22	NSD																
	31	B 2	NSD																
	32	B 12	NSD																
	33	B 22	NSD																
	34	B 32	NSD																
	35	B 42	NSD																
	36	B 41	1	Fiber	16	0.5							✓		12427	Na, Mg, Si, Ca, K, Fe	WINCHITE		
			2	Fiber	29	0.8			✓						12428	Na, Mg, Si, Ca, K, Fe			
	37	B 31	NSD																
	38	B 21	NSD																
	39	B 11	1	Fiber	8	0.3							✓		12429	Na, Mg, Si, Ca, K, Fe			
	40	B 1	NSD																
	40						0	0	2	0	0	0	6						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029
Report Date: Sep 9, 2002

Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 021029-15
Project Name: Asbestos/Vermiculite W.R.Grace
Analyst: DW
Sample No.: 02324661
Analysis Date: Aug 27, 2002
Description: Soil #6 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	1	Fiber	6	0.4			✓					2476	12430	Na, Mg, Al, Si, K, Ca, Fe	[2 0 1] ZONE AXIS	JH	9/5/02
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	1	Fiber	90	0.5							✓		12431	Na, Mg, Al, Si, K, Ca, Fe			
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	1	Fiber	9	0.5							✓	2477	12432	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE, [1 0 0] ZONE AXIS	JH	9/6/02
	17	B 13	1	Fiber	62	0.4			✓					2478	12433	Na, Mg, Al, Si, K, Ca, Fe	[5 3 0] ZONE AXIS	JH	9/6/02
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	1	Fiber	16	0.4							✓		12434	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	1	Fiber	11	0.5			✓						12435	Na, Mg, Al, Si, K, Ca, Fe			
	26	C 2	NSD																
	27	C 12	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029
Report Date: Sep 9, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 021029-15
Project Name: Asbestos/Vermiculite W.R.Grace
Analyst: DW
Sample No.: 02324661
Analysis Date: Aug 27, 2002
Description: Soil #6 Pump#2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
B	28	D 1	1	Fiber	6	0.35							✓		12436	Na, Mg, Al, Si, K, Ca, Fe	WINCHITE		
	29	D 11	NSD																
	30	D 21	NSD																
	31	D 31	NSD																
	32	D 41	NSD																
	33	D 40	NSD																
	34	D 30	NSD																
	35	D 20	NSD																
	36	D 10	NSD																
	37	C 10	NSD																
	38	C 20	NSD																
	39	C 30	NSD																
	40	C 40	NSD																
	40						0	0	3	0	0	0	4						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029
Report Date: Sep 9, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite W.R.Grace
Sample No.: JED 1
Description: 5/22/02 Pump #3

Lab/Cor Sample No.: 021029-16
Analyst: DW
Analysis Date: Aug 23, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 24	NSD**																
	2	B 14	NSD																
	3	B 4	NSD																
	4	C 4	NSD																
	5	C 14	NSD																
	6	C 24	NSD																
	7	C 34	NSD																
	8	C 44	NSD																
	9	C 43	NSD																
	10	C 33	1	Fiber	20	2			✓						12335	Mg, Si, K, Ca, Fe			
	11	C 23	1	Fiber	26	2							✓	2479	12336	Na.Mg, Si, K, Ca, Fe	WINCHITE, [3 0 1] ZONE AXIS	JH	9/6/02
			1	Fiber	30	2							✓		12337	Si, Ca, Fe			
	12	C 13	NSD																
	13	C 3	NSD																
	14	B 3	NSD																
	15	B 13	NSD																
	16	B 23	NSD																
	17	B 33	NSD																
	18	B 43	NSD																
	19	B 42	NSD																
	20	B 32	NSD																
	21	B 22	NSD																
	22	B 12	NSD																
	23	B 2	NSD																
	24	C 2	NSD																
	25	C 12	1	Fiber	15	1							✓		12338	Na.Mg, Si, K, Ca, Fe	WINCHITE		
	26	C 22	NSD																
B	27	B 10	NSD																
	28	B 20	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021029 | *Report Date:* Sep 9, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021029-16

Project Name: Asbestos/Vermiculite W.R.Grace | *Analyst:* DW

Sample No.: JED 1 | *Analysis Date:* Aug 23, 2002

Description: 5/22/02 Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	29	B 40	NSD																
	30	B 41	NSD																
	31	B 31	NSD																
	32	B 21	1	Fiber	15	1							✓	2480	12339	Na.Mg, Si, K, Ca, Fe	UNKNOWN	JH	9/6/02
	33	B 11	NSD																
	34	B 1	NSD																
	35	B 2	NSD																
	36	B 12	NSD																
	37	B 32	1	Fiber	15	4							✓			Mg, Al, Si, K, Ti, Fe			
	38	B 22	NSD																
	39	B 42	NSD																
	40	B 43	NSD																
	40						0	0	1	0	0	0	5						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Appendix 6

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

December 3, 2002

Ecology and Environment, Inc.
2101 Fourth Avenue
Suite 1900
Seattle, WA 98121

Attn: Jeff Fowlow

Project Name: Asbestos/Vermiculite WR Grace
Project Number: TDD #10170014 Case No. 124969-S10
P. O. Number: Not Available

Lab/Cor Batch Number: 021318

Conditions Enclosed please find results for samples submitted to our laboratory on October 25, 2002. A list of samples received follows, with limitation or rejection criteria noted where applicable.

Lab/Cor Sample No.	Client Sample No.	Limitation/Rejection Criteria
021318-01	2434352	No special conditions were noted
021318-02	2434354	No special conditions were noted
021318-03	2434355	No special conditions were noted
021318-04	2434356	No special conditions were noted
021318-05	2434362	No special conditions were noted
021318-06	2434364	No special conditions were noted
021318-07	2434365	No special conditions were noted
021318-08	2434369	No special conditions were noted
021318-09	2434370	No special conditions were noted
021318-10	2434373	No special conditions were noted
021318-11	2434374	No special conditions were noted
021318-12	2434375	No special conditions were noted
021318-13	2434377	No special conditions were noted
021318-14	2434378	No special conditions were noted
021318-15	2434350	No special conditions were noted

Method Preparation and analysis of the above samples was conducted in accordance with the NIOSH method 7402 for the identification of asbestos. The samples were collapsed with acetone, carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in acetone until cleared of filter debris.

TEM analysis was performed using a Philips 410 transmission electron microscope equipped with an EDAX PV9800 X-ray analyzer. The air samples were scanned at a magnification of approximately 990X using an accelerating voltage of 100 KV. The magnification was increased to about 10,000X for structure sizing.

Counting Rules

Minimum Aspect Ratio	Minimum Length	Minimum Width	Minimum Required Analytical Sensitivity	Stopping Rules
3:1	5 µm	0.25 µm	NA	100 Fibers

Disclaimer This test report relates only to the items tested in this report. Interpretation of these results is the sole responsibility of the client.

7619 6th Avenue NW, Seattle, WA 98117 **(206) 781-0155** **(206) 789-8424 (FAX)**

If further clarification of these results is needed, please do not hesitate to call me. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with analytical services.

Sincerely,

John Harris
Laboratory Director

7619 6th Avenue NW, Seattle, WA 98117 **(206) 781-0155** **(206) 789-8424 (FAX)**

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318

Report Date: December 3, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD #10170014 Case No. 124969-S10
P. O. No.:	Not Available
Sample Type:	Air

Tracking Information			
Login:	Oct 25, 2002	*By:*	DJ
Prep:	Oct 28, 2002	*By:*	PA
Verified:	Oct 28, 2002	*By:*	PA
Reviewed:	Nov 4, 2002	*By:*	DW
Final Review:	Dec 3, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm^2)	Area Analyzed (mm^2)	Analyst	Analysis Date
021318-01	02434352	Personal Background (Januch)	ASBESTOS	<0.006	0 - 0.021	0	0	0.006	168.8	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.017	0.004 - 0.050	3								
Test			OTHER FIBERS											
			Winchite	<0.006	0 - 0.021	0								
			Richterite	<0.006	0 - 0.021	0								
			TOTAL	0.017	0.004 - 0.050	3								
021318-02	02434354	Location C - Dave, Pump #6	ASBESTOS	<0.006	0 - 0.023	0	0	0.006	151.0	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.063	0.030 - 0.116	10								
Test			OTHER FIBERS											
			Winchite	<0.006	0 - 0.023	0								
			Richterite	<0.006	0 - 0.023	0								
			TOTAL	0.063	0.030 - 0.116	10								
021318-03	02434355	Location C - Dave, Pump #3	ASBESTOS	<0.006	0 - 0.022	0	0	0.006	163.6	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.023	0.006 - 0.060	4								
Test			OTHER FIBERS											
			Winchite	<0.006	0 - 0.022	0								
			Richterite	<0.006	0 - 0.022	0								
			TOTAL	0.023	0.006 - 0.060	4								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 021318

Report Date: December 3, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD #10170014 Case No. 124969-S10
P. O. No.:	Not Available
Sample Type:	Air

Tracking Information		
Login:	Oct 25, 2002	*By:* DJ
Prep:	Oct 28, 2002	*By:* PA
Verified:	Oct 28, 2002	*By:* PA
Reviewed:	Nov 4, 2002	*By:* DW
Final Review:	Dec 3, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm^2)	Area Analyzed (mm^2)	Analyst	Analysis Date
021318-04	02434356	Location C - Marion, Pump #4	ASBESTOS	<0.007	0 - 0.027	0	0	0.007	129.0	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.030	0.008 - 0.076	4								
Test			OTHER FIBERS											
			Winchite	<0.007	0 - 0.027	0								
			Richterite	<0.007	0 - 0.027	0								
			TOTAL	0.030	0.008 - 0.076	4								
021318-05	02434362	Location C - Marion, Pump #1	ASBESTOS	<0.006	0 - 0.021	0	0	0.006	165.0	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.041	0.016 - 0.084	7								
Test			OTHER FIBERS											
			Winchite	<0.006	0 - 0.021	0								
			Richterite	<0.006	0 - 0.021	0								
			TOTAL	0.041	0.016 - 0.084	7								
021318-06	02434364	Location C - Deborah, Pump #3	ASBESTOS	<0.001	0 - 0.004	0	0	0.001	939.0	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.003	0.001 - 0.009	3								
Test			OTHER FIBERS											
			Winchite	<0.001	0 - 0.004	0								
			Richterite	<0.001	0 - 0.004	0								
			TOTAL	0.003	0.001 - 0.009	3								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 021318 *Report Date:* December 3, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD #10170014 Case No. 124969-S10
P. O. No.:	Not Available
Sample Type:	Air

Tracking Information		
Login:	Oct 25, 2002	*By:* DJ
Prep:	Oct 28, 2002	*By:* PA
Verified:	Oct 28, 2002	*By:* PA
Reviewed:	Nov 4, 2002	*By:* DW
Final Review:	Dec 3, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm^2)	Area Analyzed (mm^2)	Analyst	Analysis Date
021318-07	02434365	Location C - Dierdre, Pump #4	ASBESTOS	<0.007	0 - 0.026	0	0	0.007	136.6	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.049	0.020 - 0.101	7								
Test			OTHER FIBERS											
			Winchite	<0.007	0 - 0.026	0								
			Richterite	<0.007	0 - 0.026	0								
			TOTAL	0.049	0.020 - 0.101	7								
021318-08	02434369	Location A/B - Marion, Pump #1	ASBESTOS	<0.006	0 - 0.022	0	0	0.006	159.7	40	385	0.4026	DW	11/1/02
			NON-ASBESTOS	0.030	0.010 - 0.070	5								
Test			OTHER FIBERS											
			Winchite	<0.006	0 - 0.022	0								
			Richterite	<0.006	0 - 0.022	0								
			TOTAL	0.030	0.010 - 0.070	5								
021318-09	02434370	Location A/B - David, Pump #2	ASBESTOS	0.010	0.000 - 0.054	1	33	0.010	98.5	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.010	0.000 - 0.054	1								
Test			OTHER FIBERS											
			Winchite	0.010	0.000 - 0.054	1								
			Richterite	<0.010	0 - 0.051	0								
			TOTAL	0.029	0.006 - 0.085	3								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 021318

Report Date: December 3, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD #10170014 Case No. 124969-S10
P. O. No.:	Not Available
Sample Type:	Air

Tracking Information			
Login:	Oct 25, 2002	*By:*	DJ
Prep:	Oct 28, 2002	*By:*	PA
Verified:	Oct 28, 2002	*By:*	PA
Reviewed:	Nov 4, 2002	*By:*	DW
Final Review:	Dec 3, 2002	*By:*	JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE
Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
021318-10	02434373	Location A/B - Marion, Pump #5	ASBESTOS	<0.008	0 - 0.030	0	0	0.008	116.2	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.033	0.009 - 0.084	4								
Test			OTHER FIBERS											
			Winchite	<0.008	0 - 0.030	0								
			Richterite	<0.008	0 - 0.030	0								
			TOTAL	0.033	0.009 - 0.084	4								
021318-11	02434374	Location A/B - Marion, Pump #1	ASBESTOS	<0.006	0 - 0.022	0	0	0.006	159.5	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.024	0.007 - 0.061	4								
Test			OTHER FIBERS											
			Winchite	<0.006	0 - 0.022	0								
			Richterite	<0.006	0 - 0.022	0								
			TOTAL	0.024	0.007 - 0.061	4								
021318-12	02434375	Location A/B - David, Pump #2	ASBESTOS	0.011	0.001 - 0.039	2	18	0.005	175.8	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.027	0.009 - 0.063	5								
Test			OTHER FIBERS											
			Winchite	0.022	0.006 - 0.056	4								
			Richterite	<0.005	0 - 0.021	0								
			TOTAL	0.065	0.030 - 0.107	11								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Report Number: 021318

Report Date: December 3, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD #10170014 Case No. 124969-S10
P. O. No.:	Not Available
Sample Type:	Air

Tracking Information		
Login:	Oct 25, 2002	*By:* DJ
Prep:	Oct 28, 2002	*By:* PA
Verified:	Oct 28, 2002	*By:* PA
Reviewed:	Nov 4, 2002	*By:* DW
Final Review:	Dec 3, 2002	*By:* JH

Analysis Information	
Analysis Type:	NIOSH
Reference No.:	7402
Min. Aspect Ratio:	3:1
Min. Length:	5 µm
Min. Width:	0.25 µm

FINAL TABLE

Transmission Electron Microscopy – NIOSH – Air Sample Analysis

Lab/Cor Sample No.	Client Sample No.	Description	Fiber Type	Concen-tration (struc/cc)	95% Confidence Interval (struc/cc)	Struc. Count	Opt. Vis. Asb. Fibs. (%)	Analytical Sens. (struc/cc)	Volume (liters)	Number of Grid Openings	Filter Area (mm²)	Area Analyzed (mm²)	Analyst	Analysis Date
021318-13	02434377	Location A/B - Jed, Pump #4	ASBESTOS	<0.014	0 - 0.051	0	0	0.014	68.9	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	0.042	0.009 - 0.122	3								
Test			OTHER FIBERS											
			Winchite	0.014	0.000 - 0.077	1								
			Richterite	<0.014	0 - 0.051	0								
			TOTAL	0.056	0.015 - 0.142	4								
021318-14	02434378	QA/QC Field Blank	ASBESTOS	NA	NA	0	0	NA	0.0	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	NA	NA	3								
Blank			OTHER FIBERS											
			Winchite	NA	NA	0								
			Richterite	NA	NA	0								
			TOTAL	NA	NA	3								
021318-15	02434350	QA/QC Field Blank	ASBESTOS	NA	NA	0	0	NA	0.0	40	385	0.4026	DW	11/4/02
			NON-ASBESTOS	NA	NA	5								
Blank			OTHER FIBERS											
			Winchite	NA	NA	0								
			Richterite	NA	NA	0								
			TOTAL	NA	NA	5								

% Optically Visible Asbestos Fibers = (#Asbestos / #Total Fibers). This number indicates the representative fraction of asbestos to total fibers as defined by NIOSH 7400 standards and can be used as a factor to determine asbestos concentrations from PCM counts in similar sampling areas.

NA – Not Applicable. For samples in which no fiber types are found, percentage values do not apply.

NOTE: These counting rules are intended to coincide with NIOSH 7400 counting rules and do not measure smaller asbestos fiber populations below 5.0 µm lengths as would other TEM airborne analysis methods (AHERA, EPA - Yamate).

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-01
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434352 | *Analysis Date:* Nov 4, 2002
Description: Personal Background (Januch)

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 24	NSD**																
	2	B 14	1	Fiber	60	3.5							✓			Al, Si, K, Ca, Fe			
	3	B 4	NSD																
	4	C 4	NSD																
	5	C 14	NSD																
	6	C 24	NSD																
	7	C 34	NSD																
	8	C 44	NSD																
	9	C 43	NSD																
	10	C 33	NSD																
	11	C 23	NSD																
	12	C 13	NSD																
	13	C 3	NSD																
	14	B 3	NSD																
	15	B 13	NSD																
	16	B 23	NSD																
	17	B 22	NSD																
	18	B 12	NSD																
	19	B 2	NSD																
	20	C 2	NSD																
	21	C 12	NSD																
	22	C 22	NSD																
	23	C 32	NSD																
	24	C 42	NSD																
	25	C 41	NSD																
	26	C 31	NSD																
	27	C 21	NSD																
B	28	D 44	NSD																
	29	D 34	NSD																
	30	D 24	NSD																
	31	D 14	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318
Report Date: Dec 3, 2002

Client: Ecology and Environment, Inc.
Project Name: Asbestos/Vermiculite WR Grace
Sample No.: 02434352
Description: Personal Background (Januch)

Lab/Cor Sample No.: 021318-01
Analyst: DW
Analysis Date: Nov 4, 2002

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	D 13	NSD																
	33	D 23	NSD																
	34	D 43	NSD																
	35	D 42	1	Fiber	80	4							✓			Si, P			
	36	D 32	NSD																
	37	D 22	1	Fiber	10	0.3							✓			None	PROBABLE-ORGANIC		
	38	D 41	NSD																
	39	D 40	NSD																
	40	D 30	NSD																
	40						0	0	0	0	0	0	3						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-02
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434354 | *Analysis Date:* Nov 4, 2002
Description: Location C - Dave, Pump #6

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	1	Fiber	5.5	0.5							✓			P, S, K			
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	1	Fiber	9	0.25							✓			P, S, K			
	14	C 13	1	Fiber	6	0.5							✓			P, S, K			
	15	C 3	NSD																
	16	B 3	1	Fiber	5.5	0.3							✓			P, S, K			
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33																	
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	1	Fiber	6	0.5							✓			P, S, K			
	26	C 2	NSD																
	27	C 12	NSD																
B	28	A 42	NSD																
	29	A 32	NSD																
	30	A 22	NSD																
	31	A 12	1	Fiber	9	0.5							✓			Ca			

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318
Report Date: Dec 3, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 021318-02
Project Name: Asbestos/Vermiculite WR Grace
Analyst: DW
Sample No.: 02434354
Analysis Date: Nov 4, 2002
Description: Location C - Dave, Pump #6

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
			2	Fiber	6	1							✓			Ca			
	32	A 2	NSD																
	33	D 2	1	Fiber	11	0.75							✓			P, S, K			
	34	D 12	NSD																
	35	D 22	NSD																
	36	D 32	NSD																
	37	D 42	NSD																
	38	D 41	1	Fiber	7.5	0.65							✓			P, S, K			
			2	Fiber	11	0.55							✓			P, S, K			
	39	D 31	NSD																
	40	D 21	NSD																
	40						0	0	0	0	0	0	10						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-03

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434355 | *Analysis Date:* Nov 4, 2002

Description: Location C - Dave, Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	1	Fiber	8	0.5							✓			None	PROBABLE-ORGANIC		
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	1	Fiber	16	1							✓			None	PROBABLE-ORGANIC		
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
	27	C 12	NSD																
B	28	B 44	NSD																
	29	B 34	NSD																
	30	B 24	NSD																
	31	B 14	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318
Report Date: Dec 3, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 021318-03
Project Name: Asbestos/Vermiculite WR Grace
Analyst: DW
Sample No.: 02434355
Analysis Date: Nov 4, 2002
Description: Location C - Dave, Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	B 4	NSD																
	33	C 4	NSD																
	34	C 14	NSD																
	35	C 24	NSD																
	36	C 34	1	Fiber	45	2							✓			P, S, K			
	37	C 44	NSD																
	38	C 43	NSD																
	39	C 33	1	Fiber	8	0.5							✓			None	PROBABLE-ORGANIC		
	40	C 23	NSD																
	40						0	0	0	0	0	0	4						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-04

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434356 | *Analysis Date:* Nov 4, 2002

Description: Location C - Marion, Pump #4

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	1	Fiber	10	0.35							✓			None	PROBABLE-ORGANIC		
	3	B 24	1	Fiber	8	0.75							✓			None	PROBABLE-ORGANIC		
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	1	Fiber	6	0.35							✓			None	PROBABLE-ORGANIC		
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
	27	C 12	NSD																
B	28	A 1	NSD																
	29	A 11	NSD																
	30	A 21	NSD																
	31	A 31	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-04
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434356 | *Analysis Date:* Nov 4, 2002
Description: Location C - Marion, Pump #4

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 41	NSD																
	33	A 42	NSD																
	34	A 32	NSD																
	35	A 22	NSD																
	36	A 12	NSD																
	37	A 2	1	Fiber	6	0.3							✓			Ca			
	38	D 2	NSD																
	39	D 12	NSD																
	40	D 22	NSD																
	40						0	0	0	0	0	0	4						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-05
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434362 | *Analysis Date:* Nov 4, 2002
Description: Location C - Marion, Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	1	Fiber	7	0.5							✓			None	PROBABLE-ORGANIC		
	5	B 4	1	Fiber	7.5	0.35							✓			None	PROBABLE-ORGANIC		
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	1	Fiber	25	0.75							✓			P, S, K			
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	1	Fiber	8	0.45							✓			None	PROBABLE-ORGANIC		
	26	C 2	NSD																
	27	C 12	NSD																
B	28	A 41	NSD																
	29	A 31	NSD																
	30	A 21	1	Fiber	6	0.5							✓			P, S, K			
	31	A 11	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-05

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434362 | *Analysis Date:* Nov 4, 2002

Description: Location C - Marion, Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 1	NSD																
	33	D 1	1	Fiber	5	1							✓			Na, Al, Si, K, Ca, Fe			
	34	D 11	NSD																
	35	D 21	NSD																
	36	D 31	NSD																
	37	D 41	NSD																
	38	D 40	1	Fiber	5.5	0.75							✓			Si			
	39	D 30	NSD																
	40	D 20	NSD																
	40						0	0	0	0	0	0	7						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-06

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434364 | *Analysis Date:* Nov 4, 2002

Description: Location C - Deborah, Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	1	Fiber	5.5	0.35							✓			None	PROBABLE-ORGANIC		
			2	Fiber	8	1.5							✓			Na, Mg, Si, Ca			
	12	C 33	NSD																
	13	C 3	NSD																
	14	B 3	NSD																
	15	B 13	NSD																
	16	B 23	NSD																
	17	B 33	NSD																
	18	B 43	NSD																
	19	B 42	NSD																
	20	B 32	NSD																
	21	B 22	1	Fiber	8	0.5							✓			None	PROBABLE-ORGANIC		
	22	B 12	NSD																
	23	B 2	NSD																
	24	C 2	NSD																
	25	C 32	NSD																
	26	C 42	NSD																
B	27	A 1	NSD																
	28	A 11	NSD																
	29	A 21	NSD																
	30	A 31	NSD																

NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318
Report Date: Dec 3, 2002

Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 021318-06
Project Name: Asbestos/Vermiculite WR Grace
Analyst: DW
Sample No.: 02434364
Analysis Date: Nov 4, 2002
Description: Location C - Deborah, Pump #3

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	A 41	NSD																
	32	A 42	NSD																
	33	A 32	NSD																
	34	A 22	NSD																
	35	A 12	NSD																
	36	A 2	NSD																
	37	D 32	NSD																
	38	D 42	NSD																
	39	D 41	NSD																
	40	D 31	NSD																
	40						0	0	0	0	0	0	3						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-07
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434365 | *Analysis Date:* Nov 4, 2002
Description: Location C - Dierdre, Pump #4

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	1	Fiber	25	4							✓			Al, Si, P			
	2	B 34	1	Fiber	12	0.5							✓			None	PROBABLE-ORGANIC		
			2	Fiber	5.5	0.65							✓			None	PROBABLE-ORGANIC		
	3	B 24	NSD**																
	4	B 14	NSD																
	5	B 4	1	Fiber	10	0.5							✓			P, S, K			
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	1	Fiber	5.5	0.35							✓			None	PROBABLE-ORGANIC		
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	1	Fiber	40	4							✓			Al, Si, P			
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 12	NSD																
	24	B 2	1	Fiber	15	0.65							✓			None	PROBABLE-ORGANIC		
	25	C 2	NSD																
	26	C 12	NSD																
	27	C 22	NSD																
B	28	B 44	NSD																
	29	B 34	NSD																
	30	B 24	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-07
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434365 | *Analysis Date:* Nov 4, 2002
Description: Location C - Dierdre, Pump #4

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	B 14	NSD																
	32	B 4	NSD																
	33	C 4	NSD																
	34	C 14	NSD																
	35	C 24	NSD																
	36	C 34	NSD																
	37	C 44	NSD																
	38	C 43	NSD																
	39	C 33	NSD																
	40	C 23	NSD																
	40						0	0	0	0	0	0	7						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-08
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434369 | *Analysis Date:* Nov 1, 2002
Description: Location A/B - Marion, Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	1	Fiber	5.5	0.4							✓			None	PROBABLE-ORGANIC		
	4	B 14	NSD																
	5	B 4	1	Fiber	11	2							✓			Mg, Al, Si, Ca, Fe			
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	1	Fiber	7.5	1							✓			Mg, Al, Si, Ca, Fe			
	14	C 13	1	Fiber	60	1							✓			None	PROBABLE-ORGANIC		
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	1	Fiber	12	2.5							✓			Mg, Si, Al			
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
	27	C 12	NSD																
B	28	A 41	NSD																
	29	A 31	NSD																
	30	A 21	NSD																

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318
Report Date: Dec 3, 2002
Client: Ecology and Environment, Inc.
Lab/Cor Sample No.: 021318-08
Project Name: Asbestos/Vermiculite WR Grace
Analyst: DW
Sample No.: 02434369
Analysis Date: Nov 1, 2002
Description: Location A/B - Marion, Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	A 11	NSD																
	32	A 1	NSD																
	33	D 1	NSD																
	34	D 11	NSD																
	35	D 21	NSD																
	36	D 31	NSD																
	37	D 41	NSD																
	38	D 42	NSD																
	39	D 32	NSD																
	40	D 22	NSD																
	40						0	0	0	0	0	0	5						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-09

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434370 | *Analysis Date:* Nov 4, 2002

Description: Location A/B - David, Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	1	Fiber	15	2.5			✓					2580	12673	Mg, Al, Si, Ca, Fe	[3 1 0] ZONE AXIS	JH	11/27/02
	11	C 33	NSD																
	12	C 23	NSD																
	13	C 13	NSD																
	14	C 3	NSD																
	15	B 3	NSD																
	16	B 13	NSD																
	17	B 23	NSD																
	18	B 33	NSD																
	19	B 43	NSD																
	20	B 42	NSD																
	21	B 32	1	Fiber	5	1							✓			Na, Mg, Al, Si, K, Ca, Fe			
	22	B 22	NSD																
	23	B 12	NSD																
	24	B 2	NSD																
	25	C 2	NSD																
	26	C 12	NSD																
	27	C 22	NSD																
B	28	A 41	NSD																
	29	A 31	1	Fiber	5	0.35							✓	2581	12674	Mg, Si, Ca, Fe	[3 1 0] ZONE AXIS, WINCHITE	JH	11/27/02

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-09
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434370 | *Analysis Date:* Nov 4, 2002
Description: Location A/B - David, Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	30	A 21	NSD																
	31	A 11	NSD																
	32	A 1	NSD																
	33	D 1	NSD																
	34	D 11	NSD																
	35	D 21	NSD																
	36	D 31	NSD																
	37	D 41	NSD																
	38	D 42	NSD																
	39	D 32	NSD																
	40	D 22	NSD																
	40						0	0	1	0	0	0	2						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-10

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434373 | *Analysis Date:* Nov 4, 2002

Description: Location A/B - Marion, Pump #5

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	1	Fiber	6	0.45							✓			None	PROBABLE-ORGANIC		
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	1	Fiber	5.5	1							✓			Mg, Al, Si, K, Ca, Fe			
	25	B 2	NSD																
	26	C 2	NSD																
	27	C 12	NSD																
	28	C 22	1	Fiber	5.5	0.75							✓			Na, Al, Si, K, Ca, Fe			
B	29	B 43	NSD																
	30	B 33	NSD																

**NSD – No Structures Detected

02131800.TEM

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-10

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434373 | *Analysis Date:* Nov 4, 2002

Description: Location A/B - Marion, Pump #5

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	B 23	NSD																
	32	B 13	NSD																
	33	B 3	NSD																
	34	C 3	NSD																
	35	C 13	NSD																
	36	C 23	NSD																
	37	C 33	NSD																
	38	C 43	NSD																
	39	C 42	1	Fiber	20	0.5							✓			None	PROBABLE-ORGANIC		
	40	C 32	NSD																
	40						0	0	0	0	0	0	4						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-11
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434374 | *Analysis Date:* Nov 4, 2002.
Description: Location A/B - Marion, Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	1	Fiber	5.5	0.35							✓			P, S, K			
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 33	1	Fiber	7.5	0.5							✓			None	PROBABLE-ORGANIC		
	12	C 43	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
	27	C 12	NSD																
B	28	A 41	NSD																
	29	A 31	NSD																
	30	A 21	NSD																
	31	A 11	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-11
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434374 | *Analysis Date:* Nov 4, 2002
Description: Location A/B - Marion, Pump #1

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 1	NSD																
	33	D 1	NSD																
	34	D 11	1	Fiber	7.5	0.45							✓			None	PROBABLE-ORGANIC		
	35	D 21	NSD																
	36	D 31	NSD																
	37	D 41	NSD																
	38	D 42	NSD																
	39	D 32	NSD																
	40	D 22	1	Fiber	8	1.5							✓			Mg, Si, Ca, Fe	HIGH FE		
	40						0	0	0	0	0	0	4						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-12
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434375 | *Analysis Date:* Nov 4, 2002
Description: Location A/B - David, Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 41	NSD**																
	2	B 31	1	Fiber	10	0.5			✓						12675	Mg, Si, Ca, Fe			
	3	B 21	NSD																
	4	B 11	NSD																
	5	B 1	NSD																
	6	C 1	1	Fiber	35	1							✓	2601	12676	Mg, Si, Ca, Fe	[3 0 1] ZONE AXIS, WINCHITE	JH	11/27/02
	7	C 11	NSD																
	8	C 21	NSD																
	9	C 31	NSD																
	10	C 41	1	Fiber	40	1							✓			None	PROBABLE-ORGANIC		
	11	C 42	NSD																
	12	C 32	NSD																
	13	C 22	1	Fiber	5	1.2							✓			Na, Mg, Si, K, Ca			
	14	C 12	NSD																
	15	C 2	1	Fiber	5	1							✓		12677	Na, Mg, Al, Si, K, Ca, Fe			
	16	B 2	NSD																
	17	B 12	1	Fiber	14	0.3			✓					2600	12678	Na, Mg, Si, K, Ca, Fe	[3 1 0] ZONE AXIS	JH	11/27/02
	18	B 22	NSD																
	19	B 32	NSD																
	20	B 42	1	Fiber	11	0.5							✓		12679	Na, Mg, Si, K, Ca, Fe	WINCHITE		
			2	Fiber	5.5	0.3							✓		12680	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	21	B 43	NSD																
	22	B 33	1	Fiber	6.5	0.5							✓			None	PROBABLE-ORGANIC		
	23	B 23	NSD																
	24	B 13	NSD																
	25	B 3	1	Fiber	15	0.4							✓		12681	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	26	C 3	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-12
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434375 | *Analysis Date:* Nov 4, 2002
Description: Location A/B - David, Pump #2

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	27	C 13	NSD																
	28	C 23	NSD																
	29	C 33	NSD																
	30	C 43	NSD																
B	31	B 44	NSD																
	32	B 34	NSD																
	33	B 24	NSD																
	34	B 14	NSD																
	35	B 4	NSD																
	36	C 4	NSD																
	37	C 14	1	Fiber	10	0.35							✓			None	PROBABLE-ORGANIC		
	38	C 24	NSD																
	39	C 34	NSD																
	40	C 44	NSD																
	40						0	0	2	0	0	0	9						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-13
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434377 | *Analysis Date:* Nov 4, 2002
Description: Location A/B - Jed, Pump #4

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	1	Fiber	5.5	0.5							✓			None	PROBABLE-ORGANIC		
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	1	Fiber	20	1							✓			None	PROBABLE-ORGANIC		
			2	Fiber	40	0.75							✓		12682	Na, Mg, Si, K, Ca, Fe	WINCHITE		
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	1	Fiber	5.5	0.65							✓			None	PROBABLE-ORGANIC		
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
	27	C 12	NSD																
B	28	A 41	NSD																
	29	A 31	NSD																
	30	A 21	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-13
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434377 | *Analysis Date:* Nov 4, 2002
Description: Location A/B - Jed, Pump #4

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	31	A 11	NSD																
	32	A 1	NSD																
	33	D 1	NSD																
	34	D 11	NSD																
	35	D 21	NSD																
	36	D 31	NSD																
	37	D 41	NSD																
	38	D 42	NSD																
	39	D 32	NSD																
	40	D 22	NSD																
	40						0	0	0	0	0	0	4						

*NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-14
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434378 | *Analysis Date:* Nov 4, 2002
Description: QA/QC Field Blank

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coordinates	Structure No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbestos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	1	Fiber	15	0.65							✓			None	PROBABLE-ORGANIC		
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	NSD																
	10	C 44	1	Fiber	12	0.55							✓			None	PROBABLE-ORGANIC		
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	NSD																
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	NSD																
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
	27	C 12	NSD																
B	28	B 14	1	Fiber	9	0.65							✓			None	PROBABLE-ORGANIC		
	29	B 4	NSD																
	30	C 4	NSD																
	31	C 14	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-14

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434378 | *Analysis Date:* Nov 4, 2002

Description: QA/QC Field Blank

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	C 24	NSD																
	33	C 34	NSD																
	34	C 44	NSD																
	35	C 43	NSD																
	36	C 33	NSD																
	37	C 23	NSD																
	38	C 13	NSD																
	39	C 3	NSD																
	40	B 3	NSD																
	40						0	0	0	0	0	0	3						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-15
Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW
Sample No.: 02434350 | *Analysis Date:* Nov 4, 2002
Description: QA/QC Field Blank

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
A	1	B 44	NSD**																
	2	B 34	NSD																
	3	B 24	NSD																
	4	B 14	NSD																
	5	B 4	NSD																
	6	C 4	NSD																
	7	C 14	NSD																
	8	C 24	NSD																
	9	C 34	1	Fiber	12	0.65							✓			None	PROBABLE-ORGANIC		
	10	C 44	NSD																
	11	C 43	NSD																
	12	C 33	NSD																
	13	C 23	1	Fiber	10	0.65							✓			None	PROBABLE-ORGANIC		
	14	C 13	NSD																
	15	C 3	NSD																
	16	B 3	NSD																
	17	B 13	1	Fiber	5.5	0.65							✓			None	PROBABLE-ORGANIC		
	18	B 23	NSD																
	19	B 33	NSD																
	20	B 43	NSD																
	21	B 42	NSD																
	22	B 32	NSD																
	23	B 22	NSD																
	24	B 12	NSD																
	25	B 2	NSD																
	26	C 2	NSD																
	27	C 12	NSD																
B	28	A 41	NSD																
	29	A 31	NSD																
	30	A 21	NSD																
	31	A 11	NSD																

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318 | *Report Date:* Dec 3, 2002

Client: Ecology and Environment, Inc. | *Lab/Cor Sample No.:* 021318-15

Project Name: Asbestos/Vermiculite WR Grace | *Analyst:* DW

Sample No.: 02434350 | *Analysis Date:* Nov 4, 2002

Description: QA/QC Field Blank

TEM ASBESTOS FIBER COUNT – RAW DATA

Grid	GO No.	Grid Coord-inates	Struc-ture No.	Structure Type	Average Length	Average Width	Asbestos						Non-Asbes-tos	Neg. No.	EDS No.	Elements	Comments	Confirmation	
							Ch	Am	Ac	An	Tr	Cr						By	Date
	32	A 1	1	Fiber	6	0.5							✓			None	PROBABLE-ORGANIC		
	33	D 1	NSD																
	34	D 11	NSD																
	35	D 21	NSD																
	36	D 31	NSD																
	37	D 41	1	Fiber	10	0.65							✓			None	PROBABLE-ORGANIC		
	38	D 42	NSD																
	39	D 32	NSD																
	40	D 22	NSD																
	40						0	0	0	0	0	0	5						

**NSD – No Structures Detected

Ch – Chrysotile Ac – Actinolite Tr – Tremolite Am – Amosite An – Anthophyllite Cr – Crocidolite

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

December 3, 2002

Ecology and Environment, Inc.
2101 Fourth Avenue
Suite 1900
Seattle, WA 98121

Attn: Jeff Fowlow

Project Name: Asbestos/Vermiculite WR Grace
Project Number: TDD #10170014 Case No. 124969-S10
P. O. Number: Not Available

Lab/Cor Batch Number: 021316

Conditions Enclosed please find results for samples submitted to our laboratory on October 25, 2002. A list of samples received follows, with limitation or rejection criteria noted where applicable.

Lab/Cor Sample No.	Client Sample No.	Limitation/Rejection Criteria
021316-01	02434351	No special conditions were noted
021316-02	02434358	No special conditions were noted
021316-03	02434360	No special conditions were noted
021316-04	02434361	No special conditions were noted
021316-05	02434367	No special conditions were noted
021316-06	02434368	No special conditions were noted

Method Preparation and analysis of the above samples was conducted in accordance with the ISO method 10312 for the direct identification of asbestos in airborne samples. The samples were etched, collapsed with acetone, carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in acetone until cleared of filter debris.

TEM analysis was performed using a Philips 410 transmission electron microscope equipped with an EDAX PV9800 X-ray analyzer. The air samples were scanned at a magnification of approximately 990X using an accelerating voltage of 100 KV. The magnification was increased to about 10,000X for structure sizing.

Counting Rules	Minimum Aspect Ratio	Minimum Length	Minimum Width	Minimum Required Analytical Sensitivity	Stopping Rules
(ISO fibers)	5:1	0.5 µm	0.25 µm	NA	100 Fibers
(PCM equiv)	3:1	5.0 µm	0.20 - 3.0 µm	NA	100 Fibers

Disclaimer This test report relates only to the items tested in this report. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please do not hesitate to call me. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with analytical services.

Sincerely,

John Harris
Laboratory Director

7619 6th Avenue NW, Seattle, WA 98117 (206) 781-0155 (206) 789-8424 (FAX)

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

Report Number: 021318

Report Date: November 27, 2002

Client Information	
Project Name:	Asbestos/Vermiculite WR Grace
Project No.:	TDD #10170014 Case No. 124969-S10
P. O. No.:	Not Available
Sample Type:	Air

Tracking Information			
Login:	Oct 25, 2002	*By:*	DJ
Prep:	Oct 28, 2002	*By:*	PA
Verified:	Oct 28, 2002	*By:*	PA
Reviewed:	Nov 4, 2002	*By:*	DW
Final Review:	Nov 27, 2002	*By:*	JH

Analysis Information	
Analysis Type:	ISO
Reference No.:	10312

FINAL TABLE

Transmission Electron Microscopy – ISO – Air Sample Analysis

LabCor Sample No.	021316-01	021316-02	021316-03	021316-04	021316-05	021316-06
Client Sample No.	**02434351**	**02434358**	**02434360**	**02434361**	**02434367**	**02434368**
Analyst	DW	DW	DW	DW	DW	DW
Date	11/6/02	11/6/02	11/6/02	11/7/02	11/11/02	11/11/02
Lab Filter Area (mm2)	385	385	385	385	385	385
Area Analyzed (mm2)	0.2013	0.2013	0.2013	0.2013	0.2013	0.2013
Air Volume (L)	954.6	954.6	1376.4	1239.6	2132.6	1806.9
Level of Analysis (chrysotile)	CD or CDQ	CD or CDQ	CD or CDQ	CD or CDQ	CD or CDQ	CD or CDQ
Level of Analysis (amphibole)	AZQ or ADQ	AZQ or ADQ	AZQ or ADQ	AZQ or ADQ	AZQ or ADQ	AZQ or ADQ
Average Grid Opening Area	0.0101	0.0101	0.0101	0.0101	0.0101	0.0101
Number of Grid Openings Analyzed	20	20	20	20	20	20
Analytical Sensitivity (Struc./L)	2.00	2.00	1.39	1.54	0.90	1.06
Number of Primary Asbestos Struc.	0	1	4	0	0	2
Number of Asbestos Structures Counted	0	1	4	0	0	2
Number of Asbestops Primary Structures >5.0um	0	0	2	0	0	2
Number of Asbestos ID Fibers & Bundles >5.0um	0	0	2	0	0	2
Number of PCM Equiv. Asbestos Structures	0	0	0	0	0	0
Number of PCM Equiv. Asbestos Fibers	0	0	2	0	0	2

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

TEM ASBESTOS FIBER COUNT – RAW DATA - LABCOR SAMPLE# 021316-01 - CLIENT SAMPLE #02434351

Grid	GO Num	GO Loc	Loc#	#Asb Structures Prim	*	Total	*	ID	Struc. Type	Length	Width	Chry	Amos	Actn	Trem	Croc	Anth	Non	Neg #	EDS #	Elem	Comments	PAS>5	TAFB>5	PEAS	PEAF
a	1	a	10					NAM	Fiber	0.6	0.02							√			al,si					
	2	a	1					No fibers																		
	3	a	12					NAM	Fiber	0.6	0.05							√			none					
								NAM	Fiber	1	0.1							√			al,si					
	4	a	32					No fibers																		
	5	a	41					NAM	Fiber	0.5	0.1							√			al,si,k,fe					
	6	b	1					No fibers																		
	7	b	21					NAM	Fiber	0.8	0.05							√			al,si,ca					
	8	b	42					No fibers																		
	9	b	24					No fibers																		
	10	c	14					No fibers																		
b	11	d	1					NAM	Fiber	0.6	0.1							√			al,si					
								NAM	Fiber	1	0.15							√			fe					
								NAM	Fiber	0.65	0.1							√			fe					
								NAM	Fiber	0.75	0.15							√			fe					
								NAM	Fiber	0.6	0.1							√			fe					
	12	d	11					NAM	Fiber	0.5	0.05							√			al,si					
								NAM	Fiber	0.75	0.15							√			fe					
								NAM	Fiber	0.75	0.1							√			fe					
								NAM	Fiber	0.5	0.1							√			fe					
								NAM	Fiber	0.75	0.15							√			fe					
	13	a	10					NAM	Fiber	1	0.15							√			fe					
	14	a	20					NAM	Fiber	0.5	0.05							√			fe					
	15	a	40					NAM	Fiber	0.6	0.1							√			none					
	16	b	41					NAM	Fiber	1.25	0.25							√			mg,al,si,k,fe					
								NAM	Fiber	0.6	0.05							√			none					
								NAM	Fiber	1.5	0.1							√			none					
	17	b	32					No Fibers																		
	18	b	12					NAM	Fiber	0.6	0.05							√			none					
	19	b	24					No Fibers																		

* = PCM equivalent fiber between 3:1 and 5:1 aspect ratio and is not included in primary or total structure counts

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

TEM ASBESTOS FIBER COUNT – RAW DATA - LABCOR SAMPLE# 021316-01 - CLIENT SAMPLE #02434351

Grid	GO Num	GO Loc	Loc#	#Asb Structures				ID	Struc. Type	Length	Width	Chry	Amos	Actn	Trem	Croc	Anth	Non	Neg #	EDS #	Elem	Comments	PAS>5	TAFB>5	PEAS	PEAF
				Prim	*	Total	*																			
	20	c	4					No Fibers																		
Sum	20			0		0																	0	0	0	0

* = PCM equivalent fiber between 3:1 and 5:1 aspect ratio and is not included in primary or total structure counts

Lab/Cor, Inc.

A Professional Service Corporation in the Northwest

TEM ASBESTOS FIBER COUNT – RAW DATA - LABCOR SAMPLE# 021316-02 - CLIENT SAMPLE #02434358

Grid	GO Num	GO Loc	Loc#	#Asb Structures Prim	*	Total	*	ID	Struc. Type	Length	Width	Chry	Amos	Actn	Trem	Croc	Anth	Non	Neg #	EDS #	Elem	Comments	PAS>5	TAFB>5	PEAS	PEAF
a	1	a	10					NAM	Fiber	0.5	0.05							√			al,si					
	2	a	20					No Fibers																		
	3	a	40					NAM	Fiber	0.6	0.1							√			al,si,s,k,ca					
								NAM	Fiber	11	1							√			ca					
								NAM	Fiber	0.7	0.1							√			al,si,s,k,ca					
	4	a	31					NAM	Fiber	0.5	0.05							√			al,si					
	5	d	1					No Fibers																		
	6	d	11					No Fibers																		
	7	d	20					NAM	Fiber	0.5	0.05							√			al,si					
	8	c	40					No Fibers																		
	9	b	1					No Fibers																		
	10	b	31					NAM	Fiber	0.6	0.05							√			al,si					
								NAM	Fiber	0.6	0.05							√			al,si					
b	11	c	1					No Fibers																		
	12	b	21					No Fibers																		
	13	b	31					NAM	MD10	10	10							√			al,si					
								NAM	MF																	
								NAM	Fiber	2.5	0.35							√			al,si,k,fe					
	14	b	42					NAM	Fiber	2	0.05							√			mg,al,si,ca					
	15	b	14	1		1		CDQ	Fiber	3	0.1	√							2584	12686	mg,si					
	16	a	1					No Fibers																		
	17	d	11					NAM	Fiber	0.6	0.05							√			al,si,k,					
	18	d	31					No Fibers																		
	19	d	40					No Fibers																		
	20	c	41					No Fibers																		
Sum	20			1		1																	0	0	0	0

* = PCM equivalent fiber between 3:1 and 5:1 aspect ratio and is not included in primary or total structure counts

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TEM ASBESTOS FIBER COUNT – RAW DATA - LABCOR SAMPLE# 021316-03 - CLIENT SAMPLE #02434360

Grid	GO Num	GO Loc	Loc#	#Asb Structures Prim	*	Total	*	ID	Struc. Type	Length	Width	Chry	Amos	Actn	Trem	Croc	Anth	Non	Neg #	EDS #	Elem	Comments	PAS>5	TAFB>5	PEAS	PEAF
a	1	a	11	1				ADQ	MD10					√					2595	12687	mg,al,si,ca,fe	[7 1 2] zone axis				
						1			MF	2.5	0.5			√												
								NAM	Fiber	0.6	0.1							√			al,si,k					
	2	a	31					NAM	MD10	8	1							√			mg,al,si,ca,fe					
									MF									√								
				2		2		CDQ	Fiber	1	0.1	√							2586	12688	mg,si					
	3	a	41					NAM	Fiber	40	7.5							√			si					
	4	a	32					NAM	MD10	8	2							√		12689	na,mg,si,k,ca,fe					
									MF	3	0.3															
	5	a	22					NAM	Fiber	3	0.4							√		12690	mg,si,ca,fe	ferro-actinolite / augite				
								NAM	Fiber	3.5	0.5							√			mg,al,si,k,fe					
	6	a	12					No Fibers																		
	7	d	22					NAM	Fiber	1	0.15							√			al,si,k					
								NAM	Fiber	2.5	0.25							√			al,si,k					
	8	d	42					NAM	Fiber	0.8	0.05							√			al,si,k					
	9	c	40					NAM	Fiber	2.5	0.35							√			al,si,k					
								NAM	MD10	5	4							√			si					
								NAM	MF	2	0.3															
	10	c	30					No Fibers																		
	11	c	1					NAM	Fiber	0.5	0.1							√			al,si,k					
	12	b	41					No Fibers																		
b	13	a	1					NAM	Fiber	7.5	1							√			al,si,k					
								NAM	Fiber	12	1.2							√			mg,al,si,fe					
	14	a	11					No Fibers																		
	15	a	41					No Fibers																		
	16	b	30					No Fibers																		
	17	b	21					NAM	Fiber	3	0.6							√			ti					

* = PCM equivalent fiber between 3:1 and 5:1 aspect ratio and is not included in primary or total structure counts

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TEM ASBESTOS FIBER COUNT – RAW DATA - LABCOR SAMPLE# 021316-03 - CLIENT SAMPLE #02434360

Grid	GO Num	GO Loc	Loc#	#Asb Structures Prim	*	Total	*	ID	Struc. Type	Length	Width	Chry	Amos	Actn	Trem	Croc	Anth	Non	Neg #	EDS #	Elem	Comments	PAS>5	TAFB>5	PEAS	PEAF
				3		3		ADQ	Fiber	15	2.5		√							12691	mg,al,si,k,ca,mn,fe	GO broken post-Au coat	1	1		1
								NAM	Fiber	1	0.1							√			al,si,k					
								NAM	Fiber	2.5	0.5							√			s,ca					
	18	b	1					NAM	Fiber	2	0.4							√			al,si,k					
	19	c	32					NAM	Fiber	2.5	0.3							√			na,mg,al,si,k,ca					
				4		4		ADQ	Fiber	9	1.2			√					2596	12692	mg,al,si,ca,fe	[3 0 2] zone axis	1	1		1
	20	c	33					NAM	Fiber	2	0.15							√			al,si,k					
								NAM	Fiber	3	0.6							√			mg,al,si,k,ca,fe					
Sum	20			4		4																	2	2	0	2

* = PCM equivalent fiber between 3:1 and 5:1 aspect ratio and is not included in primary or total structure counts

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TEM ASBESTOS FIBER COUNT – RAW DATA - LABCOR SAMPLE# 021316-04 - CLIENT SAMPLE #02434361

Grid	GO Num	GO Loc	Loc#	#Asb Structures Prim	*	Total	*	ID	Struc. Type	Length	Width	Chry	Amos	Actn	Trem	Croc	Anth	Non	Neg #	EDS #	Elem	Comments	PAS>5	TAFB>5	PEAS	PEAF
a	1	d	10					No Fibers																		
	2	d	20					No Fibers																		
	3	d	40					NAM	Fiber	1.25	0.25							√			al,si,k,fe					
	4	c	10					NAM	Fiber	4	0.75							√			na,al,si,k,ti					
	5	c	1					No Fibers																		
	6	c	2					No Fibers																		
	7	b	2					No Fibers																		
	8	b	12					No Fibers																		
	9	b	32					No Fibers																		
	10	b	41					NAM	Fiber	0.75	0.15							√			al,si,fe					
								NAM	Fiber	1.2	0.15							√			si					
	11	b	40					No Fibers																		
	12	a	30					NAM	Fiber	1.5	0.3							√			mg,al,si,ca,fe					
b	13	c	10					No Fibers																		
	14	c	20					No Fibers																		
	15	c	30					No Fibers																		
	16	c	41					NAM	Fiber	7.5	1							√			al,si,ca					
	17	c	31					No Fibers																		
	18	c	44					NAM	Fiber	1	0.15							√			si					
	19	b	43					No Fibers																		
	20	b	42					NAM	Fiber	1.2	0.3							√			al,si,k,fe					
Sum	20			0		0																	0	0	0	0

* = PCM equivalent fiber between 3:1 and 5:1 aspect ratio and is not included in primary or total structure counts

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TEM ASBESTOS FIBER COUNT – RAW DATA - LABCOR SAMPLE# 021316-05 - CLIENT SAMPLE #02434367

Grid	GO Num	GO Loc	Loc#	#Asb Structures Prim	*	Total	*	ID	Struc. Type	Length	Width	Chry	Amos	Actn	Trem	Croc	Anth	Non	Neg #	EDS #	Elem	Comments	PAS>5	TAFB>5	PEAS	PEAF
a	1	b	34					No Fibers																		
	2	b	24					No Fibers																		
	3	b	14					No Fibers																		
	4	b	3					NAM	Fiber	2	0.2							√			na,al,si					
								NAM	Fiber	1	0.2							√			na,al,si					
								NAM	Fiber	1.25	0.25							√			al,si,ca					
								NAM	Fiber	4	0.65							√			si					
	5	b	4					NAM	Fiber	1	0.15							√			none					
								NAM	MD10	2.5	0.75							√			na,al,si					
									MF																	
	6	c	13					No Fibers																		
	7	c	23					NAM	Fiber	2.5	0.4							√			al,si,k,fe					
	8	c	34					No Fibers																		
	9	c	44					No Fibers																		
	10	c	1					No Fibers																		
	11	d	10					No Fibers																		
	12	d	21					No Fibers																		
b	13	b	40					No Fibers																		
	14	b	30					No Fibers																		
	15	a	30					NAM	MD10	5	5							√			al,si					
									MF																	
	16	a	11					No Fibers																		
	17	a	1					NAM	Fiber	1	0.1							√			al,si					
	18	d	10					No Fibers																		
	19	c	21					No Fibers																		
	20	c	11					No Fibers																		
Sum	20			0		0																	0	0	0	0

* = PCM equivalent fiber between 3:1 and 5:1 aspect ratio and is not included in primary or total structure counts

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TEM ASBESTOS FIBER COUNT – RAW DATA - LABCOR SAMPLE# 021316-06 - CLIENT SAMPLE #02434368

Grid	GO Num	GO Loc	Loc#	#Asb Structures				ID	Struc. Type	Length	Width	Chry	Amos	Actn	Trem	Croc	Anth	Non	Neg #	EDS #	Elem	Comments	PAS>5	TAFB>5	PEAS	PEAF
				Prim	*	Total	*																			
a	1	a	40					NAM	MD10	5	5							√			al,si					
									MF																	
	2	a	30					NAM	MD10	10	10							√			al,si,k					
									MF																	
	3	a	10					No Fibers																		
	4	a	21					No Fibers																		
	5	d	10					No Fibers																		
	6	d	20					No Fibers																		
	7	c	30					No Fibers																		
	8	c	40					No Fibers																		
	9	c	31					No Fibers																		
	10	c	11					NAM	Fiber	1	0.35							√			al,si,k					
	11	b	11	1		1		ADQ	Fiber	9	1.2			√					2597	12696	na,mg,si,k, ca,fe	[5 1 2] zone axis	1	1		1
	12	b	31					NAM	Fiber	1.5	0.15							√			al,si					
b	13	d	40					No Fibers																		
	14	d	30					No Fibers																		
	15	d	20					No Fibers																		
	16	d	10					No Fibers																		
	17	d	1					No Fibers																		
	18	b	1					No Fibers																		
	19	b	11					NAM	Fiber	1	0.15							√			al,si,k					
	20	b	32					NAM	Fiber	20	1							√	2612	12697	na,mg,si,k, ca,fe	unknown				
								NAM	Fiber	19	0.5							√	2625	12698	na,mg,si,k, ca,fe	[2 0-1] zone axis, winchite				
								NAM	MD10	10	7.5							√		12699	na,mg,si,k, ca,fe	winchite				
									MF																	
				2		2		ADQ	Fiber	10	1.2			√					2598	12700	mg,al,si,ca ,fe	[1 1 1] zone axis	1	1		1
Sum	20			2		2																	2	2	0	2

* = PCM equivalent fiber between 3:1 and 5:1 aspect ratio and is not included in primary or total structure counts

Lab/Cor, Inc.
Structure Sketch Sheet

rev. 12/17/97

Sample #: 021316-01 Magnification:

ID#	ID#	ID#	ID#	ID#
L= W=	L= W=	L= W=	L= W=	L= W=

Sample #: 021316-02 Magnification:

ID# B-15-1	ID#	ID#	ID#	ID#
L= 2.5 W= 0.1	L= W=	L= W=	L= W=	L= W=

Sample #: 021316-03 Magnification:

ID# A-1-1	ID# A-2-2	ID# A-4-1	ID# A-5-1	ID# A-9-2
F 2.5 0.5	F 2.5 0.5	F 1.0 0.1	F 2.0 0.3	F 2.0 0.3
L= W=	L= 1.0 W= 0.1	L= 8.0 W= 2.0	L= 3.0 W= 0.4	L= 5.0 W= 4.0

Sample #: Magnification:

ID# B-17-2	ID# B-19.2	ID#	ID#	ID#
F 15 2.5	F 9.0 1.2			
L= 15 W= 2.5	L= 9.0 W= 1.2	L= W=	L= W=	L= W=

Sample #: 021316-04 Magnification:

ID#	ID#	ID#	ID#	ID#
L= W=	L= W=	L= W=	L= W=	L= W=

Sample #: 021316-05 Magnification:

ID#	ID#	ID#	ID#	ID#
L= W=	L= W=	L= W=	L= W=	L= W=

Sample #: 021316-06 Magnification:

ID# A-11-1	ID# B-20-1	ID# B-20-2	ID# B-20-3	ID# B-20-4
F 9.0 1.2				
L= 9.0 W= 1.2	L= 20 W= 1.0	L= 19 W= 0.5	L= 10 W= 7.5	L= 10 W= 1.2

Sample #: Magnification:

ID#	ID#	ID#	ID#	ID#
L= W=	L= W=	L= W=	L= W=	L= W=

Appendix 7

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/22/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434357
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	PERSONAL MONITOR JED		

		Result	Units	Qlfr
GEN				
Parameter :	Bulk Fiber Analysis			
Method :				
Prep Method:				
Analytes :	***200048 Filter fiber count**	**59**	**Fiber/mm2**	

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/22/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434358
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	AREA PUMP #2		

		Result	Units	Qlfr
GEN				
Parameter :	Bulk Fiber Analysis			
Method :				
Prep Method:				
Analytes :	***200048 Filter fiber count**	**244**	**Fiber/mm2**	

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/23/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434363
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	PERSONAL MONITOR #2 KEVEN		

		Result	Units	Qlfr
GEN				
Parameter	: Bulk Fiber Analysis			
Method	:			
Prep Method	:			
Analytes	: ***200048 Filter fiber count**	**41**	**Fiber/mm2**	

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/23/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434366
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	PERSONAL MONITOR #5 JED		

		Result	Units	Qlfr
GEN				
Parameter :	Bulk Fiber Analysis			
Method :				
Prep Method:				
Analytes :	***200048 Filter fiber count**	**56**	**Fiber/mm2**	

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/23/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434372
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	PERSONAL MONITOR #4 JED		

		Result	Units	Qlfr
GEN				
Parameter :	Bulk Fiber Analysis			
Method :				
Prep Method:				
Analytes :	***200048 Filter fiber count**	**5**	**Fiber/mm2**	

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/23/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434376
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	PERSONAL MONITOR #3 KEVEN		

		Result	Units	Qlfr
GEN				
Parameter	: Bulk Fiber Analysis			
Method	:			
Prep Method	:			
Analytes	: *200048 Filter fiber count	45	Fiber/mm2	

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/23/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434378
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	FIELD BLANK QC		

			Result	Units	Qlfr
GEN					
Parameter	: Bulk Fiber Analysis				
Method	:				
Prep Method	:				
Analytes	: ***200048**	**Filter fiber count**	**0**	**Fiber/mm2**	

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/23/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434379
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	PERSONAL MONITOR #5 DOC		

		Result	Units	Qlfr
GEN				
Parameter :	Bulk Fiber Analysis			
Method :				
Prep Method:				
Analytes :	***200048 Filter fiber count**	**18**	**Fiber/mm2**	

Manchester Environmental Laboratory
Report by Parameter for Project HWD-174C

Project Code:	HWD-174C	**Collected:**	10/23/02
Project Name:	ASBESTOS/VERMICULITE W.R. GRAC	**Matrix:**	Other
Project Officer:	JED JANUCH	**Sample Number:**	02434380
Account Code:	02T10P50102D10ZZLA00	**Type:**	Reg sample
Station Description:	FIELD BLANK		

		Result	Units	Qlfr
GEN				
Parameter :	Bulk Fiber Analysis			
Method :				
Prep Method:				
Analytes :	***200048** **Filter fiber count**	**0**	**Fiber/mm2**	

Appendix 8

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: OEA-095

MEMORANDUM

To: Keven McDermott
Program Manager, Investigation and Engineering Unit
Jed Januch
Civil Investigator, Investigation and Engineering Unit

From: Julie Wroble
Toxicologist, Risk Evalatuion Unit

Re: Vermiculite Expansion Plant, Spokane, WA, Preliminary Risk Analysis

Date: May 29, 2003

I. Introduction

A preliminary risk evaluation was performed to determine whether workers exposed to air during a variety of activities conducted on site at the former W.R. Grace Vermiculite Expansion Facility are subject to increased cancer risk. The purpose of this analysis was to determine the potential risks to individuals under simulated working conditions. The results of this analysis indicated that cancer risks as high as 1 in 100 for workers and 2 in 100 for residents might result from exposure to soils contaminated with asbestos at this site. Note that the exposure assumptions (e.g., fiber concentrations, frequency and duration of exposure) were assumed to represent reasonable maximum exposures (RME). The RME assumptions were used to determine if there is any concern due to *potential* risks associated with asbestos present in site soils.

II. Exposure Assumptions

Briefly, PCM and TEM results provided by Jed Januch were used to estimate potential air concentrations of asbestos fibers. Note that the concentrations of asbestos and other fibers (winchite and richterite) were summed to be consistent with the approach used by Region 8 toxicologists at the Libby, Montana, site. These data were obtained from personal monitors worn while EPA staff performed a variety of activities on the site. Most of the samples did not contain asbestos, winchite, or richterite fibers above the detection limit; for these samples, no risk estimates were calculated. For three samples analyzed using TEM, asbestos fibers were detected. In six samples analyzed using PCM, asbestos fibers were detected. In a few cases, the same samples were analyzed using both methods; in every case, the PCM analysis yielded higher fiber counts than the TEM fiber counts. This result is to be expected because TEM is a more sensitive method for the detection of asbestos fibers; PCM may detect fibers that are similar to asbestos, but are not true asbestos fibers.

The data from both PCM and TEM analyses were used as exposure point concentrations for the risk calculations. Next, conservative assumptions were made regarding exposure. The exposure scenarios presented below are consistent with EPA, Region 10, default exposure assumptions for residential and industrial settings, respectively. For the residential scenario, a hypothetical future resident that lives next to the site was assumed to breathe air containing fibers for 350 days per

year for 30 years. For the worker scenario, a hypothetical future worker was assumed to breathe air containing fibers for 250 days per year for 25 years. Both residents and workers were assumed to breathe 20 cubic meters of air per day. By multiplying the concentrations of asbestos fibers measured in air samples with the preceding assumptions about exposure, the lifetime average daily intake can be estimated. The exposure frequency and duration may be lower for actual receptors; however, conservative defaults were used at this time to determine the risks associated with worst-case exposures.

III. Toxicity Assumptions

The IRIS inhalation unit risk of 0.23 $(f/cc)^{-1}$ was used as the toxicity value. This unit risk value is calculated for the additive combined risk of lung cancer and mesothelioma, and is calculated as a composite value for males and females. The epidemiological data show that cigarette smoking and asbestos exposure interact synergistically for production of lung cancer and do not interact with regard to mesothelioma.

IV. Risk Estimates

EPA's linear low-dose cancer risk equation was used to calculate cancer risk. Briefly, the lifetime average daily intake was multiplied by the inhalation unit risk to determine the potential excess lifetime cancer risk. For a few samples, the excess lifetime cancer risks exceeded 1×10^{-2}; therefore, the one-hit equation for high carcinogenic risk levels was used to estimate cancer risk for these samples. Tables 1 and 2 (included as Attachment 1) show the equations used and the detailed results for residents and workers, respectively. The summary table below gives the estimated cancer risks for the residential and industrial scenarios as described above. Included in this table are samples where fibers were detected and the paired sample that was analyzed using the alternate method, for those where both methods were used.

Location	Sample/ Analysis Type	Air Concentration (f/cc)	Inhalation Unit Risk (f/cc)-1	Excess Lifetime Cancer Risk – Residents	Excess Lifetime Cancer Risk – Workers
Soil #11	2434357/PCM	0.25	0.23	2E-02	1E-02
Soil #11	2434363/PCM	0.11	0.23	1E-02	6E-03
	2434363/TEM	ND	0.23	NC	NC
Soil #11	2434366/PCM	0.16	0.23	2E-02	9E-03
	2434366/TEM	ND	0.23	NC	NC
PM2	2434370/TEM	0.01	0.23	9E-04	6E-04
Soil #12	2434372/PCM	0.02	0.23	2E-03	1E-03
	2434372/TEM	ND	0.23	NC	NC
PM2	2434375/TEM	0.033	0.23	3E-03	2E-03
PM3	2434376/TEM	0.045	0.23	4E-03	3E-03
Soil #4, 10	2434376/PCM	0.16	0.23	2E-02	9E-03
	2434377/TEM	0.014	0.23	1E-03	8E-04
Soil #4, 10	2434379/PCM	0.04	0.23	4E-03	2E-03

These data suggest that the potential for elevated cancer risks associated with exposures to asbestos fibers released from soil at this facility is elevated; however, asbestos and similar fibers were detected only in 3 of 20 samples analyzed using TEM and 6 of 6 samples analyzed using PCM. This suggests that the potential for exposure is variable at the site and may depend upon the type of activity being performed. As expected, fibers were detected more frequently using PCM versus TEM; this is consistent with the relative sensitivity of these two methods.

While the exposure factors are uncertain, other factors to consider are that some of these data are based on measurements using TEM, not PCM; therefore, accurate identification of fibers has been made, at least in some samples.

V. Uncertainties

These risk calculations were performed to follow up on a glove box study that was performed previously using soil collected from this site. That study showed greater potential for exposure than what was demonstrated in the current investigation. However, the risk estimates for those samples with detected fibers do indicate that risks are elevated.

All risk estimates have inherent uncertainty based on the methods used to determine probability of adverse effects. Below are the main sources of uncertainty in this analysis.

1. The breathing air of residents and workers at or near the site may contain asbestos fibers at concentrations similar to those detected in personal monitors during simulated work activities. The actual concentration of fibers in air to which people may be exposed over a long period of time may be greater or less than the levels measured in this study.
2. The samples collected reflect exposures over a time period of about an hour. The exposure scenarios considered in this analysis assume that the fiber concentrations measured are constant over a 25- to 30-year exposure period.
3. Risks were calculated for individual samples to provide a range of possible risk estimates. Actual exposure concentrations may be very low (consistent with the samples for which no fibers were detected) or may be even greater than levels measured in this investigation.
4. EPA's current inhalation unit risk value was used as the measure of toxicity for all fibers. EPA's Science Advisory Board is currently performing a review of the IRIS data file on asbestos.
5. Greater than 50% of the fibers had an aspect ratio of 20:1. About 15% of the fibers were greater than 20 microns long. Long, thin fibers may be more toxic than suggested by the current inhalation unit risk value.
6. The exposure assumptions were consistent with Region 10 defaults typically used at hazardous waste sites; these assumptions may overestimate, but are not likely to underestimate potential exposures by residents and workers at or near this site.

ATTACHMENT 1

Table 1: Risk Expressed Using Linear Low-Dose Cancer Risk Equation/Residential Exposure Assumptions

Location	Analysis Type	Sample	Asbestos Air PCME Concentration (f/cc)	Other Air PCME Concentration (f/cc)	Air PCME Concentration (f/cc)	Lifetime Average Daily Intake	Inhalation Unit Risk (f/cc)-1	Excess Lifetime Cancer Risk	Excess Lifetime Cancer Risk*
Blank	TEM	2434350	ND	ND	ND	NC	0.23	NC	NC
Jed (BKG)	TEM	2434352	ND	ND	ND	NC	0.23	NC	NC
Jed (PM6)	TEM	2434353	ND	ND	ND	NC	0.23	NC	NC
Dave (PM6)	TEM	2434354	ND	ND	ND	NC	0.23	NC	NC
Dave (PM3)	TEM	2434355	ND	ND	ND	NC	0.23	NC	NC
Marion (PM4)	TEM	2434356	ND	ND	ND	NC	0.23	NC	NC
Soil #11	PCM	2434357	0.25	ND	0.25	0.102739726	0.23	2.36E-02	2.34E-02
Marion (PM1)	TEM	2434362	ND	ND	ND	NC	0.23	NC	NC
Keven (PM2)	TEM	2434363	ND	ND	ND	NC	0.23	NC	NC
Soil #11	PCM	2434363	0.11	ND	0.11	0.045205479	0.23	1.04E-02	1.03E-02
Deborah (PM3)	TEM	2434364	ND	ND	ND	NC	0.23	NC	NC
Dierdre (PM4)	TEM	2434365	ND	ND	ND	NC	0.23	NC	NC
Jed (PM5)	TEM	2434366	ND	ND	ND	NC	0.23	NC	NC
Soil #11	PCM	2434366	0.16	ND	0.16	0.065753425	0.23	1.51E-02	1.50E-02
Marion (PM1)	TEM	2434369	ND	ND	ND	NC	0.23	NC	NC
David (PM2)	TEM	2434370	0.01	0	0.01	0.004109589	0.23	9.45E-04	NC
Jed (PM4)	TEM	2434372	ND	ND	ND	NC	0.23	NC	NC
Soil#12	PCM	2434372	0.02	ND	0.02	0.008219178	0.23	1.89E-03	NC
Marion (PM5)	TEM	2434373	ND	ND	ND	NC	0.23	NC	NC
Marion (PM1)	TEM	2434374	ND	ND	ND	NC	0.23	NC	NC
David (PM2)	TEM	2434375	0.011	0.022	0.033	0.013561644	0.23	3.12E-03	NC
Keven (PM3)	TEM	2434376	0.018	0.027	0.045	0.018493151	0.23	4.25E-03	NC
Soil #4, 10	PCM	2434376	0.16	ND	0.16	0.065753425	0.23	1.51E-02	1.50E-02
Jed (PM4)	TEM	2434377	0.014	ND	0.014	0.005753425	0.23	1.32E-03	NC
Blank	TEM	2434378	ND	ND	ND	NC	0.23	NC	NC
Soil #4, 10	PCM	2434379	0.04	ND	0.04	0.016438356	0.23	3.78E-03	NC

Key:
ND = Not detected
NC = Not calculated
Note: These are TEM, not PCM data

risk =(conc x ef x ed/at) x IUR

Exposure Frequency = 350 days/year
Exposure Duration = 30 years
Averaging Time = 25,550 days

* Where risks calculated as shown above exceeded 1E-02, risk was recalculated using the one-hit equation: risk = 1 - exp(-intake * unit risk)

ATTACHMENT 1

Table 2: Risk Expressed Using Linear Low-Dose Cancer Risk Equation/Worker Exposure Assumptions

Location	Analysis Type	Sample	Asbestos Air PCME Concentration (f/cc)	Other Air PCME Concentration (f/cc)	Air PCME Concentration (f/cc)	Lifetime Average Daily Intake	Inhalation Unit Risk (f/cc)-1	Excess Lifetime Cancer Risk	Excess Lifetime Cancer Risk*
Blank	TEM	2434350	ND	ND	ND	NC	0.23	NC	NC
Jed (BKG)	TEM	2434352	ND	ND	ND	NC	0.23	NC	NC
Jed (PM6)	TEM	2434353	ND	ND	ND	NC	0.23	NC	NC
Dave (PM6)	TEM	2434354	ND	ND	ND	NC	0.23	NC	NC
Dave (PM3)	TEM	2434355	ND	ND	ND	NC	0.23	NC	NC
Marion (PM4)	TEM	2434356	ND	ND	ND	NC	0.23	NC	NC
Soil #11	PCM	2434357	0.25	ND	0.25	0.061154599	0.23	1.41E-02	1.40E-02
Marion (PM1)	TEM	2434362	ND	ND	ND	NC	0.23	NC	NC
Keven (PM2)	TEM	2434363	ND	ND	ND	NC	0.23	NC	NC
Soil #11	PCM	2434363	0.11	ND	0.11	0.026908023	0.23	6.19E-03	NC
Deborah (PM3)	TEM	2434364	ND	ND	ND	NC	0.23	NC	NC
Dierdre (PM4)	TEM	2434365	ND	ND	ND	NC	0.23	NC	NC
Jed (PM5)	TEM	2434366	ND	ND	ND	NC	0.23	NC	NC
Soil #11	PCM	2434366	0.16	ND	0.16	0.039138943	0.23	9.00E-03	NC
Marion (PM1)	TEM	2434369	ND	ND	ND	NC	0.23	NC	NC
David (PM2)	TEM	2434370	0.01	0	0.01	0.002446184	0.23	5.63E-04	NC
Jed (PM4)	TEM	2434372	ND	ND	ND	NC	0.23	NC	NC
Soil#12	PCM	2434372	0.02	ND	0.02	0.004892368	0.23	1.13E-03	NC
Marion (PM5)	TEM	2434373	ND	ND	ND	NC	0.23	NC	NC
Marion (PM1)	TEM	2434374	ND	ND	ND	NC	0.23	NC	NC
David (PM2)	TEM	2434375	0.011	0.022	0.033	0.008072407	0.23	1.86E-03	NC
Keven (PM3)	TEM	2434376	0.018	0.027	0.045	0.011007828	0.23	2.53E-03	NC
Soil #4, 10	PCM	2434376	0.16	ND	0.16	0.039138943	0.23	9.00E-03	NC
Jed (PM4)	TEM	2434377	0.014	ND	0.014	0.003424658	0.23	7.88E-04	NC
Blank	TEM	2434378	ND	ND	ND	NC	0.23	NC	NC
Soil #4, 10	PCM	2434379	0.04	ND	0.04	0.009784736	0.23	2.25E-03	NC

Key:
ND = Not detected
NC = Not calculated
Note: These are TEM, not PCM data

risk =(conc x ef x ed/at) x IUR

Exposure Frequency = 250 days/year
Exposure Duration = 25 years
Averaging Time = 25,550 days

* Where risks calculated as shown above exceeded 1E-02, risk was recalculated using the one-hit equation: risk = 1 - exp(-intake * unit risk)