Health Consultation

Determination of Public Health Implications

ATLAS POWDER DUMP AREA
SENTER, HOUGHTON COUNTY, MICHIGAN

Prepared by the
Michigan Department of Community Health

MAY 10, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
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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Foreword

The Michigan Department of Community Health (MDCH) conducted this evaluation for the federal Agency for Toxic Substances and Disease Registry (ATSDR) under a cooperative agreement. ATSDR conducts public health activities (assessments/consultations, advisories, education) at sites of environmental contamination. The purpose of this document is to identify potentially harmful exposures and actions that would minimize those exposures. This is not a regulatory document and does not evaluate or confirm compliance with laws. This is a publicly available document and is provided to the appropriate regulatory agencies for their consideration.

The following steps are necessary to conduct public health assessments/consultations:

- Evaluating exposure: MDCH toxicologists begin by reviewing available information about environmental conditions at the site: how much contamination is present, where it is found on the site, and how people might be exposed to it. This process requires the measurement of chemicals in air, water, soil, or animals. Usually, MDCH does not collect its own environmental sampling data. We rely on information provided by the Michigan Department of Natural Resources and Environment (MDNRE), U.S. Environmental Protection Agency (EPA), and other government agencies, businesses, and the general public.

- Evaluating health effects: If there is evidence that people are being exposed – or could be exposed – to hazardous substances, MDCH toxicologists then determine whether that exposure could be harmful to human health, using existing scientific information. The report focuses on public health – the health impact on the community as a whole.

- Developing recommendations: In its report, MDCH outlines conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. If there is an immediate health threat, MDCH will issue a public health advisory warning people of the danger, and will work with the appropriate agencies to resolve the problem.

- Soliciting community input: The evaluation process is interactive. MDCH solicits and considers information from various government agencies, parties responsible for the site, and the community. If you have any questions or comments about this report, we encourage you to contact us.

Please write to: Toxicology and Response Section
Division of Environmental Health
Michigan Department of Community Health
PO Box 30195
Lansing, MI 48909
Or call us at: 1-800-648-6942 (toll free)
For more information, please visit:
www.michigan.gov/mdch-toxics

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Abbreviations and Acronyms

95UCL	95% Upper Confidence Limit of the mean
µg	microgram
Atlas Powder	Atlas Powder Company
BLL	blood lead level
DCC	Direct Contact Criteria
DEHP	di(2-ethylhexyl)phthalate
dl	deciliter
DRI	Dietary Reference Intake
DWC	Drinking Water Criteria
EPA	U.S. Environmental Protection Agency
IEUBK	Integrated Exposure Uptake Biokinetic model
kg	kilogram
L	liter
MDCH	Michigan Department of Community Health
MDNRE	Michigan Department of Natural Resources and Environment
mg	milligram
NHL	non-Hodgkin lymphoma
RRD	Remediation and Redevelopment Division
Torch Lake	Torch Lake Superfund site
UL	Tolerable Upper Intake Level
VOCs	volatile organic compounds
XRF	X-ray fluorescence

Summary

A citizen living in Dollar Bay, Houghton County, Michigan reported a perceived cancer cluster and wondered whether disease incidence was related to a former explosives manufacturing facility and alleged barrel dump nearby. The Michigan Department of Community Health (MDCH) alerted state and federal regulatory agencies about the alleged dump, which was subsequently investigated.

MDCH has reached five conclusions in this health consultation report:

1. *MDCH has determined that daily exposure to the 95% Upper Confidence Limit of the mean (95UCL) concentration of lead in the soil, or less frequent exposure to the higher concentrations found at this site, can be expected to cause harm to children in the long- or short-term.* Exposure should be prevented.

   Next steps: Regulatory agencies will first evaluate the adjoining property to determine how the contamination will be addressed. MDCH will provide public health expertise as requested.

2. *It is difficult to determine whether daily exposure to the average concentration of arsenic in the soil on the site, or less frequent exposure to higher concentrations in specific areas, can cause harm.* The higher levels of arsenic generally were found in areas where there was also increased lead in the soil. Exposure to lead may pose the greater threat. If exposure to lead is prevented, as recommended in the previous conclusion, then exposure to arsenic will also be prevented.

   Next steps: As indicated for Conclusion 1, further evaluation of the area will be conducted to determine response actions. MDCH will provide assistance as requested.

3. *MDCH has determined that daily exposure to elevated concentrations of iron in groundwater used for drinking at or near the Atlas Powder site is not expected to cause harm to healthy individuals.* Persons with metabolic disorders may be susceptible to iron toxicity. Residents have been informed of their water testing results.

   Next steps: Public health agencies will provide guidance to those residents with questions about their water testing results.

4. *MDCH has determined that daily exposure to slightly elevated concentrations of nitrates in groundwater used for drinking at or near the Atlas Powder site is not expected to cause harm to otherwise healthy infants.* Infants with underlying health conditions that could compromise the oxygen-carrying capacity of the blood should not consume nitrate-contaminated water on a regular basis. Residents have been informed of their water testing results.

   Next steps: Public health agencies will provide guidance to those residents with questions about their water testing results.

5. *MDCH has determined that exposure to the contamination discovered at the Atlas Powder dump area is not likely to have resulted in the cancers reported by the complainant.* The chemicals of interest at this site are not associated with the cancers reported.

   Next steps: MDCH will provide a copy of this health consultation report to the complainant and make it publicly available on its website.

Purpose and Health Issues

The purpose of this health consultation is to determine whether any contamination from a former explosives manufacturing site may have affected or is expected to affect residents living down-gradient from the site. A citizen brought her concerns of a perceived cancer cluster and nearby former explosives factory to the attention of state regulators, who asked the state health agency to assist. The area of investigation discussed in this document is not the entire factory property but a dump area covering about one and two-thirds acres and littered with debris (see examples in Figure 1). Regulatory agencies are seeking to obtain access to the entire site for further assessment.

Background

In September 2008, the former Michigan Department of Environmental Quality, now the Michigan Department of Natural Resources and Environment (MDNRE)[1], received a letter from a citizen concerned about the number of cancers in her neighborhood. The citizen questioned whether the cancers could have been caused by any residual contamination from a former explosives factory nearby. The text of the letter, with private names and addresses removed, is below (private citizen; Dollar Bay, Michigan; personal communication; 2008):

> Can you tell me if the soil seepage into Torch Lake Twp from the Old Pointe Mills Dupont Plant has been analyzed? We have several cancer cases along [address removed]. A friend of mine [named removed] died of pancreatic cancer – the new owners after him [name removed] died shortly after moving into the same house. Two houses away another pancreatic cancer death. Also, breast cancer and lymphomas. Most recent [name and address] died. Too many cancer deaths along a 2-3 mile stretch. I realize Ripley and Lake Linden are commercial potential sites, but how about checking out the taxpayers' shoreline and soil behind Dollar Bay? How long does it take for contaminants to leach into wells, waterways and soil? We are downhill from Dupont and the Nitro/explosives/etc. used/made there.

MDNRE forwarded the letter to the MDCH Division of Environmental Health, which usually handles questions of this nature. MDCH sent a letter and factsheet to the citizen, discussing how

[1] On October 8, 2009, Michigan Governor Jennifer M. Granholm issued Executive Order 2009-45 which eliminated the Departments of Environmental Quality and Natural Resources to create the Department of Natural Resources and Environment. This Order became effective on January 17, 2010. "MDNRE" is used throughout the remainder of this document, regardless of department name at the time of certain events.

Figure 1. Debris documented in July 2009 at the Atlas Powder dump area, Senter (Houghton County), Michigan.

Additional photographs available at http://www.epaosc.org/site/site_profile.aspx?site_id=4977 perceived cancer clusters are investigated (Appendix A). It was unlikely, due to the different cancer types and the small population available for statistical analysis, that MDCH would be able to determine if the perceived cancer cluster could be validated statistically.

During a follow-up phone call, the citizen gave MDCH more information on the former explosives plant. The plant was initially operated by the DuPont company but, following an antitrust lawsuit, became the Atlas Powder Company (Atlas Powder; Haller 2007). The property is located in Senter, Houghton County, Michigan (Figure 2). The areas mentioned in the citizen's letter – Ripley, Lake Linden, and Dollar Bay – are associated with the Torch Lake Superfund site (Torch Lake). MDCH reviewed its current and historic site files on Torch Lake and found documents referring to an alleged dump site near Atlas Powder. In a letter to the Office of Great Lakes (then part of the Michigan Department of Natural Resources, now part of MDNRE) dated February 5, 1987, a research associate at Michigan Technological University in Houghton, Michigan provided anecdotal evidence of several barrel dump sites near Torch Lake (MTU 1987):

> Site C. Atlas Powder Co. Dump Site (Photos 9, 10 [photos unavailable]).
> This site reportedly contains 200-300 barrels that were buried in the late 1940's when a primitive road was cut through the dump. Photos 9 & 10, show barrels that were only partially covered. [Name removed] said an Atlas employee told him that some of the barrels contained a "black tar-like explosive substance." These barrels, and the road bed, lie about 300 yards from the shore of Torch Bay and the mouth of a spring that flows year-round into the lake.

After MDCH discussed this information with MDNRE and U.S. EPA staff familiar with Torch Lake, the agencies determined that the alleged barrel dump was not part of the Torch Lake Superfund site nor had it ever been fully investigated. It was prudent to determine what contamination might exist and whether local residents were being exposed.

Discussion

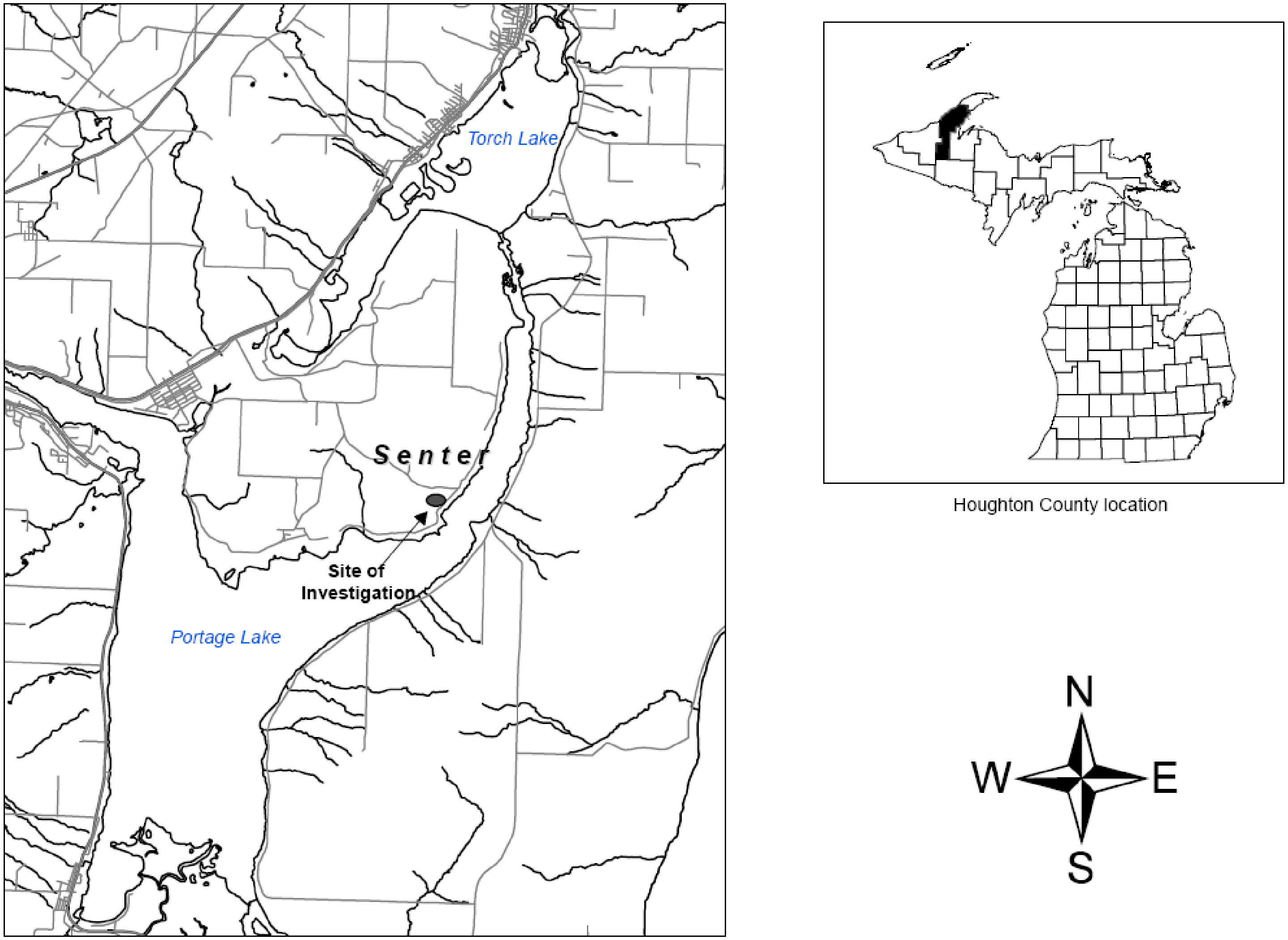
<u>Comparison Values Used</u>

The screening levels used in the assessment for the Atlas Powder dump area were the MDNRE generic Residential and Commercial I Drinking Water Criteria (DWC) and generic Residential and Commercial I Direct Contact Criteria (DCC). The DWC identifies a drinking water concentration that should not cause harm to people drinking that water on a long-term (30-year) basis (MDNRE 2004). The DCC identifies a soil concentration that is protective against negative health effects due to long-term (30-year) ingestion of (eating) and dermal (skin) exposure to contaminated soil (MDNRE 2005).

<u>Environmental Contamination</u>

The MDNRE and U.S. EPA began field-sampling activities in July 2009. The agencies were granted access only to a small portion of the Atlas Powder area. (As of the date of this document, EPA is seeking access to the larger property, containing the production portions of Atlas Powder, through legal means.) The investigated property included the dump in question and is about 300

Figure 2. Senter (Houghton County), Michigan and vicinity



feet from the nearest residence (Weston 2010). The site is wooded but is accessible via a gated dirt road (A. Keranen, MDNRE Remediation and Redevelopment Division [RRD], personal communication, 2010).

Sampling activities included groundwater sampling, geophysical screening for buried drums, X-ray fluorescence (XRF) screening of soils, and laboratory analysis of several soil samples (Weston 2010).

Groundwater Sampling

Groundwater samples from private wells were analyzed for general inorganic chemicals, selected metals of interest, volatile organic compounds (VOCs), and aromatic compounds (Weston 2010). Table 1 shows the specific compounds tested for in the samples. Degradants of nitroglycerin, the explosive manufactured at Atlas Powder, include nitrates and nitrites, which are among the inorganic chemicals listed. Historical groundwater analyses in this area have shown some metals to be present at elevated levels (MDCH, unpublished data, 1990). VOCs such as solvents might have been released to the soil at Atlas Powder, based on a history of the site compiled by Haller (2007), and could have leached to the groundwater. Haller (2007) also reports that materials were burned on-site occasionally, which may lead to the formation of the aromatics listed in Table 1.

In July and September 2009, field staff sampled water from a total of 14 private wells. (Water samples from two additional wells were submitted by the well owners and analyzed only for general inorganics [Weston 2010].) Table 2 shows the analytical results for the chemicals detected. No VOCs or aromatics were detected in the samples other than di(2-ethylhexyl)phthalate (DEHP). Based on laboratory quality-control data, the DEHP detections were due to contamination at the laboratory (common with several chemicals, including DEHP); it is not likely that DEHP is actually present in the groundwater at Atlas Powder (Weston 2010).

Two wells had iron concentrations higher than the health-based screening value, and a third well exceeded the screening value for nitrate (Weston 2010). The generic DWC value is used in cases where the water in question is consumed daily and year-round. Wells at vacation homes would be used less often and would have higher DWCs, due to the exposure being less frequent. It was not reported whether the sampled wells were at year-round or vacation properties. Due to this uncertainty, iron and nitrate are retained for exposure-pathways analysis.

Groundwater from a spring and water in a stream in a ditch, both located southwest of the dump site, were analyzed for the same parameters as the drinking water wells (Table 1). No VOCs or aromatics were detected in these samples, and the only exceedance of the inorganics and metals detected was for aluminum (120 micrograms per liter [µg/L]), in the sample from the spring (Weston 2010). Because the spring and the stream are not used for drinking water purposes, the data are not included in Table 2. However, since children and adults may come into contact with the surface water recreationally, there is further discussion in the *Exposure Pathways Analysis* section.

Geophysical Screening and Test-Trenching

Although a geophysical study had been performed previously in this general area, the area studied earlier (1989) was adjacent to the actual dump site discussed here (MDNRE 2009). In

Table 1. Parameters analyzed for in groundwater sampling at the Atlas Powder site, Senter (Houghton County), Michigan in 2009.

Inorganics	**Volatile Organics**		**Aromatics**
Chloride	1,1 Dichloroethane	cis-1,3 Dichloropropene	1 Methylnaphthalene
Fluoride	1,1 Dichloroethylene	Dibromomethane	2 Chloronaphthalene
Hardness (as calcium carbonate)	1,1 Dichloropropene	Dichlorodifluoromethane	2 Methylnaphthalene
	1,1,1 Trichloroethane	Dichloromethane	2,4 Dinitrotoluene
Iron	1,1,1,2 Tetrachloroethane	Ethylbenzene	2,6 Dinitritoluene
Nitrate nitrogen	1,1,2 Trichloroethane	Fluorotrichloromethane	Acenaphthene
Nitrite nitrogen	1,1,2,2, Tetrachloroethane	Hexachlorobutadiene	Acenaphthylene
Sodium	1,2 Dichlorobenzene	Isopropylbenzene	Anthracene
Sulfate	1,2 Dichloroethane	m & p-Xylene	Benzo[a]anthracene
	1,2 Dichloropropane	Methyl ethyl ketone	Benzo[a]pyrene
	1,2,3 Trichlorobenzene	Methyl isobutyl ketone	Benzo[b]fluoranthene
	1,2,3 Trichloropropane	Methyl-tert-butyl-ether (MTBE)	Benzo[g,h,i]perylene
	1,2,4 Trichlorobenzene	Napthalene	Benzo[k]fluoranthene
	1,2,4 Trimethylbenzene	n-Butylbenzene	Chrysene
Metals	1,3 Dichlorobenzene	Nitrobenzene	Di(2-ethylhexyl)adipate
Aluminum	1,3 Dichloropropane	n-Propylbenzene	**Di(2-ethylhexyl)phthalate**
Arsenic	1,3,5 Trimethylbenzene	o-Chlorotoluene	Dibenz[a,h]anthracene
Barium	1,4 Dichlorobenzene	o-Xylene	Fluoranthene
Cadmium	2,2 Dichloropropane	p-Chlorotoluene	Fluorene
Chromium	Benzene	p-Isopropyltoluene	Indeno(1,2,3,c,d)pyrene
Copper	Bromobenzene	sec-Butylbenzene	Phenanthrene
Iron	Bromochloromethane	Styrene	Pyrene
Lead	Bromodichloromethane	tert-Butylbenzene	
Manganese	Bromoform	Tetrachloroethylene	
Mercury	Bromomethane	Tetrahydrafuran	
Selenium	Carbon Tetrachloride	Toluene	
Zinc	Chlorobenzene	Total Trihalomethanes	
	Chlorodibromomethane	Total Xylenes	
	Chloroethane	trans-1,2 Dichloroethylene	
	Chloroform	trans-1,3 Dichloropropene	
	Chloromethane	Trichloroethylene	
	cis-1,2 Dichloroethylene	Vinyl chloride	

Note: Bold print indicates parameters that were detected.

Table 2. Levels of chemicals detected in private well samples near the Atlas Powder site, Senter (Houghton County), Michigan in 2009.[A]

	No. detections / No. samples	Maximum concentration	Screening value (No. exceedances)
Inorganics[B]			
Chloride	10 / 16	13,000	250,000 (0)
Fluoride	8 / 16	200	4,000 (0)
Iron[C]	3 / 16	8,000[D]	2,000 (1)
Nitrate nitrogen	7 / 16	10,200	10,000 (1)
Sodium	14 / 16	35,000	120,000 (0)
Sulfate	15 / 16	183,000	250,000 (0)
Metals			
Arsenic	4 / 14	3	10 (0)
Barium	14 / 14	220	2,000 (0)
Iron[C]	14 / 14	6,880[D]	2,000 (2)
Lead	2 / 14	2	4 (0)
Manganese	5 / 14	80	860 (0)
Selenium	2 / 14	1	50 (0)
Zinc	7 / 14	170	2,400 (0)

Notes:
A. Concentrations in micrograms per liter (µg/L).
B. Hardness values not reported in this table.
C. Laboratory analyses for *Inorganics* and *Metals* both report iron but are different methods. The results from each analysis are shown separately for completeness.
D. Maximum iron values were at the same address. Therefore, only 2 locations had exceedances, not 3 (as could be assumed from 1 under *Inorganics* results and 2 under *Metals* results).

Figure 3. Map of visual and geophysical screening results from field work conducted in July 2009 at the Atlas Powder dump area, Senter (Houghton County), Michigan. (from Weston 2010)

July 2009, field staff conducted a geophysical survey of the site to determine if there were barrels buried there. The results of the investigation suggested that there were several areas were there could be barrels at depth, as indicated by the denser magnetic-field plots in Figure 3 (Weston 2010).

In September 2009, EPA and MDNRE returned to the site and conducted test trenching in eight areas that appeared most likely to contain buried material. Drums and similar containers were *not* discovered in the excavated areas. Field staff conducted XRF screening within the trenches and of surrounding undisturbed surface soil (Weston 2010; J. Walczak, MDNRE Remediation and Redevelopment Division [RRD], personal communication, 2010), as discussed in the next section.

XRF Screening and Laboratory Analysis of Soils

XRF screening is used for field-screening samples to determine the presence and approximate concentration of metals.[2] The technique is used frequently in assessing lead hazards in older buildings. Large amounts of lead were used at the Atlas Powder site for piping and flooring in the nitroglycerin production line (MDNRE 2009). Table 3 shows the specific metals screened for in this sampling.

In July 2009, field staff screened 119 surface soil samples using XRF. The results are shown in Table 4. Many high concentrations of lead were found in several large areas throughout the site (Figure 4). The 95% Upper Confidence Limit of the mean (95UCL, a statistical calculation that equals or exceeds the true mean 95 percent of the time) for lead was 949 mg/kg. A small number of arsenic exceedances were detected (Figure 5) (Weston 2010). Initial statistical testing of the data with EPA's "ProUCL" software suggested that all of the arsenic detections were outliers, "hotspots" that precluded further statistical analysis. There was one sample that exceeded the screening level for antimony (Weston 2010).

During the test trenching work in September 2009, field staff conducted XRF analyses within the trenches, before the trenches were refilled, and also nearby, on undisturbed soil (Weston 2010; J. Walczak, MDNRE-RRD, personal communication, 2010). Analyses were conducted on 56 samples. Table 3 shows the metals screened for during this sampling. Table 4 shows the results of the screening. (The sampling locations were not geocoded and therefore are not mapped.) Many high levels of lead were detected, both inside and outside of the trenches. All arsenic detections exceeded the generic DCC. There were no detections of antimony. Two samples exceeded the DCC for iron (Weston 2010). Because the sampling strategy was biased toward the trenches and not randomized over the entire site, statistical analysis of the results was not conducted.

During the September 2009 field work, four samples of surface soil from the dump site and one background sample were taken and submitted for laboratory analysis for metals. Three of the samples exceeded the screening level for lead, with concentrations ranging up to 16,000 mg/kg

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[2] XRF analysis is useful, however it typically does not have as stringent quality assurance and quality control as laboratory analysis of soil samples. Results from XRF analysis may differ from laboratory analysis due to different sample preparation, quality assurance/quality control sampling, and instrument calibration and usage conditions. Field conditions are difficult, if not impossible, to control. XRF data should be verified by laboratory analysis.

Table 3. Elements screened for in X-Ray Fluorescence sampling at Atlas Powder, Senter (Houghton County), Michigan in July and September 2009.

Antimony	**Manganese**	Sulfur[B]
Arsenic	**Mercury**	Tellurium[A]
Barium[B]	**Molybdenum**	Thallium[B]
Cadmium	**Nickel**	Tin[B]
Calcium[B]	Palladium[B]	**Titanium[B]**
Cesium[B]	**Potassium[B]**	Tungsten[B]
Chromium	**Rubidium[B]**	Uranium[B]
Cobalt	Scandium[B]	Vanadium[B]
Copper	Selenium	**Zinc**
Iron	Silver	**Zircon[B,C]**
Lead	**Strontium**	

Notes:
A. Bold print indicates elements that were detected.
B. Screened only in September 2009.
C. Zircon is zirconium silicate.

Table 4. Levels of elements detected in soil samples screened with X-Ray Fluorescence at Atlas Powder, Senter (Houghton County), Michigan in July and September 2009[A].

	No. detections / No. samples			Maximum concentration				Exceedances		
	July	*Sept. - trench*	*Sept. - surface*	*July*	*Sept. - trench*	*Sept. - surface*	**Screening value**	*July*	*Sept. - trench*	*Sept. - surface*
Antimony	9 / 119	0 / 1[C]	0 / 1[C]	315	ND[E]	ND[E]	180	1	0	0
Arsenic	6 / 119	9 / 27	9 / 29	467	841	425	7.6	5	9	9
Barium	NT[B]	1 / 1[C]	0 / 1[C]	NT[B]	229	ND[E]	37,000	NT[B]	0	0
Cadmium	8 / 119	0 / 1[C]	0 / 1[C]	76	ND[E]	ND[E]	550	0	0	0
Calcium	NT[B]	2 / 24[D]	1 / 1[D]	NT[B]	1,519	10,744	NA[F]	NT[B]	H	H
Chromium	1 / 119	0 / 24[D]	1 / 1[D]	590	ND[E]	47	2,500[G]	0	0	0
Cobalt	2 / 119	2 / 27	0 / 29	607	1,436	ND[E]	2,600	0	0	0
Copper	33 / 119	23 / 27	17 / 29	509	2,201	753	20,000	0	0	0
Iron	119 / 119	27 / 27	29 / 29	60,120	531,670	53, 450	160,000	0	2	0
Lead	93 / 119	25 / 27	27 / 29	12,676	10,709	5,953	400	24	13	15
Manganese	101 / 119	22 / 27	26 / 29	6,058	3,291	18,733	25,000	0	0	0
Mercury	1 / 119	0 / 27	0 / 29	46	ND[E]	ND[E]	160	0	0	0
Molybdenum	34 / 119	3 / 27	4 / 29	23	14	29	2,600	0	0	0
Nickel	1 / 119	0 / 27	0 / 29	72	ND[E]	ND[E]	4,000	0	0	0
Potassium	NT[B]	1 / 24[D]	1 / 1[D]	NT[B]	1	7,415	NA[F]	NT[B]	H	H
Rubidium	NT[B]	26 / 27	25 / 29	NT[B]	34	44	NA[F]	NT[B]	H	H
Strontium	119 / 119	27 / 27	28 / 29	94	131	107	330,000	0	0	0
Titanium	NT[B]	0 / 24[D]	1 / 1[D]	NT[B]	ND[E]	1,641	NA[F]	NT[B]	0	H
Zinc	118 / 119	24 / 27	23 / 29	5,315	56,711	40,135	170,000	0	0	0
Zircon	NT[B]	27 / 27	28 / 29	NT[B]	160	225	NA[F]	NT[B]	H	H

Notes:

A. Concentrations are in milligrams per kilogram (mg/kg).
B. "NT" = not tested for during the screening event
C. Only two samples were screened for this element in September.
D. Only 25 samples were screened for this element in September.
E. "ND" = not detected (detection limits varied)
F. "NA" = not available
G. Screening value is for the hexavalent form of chromium and is more protective.
H. See discussion in text.

Figure 4. Soil lead concentrations detected during field work conducted in July 2009 at the Atlas Powder dump area, Senter (Houghton County), Michigan. (from Weston 2010)

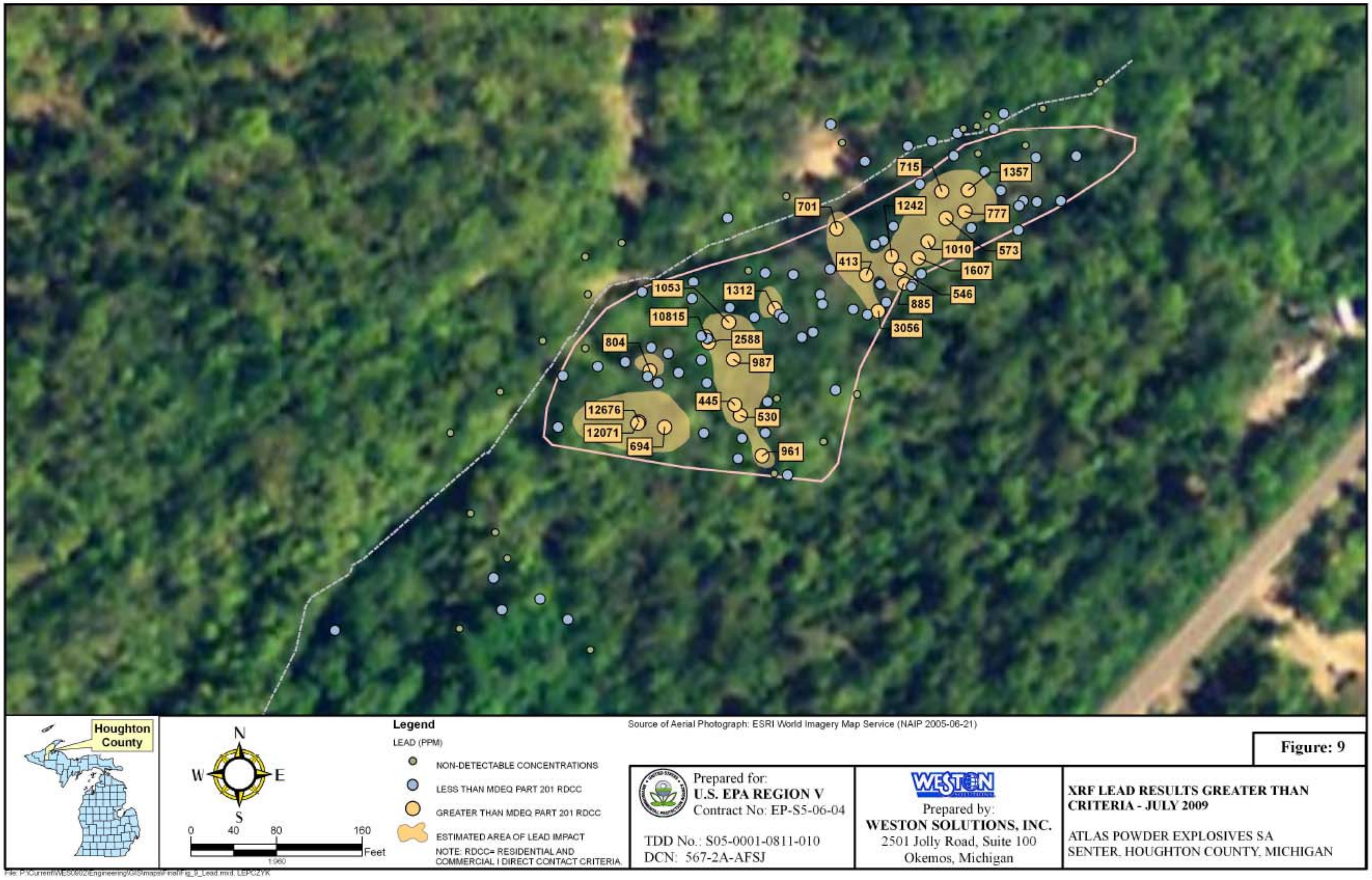
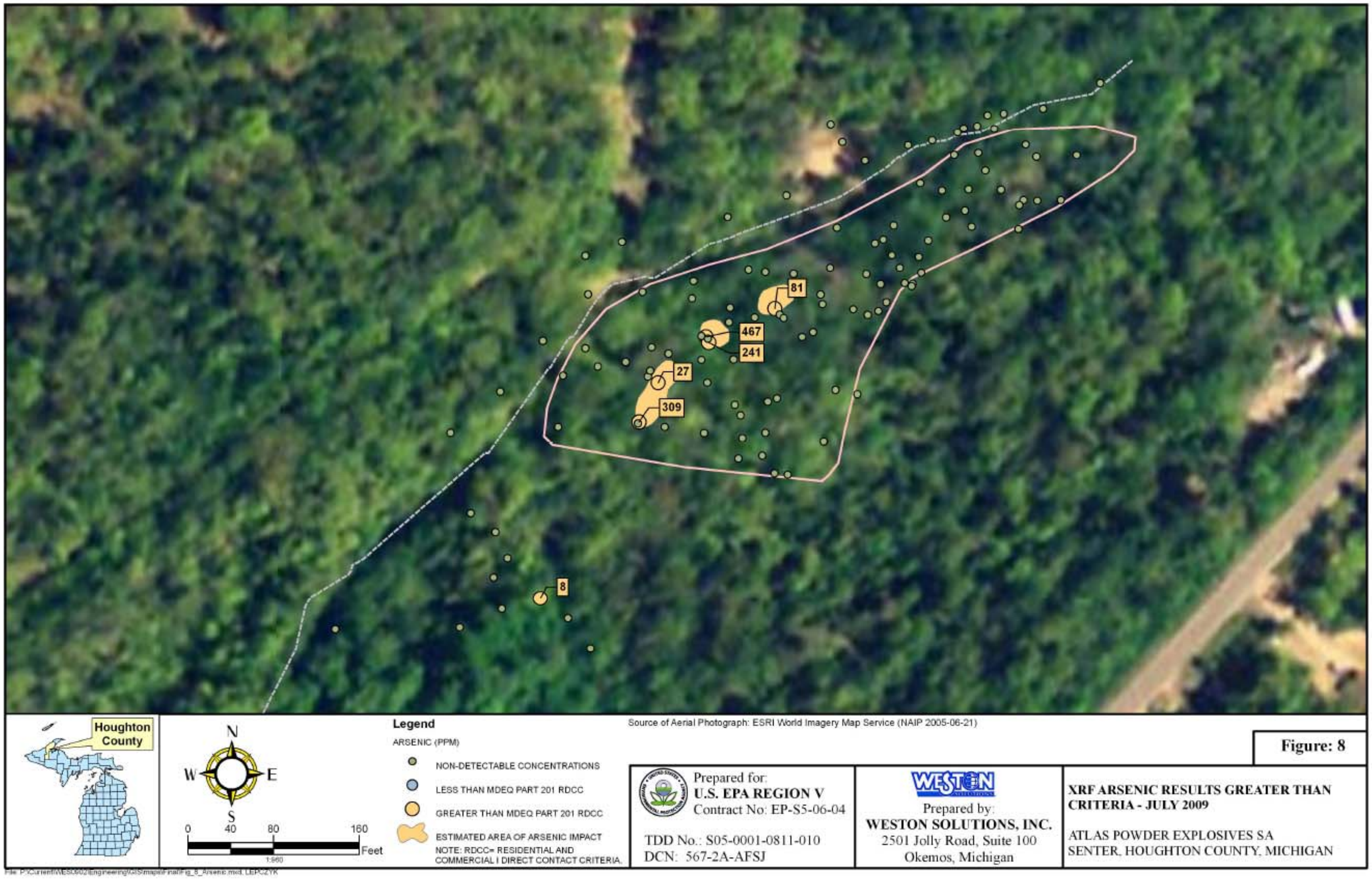


Figure 5. Soil arsenic concentrations detected during field work conducted in July 2009 at the Atlas Powder dump area, Senter (Houghton County), Michigan. (from Weston 2010)



(data not shown). One of the samples exceeded the arsenic screening level at 16 mg/kg (data not shown). Antimony was not included in the laboratory analysis. Iron was detected but did not exceed its DCC (data not shown) (Weston 2010).

Lead, arsenic, antimony, and iron are retained for exposure-pathways analysis.

Exposure Pathways Analysis

To determine whether persons are, have been, or are likely to be exposed to contaminants, MDCH evaluates the environmental and human components that could lead to human exposure. An exposure pathway contains five elements:

- a source of contamination
- contaminant transport through an environmental medium
- a point of exposure
- a route of human exposure
- a receptor population

An exposure pathway is considered complete if there is evidence, or a high probability, that all five of these elements are, have been, or will be present at a site. It is considered either a potential or an incomplete pathway if there is a lower probability of exposure or there is no evidence that at least one of the elements above are, have been, or will be present. Table 5 examines the exposure pathways for the chemicals of interest at this site.

Table 5. Exposure pathways for chemicals of interest at the Atlas Powder site, Senter, Michigan.

Chemicals of Interest	Source of Contamination	Environmental Medium	Exposure Point	Exposure Route	Exposed Population	Time Frame	Exposure Likelihood
Aluminum, iron, nitrate	Source not yet defined	Soil	Groundwater (private drinking wells, surface water)	Ingestion, inhalation, skin contact	Local residents, visitors, and workers	Past	Potential
						Present	Complete
						Future	Potential
Antimony, arsenic, iron, lead	Waste materials from an explosives plant	Soil	Soil	Ingestion, inhalation, skin contact	Local residents, visitors, trespassers	Past	Potential
						Present	Potential
						Future	Potential

Water treatment systems, such as softening or oxidation units, can remove a significant amount of iron (ATSDR 2007; C. Thomas, MDNRE Water Bureau, personal communication, 2010). It was not reported whether the residences with elevated iron use water treatment systems. (Drinking-water samples are typically pre-treated water.) Therefore, people may be drinking elevated concentrations of iron in the water. Nitrate in groundwater can arise from overuse of fertilizers, improper well construction, and leaking septic systems (CDC 2003). It is unclear where the nitrate detected in this investigation might be originating. Some treatment processes can remove nitrate from drinking water (CDC 2003). As discussed earlier in this document, the stream and spring where the aluminum was detected are not likely to be drinking water sources. Therefore, only iron and nitrate are evaluated further in the *Toxicological Evaluation* section.

Although there are no data regarding the pH (acidity or corrosivity) of the groundwater samples taken, field staff did not report any unusual observations during the sampling, such as abnormal odors or stressed vegetation. Inorganic substances such as metals and nitrates do not readily absorb through the skin (MDNRE 2006). Therefore, dermal contact with groundwater, such as bathing in well water or playing in the spring or stream that were sampled, is not expected to cause harm.

Only one soil sample out of 119 exceeded the antimony DCC (Table 4). The exceedance was less than twice the value of the screening value and is considered minor. Therefore, antimony is removed from further evaluation in this assessment.

The highest soil concentration for arsenic *in surficial soil* was over 50 times the screening value (Table 4). (The highest concentration for arsenic overall was from a trench and more than 100 times the DCC.) The high concentrations were detected in areas that also had a greater amount of debris (Figure 3) which may present an attractive nuisance. People exploring the site might spend more time in these areas, increasing the risk of a harmful exposure. Field staff noted a trail on the investigated property and witnessed recreational-vehicle use on the adjoining property, near the investigation area (J. Walczak, MDNRE RRD, personal communication, 2010). This indicated a likelihood for exposure to the contamination. Therefore, arsenic is evaluated further in the *Toxicological Evaluation* section.

Lead was detected in a majority of soil samples (Table 4). Dust or dirt can remain on clothing and skin and possibly be ingested. Although young children may not play in this area, older children and adults using the area may track contaminated dirt back to their houses, leading to contaminated indoor dust to which children at home could then be exposed. As discussed in the previous paragraph, there is a likelihood for exposure to the soil contamination by users of the investigated property or adjoining property. Therefore, lead is evaluated further in the *Toxicological Evaluation* section.

Toxicological Evaluation

Iron

Iron is the 4th most abundant element in the earth's crust and an essential nutrient. Foods with high iron content include organ meats, dried legumes, fish and shellfish, egg yolks, green vegetables, and tomatoes. Iron is necessary in the formation of heme, a component of hemoglobin, an important blood protein responsible for transporting oxygen in the body (HSDB 2010).

Excess intake of iron may cause gastrointestinal upset and may interfere with some medications, such as antibiotics. Long-term exposure to too much iron can result in liver damage. Generally, the bodies of healthy individuals can adequately regulate absorption and excretion of iron. However, persons whose livers cannot metabolize iron efficiently may be susceptible to toxic effects. Also, children taking mineral supplements without supervision may take in too much iron at once and be at risk of a fatal overdose (HSDB 2010).

The Institute of Medicine at the National Academy of Sciences has set the Dietary Reference Intake (DRI) value for iron at 8-11 milligrams per day (mg/day) for males, depending on age, and 8-27 mg/day for females, depending on age and reproductive status. The Tolerable Upper Intake Level (UL) is 40-45 mg/day. Assuming that a person is meeting his or her DRI through diet and supplements, the margin (difference) between the maximum DRI and minimum UL is 29 mg/day for adult males and 13 mg/day for pregnant females (22 mg/day for non-pregnant, pre-menopausal women). The margin between the maximum DRI and minimum UL for a child is 30 mg/day (NAS 2004). If a healthy adult were to drink 2 liters per day (L/day) of groundwater at the highest concentration of iron found in a drinking water well at this site (8,000 µg/L), the person would ingest 16 mg of iron per day (1,000 µg equals 1 mg), not counting dietary or other sources. This excess in iron intake is less than the margin for adult males and non-pregnant females and should not result in harm to those persons. While the excess is greater than the margin for pregnant females, national data has indicated that pregnant women usually do not have adequate intake of iron (NIH 2007). Pregnant women should consult with their doctors to determine if their iron intake is sufficient. If a healthy child were to drink 1 L/day of groundwater at the highest concentration of iron found at this site, the child would ingest 8 mg of iron per day, not counting dietary or other sources. This excess in iron intake falls below the margin for children and should not result in harm. As noted earlier, persons with liver conditions that prevent the efficient metabolism of iron may be at risk of toxic effects. Also, as stated in the *Exposure Pathways Analysis* section, water treatment systems can remove most, if not all, of the iron in the drinking water, decreasing exposure. However, salt (as sodium chloride) used in water softeners replaces the calcium in the water with sodium, which poses an exposure risk to people on sodium-restricted diets (WSUE 1989). The system recommended for soft or moderately soft water, such as that found in the Atlas Powder area, is an iron oxidation-style treatment system, which would not add sodium to the water (C. Thomas, MDNRE Water Bureau, personal communication, 2010).

Most forms of iron are not considered human carcinogens. Only iron dextran complex, which is used in the treatment of certain forms of anemia in people, is reasonably anticipated to be a human carcinogen (NTP 2005). Therefore, exposure to iron at the Atlas Powder site is *not* expected to cause cancer.

Nitrates

Nitrate is formed when nitrogen combines with oxygen or ozone (CDC 2003). Greens, root vegetables, broccoli and cauliflower have higher naturally-occurring nitrate concentrations than other vegetables. Sodium nitrate is often used in processed foods as a preservative. Excess fertilizer, human and animal waste, and improperly installed wells can lead to nitrates contaminating drinking water (ATSDR 2007a).

Once in the body, nitrates can be converted to nitrites, which inhibit the blood's oxygen-carrying capacity. This disorder is called methemoglobinemia or "blue-baby syndrome," due to the decreased oxygen causing a bluish color in the skin in affected infants. Infants are exposed when contaminated water is used in formula or cereal and can also be exposed through the breast milk of affected mothers (CDC 2003, ATSDR 2007a).

In this investigation, the nitrate screening level was exceeded by two percent (Table 2), which is not considered significant, but minimizing any infant exposure would be prudent. (It was not reported if any infants lived year-round at the residence in question.) The cause of the elevated nitrates should be determined and corrected.

Researchers in Iowa found an increased risk of colon cancer in people exposed to nitrate in public drinking water supplies and low vitamin C or high meat intake (DeRoos et al. 2003). The authors suggested that the increased risk might only occur among susceptible populations (those genetically predisposed to or previously diagnosed with colon cancer). The groundwater nitrate exceedance reported in the Atlas Powder investigation was slight (two percent greater than the DWC) and it was for only one well. Therefore, nitrates in groundwater are *not* likely to be attributable to the cancer cases near Atlas Powder reported by the complainant.

Arsenic

Arsenic is a naturally occurring element that is widely distributed in the earth's crust. Some nutritional studies indicate that arsenic may be a nutrient essential for good health. Inorganic arsenic compounds are used mainly to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants (ATSDR 2007b).

Perhaps the single most common and characteristic sign of oral exposure to inorganic arsenic is the appearance of skin ailments: hyperkeratinization (thickening) of the skin, especially on the palms and soles; formation of multiple hyperkeratinized corns or warts; and hyperpigmentation (darkening, usually a speckled pattern) of the skin with some hypopigmentation (loss of pigmentation). These effects are usually the earliest observable signs of chronic (long-term) exposure to arsenic. Other symptoms of chronic arsenic toxicity include sensory effects, such as particularly painful dysesthesia (an unpleasant, abnormal sensation) or a "pins and needles" sensation, which occur earlier in the progression of symptoms. A reversible bone marrow depression may occur. Anemia is common in chronic arsenic toxicity (ATSDR 2007b). It is difficult to determine the likely amount of arsenic to which a person would be exposed if they were in contact with the soil at the Atlas Powder site. Sporadic exposure to the whole site would likely result in less risk of negative health effects than regularly visiting the areas where the arsenic concentrations were higher.

Inorganic arsenic has been classified as a human carcinogen (EPA 1998). Several studies have shown that oral exposure to arsenic (drinking it or eating it) can increase the risk of various forms of cancer (skin, liver, bladder, and lung) (ATSDR 2007b). The types of cancer reported by the complainant (pancreatic, breast, lymphoma) are *not* usually associated with exposure to arsenic.

Lead

Lead is a naturally occurring element. It is used in a number of occupational settings and by hobbyists. Sources for lead exposure include battery manufacture and repair, plumbing, pipefitting, jewelry and pottery making, stained glass making, emissions from foundries and smelters, and some imported or folk remedies. Lead was used in residential paint before its use was discontinued in 1978 (ATSDR 2007c). As indicated earlier in this document, large amounts of lead were used at Atlas Powder for piping and flooring (MDNRE 2009).

Lead is well known for its neurotoxic effects, causing learning and behavioral difficulties in children. Nervous system effects in adults include decreased reaction times, weakness in the hands and ankles, and impaired memory. It can also damage the kidneys, the reproductive system, and cause anemia (ATSDR 2007c).

Rather than an *external* dose in milligrams of lead per kilogram of body weight per day (mg/kg/day), the level of lead *in* the body, usually expressed as blood lead levels (BLLs), is used to determine the potential for adverse health effects. This approach is used because exposure can occur from several different sources including air, food, water, and soil contamination. Models that account for multiple exposures to lead often are used to assess potential effects from exposure to lead in the environment (ATSDR 2007c). The criterion for lead in soil is based on the IEUBK (Integrated Exposure Uptake Biokinetic) model. All potential sources of lead (air, food, water, soil) must be evaluated to determine if the contribution from contaminated soil is significant. The model uses assumed exposure values but site-specific information can be substituted.

Generally, BLLs rise 3-7 micrograms per deciliter (µg/dl) for every 1,000 mg/kg increase in soil or dust concentration. A child is considered lead-poisoned if his BLL, by venous blood sample, is 10 µg/dl or higher (ATSDR 1992). However, while 10 µg/dl blood lead in children is considered the "level of concern" by the Centers for Disease Control and Prevention and the level at which medical intervention occurs in the state of Michigan, research has suggested that subtle neurotoxic effects occur at lower levels (Canfield et al. 2003, Cory-Slechta 2003). These findings have strengthened the assertion, by scientists as well as activists, that there is no threshold level (no level below which adverse effects are not observed) for lead in the body.

MDCH used the IEUBK model to estimate how a child's BLL could change if he were exposed to either the highest concentration of lead in the soil at the Atlas Powder site or to the 95UCL. The only other parameter changed in the model was the concentration of lead in drinking water. The model default is 4 µg/L, but MDCH changed that to the highest drinking-water concentration found for the site, 2 µg/L. The model predicted that a child up to the age of 7 years exposed to 12,000 mg/kg lead in soil (the highest XRF concentration for the site was 12,676 mg/kg) would likely experience a BLL of nearly 50 µg/dl. At this level, a child would need both medical and environmental interventions, including chelation therapy (ATSDR 1992). For a child exposed to the 95UCL (949 mg/kg), the model predicted a BLL of about 10 µg/dl, requiring an evaluation of that child's environment to identify and eliminate sources of lead (ATSDR 1992).

These model outputs assume that exposure is occurring on a *daily* basis. If the exposure is intermittent, then the BLL may not be as increased, but some kind of intervention may still be necessary. Also, rather than be exposed to the average concentration (95UCL), a child may prefer to play in a specific area, especially if there are items of interest, such as the debris noted at the site (Figure 1). If a child concentrates his time in an area where the soil lead concentration is greater, then he may be experience toxic effects sooner. The younger a child is, the more susceptible he is likely to be to lead's toxicity. Although a toddler would not be expected to be exposed *at* this site, family members using the site may track home dirt, which would then be available to the toddler. Thus, exposure to lead in the soil at the Atlas Powder site has the potential to harm exposed persons and must be prevented.

The National Toxicology Program reported that lead may be "reasonably anticipated to be a human carcinogen" (NTP 2005). This determination was based on limited evidence in human studies and sufficient evidence in animal studies. Rat and mouse studies resulted primarily in kidney tumors, though cancerous effects were occasionally seen in brain, lung, and the hematopoietic system (organs and tissues involved in producing blood) (NTP 2004). Of the types of cancer in the Atlas Powder area reported by the complainant, only lymphoma might be associated with exposure to lead, since the lymphatic system is involved in blood production. However, research on chemical-exposure risk factors for non-Hodgkin lymphoma (NHL) only suggests benzene and certain pesticides as possibly increasing one's risk of developing the disease. Exposure to lead has not been reported as associated with an increased risk of NHL (ACS 2009b). The American Cancer Society does not report known or suspected chemical-exposure risk factors for Hodgkin disease (ACS 2009a). This information suggests that exposure to lead at the Atlas Powder site likely did *not* result in the cancers reported by the complainant.

Children's Health Considerations

In general, children may be at greater risk than adults from exposure to hazardous substances at sites of environmental contamination. Children engage in activities such as playing outdoors and hand-to-mouth behaviors that could increase their intake of hazardous substances. They are shorter than most adults, and therefore breathe dust, soil, and vapors found closer to the ground. Their lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. The developing body systems of children can sustain permanent damage if toxic exposures are high enough during critical growth stages. Fetal development involves the formation of the body's organs. Injury during key periods of prenatal growth and development could lead to malformation of organs (teratogenesis), disruption of function, and premature death. Exposure of the mother could lead to exposure of the fetus, via the placenta, or affect the fetus because of injury or illness sustained by the mother (ATSDR 1998). The implication for environmental health is that children can experience substantially greater exposures to toxicants in soil, water, or air than adults can.

Excessive exposure to iron at the Atlas Powder site is not expected to harm otherwise healthy children. However, children with compromised liver function may have difficulty metabolizing excess iron in their drinking water. Additionally, a pregnant woman who is meeting her iron intake needs via diet and supplements may be exposing her fetus to excess iron in drinking water and should consult with her doctor (ATSDR 2006, HSDB 2010). The high levels of iron in the soil were detected within the trenches, which have been refilled, and are not expected to cause harm.

Exposure to nitrates can cause "blue-baby syndrome" in infants (CDC 2003, ATSDR 2007a). Although the concentration of nitrates in the groundwater at this site only slightly exceeded the screening level and may not affect exposed children, exposure should be prevented. The cause of the contamination should be determined and corrected.

Children do not appear to be any more susceptible to the toxic effects of arsenic than adults are (ATSDR 2007b). Children playing at the Atlas Powder site may be exposed to high levels of arsenic in the soil, especially if they are spending more time near the debris areas, where the concentrations were the highest. Additionally, family members playing or working near the debris areas may bring arsenic-contaminated dust home on their clothes, resulting in transfer of the contamination to the home environment.

Young children are very susceptible to lead's toxic effects (ATSDR 2007c). The potential for harmful exposure to lead, either directly or through transfer to the home environment, exists at this site and should be mitigated. Suggested actions include fencing the site or removing soils with high concentrations.

The debris at the Atlas Powder site is an attractive nuisance. Children may cut themselves on the items around the site. Additionally, they, as well as adults, may try digging up items. Although MDNRE and EPA did not find buried drums or similar items in the test trenches, there may be intact undiscovered containers buried there containing chemicals that could be hazardous upon release.

Community Health Concerns

Other than the original complaint that helped begin this investigation, MDCH is unaware of any health concerns voiced by the community regarding the Atlas Powder site.

Conclusions

MDCH has determined that daily exposure to the 95UCL concentration of lead in the soil, or less frequent exposure to the higher concentrations found at this site, can be expected to cause harm to children in the long- or short-term.

It is difficult to determine whether daily exposure to the average concentration of arsenic in the soil on the site, or less frequent exposure to higher concentrations in specific areas, can cause harm. The higher levels of arsenic generally were found in areas where there was also elevated lead in the soil. Exposure to lead may pose the greater threat.

MDCH has determined that daily exposure to elevated concentrations of iron in groundwater used for drinking at or near the Atlas Powder site is not expected to cause harm to healthy, non-pregnant individuals. MDCH cannot determine whether pregnant women exposed to iron in the drinking water are at risk of injuring their fetuses. Nutritional status as well as the woman's general health will have a bearing on whether her fetus might be at risk.

MDCH has determined that daily exposure to slightly elevated concentrations of nitrates in groundwater used for drinking at or near the Atlas Powder site is not expected to cause harm to otherwise healthy infants.

MDCH has determined that exposure to the contamination discovered at the Atlas Powder dump area is not likely to have resulted in the cancers reported by the complainant.

Recommendations

1. To avoid unnecessary exposure to arsenic and lead in the soil, people should avoid or be prevented from using this area. Owners of the investigated property and their guests who do use the area should avoid tracking dirt or dust into homes by removing outwear before entering a home.
2. Persons whose wells were tested should be notified of the results and advised of what the results mean.
3. Persons with metabolic conditions or pregnant women living near the Atlas Powder site and receiving their drinking water from private wells should discuss with their physicians the health implications of consuming water with elevated iron.
4. Persons living in homes with elevated iron in their drinking water near the Atlas Powder site should consider using a water treatment system. These treatment systems can significantly reduce or eliminate iron in the drinking water.
5. Infants living near the Atlas Powder site who have underlying health conditions that could compromise the oxygen-carrying capacity of the blood should not consume nitrate-contaminated water on a regular basis.
6. To be protective, the source of the nitrate exceedance in the one private well (and any other wells not yet identified) should be identified and corrected.

Public Health Action Plan

MDNRE and EPA will seek access to the remainder of the Atlas Powder property to further investigate environmental conditions, which will guide their decisions in addressing this site and protecting public health. There have been no reported changes to site access.

MDNRE sent results of the private well testing to the respective property owners. The letters included contact information for the local and state health departments if the residents wanted more information on the interpretation of the results. As of April 8, 2010, MDCH has not been contacted by any of the residents.

MDCH will provide a copy of this health consultation to the complainant and make the report publicly available on its website.

MDCH will remain available as needed for future consultation at this site.

If any citizen has additional information or health concerns regarding this health consultation, please contact MDCH's Division of Environmental Health at 1-800-648-6942.

Preparers of Report

Michigan Department of Community Health
Division of Environmental Health

Christina Bush, Toxicologist

ATSDR Region 5 Office

Mark Johnson
Office of Regional Operations

ATSDR Division of Health Assessment and Consultation

Trent LeCoultre, Technical Project Officer
Cooperative Agreement Program Evaluation Branch

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Appendix A. Letter responding to citizen concerns of a perceived cancer cluster near Senter, Houghton County, Michigan.

STATE OF MICHIGAN
DEPARTMENT OF COMMUNITY HEALTH
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

JANET OLSZEWSKI
DIRECTOR

October 22, 2008

[redacted]
Dollar Bay, MI 49922

Dear [redacted]:

Mary Schafer with the Michigan Department of Environmental Quality (MDEQ) forwarded to me your letter dated about September 18, 2008 in which you expressed your concern regarding the contamination around the Torch Lake Superfund site and cancers in the area. I am a toxicologist with the Michigan Department of Community Health (MDCH) and am working with MDEQ and the U.S. Environmental Protection Agency (EPA) at this site. My role is to evaluate the public health implications of exposure to contamination remaining from the copper mining operations and to address any community health concerns.

MDCH first became involved at the Torch Lake site back in the late 1980s, when the site was placed on the National Priorities List (the Superfund site list). In a 1989 Preliminary Public Health Assessment report, the then Michigan Department of Public Health and the federal Agency for Toxic Substances and Disease Registry (ATSDR, who funds the work we do at contaminated sites) noted that, according to cancer incidence data collected between 1970 and 1981, the rate of stomach cancer deaths in this area was above the state average. This could have been due to the predominantly Scandinavian descent of the population at that time. Studies have reported that Scandinavians appear to have a higher incidence for stomach cancer.

Since the 1989 report, the only other cancer incidence review done for the area occurred in 1993, when the Western Upper Peninsula District Health Department (WUPDHD) requested an analysis of leukemia incidence and all cancers combined in the Houghton and Keweenaw area. The communities of Calumet, Chassell, Houghton, and Hubbell, and the counties of Houghton and Keweenaw, were looked at individually. The individual incidence rates were then compared to the rates for the state as a whole. The timeframe reviewed was 1985 to 1990. None of the areas showed a statistically significant difference between observed and expected rates for leukemia; the observed rates were usually *lower* than what would normally be predicted. In regard to all cancers combined, there were no statistically significant findings for Keweenaw County. Calumet cancer rates, for all cancers combined, were significantly *lower* than both Houghton County and the state. Initial, simpler analysis of cancer rates in the Chassell area suggested a *higher* incidence than the county and state, but further, refined analysis did not show a statistically significant difference.

I contacted the WUPDHD to ask if they had conducted any analyses that my office may not have been aware of, but no formal work has been conducted. The district health department did mail out a cancer and other chronic disease survey, around 1999, to Torch Lake shoreline communities. They received about 4,000 responses but did not see any disease trend in the information gathered.

CAPITOL VIEW BUILDING • 201 TOWNSEND STREET • LANSING, MICHIGAN 48913
www.michigan.gov • (517) 373-3740

[redacted]
October 22, 2008
Page 2

I am enclosing some information that I hope you find helpful:

1. Excerpts from the "Western Upper Peninsula Community Profile 2000", showing local, state, and national cancer incidence and mortality data for individual years from 1985 to 1998, and incidence data broken out for the four primary sites reported to the Michigan Cancer Registry, shown in five-year blocks for Western U.P. residents and state residents.
2. A "Cancer Clusters: Common Questions" factsheet developed by our office in response to the many questions we receive regarding cancer incidence rates. This information can guide your efforts if you choose to pursue this matter further.

Lastly, I want you to know that my work in the Torch Lake area is not done yet. Plans are being made to acquire more environmental data to ensure that drinking water wells are not affected by the contamination and to determine if stampsands previously under water, but now exposed due to receding lake levels, present any public health hazard. If you have any further questions, please do not hesitate to contact me at 800-648-6942 (ask for me) or via e-mail at bushcr@michigan.gov.

Sincerely,

Christina Rose Bush

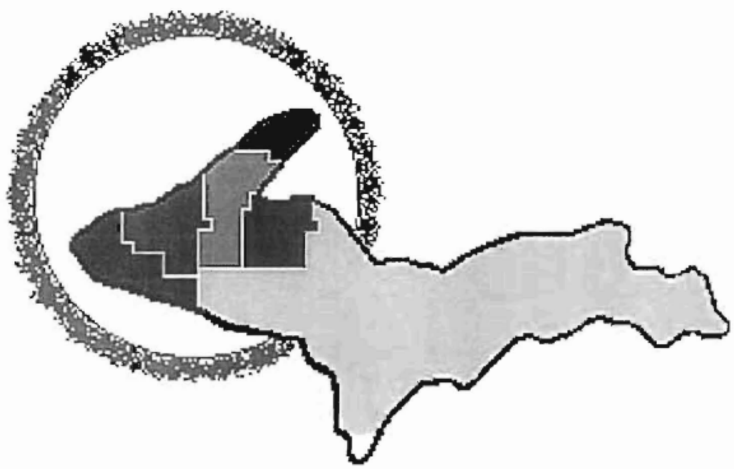
Christina Bush, Toxicologist
Toxicology and Response Section
Division of Environmental Health
Bureau of Epidemiology

Enclosures

CC: Western U.P. District Health Department
Mary Schafer, MDEQ
Patrick Hamblin, EPA

Western Upper Peninsula Community Profile 2000

A Data Book for Baraga, Gogebic, Houghton, Keweenaw and Ontonagon counties, Michigan



Copper Country Human Services Coordinating Body
Gogebic-Ontonagon Human Services Coordinating Board
Western Upper Peninsula District Health Department

Western Upper Peninsula Community Profile 2000

A publication of

Copper Country Human Services Coordinating Body
Paul Ollila, Chairperson
Susan Donnelly, Ph.D., Coordinator

Gogebic-Ontonagon Human Services Coordinating Board
Graydon Blank, Chairperson
Betsy Wesselhoft, Coordinator

Western Upper Peninsula District Health Department
M. Gail Shebuski, M.D., M.P.H., Medical Director
Guy St. Germain, Administrator

Author/Editor
Ray Sharp, Community Health Assessment Specialist
Western U.P. District Health Department

This report was produced with assistance from members of the Copper Country Community Assessment Work Group and the Gogebic-Ontonagon Data Outcomes Committee, work groups of their respective multi-purpose collaborative boards. Many people throughout the region and state have contributed data, ideas, suggestions and support to this project; however, the author acknowledges that any errors are his own.

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Cancer Data

Cancer is the second leading cause of death after heart disease, and the leading cause of potential years of life lost. In a typical week, 7-8 Western U.P. residents will be newly diagnosed with an invasive malignancy, and 3-4 residents will die from cancer. Crude cancer rates in the Western U.P. are higher than state and national rates due to the larger-than-average proportion of elderly people, but age-adjusted rates tell a different story. When adjusting for age by computing rates based on a standard population distribution, regional rates of cancer incidence and death are somewhat lower than state and national rates.

Cancer Incidence and Mortality Trends, Western U.P. 1985-1998

	Cases Diagnosed				Deaths			
Year of Diagnosis or Death	Number	Age-Adjusted Rate	Michigan Rate	National Rate	Number	Age-Adjusted Rate	Michigan Rate	National Rate
1985	342	30.1±3.3	37.5	37.3	217	16.8±2.3	17.6	17.1
1986	357	30.9±3.4	37.5	37.5	217	17.2±2.4	17.4	17.2
1987	410	35.5±3.6	38.7	38.8	212	17.4±2.4	17.6	17.2
1988	351	30.2±3.3	38.8	38.5	211	17.2±2.4	17.5	17.2
1989	466	40.8±3.9	41.5	38.8	169	13.9±2.2	17.7	17.3
1990	432	38.0±3.8	42.6	40.0	217	18.3±2.6	17.6	17.3
1991	424	36.9±3.7	45.3	41.7	213	16.8±2.4	18.0	17.3
1992	488	42.3±4.0	45.5	42.6	221	17.0±2.4	17.7	17.2
1993	493	43.1±4.0	44.5	41.2	204	15.9±2.3	17.4	17.2
1994	394	32.1±3.4	42.7	40.4	185	14.3±2.2	17.3	17.1
1995	444	38.9±3.9	41.6	39.5	218	16.2±2.3	17.0	19.9
1996	408	35.2±3.6	41.2	38.9	229	17.4±2.4	16.9	16.7
1997	434	30.7±3.5	41.4	---	207	15.7±2.3	16.6	---
1998	---	---	---	---	189	14.6±2.3	16.3	---

Source of regional and Michigan Cases Diagnosed: Michigan Resident Cancer Incidence File, MDCH.
Source of regional and Michigan Death Data: Michigan Resident Death Files, MDCH.
Source of national data: Surveillance, Epidemiology and End Result Program, National Cancer Institute.
Age-adjusted rates are per 10,000 population, computed by direct method, using the age distribution of the U.S. in 1970 as the standard.

Several trends emerge in the analysis of regional cancer rates over the period from 1985 to 1998. While local annual data fluctuate more than state and national rates due to the smaller population size, comparisons can be made using multi-year averages. The average age-adjusted incidence rate, 1985-1997, was 35.75 per 10,000 in the Western U.P., compared with 41.45 statewide. The average age-adjusted death rate, 1985-1998, was 16.34 per 10,000 in the Western U.P., compared with 17.34 statewide. Therefore, after adjusting for age, local residents were 13.8 percent less likely to be diagnosed with cancer and 5.8 percent less likely to die from cancer.

Cancer death rates have been in decline since a peak in the early 1990's, due to earlier detection and more successful treatment options. This trend is observed at the regional, state and national levels. It is not clear whether local rates are lower than Michigan rates due to hereditary, environmental, dietary or lifestyle factors; differences in reporting or medical care; or some combination of factors.

Cancer Incidence Trends

A popular misperception, based on anecdotes and mass media reports, is that the United States is in the midst of a "cancer epidemic," or that the local cancer incidence rate "must be much higher than average." Health statisticians say that actually a larger percentage of deaths than in the past are caused by cancer, cardiovascular diseases and other conditions associated with aging, principally because people are living longer and are less likely to die as infants, during childbirth, from vaccine-preventable diseases, or from infections treatable by antibiotics.

The four most prevalent types of cancer – prostate, breast, lung and colorectal – represent one third to one half of all cancer cases. Age-adjusted cancer incidence rates climbed steadily in the 1970's and 1980's, but have declined slightly since the early 1990's. One reason for the increases in cancer incidence rates through the middle of the last decade was improved awareness, screening and detection, especially for prostate cancer. Early detection has led to higher survival rates for many cancers that are isolated to a single site in their early stages, such as breast and prostate cancers. Therefore, paradoxically, it is possible for a rise in the reported incidence of a particular cancer to coincide with a decline in the death rate for that cancer. Other cancers, such as lung cancer, metastasize (spread) quickly, and consequently treatments are less likely to be successful.

Given the small populations in Western U.P. counties, single-county or single-year comparisons for specific cancers are virtually meaningless. Below are regional and state cancer-incidence trends using multi-year averages. Note the doubling of prostate gland cancer-incidence rates from the 1980's to 1990's, coincident with the development of the PSA screening test. (Age-adjusted rates are per 10,000 population.)

Cancer Incidence Trends, Western U.P. Residents 1985-1997

	1985-1989		1990-1994		1995-1997	
Primary Site	Average Number	Age-Adjusted Rate	Average Number	Age-Adjusted Rate	Average Number	Age-Adjusted Rate
Prostate Gland	42.6	2.9 ± 0.4	77.6	6.0 ± 0.6	61.3	5.0 ± 0.8
Breast	56.4	5.3 ± 0.7	61.2	5.7 ± 0.7	52.3	5.1 ± 0.9
Lung	53.4	4.7 ± 0.6	61.8	5.4 ± 0.6	63.0	5.4 ± 0.8
Colon/Rectum	56.4	4.6 ± 0.6	56.6	4.5 ± 0.6	49.3	3.9 ± 0.7
All Other Sites	176.4	15.9 ± 1.1	189.0	16.8 ± 1.2	172.3	15.5 ± 1.4
Total	385.2	33.5 ± 1.6	446.2	38.4 ± 1.7	398.3	34.9 ± 2.1

Cancer Incidence Trends, Michigan Residents 1985-1997

	1985-1989		1990-1994		1995-1997	
Primary Site	Average Number	Age-Adjusted Rate	Average Number	Age-Adjusted Rate	Average Number	Age-Adjusted Rate
Prostate Gland	4,287.6	4.1 ± 0.1	8,262.6	7.6 ± 0.1	7,152.0	6.6 ± 0.1
Breast	5,795.2	5.9 ± 0.1	6,571.4	6.3 ± 0.1	6,690.7	6.0 ± 0.1
Lung	6,123.0	6.3 ± 0.1	7,091.2	6.8 ± 0.1	7,105.7	6.5 ± 0.1
Colon/Rectum	5,248.2	5.2 ± 0.1	5,393.2	4.9 ± 0.1	5,230.3	4.5 ± 0.1
All Other Sites	17,187.6	17.3 ± 0.1	19,575.2	18.5 ± 0.1	19,857.0	17.8 ± 0.1
Total	38641.6	38.8 ± 0.2	46893.6	44.1 ± 0.2	46035.7	41.4 ± 0.2

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Michigan Department of Community Health

MDCH

Jennifer M. Granholm, Governor
Janet Olszewski, Director

Cancer Clusters: Common Questions

You know several people in your neighborhood who have been diagnosed with or died from cancer within the past few years. You're worried. Is there something wrong in this area? Why does it seem so many people are getting cancer?

What is a cancer "cluster?"
A cancer cluster is a greater-than-expected number of cancer cases that occurs within a group of people in a geographic area over a specific period. A cluster may be "perceived" (i.e., a person notices what seems to be a high number of cancer cases) or "real" (i.e. statistical analysis of cancer incidence data shows that the number of cases is higher than would be predicted).

How is a cancer cluster identified?
Concerns regarding a perceived cancer cluster first should be discussed with a public health professional, either from your local health department or the Michigan Department of Community Health (MDCH). This person can help determine if an initial evaluation is necessary.

Simply counting the number of cancers found in a specific geographic area is not enough to determine if a cluster is present. An initial evaluation of a perceived cancer cluster requires the following information:

- cancer(s) of concern (breast, lung, prostate, etc.),
- number of cases,
- year of diagnosis for each case, and
- geographic area of concern.

The person asking for the evaluation should provide this information. The information can be compared to data from the state as a whole, from the county in which the community is situated, or from nearby or similar geographic areas.

Further investigation may be warranted if:

- the rate of one type of cancer is increased,
- a rare type of cancer is seen at a high rate, or
- a type of cancer is seen in a group not usually affected by that cancer, such as a cancer in children that is normally seen in adults.

If a review is indicated, cancer incidence data must be evaluated by a qualified statistician or epidemiologist.

The larger the population of the geographic area investigated, the easier it is to interpret the information. For example, a cancer analysis in one zip code area is often difficult to interpret. Analysis of several zip codes, such as for a city, generally provides more certainty. Analysis of a single neighborhood would not have the statistical power to draw clear conclusions.

What causes cancer clusters?
A cancer cluster may be due to chance, miscalculation of the expected number of cancer cases, exposure to known causes of cancer (such as smoking), or exposure to unknown causes of cancer. In most cases, no specific cause can be determined for a cancer cluster.

What causes cancer?
Cancer is a common illness - 1 out of 3 people will develop cancer in their lifetime.

The cells in your body are constantly being damaged and repairing that damage. This is normal. When damage is not repaired, cancer can develop. The development of cancer can be thought of as a series of events, each with a certain likelihood of happening, rather than as a single, all-or-nothing occurrence. These steps take time. The total time between a cell being damaged to a cancer being detected is called the latency period. Blood-related cancers, such as leukemia, may take 4-5 years to develop; solid tumors, such as those found in lung cancer, may have a latency period of decades.

Environmental factors that may affect a person's likelihood of developing cancer include:

- ♦Lifestyle choices (nutrition, tobacco use, physical activity)
- ♦Naturally occurring exposures (UV light, radon)
- ♦Medical treatments (radiation, immune system-suppressing drugs)
- ♦Occupational exposures
- ♦Pollution

Many people believe that much of our cancer risk comes from chemical pollutants in our air, food, or water. However, most of our cancer risk comes from lifestyle choices. Non-environmental risk factors include age, race, gender, and genetic factors.

Just because you might be exposed to a carcinogen (a cancer-causing agent) does not mean that you will develop cancer as a result of that exposure. If you are concerned about developing cancer, you should discuss this matter with your physician. Many cancers are successfully treated if they are discovered in the early stages.

Other Sources of Information:

Check with your local health department regarding perceived cancer clusters in your area. If necessary, your local agency can refer you to MDCH for further information.

View the MDCH factsheet called "Cancer and the Environment" at http://www.michigan.gov/documents/mdch_Cancer&Environment_86809_7.pdf

View Michigan or county data regarding certain forms of cancer at the MDCH Cancer Registry. http://www.michigan.gov/mdch, under "Statistics and Reports."

Learn more about cancer cluster investigations at the Centers for Disease Control and Prevention website. http://www.cdc.gov/nceh/clusters/default.htm

Get cancer information from the American Cancer Society website. http://www.cancer.org/docroot/home/index.asp

Certification

This "**Atlas Powder Dump Area – Determination of Public Health Implications**" Health Consultation was prepared by the Michigan Department of Community Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures. Editorial review was completed by the cooperative agreement partner.

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Technical Project Officer, Cooperative Agreement Program Evaluation Branch (CAPEB), Division of Health Assessment and Consultation (DHAC), ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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Team Leader, CAPEB, DHAC, ATSDR