Health Consultation

CHAUNCEY PCB SITE
REVIEW OF EPA SAMPLE DATA FOR
NOVEMBER 2003 THROUGH MARCH 2004

CHAUNCEY, LOGAN COUNTY, WEST VIRGINIA

EPA FACILITY ID: WVN000305921

MARCH 9, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

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

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

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February 3, 2005

Prepared by

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

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Foreword

This document summarizes public health concerns for the Chauncey PCB Site in West Virginia. These public health concerns are related to exposures to lead-containing soil near a former power plant, the potential for exposures to dioxins at the site and from the public water supply, and the evaluation of the elementary school ball field for pesticide, polychlorinated biphenyl (PCB), and metal contaminants. The first health consultation at this site was completed by the Agency for Toxic Substances and Disease Registry (ATSDR) on March 8, 2004. The first health consultation reviewed data from analyses of the environmental samples taken by the U. S. Environmental Protection Agency (EPA) in October and November 2003. This health consultation reviews data from EPA samples taken from November 2003 through March 2004.

The steps taken in completing a health consultation are as follows:

Evaluating exposure: The West Virginia Department of Health and Human Resources (WVDHHR) starts by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it is found on the site, and how people might be exposed to it. WVDHHR typically does not collect environmental samples. WVDHHR relies on information provided by the West Virginia Department of Environmental Protection (WVDEP), EPA, and other governmental agencies, businesses, and other sources of accurate, factual, and reliable information.

Evaluating health effects: If evidence exists that people are being exposed, or could be exposed, to hazardous substances, WVDHHR scientists will take steps to evaluate whether that exposure could be harmful to human health. The evaluation is based on existing scientific information. The report of this evaluation is the health consultation. The health consultation focuses on public health - the health impact on the community as a whole.

Developing recommendations: In the health consultation, WVDHHR outlines its conclusions regarding any potential health threat posed by a site and offers recommendations for reducing or eliminating human exposure to contaminants. The role of WVDHHR at a site is primarily advisory. For that reason, the health consultation will typically recommend actions to be taken by other agencies, including WVDEP and EPA.

Soliciting community input: The evaluation process is interactive. WVDHHR starts by soliciting and evaluating information from various governmental agencies, the organizations responsible for cleaning up sites, and the community surrounding the site. Any conclusions about the site are shared with groups and organizations that provided the information.

If you have questions or comments about this report, we encourage you to:

write: Program Manager
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Summary and Statement of Issues

The Chauncey PCB Site (the site) involves various areas in and around the town of Chauncey, West Virginia, where residents suspect that dumping of chemicals has occurred in the past. The site is about 20 acres.

A health consultation completed on March 8, 2004, reviewed data from samples taken by the U.S. Environmental Protection Agency (EPA) in April 2003 and data from samples taken by West Virginia Department of Environmental Protection (WVDEP) in October and November 2003 [1]. The site was initially named the "Chauncey PCB Site" on the basis of Chauncey residents' concerns that PCBs were contaminating their community. After evaluating the available environmental data, West Virginia Department of Health and Human Resources (WVDHHR) concluded that PCBs were not found at this site in high enough amounts to be causing adverse health effects. The main exposure pathway that WVDHHR identified in the first health consultation was exposure to lead and arsenic from incidental ingestion of soil or sediment containing these chemicals. WVDHHR concluded that under the site-specific conditions of exposure at this site, chemicals in the samples posed *no apparent public health hazard for the present or future*. No historical data existed, so the site was classified as an *indeterminate public health hazard for the past*.

After the April 2003 sampling event, EPA took additional samples at this site because results of the previous sampling showed some contaminants present (though not at high enough levels to be likely to adversely affect health) where additional evaluation was prudent and because of community member concerns relating to dumping of pesticides in an area now used as ball fields for children. The additional sampling was done from November 2003 through March 2004. The results are reviewed in this health consultation, which evaluates the potential for adverse health effects occurring from exposures to the chemicals at the levels detected at this site.

WVDHHR prepared this health consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

Background

Site Description and History

The Chauncey PCB Site (the site) consists of various areas in and around the town of Chauncey, West Virginia, where residents suspect that chemical dumping occurred in the past. Residents believe that the chemical dumping may be related to the number of Chauncey residents with cancer. EPA took samples at the site because of these concerns. EPA asked staff of the ATSDR Cooperative Partners Program in West Virginia to evaluate the sample results and the potential for adverse health effects from exposure to the chemicals found at the site.

Chauncey is approximately 8.5 road miles south of Logan, West Virginia, at the intersection of State Route 44 and County Route 119/18 (Figure 1). Miller Branch and Middle Fork run through portions of the town and drain into Island Creek. Island Creek flows north beside Route 44 and enters the Guyandotte River at Logan. Chauncey has an elementary school and a private school for elementary through high school students. The former coal-fired power plant is south of the elementary school. A United Parcel Service facility is between the school and the former power plant. The ball fields are north of the elementary school. All these places are along the banks of

Island Creek. A former gasoline station is south of the former power plant along Island Creek. Island Creek flows from south to north in this area (Figure 2).

The first round of EPA sampling, done in April 2003, found dioxins and dioxin-like compounds in the water of the subbasement of the former power plant. The levels found were not high enough to be likely to cause adverse health effects. However, because of the continued concern that dioxins could be present in this area, EPA sampled for dioxins and dioxin-like chemicals in additional areas around the former power plant between November and December 2003. Samples reviewed in this report were taken in the following areas:

Area 1. Adjacent to the fence line of the former power plant

Because of the proximity of the former power plant, samples were tested for lead, arsenic, dioxin, and dioxin-like chemicals.

Area 2. Bermed area

This area is close to the former power plant. It was referred to as the "pit" in the previous health consultation. The initial EPA samples found lead in the soil up to 1270 milligrams per kilogram (mg/kg). EPA tested for metals (including lead), dioxins, and furans in soil from this area.

Area 3. Former gasoline station

The soil in this area was tested for metals.

Area 4. Ball fields

EPA took samples of soil at the elementary school ball field and the T-ball field because of concern over possible pesticide contamination. A local resident had said that many years ago he dumped outdated pesticides from a hardware store in the area now used for the ball fields. Soil at the ball fields was tested for arsenic, lead, polychlorinated biphenyls (PCBs), and pesticides.

Sediment of Island Creek in the former power plant area

Island Creek sediment in this area was tested for dioxins and furans because of the area's proximity to the former power plant.

Well water from a privately owned well

Well water from a private well near the former power plant was sampled. The well is not currently in use. More than 170 analyses for organic and inorganic chemicals were run on this sample.

Surface water at the intake of the Logan Public Service District (PSD) #1

Water at the intake of the Logan County Public Service District – Northern Regional (Logan PSD #1) at Henlawson was sampled prior to any treatment. The intake uses water from the Guyandotte River. The water intake is approximately 13 miles downstream from this site. More than 200 analyses for organic and inorganic chemicals were run on these samples.

Demographics

Approximately 280 people live in and near Chauncey in 110 homes. Twenty-five percent of the people living at or near this site are 19 years of age or younger, 60% are 20 to 65 years old, and 15% are 65 years or older. The median age of people in this area is 39.1. This area has a higher median age than that of the United States (36.5) [2]. Omar Elementary School in Chauncey has about 270 students in kindergarten through fourth grade. Until 1997, the elementary school served kindergarten through ninth grade. Beth Haven Christian School in Chauncey has about 150 students in kindergarten through eleventh grade. Most of the students in these two schools live outside of Chauncey.

Community Health Concerns

The prior EPA sample results (April 2003) raised concerns in the community about exposure to lead in the soil near the former power plant. However, community members indicate that few if any children regularly contact the soil at this site.

Residents were also concerned about the presence of dioxins and dioxin-like compounds in the water of the subbasement of the former power plant. Community members were worried that the dioxins and dioxin-like compounds might have entered Island Creek when the water from the subbasement was pumped into Island Creek.

Some community members were troubled about whether the drinking water supplied by the Logan PSD #1 could contain contaminants from this site, because the water supply intake is downstream from the site.

Additionally, community members were concerned that past pesticide dumping in the area now used for the community ball fields may have caused pesticide contamination of the soil in this area.

Discussion

Data Review and Selection of Chemicals of Concern

All soil samples for which data were reviewed were taken on or close to the surface of the ground (from the surface to 6 inches deep).

Table 1 summarizes the tests run on the samples reviewed for this report. The source of these data is *U.S. Region III Superfund Technical Assessment and Response Team Trip Report addendum*, dated 2004 March 17 [3] and sample data sheets for the well water and ball field, 2004 March [4, 5].

The first step in assessing human health risk is selecting chemicals of concern. This process compares data from the site to environmental guideline comparison values (CVs). CVs are established on the basis of an evaluation of toxicology literature for a given substance. They are used as screening tools. Exposure to a chemical below its corresponding CV indicates that adverse health effects are unlikely. Many safety factors are included in deriving these CVs, making them very conservative (that is, protective of public health). Chemicals found at levels above a CV are considered to be “chemicals of concern.” However, exposure to chemicals at levels above a CV *does not necessarily mean* that an adverse health effect will result. It simply indicates a *need for further evaluation* to find out whether the chemical *could have caused* adverse health effects at this site. Some chemicals have both carcinogenic (cancer-causing) and noncarcinogenic (non-cancer causing) CVs. For chemicals with both carcinogenic and noncarcinogenic CVs, the most conservative CV (that is, the lowest) was selected.

A chemical was selected as a chemical of concern if test results indicated that the chemical was in the environment in amounts above the selected CV, if no established CVs exist for that chemical, or if the chemical is of particular concern to the community. The chemicals of concern selected for this site are listed in Table 2.

No chemicals were found in the water sampled at the water intake at the Logan PSD #1 water plant or in the water from the private well at high enough levels to be considered chemicals of concern.

Samples were taken in a grid pattern across the ball fields. One test out of 25 for lead in the ball field samples showed levels much higher than all the other lead results. This test found 1,550 mg/kg of lead in the soil. All other results for the ball field soil ranged from 9.8 to 258 mg/kg of lead. Although this one sample is an anomaly, it only slightly changes the average lead content of the soil in *Area 4. Ball fields*. In fact, a duplicate sample taken at the same place found lead in the soil at 245 mg/kg. The sample, and duplicate, were taken in the ball field near the fence. The average lead content of the soil in *Area 4.* is 168 mg/kg when the 1,550 mg/kg result is included, and 116 mg/kg when this result is not included. WVDHHR used the higher average soil lead level (168 mg/kg) to calculate the average soil lead level for *Area 4* (Table 3).

Human Exposure Pathway Analysis

An exposure pathway consists of five parts:

1. a source of contamination,
2. movement of one or more contaminants into and through the environment (in soil, air, groundwater, or surface water) to bring them into contact with people,
3. a place where humans could be exposed to the contaminant(s),
4. a way for humans to be exposed to the contaminant(s) (such as by drinking the water or breathing the air), and
5. one or more people who may have been in contact with the contaminant(s).

Exposure pathways are considered *complete* when all five of these elements existed at some point in the past, when they exist in the present, or when they are likely to occur in the future. Exposure pathways are considered *potential* when one or more of the elements are missing or uncertain but could have existed in the past, could currently exist, or could exist in the future. Pathways are considered *eliminated* when one or more of these five items have not existed, do not exist, or are unlikely to exist.

A completed pathway means that people have been exposed to chemicals. However, the existence of a completed pathway *does not necessarily mean that a public heath hazard existed* in the past, exists currently, or is likely to exist in the future. Chemicals found in the completed pathways at this site were evaluated to determine whether adverse health effects could have occurred in the past, are occurring in the present, or could occur in the future. One completed pathway and two eliminated pathways are discussed.

Chemicals can get into the body in three ways.

- They can be ingested (swallowed) when a person drinks water, takes in small amounts of contaminants through normal hand-to-mouth activities (incidental ingestion), eats contaminated food, or engages in pica. Pica is the craving and eating of soil (over 1,000 milligrams per day or more on a routine basis) and other nonfood items. Pica behavior is not considered a method of exposure in this report because this behavior is not likely to occur at this site.

- They can go through the skin. This is called dermal exposure. Many chemicals are not absorbed through the skin easily. The types and amounts of chemicals found at this site make the dermal pathway unlikely at this site. Therefore, the dermal pathway is not considered at this site.
- They can be inhaled (breathed in). Air containing chemicals or particles that are very small can get into the part of the lung where they can be absorbed. This is called inhalation. The chemicals found at this site do not evaporate easily into the air where people can breathe them. In addition, soil particles are generally not small enough to carry chemicals into the part of the lung where they can be absorbed. Therefore, the inhalation pathway is not considered at this site.

Completed Pathway

Incidental Ingestion of On-Site Soil – Completed Pathway for the Past, Present, and Future

Several chemicals of concern are in soils at this site. The source of these chemicals is unknown. Residents of Chauncey could come into contact with the chemicals in these soils when they play or work in the areas containing these soils. The way that people could get chemicals from the soil into their bodies is through incidental ingestion (that is, unintentional swallowing of soil containing the chemicals). Small children have more hand-to-mouth activities than do adults and are more likely to ingest contaminated soil this way. The incidental ingestion pathway is completed for on-site soil. It is assumed that these chemicals existed in these soils in the past, although the amount of chemicals present at that time is unknown. This pathway existed in the past, is occurring now, and will be present in the future under current conditions.

Eliminated Pathways

Ingestion of Surface Water Treated by the Logan PSD#1 – Eliminated Pathway for the Past, Present, and Future

No chemicals of concern were found in surface water used by Logan PSD#1 for the community drinking water source. The tests were run on the water before it entered the water treatment plant. The water was analyzed for 201 chemicals. More than 150 of these chemicals could not be detected in the water (meaning that the amounts were at or below the detection limit for that test). The chemicals that were detected were not found in high enough quantities to be selected as chemicals of concern. The source of the water is the Guyandotte River. The water from this site flows from Island Creek into the Guyandotte. The water intake is approximately 13 miles downstream from the site. Due to the dilution of water from Island Creek in the Guyandotte River, it is unlikely that chemicals from this site would be detected in the water source used by this public water system. For both of these reasons, the ingestion of drinking water supplied by the Logan PSD#1 is eliminated for the past and present. If conditions do not change, this pathway is eliminated for the future.

Ingestion of Groundwater from the Private Well near the Former Power Plant – Eliminated Pathway for the Present

No one is using this well water. Therefore, people are not exposed to any chemicals in this water. The water test showed that no chemical was found in the water at a high enough level to be considered a chemical of concern. For both of these reasons, this pathway is eliminated for the present.

Exposure Analysis

Calculation of Exposure Doses for Incidental Ingestion

Estimated exposure doses (expressed as milligrams per kilogram per day [mg/kg/day]) were calculated by multiplying

- the amount of media (water, sediment, or soil) ingested in a day by
- the amount of the chemical found in that media (amounts from Table 2) by
- how much of the chemical is taken into the body (the absorption factor) by
- the exposure factor, representing the amount of time over which the exposures occurred, and *then*
- dividing all of the above by the body weight of the person exposed (Table 4).

A more detailed way to define the exposure factor is "the time period that exposure to a chemical is assumed to occur divided by the total time period during which the exposures occur." For instance, an exposure factor for a person exposed 180 days a year for 30 years out of a lifetime of 70 years would be 0.211. The formula used is as follows:

$$\frac{\text{(180 days per year [assumed exposure time]) x (30 years [assumed exposure time])}}{\text{(365 days per year [total days in a year]) x (70 years [assumed years in a lifetime])}}$$

The assumed number of years over which an exposure occurred is used in the numerator of the equation to estimate the exposure to noncarcinogenic chemicals. A 70-year lifetime is used in the numerator to estimate carcinogenic risk. This approach assumes that estimates of exposure over the actual exposure time adequately estimates the noncarcinogenic risk. The estimate of carcinogenic risk assumes that the estimated dose received over a short period of time is equivalent to a lower dose spread over a lifetime.

Sometimes not all of a chemical entering the body gets absorbed into the body. Thirty percent of the lead in soil is assumed to be absorbed into the body [6]. This is a conservative estimate of lead absorption, meaning that most people will absorb less than 30% of the lead that enters their body from ingesting soil. Lead absorption is affected by age, fasting, nutritional calcium and iron status, and particle size. Studies suggest that people who have adequate calcium and iron in their bodies absorb less lead than people who are deficient in these minerals. Arsenic is assumed to be 80% absorbed when ingested [7]. All other chemicals were assumed to be 100% absorbed.

The assumptions used to calculate the exposure doses are noted in Table 4. The number of days per year of exposure to this medium, 270 days a year, was based on an estimation of the number of days of good weather where outdoor activities are likely for a child or an adult. These assumptions require a persistent pattern of ingesting surface water, soil, or sediment. The estimated exposure doses, therefore, are much higher than would likely occur to any person at this site.

Calculation of the Risk of Elevated Blood Lead Levels in Children Exposed to Lead in Soil

The EPA model for predicting blood lead levels in children was used to assess potential health effects from exposures to lead at this site. The assumption was made that children under the age of 4 would not have access the lead-containing soils in *Area 2. Bermed Area*, in a non-residential area. Children as young as 2-years-old were assumed to be exposed to soil at *Area 4*. because young children often attend ballgames and play in dirt while there. The EPA model is called the Integrated Exposure Uptake Biokinetic Model (IEUBK). It estimates the likelihood that a typical child will have blood lead concentrations over the level of concern, which is 10 micrograms per deciliter (µg/dL).

The model assumes that children will be exposed to lead from a variety of sources, including outdoor soil, dust in the home, air, drinking water, and food. The average amount of lead in on-site and off-site soils was used to calculate estimated blood lead levels in children at this site. The calculations used the EPA default assumptions about the amount of lead in outdoor air (0.1 microgram per cubic meter [$\mu g/m^3$]), drinking water (4 micrograms per liter [µg/L]), and diet (from 5.53 to 7.00 micrograms per day [µg/day] depending on age). The model assumes that high levels of lead in the soil outside the home will result in high levels of lead in the dust inside the home. No estimate was made for exposure to lead-based paint in homes [8].

A time-weighted average was used to estimate the lead exposures to soils at this site. This method weighed the amount of time spent in contact with on-site or off-site soils with the amount of time spent at home. Soil around homes was assumed to have a lead content of 79 mg/kg. This was based on the average of two residential soil samples taken at this site [9]. The calculation method and the results can be found in Table 3.

Calculation of the Risk of Elevated Blood Lead Levels in Adults Exposed to Lead in Soil

Estimates of the blood lead levels of adults exposed to on-site and off-site soils were calculated using a method recommended by the EPA. A different model was used for an adult because of differences between adults' and children's exposure to and absorption of lead. EPA-recommended values were used to make the calculations except for site-specific values. The site-specific values used in this estimate were the number of days per year a person was assumed to be exposed to the lead in the soil and the amount of lead in the soil [10].

Selection of Chemicals To Be Reviewed for Noncarcinogenic Effects

Chemicals to be reviewed for noncarcinogenic effects were selected on the basis of whether exposures at this site were expected to result in doses high enough to harm people's health. Estimated exposure doses were judged against health-based comparison values (CVs) that are protective of public health. These are values below which exposures would not be expected to harm people. ATSDR Minimal Risk Levels (MRLs) and EPA Reference Doses (RfDs) are examples of health-based CVs that are protective of public health.

If an estimated dose of a chemical at this site was below these health-based CVs, meaning that exposures to these chemicals at these levels are not expected to result in adverse health effects, the chemical of concern was eliminated from further review.

All chemicals of concern for which estimated exposure doses were over the health-based CV, or for which there no health-based CV exists, were selected for further review. The comparisons between estimated doses and health-based CVs are outlined in Table 4.

The review for possible adverse health effects is done by considering the estimated exposure doses for these chemicals in light of research that indicates possible health effects from chemical exposure in specified amounts. One source for this information is the ATSDR toxicological profiles.

The ATSDR Chronic Oral MRL for arsenic was the health-based CV used in this report. It is an estimate of daily human exposure to arsenic at or below which the arsenic is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects to a person exposed to arsenic orally (by mouth) for more than 1 year.

An exposure dose where no effects are observed is known as the no-observed-adverse-effect level (NOAEL). The lowest exposure dose where an adverse health effect is observed is called the lowest-observed-adverse-effect level (LOAEL).

Selection of Chemicals To Be Reviewed for Carcinogenic Effects

Past cancer risks based on current environmental sampling results are difficult to specify because cancers usually do not develop until many years after exposures. No data for past exposures are available. Therefore, the theoretical cancer risks were calculated based on current environmental data.

WVDHHR calculated a theoretical excess cancer risk for all chemicals of concern where the EPA has calculated a Cancer Slope Factor. The excess cancer risk is the number of cases of cancer in a population that may be caused from exposure to a particular chemical at this site given the assumed exposure conditions. Excess cancers are those cancers that might be caused by a chemical exposure that is over and above other cancers seen in a population. A Cancer Slope Factor (CSF) is an estimate of the possible increases in cancer cases in a population, expressed in $(mg/kg/day)^{-1}$ that are estimated to result from exposure to a particular chemical. Several steps are used to calculate the excess cancer risk. Exposures for each age group are averaged over a 70-year lifetime. The estimate obtained for each age group is added together. This gives a theoretical excess cancer risk for a person that is exposed to the chemical over the total exposure time noted in the exposure frequency assumptions in Table 4. This number was multiplied by the CSF (Table 4).

The numbers obtained using this method are only estimates of risk because of the uncertainties and conservative assumptions made in calculating the CSFs. This approach assumes that the effects from exposure to a carcinogen over a short time period will be the same as if the exposure was averaged over a lifetime. The actual risk of cancer is probably lower than the calculated number. The true risk is unknown and could be as low as zero. The method also assumes no safe level for exposure to a carcinogen. Lastly, the method computes an estimated risk that is much more than that expected for most of the people in the population, because it uses the 95% upper bound of the risk instead of the average risk. All this means that a very good chance exists that the risk of cancer is actually lower than that calculated, perhaps by several orders of magnitude.[1]

WVDHHR's final step in selecting the chemicals to be reviewed was to evaluate the probable or actual exposure scenarios to decide whether the exposure doses or cancer risks might be a health hazard. Considering these uncertainties, theoretical cancer risks lower than 1 in 10,000 were considered very low risk and are not discussed in the text. Theoretical cancer risks between 1 and 9.9 in 10,000 were classified as a low risk, between 10 and 99 as a moderate risk, and greater than 99 in 10,000 as a significant risk.

Possible Health Consequences – Toxicological & Epidemiological Assessment

On the basis of these criteria and data reviewed, WVDHHR selected arsenic in the soil in *Area 1.*, lead in the soil in *Area 2.* and arsenic, 4,4-DDE, 4,4-DDD, and Aroclor-1260 in soil in *Area 4.* for assessment for potential adverse health effects

The review found that a child coming into contact with lead in the soils in *Area 2.* for 270 days a year could experience blood lead levels up to 10.7 µg/dL. Some adverse health effects are likely under these exposure conditions. However, residents report that they know of no child who accesses *Area 2.* with this frequency. Children coming into contact with *Area 2* soil for 182 days a year would not be expected to have blood lead levels higher than the 10 µg/dL CDC level of concern.

Adults exposed to soils from *Area 2.* with this frequency were estimated to have blood lead levels of 4.9 µg/dL. No adverse health effects would be expected in adults exposed to lead in the soil in *Area 2*.

Arsenic, 4,4-DDE, 4,4-DDD, and Aroclor-1260 were not found at levels where exposure to soils at this site would be likely to cause adverse health effects.

4,4-DDE, 4,4-DDD, and Aroclor-1260 - Noncarcinogenic Effects

The estimated exposure doses for these chemicals were all <0.0001 mg/kg/day. This level was much lower than levels of chemical exposure found to be likely to cause any adverse health effects. Exposure to 4,4-DDE, 4,4-DDD, and Aroclor 1260 at this site are not likely to cause adverse health effects.

Arsenic - Noncarcinogenic Effects

Arsenic, a naturally occurring element, is found in soils in West Virginia. Arsenic is commonly used as a wood preservative and is also used in some pesticides. The source of arsenic at this site is unknown.

The estimated exposure dose greater than the ATSDR Chronic Oral MRL for arsenic (0.0003 mg/kg/day) are as follows:

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1 A value that is one order of magnitude smaller or larger than another value is 10 times smaller or larger than the original number. A number that is two orders of magnitude smaller or larger than another is 100 times smaller or larger than the original number.

- 0.0011 mg/kg/day for a child weighing 10 kg (about 22 lb) exposed to 92.3 mg/kg/day of arsenic in on-site soil at *Area 1. adjacent to the fence line of former power plant*, 270 days a year

The estimated exposure dose was compared with those seen in a study by Tseng et al. (1968). The study showed that skin changes occur at a LOAEL dose of 0.014 mg/kg/day. The NOAEL for arsenic from this study is 0.0008 mg/kg/day. On the basis of this information, the estimated exposure dose of 0.0011 mg/kg/day could cause darkening of the skin and development of keratoses (darkened-rough spots) on the skin [7]. However, few if any young children are expected to come into contact with this soil at this rate. Less contact with the soil means that the exposure dose is less. Furthermore, findings of the Tseng et al. study were based on daily ingestion of arsenic-contaminated drinking water, which is a more direct exposure than is the occasional contact with arsenic-contaminated soils. Considering the Chauncey site conditions, a low potential exists for children to have any arsenic-caused adverse health effects from exposure to on-site soil through incidental ingestion.

Arsenic - Carcinogenic Effects

Several studies have shown that inorganic arsenic can increase the risk of lung, skin, bladder, liver, kidney, and prostate cancers. Organic arsenic compounds have been shown to have little ability to cause cancer [7]. Assuming that the arsenic at this site is inorganic, the form with the greater carcinogenic potential, is conservative and protective of public health.

The calculated theoretical excess cancer risk for a person exposed to the greatest amount of arsenic found in on-site soil in *Area 1.* is 2 in 10,000 people. This level of risk would occur to a person who was exposed to the greatest amount of arsenic found in on-site soil during 270 days a year for 36 years. It is unlikely that any person would encounter the maximum amount of arsenic in the soil with the frequency estimated. Taking all these factors into account, this level of theoretical cancer risk from exposure to arsenic in on-site soils is considered to be low.

Lead - Noncarcinogenic Effects

Lead is a naturally occurring metal. It can be found in all parts of the environment. Lead is used to make batteries and ammunition. Many water systems and homes still have lead pipes and/or have lead-containing pipe solder that can leach lead into drinking water. Lead is no longer used to make pipes or is an ingredient in pipe solder. In the past, lead has been added to household paint, gasoline, and glazes for ceramic pottery. Lead has many adverse health effects, particularly for children exposed to this chemical.

The IEUBK Model was used to estimate blood lead concentrations in children (ages 4-7) exposed to on-site soils in *Area 2.* and children (ages 2-7) in *Area 4*. Calculations were made using the average on-site lead concentration in soils in two areas, *Area 2. and 4.*

The most recent data indicates that the average lead soil content for *Area 2.* is 1,800 mg/kg. When all the soil samples taken in this area are averaged together (including samples reviewed for the previous health consultation) the lead content is 1,366 mg/kg.

A time weighted average was used to calculate the average daily exposures, because children are not assumed to be in daily contact with these soils. An assumption was made that soils around homes in Chauncey away from these areas contain 79 mg/kg lead. This assumption was based on the average of 2 residential soil samples [9]. The IEUBK model was run with both soil lead averages (1,800 mg/kg and 1,366 mg/kg). Contact with the soil for 270 and 182 days a year was modeled (Table 3).

Summary of Results in Table 3.

Soil samples:	Days of contact per year	Average lead content of soil	Estimated blood lead levels in children ages 4-7 exposed to these soils*
Area 2. Bermed Area	270	1,800 mg/kg	8.2 – 10.7 µg/dL
Area 2. Bermed Area	182	1,800 mg/kg	6.1 – 7.9 µg/dL
Area 2. Bermed Area	270	1,366 mg/kg	6.7 – 8.7 µg/dL
Area 2. Bermed Area	182	1,366 mg/kg	5.1 – 6.6 µg/dL
Area 4. Ball fields	270	168 mg/kg	2.2 – 3.3 µg/dL*
** The age of children considered at Area 4. Ball fields is 2-7*			

A child between the ages of 4 and 7 who came in contact with the lead with an average content of 1,800 mg/kg in soils in *Area 2.* for 270 days a year could have blood lead levels between 8.2 and 10.7 µg/dL. Residents report that they know of no child who accesses *Area 2.* with this frequency. If a child came into contact with the soil with an average lead content of 1,800 mg/kg for 182 days a year at *Area 2.*, his or her blood lead levels would be estimated to be between 6.7 and 8.7 µg/dL. Even this estimate assumes that a child will be in contact with the soil more than is likely.

Similarly, it is unlikely that a child coming into contact with soils in *Area 4.* for 270 days a year would have blood lead levels higher than 10 µg/dL. The estimated in *Area 4.* included children as young as 2-years-old because parents often bring young children to watch ball games and allow them to play in the dirt.

Exposures to lead are most dangerous to young children, infants, and fetuses. Adults can be exposed to more lead without experiencing adverse health effects. The CDC level of concern for blood lead levels in children is 10 µg/dL, because no effective ways exist to reduce children's blood lead levels below this point after blood lead levels are at 10 µg/dL. Some researchers believe, however, that *any* elevation of blood lead levels will cause measurable adverse health effects. Examples of negative effects at low levels of exposure are subtle changes in brain function (Payton et al. 1998), changes in the cardiovascular system that can be detected in children's electrocardiograms (Silver and Rodriguez-Torres 1968), growth retardation (Shukla et al. 1989), and changes in the blood (Chisolm et al. 1985) [6].

The maximum estimated blood lead levels for children at the site were slightly higher than 10 µg/dL. The potential health effects at this level of exposure are the same as outlined in the preceding paragraph. Therefore, the potential exists for some adverse health effects to children who regularly and routinely come into contact with lead-containing *Area 2* soils via incidental ingestion.

Calculations of blood lead levels in adults exposed to these soils indicated that no exposure scenario would elevate their blood lead level above 4.9 µg/dL. Adverse health effects in adults would not be expected at this level.

On the basis of the results reviewed and the assumptions made, the site investigators conclude that no likely exposures to lead at this site would raise the blood lead level of children or adults higher than 10 µg/dL, the CDC level of concern for children exposed to lead.

Child Health Considerations

The many differences between children and adults demand special consideration. Children can be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and often use hand-to-mouth behaviors that increase their exposure potential. Also, because children are shorter than are adults, they breathe dust, soil, and vapors that are close to the ground. The fact that children are smaller than adults means that they get a higher dose of a substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can be permanently damaged. Finally, children are dependent on adults for access to housing, medical care, and for risk identification. This health consultation considered potential health effects to children to assist adults who make decisions regarding their children's health.

This report evaluated the potential for incidental ingestion of lead-containing soils at this site to cause elevated blood levels in children. No child was deemed likely to ingest enough lead-containing soil to elevate his or her blood lead level higher than 10 µg/dL for any area reviewed for this health consultation. However, some researchers have found subtle but measurable changes in children at blood lead levels below 10 µg/dL and within the blood lead level range found in this health consultation. Possible potential adverse health effects may be subtle but measurable, such as small changes in brain function (Payton et al. 1998), changes in the cardiovascular system detected in children's electrocardiograms (Silver and Rodriguez-Torres 1968), growth retardation (Shukla et al. 1989), and changes in the blood (Chisolm et al 1985) [6].

Conclusions

The five public health hazard categories used by ATSDR are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

The WVDHHR concludes that the Chauncey PCB site poses *no apparent public health hazard for the present* from the exposures likely to occur at this site to either children or adults. As long as the frequency of access to contaminated areas does not increase, such as by building homes on the Bermed Area, the Chauncey PCB site poses *no apparent public health hazard for the future.* WVDHHR concluded that the site poses *an indeterminate public health hazard in the past* because of the lack of data for the past.

On the basis of the sample results reviewed and the assumptions made, the conclusion is that no exposures to lead at this site would raise the blood lead level of children or adults higher than 10 µg/dL, the CDC level of concern for children exposed to lead. However, adverse health effects are possible for children exposed to lead at the levels estimated in this report. They are subtle changes in brain function, changes in children's electrocardiograms, growth retardation, and changes in blood chemistry. No other chemicals were found in high enough concentrations in any of the samples reviewed to be likely to cause adverse health effects.

Recommendations

No public health recommendations are needed to keep people from being exposed to harmful amounts of chemicals found at this site.

Public Health Action Plan

WVDHHR will be available to community members who need information regarding the conclusions of this report and the potential for adverse health effects from exposure to lead at this site.

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Certification

The West Virginia Department of Health and Human Resources (WVDHHR) prepared this Health Consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). The Health Consultation is in accordance with approved methodology and procedures in existence at the time it was initiated.

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The Division of Health Assessment and Consultation of ATSDR has reviewed this Health Consultation and concurred with its findings.

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Figures

Figure 1: Chauncey Area

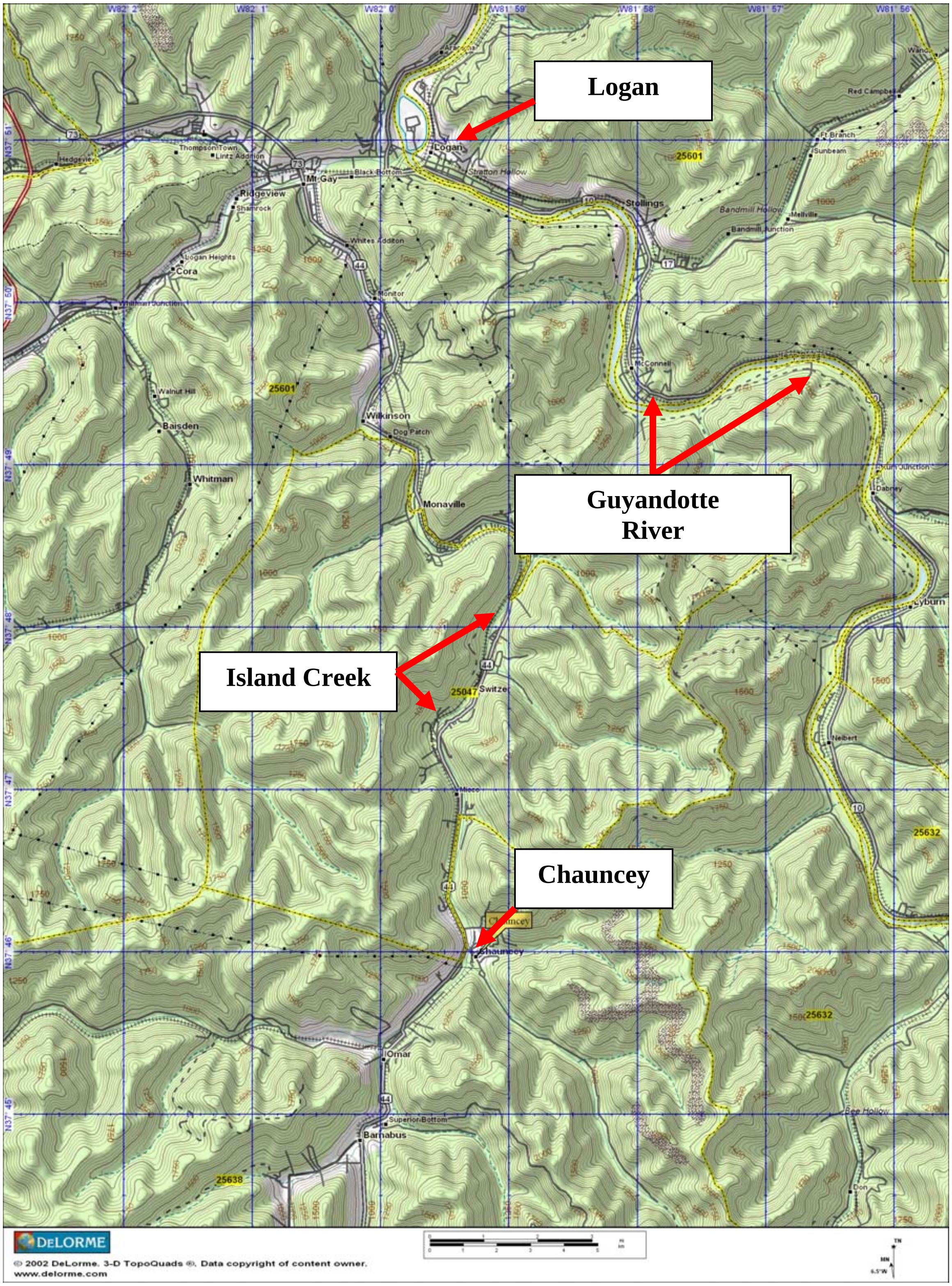
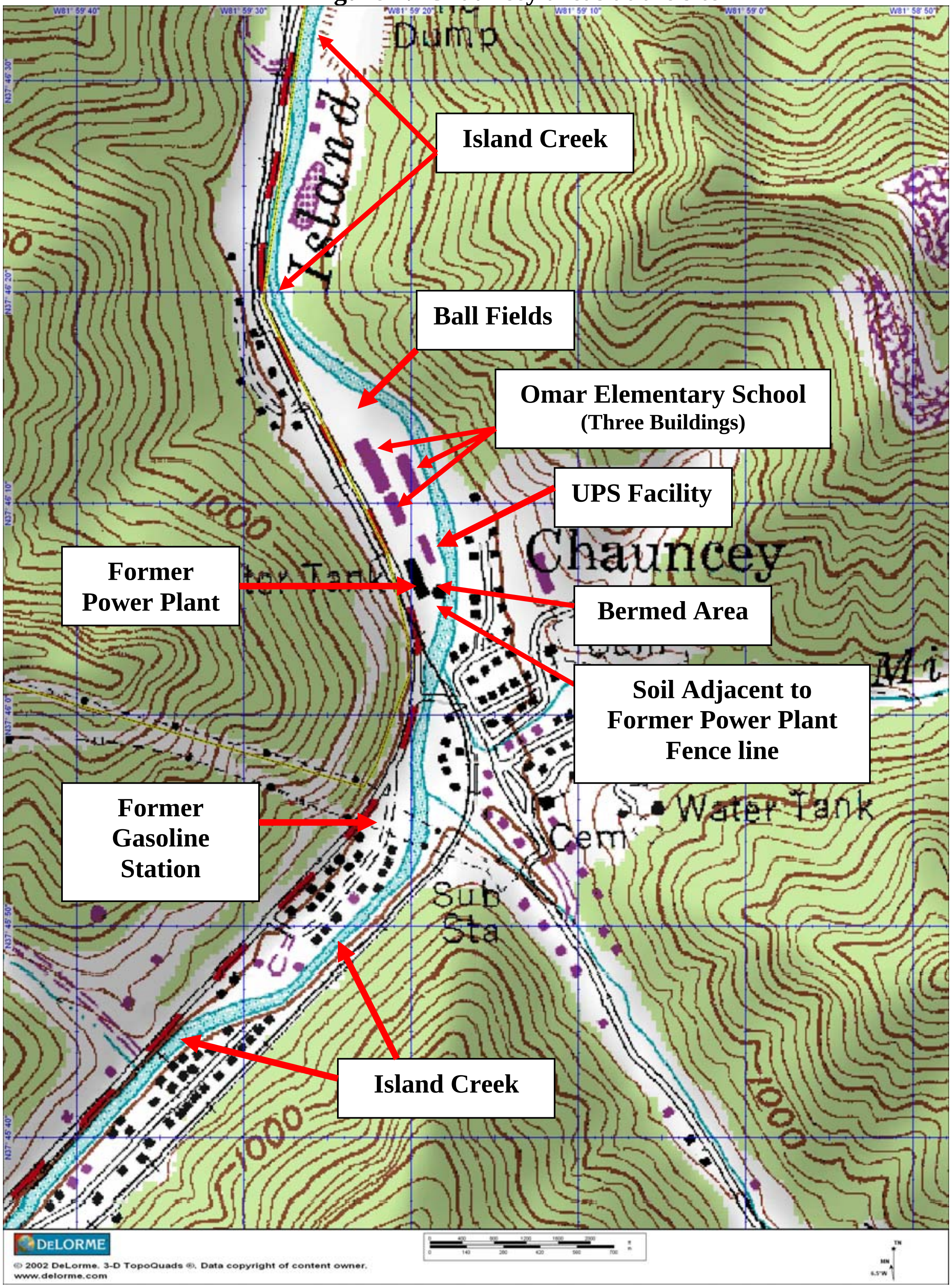


Figure 2: Chauncey areas at the site



Tables

Table 1. Number of Analyses on samples taken at the Chauncey PCB Site								
Sample Location	Number of samples	Number of analyses on each sample at these locations						
		Metals	Volatile organic chemicals	Semi-volatile chemicals	PCBs	Pesticides	Dioxins and furans
Logan PSD Water Intake	2	23	61*	65*	7*	20*	25*
Private Well Water	1	23	32*	65*	7*	21*	25*
Sediment in Island Creek near the former power plant	7	0	0	0	0	0	25
Area 1. Surface soil near the fence line of the former power plant	7	23	0	0	0	0	25
Area 2. Surface soil in the bermed area near the former power plant	6	23	0	0	0	0	25
Area 3. Surface soil at the former gasoline station	9	23	0	0	0	0	0
Area 4. Surface soil at the ball fields	25	2**	0	0	7	40	0
	*all sample results were at or below the detection limit for the chemicals tested						
	** arsenic and lead						

Table 2. Summary of Detected Chemicals of Concern for the Chauncey PCB Site								
	#	#	Maximum	Range of results over	# Samples	Background	Environmental Guideline CVs	
	Samples	Detects		the Comparison Value (CV)	over CV			Type
			ppm	ppm			ppm	
SURFACE SOIL: ***AREA #1 (Adjacent to fence line of former power plant - near Island Creek)***								
Arsenic	7	7	92.3	4.71 - 92.3	7	4.3	0.5	CREG
TCDD equivalents	7	7	0.0000137	0.00000247 - 0.0000137	7	0.00000072	0.001	ASTDR Action Level (TCDD)
TCDD equiv (scientific notation)			*13.7E-06*	*2.47E-06 - 13.7E-06*	*7*	*0.72E-06*		
SURFACE SOIL: ***AREA #2 (Bermed Area)***								
Arsenic	6	6	21.0	2.8 - 21.0	6	4.3	0.5	CREG
Lead	6	6	7,360	878 - 7,360	3	21.4	400	EPA Guidance
TCDD equivalents	6	6	0.00018836	0.00000265 - 0.00018836	6	0.00000072	0.001	ASTDR Action Level (TCDD)
TCDD equiv (scientific notation)			*1.88E-04*	*2.65E-06 - 188.36E-06*	*6*	*0.72E-06*		
SURFACE SOIL: ***AREA #3 (Former Gas Station)***								
Arsenic	9	8	8.46	3.31 - 8.46	8	4.3	0.5	CREG
SURFACE SOIL: ***AREA #4 (Ball fields)***								
Arsenic	25	25	20.3	3.1 - 20.3	25	4.3	0.5	CREG
Lead *	25	25	258	9.8 - 1550	25	21.4	400	EPA Guidance
4,4-DDE	25	12	0.017	0.0022 - 0.0170	12			none
4,4-DDD	25	2	0.0089	0.0019 - 0.0089	2			none
Arochlor 1260	25	7	0.11	0.012 - 0.110	7			none
SEDIMENT: Island Creek								
TCDD equivalents	6	6	0.00001284	0.00000023 - 0.00001284	5	0.00000072	0.001	ASTDR Action Level (TCDD)
TCDD equiv (scientific notation)			*12.84E-06*	*0.23E-06 - 12.84E-06*	*6*	*0.72E-06*		
*NOTE: One sample was found at 1550 mg/kg. This was 6 times higher than the next highest value found.								
ppm = parts per million (eqivalent to milligrams per kilogram or mg/kg)								
CREG= ATSDR Cancer Risk Evaluation Guide								
EPA Guidance *(Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (US EPA 1994))*								
ATSDR Action Level (TCDD) (*Dioxin and Dioxin-Like Compounds in Soil, Part 1: ATSDR Interim Policy Guideline Aug 21, 1997*)								
TCDD equivalents= Toxicity equivalents for dioxins and dioxin-like compounts								

Table 3. Chauncey PCB Site
Calculation of blood lead levels of children exposed to lead-containing soils at this site
Time Weighted Averages
Assume that residential exposures are at a soil lead level of 79 mg/kg (average residential soil found at 79

Calculation	A	B	C	D	E	F	G	H
			AxB=C			DxE=F	C+F=G	G/365
Age Group	Blood level exposure in the area*	Days per year in the area	Blood level times days	Blood level exposure at assumed residential site*	Days per year at the residence	Blood level times days	Add blood level at both areas (to reflect 365 days a year)	Divide by 365 to get a time weighted average
	µg/dL			µg/dL				
Area 2. Bermed Area with average soil lead content of 1,800 mg/kg								
4-5	13.7	270	3699	2.1	95	199.5	3898.5	10.7
5-6	11.7	270	3159	1.9	95	180.5	3339.5	9.1
6-7	10.4	270	2808	1.8	95	171	2979	8.2
Area 2. Bermed Area with average soil lead content of 1,800 mg/kg								
4-5	13.7	182	2493.4	2.1	183	384.3	2877.7	7.9
5-6	11.7	182	2129.4	1.9	183	347.7	2477.1	6.8
6-7	10.4	182	1892.8	1.8	183	329.4	2222.2	6.1
Area 2. Bermed Area with average soil lead content of 1,366 mg/kg**								
4-5	11.2	270	3024	1.6	95	152	3176	8.7
5-6	9.6	270	2592	1.5	95	142.5	2734.5	7.5
6-7	8.5	270	2295	1.5	95	142.5	2437.5	6.7
Area 2. Bermed Area with average soil lead content of 1,366 mg/kg**								
4-5	11.2	182	2038.4	2.1	183	384.3	2422.7	6.6
5-6	9.6	182	1747.2	1.9	183	347.7	2094.9	5.7
6-7	8.5	182	1547	1.8	183	329.4	1876.4	5.1
Area 4. Ball field Area with average soil lead content of 168 mg/kg								
2-3	3.6	270	972	2.6	95	247	1219	3.3
3-4	3.4	270	918	2.7	95	256.5	1174.5	3.2
4-5	2.9	270	783	2.1	95	199.5	982.5	2.7
5-6	2.5	270	675	1.9	95	180.5	855.5	2.3
6-7	2.3	270	621	1.8	95	171	792	2.2

** Blood lead levels were estimated using the EPA Integrated Expoure Uptake Biokinetic Model for Lead in Children (IEUBK)*
*** Average of lead in soils in this area from the 4/2003 and 11/2003 sampling events*

Table 4. Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil and Sediment - Chauncey PCB Site

Contaminant	Max level	Estimated Exposure Doses		Health based Guideline		Excess Cancer Risk	
	ppm	Child	Adult	mg/kg/day	Source	CSF	calculation
	mg/kg	mg/kg/day	mg/kg/day				# in 10,000
SURFACE SOIL: ***AREA #1 (Adjacent to fence line of power plant - near Island Creek)***							
Arsenic	92.3	**0.0011**	0.0001	0.0003	ATSDR Chron Oral MRL	1.5	**2**
TCDD equivalents	0.0000137	<0.00000001	<0.00000001	0.0000000010	ATSDR Chron Oral MRL		
SURFACE SOIL: ***AREA #2 (Bermed Area)***							
Arsenic	21.0	0.0002	<0.0001	0.0003	ATSDR Chron Oral MRL	1.5	<1
Lead	7,360	**0.10889**	**0.00778**		none		
TCDD equivalents	0.00018836	<0.00000001	<0.00000001	0.0000000010	ATSDR Chron Oral MRL		
SURFACE SOIL: ***AREA #3 (Former Gasoline Station)***							
Arsenic	8.46	0.0001	<0.0001	0.0003	ATSDR Chron Oral MRL	1.5	<1
SURFACE SOIL: ***AREA #4 (Ball fields)***							
Arsenic	20.3	0.0002	<0.0001	0.0003	ATSDR Chron Oral MRL	1.5	<1
Lead*	168	**0.0025**	**0.0002**		none		
4,4-DDE	0.017	**<0.0001**	**<0.0001**		none		
4,4-DDD	0.0089	**<0.0001**	**<0.0001**		none		
Aroclor 1260	0.11	**<0.0001**	**<0.0001**		none	2	<1
SEDIMENT: Island Creek							
TCDD equivalents	0.00001284	<0.00000001	<0.00000001	0.0000000010	ATSDR Chron Oral MRL		

ASSUMPTIONS			
Ingestion rate	kilograms/day	0.0002	0.0001
Exposure frequency	days/year	270	270
	years	6	30
Body weight	kilgrams	10	70

The Estimated Exposure Doses and Excess Cancer Risk numbers in **Boldface Type** will be reviewed further. See Section D in the text.

Table 4. Estimated Exposure Doses and Cancer Risk for Incidental Ingestion of Soil and Sediment - Chauncey PCB Site
*NOTE: The average amount of lead in the soil in ***Area #4*** .
mg/kg = milligram per kilogram (equivalent to parts per million or ppm)
mg/kg/day = milligram per kilogram per day
kg/day = kilogram per day
CSF = EPA Cancer Slope Factor
ATSDR Chron Oral MRL = ATSDR Chronic Oral Minimal Risk Level for exposures over 365 days
TCDD equivalents= Toxicity equivalents for dioxins and dioxin-like compounds