

Letter Health Consultation

AMERICAN WOOD FIBERS

MARION, VIRGINIA

**Prepared by
Virginia Department of Health**

JANUARY 10, 2013

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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December 28, 2012

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Dear Mr. Turner:

This letter is in response to your request for the Virginia Department of Health (VDH) to examine potential public health implications of airborne particulate matter generated by the American Wood Fibers facility in Marion, Virginia. Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), VDH evaluated air sampling results provided by the Virginia Department of Environmental Quality (DEQ) on February 17, 2012 to determine if particulate matter is present at levels that could be harmful to the surrounding community.

BACKGROUND

American Wood Fibers is located at 514 Lee Highway, in Marion, Virginia. The facility manufactures animal bedding, wood stove pellets, and wood flour to make composite material. The facility operates twenty-four hours a day, six days a week. This facility has a permit issued by the DEQ. In 2008, a permit was issued for manufacturing animal bedding, pellets for wood stoves and wood flour. This permit was superseded in 2009 to install a wood-burning hot water heater, and again in 2010 to add a system that produces odor-controlling litter for animal bedding.

American Wood Fibers is located in a rural community approximately 10 miles west of Marion, VA. To the south of the facility are the Middle Fork Holston River, a train track, and Interstate 81. Less than a mile west is Chilhowie Elementary School, Homestead Materials Handling Company, farm sheds, and an abandoned house. There are two homes directly north and less than ten mobile homes to the northwest. One of the mobile homes is occupied and the others are in disrepair. A neighborhood with approximately 30 homes is east of the facility. There is a Quikrete company building to the southeast. During a site evaluation conducted by DEQ in 2008,

the distance from American Wood Fibers to the nearest occupied house was determined to be 150 feet and the distance to the nearest occupied non-residential building was determined to be 900 feet. Ten houses are within 1,000 feet of the facility's property and more than 65 are within ½ mile of the facility (C. Bazyk, 2012).

Marion, VA has a population of 5,968 with the majority of the population being white (90%) followed by blacks (7%), and Hispanics (3%). Children under the age of five represent approximately six percent of the population and adults older than 65 years of age represent 20% of the population (U.S. Census Bureau, 2010).

Community Health Concerns

Several homeowners residing east of American Wood Fibers expressed their concerns to Smyth County officials and to DEQ about wood dust being generated by the facility. DEQ received one anonymous complaint in 2010, several complaints from the same individual in 2011, and one complaint in 2012. The complaint received in 2012 was from a different resident in the community. Nine different individuals expressed their concerns to Smyth County officials in 2011 by filing a Smyth County Ordinance on Nuisance Complaint Form (C. Bazyk, 2012).

Environmental Monitoring and Results

DEQ initiated air sampling to address the dust concerns of residents living near American Wood Fibers. Twenty-four hour time-weighted average samples were collected from September 24 through October 26, 2011. A total of 16 samples of particulate matter measuring less than or equal to 10 micrometers (PM₁₀) and 15 total suspended particles (TSP) samples were analyzed (Table 1). The average PM₁₀ and TSP results for the sampling period were 10.6 and 16.4 micrograms/cubic meters (µg/m³), respectively. The highest reported 24-hour time-weighted average PM₁₀ and TSP sampling results were 17.8 and 33.8 µg/m³, respectively. Monitors for PM₁₀ and TSP were placed approximately 600 meters northeast of American Wood Fibers in the backyard of one of the concerned residents (See Attachments). The wind direction was predominantly from the west; wind speeds were around 1-10mph; and temperatures were around 65 degrees during sampling days (Weather Underground, 2011). The air monitoring filters were collected every 24 hours and submitted to the Department of Consolidated Laboratories in Richmond, VA for analysis.

Table 1: September-October 2011; Twenty-four hour PM and TSP Sampling Results and Comparison Values (all units in $\mu\text{g}/\text{m}^3$)*

Sample Type	Average	High	Number of Samples	Number of Detects	Comparison Values (CV)		Number of samples exceeding CV
					PM ₁₀ NAAQS 24 Hr	†TSP NAAQS 24 Hr	
PM ₁₀	10.6	17.8	16	16	150	260	0
TSP	16.4	33.8	15	15			0

*(Source: DEQ) PM₁₀=Particulate Matter 10 micrometer in size or less TSP=total suspended particles NAAQS=National Ambient Air Quality Standards (not to be exceeded more than once per year on average over three years). †TSP standard replaced by PM₁₀ in 1987.

Chromated copper arsenate (CCA) has been used to treat lumber since the 1940s. It contains the metals chromium, copper, and arsenic which protect the wood from insects and microbial agents (EPA 2011). VDH requested that DEQ test the ambient air for metals which could be present if American Wood Fibers processed CCA treated lumber. Particulate filters from three different days were analyzed to determine metal air concentrations (Table 2). Metals detected included beryllium, chromium, manganese, nickel, arsenic, cadmium, and lead.

Table 2: 2011 Metal Air Concentrations and Comparison Values (all units in $\mu\text{g}/\text{m}^3$)*

Metals	Dates samples collected			Comparison Values			
	9/24/2011	10/6/2011	10/26/2011	VA SAAC Hourly	Chronic EMEG	Acute EMEG	CREG
Beryllium	0	0.000001	0.000008	0.1			0.00042
Chromium†	0.00158	0.00177	0.00188	2.5			
Manganese	0.00286	0.00809	0.00874	250	0.04		
Nickel	0.00157	0.00283	0.00129	5.0	0.09	0.2 IN	
Arsenic	0.00075	0.00078	0.00091	10			0.00023
Cadmium	0.000128	0.000155	0.000135	2.5	0.01	0.030	0.00056
Lead	0.0042	0.00304	0.0027	7.5			

*(Source: DEQ) EMEG=Environmental Media Evaluation Guide CREG=Cancer Risk Evaluation Guide VA SAAC=Virginia Significant Ambient Air Concentration IN=Intermediate **Bold face**=values exceed one or more comparison values. †Total chromium reported.

Contaminant Evaluation

VDH determines if a potential health risk exists by comparing environmental sampling results to ATSDR's environmental comparison values (CVs). CVs represent concentrations of a substance (e.g., in water, soil, and air) to which humans may be exposed via a particular exposure route during a specified period of time without experiencing adverse health effects. Although concentrations at or below the relevant CV may reasonably be considered safe, it does not

automatically follow that any environmental concentration that exceeds a CV would be expected to produce adverse health effects. If ATSDR does not have a CV for a substance, then other federal or state guidelines can be used.

Total Suspended Particles

Total suspended particles, commonly referred to as fugitive dust, refers to particles of all sizes and is a mixture of all airborne solid and liquid particles having sizes from less than 0.01 to 100 micrometers (μm) and larger. In 1971, the U.S. Environmental Protection Agency (EPA) issued a fugitive dust standard to protect public health and welfare with no preference to the size of the particulate matter. The original 24-hour average air quality standard for TSP was $260 \mu\text{g}/\text{m}^3$ (EPA 2012a). It was subsequently recognized that particulate matter larger than $10 \mu\text{m}$ were a nuisance but did not pose a significant health risk. Therefore, in 1987, the TSP standard was replaced by the more health protective PM_{10} 24-hour average air quality standard and the TSP is no longer enforceable by the EPA (EPA 2012b). Because ATSDR does not have a CV for TSP, EPA's 1971 standard was used as a surrogate CV to evaluate nuisance concerns. The average of the samples and the highest reported sample collected were below this CV.

Particulate Matter (PM_{10})

Particulate matter measuring $10 \mu\text{m}$ or less are capable of bypassing the body's defense mechanisms (nose, mouth, and throat) that are intended to filter larger particles. These particles can reach deep into the respiratory tract and have been associated with increased hospital admissions, exacerbation of asthma, changes in lung function, inflammation, and premature death in individuals with lung and heart disease. PM_{10} are generated by the grinding and abrasion of solids and are usually found near roadways and near industrial sites. In 1987, EPA promulgated a new air quality standard for ambient particulate matter that applies to particulate matter measuring $10 \mu\text{m}$ or less. This standard limits 24-hour average PM_{10} air concentrations to $150 \mu\text{g}/\text{m}^3$. This value is protective of sensitive individuals including asthmatics, the elderly, and children (EPA 2012c).

EPA uses a nationwide network of air quality monitors to measure local trends in PM levels. PM_{10} results from monitors that meet the minimum trend completeness criteria in Virginia collected during 2009 and 2010 averaged $32 \mu\text{g}/\text{m}^3$, with the highest and lowest concentration reported equaling 63 and $24 \mu\text{g}/\text{m}^3$, respectively (see Attachments) (EPA 2012d). The highest concentration ($17.8 \mu\text{g}/\text{m}^3$) of PM_{10} collected at the sampling station near American Wood Fibers is below the lowest PM_{10} concentration ($24 \mu\text{g}/\text{m}^3$) reported by EPA in Virginia during 2009 and 2010.

Because ATSDR does not have a CV for particulate matter, EPA's National Ambient Air Quality Standard (NAAQS) was used as a surrogate CV for PM_{10} . The average of the samples and the highest reported result was below this CV (Table 1).

Metals

Metal concentrations were compared to ATSDR's non-cancer and cancer CVs and to Virginia hourly Significant Ambient Air Concentrations (SAAC) (ATSDR 2005) (Table 2). ATSDR CVs used for metals include:

Environmental Media Evaluation Guides (EMEGs)

EMEGs are estimated contaminant concentrations that are not expected to result in adverse non-carcinogenic health effects based on ATSDR evaluation. They are based on conservative assumptions about exposure, such as intake rate, exposure frequency and duration, and body weight. ATSDR has developed EMEGs that apply to acute (14 days or less), intermediate (15–364 days) and chronic (365 days or more) exposures.

Cancer Risk Evaluation Guides (CREGs)

CREGs are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million persons exposed during their lifetime. ATSDR's CREGs are calculated from EPA's cancer slope factors for oral exposures or unit risk values for inhalation exposures. These values are based on EPA evaluations and assumptions about cancer risks at low levels of exposure. CREGs are used to estimate the number of (extra/excess) cancers if a group of people were exposed to the contaminant above the CREG concentration everyday, 24 hours a day, for a lifetime.

Significant Ambient Air Concentration (SAAC)

The Virginia SAAC is the concentration of a toxic pollutant in the ambient air that, if exceeded for one hour, may have an adverse effect on human health. The only metal result exceeding any of the three CVs was arsenic.

DISCUSSION

Exposure Pathway Evaluation

Chemicals present in the environment above their respective CVs can only impact health when an individual is exposed. VDH determines if an exposure to environmental contamination occurred in the past, is occurring, or might occur in the future by identifying if a completed exposure pathways exists. A completed exposure pathway consists of 5 elements:

Element 1: A source of contamination

Element 2: An environmental medium that can transport the contaminant

Element 3: A location where people might come into contact with the contaminated medium

Element 4: The route by which people physically contact the environmental contaminant

Element 5: Population that may or have come in contact with the contaminants

VDH eliminates an exposure pathway if at least one of the five elements above is missing and is very unlikely to ever be present. Exposure pathways not eliminated can be either *completed* or *potential pathways*.

Completed pathways- all five pathway elements exist

Potential pathways-at least one of the five elements is missing or lacks sufficient information but may be present

A completed pathway has been identified at American Wood Fibers (Table 3).

Table 3: Site Specific Exposure Pathway Elements

Pathway Name	Exposure Pathway Elements					Time Frame
	Source <i>(Element 1)</i>	Environmental Transport Medium <i>(Element 2)</i>	Exposure Point <i>(Element 3)</i>	Exposure Route <i>(Element 4)</i>	Exposed Population <i>(Element 5)</i>	
Ambient Air	American Wood Fibers	Air	Ambient Air	Inhalation	Community	Past Present Future

Public Health Implications

When people are exposed to chemicals, the exposure does not always result in adverse health effects. The type and severity of health effects that may occur in an individual from contact with contaminants depend on the toxicological properties of the contaminants, how much of the contaminant to which the individual is exposed, how often, and how long the individual is exposed. Once exposure occurs, characteristics such as age, sex, nutritional status, genetics, life style, and health status of the exposed individual influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. These factors and characteristics influence whether exposure to a contaminant could or would result in adverse health effects (ATSDR 2005).

The concentration of PM₁₀ detected in ambient air to the north east of American Wood Fibers is not expected to harm the public’s health because it is well below the NAAQS PM₁₀ standard which is protective of sensitive individuals including asthmatics. Particulate matter measuring 2.5 µm (PM_{2.5}) or less are believed to pose the greatest health risk because they can enter deeper into the respirable region of the lungs where PM₁₀ cannot. Sources of PM_{2.5} include combustion activities such as power plants, motor vehicles, and fires. Activities at American Wood Fibers during sampling did not support monitoring for PM_{2.5}.

National Cancer Institute
 Lifetime risk of developing cancer:
“Based on cancer rates from the 2007 to 2009 Surveillance, Epidemiology, and End Results report, it was estimated that men had about a 45 percent chance of developing cancer in their lifetimes, while women had about a 38 percent chance (NCI 2012).”

The three 24-hour arsenic levels reported were above the arsenic CREG (Table 1). Although the arsenic levels exceeded the arsenic CREG, it is not unexpected to find arsenic background levels 10 to 100 times above the CREG for arsenic (ATSDR 2007). To determine if the level of arsenic in the air had any health implications, VDH calculated the estimated cancer risk. To estimate cancer risk (CR) from arsenic inhalation, the inhalation unit risk (IUR) factor for arsenic ($0.0043 \mu\text{g}/\text{m}^3)^{-1}$ is multiplied times the air concentration of arsenic in $\mu\text{g}/\text{m}^3$. The calculated excess cancer risk using the maximum arsenic air concentration value reported ($0.00091 \mu\text{g}/\text{m}^3$) is 3.9 in 1,000,000.

$$\text{CR} = \text{IUR} \times \text{concentration}$$

$$0.0000039 = 0.0043 (\mu\text{g}/\text{m}^3)^{-1} \times 0.00091 \mu\text{g}/\text{m}^3$$

This means that there is an additional cancer risk that approximately 4 in 1,000,000 people may develop cancer if exposed to arsenic for 70 years at this concentration. This additional excess cancer risk to individuals living near American Wood Fibers represents a small incremental risk above background cancer risk in the U.S. population, where background cancer risk means that more than one in three people will develop cancer in their lifetime.

The three 24-hour chromium levels reported did not exceed the SAAC. However, chromium is found in the environment in different oxidation states, chromium III and chromium VI. Chromium VI is a known carcinogen. Because total chromium was reported, VDH calculated the additional cancer risk assuming that the reported chromium only contained chromium VI. This assumption is likely to overestimate cancer risk for chromium because it is unlikely that all chromium at the site is chromium VI. The calculated excess cancer risk using the maximum chromium reported ($0.00188 \mu\text{g}/\text{m}^3$) and an IUR factor of $0.0012 (\mu\text{g}/\text{m}^3)^{-1}$ for chromium VI is 2.3 in 1,000,000. This additional excess cancer risk to individuals living near American Wood Fibers represents a small incremental risk above background cancer levels in the U.S. population even when added to the additional excess cancer risk from arsenic.

CONCLUSIONS

Exposure to dust near American Wood Fibers facility in Marion, VA, is not expected to harm people's health because the average concentration and the highest concentration reported for PM_{10} and TSP are both below CVs.

Exposure to beryllium, manganese, nickel, cadmium, and lead in the air near American Wood Fibers in Marion, VA is not expected to harm people's health, because the average concentration and the highest concentration reported are below CVs.

The concentration of arsenic in the air near American Wood Fibers in Marion, VA is not expected to harm people's health because the additional estimated cancer risk, 4 in 1,000,000, is very low.

The concentration of chromium in the air near American Wood Fibers in Marion, VA is not expected to harm people's health because the additional estimated cancer risk, 2.3 in 1,000,000, is very low (assuming only chromium VI was present in the samples).

RECOMMENDATIONS

VDH recommends that the air quality results and associated conclusions be provided to the community.

I trust that the above information will be of help to you. Should you have any additional questions, or need assistance with community communications, please contact the VDH Division of Environmental Epidemiology at (804) 864-8182 or at 109 Governor Street, Richmond, VA 23219.

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REFERENCES

ATSDR 2005. Public Health Assessment Guidance Manual (Update). Agency for Toxic Substances and Disease Registry. 2005

ATSDR 2007a. Agency for Toxic Substances and Disease Registry. Toxicological profile for Arsenic. Atlanta, GA: US Department of Health and Human Services; August. Available at: <http://www.atsdr.cdc.gov/toxprofiles/tp2.html>. Last accessed January 19, 2010.

ATSDR 2007b Agency for Toxic Substances and Disease Registry. Tox FAQs for arsenic. Atlanta, GA: Division of Toxicology and Environmental Medicine; August. Available at: <http://www.atsdr.cdc.gov/tfacts2.html>. Last accessed January 19, 2010.

C. Bazyk 2012. Personal Communication with Crystal Bazyk, Air Compliance Manager, VADEQ. March 19th 2012.

EPA 1999. Sampling of ambient air for total suspended particulate matter (SPM) and PM₁₀ using high volume (HV) sampler. Center for Environmental Research Information, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, OH 45268.

EPA 2011. U.S. Environmental Protection Agency Website. July 2011. Internet access: <http://www.epa.gov/oppad001/reregistration/cca/>. Last accessed June 2012

EPA 2012a. U.S. Environmental Protection Agency Website. November 2012. Internet access: http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_history.html. Last accessed May 30, 2012

EPA 2012b. U.S. Environmental Protection Agency Website. January 2012. Internet access: <http://www.epa.gov/airtrends/aqtrnd95/pm10.html>. Last accessed May 30, 2012

EPA 2012c. U.S. Environmental Protection Agency Website. March 2012. Internet access: <http://www.epa.gov/ord/ca/quick-finder/particulate-matter.htm>. Last accessed May 30, 2012

EPA 2012d. U.S. Environmental Protection Agency Website. Internet access: <http://www.epa.gov/airtrends/pm.html#pmloc> Last accessed May 30, 2012

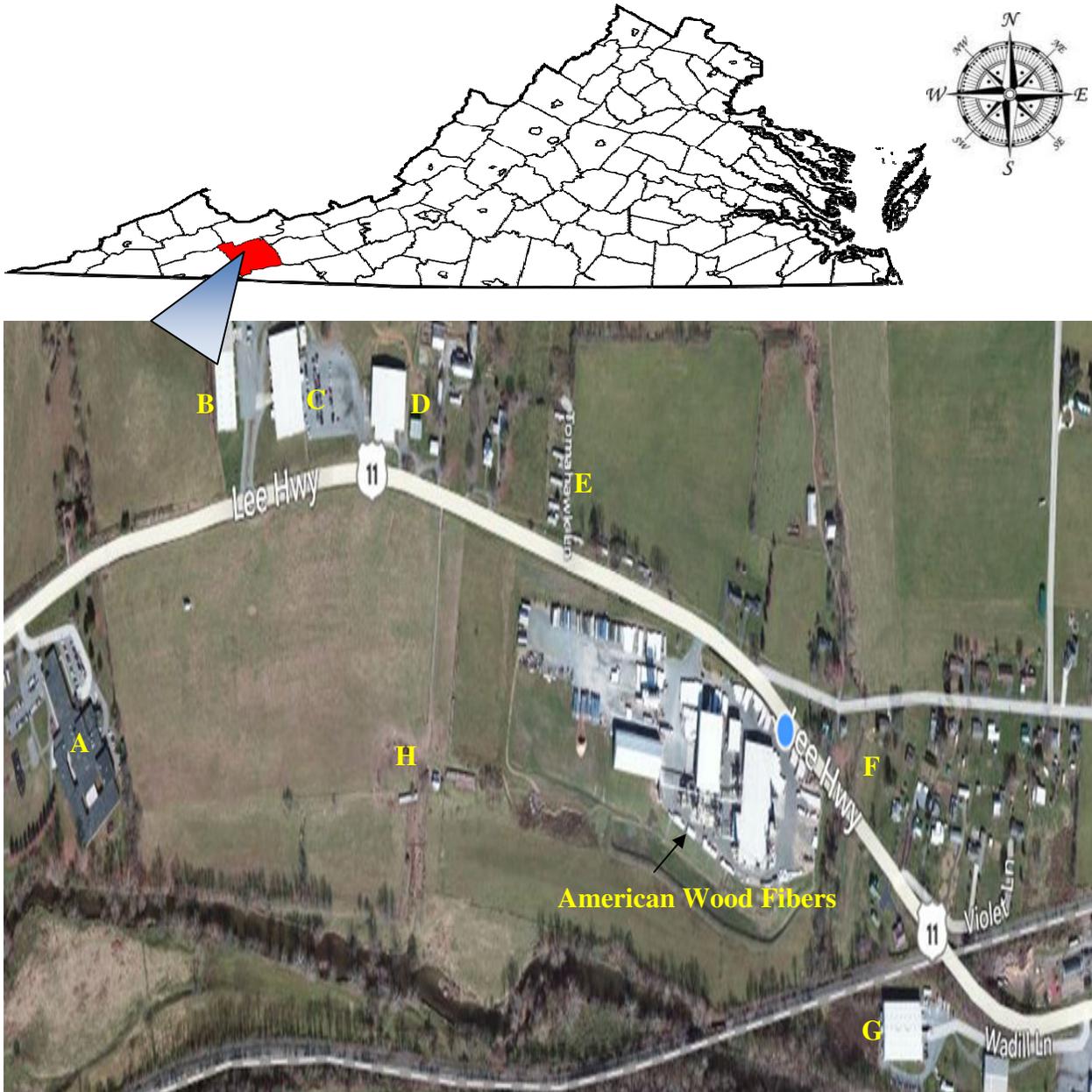
NCI 2012. National Cancer Institute. Internet access: <http://seer.cancer.gov/statfacts/html/all.html>. Last accessed June 6, 2012.

U.S. Census Bureau 2010. State and County QuickFacts. 2010. Internet access: <http://quickfacts.census.gov/qfd/states/51/5149464.html>. Last accessed May 28, 2012.

Weather Underground 2011. Internet access: <http://www.wunderground.com/history/airport/KTRI/2011/9/24DailyHistory.html>. Last accessed October 26, 2012.

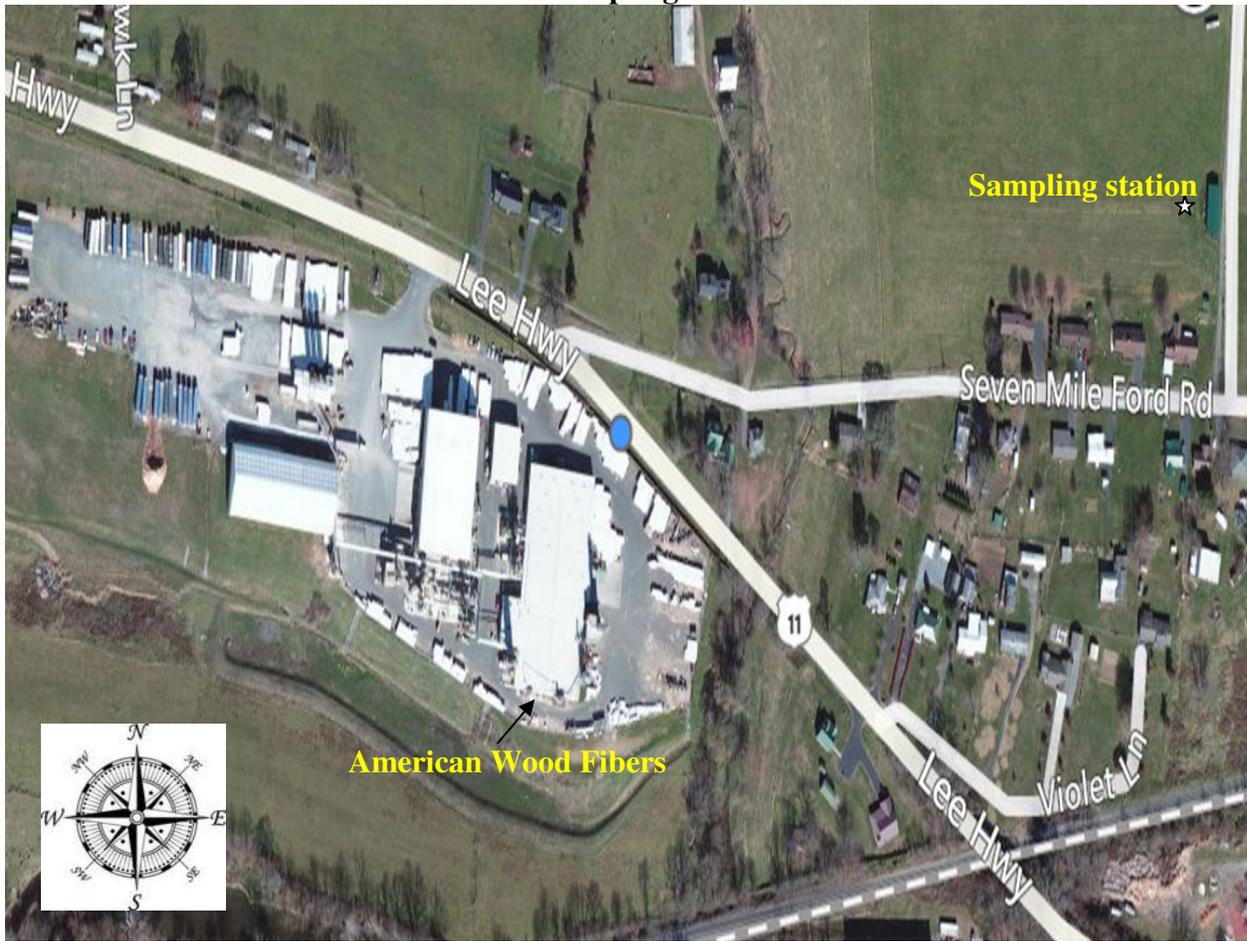
Attachments

Location of American Wood Fibers and its surroundings neighborhood



A= Chilhowie Elementary School **B=** Homestead Materials Handling Company **C=** Oak Hall Cap and Gown **D=** Empty Building **E=** Mobile homes **F=** Residential homes **G=** Quikrete **H=** Farm sheds and abandoned house

Location of American Wood Fibers and sampling station



PM₁₀ and TSP air monitors.



2009 and 2010 PM₁₀ Annual 2nd Maximum 24-Hour Average Air Monitoring Results from Sampling Stations in Virginia*

Sampling station location	Sampling year	
	2009	2010
Carroll	30	25
Roanoke City	63	33
Culpeper	26	30
Warren	24	28
Winchester City	28	32
Fredericksburg City	28	40
King William	27	31
High	63	
Low	24	
Average	32	

(Source: EPA) *All results in $\mu\text{g}/\text{m}^3$. PM₁₀=particulate matter measuring less than 10 μm . **Bold face**=high, low, and average for all 2009 and 2010 results.