ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

CENTRAL CHEMICAL SITE
HAGERSTOWN, WASHINGTON COUNTY, MARYLAND
EPA FACILITY ID: MD003061447
AUGUST 8, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment 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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PUBLIC HEALTH ASSESSMENT

CENTRAL CHEMICAL SITE
HAGERSTOWN, WASHINGTON COUNTY, MARYLAND

EPA FACILITY ID: MD003061447

Prepared by:

U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
Superfund and Program Assessment Branch
Division of Health Assessment and Consultation
Atlanta, Georgia

Summary

The Central Chemical Site currently poses no apparent public health hazard from exposures to site-related chemicals in on-site or off-site soil, groundwater, surface water, stormwater or stream sediment.

Trespassing has occurred in the past, but has been strongly discouraged for several years now. The site is well-fenced, clearly posted, and gated. Signs and fences are well maintained. The demolition and removal of the abandoned buildings has been completed with oversight by EPA.

The public has little contact with on-site soil or dust. Much of the site, including the former waste lagoon, is undeveloped and covered by vegetation. Gravel covers a former staging or parking area at the front gate. The vegetation and gravel reduce off-site transport of surface soil.

Conservative estimates of exposure to on-site soil did not indicate a concern for noncancer health effects. For cancer, the DDT exposure estimate was in the increased theoretical excess cancer risk category. Measures implemented to restrict access to the site make it very unlikely for the public to have sufficient exposures to cause adverse health effects from exposure to DDT.

Off-site soil and surface water in the Brighton Manor stormwater retention pond are not considered to be exposure pathways of concern for site-related chemicals. Parents should be aware of the potential physical hazard (drowning) posed to young children when substantial standing water is present.

Groundwater currently is not used as a drinking water source. Past use of groundwater for drinking water is unknown. Future use of groundwater for drinking water may require further evaluation of arsenic and three pesticides (α-BHC, β-BHC, and dieldrin).

Marsh Run 2 and Antietam Creek are not used as sources of public or private drinking water, but they are used for occasional recreation. One pesticide, α-BHC, exceeded its cancer comparison value in all surface water samples, but adults and children are unlikely to have sufficient contact with surface water to cause adverse health effects from exposure to α-BHC. Therefore, α-BHC is not considered a significant public health concern.

Arsenic and dieldrin exceeded cancer comparison values in sediment samples from Marsh Run 2 and Antietam Creek. Typical use (occasional recreation) of these creeks is unlikely to result in sufficient contact to cause adverse health effects from exposures to these chemicals. Also, contaminated sediments are more likely to be deposited in deeper pool areas, which are less accessible.

Children may periodically play in these creeks during summer months, and could incidentally ingest surface water and sediment. These types of limited exposures are not likely to result in adverse health effects from exposure to arsenic or pesticides.

Fishing for the purpose of consuming the fish caught is not known to occur in Marsh Run or Marsh Run 2. Analysis of composite fish samples (fillets) collected from Antietam Creek in 2004 indicated very low levels of DDT-related chemicals present. These levels were not sufficiently high to warrant health concerns related to fish consumption.

Final remediation and redevelopment is expected to be done in a manner that protective of public health. If residential development of this site is considered in the future, additional investigations and exposure evaluations are recommended as part of predevelopment planning.

Remediation efforts involving substantial earthmoving activities in the undeveloped portion of the site may require further review of data on contaminants in soils.

Purpose

The Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia, is part of the US Department of Health and Human Services. Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, also known as Superfund, ATSDR conducts public health assessments for sites placed on the National Priorities List (NPL) by the US Environmental Protection Agency (EPA).

EPA placed the Central Chemical Site in Hagerstown, Maryland, on the NPL in September 1997. The Maryland Department of the Environment (MDE) evaluated some exposure pathways for the site during 1995–1997 (2– 6). The URS Corporation completed a Phase I Remedial Investigation (RI) Report in 2003 (7) and a Phase II RI Report in January 2005 (8).

ATSDR reviewed the Phase I RI Report, the Phase II RI Report and the MDE documents. ATSDR also conducted site visits and met with the Community Liaison Panel to evaluate public health issues and concerns. This public health assessment presents our findings and conclusions, identifies site-related public health issues, including child and community concerns, and recommends follow-up actions to mitigate exposures. It also describes the methods and data used to evaluate exposures for this site. ATSDR released this public health assessment for public comment in May 2005.

Background

Site Description

The Central Chemical site is on Mitchell Avenue in Hagerstown, Washington County, Maryland. The site is in the Antietam Creek watershed and in the area covered by the Hagerstown, Maryland-Pennsylvania USGS 7.5' topographic quadrangle map. The 19-acre site is about 0.8 miles from U.S. Highway 11 (Figures 1-3).

Mitchell Avenue borders the southeast perimeter of the site, and the Maryland Metals building is on the east side of the street. The Penn-Central Railroad borders the site on the west, with residential areas just beyond that. The West Irwin Heights subdivision adjoins the site on the northeast boundary. An electrical substation owned by the city of Hagerstown is located in the northeast corner of the site. A strip mall with a supermarket, drugstore, and other shops is located further east of the site and adjacent to Highway 11. A new subdivision, Brighton Manor, is located about 50 feet northeast of the site property fence line that encloses the former lagoon area near the electrical substation.

The Central Chemical site is a former pesticide and fertilizer mixing plant that blended concentrated chemicals with inert materials to produce fertilizers, herbicides, and pesticides. The plant packaged and distributed these products for retail sale. The Central Chemical Corporation operated from the 1930s until 1965, when a fire destroyed the manufacturing building. The plant then manufactured fertilizer until 1984 when Central Chemical ceased operations at the site.

Twelve vacant buildings, including the former fertilizer plant, warehouses, and several smaller structures, were previously located on the site (Figures 1, 3). In the past, building space on the site has been leased to several tenants who conducted unrelated businesses such as auto repair,

storage, and paper recycling. Most activities associated with these businesses were part-time, with an estimated 5–10 people on site each day. Central Chemical canceled all leases in September 2003. The buildings were demolished in 2005 with oversight by EPA.

Site Visits

ATSDR representatives visited this site in August 1999 and June 2004. The 1999 site visit found some buildings leased for secondary purposes (automobile repair, storage, recycling, and other activities). Most activities associated with these businesses were part-time, with an estimated 5-10 people on site each day.

Our site visit in June 2004 found the buildings vacant and the only people on-site were involved with the remedial investigation. The site is well-fenced, clearly posted, and gated. Signage and fencing are well maintained, and the community is well-informed about the site. Trespassing is strongly discouraged. We have little indication that routine trespassing presently occurs.

In June 2004, ATSDR representatives attended an evening meeting of the Community Liaison Panel. Community members and representatives of various regulatory agencies, consulting firms, and a group of potentially responsible parties (PRPs) attended the meeting. Phase I sampling results, design and progress for Phase II sampling, future site uses, demolition of the buildings, and concerns expressed by a new resident of Brighton Manor were discussed. All parties communicated openly. A consulting toxicologist provided an overview of risk assessment.

The Community Liaison Panel, which started in 2002, appears to be very effective in keeping the community well informed about the site and the Superfund remediation process. The panel also provides an opportunity for the community to have input into the remedial process.

Discussion

Evaluation of Exposure Pathways and Environmental Contaminants

An exposure pathway is a route by which a person can contact chemicals originating from a contamination source. An exposure pathway consists of the following five elements: 1) a source of contamination; 2) environmental media, such as air or soil, through which contaminants are transported; 3) a point of exposure where people can contact the contaminant; 4) a route of exposure by which the contaminant enters or contacts the body; and 5) a receptor population. A pathway is considered complete when all five elements are present and connected. If one element is missing, the pathway is considered incomplete, and human exposure is not possible.

We evaluated the potential for human exposure to contaminants from Central Chemical in a four-step process. First, we examined pathways by which people could come in contact with contaminants from the site. Second, we screened the contaminants found in each exposure pathway to determine if levels were sufficient to warrant further health evaluation. Third, for contaminants present at levels above screening values, we estimated the exposure that people could have. In the final step, we determined whether a reasonable combination of dose and duration (amount of time a person might be exposed) was sufficient to cause illness or other adverse health problems.

Appendix A lists 121 chemicals which were analyzed in soil, groundwater, surface water, stormwater, and sediment samples collected in the Phase I remedial investigation. These included pesticides, herbicides, metals, and polycyclic aromatic hydrocarbons (PAHs). Many of

these chemicals were found below levels of concern, were present in only a few samples, or were in locations where the public is not likely to come into contact with them. The following section on exposure pathways discusses our evaluation of the chemicals found at this site. Unless noted otherwise, information on sampling, chemicals, and concentrations came from the Phase I and Phase II remedial investigation reports prepared by URS Corporation (7, 8).

Buildings

The abandoned buildings formerly used to produce, or store, fertilizers and pesticides previously posed physical and chemical hazards to trespassers. They were demolished in 2005. The site is well-fenced, clearly posted, and gated. Trespassing is actively discouraged through physical security (fences, signs, and locked gate) and community awareness efforts. We saw little evidence of recent, or regular, trespassing during our site visit in June 2004. This exposure pathway is considered incomplete for the general public.

Central Chemical ceased operations in 1984 and leased some buildings for secondary uses (auto repair, storage, and recycling). Most of these were part-time operations, with few people (5–10) on-site each day. All leases were terminated in September 2003. Most of the leased space was outside the main production facility. Because we cannot accurately characterize these past exposures, they are considered indeterminate.

Central Chemical employees and visitors were likely exposed to chemicals in, or from, these buildings when the plant was operating. Because we have no way to accurately characterize past exposure, it is considered an indeterminate public health hazard.

The Community Liaison Panel met on 18 November 2004 to further discuss removing the abandoned buildings. This work began in March 2005 and required about five months to complete. The approved work plan required that debris and old equipment first be removed from the buildings. Workers vacuumed loose dust, sprayed down the insides of the buildings to further reduce dust, removed any asbestos present, and took the buildings apart piece by piece (9).

A continuous air monitoring program was implemented during the building demolition activities. It included action levels to trigger mitigation steps to reduce offsite exposures. This monitoring effort helped to ensure that suitable protective measures were taken to minimize offsite exposures to the public during the demolition and removal of these buildings.

Demolition, removal, and disposal of the existing abandoned buildings helped to make the site more palatable for redevelopment efforts. The physical security of the site (fences, signs, and locked gate) and community awareness efforts continues to actively discourage trespassing.

Air

Air is not a major exposure pathway to the public for this site. Most chemicals manufactured or used here are nonvolatile and not likely to be found in air. The site has been inactive for a long time, and any uncontained solvents or other volatile chemicals used for production processes probably have not remained on-site. Phase I and Phase II remedial investigation sampling did not include air.

We are not aware of any past air sampling or monitoring data for this site. On the basis of our site visits and removal of the buildings, we do not see a need for air sampling. Air monitoring was performed during demolition and removal of the abandoned buildings.

Dust

Present exposures to site-related chemicals in dust are not likely because vegetation covers a predominant portion of the abandoned site. Many areas not covered by vegetation are covered by gravel. Careful demolition and removal of the abandoned buildings was accomplished in 2005. Monitoring activities were incorporated into this process to reduce offsite exposures. This pathway is considered incomplete.

Past exposures to chemicals in dust likely occurred to workers and visitors when the site was in operation. Nearby residents could have been exposed to the chemicals in fugitive dust emissions when the site was operating. Because we have no way to characterize these past exposures, they are considered to be indeterminate.

On-site Soil

We evaluated contaminant data for 16 soil samples, including one field duplicate (B16FD) collected 0”– 6” below ground surface (bgs) in the Phase I remedial investigation. All of these samples were taken in, or near, the buildings (Plant Area Exposure Domain). Trespassers who previously may have entered the buildings on the site could have been exposed to a wide range of chemicals at high concentrations (Tables C1, C2). Regular or recent trespassing was not indicated during our most recent site visit, the buildings have been demolished and removed, and trespassing continues to be discouraged.

In samples collected 0”– 6” bgs from the plant area, arsenic and nine pesticides exceeded respective environmental comparison values (Tables C1, C2). Very conservative exposure estimates for these 10 chemicals indicated potential DDT exposure in the same range as the health comparison value (HCV), and well below HCVs for all others (Appendix E). Only the DDT exposure estimate was in the increased excess cancer risk category. Because of measures implemented to restrict site access, the public is not likely to have contact with soils at this site, and sufficient exposures to cause adverse health effects are very unlikely.

Surface soil samples (0”– 6” bgs) were not collected from the undeveloped portion of the site (Vegetated Exposure Area Domain) during the Phase I remedial investigation. Efforts in this domain focused more on delineating the extent of the former waste disposal lagoon (Area 1) and the staging area (Area 2). For these purposes, samples collected deeper than 6” bgs are clearly more useful. The site boundary fencing and the intact cover of vegetation on this portion of the site make it unlikely that the public would be exposed to contaminants in surface soil.

URS Corporation collected about 350 additional on-site soil samples in the Phase II RI (8). These samples confirmed that pesticide concentrations decrease substantially (2–3 orders of magnitude) with depth below ground surface. Phase II samples also indicated that the less toxic trivalent form of chromium is prevalent in soil at this site. In general, the Phase II results supported the Phase I results.

Volatile and semivolatile organic chemicals analyzed in the Phase I and Phase II remedial investigations were eliminated as contaminants of concern because (a) they were not found in many samples and (b) the public does not have routine contact with, or access to, the soil at this site. All of these samples were collected deeper than 6” bgs.

Current exposure of the public to contaminants in on-site soil is unlikely because of restricted access to the site. The site is well-fenced, clearly posted, and gated. Much of the site, including

the former waste lagoon, has an intact cover of vegetation. Gravel and some vegetation cover the former staging and parking area at the front gate, which minimizes visitor contact with contaminated soil and reduces the potential for off-site transport of contaminated soil. We saw little indication of regular, or recent, trespassing during our site visit in June 2004. While people could trespass on the site, our site visit indicated this is not likely to occur regularly. For these reasons, the site presently poses no apparent public health hazard.

Remediation efforts generating large amounts of dust, or moving large amounts of soil could greatly increase potential exposure to the public. Data on contaminants in soils may require further review if final remediation efforts involve substantial earthmoving activities in the vegetated area. ATSDR will work closely with EPA, the state of Maryland, and the site contractor, to provide timely assistance as needed.

Off-site Soil

Backyards of a few Brighton Manor residences adjoin the site property along the north boundary. URS summarized relevant DDT data for Brighton Manor (Letter from William G. Murray, URS Corporation, to Jim Gravette, Maryland Department of the Environment, 1 April 2004). Of these 38 samples, one (#58) exceeded the child comparison value (30 ppm) and none exceeded the adult comparison value (400 ppm) used by ATSDR to screen for noncancer health concerns. Based on statistical analysis of these sample results, URS Corporation estimated a 95% upper confidence level for DDT concentrations of 16.23 ppm (Letter from William G. Murray, URS Corporation, to Eric Newman, EPA Remedial Project Manager, 18 June 2004).

Our conservative exposure estimates for children and adults were below the ATSDR minimal risk level (MRL) for noncancer (0.0005 mg/kg/day). The ATSDR cancer screening value for DDT is 2 mg/kg. A conservative estimate of theoretical excess cancer risk was in the very low category (Appendix D). Based on these findings, people are unlikely to have sufficient exposure to DDT to cause adverse health effects. In addition, the grass cover observed in these areas further reduces the exposure potential.

Groundwater

URS Corporation collected 14 groundwater samples in Phase I (7). Arsenic, manganese, and four pesticides exceeded their respective environmental comparison values (Tables C3, C4). Very conservative exposure estimates for these six chemicals indicated potential γ-BHC exposure in the same range as the HCV (Appendix E). Arsenic, α-BHC, and β-BHC exposure estimates were in the increased excess cancer risk category. Because groundwater is not currently used for drinking water, the public is not likely to have contact with these chemicals. Sufficient exposures to cause adverse health effects are very unlikely.

We eliminated 19 semi-volatile organic chemicals as contaminants of concern in groundwater because of their low concentrations and low frequency of detection. Six volatile organic chemicals (Table C5) were also eliminated as contaminants of concern in groundwater because of their low concentrations and low detection frequency.

URS Corporation installed six new monitoring wells during the Phase II RI and completed two rounds of sampling (April and June 2004) for all 12 monitoring wells (8). Results for Phase II sampling were generally similar to Phase I results and are not discussed in detail here.

Groundwater is not used for drinking water near the site and is considered to pose no current public health hazard. Future use of groundwater for drinking water may require more evaluation of arsenic, BHC (alpha-, beta-, and gamma-), dieldrin, benzene, and chlorobenzene. If needed, ATSDR will assist EPA, the state of Maryland, and the site contractor with this.

Because of the limited information available, an evaluation of past exposures to chemicals in groundwater could not be done. This exposure pathway is considered indeterminate.

Surface Water

Our review and evaluation of surface water data from the Phase I remedial investigation indicated that surface water poses no apparent public health hazard. We considered the most likely use of Marsh Run 2 and Antietam Creek to be occasional recreation, and recognize that limited surface water sampling was done during Phase I.

URS Corporation collected surface water samples in the same locations as sediment samples during Phase I investigation efforts: three from Marsh Run 2 and three from Antietam Creek. One field duplicate was also collected. In addition to being analyzed for the 121 chemicals shown in Appendix A, these samples were also analyzed for another 47 chemicals that included trihalomethanes, volatile organics, and petroleum related chemicals. Chemicals found in three or more samples are shown in Table C6.

The only chemical to exceed a respective environmental comparison value was α-BHC. This pesticide exceeded its cancer comparison value in all samples. A very conservative exposure estimate (Appendix E), using the highest α-BHC level reported (0.064 µg/L), indicated potential exposures below the HCV and low theoretical increased cancer risk based on a lifetime exposure (70 years). Children playing in these creeks would likely be exposed to lower levels.

Children may periodically play in these creeks during summer months and possibly ingest some water. Such exposures are not likely to result in adverse health effects from exposure to α-BHC. Neither children nor adults would be exposed on a daily basis for a substantial portion of their lives. Because children and adults are unlikely to have sufficient contact with the water in these creeks to result in adverse health effects from exposures to α-BHC, we do not think this is a significant public health concern. These creeks are used occasionally for recreation and are not a drinking water source.

URS Corporation collected 14 additional surface water samples in the Phase II RI to further evaluate this exposure pathway. Results generally supported the Phase I findings. Site-related chemicals were found both downstream and upstream from the site.

During Phase II sampling, URS Corporation also collected one surface water sample and one soil sample from the Brighton Manor stormwater retention pond (Lot 11) and the drainage swale leading to it. DDT and most other site-related chemicals were not present at levels of concern in water or sediment. Arsenic (8.7 ppm) was found in soil above the ATSDR cancer comparison value (0.5 ppm), however, exposure to arsenic is expected to occur very infrequently and is not considered to be a public health concern.

Stream Sediment

URS Corporation collected six stream sediment samples in the same location as the surface water samples during Phase I investigation efforts (three from Marsh Run 2 and three from Antietam

Creek). One field duplicate was also collected (Tables C7 and C8). Arsenic and dieldrin exceeded cancer comparison values in sediment samples from Marsh Run 2 and Antietam Creek. URS Corporation collected 14 additional sediment samples in Phase II sampling (8). Results were comparable to those from Phase I.

Occasional recreational use of these creeks is not likely to result in sufficient contact to cause adverse health effects from exposures to arsenic or dieldrin. Contaminated sediments are more likely to be deposited in deeper pool areas, which are less accessible. Children may periodically play in these creeks during summer months, and could incidentally ingest surface water and sediment. These types of limited exposures are not likely to result in adverse health effects from arsenic or pesticides.

Storm Water

Children likely do not play in Marsh Run 2, either along Mitchell Avenue or at the storm water outfall in City Park, during storm events. People doing so are likely at a greater risk from physical rather than chemical hazards. The primary use of storm water samples is to determine if site-related contaminants are migrating off-site through surface water runoff and erosion.

Storm water samples collected along Mitchell Avenue and at City Park contained chemicals, including metals and PAHs, typically found in urban runoff. Chemical concentrations in the flush samples decreased from the first to the last samples taken. Chemical levels were lower in the samples taken at the downstream site, City Park, than those in the samples collected along Mitchell Avenue. Results of the storm water samples indicated that site-related chemicals could be transported off-site in storm water flow (7).

Interim remedial measures (e.g., silt fence along southern portion of site and gravel fill placement at entrance) were instituted between Phase I and II sampling. Stormwater samples collected in Phase II indicated that DDT-related compounds were 2–10 times less than those found in Phase I (8). This pathway is considered to pose no apparent public health hazard.

Fish

Four composite fillet samples of rock bass were collected from Antietam Creek in July 2004 (8). Low levels of DDT, DDD, and DDE were found. DDT-related results did not indicate health-related concerns regarding fish consumption. Average DDT levels fell into the 12–16 meals per month category published by EPA for both noncancer and cancer health endpoints (10).

Toxaphene was not found above 130 ppb. Detection limits reported for toxaphene in Phase II fish samples (67 ppb and 130 ppb) were in ranges where EPA recommends reduced fish meals per month because of cancer and non-cancer concerns (10). Firm conclusions are difficult to draw because the levels were reported as less than detection limits. If additional fish sampling is done, we recommend that every attempt be made to have lower detection limits for toxaphene.

Health Outcome Data

Relevant, site-specific health outcome data were not available for this public health assessment. Information on past exposures was also not available. The very limited potential for current exposure of the public to site-related contaminants makes it unlikely that adverse health effects would result.

Community Health Concerns

A Community Liaison Panel serves as a communication bridge between the community, the regulatory agencies, and the responsible parties. It has been in place for about three years. On 10 June 2004, ATSDR staff attended a meeting of this panel. Concerns about the demolition of the vacant buildings and the physical hazards posed by the buildings were expressed at that meeting. Subsequently, the PRP group undertook the demolition of these buildings with oversight from EPA. The parties agreed in advance that efforts to minimize the generation and off-site transport of dust would be included.

The Community Liaison Panel met on 18 November 2004 to further discuss removal of the abandoned buildings. On-site work began in March 2005 and required about four months. Debris and old equipment inside the buildings were removed first. Workers also sprayed down the insides of the buildings to reduce dust, removed any asbestos, and then took the buildings apart piece by piece (9).

One new homeowner in Brighton Manor, which adjoins the site on the north side, was concerned about exposures to his children. He was assured by the remedial project manager that 1) the extent of contamination, not the property boundary, determines the site; 2) soil samples at the property boundary would be analyzed; and 3) surface water and sediment samples in the detention pond (Brighton Manor, Lot 11) would be collected and analyzed.

The community wants the reuse of this site to protect the long-term health and safety of residents. The Hagerstown Land Use Committee recommended two reuse scenarios for this site: light industrial development or commercial office park (11). Both options include a natural buffer area at least 200 feet in width. These reuses would allow direct connections to surrounding land uses, and could integrate existing land use patterns.

The Community Liaison Panel is actively involved in the Superfund process at this site and provides a way for community health-related concerns to be brought to our attention.

This PHA was available for public review and comment from 3 May to 10 June 2005. Appendix F summarizes the comments which we received and our responses.

Children's Health Concerns

Three primary child health concerns identified during the public health assessment are 1) physical hazards associated with trespassing on the site, 2) potential exposure to soil contaminants in backyards that adjoin the site and 3) potential exposure to dusts during the demolition of the buildings or subsequent remediation/redevelopment activities.

Existing fencing and dense vegetation along the site boundary mitigate the first concern. Young children are not likely to enter this site. Also, the abandoned buildings have been removed.

Based on available off-site soil data, it is unlikely that children would have sufficient exposure to DDT to cause adverse health effects. In addition, backyards of Brighton Manor residences adjoining this site have a cover layer of grass which further reduces the exposure potential.

During Phase II sampling, one surface water sample and one soil sample were collected from the Brighton Manor storm-water retention pond (Lot 11) and the drainage swale leading to it (8). Analysis of these samples indicated that DDT and most site-related chemicals were not present at

levels of concern in water or sediment. Arsenic (8.7 ppm) was found above its cancer comparison value (0.5 ppm), but exposures to it are expected to be very infrequent.

Storms could knock down larger trees between the two boundary fences which separate Brighton Manor residences from the site. If falling trees damage the boundary fences, children could gain access to the site. The damaged fences could also expose areas of contaminated soil. ATSDR recommends that a contingency plan be developed to deal with this situation if it arises. The plan should include a way for residents to quickly and easily report such incidents.

Any major earthmoving activities could require suitable precautions to minimize the generation and off-site dispersion of dust.

Conclusions

Major conclusions for exposure pathways and public health hazards are stated here. All pathways considered are shown in Tables 1 and 2.

Current Exposures

The Central Chemical Site currently poses no apparent public health hazard from exposures to site-related chemicals in on-site and off-site soil, groundwater, surface water, and stormwater, or stream sediment.

The abandoned have been removed and no longer pose physical hazards to trespassers. Access to the site remains restricted.

Past Exposures

Past exposures to workers and on-site visitors likely occurred. Because past exposure information is not available, the past exposures are considered an indeterminate public health hazard. This includes exposures to: off-site fugitive dust emissions when the plant was operating, chemicals in on-site buildings previously leased for secondary uses, on-site and off-site soil, groundwater, surface water, storm water, and stream sediments.

Future Exposures

Public health hazards for future exposures are contingent on remedial actions and future use of the site. Demolition and removal of the abandoned buildings has been completed with oversight by EPA. The community has been involved in discussions about responsible reuse of the site.

Desired future uses will determine if additional exposure evaluations are needed. Some type of light industrial/mixed commercial use, with incorporation of a natural buffer, is considered more likely than residential use.

Future use of untreated groundwater for drinking water could pose a public health hazard because of arsenic, BHC, dieldrin, and benzene.

Future use of Marsh Run 2 and Antietam Creek for occasional recreational activities will likely pose no apparent public health hazard.

Public Health Issues and Recommendations

In the past, the abandoned buildings previously on the site posed physical and chemical hazards to trespassers. Demolition and removal of the abandoned buildings has been safely completed with oversight from EPA. Removal and disposal of the debris will be completed soon. The site

boundary fencing will continue to be inspected regularly by EPA, or its contractors, until the site clean-up is completed.

Residents of Brighton Manor are concerned that the integrity of the boundary fences behind their yards could be affected by falling trees during storm events. The sign located at the Mitchell Avenue entrance to the site includes contact information for both EPA and URS Corporation. This provides nearby residents with a way to report damaged fence sections and fallen trees which have exposed soil areas.

Should the community determine a need for public health education activities, ATSDR will work with EPA, the Community Liaison Panel, the state of Maryland, and other interested parties to help identify how to best meet those needs.

Public Health Action Plan

ATSDR reviewed the results for Phase II sampling in early 2005 to further evaluate exposure pathways prior to completing this public health assessment.

ATSDR will work closely with EPA to provide timely assistance on public health issues as needed.

All parties involved with this site (agencies, contractors and the community) will continue cooperative efforts to ensure that institutional controls are monitored and maintained to minimize trespassing on the site.

Signs, which provide nearby residents with a way to report damaged fence sections or exposed soil areas so they can be quickly repaired, have been placed on the site boundary fence.

The Community Liaison Panel will continue to serve as an important link to discuss issues with the community and gather health concerns from the public.

The community information line established for this site is 1-800-242-9317.

If community health education needs are identified, ATSDR will work with EPA, the state of Maryland, the local health department, the Community Liaison Panel, and other interested parties to help identify how to best meet those needs.

ATSDR will review additional data on this site as it becomes available.

Table 1. On-site Exposure Pathway and Hazard Category Summary* for Central Chemical Site, Hagerstown, Maryland

On-site	Past	Present	Future	Comments/Considerations
Production Buildings	Complete	Incomplete	Incomplete	Facility closed, access restricted, buildings removed
	Indeterminate	No Apparent	No Apparent	
Leased Buildings	Complete	Incomplete	Incomplete	Production ceased, leases canceled, buildings removed
	Indeterminate	No Apparent	No Apparent	
Air (Dust)	Complete	Incomplete	Incomplete	Facility closed, access restricted, buildings removed
	Indeterminate	No Apparent	No Apparent	
Surface Soil	Complete	Incomplete	Incomplete	Facility closed, access restricted
	Indeterminate	No Apparent	No Apparent	
Subsurface soil	Incomplete	Incomplete	Incomplete	Facility closed, access restricted Contingent on future use of site
	No Apparent	No Apparent	No Apparent	
Surface Water	Incomplete	Incomplete	Incomplete	None present
	No Apparent	No Apparent	No Apparent	
Ground Water	Incomplete	Incomplete	Incomplete	No current use of groundwater for drinking water; no planned use.
	No Apparent	No Apparent	No Apparent	

*Exposure pathways are Complete or Incomplete. Hazard categories are either No Apparent or Indeterminate Public Health Hazard.

Table 2. Off-site Exposure Pathway and Hazard Category Summary* for Central Chemical Site, Hagerstown, Maryland

Off-site	Past	Present	Future	Comments/Considerations
Air (Dust)	Complete	Incomplete	Incomplete	Buildings demolished and removed using appropriate protective measures
	Indeterminate	No Apparent	No Apparent	
Surface Soil	Complete	Complete	Complete	Only minimal exposures reasonably expected
	Indeterminate	No Apparent	No Apparent	
Subsurface soil	Complete	Incomplete	Incomplete	Contingent on future use of site and appropriate protective measures
	Indeterminate	No Apparent	No Apparent	
Surface Water	Complete	Complete	Complete	Only minimal exposures reasonably expected
	No Apparent	No Apparent	No Apparent	
Stream Sediment	Complete	Complete	Complete	Only minimal exposures reasonably expected
	No Apparent	No Apparent	No Apparent	
Ground Water	Incomplete	Incomplete	Incomplete	Contingent on no use of groundwater for drinking water or suitable treatment when it is used
	No Apparent	No Apparent	No Apparent	
Fish	Complete	Complete	Complete	Only minimal exposures reasonably expected
	Indeterminate	No Apparent	Indeterminate	

*Exposure pathways are Complete or Incomplete. Hazard categories are either No Apparent or Indeterminate Public Health Hazard.

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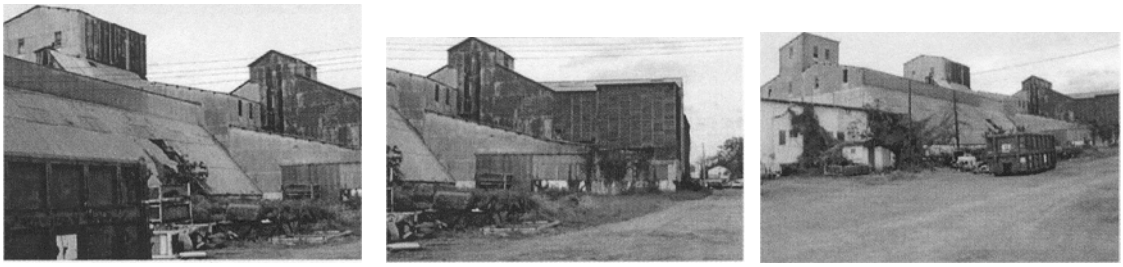
Figures

Figure 1. Abandoned Buildings at Central Chemical Site, Hagerstown, Maryland

Figure 2. Aerial Photograph of Central Chemical Site, Hagerstown, Maryland

Figure 3. Former Fertilizer Plant at Central Chemical Site, Hagerstown, Maryland



Courtesy of Redevelopment Initiative Pilot Project
(http://www.epa.gov/reg3hwmd/super/sites/MDD003061447/reports/2003-07_project.pdf)

Appendix A. Chemicals Analyzed in Phase I/II Remedial Investigations of the Central Chemical Site in Hagerstown, Maryland (7, 8)

Analytical Method*	CAS No.	Chemical Name
BNASIM	140-57-8	Aramite
BNASIM	3212-35-8	Propargite
BNASIM	39300-45-3	Karathane
BNASIM	56-72-4	Coumaphos
BNASIM	63-25-2	Sevin (Carbaryl)
BNASIM	78-34-2	Delnav
BNASIM	86-50-0	Guthion (Azinphos-methyl)
BNASIM	957-51-7	Diphenamid
CPEST	1024-57-3	Heptachlor epoxide
CPEST	1031-07-8	Endosulfan sulfate
CPEST	309-00-2	Aldrin
CPEST	319-84-6	alpha-BHC
CPEST	319-85-7;319-86-8	beta-BHC; delta-BHC
CPEST	33213-65-9	Endosulfan II
CPEST	5103-71-9;5103-74-2	alpha-Chlordane; gamma-Chlordane
CPEST	53494-70-5	Endrin ketone
CPEST	58-89-9	gamma-BHC (Lindane)
CPEST	60-57-1	Dieldrin
CPEST	72-20-8	Endrin
CPEST	72-43-5	Methoxychlor
CPEST	72-54-8; 72-55-9	4,4'-DDD; 4,4'-DDE
CPEST	7421-93-4	Endrin aldehyde
CPEST	76-44-8	Heptachlor
CPEST	8001-35-2	Toxaphene
CPEST	959-98-8	Endosulfan I
CPEST	50-29-3	4,4'-DDT
CSVOL	100-01-6; 100-02-7	4-nitroaniline; 4-nitrophenol
CSVOL	100-52-7	Benzaldehyde
CSVOL	101-55-3	4-bromophenyl phenyl ether
CSVOL	105-60-2	Caprolactam
CSVOL	105-67-9	2,4-dimethylphenol
CSVOL	106-44-5	4-methylphenol
CSVOL	106-47-8	4-chloroaniline
CSVOL	108-60-1	2,2'-oxybis(1-Chloropropane)
CSVOL	108-95-2	Phenol
CSVOL	111-44-4	bis (2-Chloroethyl) ether
CSVOL	111-91-1	bis (2-Chloroethoxy) methane
CSVOL	117-81-7	bis (2-Ethylhexyl) phthalate
CSVOL	117-84-0	Di-n-octyl phthalate
CSVOL	118-74-1	Hexachlorobenzene
CSVOL	120-12-7	Anthracene
CSVOL	120-83-2	2,4-dichlorophenol
CSVOL	121-14-2	2,4-dinitrotoluene
CSVOL	129-00-0	Pyrene
CSVOL	131-11-3	Dimethyl phthalate
CSVOL	132-64-9	Dibenzofuran
CSVOL	1912-24-9	Atrazine
CSVOL	191-24-2	Benzo[g,h,i]perylene
CSVOL	193-39-5	Indeno[1,2,3-cd]pyrene
CSVOL	205-99-2	Benzo[b]fluoranthene
CSVOL	206-44-0	Fluoranthene
CSVOL	207-08-9	Benzo[k]fluoranthene
CSVOL	208-96-8	Acenaphthylene
CSVOL	218-01-9	Chrysene
CSVOL	50-32-8	Benzo[a]Pyrene
CSVOL	51-28-5	2,4-dinitrophenol
CSVOL	534-52-1	4,6-dinitro-2-methylphenol
CSVOL	53-70-3	Dibenz[a,h]anthracene

Appendix A, continued.

Analytical Method*	CAS No.	Chemical Name
CSVOL	56-55-3	Benzo[a]anthracene
CSVOL	59-50-7	4-chloro-3-methylphenol
CSVOL	606-20-2	2,6-dinitrotoluene
CSVOL	621-64-7	N-Nitrosodi-n-propylamine
CSVOL	67-72-1	Hexachloroethane
CSVOL	7005-72-3	4-chlorophenyl phenyl ether
CSVOL	77-47-4	Hexachlorocyclopentadiene
CSVOL	78-59-1	Isophorone
CSVOL	83-32-9	Acenaphthene
CSVOL	84-66-2	Diethyl phthalate
CSVOL	84-74-2	Di-n-butyl phthalate
CSVOL	85-01-8	Phenanthrene
CSVOL	85-68-7	Benzyl butyl phthalate
CSVOL	86-30-6	N-nitrosodiphenylanmine
CSVOL	86-73-7	Fluorene
CSVOL	86-74-8	Carbazole
CSVOL	87-68-3	Hexachlorobutadiene
CSVOL	87-86-5	Pentachlorophenol
CSVOL	88-06-2	2,4,6-trichlorophenol
CSVOL	88-74-4	2-nitroaniline
CSVOL	88-75-5	2-nitrophenol
CSVOL	91-20-3	Naphthalene
CSVOL	91-57-6; 91-58-7	2-methylnaphthalene;2-chloronaphthalene
CSVOL	91-94-1	3,3`-dichlorobenzidine
CSVOL	92-52-4	Biphenyl
CSVOL	95-48-7	2-methylphenol
CSVOL	95-57-8	2-chlorophenol
CSVOL	95-95-4	2,4,5-trichlorophenol
CSVOL	98-86-2	Acetophenone
CSVOL	98-95-3	Nitrobenzene
CSVOL	99-09-2	3-nitroaniline
D2216	% SOLIDS	Percent Solids
E200.7	7429-90-5	Aluminum (Fume or Dust)
E200.7	7439-89-6	Iron
E200.7	7439-92-1	Lead
E200.7	7439-95-4	Magnesium
E200.7	7439-96-5	Manganese
E200.7	7440-02-0	Nickel
E200.7	7440-22-4	Silver
E200.7	7440-23-5	Sodium
E200.7	7440-28-0	Thallium
E200.7	7440-36-0	Antimony
E200.7	7440-38-2	Arsenic
E200.7	7440-39-3	Barium
E200.7	7440-41-7	Beryllium
E200.7	7440-43-9	Cadmium
E200.7	7440-47-3	Chromium
E200.7	7440-48-4	Cobalt
E200.7	7440-50-8	Copper
E200.7	7440-62-2	Vanadium (Fume or Dust)
E200.7	7440-66-6	Zinc
E200.7	7440-70-2	Calcium metal
E200.7	7782-49-2	Selenium
E335.2	57-12-5	Cyanide
METHOD	7439-97-6	Mercury
SW8081	3424-82-6	2,4'-DDE
SW8081	53-19-0	2,4'-DDD
SW8081	789-02-6	2,4'-DDT

* BNASIM: base, neutral, acid organic compounds CPEST: chlorinated pesticides
CSVOL: chlorinated solvents E200.7: metals SW8081: DDT related pesticides

Appendix B. Comparison Values Used To Screen Contaminants for Further Evaluation

Comparison values are calculated concentrations of chemicals in air, water, food, or soil that are unlikely to cause harmful health effects in exposed people. They are used to screen for chemicals of concern during the public health assessment process. Substances found in amounts greater than their comparison values may be selected for further evaluation of public health effects.

Environmental media evaluation guides (EMEGs) are comparison values developed for chemicals on the basis of toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. EMEGs are very conservative levels derived to protect the most sensitive populations and are not clean-up levels. They do not consider carcinogenic effects, chemical interactions, or multiple routes of exposure. EMEGs are derived from ATSDR minimal risk levels.

Reference dose media evaluation guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure. RMEGS, derived from EPA reference doses, are very conservative concentration values designed to protect sensitive members of the population.

Maximum contaminant levels (MCLs) and lifetime health advisory levels for drinking water (LTHAs) are two types of comparison values derived by EPA specifically for drinking water. MCLs are the highest permissible levels of contaminants in water which is delivered to any user of a public water system and are legally enforceable. LTHAs are more commonly referred to as maximum contaminant level goals (MCLGs). These are the highest level of a contaminant in drinking water at which no known, or anticipated, adverse effect on the health of people would occur, and which allows an adequate margin of safety. MCLGs are not enforceable health goals.

Cancer risk evaluation guides (CREGs) are estimated contaminant concentrations that are based on a probability of 1 excess cancer in 1 million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.

Comparison Doses

Minimal risk level (MRL)

An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancer effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful health effects.

Reference dose (RfD)

An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

Appendix C. Tables

Table C1. Summary of Metals Data from Phase I Soil Samples from Buildings Area (Plant Domain)

All Soil Samples			0”– 6”			0”– 6” Soil Samples		
Metals	Frequency Detected	Max. (mg/kg)	Average* (mg/kg)	ATSDR Screening Values (mg/kg) Used		Frequency Exceeded		Further Evaluation Done?
				NC†	C‡	NC	C	
Aluminum	20/20	18,500	9,718	100,000¶	NA§	0/16	---	No
Antimony	7/20	2.3	1.34	20**	NA	0/16	---	No
Arsenic	20/20	276	45	20	0.5	6/16	1,6/16	Yes††
Barium	20/20	749	116	4,000**	NA	0/16	---	No
Beryllium	20/20	3.2	1.32	100	NA	0/16	---	No
Cadmium	9/20	3.8	2.0	10	NA	0/16	---	No
Calcium	20/20	238,000	47,000	NA	NA	---		No
Chromium	20/20	87.2	27.16	200**	NA	0/16	---	No
Cobalt	20/20	19.5	7.32	500¶	NA	0/16	---	No
Copper	20/20	244	71	500¶	NA	0/16	---	No
Cyanides	20/20	0.56	0.28	1,000**	NA	0/16	---	No
Iron	20/20	42,900	21,490	NA	NA	---		No
Lead	20/20	674	104	NA	NA	---		No
Magnesium	20/20	10,700	3,107	NA	NA	---		No
Manganese	20/20	1,720	396	3,000**	NA	0/16	---	No
Mercury	19/20	24.4	2.51	20	NA	1/16	---	No
Nickel	20/20	23.2	14.55	1,000**	NA	0/16	---	No
Potassium	20/20	5,830	1,563	NA	NA	---		No
Selenium	8/20	1.7	1.02	300	NA	0/16	---	No
Silver	4/20	0.34	0.27	300**	NA	0/16	---	No
Sodium	16/20	1,460	299	NA	NA	---		No
Thallium	7/20	1.6	1.2	NA	NA	---		No
Vanadium	20/20	57.2	28.3	200¶	NA	0/16	---	No
Zinc	20/20	2,090	290	20,000	NA	0/16	---	No

* Average of detected values. † Noncancer. ‡ Cancer. § Not available. ¶ Intermediate child EMEG.
** Child reference dose EMEG.
†† Arsenic exceeded environmental comparison values and was evaluated further. Our conservative exposure estimate was below health comparison value. Our conservative theoretical excess cancer risk estimate was in the moderate category. Details are provided in Appendices D and E.

Note: ATSDR chronic child environmental media evaluation guides (EMEGs) were used as screening values for **noncancer** health effects, unless otherwise noted. For **cancer**, ATSDR cancer risk evaluation guides (CREGs) for $1x10^{-6}$ excess cancer risk (1 in 1 million) are shown.

Conclusions for metals in on-site surface soil
Current exposure: incomplete pathway (restricted site access); no apparent public health hazard.
Past exposure: complete pathway; indeterminate public health hazard (information not available).
Future exposure: considered to pose no apparent public health hazard contingent on suitable remediation and future use of the site.

Table C2. Summary of Pesticides/Herbicides in Phase I Soil Samples from Buildings Area (Plant Domain)

All Samples			0"– 6"			0"– 6" Soil Samples		
Pesticides	Frequency Detected	Max. (mg/kg)	Average* (mg/kg)	ATSDR Screening Values (mg/kg) Used		Frequency Exceeded		Further Evaluation Done?
				NC†	C‡	NC	C	
4,4'-DDD	20/20	3,900	233	NA§	3	---	16/16	Yes††
4,4'-DDE	19/20	310	28.51	NA	2	---	16/16	Yes††
4,4'-DDT	20/20	24,000	1,556	30¶	2	16/16	16/16	Yes††
α-BHC	3/20	2.80	1.53	80	0.006	0/16	16/16	Yes††
α-chlordane	11/20	7.5	2.34	30¶	0.1	0/16	16/16	Yes††
β-BHC	7/20	15	4.12	6¶	0.02	14/16	16/16	Yes††
Carbaryl	16/20	12	1.00	5,000**	NA	0/16	---	No
Dieldrin	5/20	24	7.41	0.5	0.002	16/16	16/16	Yes††
γ-Chlordane	11/20	11	3.20	30¶	2	0/16	16/16	Yes††
Heptachlor	3/20	12	5.34	30**	0.2	0/16	16/16	Yes††
Diphenamid	3/20	0.100	0.038	2,000**	NA	0/16	---	No

*Average of detected values. † Noncancer. ‡ Cancer. § Not available. ¶ Intermediate child EMEG.
** Child reference dose EMEG.

†† These chemicals exceeded environmental comparison values and were evaluated further. Conservative exposure estimates were generally below health comparison values. Conservative theoretical excess cancer risk estimates were generally in the low or moderate category. DDT exposure estimate was in the same range as the health comparison value and cancer risk estimate was in the increased category. Details are provided in Appendices D and E.

Notes: Frequency detected in all samples reflects URS results (7). Screening values were used to evaluate samples from 0"– 6" below ground surface. When detection limits were substantially greater than screening values, the chemical was counted as detected, adding to the conservative nature of our evaluation. For **noncancer** health effects, ATSDR chronic child environmental media evaluation guides (EMEGs) were used as screening values unless otherwise noted. For **cancer**, we used ATSDR cancer risk evaluation guides (CREGs) for 1 x 10^{-6} excess cancer risk (1 in 1 million).

Conclusions for pesticide/herbicides in on-site surface soil
Current exposure: incomplete pathway (restricted site access); no apparent public health hazard.
Past exposure: complete pathway; indeterminate public health hazard (information not available).
Future exposure: considered to pose no apparent public health hazard contingent on suitable remediation and future use of the site.

Table C3. Summary of Metals Data from Phase I Groundwater Samples

Metals	Frequency Detected	Max. (ug/L)	Average* (ug/L)	ATSDR Screening Values (ug/L) Used		Frequency Exceeded		Further Evaluation Done?
				NC†	C‡	NC	C	
Aluminum	14/14	2,430	489	20,000¶	NA§	0/14	---	No
Arsenic	6/14	8.9	3.45	3	0.02	1/14	6/14‡‡	Yes§§
Barium	14/14	93	39	700**	NA	0/14	---	No
Beryllium	11/14	1.7	0.82	20	NA	0/14	---	No
Cadmium	4/14	0.83	0.60	2	NA	0/14	---	No
Calcium	14/14	1,630,000	483,142	NA		---		No
Chromium	5/14	6.2	4.18	30**	NA	0/14	---	No
Cobalt	10/14	9.4	5.25	100¶	NA	0/14	---	No
Copper	13/14	17.6	4.02	100¶	NA	0/14	---	No
Cyanides	13/14	9	4.15	200**	NA	0/14	---	No
Iron	7/14	83,000	23,375	NA		---		No
Lead	1/14	21.9	21.9	NA	NA	---		No
Magnesium	14/14	287,000	65,086	NA		---		No
Manganese	14/14	7,890	1,572	500**	NA	7/14	---	Yes§§
Mercury	2/14	0.097	0.08	3	NA	0/14	---	No
Nickel	11/14	17.3	11.97	100††	NA	0/14	---	No
Potassium	14/14	70,500	18,826	NA		---		No
Selenium	4/14	6.1	3.85	50	NA	0/14	---	No
Silver	5/14	1	0.61	50 ®	NA	0/14	---	No
Sodium	14/14	61,700	19,411	NA		---		No
Thallium	1/14	2.9	2.90	0.5††	NA	1/14	---	No
Vanadium	9/14	15.9	5.14	30¶	NA	0/14	---	No
Zinc	14/14	915	128	3,000	NA	0/14	---	No

*Average of detected values. † Noncancer. ‡ Cancer. § Not available. ¶ Intermediate child EMEG.
** Child reference dose EMEG. †† Lifetime health advisory value.
‡‡ The detection limit reported for the other 8 samples (<10µg/L) exceeded the screening value.
§§ Arsenic and manganese exceeded environmental comparison values and were evaluated further. Conservative estimates indicated potential exposure levels below MRLs. Our conservative theoretical excess cancer risk estimate for arsenic was in the moderate category. Details are provided in Appendix E.

Notes:
For **noncancer** health effects, ATSDR chronic child environmental media evaluation guides (EMEGs) were used as screening values unless otherwise noted. For **cancer**, we used ATSDR cancer risk evaluation guides (CREGs) for 1 x 10^{-6} excess cancer risk (1 in 1 million).

Conclusions
Current exposure: incomplete pathway (not used for drinking water); no apparent public health hazard.
Past exposure: could not be assessed; indeterminate public health hazard.
Future exposure: use of untreated groundwater for drinking water may require further evaluation of arsenic for cancer risk. Calcium, iron, magnesium, potassium, and sodium are water quality parameters that may also require further evaluation.

Table C4. Summary of Pesticides and Herbicides Found in Phase I Groundwater Samples

Pesticides	Frequency Detected	Max. (ug/L)	Average* (ug/L)	ATSDR Screening Values (ug/L) Used		Frequency Exceeded		Further Evaluation Done?
				NC†	C‡	NC	C	
4,4'-DDT	3/14	1.1	0.42	NA§	0.1	---	3/14	Yes‡‡
α-BHC§§	14/14	19	3.25	80	0.006	0/14	14/14	Yes‡‡
α-chlordane	3/14	0.039	0.03	5**	0.1	0/14	0/14	No
β-BHC¶¶	14/14	20	4.55	6¶	0.02	1/14	14/14	Yes‡‡
Carbaryl	2/14	1.4	1.25	700††	NA	0/14	---	No
δ-BHC[a]	13/15	180	40	NA	NA	---	---	No
Dieldrin	4/14	0.096	0.08	0.5	0.002	0/14	4/14	Yes‡‡
γ-BHC (Lindane)[b]	6/14	5.2	2.09	0.1¶	NA	6/14	---	Yes‡‡
Diphenamid	9/14	490	94	200††	NA	2/14	---	No

*Average of detected values. †Noncancer. ‡ Cancer. § Not available. ¶ Intermediate child EMEG.
** Child reference dose EMEG. †† Lifetime health advisory value.
‡‡ These chemicals exceeded environmental comparison values and were evaluated further. Conservative exposure estimates were generally below health comparison values. Conservative theoretical excess cancer risk estimates were generally in the increased or moderate category. The γ-BHC exposure estimate was in the same range as the health comparison value and the cancer risk estimate was in the increased category. Details are provided in Appendix E.
§§ alpha-hexachlorocyclohexane (also known as alpha-benzene hexachloride)
¶¶ beta-hexachlorocyclohexane (also known as beta-benzene hexachloride)
[a] delta-hexachlorocyclohexane (also known as delta-benzene hexachloride)
[b] gamma-hexachlorocyclohexane

Note:
For **noncancer** health effects, ATSDR chronic child environmental media evaluation guides (EMEGs) were used as screening values unless otherwise noted. For **cancer**, we used ATSDR cancer risk evaluation guides (CREGs) for 1 x 10^{-6} excess cancer risk (1 in 1 million).

Conclusions
Current exposure: incomplete pathway (not used for drinking water); no apparent public health hazard.
Past exposure: could not be assessed; indeterminate public health hazard.
Future exposure: use of untreated groundwater as drinking may require further evaluation of BHC (alpha-, beta-, gamma-) and dieldrin.

Table C5. Screening Evaluation of Volatile Organic Chemicals Detected in Groundwater (Phase I)

Chemical	Frequency of Detection	Maximum Concentration (ug/L)	Comparison Values (ug/L)
1,3,5-TCB	1/1	28.4	40*
Acetone	3/14	2.5	9,000†
Benzene	2/14	81	40†; 0.6 (CREG)
Chlorobenzene	2/14	320	100*
Chloroform	2/14	1.2	70*
Ethylbenzene	2/14	2.9	700*

* Lifetime health advisory value. † Reference dose EMEG.
CREG: Cancer risk evaluation guide (1×10^{-6} excess cancer risk or 1 in 1 million).
Note: Current exposure to VOCs in groundwater is considered to pose no apparent public health hazard. Future use of untreated groundwater for drinking water may require further evaluation of benzene and chlorobenzene.

Table C6. Chemicals Found in 3 or more Phase I Surface Water Samples

Chemical	Frequency Detected	Max. (ug/L)	Average* (ug/L)	ATSDR Screening Values (ug/L) Used		Frequency Exceeded		Further Evaluation Needed?
				NC†	C‡	NC	C	
Aluminum	6/7	139	51.3	20,000¶	NA§	0/7	---	No
Barium	7/7	85	71	700**	NA	0/7	---	No
Calcium	7/7	158,000	122,857	NA	NA	---	---	No††
Chromium	4/7	3.8	2.23	30**	NA	0/7	---	No
Cobalt	7/7	1.2	0.92	100¶	NA	0/7	---	No
Copper	6/7	3.4	1.57	100¶	NA	0/7	---	No
Cyanides	7/7	4	3.0	200**	NA	0/7	---	No
Magnesium	7/7	16,500	13,543	NA	NA	---	---	No††
Manganese	7/7	47.8	17.91	500**	NA	0/7	---	No
Mercury	4/7	0.082	0.08	3	NA	0/7	---	No
Potassium	7/7	4,790	3,481	NA	NA	---	---	No††
Sodium	7/7	76,900	46,271	NA	NA	---	---	No††
Zinc	7/7	15.6	5.27	3,000	NA	0/7	---	No
α-BHC	7/7	0.064	0.05	80	0.006	0/7	7/7	Yes‡‡

* Average of detected total metal concentrations. † Noncancer. ‡ Cancer. § Not available.
¶ Intermediate child EMEG. ** Child reference dose EMEG.
†† Calcium, iron, magnesium, potassium, and sodium may require further evaluation if untreated surface water is used as a public drinking water source.
‡‡ α-BHC exceeded cancer comparison value and was evaluated further using a conservative recreational exposure scenario. The resulting exposure estimate was below the health comparison value and the cancer risk estimate was in the low category. Past, present, and future exposures via surface water are considered to pose no apparent public health hazard.

Note: For **noncancer** health effects, ATSDR chronic child EMEGs were used as screening values unless otherwise noted. For **cancer**, we used ATSDR cancer risk evaluation guides (CREGs) for 1×10^{-6} excess cancer risk (1 in 1 million).

Table C7. Summary of Metals Data from Phase I Sediment Samples

Metal	Frequency Detected	Max. (mg/kg)	Average* (mg/kg)	ATSDR Screening Values (mg/kg) Used		Frequency Exceeded		Further Evaluation Needed?
				NC†	C‡	NC	C	
Aluminum	7/7	8,920	6,183	100,000¶	NA§	0/7	---	No††
Arsenic	7/7	8.8	5.29	20**	0.5	0/7	7/7	Yes‡‡
Barium	7/7	147	87.31	4,000**	NA	0/7	---	No
Beryllium	7/7	1.1	0.85	100	NA	0/7	---	No
Cadmium	7/7	1	0.36	10	NA	0/7	---	No
Calcium	7/7	153,000	96,450	NA	NA	---		No††
Chromium	7/7	58.5	26.76	200**	NA	0/7	---	No
Cobalt	7/7	15.6	7.83	500¶	NA	0/7	---	No
Copper	7/7	71.9	31.50	500¶	NA	0/7	---	No
Cyanides	7/8	1	0.40	1,000**	NA	0/7	---	No
Iron	7/7	23,700	16,813	NA	NA	---		No††
Lead	7/7	193	74.40	NA	NA	---		No
Magnesium	7/7	33,300	11,735	NA	NA	---		No††
Manganese	7/7	1,420	531	3,000**	NA	0/7	---	No
Mercury	5/8	0.15	0.10	20	NA	0/7	---	No
Nickel	7/7	22	12.76	1,000**	NA	0/7	---	No
Potassium	7/7	1,060	719	NA	NA	---		No††
Selenium	6/8	1.8	1.24	300	NA	0/7	---	No
Silver	4/8	0.56	0.39	300**	NA	0/7	---	No
Sodium	7/7	664	204	NA	NA	---		No††
Vanadium	7/7	40.5	21	200¶	NA	0/7	---	No
Zinc	7/7	520	186	20,000	NA	0/7	---	No

*Average of detected values. † Noncancer. ‡ Cancer. § Not available. ¶ Intermediate child EMEG.
** Child reference dose EMEG.
†† Aluminum, calcium, iron, magnesium, potassium, and sodium are predominant metals in soil.

Note: For **noncancer** health effects, ATSDR chronic child environmental media evaluation guides (EMEGs) were used as screening values unless otherwise noted. For **cancer**, we used ATSDR cancer risk evaluation guides (CREGs) for 1 x 10^{-6} excess cancer risk (1 in 1 million).

The occasional recreational exposure scenario considered reasonable for this site is not likely to result in sufficient exposures to cause adverse health effects. Past, present, and future exposures to metals in stream sediment are considered to pose no apparent public health hazard.

‡‡ Arsenic exceeded cancer comparison value and was evaluated further using a conservative recreational exposure scenario. The resulting exposure estimate was below the health comparison value and the cancer risk estimate was in the low category. Past, present, and future exposures via sediment are considered to pose no apparent public health hazard. Additional details are provided in Appendices D and E.

Table C8. Summary of Pesticides and Herbicides Found in Phase I Sediment Samples

Pesticides	Frequency Detected	Max. (mg/kg)	Average* (mg/kg)	ATSDR Screening Values (mg/kg) Used		Frequency Exceeded		Further Evaluation Needed?
				NC†	C‡	NC	C	
4,4'-DDE	7/7	0.130	0.058	NA§	2	---	0/7	No
4,4'-DDD	7/7	0.069	0.034	NA	3	---	0/7	No
4,4'-DDT	7/7	0.240	0.140	NA	2	---	0/7	No
α-chlordane	7/7	0.012	0.005	30¶	2	0/7	0/7	No
Carbaryl	5/7	0.053	0.019	700**	NA	0/7	---	No
Dieldrin	7/7	0.012	0.006	0.5	0.002	0/7	7/7	Yes
Endrin	3/7	0.009	0.006	2**	NA	0/7	---	No
γ-Chlordane	7/7	0.015	0.007	30¶	2	0/7	0/7	No

*Average of detected values. † Noncancer. ‡ Cancer. § Not available. ¶ Intermediate child EMEG.
** Lifetime health advisory value.

Note: For **noncancer** health effects, ATSDR chronic child environmental media evaluation guides (EMEGs) were used as screening values unless otherwise noted. For **cancer**, we used ATSDR cancer risk evaluation guides (CREGs) for 1×10^{-6} excess cancer risk (1 in 1 million).

Dieldrin exceeded cancer comparison value and was evaluated further using a conservative recreational exposure scenario. The resulting exposure estimate was below the health comparison value and the cancer risk estimate was in the very low category. Past, present, and future exposures via surface water are considered to pose no apparent public health hazard.

Appendix D. Further Evaluation of Selected Contaminants

Arsenic exceeded the CREG in 16 on-site surface soil samples and the EMEG in 6 of these. We used a conservative exposure scenario of 5 days/week, 50 weeks/year, for 30 years to the average arsenic level (Table D1) to estimate exposure potential. The resulting exposure estimate is below the minimal risk level (MRL) and the theoretical excess cancer risk is in the moderate category (Table D1). Exposures and cancer risks for trespassers and secondary users of on-site buildings would likely be lower because the frequency of exposure would be less.

Exposure of children to DDT in off-site soil was assessed assuming that they would ingest 200 mg of soil containing 13.28 mg/kg DDT for 62 days/year for 9 years. The resulting exposure estimate is below the MRL and the theoretical excess cancer risk is in the low category (Table D1).

Nine pesticide/herbicides exceeded their respective CREGs in on-site surface soil samples; three also exceeded their respective EMEGs (Table C2). We used a conservative exposure scenario of 5 days/week, 50 weeks/year, for 30 years to the average levels to estimate exposure potential. The resulting exposure estimate for DDT was in the same range as the MRL; all other exposure estimates were below the respective MRL (Table D1). Theoretical excess cancer risks were highest for DDT and low-moderate for the other chemicals. Exposures and theoretical excess cancer risks for trespassers and secondary users of on-site buildings would be lower because the frequency of exposure would be less.

Arsenic, manganese, and five pesticide/herbicides in groundwater exceeded respective screening values (Table C4). We used a conservative exposure scenario of consuming 2 L/day for 70 years to estimate exposure potential. The resulting exposure estimate for γ-BHC was in the same range as the MRL; all other exposure estimates were below the respective MRL. Theoretical excess cancer risks were in the increased category for arsenic and α/β-BHC, but groundwater is currently not used for drinking water. Excess cancer risks were in the increased category for benzene, but it was found in only two samples.

α-BHC exceeded the CREG in surface water samples (Table C5). Our exposure scenario was 1 day/week, 12 weeks/year for 9 years. An ingestion rate of 2 L/day was used. The resulting exposure estimate was below the MRL and theoretical excess cancer risks were in the low category (Table D1).

Arsenic and dieldrin exceeded their respective CREG in sediment. We used a scenario of occasional recreational activity 1 day/week, 12 weeks/ year for 9 years to assess child exposure potential. Incidental sediment ingestion of 200 mg/day was used. Resulting arsenic and dieldrin exposure estimates were below the respective MRL. Theoretical excess cancer risk estimates were considered low (Table D1).

Current exposure to on-site soil and groundwater are considered incomplete pathways because site access is restricted and groundwater is not used for drinking water. These pathways pose no apparent public health hazard. Current exposure to surface water and sediment are considered complete exposure pathways, but represent no apparent public health hazard for reasonably expected recreational activities.

Past exposure to on-site surface water and sediment are considered complete pathways. We cannot assess these exposures, which are considered an indeterminate public health hazard. Past exposure to ground-water is considered an incomplete pathway and is thought to pose no apparent public health hazard.

Future on-site exposure is considered to pose no apparent public health hazard, but that is contingent on suitable remediation and future use of the site. Future recreational exposure to surface water and sediment are considered to pose no apparent public health hazard. Future use of groundwater as drinking water may require additional evaluation of arsenic, α/β-BHC, benzene and dieldrin because of potential cancer risks.

Table D-1. Summary of Toxicological Evaluation for Chemicals Exceeding Comparison Values

Chemical	Estimated Exposure Dose (mg/kg/day)	MRL	Chronic Oral RfD	Cancer Slope Factor	Cancer Classification	Theoretical Excess Cancer Risk
On-site Surface Soil						
Arsenic	0.000022	0.0003	0.0003	1.5	A	3.3×10^{-5} (moderate)
α-BHC	0.000001	0.008	---	6.3	B2	5.1×10^{-6} (low)
β-BHC	0.000002	0.0006*	---	1.8	C	3.6×10^{-6} (low)
4,4'-DDE	0.000014	---	---	0.34	B2	4.7×10^{-6} (low)
4,4'-DDD	0.000113	---	---	0.24	B2	2.7×10^{-5} (moderate)
4,4'-DDT	0.00076	0.0005*	0.0005	0.34	B2	2.6×10^{-4} (increased)
α/γ-Chlordane	0.000002	0.0006	0.0005	0.35	B2	5.4×10^{-7} (very low)
Dieldrin	0.000004	0.00005	0.00005	16	B2	5.8×10^{-5} (moderate)
Heptachlor	0.000003		0.0005	4.5	B2	1.2×10^{-5} (moderate)
Off-site Surface Soil						
DDT	0.000013	0.0005*	0.0005	0.34	B2	5.6×10^{-7} (very low)
Groundwater						
Arsenic	0.000099	0.0003	0.0003	1.5	A	1.5×10^{-4} (increased)
Manganese	0.045	---	0.14	---	D	Not applicable
α-BHC	0.000093	0.008	---	6.3	B2	5.9×10^{-4} (increased)
β-BHC	0.00013	0.0006*	---	1.8	C	2.3×10^{-4} (increased)
γ-BHC	0.00006	0.00001*	0.0003	---	C	Not applicable
Benzene	0.0023	---	0.004	0.055	A	1.3×10^{-4} (increased)
Chlorobenzene	0.0091	0.4*	0.02	---	D	Not applicable
Dieldrin	0.000002	0.00005	0.00005	16	B2	3.7×10^{-5} (mod rate)
4,4'-DDT	0.000012	0.0005*	0.0005	0.34	B2	4.1×10^{-6} (low)
Surface Water						
α-BHC	0.0000002	0.008	---	6.3	B2	1.5×10^{-6} (low)
Sediment						
Arsenic	0.000004	0.0003	0.0003	1.5	A	5.9×10^{-6} (low)
Dieldrin	0.000000004	0.00005	0.00005	16	B2	7.1×10^{-8} (very low)

* Intermediate MRL. MRLs are chronic unless noted otherwise. Units for MRLs and RfDs are mg/kg/day.
A: human carcinogen. B2: probable human carcinogen. C: possible human carcinogen. D: not classified.
MRLs were obtained from http://www.atsdr.cdc.gov/mrls.html and RfDs were obtained from http://www.epa.gov/iris/ (last accessed 16 Dec 2004). Chemical specific information obtained from ATSDR Toxicological Profiles available at http://www.atsdr.cdc.gov/toxpro2.html.

Appendix E. Estimating Exposure Doses

This appendix briefly provides the basic equations and assumptions used to further evaluate chemicals that exceeded environmental comparison values. It also contains example calculations. It is adapted from the ATSDR Public Health Assessment Guidance Manual (12, 13).

The following basic equation was used to estimate exposure to chemicals for noncancer health concerns:

$$\text{Estimated Exposure Dose (D)} = \frac{\text{Contaminant Concentration (C)} \times \text{Ingestion Rate (IR)} \times \text{Factor (EF)}}{\text{Body Weight (BW)}}$$

D = Estimated exposure dose (mg/kg-day) to specific chemical or contaminant
C = Contaminant concentration (mg/L for water; mg/kg for soil or sediment)
IR = Ingestion rate (L/day for water; mg/day for soil or sediment)
Water (2 L/day for adults; 1 L/day for children)
Soil or Sediment (50 mg/day for adults; 200 mg/day for children)
BW = Body weight (70 kg for adults; 35 kg for children)
EF = Exposure Factor (see below)

$$EF = \frac{\text{Annual Exposure Frequency} \times \text{Annual Exposure Duration} \times \text{No. of Years of Exposure}}{\text{Averaging Time (usually 365 days} \times \text{Years of Exposure)}}$$

The estimated exposure dose (D) may also be called the annual exposure dose, and is calculated from available site specific information. The amount of water, soil, or sediment ingested by people is described by an ingestion rate (IR). The frequency and duration of exposure on a yearly basis is expressed as an exposure factor (EF) to ease calculations. Estimated body weight (BW) for adults or children is the denominator of the equation.

For cancer, lifetime excess cancer risks are calculated for a 70 year exposure period as follows:

$$\text{Estimated Annual Exposure Dose (mg/kg/day)} \times \text{Cancer Slope Factor (mg/kg/day}^{-1}\text{)}$$

Excess cancer risks for exposures less than an entire lifetime are calculated as follows:

$$(\text{Estimated Annual Exposure Dose} \times \text{Cancer Slope Factor}) \times \frac{\text{No. of Years Exposed}}{\text{70 year lifetime}}$$

A typical less-than-lifetime exposure period is the residence time in the community where the exposure occurred. Two such residence times often used are 30 years for the maximum time at one residence and 9 years for the median time at one residence (EPA 1997). In this consultation, we took a conservative approach by considering only lifetime exposures.

Example Calculations

Exposure estimate for adults to arsenic in on-site soil

Exposure assumptions: 5 days per week, 50 weeks per year, for 30 years

$$\text{AEF} = \frac{\text{Annual Exposure Frequency} \times \text{Annual Exposure Duration} \times \text{No. of Years of Exposure}}{\text{Averaging Time (usually 365 days} \times \text{Years of Exposure)}}$$

$$\text{Adult AEF} = \frac{5 \text{ days/week} \times 50 \text{ weeks/year} \times 30 \text{ years}}{365 \text{ days/year} \times 30 \text{ years}} = \frac{7{,}500 \text{ days}}{10{,}950 \text{ days}} = 0.68$$

$$\text{Adult EED} = \frac{45 \text{ mg/kg} \times 50 \text{ mg/day} \times 0.68 \times 10^{-6} \text{ kg/mg}}{70 \text{ kg}} = \frac{0.00153}{70} = 0.000022 \text{ mg/kg/day}$$

Conclusion

This conservative estimated adult exposure dose is 14 times below the current MRL of 0.0003 mg/kg/day. We think this indicates that visitors, trespassers, and people involved with secondary leases of on-site buildings were unlikely to have exposures to arsenic that could cause non-cancer adverse health effects. Visitors, trespassers, and people involved with secondary leases of on-site buildings would have a much lower annual exposure factor. We are unable to evaluate actual past worker exposure because relevant information is not available.

Theoretical Excess Cancer Risks

$$\textit{(Estimated Annual Exposure Dose} \times \textit{Cancer Slope Factor)} \times \frac{\textit{No. of Years Exposed}}{\textit{70 year lifetime}}$$

$(0.000022 \text{ mg/kg/day} \times 1.5) \times 30/70 = 0.000014 = 1.4 \times 10^{-5} = 2$ per 100,000 (moderate)

Theoretical excess cancer risk calculated from the conservative exposure estimate indicates that if 100,000 people were exposed for 30 years, 2 additional cancer cases could occur. The baseline cancer rate in the U.S. is 1 in 4 (25%). Thus, these two additional cancer cases would be in addition to 25,000 cases that would be expected to occur in a population of 100,000. We do not think there is a substantial cancer risk from exposure of the public to arsenic at this site.

Exposure estimate for children to arsenic in on-site soil

Exposure assumptions: 2 days per week, 12 weeks per year, for 9 years

$$\text{Child EF} = \frac{2 \text{ days/week} \times 12 \text{ weeks/year} \times 9 \text{ yrs}}{9 \text{ yrs} \times 365 \text{ days/yr}} = \frac{216 \text{ days}}{3{,}285 \text{ days}} = 0.066$$

$$\text{Child EED} = \frac{45 \text{ mg/kg} \times 200 \text{ mg/day} \times 0.066 \times 10^{-6} \text{ kg/mg}}{35 \text{ kg}} = \frac{0.000594}{35} = 0.000017 \text{ mg/kg/day}$$

Conclusion

This estimated exposure dose is about 18 times below the current MRL of 0.0003 mg/kg/day. We think this indicates that child visitors and trespassers are unlikely to have exposures to arsenic in soil that could cause adverse health effects.

Appendix F. Public Comments and Responses

ATSDR released this health assessment for public comment on 3 May 2005. The public comment period closed on 10 June 2005. Eleven people supplied comments using the ATSDR Public Health Assessment Questionnaire. Of the 11 questionnaires returned, eight came from concerned members of the community. An elected official, a health care professional and a site owner/operator/representative also provided comments. In addition, two people provided comments by email.

Responses to the Yes/No questions on the ATSDR Public Health Assessment Questionnaire are summarized below:

1. Did the report provide the site related environmental health information that you needed?
   Yes-10 No-0 No Response-1

2. Were the public health conclusions and recommendations easy to understand?
   Yes-10 No-0 No Response-1

3. Was the public health assessment report available to you when you needed it?
   Yes-7 No-1 No Response-2 Other response-1

   Note: One concerned community member responded "No" and indicated that they had to wait more than one year. Two people left this question blank. Another concerned community member did not check either "Yes" or "No", and indicated that they did not know there was a report.

4. Were your concerns about health effects from exposure to site contaminants addressed in the report?
   Yes-7 No-3 No Response-1

   Note: Two concerned members of the community and one site owner/operator/representative responded "No". Specific comments are addressed below. Two community members expressed appreciation for the public health assessment and the information which it provided.

Specific comments received during the public comment period are listed below along with the *ATSDR responses*.

URS Corporation provided editorial (grammatical) comments.
These have been incorporated into the final public health assessment as appropriate.

What are the physical hazards of the stormwater retention pond located between the site and Brighton Manor?
During/after some storm events, this retention pond may contain water at a depth of 2' or greater. This may pose a physical hazard (drowning) to small children. The retention pond is not fenced and access is unrestricted. If the community views this as a concern, then we recommend that steps be taken to restrict access to (fence) the retention pond.

Is it true that no one fishes in Marsh Run?
ATSDR is not aware of any fishing that occurs in Marsh Run or Marsh Run 2 for consumption purposes.

Was ingestion the only route assessed?
Ingestion was the primary route of exposure assessed, but consideration was given to all exposure pathways. As noted in the assessment, there was insufficient information to address past exposures.

Has a contingency plan been developed for reporting breaks in the site boundary fence or areas of soil exposed by fallen trees along the site boundary?
The sign located at the Mitchell Avenue entrance to the site shows telephone contact information for both EPA and URS Corporation. This provides nearby residents with a way to report damaged fence sections and fallen trees which have exposed soil areas.

In the Summary Toxicological Evaluation for Chemicals Exceeding Comparison Values (Table D-1), were the individual risks combined to look at cumulative risks on the same target organ?
The cancer risk estimates shown in Table D-1 are theoretical excess cancer risks for daily exposures over a lifetime (70 years) for each chemical listed. This is a very conservative approach. Residents are not likely to have 70 years of daily exposure to this site, which reduces the overall theoretical excess cancer risk. Given the intermittent nature of potential residential exposures for this site, the exposures are unlikely to result in increased cancer.

A concerned community member (resident in Brighton Manor since 1988) indicated reluctance to believe that there is no apparent exposure or hazards involved at the Central Chemical site. This person commented that two immediate neighbors have developed cancer in recent years and that both of these neighbors have lived there since 1988.
We evaluated all available information in the course of performing this public health assessment. Our conservative evaluation indicates that the site poses no apparent public health hazard on the basis of current conditions. Past exposures could not be evaluated and future exposures will, in part, be driven by final remediation of the site. The site clearly poses hazards to trespassers, but the site is well-fenced and access is clearly restricted. Signs are posted indicating that the property is a Superfund site and that trespassing is not allowed. The buildings on the site have been removed as part of the clean-up process.

Cancer is a group of more than 200 different diseases. Cancer can develop in people of all ages, but is most common in people over 60 years old. The most common carcinogens in our society are those in cigarette smoke. Ionizing radiation, heredity, and lifestyle behaviors (such as smoking, alcohol consumption, diet, and exercise) are also important factors which can contribute to the development of cancer. It is very difficult to determine if cancers present in people living near a given hazardous waste site are the result of exposures to chemicals found at that site. This is primarily because of 1) the long latency period for cancer, 2) lifestyle behaviors associated with cancer and 3) the lack of information on specific exposure patterns.

A concerned member of the community indicated concerns about exposures to multiple chemicals listed in the public health assessment.
ATSDR recognizes the importance of assessing chemical mixtures. The agency has developed a guidance manual for assessing the joint toxic action of chemical mixtures, nine final chemical interaction profiles, and two additional draft chemical interaction profiles. These can be found at the internet site http://www.atsdr.cdc.gov/iphome.html. While additive joint action of some chemicals found at the Central Chemical Site may be possible, likely exposure scenarios for the public at this site do not indicate a concern.

A site owner/operator/representative asked about the outcome from all the removal actions.
The intended outcome of remediation efforts at the Central Chemical Site is to protect the environment and human health, and to allow the site to be safely re-developed for other uses.

Several comments were received regarding community health education and outreach. These included:

> Is anyone providing health education about the need for maintaining good vegetation cover in the backyards that adjoin the site, using good hygiene after working or playing in the soil, keeping dust down in homes, or precautions about digging or building?
>
> Is it necessary to have public education about digging or building on private property which adjoins the site?

If the community determines that specific health education activities are needed, ATSDR will work with EPA, the Community Liaison Panel, the PRP Workgroup, and other interested parties to help identify how to best meet those needs.