Health Consultation

Public Health Evaluation of Soil

Sampling Data

FORMER LONG LANE SCHOOL SITE
AT WESLEYAN UNIVERSITY

MIDDLETOWN, MIDDLESEX COUNTY, CONNECTICUT

NOVEMBER 30, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
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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HEALTH CONSULTATION

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FORMER LONG LANE SCHOOL SITE
AT WESLEYAN UNIVERSITY

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Prepared By:

The Connecticut Department of Public Health
Under cooperative agreement with
Agency for Toxic Substances and Disease Registry

The conclusions and recommendations in this health consultation are based on the data and information made available to the Connecticut Department of Public Health (CT DPH) and the Agency for Toxic Substances and Disease Registry (ATDSR). Upon request, CT DPH and ATSDR will review additional information when received. The review of additional data could change the conclusions and recommendations listed in this document.

BACKGROUND AND STATEMENT OF ISSUE

The former Long Lane School property site (the Site) was acquired from the Connecticut Department of Public Works by Wesleyan University in 2000. The Site encompasses approximately 140 acres and is located along Long Lane, in Middletown, Connecticut, as shown in the Figure in Appendix A. The Site is surrounded by residences, except to the north, where there are Wesleyan University athletic fields and other University buildings. The Site was historically operated as a training school/reformatory for troubled youth from circa 1869 until 2003. The school also operated a farm from its inception through the 1970s on two main parcels. In the southeast portion of the Site there is also a pond that was used as a recreation area. The main campus of the Long Lane School consisted of approximately twenty-five buildings located east of Long Lane, including dormitories, an infirmary, a school building, a maintenance garage and office, a boiler house, an administration building, a 58-bed secured facility, and a variety of ancillary and out-buildings. On a narrow strip of land along Long Lane, directly in front of the main campus area, is the Arboretum. The Arboretum extends approximately ¼ mile and is approximately 50 feet wide. It consists of a grouping of mature, historic trees, which are currently maintained by a volunteer group (HRP 2007).

In late 2005, many of the Site buildings were razed. Figure 1 shows the locations of current and previous buildings on the Site. Wesleyan University currently operates administrative offices from the Cady School building, and grounds crews still utilize the maintenance garage and grounds workshop buildings. In March 2006, the University constructed an all-weather turf field in the area of the former high-security building on the east-central portion of the site. Future use of the Long Lane School Site will be for expansion of the Wesleyan University Campus. It is possible that future uses could include: faculty housing, student housing, academic buildings, athletic fields, parking lots, daycare for faculty children, or administrative buildings. Specific decisions about future use have not yet been made (HRP 2007).

From the time the school opened in the mid 1800s, through 1950, coal was the main source of fuel. Before construction of the main boiler house (which served as the centralized heating source), many of the oldest buildings on site were heated with individual coal burners. As was common practice during that time, coal ash was used as grading and backfill around many of the school's oldest buildings, beneath sidewalks and roads, and to backfill low spots in various places on the main campus. In addition, historical regrading and reworking activities (such as landscaping) also resulted in placement of ash in various locations throughout the site (HRP 2007).

Phase I, II and III Site Investigations already have been completed for the Site. These investigations have included collection and analysis of hundreds of soil samples. The Phase III investigation conducted in 2006 and the Conceptual Site Model and Ash Distribution Study provides the contents and contaminant characteristics of the ash present at the site. The ash contains anthracite and bituminous coal, coal ash, wood ash, and trace amounts of tar. The ash

contains elevated concentrations of lead, arsenic and polycyclic aromatic hydrocarbons (PAHs). In addition, pesticides were applied in the past in areas adjacent to building foundations that were also backfilled with ash (HRP 2007).

Even though a large number of soil samples have been collected, the site is quite large and the location of all the ash deposits is not fully understood. In order to improve the probability of locating all the historic ash deposits that are representative of site conditions, Wesleyan University used a statistical program to create a sampling grid designed to detect (with 95% confidence), an ash deposit of at least 30 feet in diameter (in an area where historic information indicates a high probability that ash was deposited), or at least 50 feet in diameter (in an area where there is low probability that ash was deposited). Details of the remediation plan have not yet been decided, but it has been proposed that soil with ash content greater than 5% by volume (using visual inspection) be removed (HRP 2007).

In January 2007, CT DEP requested that CT DPH evaluate the statistical sampling approach contained in the Conceptual Site Model and Scope of Work for Ash Distribution Study, prepared by HRP Associates Inc. for Wesleyan University (HRP 2007a). Specifically, CT DEP requested that CT DPH evaluate (1) the adequacy of the proposed statistical sampling plan, and (2) whether small, undiscovered ash deposits could pose a public health risk in the future. In response to CT DEP's request, CT DPH prepared a letter (see Appendix B) concluding that (1) the statistical sampling plan appears to be a reasonable approach to finding ash deposits and providing data needed to evaluate health risk, and (2) based on available data and conservative assumptions about exposure, small ash deposits that remain after cleanup are unlikely to present a public health risk. CT DPH also recommended that Wesleyan University develop an ash management plan to address the safe management of ash that could be discovered in the future.

In March 2007, consultants for Wesleyan University completed the statistical sampling program, which resulted in a more complete characterization of ash deposits throughout the site. In May 2007, CT DEP requested that CT DPH review the additional sampling data presented in the Ash Distribution Study and prepare a health consultation. They asked that the health consultation provide: (1) an updated assessment of public health risks from future exposure to undiscovered ash deposits and (2) an assessment of current risks to Arboretum volunteers/workers who may be exposed to contaminated soil while performing tree maintenance activities.

Site Visit

CT DPH staff visited the site on January 11, 2007 with CT DEP, Wesleyan University representatives and the site contractor. CT DPH and CT DEP discussed site-related soil sampling and remediation issues with Wesleyan representatives and contractors and toured the site. The weather was clear and cold. CT DPH staffed also toured two of the remaining buildings onsite, as well as the Arboretum, the new athletic field, and the pond area.

Demographics

The site is in the town of Middletown, Middlesex County, Connecticut whose population is 46,918 (US Census Bureau 2000). As stated earlier, the site encompasses approximately 140

acres of land. The site is bordered by residential properties in all directions, except to the north. Approximately 100 people live in close proximity to this site.

Environmental Contamination and Health Comparison Values

1. Long Lane School Property

Between 2005 and 2007, Wesleyan University collected and analyzed approximately 174 surface and subsurface soil samples. Depths ranged from 0-6 inches to as deep as six feet below ground surface (bgs). Metals and polycyclic aromatic hydrocarbons (PAHs) were commonly detected at elevated concentrations in soil samples with ash. Low levels of a variety of persistent pesticides (<0.006 to 1.75 mg/kg) were detected in some samples near building foundations but none of the pesticide concentrations exceeded Connecticut's direct exposure soil cleanup standards (i.e., CT Remediation Standard Regulations, Residential Direct Exposure Criteria; CT RSRs).[1]

In addition to the soil samples that were analyzed, Wesleyan University also collected hundreds more soil samples from around the property that were visually screened for the presence of ash. Because the site is so large, visual analysis was used to supplement the analytical results. Based on visual inspection, samples containing greater than 5% ash were considered to be "contaminated" and have been proposed for removal. The percentage of ash content was estimated using a visual reference sample. The 5% threshold was determined based on a comparison of analytical datasets for soil with (1) pure ash, (2) mixed soil and ash, and (3) native soil. Soil containing greater than 5% ash was found to have chemical concentrations that were very likely to exceed CT RSRs for residential soil. Soil containing less than 5% ash was found not to have chemicals at concentrations exceeding CT RSRs (HRP 2007a).

Soil containing ash was found to be distributed preferentially around building foundations, in former maintenance and groundskeeping areas, beneath roads, in historic low-lying areas, and in areas that were graded in the past. There were also some randomly distributed ash spots that may reflect filling of holes, and possible holes left by trees destroyed during the 1938 hurricane.

Table 1 summarizes soil data from the former Long Lane School property for those contaminants exceeding CT RSRs. Lead, arsenic and several PAH compounds exceeded CT RSRs. The maximum arsenic concentration was 63 parts-per-million (ppm) at 16-22 inches bgs, which is approximately 6 times higher than the CT RSR of 10 ppm. The maximum lead concentration was 22,300 ppm in the 0-2.5 feet bgs, which is approximately 56 times higher than the CT RSR of 400 ppm. Maximum PAH concentrations greatly exceeded CT RSRs. On average, CT RSRs were exceeded at about 17% of the sample locations.

[1] CT has developed cleanup standards for residential soils. These standards assume that young children have direct contact with soil every day, over the long term. The cleanup standards are contained in CT's Remediation Standards Regulations and are referred to as CT RSRs. They are used in this health consultation as comparison values, below which, further evaluation of health risk is unnecessary because health impacts from exposure are unlikely (CT DEP 1996).

2. Arboretum

In February and March 2007, Wesleyan University collected seven samples at various depths (0-6 to as deep as 25 inches bgs) in the Arboretum area of the former Long Lane School property. Soil results are summarized in Table 2. Based on the soil sampling results, contamination is randomly distributed throughout the Arboretum and contaminant concentrations are lower than in the rest of the Long Lane School site. Arsenic and PAHs are the only contaminants exceeding CT RSRs. Table 2 summarizes the Arboretum results. On average, CT RSRs were exceeded at about one-third of the sample locations.

Table 1. Summary of Results[*] from Surface and Depth Samples taken from the Long Lane School Site, October 2005, February 2006, and February and March 2007.

Contaminant	Concentration Range (ppm[#])	Number of Exceedances of Comparison Value/Number of Samples Taken	Comparison Value (ppm)[^]/Average Concentration (ppm)
Arsenic	<2.6 - 63	26 / 133	10 / 7.62
Lead	<0.8 – 22,300	9 / 144	400 / 303
Benzo(a)anthracene	<0.19 - 133	21 / 105	1 / 3.8
Benzo(a)pyrene	<0.19 - 105	23 / 106	1 / 3.9
Benzo(b)fluroanthene	<0.19 - 130	21 / 93	1 / 5.4
Dibenzo(a,h)anthracene	<0.19 - 28	12 / 105	1 / 0.93
Indeno(1,2,3-cd)pyrene	<0.19 - 88	18 / 103	1 / 2.9

[*]Only contaminants found to exceed CT RSRs are included in this Table.
[#] Parts per million
< = Less than
[^]Source of the Comparison Values is the Connecticut Remediation Standard Regulations Direct Exposure Criteria (CT RSRs). CT RSRs are soil standards that were developed to be protective of children and adults who have contact with soils on a daily basis for many years (30 years) in a residential setting (CT DEP 1996).

Table 2. Summary of Results[*] from Surface and Subsurface Samples taken from the Arboretum of the former Long Lane Property Site, February and March 2007.

Contaminant	Concentration Range (ppm[#])	Number of Exceedances of Comparison Value/Number of Samples Taken	Comparison Value (ppm)[^]/95% UCL[&] Concentration (ppm)
Arsenic	<2.6 - 35	5/8	10/20
Benzo(a)anthracene	0.2 - 2.8	2/6	1/1.7
Benzo(a)pyrene	<0.2 - 2.5	2/6	1/1.6
Benzo(b)fluroanthene	<0.2 - 4.1	2/6	1/3.5
Indeno(1,2,3-cd)pyrene	<0.20 - 1.9	1/6	1/2.0

[*]Only contaminants found to exceed CT RSRs are included in this Table.
[#] parts per million
< = Less than
[^]Source of the Comparison Values is the Connecticut Remediation Standard Regulations Direct Exposure Criteria (CT RSRs). CT RSRs are soil standards that were developed to be protective of children and adults who have contact with soils on a daily basis for many years (30 years) in a residential setting (CT DEP 1996).
[&] The 95% Upper Concentration Limit (UCL) is a conservative estimate of the average.

DISCUSSION

Exposure Pathway Analysis

As stated earlier, CT DPH was asked by CT DEP to answer the following two questions in this health consultation: (1) using all available soil data at the former Long Lane School site, do potential future exposures to undiscovered/unremediated ash deposits present a threat to public health, and (2) does contaminated soil in the Arboretum present an exposure risk to volunteers/workers who may be exposed to contaminated soil while performing tree maintenance activities.

To evaluate exposures to soil contaminants, CT DPH evaluated the environmental data and considered how people might come into contact with contaminants in soil. Possible pathways of exposure are dermal, inhalation, and incidental ingestion of soil. In other words, in order to be exposed to contaminants in soil at the Long Lane school Site and Arboretum, one must come into contact with the soil by touching the soil, breathing airborne soil particles, or eating soil adhered to fingers or food items. CT DPH did not evaluate the inhalation pathway because it was determined not to be a significant exposure pathway. The Site does not have large areas of bare soil that would create the potential for excessive dust. Lawn maintenance activities (such as mowing) have the potential to create some dust (if the soil is dry), but the activities are unlikely to be long enough or frequent enough to result in significant exposures. Therefore, dermal and ingestion exposure to soil are the two pathways evaluated for the Long Lane School and Arboretum areas.

To evaluate whether future exposures to undiscovered/unremediated ash deposits could pose a risk at the Long Lane School Site, CT DPH evaluated exposures to a young child/adult resident.

As stated previously, future uses of the site have not yet been decided. Residential housing and/ or daycare for faculty children are possible future uses. With these future uses, young children would be present at the property for extended periods of time over a long period of time. Children could be exposed to an ash deposit in the soil while playing. Adult residents could be exposed while gardening or performing other yard maintenance activities. Long-term exposure involving young children is the most sensitive exposure scenario. If risks to young children are not a concern, then exposures to other receptors will also be of no concern (e.g., college students, adult faculty, groundskeepers).

CT DPH also evaluated the exposure risk to Arboretum volunteers and professional tree workers who could be exposed to contaminants in soil in the Arboretum area while they conduct tree maintenance activities. Their potential contact with soil is assumed to be casual (i.e., no digging or working directly in the soil)[2]. We do not expect other groups such as children, to be exposed to contaminated soil in the Arboretum. Although the area is unrestricted to the public, there is a paved walkway which directs people through the area. The Arboretum is a narrow strip of land, located along a busy roadway, so it is not attractive as a play area for young children.

Public Health Implications for Adults and Children

When determining the public health implications of exposure to hazardous contaminants, CT DPH considers how people might come into contact with contaminants and compares contaminant concentrations with health protective comparison values. When contaminant levels are below health-based comparison values, health impacts from exposure to those levels are unlikely. Contaminant levels exceeding comparison values do not indicate that health impacts are likely but instead warrant further evaluation. In this health consultation, CT DPH used CT RSRs as health protective screening values. As stated previously, these values are health-based levels developed to be protective of children and adults with frequent, long-term exposure to contaminants in soil. CT DPH evaluated risks from exposure to contaminants found above CT RSRs. As stated previously, lead, arsenic and PAHs are the only contaminants found at levels exceeding CT RSRs. General toxicology information for these contaminants are provided in Appendix C.

<u>Former Long Lane School Site</u>

As stated in the Exposure Pathways Analysis Section, CT DPH evaluated a child/adult resident exposure scenario. It was assumed that a young child/adult would have direct contact with contaminants in soil on the legs, feet, hands and arms at a frequency of 7 days per week, 9 months per year for 30 years. This exposure scenario is conservative because it assumes direct contact with bare soil every day. Throughout the former Long Lane School property, the soil is mostly covered with grass. Nine months of exposure per year is assumed because the ground will be covered with snow for 3 months and/or the weather will be too cold for any outdoor activities where children or adults would be exposed to soil contamination.

[2] There is the possibility that digging would be required for planting new trees, removing dead trees, or for utility work (both in the Arboretum and former Long Lane School portions of the Site). Such activities will be covered in the Ash Management Plan., which will include provisions to appropriately manage ash encountered in the future, thereby minimizing potential exposures.

For the concentration of contaminants in soil to which a resident could be exposed, CT DPH calculated average concentrations using both surface and subsurface soil data. For results that were non-detect, one half the detection limit was used in the calculation. The full dataset of available soil results (surface and subsurface) were used because we are evaluating future exposure to an undiscovered/unremediated ash deposit that could be in surface or subsurface soil. An average concentration calculated using all the soil data should provide a representative ash concentration to which a person could be exposed in the future. Average soil concentrations for the Long Lane School property are included in Table 1. CT DPH did not calculate a 95% UCL because there was a large enough dataset of samples to provide good confidence in the average. The average concentrations of PAHs exceeded CT RSRs. Therefore, cancer and non-cancer risks from exposure to PAHs in soil were evaluated. For lead and arsenic, although some individual sample results exceeded CT RSRs, the average concentrations of these contaminants did not exceed CT RSRs (see Table 1). Therefore, cancer and noncancer risks from exposure to lead and arsenic at the Long Lane School property were not evaluated.

CT DPH's noncancer risk calculations show that the average daily dose of PAHs to a future resident is well below the safe dose. The safe dose used for PAHs is the U.S. Environmental Protection Agency (EPA) Reference Dose (RfD) of 0.02 mg/kg/day for naphthalene. A RfD is an average daily dose below which, adverse health effects are not expected. Naphthalene is used as a surrogate for evaluating noncancer effects from all of the PAH compounds because at this time, there are no RfDs for long-term exposure to PAHs. Because the estimated average daily dose of PAHs to a future resident at the former Long Lane property is well below the safe dose, noncancer health effects from exposure to PAHs in undiscovered ash deposits are not expected.

With regard to cancer risks, the theoretical excess lifetime cancer risk from exposure to PAHs for a future resident is 9×10^{-5} (9 excess cancers in 100,000 exposed persons). This is the theoretical future cancer risk from daily, direct contact exposure (for 30 years) to an ash deposit in surface accessible soil, which is not discovered or remediated. First, based on the statistical sampling plan used to characterize the site, there is only a small probability (5% or less) that a large ash deposit will be undiscovered on the property following remediation. Second, Wesleyan University plans to implement an ash management plan to address the discovery of any ash-contaminated soil in the future. Thus, it is likely that an ash deposit discovered in the future will be addressed right away. Third, an excess cancer risk of 9×10^{-5} is a relatively small increased cancer risk from exposure to PAHs in the soil. Actual risks are likely to be less because CT DPH used very conservative (health protective) assumptions about exposure (i.e. a child/adult resident exposed <u>every day</u> for 30 years). At these calculated, theoretical cancer risk levels, we would not expect to observe excess cancer health effects from these potential future exposures. Detailed risk calculations are provided in Appendix D.

<u>Arboretum</u>

CT DPH also evaluated current cancer and noncancer risks to Arboretum volunteers and workers. It was assumed that an adult worker or volunteer could be exposed for 2 days per week, 6 months per year, for 20 years. This is a conservative estimate of the frequency and duration that an Arboretum worker could be potentially exposed to contaminated soil. As with the Long Lane School property risk calculations, CT DPH used the entire dataset of soil results (surface and subsurface) to calculate the average concentration to which a worker could be

exposed. However, for the Arboretum, a 95% UCL was calculated because the number of soil samples from the Arboretum is small.

Noncancer risks from exposure to soil in the Arboretum were calculated for PAHs and arsenic. Lead was not found in the Arboretum at levels exceeding CT RSRs. The average daily doses of PAHs and arsenic are well below their safe doses, indicating that noncancer health effects from exposure are not expected. As described above, to evaluate noncancer risks from PAHs, CT DPH used the EPA RfD for naphthalene of 0.02 mg/kg/day . For arsenic, the EPA RfD of 0.003 mg/kg/day was used. This is identical to the ATSDR Minimal Risk Level, which is another type of "safe dose".

CT DPH also evaluated theoretical cancer risks to Arboretum workers. Cancer risks are very small (2×10^{-6}, or 2 excess cancers in 1,000,000 exposed people), indicating that cancer health effects from current exposure to contaminated soil in the Arboretum are not expected. Actual risks are likely to be much less because CT DPH used conservative (health protective) assumptions about exposure. Detailed risk calculations are provided in Appendix D.

CONCLUSIONS

Soil sampling throughout the Long Lane School parcel and the Arboretum shows that ash deposits contain elevated concentrations of lead, arsenic and PAHs. Despite the fact that a large amount of sampling has occurred at the site, it is possible that there are some ash deposits with elevated levels of contaminants that were not discovered during the extensive sampling program.

As requested, CT DPH evaluated <u>current</u> exposures to Arboretum workers who have the potential to come into contact with contaminated soil while they perform maintenance work on the historic trees. CT DPH concludes that given the Arboretum's current use, exposures to arsenic, lead and PAHs in the soil are not expected to cause harm to people's health[3]. However, if the use of the Arboretum changes in the future, this conclusion could change as well.

As requested, CT DPH also evaluated whether <u>future</u> exposures to undiscovered/unremediated ash deposits an the Long Lane School Site could pose a threat to public health. To do this, CT DPH evaluated exposures and risks to future residents at the Long Lane School Site who may encounter an undiscovered/unremediated ash deposit. CT DPH concludes that arsenic, lead and PAHs in undiscovered ash deposits at the Long Lane Site are not expected to cause harm to people's health in the future[4].

[3] ATSDR has a categorization scheme whereby the level of public health hazard at a site is assigned to one of five conclusion categories (Appendix E). CT DPH has concluded that under current exposure conditions, there is No Apparent Public Health Hazard from exposure to arsenic, lead and PAHs in the soil in the Arboretum.

[4] ATSDR has a categorization scheme whereby the level of public health hazard at a site is assigned to one of five conclusion categories (Appendix E). CT DPH has concluded that there is No Apparent Public Health Hazard from future exposure to arsenic, lead and PAHs in undiscovered ash deposits in soil at the Long Lane Site.

Even though CT DPH's evaluation indicates that contaminants in the soil in the Arboretum are not expected to result in health effects, this conclusion is only valid given the current use of the Arboretum. If usage changes in the future (for example, if the Arboretum area is used by young children), exposures and risks would need to be re-evaluated to ensure that exposures do not harm public health.

Although CT DPH's evaluation indicates that exposure to contaminants in the Arboretum and Long Lane parcels are not expected to result in harm to public health, there are ash deposits currently present at the site, which contain contaminants at levels exceeding CT RSRs. CT DPH's findings about exposure and risk are not meant to suggest that known ash deposits at the Site need not be addressed.

CT DPH fully supports Wesleyan University's current plans to address known ash deposits because the remediation of known ash deposits will further reduce the potential for exposure now and in the future. In addition, there are legal requirements that the CT RSRs be met. CT DPH also supports Wesleyan University's plans to implement an ash management plan which will ensure the safe management of ash-contaminated soil into the future.

RECOMMENDATIONS

1. CT DPH agrees with Wesleyan University's proposed plan to remediate known ash deposits at the Long Lane and Arboretum parcels which contain greater than 5% ash (by visual inspection). CT DPH supports remediation of the ash because it will serve to limit direct contact exposure now and in the future. Wesleyan University should consider a range of alternatives when determining the best remedial option to remediate and/or limit exposure to the ash. If ash deposits are left in place at depth, CT DEP should ensure that the property owner record an Environmental Land Use Restriction (ELUR) or other similar institutional control to prevent future exposures to ash at depth.

2. Wesleyan University should continue to work with CT DEP to develop an Ash Management Plan (AMP) that runs with the land for the Arboretum and Long Lane parcels through an ELUR or other similar institutional control. The AMP and ELUR would be recorded on the land records by the property owner. The AMP plan should include provisions to appropriately manage ash that is found or uncovered in the future.

    a. The AMP should require an evaluation of the need for investigation and/or remediation if the property is sold or if the property use changes substantially from what was evaluated in this Health Consultation.

    b. The AMP should include provisions to notify CT DEP and CT DPH if the former Long Lane School property is sold, or if the use of the property changes substantially from what was evaluated in this health consultation.

    c. The AMP should include provisions to protect workers who disturb ash while digging at the site.

PUBLIC HEALTH PLAN

Actions Taken

1. In response to a request from Wesleyan University and CT DEP, CT DPH prepared a Technical Assistance Letter evaluating the adequacy of sampling data and evaluating exposures and risks to soil contamination at the former Long Lane School Site.

2. In response to a request from Wesleyan University and CT DEP, CT DPH responded to a technical request regarding the appropriateness of constructing a temporary parking lot over an area on the Long Lane Site known to have ash deposits (letter dated June 26, 2007).

3. CT DPH participated in a site visit of the former Long Lane Site and the Arboretum in January 2007.

4. At the request of CT DEP, CT DPH has attended several technical meetings with representatives from Wesleyan University and their consultants.

Actions Planned

1. CT DPH will make this health consultation available to Wesleyan University, CT DEP, and any interested community members.

2. CT DPH will continue to work with Wesleyan University and CT DEP to respond to health questions and concerns regarding cleanup of hazardous contaminants at the former Long Lane School Site.

3. If additional data for the Site become available, CT DPH will review the data and will update this health consultation, if necessary.

4. CT DPH will work with Wesleyan University and CT DEP, as needed, to develop an ash management plan for the Site.

5. CT DPH will review the final remediation plan for this Site.

REFERENCES

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[United States Census Bureau. 2000] American Fact Finder. Census 2000 Summary. Available at http://factfinder.census.gov/servlet/GCTTable?_bm=y&-geo_id=04000US09&-_box_head_nbr=GCT-PH1&-ds_name=DEC_2000_SF1_U&-format=ST-7.

CERTIFICATION

The Health Consultation for the Public Health Evaluation of Soil Sampling Data for the former Long Lane School Site at Wesleyan University in Middletown, Connecticut was prepared by the Connecticut Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the ATSDR Cooperative Agreement Partner.

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Agency for Toxic Substances and Disease Registry (ATSDR)

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Team Leader-Coop Agreement Program
CAT, DHAC, ATSDR

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Appendix A
Site Plan of the Former Long Lane School Site and Arboretum

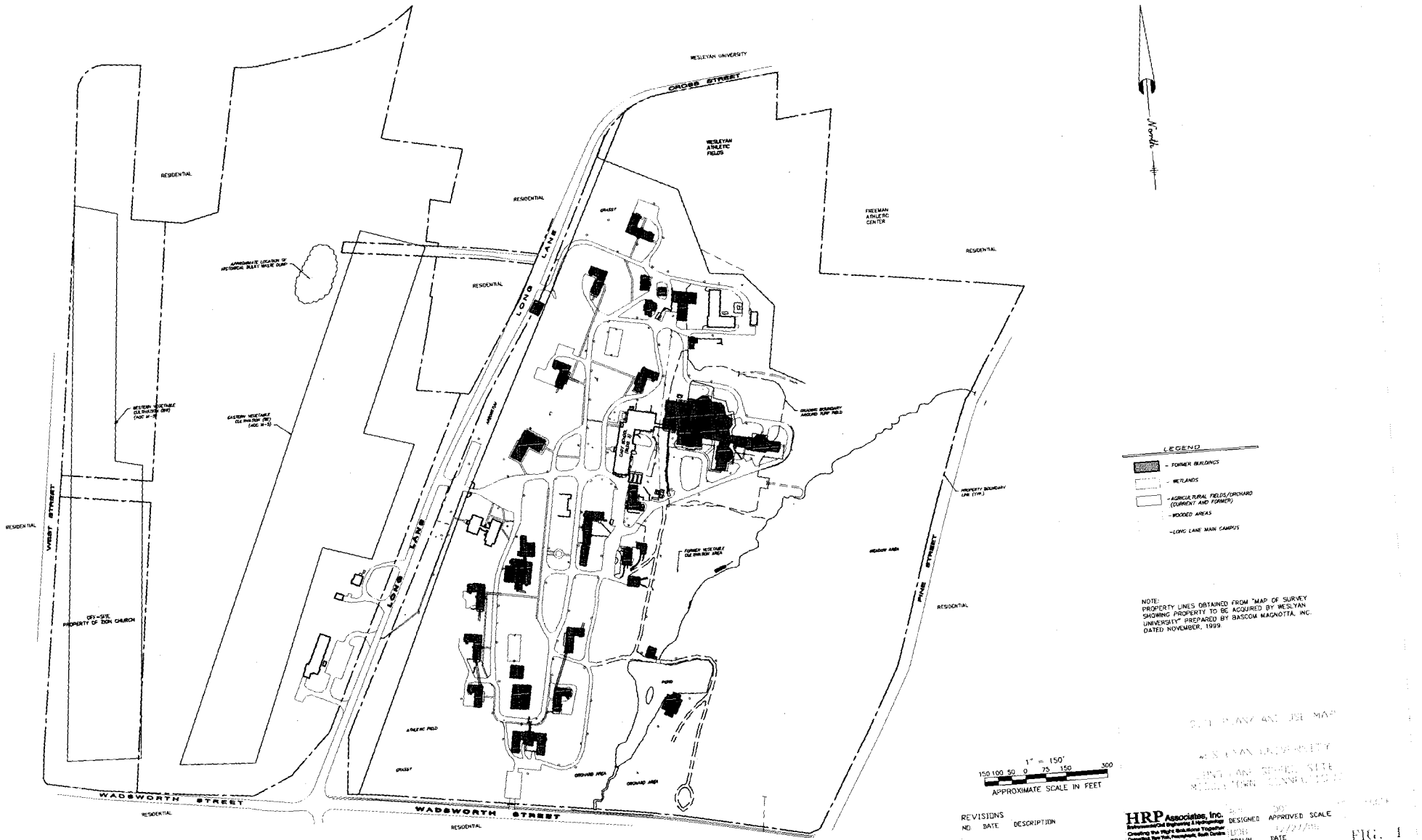
WESLEYAN UNIVERSITY
CROSS STREET
RESIDENTIAL
WESLEYAN ATHLETIC FIELDS
FREEMAN ATHLETIC CENTER
GRASS
LONG LANE
WEST STREET
PINE STREET
WADSWORTH STREET
OFF-SITE PROPERTY OF ZION CHURCH
ATHLETIC FIELD
GROUND AREA
POND
North
LEGEND
- FORMER BUILDINGS
- WETLANDS
- AGRICULTURAL FIELDS/ORCHARD (CURRENT AND FORMER)
- WOODED AREAS
- LONG LANE MAIN CAMPUS
NOTE:
PROPERTY LINES OBTAINED FROM "MAP OF SURVEY SHOWING PROPERTY TO BE ACQUIRED BY WESLYAN UNIVERSITY" PREPARED BY BASCOM MAGNOTTA, INC. DATED NOVEMBER, 1999.
1" = 150'
150 100 50 0 75 150 300
APPROXIMATE SCALE IN FEET
REVISIONS
NO. DATE DESCRIPTION
HRP Associates, Inc.
Environmental Engineering & Hydrogeology
Creating the Right Solutions Together
Connecticut New York Pennsylvania South Carolina
197 Scott Swamp Road
Farmington, Connecticut 06032
Ph:(860)674-9670 Fax:(860)674-9824
www.hrpassociates.com
DESIGNED
DRAWN
CHECKED
APPROVED
DATE
PROJECT NO.
SCALE
SHEET NO.

FIG. 1

Appendix B
Technical Letter from CT DPH to CT DEP dated January 31, 2007

January 31, 2007

Peter Hill
Environmental Analyst
Connecticut Department of
Environmental Protection
79 Elm Street
Hartford, CT

RE: Wesleyan University ("WU"), Former Long Lane School Campus
Middletown CT
Proposed Ash Investigation

Dear Mr. Hill,

This letter is in response to your request that we evaluate the work plan titled, "Conceptual Site Model and Scope of Work for Ash Distribution Study, Wesleyan University, Long Lane Campus, 170 Long Lane, Middletown, CT 06459," dated January 12, 2007 (the "Work Plan"). The primary goal of our review was to determine if the proposed investigation will provide adequate environmental data for a preliminary evaluation of health risk posed by accessible ash and coal (ash) that remains onsite following remediation of the former Long Lane School property. The Work Plan was prepared by HRP Associates, Inc. for Wesleyan University. Following further sampling and analysis of soil as described in the above document, a more comprehensive evaluation of health risks from remaining ash will be described in a Health Consultation by the Connecticut Department of Public Health (CT DPH).

As described in the Work Plan, the primary goals of the investigation are to determine the location of the ash and provide more analytical information regarding the nature of the ash. The proposed investigation was developed using the computer program "Visual Sample Plan" to determine the location and number of samples needed to find ash deposits at the site. According to the sampling plan submitted by Wesleyan University, it is assumed that following remediation of this property, there will be areas of ash that were not discovered during the investigation and therefore will remain.

The proposed investigation provides the information that is needed for our preliminary evaluation of health risk from exposure to the remaining ash deposits. To provide an early understanding of the potential outcomes of the Health Consultation, we have evaluated the existing data with regard to exposure to elevated levels of polycyclic aromatic hydrocarbons (PAHs), lead, and arsenic assuming passive recreational exposures for a college student, aged 18-22 years and have calculated risks for adverse health effects. Because we do not know what

the chemical concentrations are in the ash left behind after the cleanup, we used the maximum and average concentrations of total PAHs, lead, and arsenic in the risk calculations. Even using the maximum concentrations, only minimal excess risks for adverse health effects is expected from exposure to contaminants that may remain on this site. These minimal excess risks are unlikely to result in illness among exposed people. Following the completion of the activities described in the Work Plan and our review of additional data from the investigation, we will prepare a Health Consultation which will contain a final evaluation of the risks posed by unremediated ash.

It is our understanding that the future use of the site will be for the expansion of the Wesleyan campus and is likely to include athletic fields. Based on our review of the existing data it is likely that the Health Consultation will recommend that known ash deposits at the site be covered to limit exposure, with a minimum of one foot of clean material. It is also likely that the Health Consultation will recommend that an Ash Management Plan be developed to address ash that is discovered during the future. This plan would include a protocol for safe ash management if use changes in the future such that people, particularly children would have greater opportunities for contact with the ash, e.g., daycare, playground, garden, residences or if the property is sold. This plan will include the use of personal protective equipment (e.g., gloves) when any digging is to take place where the soil is contaminated or not yet characterized. Please note the Health Consultation will not identify the requirements of the CT DEP to ensure that the Ash Management Plan is followed in the future.

If you have any questions or need additional information, please contact me at (860) 509-7583.

Sincerely,

Sharee M. Rusnak
Environmental and Occupational
Health Assessment Program
CT Dept. of Public Health

Appendix C
General Toxicology Information for Arsenic, PAHs, Lead

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ARSENIC

CAS # 7440-38-2

Division of Toxicology and Environmental Medicine ToxFAQs™ **August 2007**

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

❑ Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
❑ Arsenic cannot be destroyed in the environment. It can only change its form.
❑ Rain and snow remove arsenic dust particles from the air.
❑ Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
❑ Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

❑ Ingesting small amounts present in your food and water or breathing air containing arsenic.
❑ Breathing sawdust or burning smoke from wood treated with arsenic.
❑ Living in areas with unusually high natural levels of arsenic in rock.
❑ Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

❑ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.

❑ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

❑ If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1996**

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ **August 2007**

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- ❏ Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- ❏ When lead is released to the air, it may travel long distances before settling to the ground.
- ❏ Once lead falls onto soil, it usually sticks to soil particles.
- ❏ Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- ❏ Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- ❏ Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- ❏ Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- ❏ Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

❑ Avoid exposure to sources of lead.

❑ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.

❑ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.

❑ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children

❑ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (μg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 μg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 μg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Appendix D
Risk Calculations

WHERE:

IR = soil ingestion rate; adult-50 mg/day, Child-100 mg/d (EPA 1997)*

Conc. = Soil concentration
- Long Lane School PAHs- 16.9 mg/kg (noncancer), 10.2 mg/kg (cancer)
- Arboretum PAHs – 8.8 mg/kg (noncancer), 2.6 mg/kg (cancer)

EF = Exposure Frequency
- Long Lane School – 5 days/week, 9 mo/yr (252 days/yr)
- Arboretum – 2 days/week, 6 mo/yr (48 days/yr)

ED = Exposure Duration
- Long Lane School – 30 years
- Arboretum – 20 years

C1 = conversion factor; 10^{-6} kg/mg

C2 = conversion factor; 1 year/365 days

BW = Body Weight; child-16 kg, adult-70 kg

AT = Averaging Time; noncancer-6 years, cancer-70 years

AF = Soil-skin adherence factor; child-0.2 mg/cm^2-ev, adult-0.07 mg/cm^2-ev (EPA 2004)

ABS = Soil dermal absorption fraction, PAHs-0.13, Arsenic-0.03 (EPA 2004)

F = Event Frequency, 1 ev/day

SA = Skin Surface Area: legs, feet, hands, arms
- Child Resident - 3307 cm^2, Resident Adult-10,695 cm^2. Arboretum worker-9697 cm^2 (EPA 2004)

ADDi = Average Daily Dose ingestion

ADDd = Average Daily Dose dermal

HI = Hazard Index

RfD = Reference Dose
- 0.02 mg/kg/day PAHs (napthalene)
- 3E-4 mg/kg/day arsenic (EPA 2007)

CSF = Cancer Slope Factor
- 7.3 risk per mg/kg/d PAHs (benzo-a-pyrene)
- 1.5 risk per mg/kg/d arsenic (EPA 2007)

ELCR = Excess Lifetime Cancer Risk

* EPA (1997) recommends using a soil ingestion rate of 50 mg/day for a child/adult over 6 years old. The U.S. EPA states that these values represent best estimates of average soil ingestion rates. U.S. EPA programs have used 200 mg/day and 100 mg/day as conservative estimates of average soil intake rates. CT DPH opted to use the best estimate average value of 50 mg/day rather than the more conservative estimates for the sake of consistency.

APPENDIX E
ATSDR PUBLIC HEALTH HAZARD CATEGORIES

Category / definition	Criteria	ASTDR Actions
A. Urgent Public Health Hazard This category is used for sites where short-term exposures (< 1 year) to hazardous substances or conditions could result in adverse health effects that require rapid intervention. This determination represents a professional judgment based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.		ATSDR will expeditiously issue a health advisory that includes strong recommendations to immediately stop or reduce exposure to mitigate the health risks posed by the site.
B. Public Health Hazard This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 year) to hazardous substance or conditions that could result in adverse health effects. This determination represents a professional judgment based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.	ATSDR will make recommendations to stop or reduce exposure in a timely manner to mitigate the health risks posed by the site.

C. Indeterminate Public Health Hazard This category is used for sites in which "critical" data are insufficient with regard to extent of exposure and/or toxicologic properties at estimated exposure levels. This determination represents a professional judgment that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.	The health assessor must determine, using professional judgment, the "criticality" of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.	ATSDR will make recommendations in the public health assessment to identify the data or information needed to adequately assess the public health risks posed by the site.
D. No Apparent Public Health Hazard This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects. This determination represents a professional judgment based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.	
E: No Public Health Hazard This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard. Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future	Sufficient evidence indicates that no human exposures to contaminated media have occurred, no exposures are currently occurring, and exposures are not likely to occur in the future.	

* Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plan.