36771

FINAL FIELD SAMPLING AND ANALYSIS REPORT

NJ ASBESTOS DUMP SITE WHITE BRIDGE ROAD MEYERSVILLE, NEW JERSEY

Prepared for:

U.S. Environmental Protection Agency

Contract No.: 68-W9-0003

Work Assignment No.: C02070

TES 6

ALLIANCE
Technologies Corporation

FINAL REPORT
FIELD SAMPLING AND ANALYSIS
AT THE WHITE BRIDGE ROAD SITE
MEYERSVILLE, NJ

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
26 Federal Plaza
Emergency **and Remedial** Response Division
New York, New York 10278

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EXECUTIVE SUMMARY

Alliance Technologies Corporation, under EPA contract No. 68-W9-0003, Work Assignment C02070, completed a sampling and analysis effort at two parcels of land associated with the National Priority List Site known as the Asbestos Dump Site. This final report summarizes the results from the White Bridge Road site in Meyersville, New Jersey. The field component was conducted during late October 1990 in accordance with a Field Operations Plan (dated 10/26/90) prepared by Alliance.

The field effort included: surveying the site and establishing a grid system; collecting surface and subsurface soil samples; and analysis of selected samples. The effort also included a geophysical survey using ground penetrating radar, and ambient air sampling for health and safety purposes.

Most surface soil samples were analyzed by transmission electron microscopy (TEM). Any soils determined to contain asbestos after a visual inspection were scheduled for analysis by polarized light microscopy. The majority of the analyses was below the TEM detection limit of 0.5 percent. The volume of asbestos containing fill material was estimated at 23,910 cubic yards, with the majority of this found in the former riding track area. A second area of fill was found at the southwest border of the property.

1.0 INTRODUCTION

Alliance Technologies Corporation prepared this Final Report as required by Work Assignment No. C02070, Contract No. 68-W9-0003 for the U.S. Environmental Protection Agency. This report summarizes the results at a sampling and analysis effort at the parcel of land located at 651 White Bridge Road in southeastern Morris County, Meyersville, New Jersey.

This Work Assignment was completed by Alliance and several competitively procured subcontractors. Site surveying activities were completed by Keller and Kirkpatrick of Parsippany, New Jersey. Hager-Ritcher Geosciences, Inc. of Salem, New Hampshire was subcontracted to perform a ground penetrating radar survey at the site. All asbestos analyses were performed by Eastern Analytical Laboratories of Billerica, Massachusetts. Drilling activities were performed by Jersey Boring and Drilling.

Field sampling at the White Bridge Road site was part of a larger investigation that also included sampling at a parcel of land at 237 New Vernon Road. Both of these parcels are associated with the National Priorities List (NPL) site known as the Asbestos Waste Dump Site.

The purpose of this report is to summarize the results of the field measurements and analysis effort completed for this assignment. All activities completed under this task were consistent with requirements specified in our Work Plan and further documented in the Field Operations Plan (FOP). This report, though comprehensive in many technical areas, does not include all of the requirements for a complete remedial investigation. Fate, transport, and risk assessment are not discussed in this report, as these areas were outside the scope of this assignment.

Information gathered during this Work Assignment is intended to be used to assist in the selection of remedial alternatives. The data will also be used to satisfy the modeling requirements cited by the Agency for Toxic Substances and Disease Registry (ATSDR) in terms of the fiber length and diameter. The data has been reported in a format that should be usable and comparable to existing information used in similar modeling situations.

1.1 Site Background

The Asbestos Dump Site is a National Priority List site which includes four properties located in southeastern Morris County, New Jersey. These four properties are the Millington Site, the Dietzman Tract, the New Vernon Road Site, and the White Bridge Road Site. The Asbestos Dump Site project was divided into two operable units. A Record of Decision (ROD) for the first operable unit, the Millington Site, was signed on September 30, 1988. Negotiations for implementation of the remedial action were

unsuccessful and EPA issued a unilateral order to the potential responsible party (PRP), National Gypsum Corporation. National Gypsum is currently conducting the remedial design for that site. The subjects of the second operable unit are the Dietzman Tract, the New Vernon Road Site and the White Bridge Road Site. In August 1990, EPA sampled the New Vernon Road and White Bridge Road sites as part of a Removal Assessment Program. The results indicate the presence of chrysotile asbestos in soils at levels up to 5 percent. EPA transmitted this data to the ATSDR for review. EPA has initiated this Work Assignment to further characterize the New Vernon Road and White Bridge Road sites. Additional soil data provided under this assignment will be used when evaluating the various remedial options for these sites.

1.1.1 Site Location/Description

This site is located at 651 White Bridge Road in Meyersville, New Jersey. It consists of approximately 12 acres of land off New Vernon Road, bounded by the Great Swamp National Wildlife Refuge to the east and south, and private residences to the north and west. There are two residents living onsite and 18 horses reportedly boarding in stables at the site. There are five residences on White Bridge Road (between New Vernon Road and Great Swamp), within approximately 700 feet of the site. One of them is directly across the street.

The site consists of a two-story building where the owners reside, a garage, and two sheds and three stables that are used for the horses (see Figure 1-1). The roadway on the northwest side of the site, leading to all of the above structures, is paved with asphalt. There is a large grazing field for the horses that is divided into four sections by post and rail fencing which takes up the majority of the property. A pond, approximately 100 feet in diameter, is situated in the northern portion of the grazing field. Trees line the property along White Bridge Road.
The riding track is approximately 250 feet long by 125 feet wide and is situated approximately 350 feet from the house and stables. A dirt roadway along the northeastern border is approximately 250 feet long.

1.1.2 Site History

The White Bridge Road and New Vernon Road sites are satellite sites of the NPL Asbestos Millington Dump Site. In September 1983, the U.S. EPA Emergency Response and Hazardous Materials Inspection Branch reviewed site conditions for removal eligibility. The site was addressed by the EPA through a 106 Order issued on April 4, 1985, which required National Gypsum to perform a Remedial Investigation/Feasibility Study (RI/FS) on the entire Asbestos Dump. Subsequent to issuance of the Order, it was deemed appropriate to split the work into two operable units. An RI for operable unit two has been conducted (1987); however, it has not been approved by the U.S. EPA. Further activities have not been conducted for operable unit two.

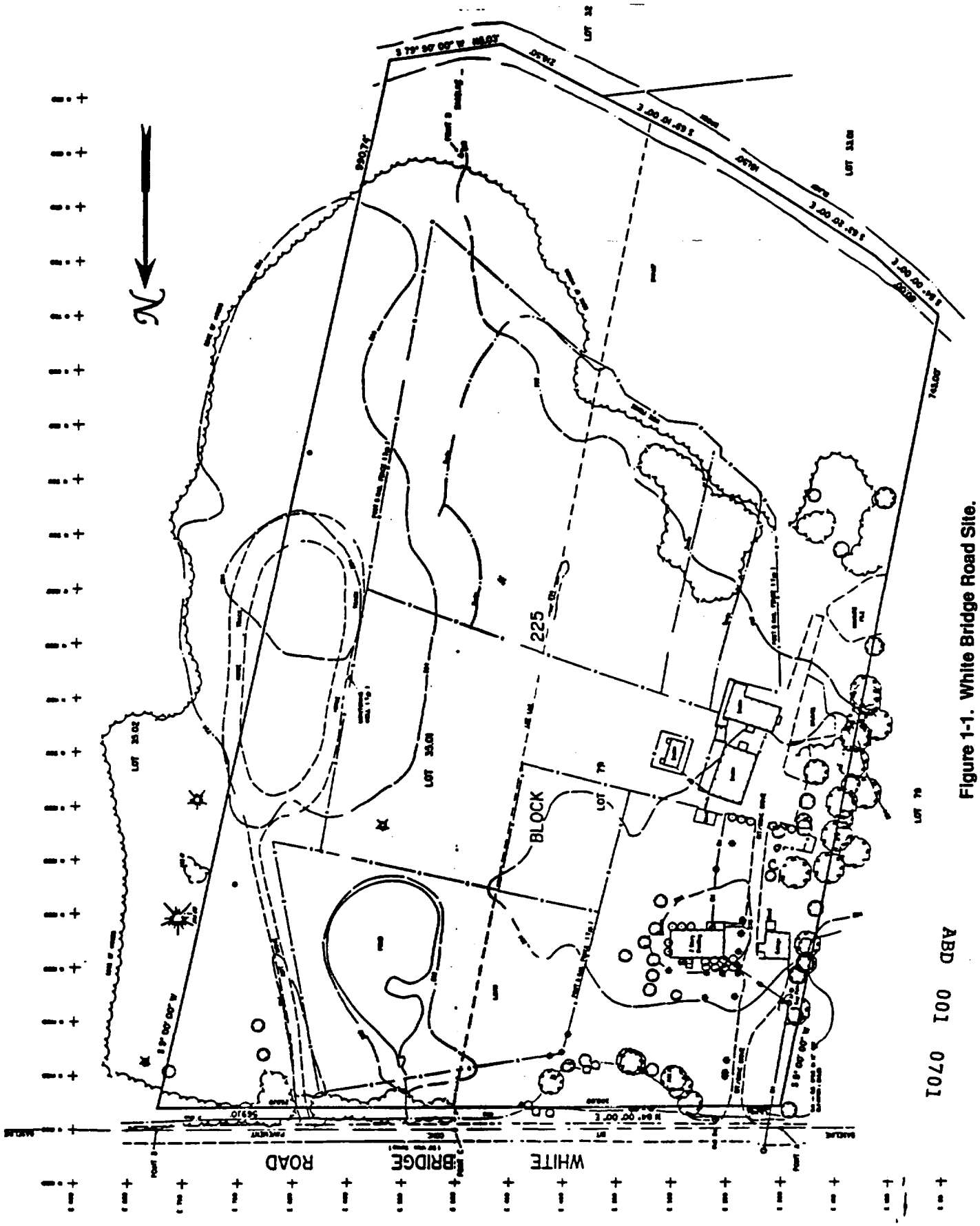

Figure 1-1. White Bridge Road Site.

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The land at the White Bridge Road Site was used as a farm from 1945 until 1969. From 1970 until 1975, landfilling operations by the National Gypsum Corporation were performed. The refuse included asbestos tiles and siding. Following termination of the landfilling, the owner converted the property into a horse farm with stables, a riding ring, and pasture fields.

1.1.3 Previous Investigations

Previous investigations of this parcel of land were conducted by the potentially responsible party and EPA. Fred C. Hart Associates completed a remedial investigation of the NPL Asbestos Waste Site for National Gypsum Company and summarized their findings in a draft report dated May 29, 1987. The draft RI contained limited information directly relevant to asbestos contamination.

The EPA investigation was performed during August and September 1990 and consisted of a site walkover and the collection of several types of samples for subsequent asbestos analyses. It was from this effort that EPA concluded additional information relevant to asbestos in soil should be collected.

1.2 Project Approach as Detailed in the FOP

This Work Assignment required the performance of several different types of field activities to assist in characterization of the site. Tasks performed include: surveying the site to develop a grid pattern for sampling purposes and topographic maps; a geophysical investigation utilizing ground penetrating radar in selected locations; soil sampling using hand augers and in some instances, a drill rig; and analysis of the soil samples at a National Institute of Standards and Technology (NIST) certified laboratory. The FOP provided a complete summary of the activities to be completed under this assignment.

1.2.1 Site Survey and Grid Patterns

Alliance subcontracted the surveying activities to Keller and Kirkpatrick, a licensed surveyor from Parsippany, New Jersey. This task required the establishment of site bench marks for future reference, elevations specific to site features, the generation of a topographic map and a site grid. The responsibilities, records, and procedures of the survey followed the specifications presented in *Compendium of Superfund Field Operations Methods*, U.S. EPA, September 1987.

Mapping shows all planimetric features including, but not limited to, buildings, walks, roads, fences, ditches, trees, utility poles, pits, ponds, and other features as well as contours and spot elevations on roads, dikes, and ditch inverts.

All horizontal and vertical control points are shown on the final map along with tabulation of coordinates and elevations. The description, origin, and elevations of the bench marks used for the mapping control are also shown on the map.

The horizontal coordinate system has been referenced to a local recoverable baseline at the site. The state plane coordinate system was used. The map shows the basis of bearing, north arrow, names of streets and highways, project number, project name, and a bar scale.

A grid pattern was developed to assist in the identification of sampling locations. The White Bridge Road Site had a 50 by 50 foot grid pattern across the entire site.

1.2.2 Geophysical Investigations

Ground penetrating radar (GPR) was applied to characterize the nature of subsurface stratigraphy. GPR does not specifically enable primary detection of asbestos materials. However, interpretation of the GPR data has helped distinguish fill material from naturally deposited sediments.

The primary objective of the GPR survey was to characterize the lateral and vertical extent of the fill areas. A secondary objective was to obtain reconnaissance GPR profiles in selected areas presumed not to have been filled. The GPR method was selected for the survey because of its ability to provide continuous, rather than point-by-point, profiles of subsurface conditions.

A Geophysical Survey Systems, Inc., Model SIR-3:VDU-38 ground penetrating radar system was used for this survey. The system consisted of an electronics unit, power supply, graphic recorder, color video display unit and transmitting/receiving antenna. The transmit/receive antenna is housed in a box that is moved across the surface. The antenna transmits electromagnetic signals into the subsurface and then detects, amplifies, and displays reflections of the signals in real time on a graphic recorder and color video display unit. The result is a radar record of the subsurface. The data are also recorded on a tape recorder for later computer processing and detailed interpretation.

Preliminary data were acquired at each site using both 500 and 300 MHz antennas. The 300 MHz antenna achieved better signal penetration and was used for most of the survey. Several profiles were run with both GPR antennas and a few with only the 500 MHz antenna.

Initial test profiles at the White Bridge Road Site indicated that the maximum GPR signal penetration at the site was generally less than about 60 nanoseconds (nsec). Thus, GPR data were recorded for this survey with a time window of 90 nsec. The 90 nsec

time window represents an estimated maximum depth of investigation of about 10 feet, using a handbook travel time of 9 nsec/foot for silt and clay rich soils.

The GPR antenna was pulled by hand for all profiles. The profiles were acquired on the staked grid provided by Alliance Technologies and in the locations specified. The profiles are generally spaced 50 feet apart.

1.2.3 Field Sampling

Samples were collected for the surface and subsurface soils. In addition, air samples were collected for health and safety purposes.

Alliance used a combination of hand augering and drill rig services to collect soil samples at predetermined locations. Surface and subsurface samples were collected at the following intervals: 0 to 6 inches, 6 to 18 inches, and 18 to 36 inches. All analyses were for asbestos content. Specific analytical techniques varied depending on sample location and characteristics. The air sampling component involved personal monitoring and ambient air monitoring. All analyses of the air samples were by phase contrast microscopy (PCM).

Surface and subsurface soil samples were collected near the intersecting grid nodes within the site. Surface sampling featured core sample to a depth of 6 inches at each node. Subsurface samples were collected at depths of 6 to 18 inches and 18 to 36 inches, using hand augers, split-spoons, or thin-wall tube samplers. Samples from each depth were laid out separately on plastic sheeting.

Each collected soil sample was visually examined for evidence of suspected asbestos material. If the sample appeared to contain asbestos, it was submitted for polarized light microscopy (PLM) analysis. If no asbestos-contamination was suspected, the sample was submitted for transmission electron microscopy (TEM) analysis. Initially, only surface soils were selected for analysis. Later, a random selection of subsurface soils was submitted for TEM analysis.

1.2.4 Analytical Procedures

In the performance of this Work Assignment, several hundred soil samples were taken at the White Bridge Road Site. These samples consisted of a variety of materials including friable and non-friable asbestos-containing material (ACM), organic matter, topsoil, sand and other inorganic matter. Additionally, there were air samples taken to determine ambient concentrations during soil boring and sampling activities.

Four analytical approaches were used to characterize the extent of contamination. These were: visual screening, polarized light microscopy, transmission electron microscopy, and

phase contrast microscopy. More detail on these procedures is presented in the Quality Assurance Project Plan (QAPjP) component of the FOP.

1.2.5 Deviations from the FOP

There were no major deviations from the FOP during the field/analysis effort. The number of sample points was not firmly defined in the FOP. However, after review of the site and discussion with EPA, it was agreed that the number of sample points would be in the range of 90 to 100. Alliance finished the White Bridge Road Site with the collection of samples from 112 points based on a 50-foot grid interval.

The most notable deviation from the FOP was regarding the number of air samples collected. There was only one sampling period per day (rather than two). This represented a reduction of five samples per day. This decision was based on the agreement that one sample period would be sufficiently representative for daily activities.

The FOP also estimated the drilling effort to be three points. This was increased to eighteen points to better characterize known fill areas.

None of these deviations are suspected to have an adverse impact on the overall quality of the data generated under this Work Assignment.

1.3 Report Organization

The remainder of this report is divided into three major sections: Summary of Results, Nature and Extent of Contamination, and Summary and Conclusions. The Site Survey and Percent Asbestos Surface Soil Maps are included in a Map Pocket at the back of this volume. Raw Data are provided as Appendices. All appendices are in a separate volume.

Section 2, Summary of Results, includes tabulated results of the numerous analyses performed for this assignment. Also included within this section are several site maps used for identifying sample points and concentrations. Results from the ground penetrating radar survey are also provided in this Section. Results of the health and safety air monitoring conducted during the field effort are tabulated. This section has a summary of quality control measures and data limitations identified during the data reduction and validation component of this assignment.

Section 3, Nature and Extent of Contamination, further defines areas and estimated volumes of asbestos contamination identified during this assignment. Several geologic cross-sections are presented to better characterize the volume and location of fill material.

Section 4, Summary and Conclusions, reviews data issues discussed in the report. The subsection for conclusions includes recommendations for remedial actions.

Volume II of this report includes all Appendices. Field data sheets, analytical summary sheets, maps and the complete GPR report are provided in Volume II.

2.0 SUMMARY OF RESULTS

This section summarizes the results of the sampling and analysis effort. It is divided into a series of tables listing analytical results, a discussion on the ground penetrating radar results, a summary of quality control results, and data limitations.

2.1 Soil Investigation

Several tables are presented in this subsection to summarize analytical results. Table 2-1 lists the percent asbestos detected in the samples analyzed during this Work Assignment. The samples which were analyzed represent a subset of the actual samples collected. The following samples were selected for analysis:

- All surface samples were analyzed
- A random selection of subsurface samples.

All other samples were archived for possible future analysis.

Table 2-1 shows 176 analyses were performed by transmission electron microscopy and 33 analyses were performed by polarized light microscopy. The TEM data shows 110 of 176 analyses found no asbestos. Of the 66 samples analyzed by TEM where asbestos was found, 0.07% was the average concentration, with only one sample at a concentration greater than 1 percent. This was expected since samples scheduled for TEM analyses were from areas thought to be free of asbestos containing material.

Of the 33 samples analyzed by PLM, 22 were reported to be <1% or 0. Samples that were reported <1% were also analyzed by TEM to better quantify the concentration. Samples that were scheduled for PLM analyses were collected from areas of known asbestos contamination or were judged by the field sampling personnel to contain asbestos.

Table 2-2 lists all samples analyzed by TEM that had detectable quantities of asbestos present. Also listed are the characteristics of the asbestos fibers found in these samples. Review of this data shows the averages for the dimensions of the chrysotile fibers to be of length, 4.3 microns, width, 0.10 microns, and thickness, 0.09 microns. Several of the fibers were so small that a thickness value was not reported.

Table 2-3 is provided to compare surface and subsurface concentrations. Information from Table 2-1 was sorted to remove all data points that did not have analytical results of subsurface samples. This subset was further refined to remove data points that had "0" for both the surface and subsurface sample.

Table 2-1. Analytical Results Summary – White Bridge Road

Grid Point	Sampling Date	Depth (inches)	Analytical Technique		Comments
			TEM % Asbestos	*PLM* % Asbestos	
N 600 E 500	-10/31-	6	0		
N 600 E 550	-10/31-	6	0		
N 600 E 600	-11/1-	6	0.002181		
N 600 E 600	-11/1-	18	0		
N 650 E 450	-10/31-	6	0		
N 650 E 500	-10/31-	6	0		Lab duplicate
N 650 E 500	-10/31-	6	0.000270		Lab duplicate
N 650 E 500	-10/31-	18	0		
N 650 E 550	-10/31-	6	0		
N 650 E 600	-11/1-	6 A	1.060388	< 1.0	
N 650 E 600	-11/1-	6 B		< 1.0	Lab duplicate
N 650 E 600	-11/1-	6 B		< 1.0	Lab duplicate
N 650 E 650	-11/1-	6	0		
N 700 E 450	-10/31-	6	0		
N 700 E 550	-11/2-	6		10.0	
N 700 E 650	-11/1-	6	0		
N 750 E 400	-10/31-	6	0.015706		
N 750 E 400	-10/31-	18	0.003578		Lab duplicate
N 750 E 400	-10/31-	18	0.016831		Lab duplicate
N 750 E 500	-10/31-	6	0.001113		
N 750 E 500	-10/31-	18	0		
N 750 E 600	-11/2-	6	0.163962		
N 750 E 600	-11/2-	48	0		Lab duplicate
N 750 E 600	-11/2-	48	0		Lab duplicate
N 750 E 750	-11/1-	6	0		
N 800 E 300	-10/31-	6	0		Lab duplicate
N 800 E 300	-10/31-	6	0		Lab duplicate
N 800 E 400	-10/31-	6	0.003776		
N 800 E 500	-10/31-	6 A		0.0	Field/Lab duplicate
N 800 E 500	-10/31-	6 A		< 1.0	Lab duplicate
N 800 E 500	-10/31-	6 B		< 1.0	Field duplicate
N 850 E 150	-10/31-	6	0.001789		
N 850 E 150	-10/31-	18	0.000673		
N 850 E 300	-10/31-	6	0		

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy
TEM method detection limit is 0.5 %. PLM detection Limit is 1 %.

Table 2-1. Analytical Results Summary – White Bridge Road (cont)

Grid Point	Sampling Date	Depth (inches)	Analytical Technique		Comments
			TEM % Asbestos	PLM % Asbestos	
N 850 E 500	-10/31-	6	0.000299		
N 850 E 500	-10/31-	18	0		
N 850 E 550	-11/2-	6		0.0	
N 850 E 600	-11/2-	6	0.330782	< 1.0	
N 850 E 750	-11/1-	6	0		Lab Duplicate
N 850 E 750	-11/1-	6	0.000408		Lab Duplicate
N 850 E 750	-11/1-	18	0		
N 900 E 100	-10/31-	6	0.001116		
N 900 E 100	-10/31-	18	0		
N 900 E 150	-10/31-	6		20.0	
N 900 E 300	-10/31-	6 A	0.000612		Field duplicate
N 900 E 300	-10/31-	6 B	0.003081		Field duplicate
N 900 E 300	-10/31-	18 A	0		
N 900 E 400	-10/31-	6	0.000572		
N 900 E 400	-10/31-	18	0		
N 900 E 500	-10/31-	6	0		
N 900 E 550	-10/31-	6		0.0	
N 900 E 650	-11/2-	6		15.0	
N 950 E 100	-10/31-	6	0.001961		
N 950 E 100	-10/31-	18	0.001087		
N 950 E 200	-10/31-	6	0		
N 950 E 500	-10/31-	6	0		
N 950 E 800	-11/1-	6 A	0		Field Duplicate
N 950 E 800	-11/1-	6 B	0		Field Duplicate
N1000 E 150	-10/31-	6		5.0	
N1000 E 200	-10/31-	6	0.003483		
N1000 E 200	-10/31-	18	0		
N1000 E 250	-10/31-	6	0.000646		
N1000 E 350	-10/31-	6	0.000193		Lab duplicate
N1000 E 350	-10/31-	6	0.003162		Lab duplicate
N1000 E 350	-10/31-	18	0		
N1000 E 400	-10/31-	6	0		
N1000 E 500	-10/31-	6	0.000285		
N1000 E 550	-10/31-	6		5.0	

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy

TEM method detection limit is 0.5 %. PLM detection Limit is 1 %.

Table 2-1. Analytical Results Summary – White Bridge Road (cont)

Grid Point	Sampling Date	Depth *(inches)*	Analytical Technique		Comments
			TEM % Asbestos	*PLM* % Asbestos	
N1050 E 450	-10/30-	6	0		
N1050 E 500	-10/30-	6		0.0	
N1050 E 550	-11/1-	6		0.0	
N1050 E 800	-11/1-	6	0		
N1100 E 100	-10/31-	6	0.000204		Lab duplicate
N1100 E 100	-10/31-	6	0		Lab duplicate
N1100 E 150	-10/31-	6	0.034650		
N1100 E 150	-10/31-	18	0.000493		
N1100 E 200	-10/31-	6	0.000405		
N1100 E 200	-10/31-	18	0		
N1100 E 300	-10/30-	6	0.001695		Field Duplicate
N1100 E 300	-10/31-	6	0.006048		Field Duplicate
N1100 E 300	-10/30-	18	0		Field Duplicate
N1100 E 300	-10/31-	18	0		Field Duplicate
N1100 E 350	-10/30-	6	0.027969		
N1100 E 350	-10/30-	18	0.000283		
N1100 E 400	-10/30-	6	0.002123		
N1100 E 400	-10/30-	18	0		
N1100 E 450	-10/30-	6	0.000387		
N1100 E 450	-10/30-	18	0		
N1100 E 500	-10/30-	6	0		
N1100 E 550	-10/30-	6	0.546812		
N1100 E 550	-10/30-	18	0.434025		
N1100 E 600	-11/1-	6		5.0	
N1100 E 650	-11/2-	6		0.0	
N1100 E 650	-11/2-	24		20.0	
N1100 E 700	-11/1-	6		5.0	
N1100 E 750	-11/2-	6	0.043027		
N1100 E 750	-11/2-	24	0.017218		Lab duplicate
N1100 E 750	-11/2-	24	0.005544		Lab duplicate
N1100 E 750	-11/2-	96	0.043027		
N1100 E 800	-11/2-	6	0		
N1150 E 350	-10/29-	6	0.000315		
N1150 E 400	-10/29-	6	0		

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy
TEM method detection limit is 0.5 %. PLM detection Limit is 1 %.

Table 2-1. Analytical Results Summary – White Bridge Road (cont)

Grid Point	Sampling Date	Depth (inches)	Analytical Technique		Comments
			TEM % Asbestos	PLM % Asbestos	
N1150 E 400	-10/29-	18	0		Lab duplicate
N1150 E 400	-10/29-	18	0		Lab duplicate
N1150 E 450	-10/29-	6	0		
N1150 E 450	-10/29-	18	0		
N1150 E 500	-10/29-	6	0.000868		
N1150 E 550	-10/30-	6	0.011684		
N1150 E 800	-11/1-	6	0		
N1200 E 100	-10/31-	6	0		
N1200 E 100	-10/31-	18	0		
N1200 E 150	-10/31-	6 A	0		
N1200 E 350	-10/29-	6 A	0		Lab duplicate
N1200 E 350	-10/29-	6 A	0		Lab duplicate
N1200 E 350	-10/29-	18 A	0		
N1200 E 350	-10/29-	18 B	0.000371		Field duplicate
N1200 E 350	-10/29-	36 B	0		
N1200 E 400	-10/29-	6 A	0.001021		
N1200 E 450	-10/29-	6	0		
N1200 E 450	-10/29-	18	0.000306		
N1200 E 450	-10/29-	36	0		Lab duplicate
N1200 E 450	-10/29-	36	0		Lab duplicate
N1200 E 500	-10/29-	6 A	0		Field duplicate
N1200 E 500	-10/29-	18 A	0		Field duplicate
N1200 E 500	-10/29-	6 B	0		Field duplicate
N1200 E 500	-10/29-	18 B	0		Field duplicate
N1200 E 550	-10/30-	6 A	0		
N1200 E 550	-10/30-	18 A	0		
N1200 E 550	-10/30-	18 B	0		
N1200 E 650	-11/2-	24		5.0	Lab duplicate
N1200 E 650	-11/2-	24		4.0	Lab duplicate
N1200 E 700	-11/1-	6		15.0	
N1200 E 750	-11/1-	6	0.000374		
N1200 E 750	-11/1-	18	0		
N1217 E 587	-10/30-	6	0.037740	< 1.0	
N1250 E 250	-10/30-	6		0.0	
N1250 E 300	-10/30-	6	0.006313		

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy
TEM method detection limit is 0.5 %. PLM detection Limit is 1 %.

Table 2-1. Analytical Results Summary – White Bridge Road (cont)

Grid Point	Sampling Date	Depth (Inches)	Analytical Technique		Comments
			TEM % Asbestos	PLM % Asbestos	
N1250 E 300	-10/30-	18	0.000448		
N1250 E 350	-10/29-	6 A	0		
N1250 E 400	-10/29-	6	0.004118		
N1250 E 450	-10/29-	6 A	0.000856		Field duplicate
N1250 E 450	-10/29-	6 B		0.0	Field duplicate/Lab
N1250 E 450	-10/29-	6 B		0.0	Field duplicate/Lab
N1250 E 500	-10/29-	6	0		
N1250 E 500	-10/29-	18	0		
N1250 E 550	-10/30-	6	0		
N1250 E 550	-10/30-	18	0		
N1250 E 600	-10/30-	6	0		
N1250 E 600	-10/30-	18	0		
N1250 E 650	-10/30-	6		0.0	
N1250 E 800	-11/1-	6	0		
N1300 E 350	-10/30-	6 A	0		Field duplicate
N1300 E 350	-10/30-	6 B	0		Field duplicate
N1300 E 350	-10/30-	18 A	0		Field duplicate
N1300 E 350	-10/30-	18 B	0		Field duplicate
N1300 E 400	-10/29-	6	0.003192		
N1300 E 400	-10/29-	18	0		
N1300 E 450	-10/30-	6	0		Lab duplicate
N1300 E 450	-10/30-	6	0		Lab duplicate
N1300 E 450	-10/30-	18	0		Lab duplicate
N1300 E 450	-10/30-	18	0		Lab duplicate
N1300 E 500	-10/30-	6		0.0	Lab duplicate
N1300 E 500	-10/30-	6		0.0	Lab duplicate
N1300 E 500	-10/30-	18	0		
N1300 E 700	-11/1-	6	0.000501		
N1350 E 400	-10/30-	6	0.000222		
N1350 E 450	-10/30-	6	0		
N1350 E 450	-10/30-	18	0		
N1350 E 500	-10/30-	6	0		
N1350 E 500	-10/30-	18	0		
N1350 E 650	-10/30-	6	0.006597		
N1350 E 650	-10/30-	18	0		

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy

TEM method detection limit is 0.5 %. PLM detection Limit is 1 %.

Table 2-1. Analytical Results Summary – White Bridge Road (cont)

Grid Point	Sampling Date	Depth (inches)	Analytical Technique		Comments
			TEM % Asbestos	PLM % Asbestos	
N1350 E 800	-11/1-	6	0		
N1400 E 250	-10/30-	6	0.001273		
N1400 E 250	-10/30-	18	0		
N1400 E 300	-10/30-	6	0		
N1400 E 300	-10/30-	18	0		
N1400 E 350	-10/30-	6	0.000376		
N1400 E 350	-10/30-	18	0		
N1400 E 400	-10/30-	6 A	0		Field duplicate
N1400 E 400	-10/30-	6 B	0		Field duplicate
N1400 E 400	-10/30-	18 A	0		Field duplicate
N1400 E 400	-10/30-	18 B	0		Field duplicate
N1400 E 450	-10/30-	6	0		
N1400 E 450	-10/30-	18	0		
N1400 E 500	-10/30-	6	0		
N1400 E 500	-10/30-	18	0		
N1400 E 600	-10/30-	6	0		Lab duplicate
N1400 E 600	-10/30-	6	0.000229		Lab duplicate
N1400 E 600	-10/30-	18	0		
N1400 E 650	-10/30-	6	0.479973	< 1.0	
N1450 E 250	-10/30-	6	0.095782	< 1.0	
N1450 E 450	-10/30-	6	0		
N1450 E 450	-10/30-	18	0		Lab duplicate
N1450 E 450	-10/30-	18	0		Lab duplicate
N1450 E 500	-10/30-	6	0.000377		
N1450 E 550	-10/30-	6	0.000666		
N1450 E 600	-10/30-	6	0		Lab duplicate
N1450 E 600	-10/30-	6	0		Lab duplicate
N1450 E 600	-10/30-	18	0		
N1450 E 650	-11/1-	6	0.971433	< 1.0	
N1450 E 700	-11/1-	6	0.000347		
N1450 E 700	-11/1-	18	0		
			TEM	PLM	
Total Number of Analyses			176	33	

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy
TEM method detection limit is 0.5 %. PLM detection Limit is 1 %.

Of the 34 data points presented in this subset, 22 were situations where asbestos was found in the surface sample (0 to 6 inches) but not in the subsurface sample (usually the 6 to 18 inch interval). For 7 of the data points, asbestos was found in both the surface and subsurface sample. In each of these instances, the higher concentration was present in the surface sample. These sample points were not limited to known fill areas. Points were also found in the riding field near the stable (three points along E 350) and near the southwest border.

Alliance collected four samples to represent native soils as background samples. Each of these samples were analyzed by TEM. None of the samples contained detectable amounts of asbestos. Offsite samples were collected to determine background asbestos content in naturally occurring soils in the area. The following describes the sample location for the background soil samples:

- NW Uplands - 2.6 miles from intersection of White Bridge Road and New Vernon Road, just beyond Mary Knoll Drive on the west side of the street.
- NW Wetlands - 1.3 miles from the intersection of White Bridge Road and New Vernon Road, on the west side of the street.
- NW Uplands - In wooded areas between 542 and 580 Meyersville Road.
- Wetlands - In a wooded swampy area adjacent to 26 Maple Road, approximately 150 yards from the road.

These locations were selected because they were upwind and upgradient from the site being investigated. These locations were judged by Alliance geologists to be the best available points for characterizing background samples.

2.2 Ground Penetrating Radar (GPR)

2.2.1 Objective

A GPR survey was performed at the White Bridge Road Site to determine the vertical and spatial extent of the asbestos fill material. Although GPR does not allow detection of asbestos containing material, the GPR method is useful for differentiating between naturally bedded material (soils, sand, clay and peat deposits), and non-natural occurring exotic material dumped at this site composed primarily of asbestos tiles. The purpose of the GPR survey was to assist in identifying the uppermost fill areas. Alliance also used the GPR data (to a lesser degree) to assist in the selection of optimum locations for subsurface borings.

Table 2-2. Fiber Dimensions for TEM Detected Asbestos – White Bridge Road

Grid Point		Sampling Date	Depth (Inches)	Asbestos %	Dimensions (μm) *Chrysotile*			Number of Observed *Chrysotile*		
					Length	*Width*	*Thickness*	*Mass*	*Fibers*	*Bundles*
N 600	E 600	-11/1-	6	0.002181	*1.2*	*0.00*	*0.12*	*8.640*	*0*	*1*
N 650	E 500	-10/31-	6	0.000270	0.6	0.10	nr	1.225	1	0
N 650	E 600	-11/1-	6 A	1.060388	4.2	0.57	0.16	3443	1	11
N 750	E 400	-10/31-	6	0.015706	1.6	0.10	0.09	50.992	3	11
N 750	E 400	-10/31-	18	0.003578	1.3	0.08	0.07	11.618	2	3
N 750	E 400	-10/31-	18	0.016871	0.8	0.01	0.06	54.645	3	3
N 750	E 500	-10/31-	6	0.001113	2.3	0.10	nr	4.697	1	0
N 750	E 600	-11/2-	6	0.163962	6.1	0.18	0.12	617.518	1	14
N 800	E 400	-10/31-	6	0.003776	1.6	0.09	0.09	14.222	0	4
N 850	E 150	-10/31-	6	0.001789	1.8	0.09	nr	5.871	2	0
N 850	E 150	-10/31-	18	0.000673	1.5	0.08	0.07	2.184	0	1
N 850	E 500	-10/31-	6	0.000299	0.5	0.10	0.11	1.300	1	0
N 850	E 600	-11/2-	6	0.330782	29.0	0.13	0.11	1138.4	1	13
N 850	E 750	-11/1-	6	0.000408	1.0	0.08	0.07	1.456	0	1
N 900	E 100	-10/31-	6	0.001116	1.3	0.09	0.08	4.347	0	2
N 900	E 300	-10/31-	6 A	0.000612	1.5	0.08	0.07	2.184	0	1
N 900	E 300	-10/31-	6 B	0.003081	2.0	0.00	nr	10.603	1	0
N 900	E 400	-10/31-	6	0.000572	0.8	0.10	0.10	2.080	0	1
N 950	E 100	-10/31-	6	0.001961	1.1	0.08	0.08	7.511	0	5
N 950	E 100	-10/31-	18	0.001087	0.9	0.08	0.10	3.530	2	1
N1000	E 200	-10/31-	6	0.003483	1.4	0.08	0.08	12.891	2	4
N1000	E 250	-10/31-	6	0.000646	1.0	0.10	0.10	2.600	0	1
N1000	E 350	-10/31-	6	0.000193	0.7	0.07	nr	0.700	1	0
N1000	E 350	-10/31-	6	0.003162	1.3	0.09	0.09	10.881	0	4
N1000	E 500	-10/31-	6	0.000285	1.0	0.07	0.06	1.092	0	1
N1100	E 100	-10/31-	6	0.000204	0.7	0.07	nr	0.700	1	0
N1100	E 150	-10/31-	6	0.034650	9.0	0.25	0.20	117.0	0	1

nr – Not Reported; Data in italics is Amphibole.
TEM method detection limit is 0.5%

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Table 2-2. Fiber Dimensions for TEM Detected Asbestos – White Bridge Road (cont)

Grid Point	Sampling Date	Depth (inches)	Asbestos %	Dimensions (μm) *Chrysotile*			Number of Observed *Chrysotile*		
				Length	*Width*	*Thickness*	*Mass*	*Fibers*	*Bundles*
N1100 E 150	-10/31-	18	0.000493	0.8	0.10	nr	1.634	1	0
N1100 E 200	-10/31-	6	0.000405	1.3	0.07	0.06	1.420	0	1
N1100 E 300	-10/30-	6	0.001695	1.6	0.08	0.08	7.155	0	2
N1100 E 300	-10/31-	6	0.006048	2.7	0.10	0.10	22.777	1	3
N1100 E 350	-10/30-	6	0.027969	2.6	0.19	0.15	118.051	1	2
N1100 E 350	-10/30-	18	0.000283	1.2	0.06	0.05	0.936	0	1
N1100 E 400	-10/30-	6	0.002123	3.5	0.10	0.10	9.100	0	1
N1100 E 450	-10/30-	6	0.000387	1.0	0.08	0.07	1.456	0	1
N1100 E 550	-10/30-	6	0.546812	31.9	0.10	0.09	2343	2	16
				5.6	*0.00*	*0.30*	*nr*	*2*	*1*
N1100 E 550	-10/30-	18	0.434025	30.1	0.10	0.09	1409	0	17
				4.7	*0.00*	*0.11*	*nr*	*0*	*5*
N1100 E 750	-11/2-	96	0.043027	7.8	0.09	0.08	142.5	0	8
N1100 E 750	-11/2-	24	0.0172188	2.4	0.10	0.09	67.083	1	9
N1100 E 750	-11/2-	24	0.005544	1.6	0.06	0.06	18.722	8	10
N1150 E 350	-10/29-	6	0.000315	1.4	0.09	nr	2.316	1	0
N1150 E 500	-10/29-	6	0.000868	1.5	0.10	0.10	3.900	0	1
N1150 E 550	-10/30-	6	0.011684	2.6	0.08	0.07	51.590	2	10
N1200 E 350	-10/29-	18 B	0.000371	0.5	0.10	0.10	1.300	0	1
N1200 E 400	-10/29-	6 A	0.001021	3.5	0.08	0.07	5.096	0	1
N1200 E 450	-10/29-	18	0.000306	1.0	0.07	0.06	1.092	0	1
N1200 E 750	-11/1-	6	0.000374	1.2	0.07	0.06	1.310	0	1
N1217 E 587	-10/30-	6	0.037740	6.4	0.09	0.10	122.5	1	7
N1250 E 300	-10/30-	6	0.006313	2.7	0.09	0.08	24.596	0	4
N1250 E 300	-10/30-	18	0.000448	1.0	0.08	0.07	1.456	0	1
N1250 E 400	-10/29-	6	0.004118	2.4	0.09	0.07	17.079	1	3
N1250 E 450	-10/29-	6 A	0.000856	1.4	0.10	0.10	3.640	0	1
N1300 E 400	-10/29-	6	0.003192	4.1	0.10	0.10	10.660	1	0

nr – Not Reported; Data in italics is Amphibole.
TEM method detection limit is 0.5%

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Table 2-2. Fiber Dimensions for TEM Detected Asbestos – White Bridge Road (cont)

Grid Point		Sampling Date	Depth (inches)	Asbestos %	Dimensions (μm) Chrysotile			Number of Observed Chrysotile		
					Length	*Width*	*Thickness*	*Mass*	*Fibers*	*Bundles*
N1300	E 700	-11/1-	6	0.000501	3.0	0.05	0.05	1.950	0	1
N1350	E 400	-10/30-	6	0.000222	1.8	0.04	0.04	0.749	0	1
N1350	E 650	-10/30-	6	0.006597	1.4	0.06	0.06	22.705	1	6
N1400	E 250	-10/30-	6	0.001273	1.3	0.09	0.09	4.961	0	2
N1400	E 350	-10/30-	6	0.000376	2.0	0.07	nr	2.001	1	0
N1400	E 600	-10/30-	6	0.000229	1.0	0.06	0.06	0.936	0	1
N1400	E 650	-10/30-	6	0.479973	32.5	0.14	0.12	1558	1	15
N1450	E 250	-10/30-	6	0.095782	12.6	0.09	0.09	323.4	0	10
N1450	E 500	-10/30-	6	0.000377	0.9	0.10	nr	1.838	1	0
N1450	E 550	-10/30-	6	0.000666	0.7	0.09	0.09	2.465	0	2
N1450	E 650	-10/30-	6	0.971433	28.8	0.35	0.12	3280	2	13
N1450	E 700	-11/1-	6	0.000347	1.5	0.06	0.05	1.170	0	1
		Averages		*0.067142*	*4.4*	*0.10*	*0.00*			
		Standard Deviation		*0.203285*	*7.8*	*0.08*	*0.00*			
		Number of Measurements		*65*	*67.0*	*67.00*	*0.00*			
		Maximum		*1.060388*	*32.5*	*0.57*	*0.00*			
		Minimum		*0.000193*	*0.5*	*0.00*	*0.00*			

nr – Not Reported; Data in italics is Amphibole.
TEM method detection limit is 0.5%

Table 2-3. Analytical Results Summary – White Bridge Road Detected in the Surface and/or Subsurface

Grid Point	Sampling Date	Depth *(inches)*	Analysis by	Asbestos *(%)*	Asbestos Detected Only in Surface Samples *(0–6")*	Asbestos Detected Only in Subsurface Samples *(> 6")*	Asbestos Detected in Surface and Subsurface Samples	Comments
N 600 E 600	-11/1-	6	TEM	0.002181	X			
N 600 E 600	-11/1-	18	TEM	0				
N 650 E 500	-10/31-	6	TEM	0	X			Lab duplicate
N 650 E 500	-10/31-	6	TEM	0.000270				Lab duplicate
N 650 E 500	-10/31-	18	TEM	0				
N 750 E 400	-10/31-	6	TEM	0.015706			X	
N 750 E 400	-10/31-	18	TEM	0.003578				Lab duplicate
N 750 E 400	-10/31-	18	TEM	0.016871				Lab duplicate
N 750 E 500	-10/31-	6	TEM	0.001113	X			
N 750 E 500	-10/31-	18	TEM	0				
N 750 E 600	-11/2-	6	TEM	0.163962	X			
N 750 E 600	-11/2-	48	TEM	0				Lab duplicate
N 750 E 600	-11/2-	48	TEM	0				Lab duplicate
N 850 E 150	-10/31-	6	TEM	0.001789			X	
N 850 E 150	-10/31-	18	TEM	0.000673				
N 850 E 500	-10/31-	6	TEM	0.000299	X			
N 850 E 500	-10/31-	18	TEM	0				
N 850 E 750	-11/1-	6	TEM	0	X			Lab Duplicate
N 850 E 750	-11/1-	6	TEM	0.000408				Lab Duplicate
N 850 E 750	-11/1-	18	TEM	0				
N 900 E 100	-10/31-	6	TEM	0.001116	X			
N 900 E 100	-10/31-	18	TEM	0				
N 900 E 300	-10/31-	6 A	TEM	0.000612	X			Field duplicate
N 900 E 300	-10/31-	6 B	TEM	0.003081				Field duplicate

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy

TEM method detection limit is 0.5%; PLM detection limit is 1%

Table 2-3. Analytical Results Summary – White Bridge Road Detected in the Surface and/or Subsurface (cont)

Grid Point	Sampling Date	Depth *(inches)*	Analysis by	Asbestos *(%)*	Asbestos Detected Only in Surface Samples *(0–6")*	Asbestos Detected Only in Subsurface Samples *(> 6")*	Asbestos Detected in Surface and Subsurface Samples	Comments
N 900 E 300	–10/31–	18 A	TEM	0				
N 900 E 400	–10/31–	6	TEM	0.000572	X			
N 900 E 400	–10/31–	18	TEM	0				
N 950 E 100	–10/31–	6	TEM	0.001961			X	
N 950 E 100	–10/31–	18	TEM	0.001087				
N1000 E 200	–10/31–	6	TEM	0.003483	X			
N1000 E 200	–10/31–	18	TEM	0				
N1000 E 350	–10/31–	6	TEM	0.000193	X			Lab duplicate
N1000 E 350	–10/31–	6	TEM	0.003162				Lab duplicate
N1000 E 350	–10/31–	18	TEM	0				
N1100 E 150	–10/31–	6	TEM	0.034650			X	
N1100 E 150	–10/31–	18	TEM	0.000493				
N1100 E 200	–10/31–	6	TEM	0.000405	X			
N1100 E 200	–10/31–	18	TEM	0				
N1100 E 300	–10/30–	6	TEM	0.001695	X			Field Duplicate
N1100 E 300	–10/31–	6	TEM	0.006048				Field Duplicate
N1100 E 300	–10/30–	18	TEM	0				Field Duplicate
N1100 E 300	–10/31–	18	TEM	0				Field Duplicate
N1100 E 350	–10/30–	6	TEM	0.027969			X	
N1100 E 350	–10/30–	18	TEM	0.000283				
N1100 E 400	–10/30–	6	TEM	0.002123	X			
N1100 E 400	–10/30–	18	TEM	0				
N1100 E 450	–10/30–	6	TEM	0.000387	X			
N1100 E 450	–10/30–	18	TEM	0				

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy

TEM method detection limit is 0.5%; PLM detection limit is 1%

Table 2–3. Analytical Results Summary – White Bridge Road Detected in the Surface and/or Subsurface (cont)

Grid Point	Sampling Date	Depth *(inches)*	Analysis by	Asbestos *(%)*	Asbestos Detected Only in Surface Samples *(0–6")*	Asbestos Detected Only in Subsurface Samples *(> 6")*	Asbestos Detected in Surface and Subsurface Samples	Comments
N1100 E 550	–10/30–	6	TEM	0.546812			X	
N1100 E 550	–10/30–	18	TEM	0.434025				
N1100 E 650	–11/2–	6	PLM	0.0		X		
N1100 E 650	–11/2–	24	PLM	20.0				
N1100 E 750	–11/2–	24	TEM	0.017218		X		Lab duplicate
N1100 E 750	–11/2–	24	TEM	0.005544				Lab duplicate
N1100 E 750	–11/2–	96	TEM	0.043027				
N1200 E 350	–10/29–	6 A	TEM	0		X		Lab duplicate
N1200 E 350	–10/29–	6 A	TEM	0				Lab duplicate
N1200 E 350	–10/29–	18 A	TEM	0				
N1200 E 350	–10/29–	18 B	TEM	0.000371				Field duplicate
N1200 E 350	–10/29–	36 B	TEM	0				
N1200 E 450	–10/29–	6	TEM	0		X		
N1200 E 450	–10/29–	18	TEM	0.000306				
N1200 E 450	–10/29–	36	TEM	0				Lab duplicate
N1200 E 450	–10/29–	36	TEM	0				Lab duplicate
N1200 E 650	–11/2–	24	PLM	5.0		X		Lab duplicate
N1200 E 650	–11/2–	24	PLM	4.0				Lab duplicate
N1200 E 750	–11/1–	6	TEM	0.000374	X			
N1200 E 750	–11/1–	18	TEM	0				
N1250 E 300	–10/30–	6	TEM	0.006313			X	
N1250 E 300	–10/30–	18	TEM	0.000448				
N1300 E 400	–10/29–	6	TEM	0.003192	X			
N1300 E 400	–10/29–	18	TEM	0				

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy

TEM method detection limit is 0.5%; PLM detection limit is 1%

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Table 2-3. Analytical Results Summary – White Bridge Road Detected in the Surface and/or Subsurface (cont)

Grid Point	Sampling Date	Depth *(inches)*	Analysis by	Asbestos *(%)*	Asbestos Detected Only in Surface Samples *(0–6")*	Asbestos Detected Only in Subsurface Samples *(> 6")*	Asbestos Detected in Surface and Subsurface Samples	Comments
N1350 E 650	–10/30–	6	TEM	0.006597	X			
N1350 E 650	–10/30–	18	TEM	0				
N1400 E 250	–10/30–	6	TEM	0.001273	X			
N1400 E 250	–10/30–	18	TEM	0				
N1400 E 350	–10/30–	6	TEM	0.000376	X			
N1400 E 350	–10/30–	18	TEM	0				
N1400 E 600	–10/30–	6	TEM	0	X			Lab duplicate
N1400 E 600	–10/30–	6	TEM	0.000229				Lab duplicate
N1400 E 600	–10/30–	18	TEM	0				
N1450 E 700	–11/1–	6	TEM	0.000347	X			
N1450 E 700	–11/1–	18	TEM	0				
				Totals	*22*	*5*	*7*	

PLM – Polarized Light Microscopy; TEM – Transmission Electron Microscopy

TEM method detection limit is 0.5%; PLM detection limit is 1%

2.2.2 *GPR Methodology*

The GPR method imparts an electromagnetic radar impulse directed vertically downward into the ground. The radar signal travels through the earth until it reaches material with a contrasting dielectric constant. Whenever a boundary between two materials of differing dielectric constant is reached, a portion of the radar signal is reflected back to a detector at the surface. The result of a GPR survey is a continuous subsurface profile which may be used to interpolate between known points of control such as borings.

The depth to which GPR signals are capable of penetrating varies from location to location. Depth of penetration is generally controlled by the conductivity of the subsurface material. Highly conductive materials such as metal or even moist clay, are usually very reflective and permit very little radar signal to pass through. Typical penetration depths at the White Bridge Road Site varied from 2 to 8 feet. Asbestos is not a highly conductive material, and therefore, does not attenuate the GPR signal significantly. The high clay content in the native topsoil and underlying sediments at this site provided significant signal attenuation in certain locations. However, in places where the asbestos fill is exposed at the surface (e.g., the riding track), the GPR signal was able to penetrate down to the underlying native soil. In locations where the topsoil cover was over 1 to 2 feet, the GPR signal was unable to penetrate beyond the upper 2 to 3 feet of surficial material.

2.2.3 *Survey Extent*

Figure 2-1 shows the locations of GPR profile traverses collected for the site. Some lines were collected in two portions due to cultural obstructions such as fences. A total of 6,070 linear feet of GPR data was collected using a 300 Mhz antenna at the site. The radar unit was towed by hand at approximately 1 to 2 feet per second (walking pace). The recording time for each GPR trace was 90 nanoseconds.

2.2.4 *Data Processing*

Due to the desire for high resolution profiling, the GPR data were reprocessed using gain, deconvolution and band pass filtering. This combination of signal processing steps sharpens the GPR image and allows more refined interpretation of the subsurface image. The reprocessing was performed using Radan (Version 3.0) software, which is the industry standard processing software. Limited reprocessing was performed at the end of each field day to ensure that the data were useful.

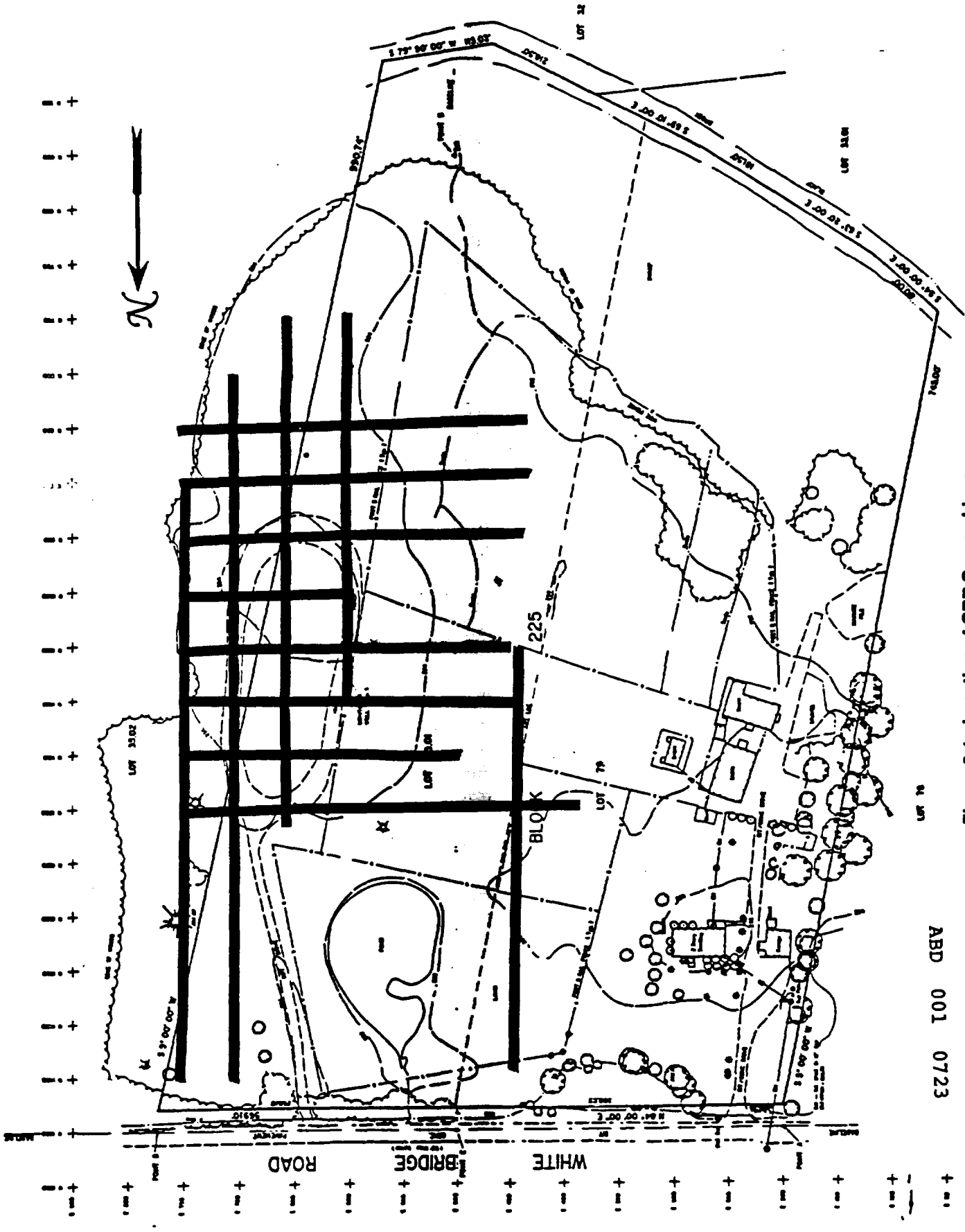

Figure 2-1. Location of GPR Survey Lines.

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2.2.5 *Results*

Figure 2-2 shows GPR line N1100 from the White Bridge Road Site. The upper portion is the reprocessed line and the lower portion shows the field record. Although the field record contains more signal, much of the display is really signal reverberation (like an echo). The deconvolution step in the data processing sequence was designed to eliminate this reverberation and broaden the signal bandwidth. The continuous, undisturbed signal at the upper left portion of the record is indicative of naturally occurring bedded silt and clay. The more chaotic looking, discontinuous signal in the central portion of the record is indicative of filled material, which in this case is mostly asbestos tiles.

Since the GPR method produces an image whose vertical scale is in time, depth interpretation must rely either on knowledge of the electromagnetic wave velocity through the various media or on known subsurface control points such as borings. In this case, there were several borings which were available to calibrate the interpretation of the GPR data.

Borings N1100, E450 through N1100, E650 are displayed on Figure 2-2. These borings show the correlation between thickness of asbestos fill and character of the GPR signal. The thickness of asbestos tile material correlates well with the discontinuous chaotic GPR signal area. The asbestos fill is underlaid by silt, clay, and peat, which are much more conductive, and therefore, the GPR signal penetrates only to the base of the filled material. The faint, near horizontal signal is background noise.

The mushy material which underlies the tile material at N1100, E700 (not on Figure) is not observable on the GPR record. This is probably due to the high conductivity of this slurry material which may contain abundant gypsum (Ca SO_4). The high water content of this material probably has a high concentration of dissolved cations (Ca^{+2}) which raise the conductivity of the slurry, and render it opaque to radar.

Figure 2-3 shows a map of the thickness of the asbestos tile material, interpreted from these data and available boring data. The GPR data are most useful in interpreting the thickness of the fill material where the borings data are sparse. Without the GPR data, the mapping in these areas would be less accurate.

2.3 Air Monitoring Summary

Table 2-4 is a tabulated presentation of the air monitoring results generated during this assignment. Approximate locations for air sampling are shown in Figure 2-4. Results for the area samples ranged from 0 to 0.001 fibers per cubic centimeter (cc). Results for samples collected as part of the personal sampling ranged from 0.001 to 0.012 fibers per cc. Presently, there is not a standard for asbestos in ambient air. There is an

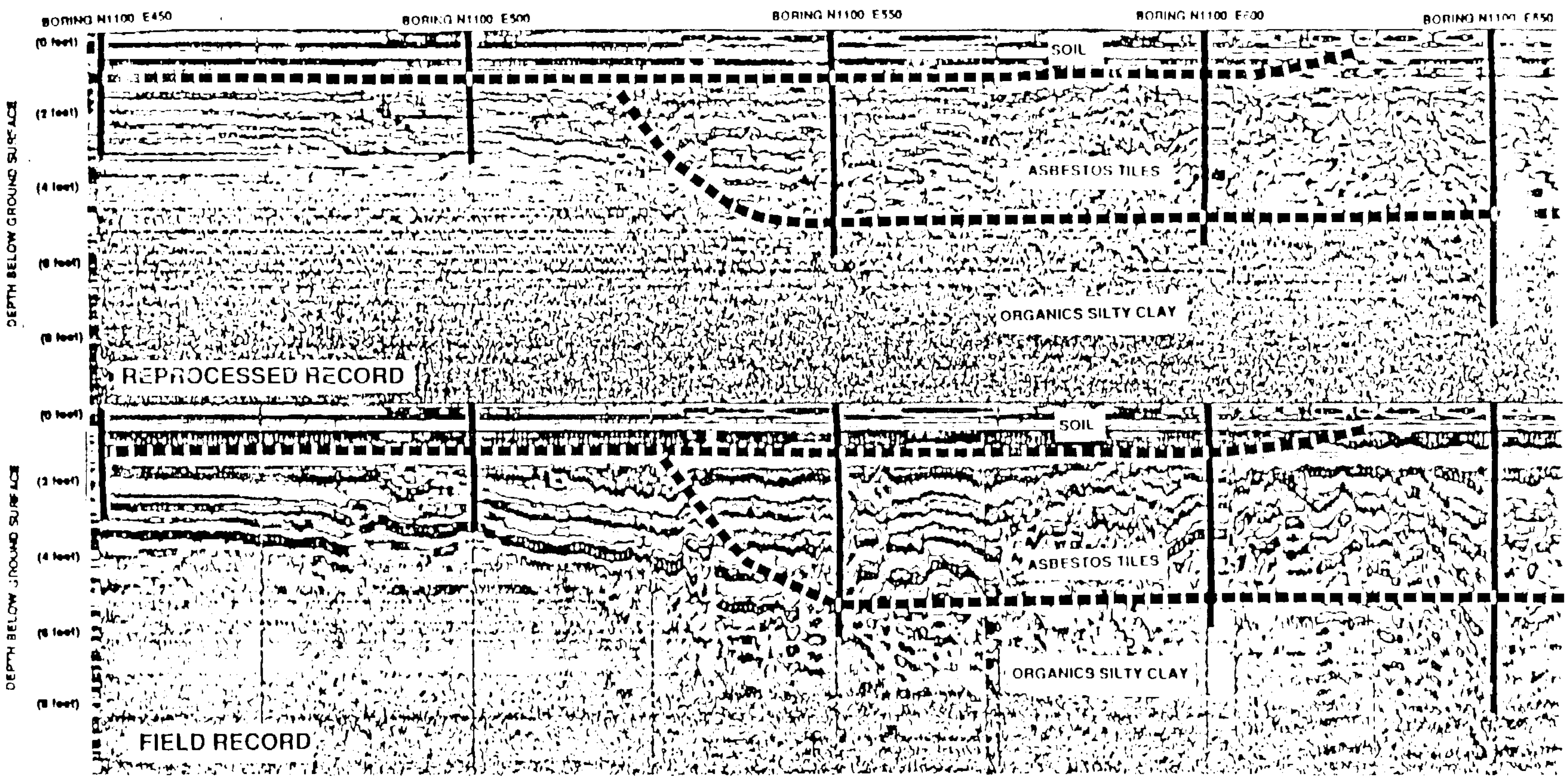

Figure 2-2. GPR Line 1100.

occupational standard of 0.1 fiber/cc (based on an 8-hour time weighted average); however, that is not directly applicable to this site. That standard was intended for indoor remediation activities. This data was generated for health and safety purposes, only. It is not recommended that this data be used for any type of modeling or emission estimates.

2.4 Summary of Quality Control Measures

The QAPjP developed for this Work Assignment outlined various QC procedures to be implemented during the field, laboratory and data reporting components. The following subsections further define and, where appropriate, report calculated results of the QC measures.

2.4.1 Data Collection and Sampling QC Procedures

Alliance used a field logbook to record all major activities at the site on a daily basis. Borings log sheets were used to record all soil characteristics noted during the sampling effort. These logs were transcribed to a computerized data form so the data could be presented by grid point rather than chronologically. All boring log data was QC reviewed for transcription error.

All samples designated for analysis, were shipped under chain-of-custody to Eastern Analytical Laboratories (EAL). Archived samples were kept at the Alliance Mobile Laboratory in file drawers labelled with chain-of-custody tape. At the end of the field effort, archived samples were returned to Alliance where they are being maintained in a locked room in sealed boxes. EAL maintained a similar chain-of-custody where control numbers were assigned and recorded on the original Alliance chain-of-custody form. EAL also stored their samples in a locked room.

Alliance designed a field strategy that featured three teams of two people. Each day, each team was required to collect a duplicate. The Alliance Field Team Leader then selected two of the three field duplicates for analysis. The third field duplicate was archived.

All data was input to a Lotus spreadsheet for summarizing and manipulation. All input was cross-checked by at least one other person. Any calculations on the spreadsheet were verified by hand as part of the routine QC procedure.

Table 2–4. Air Monitoring Results at the White Bridge Road Site

Date of Collection	Type of Sample	Sample I.D.	Sample Location	Sampling Period	Volume Collected (liters)	Concentration (fibers/cc)	Detection Limits (fibers/cc)
Oct. 29	Area	AMB-10/29-UP	Upwind	1456 - 1640	1,040	0.0005	0.0005
		AMB-10/29-DOWN	Downwind	1458 - 1635	970	<0.0005	0.0005
		AMB-10/29-DOWN (Dup.)	Downwind	1458 - 1635	970	0.001	0.0005
	Personal	AMB-10/29-1	Tom L.	1412 - 1629	274	0.002	0.0018
		AMB-10/29-2	Julia I.	1413 - 1633	280	0.004	0.0018
		AMB-10/29-3	Ron P.	1416 - 1631	270	0.002	0.0018
		AMB-10/29-FB1 (Blank)	Field Blank	NA	0 (a)	0.000	0
		AMB-10/29-FB2 (Blank)	Field Blank	NA	0 (a)	0.000	0
Oct. 30	Area	AMB-10/30-UP	Upwind	0930 - 1159	1,490	0.001	0.0003
		AMB-10/30-UP (Dup.)	Upwind	0930 - 1159	1,490	0.000	0.0003
		AMB-10/30-DOWN	Downwind	0919 - 1204	1,650	<0.0003	0.0003
	Personal	AMB-10/30-01	Maria D.	1336 - 1652	392	0.006	0.0013
		AMB-10/30-02	Bob M.	1337 - 1655	396	0.001	0.0012
		AMB-10/30-03	Rick R.	1340 - 1705	410	0.002	0.0012
		AMB-10/30-FB1	Field Blank	NA	0 (a)	0.000	0
		AMB-10/30-FB2	Field Blank	NA	0 (a)	0.000	0
Oct. 31	Area	AMB-10/31-UP	Upwind	0850 - 1715	1,010	0.000	0.0005
		AMB-10/31-DN	Downwind	0900 - 1700	960	<0.0005	0.0005
	Personal	AMB-10/31-01	Julia I.	1410 - 1720	380	0.010	0.0013
		AMB-10/31-01 (Dup.)	Julia I.	1410 - 1720	380	0.012	0.0013
		AMB-10/31-02	Ron P.	1345 - 1650	388	0.004	0.0013
		AMB-10/31-03	Tom L.	1342 - 1701	398	0.005	0.0012
		AMB-10/31-FB1	Field Blank	NA	0 (a)	0.000	0
		AMB-10/31-FB2	Field Blank	NA	0 (a)	0.000	0
Nov. 1	Area	AMB-11/1-UP	Upwind	1115 - 1748	1,179	0.000	0.0004
		AMB-11/1-DN	Downwind	1010 - 1720	1,290	0.000	0.0004
	Personal	AMB-11/1-01	Bob M.	1515 - 1729	268	0.005	0.0018
		AMB-11/1-02	Ron P.	1520 - 1720	240	0.004	0.002
		AMB-11/1-02 (Dup.)	Ron P.	1520 - 1720	240	0.004	0.002
		AMB-11/1-03	Rick R.	1517 - 1725	256	0.004	0.0019
		AMB-11/1-FB1	Field Blank	NA	0 (a)	1.273 (a)	0
		AMB-11/1-FB2	Field Blank	NA	0 (a)	0.000	0
Nov. 2	Area	AMB-11/2-UP	Upwind	0820 - 1200	675	0.001	0.0007
		AMB-11/2-DN	Downwind	0820 - 1200	675	0.001	0.0007
	Personal	AMB-11/2-01	Personal	0815 - 1200	450	0.004	0.0011
		AMB-11/2-02	Personal	0815 - 1200	450	0.010	0.0011
		AMB-11/2-02 (Dup.)	Personal	0815 - 1200	450	0.011	0.0011
		AMB-11/2-FB1	Field Blank	NA	0 (a)	0.000	0
		AMB-11/2-FB2	Field Blank	NA	0 (a)	0.000	0

(a) Field blanks have no sample volume; results expressed as total fiber load (fibers/sq. mm)

Sampling Method: NIOSH 7400; Analytical Method: Phase Contrast Microscopy

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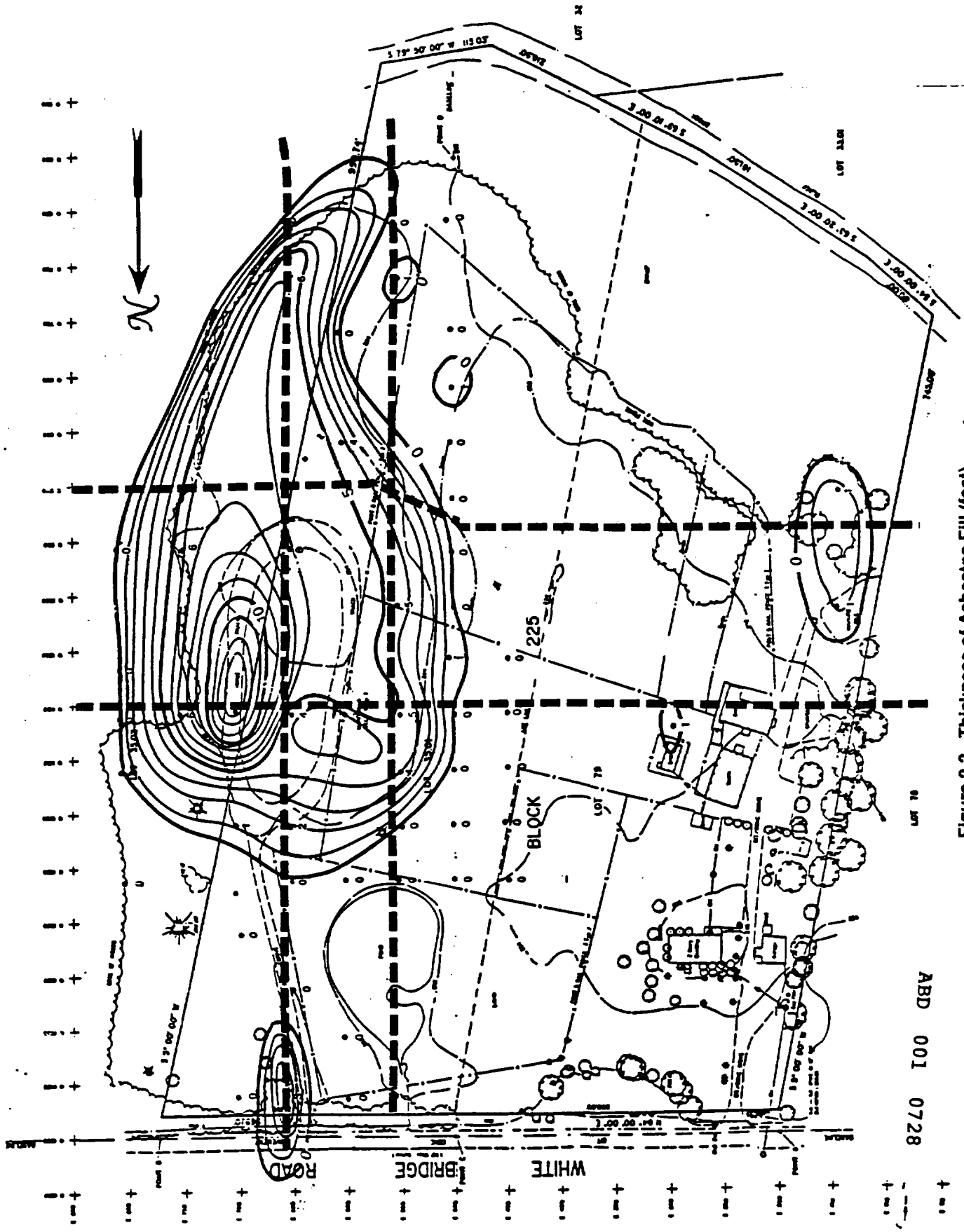

Figure 2-3. Thickness of Asbestos Fill (feet).

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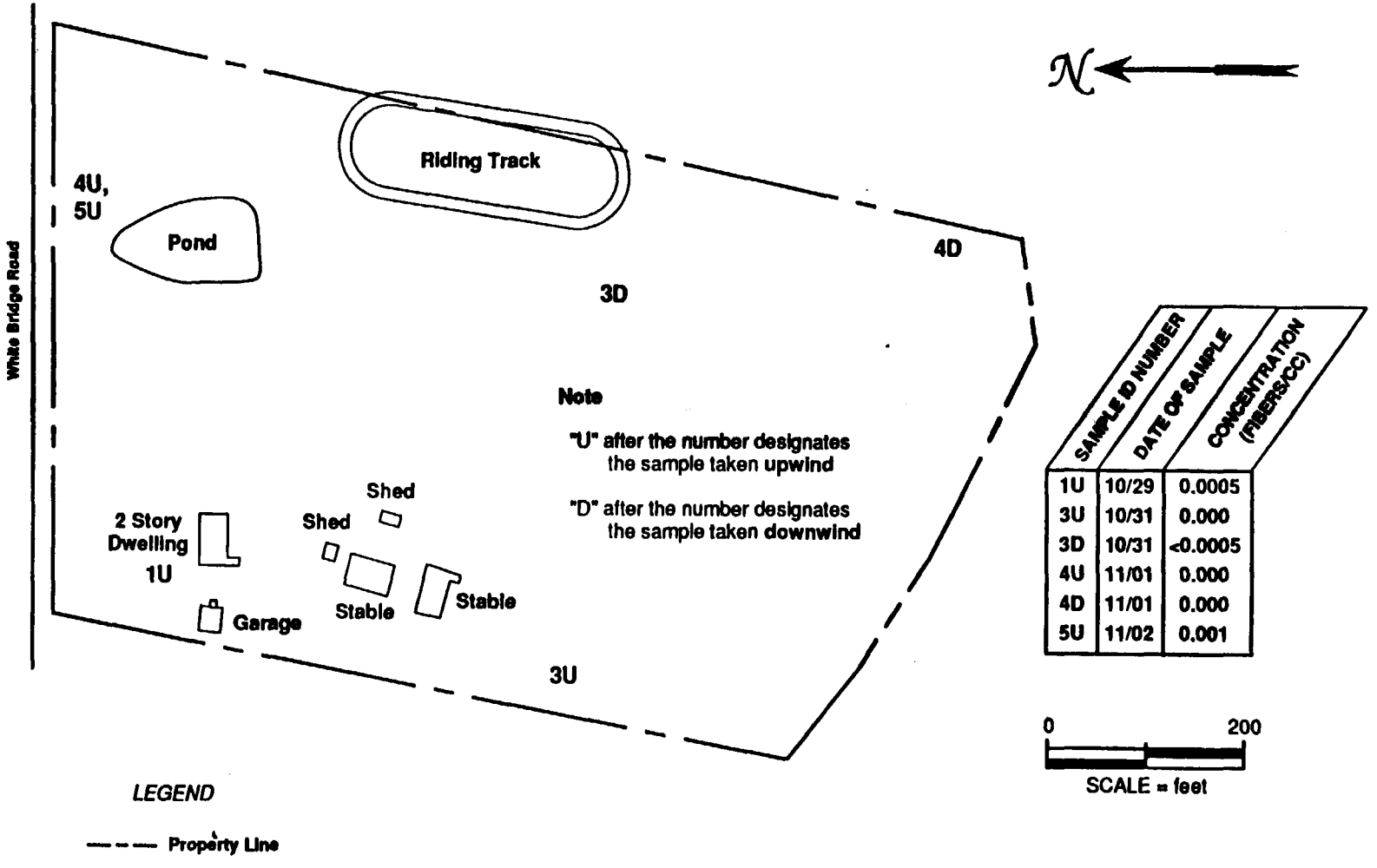

Figure 2-4. Approximate locations for air sampling.

2.4.2 *Analytical QC Procedures*

All analyses were performed by Eastern Analytical Laboratory. EAL is certified by the National Institute of Standards and Technology (NIST). They have a well defined QC program that features various procedures to assure the generation of valid representative data.

All analysts are required to participate in NIST performance evaluation studies. Other routine QC measures in place include:

- **Interlaboratory Studies:** performance evaluation samples are circulated to other laboratories and the results are tabulated by an independent auditor (quarterly).
- **Duplicate Analyses:** A sample is reanalyzed by the same analyst (or a different analyst) during which the same grid but a different opening is reviewed (1 in 10).
- **Replicate Analyses:** The same as a duplicate except it is the same grid and the same opening (1 in 10).
- **Verified Analysis:** The same sample is reviewed by all analysts and reported to the laboratory manager (weekly, or 1 in 250).
- **Water Control Samples:** Water used for sample preparation is analyzed to assure it is clean (every batch).

Tables 2-5 through 2-7 summarize the results of the field and laboratory duplicates. Of the 32 sets of samples reported, 19 were found to contain no asbestos. Of the remaining 13 sets, 5 were situations where one sample reported zero asbestos and the second sample reported a very low concentration (0.000856 was the highest value reported for a duplicate analysis that compared to a zero).

2.4.3 *Audit Results*

Alliance performed an internal audit during both the field and laboratory component of this Work Assignment. Copies of these audits are provided in Appendix E. Alliance has also included applicable audit results from EAL.

2.5 Data Validation

Data validation is the process of filtering data and accepting or rejecting it on the basis of sound criteria. For this Work Assignment, all validation was completed by Alliance. Field data validation was based on the use of approved sampling procedures and proper chain-of-custody. No problems were encountered in either of these areas.

Analytical data validation was accomplished by mathematical verification of reported concentrations. Presently, there is no EPA guidance for validation of microscopic analyses; therefore, validation procedures were somewhat limited. Alliance requested copies of all original raw data sheets generated by the laboratory in order to calculate concentrations. All reported concentrations were consistent with Alliance's verification calculations.

There was no mechanism for identifying outliers from the data set. Samples were collected across a grid pattern and, in most cases, only a single discrete value was generated. There was no incident where one value could be judged suspicious or questionable when compared to another, even in cases where field or lab duplicates were analyzed.

Alliance could not find justification to delete any data; therefore, this assignment attained completeness of 100%.

2.6 Data Limitations

The analytical results were reported on a percent basis. Duplicate analyses actually showed very good agreement when compared to each other, as all results were within 0.02% of each other. Nearly all TEM results were below the statistical quantitation limit. The relative percent differences cited in Tables 2-5 and 2-6 can be a misleading presentation of the precision of the analyses performed. It must be recognized in cases where 200% RPD is reported, one value is reported as zero. Further scrutiny of the instances where a zero value is being compared shows only a single structure was observed to yield a calculated mass of less than 1.5 picograms.

Variation in the quality control samples can be attributed to two possible sources:

1. heterogeneity of the sample

2. analyses conducted at or below the statistical limit of quantitation

The samples consisted of pieces of asbestos-rich material of variable friability in a soil matrix. There was no effort to pulverize or homogenize the whole, as-received sample. To do so may have affected the integrity of the fibers or bundles within the sample. Therefore, aliquots of the sample were carefully selected with bias toward suspected material in hopes of providing results on a "worst-case basis". A second consideration is with regard to the small number of asbestos particles actually counted. In many instances, only single-digit numbers of particles were observed. Under these circumstances, a variation of only a few particles or the length of one fiber (0.5 microns vs 10 microns) can result in a huge percentage variation in the results. What this means is that these analyses are at or below the statistical limit for reliable quantitation.

Table 2-5. Quality Control Results Summary – Field Duplicates

Grid Point	Sampling Date	Depth (inches)	Analytical Technique	Asbestos (%)	Calculated Difference	Assessment	Dimensions (μm) Length	Width	Thickness	Mass
N 800 E 500	-10/31-	6 A	PLM	0		No Asbestos Detected				
N 800 E 500	-10/31-	6 A	PLM	< 1.0						
N 800 E 500	-10/31-	6 B	PLM	< 1.0						
N 900 E 300	-10/31-	6 A	TEM	0.000612	-0.0025	134% RPD	2.0	0.08	0.07	2.184
N 900 E 300	-10/31-	6 B	TEM	0.003081			2.0	0.00		10.603
N 950 E 800	-11/1-	6 A	TEM	0		No Asbestos Detected				
N 950 E 800	-11/1-	6 B	TEM	0						
N1100 E 300	-10/30-	6	TEM	0.001695	-0.0044	112% RPD	1.6	0.08	0.08	7.155
N1100 E 300	-10/31-	6	TEM	0.006048			2.7	0.10	0.10	22.777
N1100 E 300	-10/30-	18	TEM	0		No Asbestos Detected				
N1100 E 300	-10/31-	18	TEM	0						
N1200 E 500	-10/29-	6 A	TEM	0						
N1200 E 500	-10/29-	6 B	TEM	0						
N1200 E 350	-10/29-	18 A	TEM	0		200% RPD				
N1200 E 350	-10/29-	18 B	TEM	0.000371	0.0004		0.5	0.10	0.10	1.300
N1250 E 450	-10/29-	6 A	TEM	0.000856			1.4	0.10	0.10	3.640
N1250 E 450	-10/29-	6 B	PLM	0						
N1250 E 450	-10/29-	6 B	PLM	0						
N1300 E 350	-10/30-	6 A	TEM	0		No Asbestos Detected				
N1300 E 350	-10/30-	6 B	TEM	0						
N1300 E 350	-10/30-	18 A	TEM	0						
N1300 E 350	-10/30-	18 B	TEM	0						
N1400 E 400	-10/30-	6 A	TEM	0		No Asbestos Detected				
N1400 E 400	-10/30-	6 B	TEM	0						
N1400 E 400	-10/30-	18 A	TEM	0						
N1400 E 400	-10/30-	18 B	TEM	0						

*RPD- Relative Percent Difference = [(a-b)/((a+b)/2)]*100; Calculated Difference- (a-b)*

TEM method detection limit is 0.5%; PLM detection limit is 1%

Table 2-6. Quality Control Results Summary – Laboratory Duplicates

Grid Point	Sampling Date	Depth (inches)	Analytical Technique	Asbestos (%)	Calculated Difference	Assessment	Dimensions (µm) Length	Width	Thickness	Mass
N 650 E 500	-10/31-	6	TEM	0	-0.0003	200% RPD				
N 650 E 500	-10/31-	6	TEM	0.000270			0.6	0.10	nr	1.225
N 650 E 600	-11/1-	6 B	PLM	< 1.0		No Asbestos Detected				
N 650 E 600	-11/1-	6 B	PLM	< 1.0						
N 750 E 400	-10/31-	18	TEM	0.003578	-0.0133	130% RPD	1.3	0.08	0.07	11.618
N 750 E 400	-10/31-	18	TEM	0.016831			0.8	0.15	0.06	54.646
N 750 E 600	-11/2-	48	TEM	0		No Asbestos Detected				
N 750 E 600	-11/2-	48	TEM	0						
N 800 E 300	-10/31-	6	TEM	0		No Asbestos Detected				
N 800 E 300	-10/31-	6	TEM	0						
N 800 E 500	-10/31-	6 A	PLM	0		No Asbestos Detected				
N 800 E 500	-10/31-	6 A	PLM	< 1.0						
N 850 E 750	-11/1-	6	TEM	0	-0.0004	200% RPD				
N 850 E 750	-11/1-	6	TEM	0.000408			1.0	0.08	0.07	1.456
N1000 E 350	-10/31-	6	TEM	0.000193	-0.0030	177% RPD	0.7	0.07	nr	0.700
N1000 E 350	-10/31-	6	TEM	0.003162			1.3	0.09	0.09	10.881
N1100 E 100	-10/31-	6	TEM	0.000204	0.0002	200% RPD	0.7	0.07	nr	0.700
N1100 E 100	-10/31-	6	TEM	0						
N1100 E 750	-11/2-	24	TEM	0.017218	0.0117	103% RPD	2.4	0.10	0.09	67.083
N1100 E 750	-11/2-	24	TEM	0.005544			1.6	0.06	0.06	18.721
N1150 E 400	-10/29-	18	TEM	0		No Asbestos Detected				
N1150 E 400	-10/29-	18	TEM	0						
N1200 E 350	-10/29-	6 A	TEM	0		No Asbestos Detected				
N1200 E 350	-10/29-	6 A	TEM	0						
N1200 E 350	-10/29-	18 B	TEM	0.000371	0.0004	200% RPD	0.5	0.10	0.10	1.300

*RPD- Relative Percent Difference = [(a-b)/((a+b)/2)]*100; Calculated Difference- (a-b)*

TEM method detection limit is 0.5%; PLM detection limit is 1%

Table 2-6. Quality Control Results Summary – Laboratory Duplicates (continued)

Grid Point	Sampling Date	Depth (Inches)	Analytical Technique	Asbestos (%)	Calculated Difference	Assessment	Dimensions (µm)			
							Length	Width	Thickness	Mass
N1200 E 350	-10/29-	18 B	TEM	0						
N1200 E 450	-10/29-	36	TEM	0		No Asbestos Detected				
N1200 E 450	-10/29-	36	TEM	0						
N1200 E 650	-11/2-	24	PLM	5.0	1.0000	22% RPD				
N1200 E 650	-11/2-	24	PLM	4.0						
N1250 E 450	-10/29-	6 B	PLM	0		No Asbestos Detected				
N1250 E 450	-10/29-	6 B	PLM	0						
N1300 E 450	-10/30-	6	TEM	0		No Asbestos Detected				
N1300 E 450	-10/30-	6	TEM	0						
N1300 E 450	-10/30-	18	TEM	0		No Asbestos Detected				
N1300 E 450	-10/30-	18	TEM	0						
N1300 E 500	-10/30-	6	PLM	0		No Asbestos Detected				
N1300 E 500	-10/30-	6	PLM	0						
N1400 E 600	-10/30-	6	TEM	0	-0.0002	200% RPD				
N1400 E 600	-10/30-	6	TEM	0.000229			1.0	0.06	0.06	0.936
N1450 E 450	-10/30-	18	TEM	0		No Asbestos Detected				
N1450 E 450	-10/30-	18	TEM	0						
N1450 E 600	-10/30-	6	TEM	0		No Asbestos Detected				
N1450 E 600	-10/30-	6	TEM	0						

*RPD- Relative Percent Difference = [(a-b)/((a+b)/2)]*100; Calculated Difference- (a-b)*

TEM method detection limit is 0.5%; PLM detection limit is 1%

Table 2-7. TEM Quality Control Sample Comparisons (detected quantities only)

Grid Point	Depth (inches)	Asbestos (%)	Dimensions (μm)				Structures Observed	Number of	
			Length	Width	Thickness	Mass		Fibers	Bundles
N 650 E 500	6	0							
N 650 E 500	6	0.000270	0.6	0.10	nr	1.225	1	0	0
N 750 E 400	18	0.003578	1.3	0.08	0.07	11.618	5	2	3
N 750 E 400	18	0.016831	0.8	0.15	0.06	54.646	6	3	3
N 850 E 750	6	0							
N 850 E 750	6	0.000408	1.0	0.08	0.07	1.456	1	0	1
N 900 E 300	6 A	0.000612	2.0	0.08	0.07	2.184	1	0	1
N 900 E 300	6 B	0.003081	2.0	0.00		10.603	1	1	0
N1000 E 350	6	0.000193	0.7	0.07	nr	0.700	1	1	0
N1000 E 350	6	0.003162	1.3	0.09	0.09	10.881	4	0	4
N1100 E 100	6	0.000204	0.7	0.07	nr	0.700	1	1	0
N1100 E 100	6	0							
N1100 E 300	6	0.001695	1.6	0.08	0.08	7.155	2	0	2
N1100 E 300	6	0.006048	2.7	0.10	0.10	22.777	4	1	3
N1100 E 750	24	0.017218	2.4	0.10	0.09	67.083	10	1	9
N1100 E 750	24	0.005544	1.6	0.06	0.06	18.721	18	8	10
N1200 E 350	18 A	0							
N1200 E 350	18 B	0.000371	0.5	0.10	0.10	1.300	1	0	1
N1200 E 350	18 B	0							
N1400 E 600	6	0							
N1400 E 600	6	0.000229	1.0	0.06	0.06	0.936	1	0	1

TEM method detection limit is 0.5%; PLM detection limit is 1%

Therefore, the results should be considered semi-quantitative or qualitative in nature when measured below 0.5%.

2.6.1 Detection Limits

Polarized Light Microscopy (PLM) is the EPA-recommended method of determining asbestos in bulk samples. It will be used if visual observations indicate the presence of suspected asbestos material. The detection limit of PLM is 1.0%.

Transmission Electron Microscopy (TEM) will be used on samples which asbestos material is not apparent, but have been determined by the geologist to be fill (not native soil), and on all surface (0 to 6 inches) samples that do not show visible evidence of asbestos. The detection limit of TEM is 0.5%.

The analytical method used for air sampling is Phase Contrast Microscopy (PCM), and the sampling method is NIOSH 7400. The detection limit varies with the volume of air sampled. The detection limit range for monitors worn by people is 0.0011 to 0.0020 fibers/cc. Ranges for samples taken upwind and downwind of the borings, are 0.0003 to 0.0007 fibers/cc.

3.0 NATURE AND EXTENT OF CONTAMINATION

Soil borings were taken at several locations at the White Bridge Road Site to determine the vertical and lateral extent of asbestos contamination. While laboratory analyses were only performed for surface and shallow subsurface soil samples, field identification of probable asbestos containing material (ACM) was performed based on whether the observed material appeared to be native soil or fill. This identification was straightforward in the field, since the fill material consisted of tiles, shingles, and wallboard slurry. None of this material could be confused with native soil.

It is possible, however, that material identified in the field as native soil may indeed contain some amount of asbestos. This is especially true for surface soil and sediments bordering the filled debris mass. Therefore, the maps and cross-sections presented below represent only preliminary field judgments and are not verified by laboratory analysis. In general, volume estimates made from these field observations should be regarded as minimum amounts since additional ACM may be present but may have been identified as native soil or sediment.

3.1 Graphic Presentation

Figure 2-3 presented earlier, shows a map of the depth of the thickness of the asbestos containing material based on the available soil borings and GPR data. The thickest portion of the fill material occurs at [N1100, E700], where 14 feet of asbestos containing material is buried.

Figure 3-1 shows a graphical boring log for boring [N1100, E700]. This log shows the range of materials which were observed at this site. Typically, up to 10 inches of topsoil (silt and clay) overlie 0 to 6 feet of asbestos tiles and shingles. A white or light-green slurry of foamy, pulpy material underlie the tiles. The natural sediment under the fill material is typically a grey, silty clay which may be weathered to a red-brown color. Some locations are very organic-rich, ranging up to 60% peat.

Figures 3-2, 3-3, and 3-4 show two east-west and two north-south cross-sections respectively, across the filled area. The locations of these cross-sections are shown in Figure 2-3. These sections show the vertical and lateral extent of the natural and filled materials. The asbestos tile mass is typically 4 feet thick, with occasional thin layers in places. The slurry material underlying the asbestos tiles and soil appears to have been dumped or flowed into low areas prior to the heavier tile material. Since the slurry material is less dense than the asbestos tiles, it is unstable and appears to be flowing toward the surface as a diapiric mass. If this is so, the stability of the ground surface should be investigated further, prior to selecting a remedial action. The long-term effect of the unstable slurry mass movement may affect the integrity of a capping mechanism, or may complicate any excavation efforts using heavy machinery.

ALLIANCE Technologies Corporation							TEST BORING LOG N 1100, E 700
PROJECT: WHITE BRIDGE ROAD							SHEET NO. 1 0F 1
CLIENT: EPA							JOB NO.
BORING CONTRACTOR:							DATE STARTED: 11/1/90
DRILLING METHOD: Split Spoon		CASE	SAMP	CORE	TUBE		DATE FINISHED:
TOP OF RISER ELEVATION:	TYPE						DRILLER:
GROUND SURFACE ELEVATION: 234'	DIA.						INSPECT.: R. Ramuglia
DEPTH OF WELL: 16'	WT.						SCREEN LENGTH:
WATER LEVEL AT COMPLETION:	FALL						SLOT SIZE:

WELL CONSTRUCTION	DEPTH feet	GRAPHIC LOG	SAMPLE #	SAMPLE BLOWS per 6 Inches	CLASSIFICATION	REMARKS
	0				Asbestos Tiles	No Well Installed
					Saturated Asbestos Tiles	
	5				White, Pulpy Material Green Foam (Saturated)	
	10					
					Black Silt & Roots	
	15				Dark Grey Silt & Clay	
	20					

ABD 001 0738

Figure 3-1. Boring Log for N 1100, E 700.

MS28/1/R

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3.2 Estimated Volumes

Based on the map shown in Figure 2-3, Alliance estimates a total of 23,910 cubic yards of asbestos containing fill material to be present at the White Bridge Road Site. Most of this volume (23,433 cu. yd., or 98%) is contained in the former riding track area, where the thickest portion of the fill material is located.

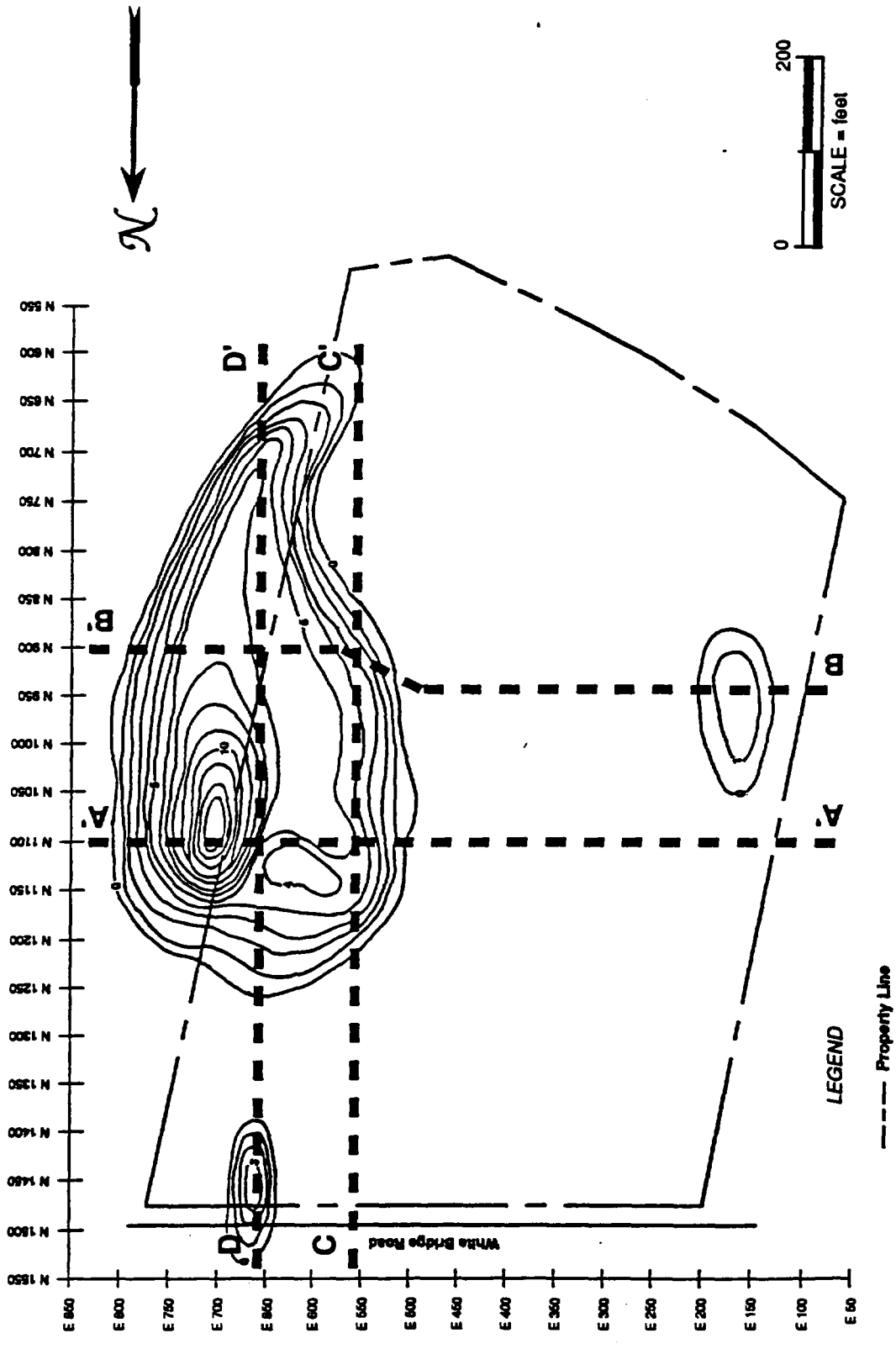


Figure 3-2. Location of cross sections showing thickness of asbestos fill.

ALLIANCE Technologies Corporation

ABD 001 0740

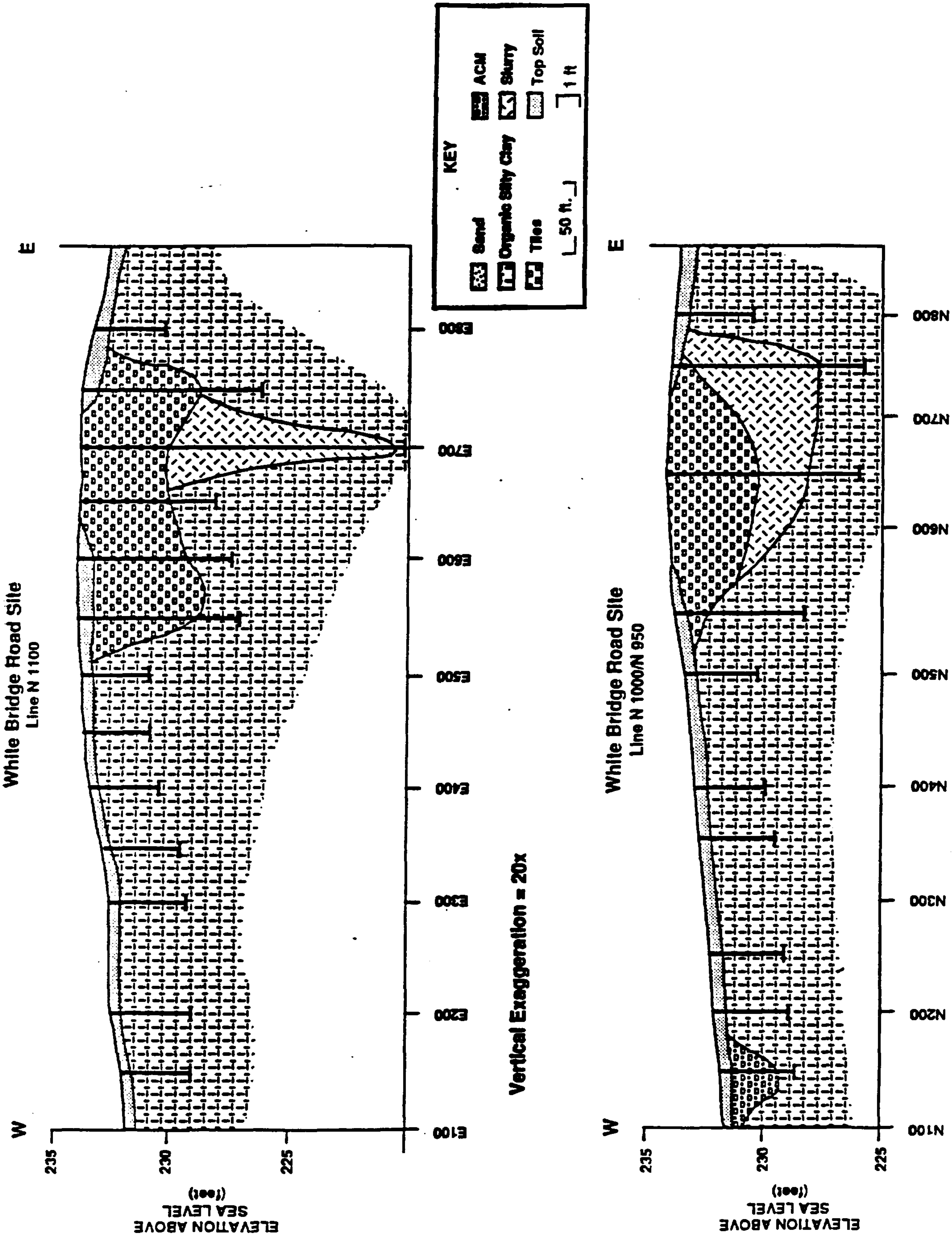


Figure 3-3. East West Cross Sections.

ABD 001 0741

ALLIANCE Technologies Corporation

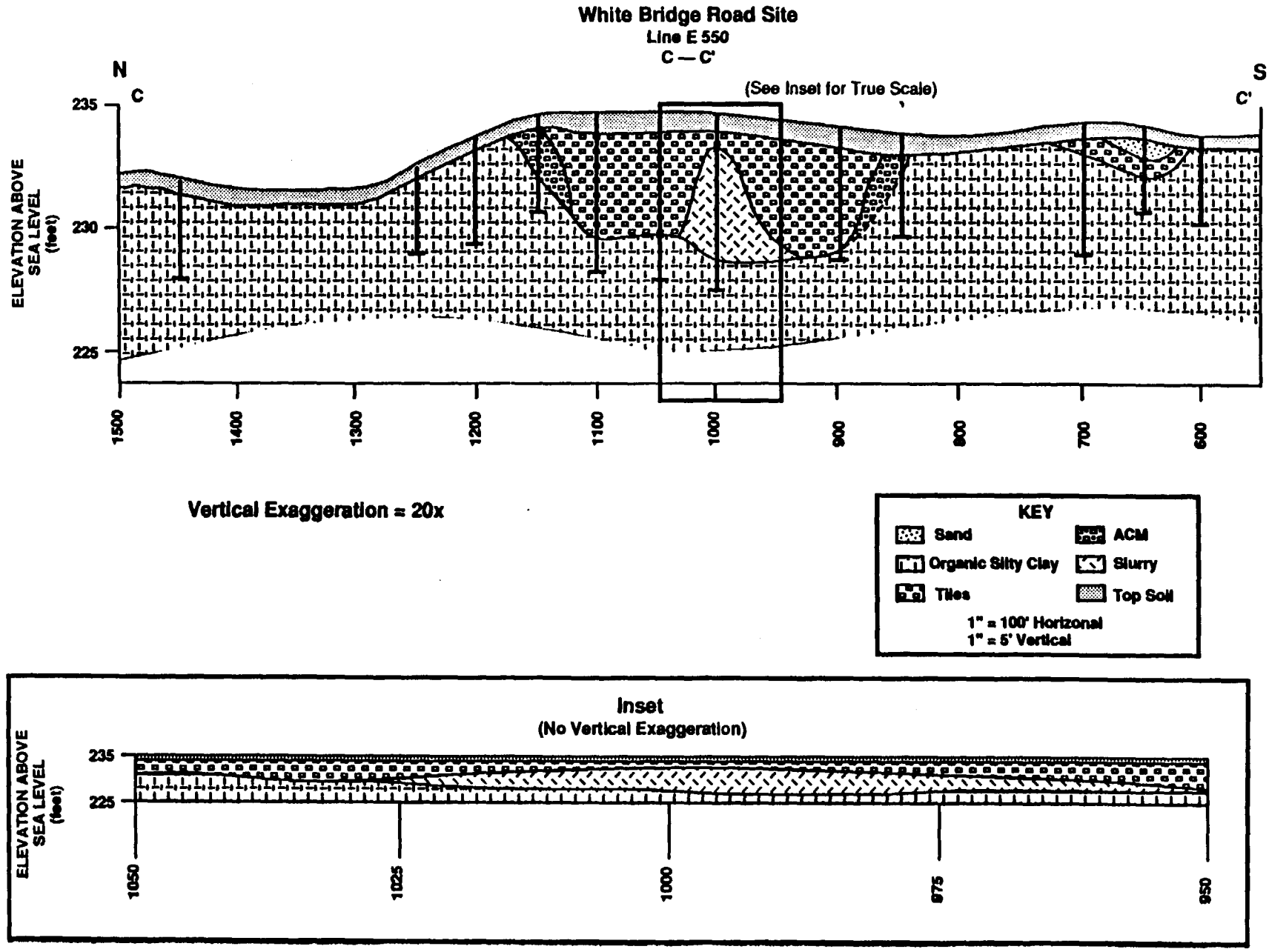


Figure 3-4. North South E 550 Cross Sections.

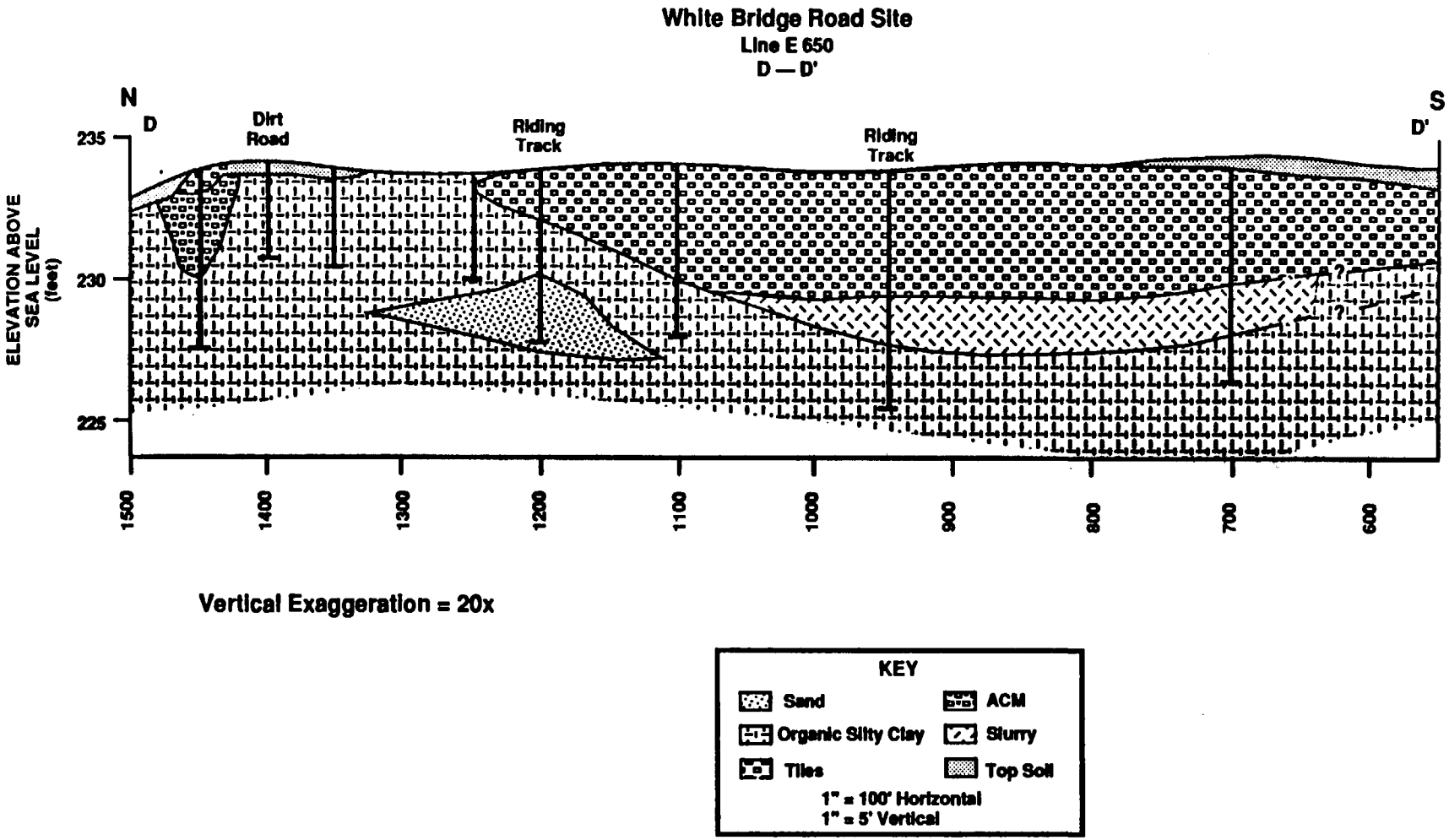


Figure 3-5. North South E 650 Cross Section.

4.0 SUMMARY AND CONCLUSIONS

4.1 Summary

Alliance performed field sampling at the White Bridge Road site to collect additional data relevant to surface and subsurface asbestos. Soil samples were collected from surveyed grid nodes at three subsurface intervals 0 to 6 inches, 6 to 18 inches, and 18 to 36 inches. The samples were evaluated by personnel trained and experienced at identifying asbestos and/or evaluating native soils. All surface samples were shipped for laboratory analysis. Any surface samples visually suspected of containing asbestos were analyzed by polarized light microscopy, all others underwent analysis by transmission electron microscopy. A selection of subsurface samples were also analyzed after evaluation of the surface sample results. All subsurface samples were analyzed by TEM.

A total of 176 samples were analyzed by TEM. Sixty-six of the 176 samples contained detectable amounts of asbestos. Samples that did contain asbestos averaged 0.0667 percent with fiber characteristics averaging 4.3 microns in length, 0.10 microns in width, and 0.09 microns thick. The reported concentration is significantly below the statistical limit for reliable quantification and therefore should be reported as $<0.5\%$.

PLM analyses were conducted on 33 samples. PLM was utilized for those samples known or highly suspected to contain asbestos. Additionally, any sample that was reported by the less sensitive PLM technique to be "less than 1 percent" was reanalyzed by TEM to better define the concentration and identify average fiber characteristics. A total of 22 PLM samples reported at <1 percent or 0.

Asbestos was found throughout many areas of the site. In many cases, tiles were readily visible on the surface. Tiles appear randomly and in no particular pattern. Observations of visible asbestos were made chiefly in the known fill area, the dirt road that extends to the former riding track, near the southwest border of the property at the end of the paved driveway, and numerous points along the perimeter of the fill area. Most of the observations were confirmed by TEM analysis to contain asbestos.

Alliance collected sufficient information on the vertical and lateral extent of contamination of estimated volume of fill material. Alliance estimated 23,910 cubic yards of fill material to be present at this site. The majority (98%) of this volume is contained in the former riding track area.

4.2 Conclusions

The most notable finding associated with this study was the identification of an additional fill area at the SW border of the property. Asbestos was found at [N1000, E150] (5%) and [N900, E150] (20%). This was an area previously thought to be clean.

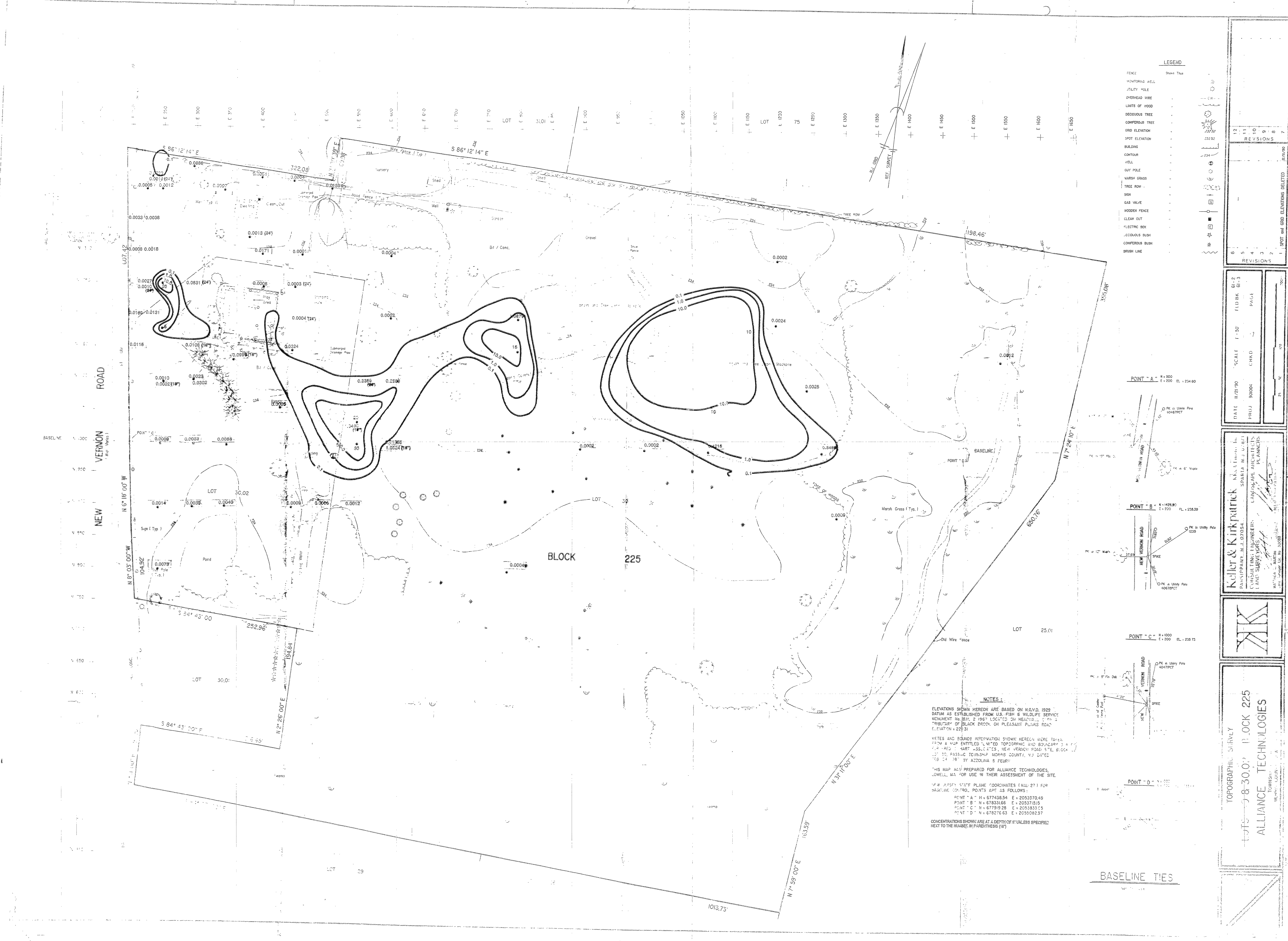
The majority of the analyses performed under this Work Assignment were by transmission electron microscopy. The TEM technique has a stated detection limit of 0.5%. Any value with a reported concentration below 0.5% should be considered semi-quantitative or qualitative in nature. In this sense, the data is most useful stating whether asbestos fibers were in soil samples collected away from known fill areas, and what was the average values found for fiber length, width and thickness.

The reported concentrations away from the fill areas were usually very low, identifying only a single fiber in many cases. It is suspected that these were the result of: windborne deposition originating at the fill area, surface water runoff, physical transport resulting from normal activities at the site (e.g. exercising horses), or likely some combination of each of these transport mechanisms.

Alliance has provided data for numerous samples from the White Bridge Road Site. The majority of the sample results are considered to be below detection limits for reliable quantitation of asbestos concentration. The data has been useful in identifying fiber characteristics.

The next sequence is for EPA to state acceptable levels of asbestos in soil at this site, considering not only fiber characteristics but land use and potential exposures. These decisions will have a fundamental impact on the selection of remedial alternatives for the White Bridge Road site.


SITE GRID NORTH
LEGEND
FENCE
MONITORING WELL
UTILITY POLE
OVERHEAD WIRES
LIMITS OF ACCESS
DECIDUOUS TREE
CONIFEROUS TREE
SPOT ELEVATION
BUILDING
CONTOUR
MAIL BOX
GUY POLE
% ASBESTOS DETECTED AT 6"
% ASBESTOS DETECTED AT 18"
POINT "A" N = 1500 E = 200
POINT "B" N = 1500 E = 7738
POINT "C"
POINT "D"
BASELINE TIES
Not To Scale
WHITE BRIDGE ROAD
BRIDGE ROAD
WHITE
BASELINE
N 84° 00' 00" E 3000
S 5° 00' 00" W 5691.0
S 79° 50' 00" W 1150
S 10° 10' 00" E 218.50
S 69° 10' 00" E 181.50
S 63° 20' 00" E 80.00
S 54° 00' 00" E 745.00
LOT 35.02
LOT 35.01
LOT 79
LOT 78
LOT 32
LOT 33.01
BLOCK 225
EDGE OF WOODS
POST & RAIL FENCE (Typ.)
WIRE FENCE
BIT./CONC. DRIVE
DIRT DRIVE
HORSE MONITORING WELL (Typ.)
POND
2 Story Dwelling
Stable
Shed
Garage
SWAMP
GRAVEL
MANURE PILE
BRIDGE
BRK
N.J. GRID
REF. SURVEY
REVISIONS
DATE: 11/9/90
SCALE: 1" = 50'
FIELD BK: 61 P
PROJ. 90004
CHKD
PAGE 18
Keller & Kirkpatrick
CONSULTING ENGINEERS
LAND SURVEYORS
FLORHAM PARK, N.J. 07932
SPARTA, N.J. 07871
LANDSCAPE ARCHITECTS
PLANNERS
MATTHEW L. MARTIN Land Surveyor Lic. No. 30068
ROBERT C. KIRKPATRICK JR. LIC. 11359
TOPOGRAPHIC SURVEY
OF
LOTS 79 & 35.01 BLOCK 225
FOR
ALLIANCE TECHNOLOGIES
TOWNSHIP OF PASSAIC
MORRIS COUNTY NEW JERSEY
NOTES:
ELEVATIONS SHOWN HEREON ARE BASED ON N.G.V.D. 1929 DATUM AS ESTABLISHED FROM U.S. FISH & WILDLIFE SERVICE MONUMENT No. B.M. 2 1967 LOCATED ON HEADWALL OVER A TRIBUTARY OF BLACK BROOK ON PLEASANT PLAINS ROAD ELEVATION = 229.31
METES AND BOUNDS INFORMATION SHOWN HEREON WERE TAKEN FROM A MAP ENTITLED "TOPOGRPHIC AND BOUNDARY SURVEY FOR FRED C. HART ASSOCIATES, WHITE BRIDGE ROAD SITE, BLOCK 225 LOT 79 PASSAIC TOWNSHIP, MORRIS COUNTY, N.J. DATED NOV. 7, 1986, BY AZZOLINA & FEURY.
THIS MAP WAS PREPARED FOR ALLIANCE TECHNOLOGIES, LOWELL, MA FOR USE IN THEIR ASSESSMENT OF THE SITE.
NEW JERSEY STATE PLANE COORDINATES (NAD27) FOR BASELINE CONTROL POINTS ARE AS FOLLOWS:
POINT 'A' N= 681038.76 E= 2053330.53
POINT 'B' N= 681206.45 E= 2053879.29
POINT 'C' N= 681126.43 E= 2053617.43
POINT 'D' N= 680265.72 E= 2053880.45
ABD 001 0746


LEGEND
FENCE
MONITORING WELL
UTILITY POLE
OVERHEAD WIRE
LIMITS OF WOOD
DECIDUOUS TREE
CONIFEROUS TREE
GRID ELEVATION
SPOT ELEVATION
BUILDING
CONTOUR
WELL
GUY POLE
MARSH GRASS
TREE ROW
SIGN
GAS VALVE
WOODEN FENCE
CLEAN OUT
ELECTRIC BOX
DECIDUOUS BUSH
CONIFEROUS BUSH
BRUSH LINE
REVISIONS
SPOT and GRID ELEVATIONS DELETED
NEW VERNON ROAD
BLOCK 225
LOT 30.02
LOT 30.01
LOT 30
LOT 25.01
LOT 29
S 86° 12' 14" E
N 7° 24' 10" E
N 31° 11' 00" E
N 7° 59' 00" E
N 6° 18' 00" W
N 8° 03' 00" W
N 2° 26' 00" E
S 84° 43' 00"
S 84° 43' 00" E
198.46'
650.76'
1013.73'
252.96'
222.08'
Marsh Grass (Typ.)
Old Wire Fence
Pond
Gravel
BASELINE
POINT "A"
POINT "B"
POINT "C"
POINT "D"
BASELINE TIES
NOTES :
ELEVATIONS SHOWN HEREON ARE BASED ON N.G.V.D. 1929 DATUM AS ESTABLISHED FROM U.S. FISH & WILDLIFE SERVICE MONUMENT No. B.M. 2 1967 LOCATED ON HEADWALL
TRIBUTARY OF BLACK BROOK ON PLEASANT PLAINS ROAD
THIS MAP WAS PREPARED FOR ALLIANCE TECHNOLOGIES, LOWELL, MA FOR USE IN THEIR ASSESSMENT OF THE SITE.
BASELINE CONTROL POINTS ARE AS FOLLOWS :
POINT "A" N = 677438.54 E = 2053970.49
POINT "B" N = 678331.66 E = 2053715.15
POINT "D" N = 678276 63 E = 2055082.97
CONCENTRATIONS SHOWN ARE AT A DEPTH OF 6" UNLESS SPECIFIED NEXT TO THE NUMBERS IN PARENTHESIS (18")
Keller & Kirkpatrick
PARSIPPANY, N.J. 07054
SPARTA N.J.
CONSULTING ENGINEERS
LAND SURVEYORS
LANDSCAPE ARCHITECTS
PLANNERS
DATE 11/21/90
SCALE 1" - 50'
FLD BK 61 - 2 61 - 3
PROJ 901004
CHKD
PAGE
TOPOGRAPHIC SURVEY
BLOCK 225
ALLIANCE TECHNOLOGIES