Health Consultation

MILWAUKEE DIE CASTING SITE

MILWAUKEE, WISCONSIN

Prepared by
Wisconsin Department of Health Services

MAY 3, 2012

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

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Summary and Statement of Issues

Introduction

The Wisconsin Division of Public Health (DPH), as part of its cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), has prepared this Public Health Consultation in order to review and identify public health issues associated with the former Milwaukee Die Casting site, located in the City of Milwaukee, Wisconsin. A number of the samples taken from inside and outside the unoccupied buildings on the property showed polychlorinated biphenyl (PCB), lead, and asbestos contamination above health-based comparison values (EPA 2010; ATSDR 2000). Appropriate steps are recommended to prevent unnecessary exposure:

Conclusion

DPH concludes that physical conditions at the Milwaukee Die Casting property could harm people's health.

Basis for decision

An unstable semi-trailer on the property, combined with breaches in property security, is an immediate danger. Pits and trenches within the Milwaukee Die Casting building increase the risk of both physical harm and chemical exposure.

Conclusion

DPH concludes that exposure to PCBs in sediments present in sub-floor trenches and in sediments around storm sewer outfalls from the property to the Milwaukee River, could harm people's health, even if the exposure is for a short time.

Basis for decision

PCBs are elevated in sediment in a number of locations in these trenches and around the storm sewer outfalls. At the highest levels found, particularly at location SD-06 and at the storm water outfall to the east-northeast of the property, the concentration is high enough to cause harm to workers or trespassers exposed to this material.

Conclusion

DPH concludes that polychlorinated biphenyls (PCBs) on accessible surfaces within the Milwaukee Die Casting could harm people's health if exposure occurred repeatedly over a period of a year of more.

Basis for decision

Exposures were estimated based on PCB concentrations found within the Milwaukee Die Casting building, combined with the expected behavior of building visitors. No acute harm is expected from the levels found in wipe samples. However, PCBs from any source can contribute to one's accumulated exposure to PCBs, and corresponding risks to health, over their lifetime.

Conclusion

DPH concludes that PCBs in surface soils outside of the eastern fenceline of the Milwaukee Die Casting property could harm people's health if exposure occurred repeatedly over a period of a year of more.

Basis for decision

PCBs in these soils area exceed standards and guidelines designed to prevent the accumulation of PCBs in fish and other foods. PCBs from any source can contribute to

	one's accumulated exposure to PCBs, and corresponding risks to health, over their lifetime.
Conclusion	DPH concludes that lead residues on accessible surfaces within the Milwaukee Die Casting building could harm people's health if exposure occurred repeatedly over a period of a year or more.
Basis for decision	Regular contact with lead in dust at the concentrations found here could increase blood lead levels to those associated with adverse health effects.
Conclusion	DPH concludes that asbestos present in dust and wipe samples taken from parts of the building could harm people's health if exposure occurred repeatedly over a period of a year or more.
Basis for decision	Asbestos on floors and surfaces within the boiler room are present at concentrations exceeding applicable comparison values, and could expose people who disturb asbestos-containing dust.
Conclusion	DPH concludes that chlorinated solvents found in soil and groundwater beneath the Milwaukee Die Casting site are not presently expected to harm people's health, but does have the potential to affect indoor air quality in buildings that might be placed on the site in the future.
Basis for decision	Contaminated groundwater found beneath the property is not used as a source of drinking water by any individuals or communities, but levels of chlorinated solvents beneath the building foundation are high enough to affect the indoor air quality of future uses of the property.
Next steps	To protect community health and well-being, DPH recommends immediate steps to prevent trespass entry to the property and to mitigate physical hazards. In order to prevent PCBs from entering the food supply, DPH recommends the removal of PCBs above the action level from soil, tunnel sludge, and sewer sludge at the Milwaukee Die Casting site and adjoining storm sewer outfalls. DPH recommends the proper removal and disposal of lead and asbestos from the building, and surfaces containing PCB residues. DPH also recommends that anyone who may contact contaminated soils and sludge at the site protect themselves with disposable shoe covers, and by thoroughly washing hands before eating and/or leaving the site. This document does not include recommendations for a specific plan of remediation. However, DPH recognizes that an environmentally sound restoration of the building may be beyond the scope of the current project, and that removal of the building may be the only feasible option for the long-term protection of the public.

Background

Site description and History. Milwaukee Die Casting is a former aluminum and zinc casting facility, now abandoned, located at 4132 North Holton St., Milwaukee, Wisconsin (Weston 2011). Areas within a one-mile radius consist of industrial, commercial, and residential uses (Figure 1).

The property is abandoned with no caretaker. Its reuse is limited by contamination by industrial polychlorinated biphenyl (PCB) oil, metals, chlorinated solvents, and by the general disrepair of the Milwaukee Die Casting building. PCBs found in the sanitary sewer leaving the property have been tied to PCBs that contaminated Milorganite™ fertilizer spread on athletic fields in the Milwaukee area in 2007 (ATSDR 2009). Currently, a bulkhead has been placed on the sanitary sewer near the property fence line to block its connection with the city system and to prevent PCBs in the sanitary sewer on the property from moving off the property prior to their removal. See Arcadis (2008), Weston (2011; 2012) and WDNR (2012) for more detailed discussion of the condition of the sewer.

Surrounding area and Demographics. The immediate boundaries to Milwaukee Die Casting (Figure 1) consist of a broadcasting antenna site and publicly accessible green space along the Milwaukee River to the east, a former aggregate crushing industrial facility to the south, a Wisconsin juvenile corrections and a transition housing facility to the north (4200 North Holton Street). To the west, across Holton Street, lies an Army National Guard Armory.

A *community profile* was developed using DHS Graphical Information System using data from the US Census Bureau, American Community Survey (www.census.gov/acs), for the five census tracts falling within a one-mile radius of the Milwaukee Die Casting property (Figure 2). Approximately 14,400 people live within this radius (USCB 2011). The Milwaukee River roughly bisects the one-mile radius area into *East* (population 8,500) and *West* (population 5,900) sections, and serves to limit the movement of people between the east and west sections to those roads that have bridges crossing the river.

The East and West sections are different socioeconomically and demographically. The West section population is comprised of groups identified as Black/African American (51%), 38% White, and 11% Hispanic. The West section is poorer compared to the rest of the county and state. Fifty-three percent (53 %) of children living on the West section live in poverty, compared to 26% of children in Milwaukee County and 14% of children in Wisconsin. The East section population is comprised of groups identified as White (89%), 3% Black/African American, and another 3% Hispanic. In contrast to the West section, economic indicators for the East section are better than those for the county and state. Only 2% of children living in the East section live in poverty, and the median value of a home in the East section is more than two times the median value of a home in the West section, and one and a half times the median home value for Milwaukee County ($258,600 versus $117,600 and $154,400 respectively).

Summary of environmental investigations. A *Removal Site Assessment Summary Report for the Milwaukee Die Casting Site* has been prepared by Weston Solutions Inc. (Weston 2012), under contract with the U.S. Environmental Protection Agency. The report includes the analysis of samples from sewers, soil, groundwater, indoor areas, and beneath the building foundation. These were gathered from on-site locations on May 31-June 2, 2011. Table 1 lists the average and maximum concentrations of lead, PCBs, and asbestos found in locations having the potential for exposure to trespassers or workers on the property. The EPA initially asked DPH to comment on the field sampling plan and participate in a site visit, and later to evaluate the public health aspects of the investigation results.

Table 1. Summary of contaminants posing risk at Milwaukee Die Casting site.

Contaminant	Average concentration (mean± std.dev.)	Maximum concentration	ATSDR CV	EPA CV	Location, max. concentration
Lead dust	2.4 ±1.2 µg/100cm^2 n=4	5 µg/100cm^2	na	2.7[§] µg/100cm^2	Office carpet MDC-DU-03[7]
Lead wipe	275±186 µg/100cm^2 n=4	520 µg/100cm^2	na	2.7[§] µg/100cm^2	Foundry floor, MDC-WP04[8]
PCB wipe	154 ± 143 µg/100cm^2 n= 7	370 µg/100cm^2	na[6]	na[6]	Foundry window pane MDC-WP07[8]
PCB sediment	38 ± 28 mg /kg[1]	17,000 mg/kg	0.4 ppm CREG[3]	0.74 mg/kg[4]	Sub-floor tunnel[2] MDC-SD06
PCBs in surface soil (0-1 ft)	14.9± 43.6 mg/kg n=15[5]	171 mg/kg	0.4 ppm CREG[3]	1 mg/kg	Outside fence boundary, east of courtyard[10]
Asbestos wipe	116,822±153,781 structures/cm^2 n=7	392,420 structures/cm^2	na	AHERA[9] 7,000 structures/ cm^2	Floor near boiler room MCD-WP03[8]
Asbestos dust	44,369±86,281 structures/cm^2 n=6	220,261 structures/cm^2	na	AHERA[9] 7,000 structures/ cm^2	Floor near boiler room MDC-DU01[7]

CV: comparison value
na: not available
[§]World Trade Center action level. EPA 2003
[1]Mean of 5 sediment samples, all less than less than 100 mg/kg total PCB. Mean does not include the maximum sample.
[2]Represents maximum sample, 17,000 mg/kg.
[3]Cancer Risk Evaluation Guide.
[4]EPA Industrial Regional Screening Level
[5]Surface soil samples are combined results of Weston 2012 (0-1 feet below surface, n=6) and WDNR 2012 (0-4 inches below surface, n=7).
[6]Exposure calculated for PCB wipe samples; see discussion in text.
[7]Weston 2012, table 8, figure 9
[8]Weston 2012, table 7, figure 8.
[9]Asbestos Hazard Emergency Response Act. CV not health-based; based on asbestos fibers or structures recovered from air filters in schools EPA 1987, EPA 2003.
[10]Weston 2012, table 1, figure 3.

From the list of environmental conditions identified in current and earlier investigations (Weston 2012, Arcadis 2008, WDNR 2012) and from an April 2011 site visit, the following are identified in this report as the key features of the property's condition that could affect public health:

- Physical hazards on grounds, particularly debris and an unstable semi-truck trailer.
- Physical hazards within non-secure building
- Potential for exposure to PCB, lead dust, and asbestos inside the building.
- Hazards from direct contact to PCBs in surface soils.
- Overland flow of storm water to storm sewers and subsequent deposition of PCBs to the Milwaukee River.
- Chlorinated solvents (trichloroethylene and tetrachloroethylene) in soils beneath building, and the potential for indoor air effects via the vapor intrusion pathway.

Community Health Concerns

The major community health concern addressed in this consultation is the potential for exposure to PCBs, lead, and asbestos. This exposure would be primarily to workers and trespassers purposely visiting the property. Elaborate graffiti and trash from transient encampments are evidence of regular trespass. A less direct community health concern is that of dispersal of on-site PCBs to the environment, particularly to waterways, and subsequent bioaccumulation in fish. Direct contact with PCBs in soil and sediments is a concern, as are physical hazards within the Milwaukee Die Casting building and the unstable truck trailer outside the building. Chlorinated solvents in soil and groundwater on site are not presently a community health hazard, but could affect future occupants of the site if not removed.

Discussion

As outlined above under *Statement of Issues*, the Wisconsin Division of Public Health identified several items having public health relevance within the Site Assessment. These include immediate physical hazards on grounds, and physical hazards within non-secure building. There are chemical health hazards with the Milwaukee Die Casting building, particularly the potential for exposure to PCB, lead dust, and asbestos. There are several less immediate chemical hazards that include hazards from direct contact to PCBs in surface soils, the potential for deposition of PCBs to the Milwaukee River from the storm sewer, and the presence of chlorinated solvents in soils beneath Milwaukee Die Casting building. This section considers each of these issues.

Physical hazards on grounds, particularly debris and an unstable semi truck trailer. The property contains physical hazards to legal visitors and trespassers to the site. The most obvious hazard is an unstable semi-truck trailer on the north side of the building. The trailer has the potential to tip over and is a substantial hazard to anyone visiting the property. The trailer should be stabilized and/or removed as soon as possible.

Physical hazards within non-secure building. A substantial fence secures the property from casual trespass. However, the fence has been compromised on the northeast part of the property. Once inside the fence, the rear

of the Milwaukee Die Casting building, along the east side, is protected from view; there has been extensive graffiti activity in this area, confirming that there is trespassing on the property despite the fencing. Most of the building's doors and windows have been sealed, but the building is not entirely secure to illegal entry. A number of floor openings within the unlighted interior are fall hazards. Steps should be taken as soon as possible to ensure access to the property is restricted.

Potential for exposure to PCB, lead dust, and asbestos inside the building.

PCB wipe samples from indoor surfaces. The average PCB concentration in 7 wipe samples (Weston 2012, table 7) was 154 ± 143 µg/100cm^2 (mean ± std. dev.), with a maximum of 370 µg/100cm.^{2} Because neither ATSDR nor EPA (2003) list a screening value for residual PCBs on hard surfaces, a screening value is calculated below for use within this health consultation. The estimate is extrapolated from the EPA reference dose (RfD). It is based upon transfer to hands, followed by hand-to-mouth contact and incidental ingestion:

The EPA reference dose (RfD), for chronic exposure, is 2 x 10^{-5} mg/kg/d
For a 10 kg (22 lb) child, the maximum daily dose likely without health effects would be 2 x 10^{-4} mg/d.

Then, this daily transfer to hands would occur by:

Dose = concentration on surface x (hand surface area/surface contact) x (surface contacts/hour) x (exposure hours/day) x surface-to-skin transfer efficiency

Where:

- Concentration on surface (SC) is to be calculated
- Hand surface area is 0.024m^2
- 360 surface contacts per hour
- 2 exposure hours per day
- 30% transfer efficiency (Cohenhubal *et al.* 2008)

Substituting:

2 x 10^{-4} mg/d = SC x (0.024m^2/contact) x (360 contacts/hr) x 2hr/d x 0.3

SC = 3.9 x 10^{-5} mg/m^2
or 3.9 x 10^{-4} µg/100cm^2

By this estimate, a concentration of 3.9 x 10^{-5} mg total PCBs per square meter (or 3.9 x 10^{-4} µg/100cm^2) of hard surface would not be expected to cause harm to young children having indoor daily exposure in an indoor environment. Note that a range of target residue concentrations may be derived, depending upon assumptions used in the calculation. A less stringent, but perhaps more realistic, exposure would be to a teenager or adult frequenting the site:

Acceptable daily dose: (2 x 10^{-5} mg/kg body wt/d) x (45kg body weight) $^{-1}$ = 0.0009 mg/d
Hand surface area is 0.024m^2
120 surface contacts per hour
0.07 exposure hours per day (= one, 1-hour visit per week, 52 hours per year)
30% transfer efficiency

Substituting:

0.0009 mg/d = SC x (0.024m^2/contact) x (120 contacts/hr) x 0.07hr/d x 0.3

SC = 0.0149 mg/m^2, or 0.15 µg/100cm^2

Discussion of uncertainty. The accuracy of this estimate is limited by the accuracy of the exposure scenario (*i.e.* the duration and frequency of exposure), as well as uncertainty factored into the calculations to make the estimates conservative. In addition, several features of the EPA reference concentration combine to add stringency to this estimate.

Wipe samples for lead on indoor surfaces. Of the metals detected in wipe and dust samples, lead is the metal present at concentrations presenting an exposure hazard. The average concentration of indoor wipe samples for lead (n = 4), was 275±186 (mean± std.dev.), and 2.4 ±1.2 for dust samples.

Using the exposure estimate developed above for hand-to-mouth ingestion, by children, of dust on hard surfaces, a screening value of 9.3 mg/m^2 (93 µg/100cm^2) was derived, using 400 mg lead/kg soil (EPA 1998) as the basis. The corresponding World Trade Center screening value (EPA 2003) is 2.7 µg/100cm^2. Compared to either of these screening values, the concentration of lead found indoors exceeds levels of health concern for chronic exposure. Neither EPA nor ATSDR has established a comparison value for acute exposure, arguing that some effects appear to be without a low exposure threshold (EPA IRIS 2004).

Although acute exposure levels have not been offered by EPA and ATSDR, the presence of lead in wipe samples at 102-fold above WTC action levels indicates the need for caution to avoid exposure. Average lead in dust samples did not exceed the WTC action level. Regular hand-to-mouth contact with lead on surfaces at the concentrations found here could be expected to increase blood lead levels.

Wipe samples for asbestos on indoor surfaces. Earlier work removed much of the asbestos from the Milwaukee Die Casting building, but visible friable asbestos remains in the boiler room. Weston (2012) reports asbestos in wipe samples from near the floor of the boiler room and from several locations in the southern foundry area (Table 1).

U.S. EPA does not list screening criteria for asbestos in settled dust, and asbestos in air samples was not part of the Weston 2012 report. Nonetheless, this material could be dispersed to the environment if not properly removed prior to future work in the building. Occupational exposure during the removal of asbestos-containing material is a legitimate exposure scenario at the former Milwaukee Die Casting facility. The National Institute for Occupational Safety and Health (NIOSH 2005) recommends that occupational exposures be reduced to the lowest feasible concentration, and recommends a relative exposure limit of 0.1 fiber/cubic centimeter in air, as determined by NIOSH Method 7400. As a comparison value for asbestos in settled dust, the EPA (2003) World Trade Center report has cited 70 structures per square millimeter (or 7000 structures/cm^2). Note that this comparison value is not health-based; it is based on clearance standards on fibers recovered from air filters in schools remediated under the Asbestos Hazard Emergency Response ACT (AHERA; EPA 1987).

Hazards from direct contact to PCBs in surface soils. Weston (2012: table 1, figure 3) sampled soil (0-1 feet below ground surface) at six locations around the eastern border of the property (samples SB-04, SB-05, SB-12, SB13, SB-14, SB-15). These were combined with nine additional samples taken by the DNR (WDNR 2012-

pending). The average total PCB concentration of these 15 samples was 14.9 ± 43.6 ppm (mean ± std.dev.), with maximum concentration being 3.2 ppm. PCBs found in these soil samples exceed EPA screening values (1 mg PCB/kg soil, Toxic Substances Control Act), and ATSDR comparison values (0.4 mg PCB/kg soil, Cancer Risk Evaluation Guide) designed to prevent bioaccumulation and harm from chronic exposure. Acute harm would not be expected from occasional contact with the PCB concentrations found in these soils, particularly where surface vegetation limits contact with soil. However, 0-1 foot depth soil samples taken in the area where trespassers crawl beneath the fence (11.8 mg/kg, (WDNR 2012, sample SS-5) indicate the likelihood of regular completed exposure pathways with these contaminated soils. Furthermore, the presence of total PCBs in one sample (WDNR 2012, SS-7) at a concentration 10-fold higher than the next highest sample suggests that the evaluation of soils on the property is incomplete. Steps to prevent exposure are indicated, that include improving the security of the property and remediation of soils.

PCB exposure from less accessible areas. PCB contamination in building tunnels is less likely to be accessible to the immediate public or to casual visitors of the property. The risk of exposure to these PCBs is primarily to workers who would encounter water or sludge in tunnels and sewers. Exposure could occur to trespassers intentionally or accidentally entering a trench through access points in the floor.

On-site trench sludge sampling. PCBs reported consisting entirely of Aroclor 1248 were reported from six locations in sub-floor trenches within the building. Five of six samples had total PCB concentration less than 100 mg PCB/kg sediment detected in sub-floor trench sediments 38 ± 28 mg /kg (mean ± std.dev) (Weston 2012, Table 9, Figure 10). The remaining sample was much higher, 17,000 mg/kg, and was from tunnel location, MDC-SD06, near the center of the building (Weston 2012, Figure 10). Weston (2011, p 11) notes that MDC-SD06 was collected from sludgy material at the bottom of the Western Access Tunnel where wipe sample WP-01 had originally been proposed. The high PCB concentration (1.7%) at this location represents a hot spot warranting extra attention in terms of concentration and extent.

Although there is no current published RfD or ATSDR comparison value for acute exposure to Aroclor 1248, plausible exposures from working with sediments containing 1.7% Aroclor 1248 could result in exposures approaching the lowest observable adverse effect level (LOAEL) for numerous endpoints in several mammalian test species, with Rhesus monkeys being most susceptible. For example, see Barsotti *et al.* (1976, referenced in Table 3-2, ATSDR 2000), which reports chloracne in monkeys exposed to 0.1 mg/kg/d of mixed PCBs for 2 months. Abrahamson and Allen (1973; referenced in ATSDR 2000 Appendix A) report immunological changes in adult monkeys and their offspring in intermediate-duration studies using Aroclor 1248 and 1254 at 0.1-0.2 mg/kg/d. Regular contact with soil or sediment containing 17,000 mg/kg corresponds to a child exposure, from incidental ingestion of soil, of 0.17 mg/kg/d. With the inclusion of uncertainty factors, these exposures would exceed any proposed human comparison value. Therefore, unprotected contact with sediments at location SD-06 should be regarded a **health hazard.**

Overland flow of storm water to storm sewers, and subsequent deposition of PCBs to the Milwaukee River. Sludge was sampled from a storm water sewer at a location 510 feet down-gradient of the Milwaukee Die Casting building. Several elevated contaminants were detected (Weston 2012, Table 11, sample SSS01), including PCBs (Aroclor 1248 1.2 ppm, and < 1ppm 1242 and 1254), lead (830 ppm) and copper (4,100 ppm). The public would not normally have contact with this sludge. However, to the extent that these contaminants can be traced to the Milwaukee Die Casting property, their presence indicates a potential for contaminants to migrate off-site through this pathway and ultimately enter the Milwaukee River.

Recent, preliminary results of additional sampling by the DNR (WDNR 2012, *pending*) indicate high levels of PCBs, in the range of 3-5% PCBs, in sediments at publically accessible storm sewer outfalls to the Milwaukee

River in the vicinity of the property. These preliminary results indicate both the potential for bioaccumulation impacts to the Milwaukee River and the potential for direct contact with acutely harmful levels of PCBs.

Chlorinated solvents (trichloroethylene and tetrachloroethylene) in soils beneath building. Samples of subslab vapor for the presence of Volatile Organic Chemicals indicate the presence of several chlorinated solvents (trichloroethylene, tetrachloroethylene, and other chemicals (benzene) that might pose a chronic exposure risk for future occupants of the building. The concentrations of chlorinated solvents found in gas vapors sampled from beneath the building foundation (see Weston 2012, section 4.3) are high enough (exceeding 8,000 parts per billion at several locations) to warrant further investigation and possible mitigation of exposure to future building occupants. The building is unoccupied and is ventilated in its current condition. The presence of solvents beneath the floor is not expected to harm visitors, and the results of the investigation are not discussed in detail here. However, the presence of these chemicals beneath the building limits any future use of the property due to the potential for harm from chronic exposure. Therefore, steps should be taken, including further assessment of the potential for vapor intrusion, to ensure this pathway of exposure is eliminated prior to any reuse of the Milwaukee Die Casting property. The potential for off-site migration of solvents was not ruled out by the current EPA investigation (Weston 2012) and should eventually be evaluated. However, the distance to, and uses of, neighboring properties do not indicate an immediate health hazard via this pathway.

Toxicology of PCBs (ATSDR 2009). Polychlorinated biphenyls are a group of structurally related molecules that are chemically stable, highly soluble in oil, and insoluble in water. Many PCBs were sold as commercial mixtures known as Aroclors; environmental analyses may attempt to characterize PCBs based on their Aroclor origin. PCBs last for decades in the environment and tend to accumulate in body fats and the food chain. In the environment, PCBs are found mostly adsorbed to sediments and soil rather than in water. PCBs have various effects on the body that are related to physiological development, regulation of the cell cycle, and tumorogenesis. Several population-level studies have linked prenatal and perinatal exposure to PCBs to lower birth weights and learning problems (Guo et al. 1999; and reviewed in ATSDR 2000). Some forms of PCBs are suspected human carcinogens. There is ample evidence that some PCB structures are hepatocarcinogenic in animals. There is limited occupational evidence of hepatocarcinogenicity in humans, but this has not been demonstrated unequivocally (reviewed in ATSDR 2000). Currently, the EPA classifies PCBs as a class B2 (probable) human carcinogen. Similarly, the National Toxicology Program (NTP 2011) classifies PCBs as "Reasonably anticipated to be human carcinogens," based upon their mechanism of action. Due to the widespread dispersion and chemical stability of PCBs in the environment, some exposure (mostly through food) is unavoidable.

Toxicological effects of lead (ATSDR 2008; 2006). Lead is a well-established developmental neurotoxin, and also affects the kidneys, blood formation, reproduction, humoral immunity, and the peripheral nervous system. Due to variation in lead uptake among individuals and among the various chemical forms of lead, the toxicity of lead exposure is usually expressed in terms of its resulting concentration in blood, and the toxic endpoints corresponding to those blood concentrations. Ten micrograms per deciliter of blood (10μg/dL) is commonly cited as the level of concern in children (CDC 1991). However, numerous studies report subtle biochemical, nephric, neuromotor, and cognitive effects in children (and in some studies, adults) chronically exposed to lead corresponding to blood lead levels as low as 2 μg/dL.

Toxicological effects of asbestos. The name asbestos represents six naturally-occurring mineral fibers that have been widely used as a building materials and other manufactured goods due to their durability and heat-resistant properties. These fibrous minerals are now known to cause lung problems, particularly when people

are chronically exposed in occupation situations. Please see Appendix 1 (ATSDR 2001) for an Asbestos Public Health Statement that summarizes exposure to and effects from asbestos.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate result in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

Lead, PCBs, and asbestos found on the Milwaukee Die Casting Property pose an exposure and toxicological risk to children. The property has ample evidence and opportunity for trespass, and once inside, the potential for exposure discussed previously would also apply to children. Exposure to lead and PCBs would occur through hand-to-mouth contact after touching surfaces. Although eating contaminated fish either by small children or by their pregnant mothers is considered to be the most important exposure pathway for the child development related health effects, any exposure to PCBs accumulates in our bodies and contributes to our lifetime exposure. Exposure to lead has well-documented neurological effects in children (ATSDR 2006; 2007). Exposure to asbestos would occur from breathing after disturbing friable asbestos or asbestos in dust on the floor. Restricting access to the property and removing the contaminants is the best way to prevent current and future exposure in children.

Conclusions

- DPH concludes that physical conditions, particularly the presence of an unstable semi-trailer and breaches in property security are an urgent hazard at the Milwaukee Die Casting property.
- DPH concludes that unprotected contact with PCBs in sediments present in sub-floor trenches and in sediments around storm sewer outfalls from the property to the Milwaukee River could harm the health of people exposed, even if the exposure is only for a short time.
- DPH concludes that PCBs on accessible surfaces within the Milwaukee Die Casting building pose a risk of exposure to visitors or workers. Exposure could harm people's health if exposure occurred repeatedly over a period of a year of more.
- DPH concludes that some exposure pathways exist to PCBs in surface soils outside of the eastern fenceline of the Milwaukee Die Casting property, and that, on average, PCB concentrations in surface soils could harm people's health if exposure occurred repeatedly over a period of a year of more.
- DPH concludes that PCBs in surface soils outside of the eastern fence line of the Milwaukee Die Casting property are low, and exposures are infrequent enough that they are not expected to result in significant exposures or to harm people's health.

- DPH concludes that lead and asbestos residues on accessible surfaces within the Milwaukee Die Casting building pose a risk of exposure to visitors or workers. Exposure could harm people's health, if exposure occurred repeatedly over a period of a year or more.
- DPH concludes that chlorinated solvents found in soil and groundwater beneath the Milwaukee Die Casting site are not currently expected to harm people's health, since contaminated groundwater found beneath the property is not used as a source of drinking water by any individuals or communities. However, the presence of these chemicals in soil and groundwater presents a risk of an indoor vapor intrusion exposure to future occupants of the property. As such, these contaminants limit future uses of the property.

Recommendations

The former Milwaukee Die Casting site has immediate, medium term, and long-term public health concerns. The most important ways to avoid these problems are:

Short term: ***recommendations to interrupt immediate hazards.***

- Ensure that the fence is in repair and that all building entrances are sealed to prevent trespass entry.
- Stabilize semi-truck trailer or remove from property.
- Restrict access to the property. The site is surrounding by a chain-link fence that is compromised on the northeast corner of the site.
- Eliminate the possibility of exposure to contaminated soil. Prevent transport of PCB contamination via storm sewers to the Milwaukee River.
- Signs warning against contact with contaminated sediment should be placed in the vicinity of the storm sewer outfall.

Medium term: ***A cleanup action is recommended to prevent unnecessary exposure to PCBs, lead, and asbestos.***

- Eliminate present and future PCB contamination of building tunnels.
- Prevent contact exposure to lead, asbestos, and PCB dust within the building

Long term: ***work recommended prior to redevelopment of the site.***

- Remediation of chlorinated solvents in soil and groundwater on the property is needed to prevent exposures to future occupants of the property.
- Determine the best course of action to prevent the migration of PCBs off site.
- Eliminate potential exposures to PCBs in soil at levels of health concern.

Public Health Action Plan

- DPH will continue to work with state and federal environmental agencies, and with the Milwaukee County Health Department, and to provide environmental health information to Milwaukee residents.

- DPH will work with the EPA and WDNR in developing a remediation strategy for the Milwaukee Die Casting property, and is prepared to review follow up sampling results and consult with these agencies as needed.

Report Preparation

This Health Consultation for the Milwaukee Die Casting Site was prepared by the Wisconsin Department of Health Services under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

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Figure 1. Aerial view of neighborhood surrounding the Milwaukee Die Casting site. Map reference: WDNR webview. *http://www.dnr.state.wi.us/maps/gis/appwebview.html*

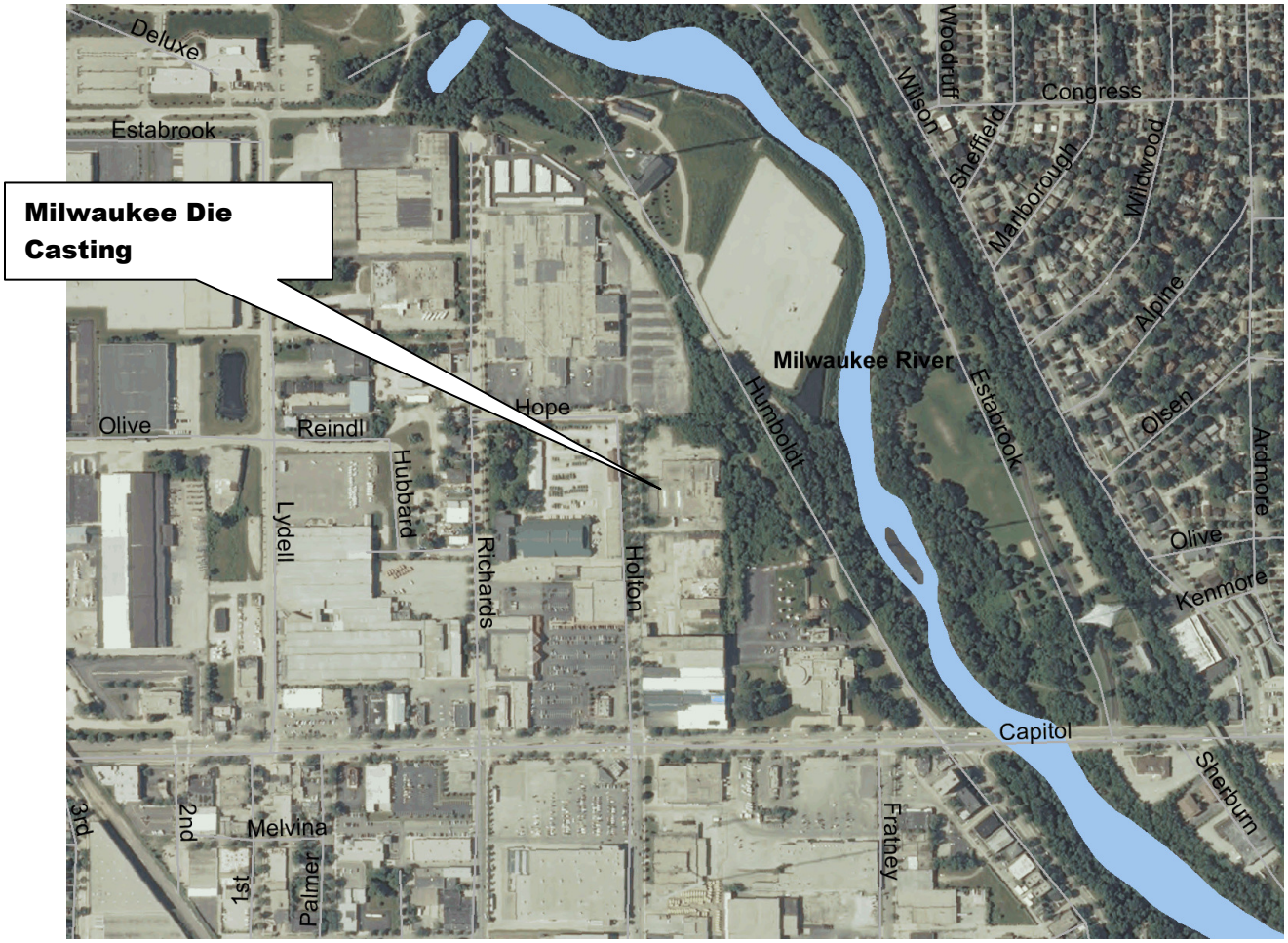
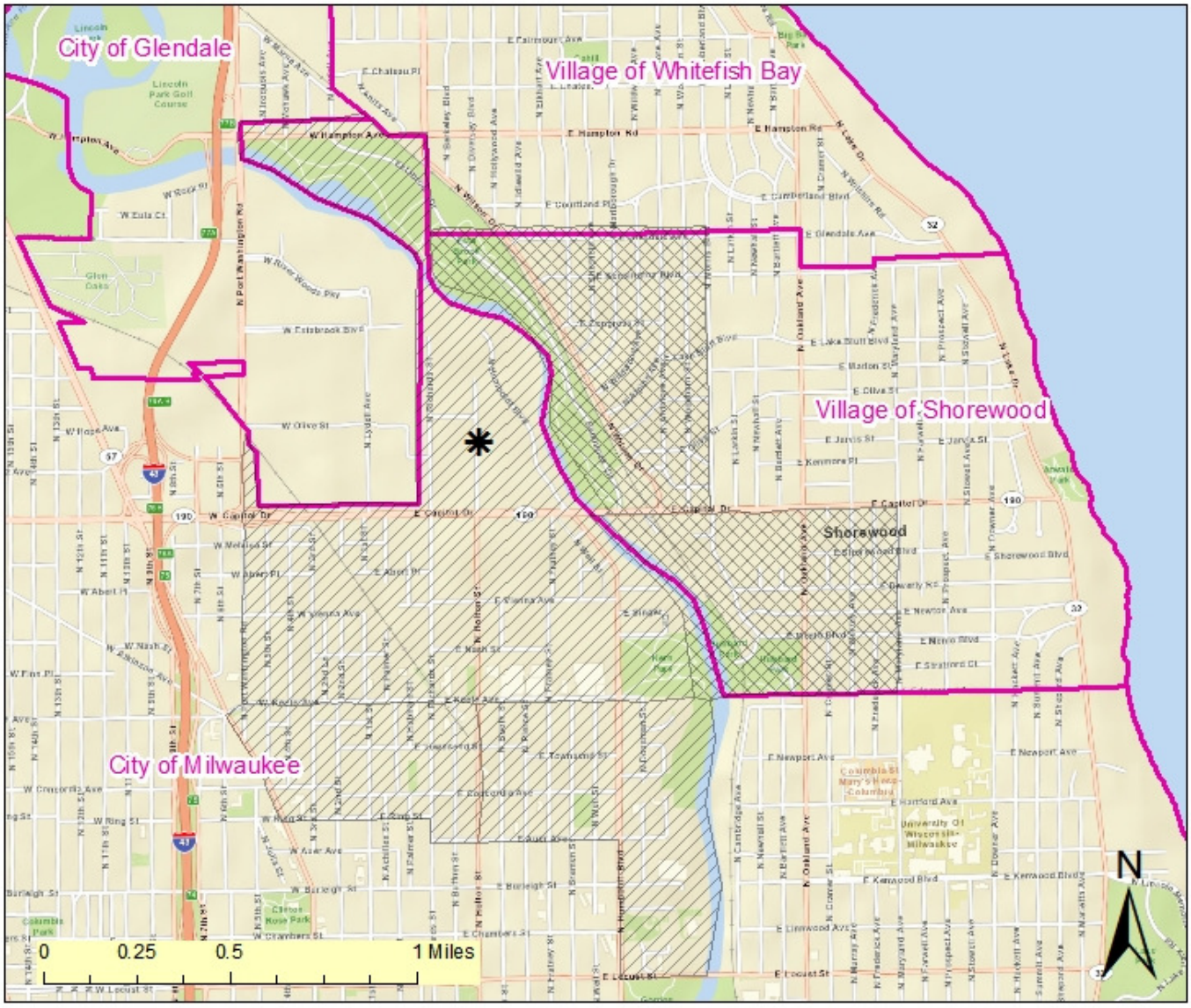


Figure 2. GIS map of the Milwaukee Die Casting site and surrounding area



Map created using ESRI ArcMap 10 on 10/13/2011.

Milwaukee Die Cast Study Area
East Side
West Side
Milwaukee Die Cast Site
City and Village Boundaries

Appendices

Appendix 1. Public Health Statement for Asbestos (*From:* Agency for Toxic Substances and Disease Registry (ATSDR). 2001. Toxicological profile for Asbestos. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

This Public Health Statement is the summary chapter from the Toxicological Profile for Asbestos. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. 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. For more information, call the ATSDR Information Center at 1-888-422-8737.

This public health statement tells you about asbestos and the effects of exposure. The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. Asbestos has been found in at least 83 of the 1,585 current or former NPL sites. However, the total number of NPL sites evaluated for this substance is not known. As more sites are evaluated, the sites at which asbestos is found may increase. This information is important because exposure to this substance may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You are exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact.

If you are exposed to asbestos, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), the fiber type (mineral form and size distribution), and how you come in contact with it. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle (including whether you smoke tobacco), and state of health.

1.1 What is asbestos?

Asbestos is the name given to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur naturally in the environment. One of these, namely chrysotile, belongs to the serpentine family of minerals, while all of the others belong to the amphibole family. All forms of asbestos are hazardous, and all can cause cancer, but amphibole forms of asbestos are considered to be somewhat more hazardous to health than chrysotile. Asbestos minerals consist of thin, separable fibers that have a parallel arrangement. Nonfibrous forms of tremolite, actinolite, and anthophyllite also are found naturally. However, because they are not fibrous, they are not classified as asbestos minerals. Amphibole asbestos fibers are generally brittle and often have a rod- or needle-like shape, whereas chrysotile asbestos fibers are

flexible and curved. Chrysotile, also known as white asbestos, is the predominant commercial form of asbestos; amphiboles are of minor commercial importance. Asbestos fibers do not have any detectable odor or taste. They do not dissolve in water or evaporate and are resistant to heat, fire, chemical and biological degradation. Because of these properties, asbestos has been mined for use in a wide range of manufactured products, mostly in building materials, friction products, and heat-resistant fabrics. Since asbestos fibers may cause harmful health effects in people who are exposed, all new uses of asbestos have been banned in the United States by the EPA. Please see the toxicological profile for more information on the properties and uses of asbestos.

1.2 What happens to asbestos when it enters the environment?

Asbestos fibers do not evaporate into air or dissolve in water. However, pieces of fibers can enter the air and water from the weathering of natural deposits and the wearing down of manufactured asbestos products. Small diameter fibers and fiber-containing particles may remain suspended in the air for a long time and be carried long distances by wind or water currents before settling. Larger diameter fibers and particles tend to settle more quickly. Asbestos fibers are not able to move through soil. They are generally not broken down to other compounds in the environment and will remain virtually unchanged over long periods. However, the most common form of asbestos, chrysotile, may have some minor mineral loss in acidic environments. Asbestos fibers may break into shorter pieces or separate into a larger number of individual fibers as a result of physical processes. When asbestos fibers are breathed in, they may get trapped in the lungs. Levels of fibers in lung tissue build up over time, but some fibers, particularly chrysotile fibers, can be removed from or degraded in the lung with time. Please see the toxicological profile for more information on the behavior of asbestos in the environment.

1.3 How might I be exposed to asbestos?

Asbestos minerals are widespread in the environment. They may occur in large natural deposits, or as contaminants in other minerals. For example, tremolite asbestos may occur in deposits of chrysotile, vermiculite, and talc. Asbestos may be found in soil that is formed from the erosion of asbestos-bearing rock. You are most likely to be exposed to asbestos by breathing in asbestos fibers that are suspended in air. These fibers can come from naturally occurring sources of asbestos or from the wearing down or disturbance of manufactured products including insulation, automotive brakes and clutches, ceiling and floor tiles, dry wall, roof shingles, and cement. However, these products do not always contain asbestos. Low levels of asbestos that present little, if any, risk to your health can be detected in almost any air sample. For example, 10 fibers are typically present in a cubic meter (fibers/m^3) of outdoor air in rural areas. (A cubic meter is about the amount of air that you breathe in 1 hour.) Health professionals often report the number of fibers in a milliliter (mL) (equivalent to a cubic centimeter [cm^3]) of air rather than in a cubic meter of air. Since there are one million cm^3 (or one million mL) in a cubic meter, there typically would be 0.00001 fibers/mL of asbestos in air in rural areas. Typical levels found in cities are about 10-fold higher.

Close to an asbestos mine or factory, levels may reach 10,000 fibers/m^3 (0.01 fibers/mL) or higher. Levels could also be above average near a building that contains asbestos products and that is being

torn down or renovated or near a waste site where asbestos is not properly covered up or stored to protect it from wind erosion.

In indoor air, the concentration of asbestos depends on whether asbestos was used for insulation, ceiling or floor tiles, or other purposes, and whether these asbestos-containing materials are in good condition or are deteriorated and easily crumbled. Concentrations measured in homes, schools, and other buildings that contain asbestos range from about 30 to 6,000 fibers/m^3 (0.00003–0.006 fibers/mL). People who work with asbestos or asbestos-containing products (for example, miners, insulation workers, asbestos abatement workers, and automobile brake mechanics) without proper protection are likely to be exposed to much higher levels of asbestos fibers in air. In addition, custodial and maintenance workers who are making repairs or installations in buildings with asbestos-containing materials may be exposed to higher levels of asbestos. Since vermiculite and talc may contain asbestos, occupational workers and the general population may be exposed to asbestos when using these products.

You can also be exposed to asbestos by drinking asbestos fibers that are present in water. Even though asbestos does not dissolve in water, fibers can enter water by being eroded from natural deposits or piles of waste asbestos, from asbestos-containing cement pipes used to carry drinking water, or from filtering through asbestos-containing filters. Most drinking water supplies in the United States have concentrations of less than 1 million fibers per liter (MFL), even in areas with asbestos deposits or with asbestos-cement water supply pipes. However, in some locations, water samples may contain 10–300 million fibers per liter or even higher. The average person drinks about 2 liters of water per day. Please see the toxicological profile for more information on how you could be exposed to asbestos.

1.4 How can asbestos enter and leave my body?

If you breathe asbestos fibers into your lungs, some of the fibers will be deposited in the air passages and on the cells that make up your lungs. Most fibers are removed from your lungs by being carried away or coughed up in a layer of mucus to the throat, where they are swallowed into the stomach. This usually takes place within a few hours. Fibers that are deposited in the deepest parts of the lung are removed more slowly. In fact, some fibers may move through your lungs and can remain in place for many years and may never be removed from your body. Amphibole asbestos fibers are retained in the lung longer than chrysotile asbestos fibers.

If you swallow asbestos fibers (either those present in water or those that are moved to your throat from your lungs), nearly all of the fibers pass along your intestines within a few days and are excreted in the feces. A small number of fibers may penetrate into cells that line your stomach or intestines, and a few penetrate all the way through and get into your blood. Some of these become trapped in other tissues, and some are removed in your urine.

If you get asbestos fibers on your skin, very few of these fibers, if any, pass through the skin into your body. Please see the toxicological profile for more information on how asbestos enters and leaves your body.

1.5 How can asbestos affect my health?

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people who have been harmed, scientists use many tests.

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

Information on the health effects of asbestos in people comes mostly from studies of people who were exposed in the past to levels of asbestos fibers (greater than or equal to 5 μm in length) in workplace air that were as high as 5 million fibers/m^3 (5 fibers/mL). Workers who repeatedly breathe in asbestos fibers with lengths greater than or equal to 5 μm may develop a slow buildup of scar-like tissue in the lungs and in the membrane that surrounds the lungs. This scar-like tissue does not expand and contract like normal lung tissue and so breathing becomes difficult. Blood flow to the lung may also be decreased, and this causes the heart to enlarge. This disease is called asbestosis. People with asbestosis have shortness of breath, often accompanied by a cough. This is a serious disease and can eventually lead to disability or death in people exposed to high amounts of asbestos over a long period. However, asbestosis is not usually of concern to people exposed to low levels of asbestos. Changes in the membrane surrounding the lung, called pleural plaques, are quite common in people occupationally exposed to asbestos and are sometimes found in people living in areas with high environmental levels of asbestos.

Effects on breathing from pleural plaques alone are usually not serious. There is conflicting evidence as to whether their presence in a person accurately predicts more serious disease development in the future.

Asbestos workers have increased chances of getting two principal types of cancer: cancer of the lung tissue itself and mesothelioma, a cancer of the thin membrane that surrounds the lung and other internal organs. These diseases do not develop immediately following exposure to asbestos, but appear only after a number of years. There is also some evidence from studies of workers that breathing asbestos can increase the chances of getting cancer in other locations (for example, the stomach, intestines, esophagus, pancreas, and kidneys), but this is less certain. Members of the public who are exposed to lower levels of asbestos may also have increased chances of getting cancer, but the risks are usually small and are difficult to measure directly. Lung cancer is usually fatal, while mesothelioma is almost always fatal, often within a few months of diagnosis. Some scientists believe that early identification and intervention of mesothelioma may increase survival.

The levels of asbestos in air that lead to lung disease depend on several factors. The most important of these are (1) how long you were exposed, (2) how long it has been since your exposure started, and (3) whether you smoked cigarettes. Cigarette smoking and asbestos exposure increase your chances of getting lung cancer. Also, there is a scientific debate concerning the differences in the extent of disease caused by different fiber types and sizes. Some of these differences may be due to the physical and chemical properties of the different fiber types. For example, several studies suggest that amphibole asbestos types (tremolite, amosite, and especially crocidolite) may be more harmful than

chrysotile, particularly for mesothelioma. Other data indicate that fiber size dimensions (length and diameter) are important factors for cancer-causing potential. Some data indicate that fibers with lengths greater than 5.0 μm are more likely to cause injury than fibers with lengths less than 2.5 μm. (1 μm is about 1/25,000 of an inch.) Additional data indicate that short fibers can contribute to injury. This appears to be true for mesothelioma, lung cancer, and asbestosis. However, fibers thicker than 3.0 μm are of lesser concern, because they have little chance of penetrating to the lower regions of the lung.

The health effects from swallowing asbestos are unclear. Some groups of people who have been exposed to asbestos fibers in their drinking water have higher-than-average death rates from cancer of the esophagus, stomach, and intestines. However, it is very difficult to tell whether this is caused by asbestos or by something else. Animals that were given very high doses of asbestos in food did not get more fatal cancers than usual, although some extra nonfatal tumors did occur in the intestines of rats in one study.

Several government offices and regulatory agencies have considered all of the evidence regarding the carcinogenicity of asbestos. The Department of Health and Human Services (DHHS) has determined that asbestos is known to be a human carcinogen. The EPA has determined that asbestos is a human carcinogen. The International Agency for Research on Cancer (IARC) has determined that asbestos is carcinogenic to humans. Please see the toxicological profile for more information on how asbestos can affect your health.

1.6 How can asbestos affect children?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans.

Asbestos exposure in both children and adults may occur while breathing air in or near buildings (public or private) containing asbestos building materials or near asbestos-related industrial operations. Children breathe differently and have different lung structures than adults. It is not known if these differences may cause a greater amount of asbestos fibers to stay in the lungs of a child when they are breathed in than in the lungs of an adult. Children drink more fluids per kilogram of body weight than adults and can also be exposed through asbestos-contaminated drinking water. Eating asbestos-contaminated soil and dust is another source of exposure for children. Certain children intentionally eat soil, and all young children eat more soil than adults through hand-to-mouth activities. Historically, family members have also been exposed to asbestos that was carried home on the clothing of other family members who worked in asbestos mines or mills. Breathing of asbestos fibers may result in difficulty in breathing, lung cancer, or mesothelioma (another form of cancer associated with asbestos exposure). These diseases usually appear many years following the first exposure to asbestos and are therefore not likely to be seen in children. But since it may take up to 40 or more years for the effects of exposure to be seen, people who have been exposed to asbestos at a young age may be more likely to contract these diseases than those who are first exposed later in life. In the small number of studies that have specifically looked at asbestos exposure in children, there is no indication that younger people might develop asbestos-related diseases more quickly than older people. Developing fetuses and infants are not likely to be exposed to asbestos through the

placenta or breast milk of the mother. Results of animal studies do not indicate that exposure to asbestos is likely to result in birth defects.

1.7 How can families reduce the risk of exposure to asbestos?

If your doctor finds that you have been exposed to significant amounts of asbestos, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

The most important way that families can lower their exposures to asbestos is to be aware of the sources of asbestos in their homes and avoid exposure to these sources. The most important source of asbestos in a home is from damaged or deteriorating asbestos-containing insulation, ceiling, or floor tiles. Should you suspect that your house may contain asbestos, contact your state or local health department or the regional offices of EPA to find out how to test your home for asbestos and how to locate a company that is trained to remove or contain the fibers. Federal law requires schools to identify asbestos-containing material in school buildings and take appropriate action to control release of asbestos fibers.

If you live close to where asbestos and certain other ores are mined or processed, where a building that contains asbestos products is being torn down or renovated, or a waste site where asbestos is not properly covered, then the levels of asbestos in dust and wind-blown soil may be higher. Pets can also bring asbestos into the home by carrying dust or dirt on their fur or feet if they spend time in places that have high levels of asbestos in the soil. Swallowing of asbestos in house dust or soil is a potential exposure pathway for children. This problem can be reduced in many ways. Regular hand and face washing to remove asbestos-containing dusts and soil, especially before meals, can lower the possibility of asbestos fibers on the skin being accidentally swallowed while eating. Families can lower exposures to asbestos by regularly cleaning the home of dust and tracked in soil. Door mats can help lower the amount of soil that is tracked into the home; removing your shoes before entering will also help. Planting grass and shrubs over bare soil areas in the yard can lower the contact that children and pets may have with soil and reduce the tracking of soil into the home.

You can bring asbestos home in the dust on your hands or clothes if you work in the mining or processing of minerals that contain asbestos, in asbestos removal, or in buildings with damaged or deteriorating asbestos. Federal law regulates work practices to limit the possibility of asbestos being brought home in this way. Your occupational health and safety officer at work can and should tell you whether chemicals you work with are dangerous and likely to be carried home on your clothes, body, or tools, and whether you should be showering and changing clothes before you leave work, storing your street clothes in a separate area of the workplace, or laundering your work clothes at home separately from other clothes. Your employer should have Material Safety Data Sheets (MSDSs) for many of the chemicals used at your place of work, as required by the Occupational Safety and Health Administration (OSHA). Information on these sheets should include chemical names and hazardous ingredients, important properties (such as fire and explosion data), potential health effects, how you get the chemical(s) in your body, how to handle the materials properly, and what to do in an emergency. Your employer is legally responsible for providing a safe workplace and should freely answer your questions about hazardous chemicals. Either OSHA or your OSHA-approved state occupational safety and health program can answer any further questions and help your employer

identify and correct problems with hazardous substances. OSHA and/or your OSHA-approved state occupational safety and health program will listen to your formal complaints about workplace health hazards and inspect your workplace when necessary. Employees have a right to seek safety and health on the job without fear of punishment.

1.8 Is there a medical test to determine whether I have been exposed to asbestos?

The most common test used to determine if you have received sustained exposure to asbestos is a chest x-ray. A chest x-ray is recommended for detecting exposure to asbestos only in persons who have sustained relatively heavy exposure. A chest x-ray is of no value for detecting evidence of asbestos exposure in a person whose exposure to asbestos has been only brief or transient. The x-ray cannot detect the asbestos fibers themselves, but it can detect early signs of lung disease caused by asbestos. While other substances besides asbestos can sometimes produce similar changes in the lungs, this test is usually reliable for detecting asbestos-related effects produced by long-term exposures at relatively high concentrations of asbestos fibers. Other tests, such as gallium-67 lung scanning and high-resolution computed tomography, are also useful in detecting changes in the lungs. However, there are currently no means of detecting exposure-related effects from commonly encountered environmental exposures.

The most reliable test to determine if you have been exposed to asbestos is the detection of microscopic asbestos fibers in pieces of lung tissue removed by surgery, but this is a very invasive test. A test can also be run to determine the presence of asbestos fibers in material rinsed out of the lung. However, this test can cause some discomfort. Asbestos fibers can also be detected in mucus (sputum), urine, or feces, but these tests are not reliable for determining how much asbestos may be in your lungs. Low levels of asbestos fibers are found in these materials for nearly all people. Higher-than-average levels can show that you have been exposed to asbestos, but it is not yet possible to use the results of this test to estimate how much asbestos you have been exposed to, or to predict whether you are likely to suffer any health effects. Please see the toxicological profile for more information about how asbestos can be measured in people and in the environment.

1.9 What recommendations has the federal government made to protect human health?

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA). Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals; then they are adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different

exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors.

Recommendations and regulations are also periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for asbestos include the following:

The federal government has taken a number of steps to protect citizens from exposure to asbestos. First, on July 12, 1989, EPA established a ban on new uses of asbestos. Uses established before this date are still allowable. Second, EPA has established regulations that require school systems to inspect for asbestos and, if damaged asbestos is found, to eliminate or reduce the exposure, either by removing the asbestos or by covering it up so it cannot get into the air. In addition, EPA provides guidance and support for reducing asbestos exposure in other public buildings. Third, EPA regulates the release of asbestos from factories and during building demolition or renovation to prevent asbestos from getting into the environment. EPA also regulates the disposal of waste asbestos materials or products, requiring these to be placed only in approved locations. Fourth, EPA has proposed a limit of 7 million fibers per liter on the concentration of long fibers (length greater than or equal to 5 μm) that may be present in drinking water. Fifth, FDA regulates the use of asbestos in the preparation of drugs and restricts the use of asbestos in food-packaging materials. NIOSH has recommended that inhalation exposures not exceed 100,000 fibers with lengths greater than or equal to 5 μm per m^3 of air (0.1 fibers/mL). OSHA has established an enforceable limit on the average 8-hour daily concentration of asbestos allowed in air in the workplace to be 100,000 fibers with lengths greater than or equal to 5 μm per m^3 of air (0.1 fibers/mL). Additional sources of information about asbestos are the 10 regional offices of the EPA. Most EPA regional offices have an asbestos coordinator.

Please see the toxicological profile for more information about regulations and guidelines to protect people from exposure to asbestos.

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Agency for Toxic Substances and Disease Registry (ATSDR). 2001. Toxicological profile for Asbestos. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.