

Public Health Assessment for

PETITIONED PUBLIC HEALTH ASSESSMENT

SHAFFER EQUIPMENT COMPANY

MINDEN, FAYETTE COUNTY, WEST VIRGINIA

CERCLIS NO. WVD981038300

JUNE 1, 1993

ADDENDUM

FEBRUARY 16, 1994

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry

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REGION 1-1



THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104 (i) (6) (F) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risks assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, this Health Assessment has been conducted using available data. Additional Health Assessments may be conducted for this site as more information becomes available.

The conclusions and recommendations presented in this Health Assessment are the result of site specific analyses and are not to be cited or quoted for other evaluations or Health Assessments.

Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

SHAFFER EQUIPMENT COMPANY ADDENDUM

PETITIONED PUBLIC HEALTH ASSESSMENT ADDENDUM

SHAFFER EQUIPMENT COMPANY

MINDEN, FAYETTE COUNTY, WEST VIRGINIA

CERCLIS NO. WVD981038300

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

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.

Agency for Toxic Substances

and Disease Registry.....William L. Roper, M.D., M.P.H. Administrator

Barry L. Johnson, Ph.D., Assistant Administrator

Division of Health Assessment

and Consultation.....Robert C. Williams, P.E., Director

Juan J. Reyes, Deputy Director

Federal Programs Branch.....Sally L. Shaver, Chief

Community Health Branch.....Cynthia M. Harris, Ph.D., Chief

Remedial Programs Branch.....Sharon Williams-Fleetwood, Ph.D., Chief

Records & Information Management Branch.....Max M. Howie, Jr., Chief

Emergency Response & Consultation Branch.....C. Harold Emmett, P.E., Chief

Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services

Additional copies of this report are available from:
National Technical Information Service, Springfield, VA
(703) 487-4650

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ADDENDUM

A public meeting was held on June 28, 1993, following the final release of the Shaffer Equipment Company Petitioned Public Health Assessment. During the meeting a number of concerns and information regarding the site, community, and the document were presented to ATSDR. Based on the information and discussions during the meeting, ATSDR is issuing this addendum to the Final Petitioned Public Health Assessment that was released on June 1, 1993. In addition, ATSDR has included in this addendum a copy of a letter that was sent to ATSDR from a community group and ATSDR's letter of response. To comply with ATSDR policy, names of private citizens were deleted from the letters. ATSDR released a draft of this public health assessment addendum for public comment from September 27, 1993 - November 6, 1993. Public comments have been received and are attached in Appendix B of this addendum.

ATSDR is aware that EPA has conducted additional sampling at the Shaffer Equipment Company site. ATSDR will continue to review new site-related data and information. If evaluation of any new data or information indicates a need for further public health actions, ATSDR will respond to address these public health needs.

Addend by deleting the following paragraph (and its associated reference) from the Health Outcome Data subsection (page 6).

In 1989, a Beckley, West Virginia gynecologist, who was a member of the Health Department Board of Directors, conducted a health survey and provided the results to the ATSDR Division of Health Studies for evaluation. (11)

ATSDR Comment: During the June 28, 1993, meeting in Minden, West Virginia, an attendee informed ATSDR that the survey mentioned above, is not related to the Shaffer Equipment Company site, but instead is related to a different West Virginia site. ATSDR does not know how the survey was misrepresented and included in the Shaffer Equipment Company file. However, had this information regarding the survey been brought to ATSDR's attention during the public comment period, ATSDR would have addressed it at that time, rather than through this addendum.

Addend the discussion under "Food Chain" in the Potential Exposure Pathways subsection (page 17) to indicate:

Early reports from the community stated that residents might have consumed snapping turtles in the area (15,16). Snapping turtles have not been analyzed for PCBs, PCDDs, and PCDFs.

The EPA does not believe that snapping turtles are consumed from this area. At a public meeting on May 29, 1990, EPA asked the audience if snapping turtles were being eaten; there was no response. However, because of limited attendance, a lack of response did not necessarily indicate that turtles were not eaten. Because of the uncertainty surrounding the use of turtles for food and the lack of data regarding turtle contamination, ATSDR could not evaluate if

exposure to these contaminants is actually occurring by ingestion. If turtles are being eaten and without data to negate contamination, ingestion of turtles would be considered a potential human exposure pathway.

During a public meeting on June 28, 1993, concerns were expressed that domestic animals using water from Arbuckle Creek, downstream from the site, could have been contaminated, particularly in the past. There was also concern that game animals that frequent the site property may be contaminated. Although gardens are not grown in the immediate vicinity of the site, there are gardens that are grown in the community and reports of gardens that have been grown in the flood plain. In addition, it was reported that Arbuckle Creek had been dredged in the past and that sediment from the creek was used in gardens.

Significant bioconcentration of PCBs can occur in the fatty tissue of domestic or game animals. Such contamination and subsequent human exposure may or may not have resulted. ATSDR does not know whether livestock or game animals are currently being contaminated. However, it appears very unlikely that significant contamination to livestock could occur since off-site sediment and soil samples are relatively low, based on the most recent environmental sampling. Game animals which feed on-site could potentially receive more substantial contamination than livestock raised downstream of the site. However, snapping turtles which frequent the site and adjacent Arbuckle Creek should have the greatest opportunity for significant contamination.

PCBs are not readily taken up into plant tissue or fruits and vegetables. PCB-contaminated dust, that may accumulate on the surface of fruits and vegetables, can sometimes be a concern when gardens are located in or near greatly contaminated soil and when dry dusty conditions exist (43,44). However, gardens in the Minden community are not located immediately surrounding the site and relatively low PCB levels have been found in off-site soil. Furthermore, peeling and thorough washing of garden produce can eliminate most surficial contamination. Since there are no data to indicate whether or not components of the locally raised food chain are contaminated, a potential human exposure pathway exists through ingestion of those products. The number of potentially exposed people is unknown.

Addend the discussion under "Food Chain" in the Eliminated Exposure Pathways subsection (page 18) to indicate:

EPA has documentation stating there are no game and edible species of fish in Arbuckle Creek. Except for snapping turtles, the aquatic food chain (fish) was eliminated as an exposure pathway.

Addend the first paragraph under the Toxicological Evaluations subsection (page 18) to indicate:

Adults and children who trespass can gain access to the Shaffer site, and may be exposed to polychlorinated biphenyl compounds (PCB) through dermal contact, dust inhalation, and inadvertent ingestion of contaminated soils. Exposure to contaminated on-site soils would be intermittent, and therefore, represents a minimal potential exposure. Children who played in

off-site residential yards and those who played in Arbuckle Creek may have been exposed to contaminated soils and sediments. Past PCB sediment concentrations were high. Nothing is known about the frequency and duration of exposure. Therefore, ATSDR could not evaluate the public health implications of this exposure. Current concentrations of PCBs in sediment and residential soil appear to be low and decreasing with time; therefore, exposures are thought to have minimal public health consequences. Remedial and other workers on the site have the same potential routes for exposure; however, remedial workers normally follow appropriate work practices and use personal protective equipment. There are some concerns regarding possible exposure through the ingestion of snapping turtles from Arbuckle Creek, domestic and game animals, and garden produce, but no data are available to evaluate those potential exposures. Past on-site workers and their families were probably exposed to levels of PCBs; however, no data exist to quantify exposure. The public health implications of this exposure therefore cannot be assessed.

Addend by deleting the following paragraph (and its associated reference) from the Health Outcome Data Evaluation subsection (page 23).

Another study was conducted by a Beckley, West Virginia gynecologist (11) who submitted a health survey to ATSDR in 1989 for an evaluation. Although the survey did indicate areas of health concern similar to those mentioned previously, the survey did not encompass the Minden area. The design and methodology of the study were obscure. Therefore, ATSDR was not able to draw any conclusions for this public health assessment.

ATSDR Comment: As discussed previously, ATSDR is addending discussions involving the health survey above, based on information provided to ATSDR in the June 28, 1993, meeting.

Addend Conclusion number 3 (page 25) to indicate:

A potential health hazard exists for sensitive subpopulations such as fetuses and breast-fed infants, if their mothers eat PCB-contaminated snapping turtles or wild game from the area. Currently, there are uncertainties as to the existence of snapping turtles at the SEC site.

Addend Recommendation number 1 (page 27) to indicate:

Because it is not clear whether snapping turtles are being eaten from the area of the site, the general population and especially pregnant women and women who breast feed infants should be cautioned not to eat aquatic life (snapping turtles) or wild game from the site vicinity, until a bioassay (chemical analysis) is performed to determine if the PCB levels in edible tissues are safe (below regulatory standards). ATSDR could not conclude with any certainty that snapping turtles are not caught and eaten from the site vicinity.

Addend the heading for Table 7 in Appendix 2 (page 55) to indicate:

On-site and Off-site PCB Surface Soil Contamination

Addend by replacing Table 14 in Appendix 2 (page 61) with the following table:

TABLE 14 EXPOSURE PATHWAYS

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS				TIME	
	SOURCE COCs	MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE		EXPOSED POPULATION
COMPLETED EXPOSURE PATHWAYS						
On-site workers	PCB oils	Air, Direct contact	Plant operations	Dermal, Inhalation, Ingestion	SEC workers, estimated 30-50 and worker's families	Past
Off-site soils, sediments	PCB	Residential yards, Arbutckle Creek sediments	Arbutckle Creek	Inhalation, Dermal, Ingestion	Children playing in yards, creek-unknown number and frequency of exposure	Past, Present, Future
POTENTIAL EXPOSURE PATHWAYS						
Off-site use of PCB contaminated oil as fuel	PCB contaminated oils, PCDD/PCDF	Air, Direct contact	Handling, Incomplete burning of PCB contaminated oil	Inhalation, Dermal, Ingestion	Off-site residences-unknown number	Past
On-site use of PCB contaminated oil as fuel in SEC building	PCB contaminated oils, PCDD/PCDF	Air Direct contact	Handling, Incomplete burning of PCB contaminated oil	Inhalation, Dermal, Ingestion	SEC workers, estimated 30-50	Past
Food chain	PCB contaminated snapping turtles, domestic or game animals, and garden produce	Locally raised meats or produce, turtles, and game animals	Human consumption	Ingestion	Persons eating garden produce, turtles, and domestic and game animals- unknown number	Past, Present, Future
On-site SEC surface soils, sediment	PCB contaminated soils, sediment	Soil, Sediment, Fugitive dust	Contaminated SEC soils, sediment	Inhalation, Dermal contact, Ingestion	Trespassers- unknown number and unknown activities, On-site workers	Past, Present, Future
SEC Equipment Building	PCB, PCDD/PCDF	Air, Dust	Inside Building surfaces	Inhalation, Dermal, Ingestion	Workers- unknown number	Past, Present, Future

TABLE 14 CONTINUED--EXPOSURE PATHWAYS

ELIMINATED EXPOSURE PATHWAYS						
Remedial workers	PCB	Soil, Air, Sediments	Remedial activities	Inhalation, Dermal, Ingestion	Remedial workers-unlikely because appropriate safety measures required for on-site activities	Past, Present, Future
Food chain	PCB	Fish	Arbuckle Creek	Ingestion	No edible fish, no exposed population	Past, Present, Future

COCs = Contaminants of concern

ATSDR Comment: Based upon ATSDR site visits in the past, no gardens or farm animals were observed in the site vicinity. However, information regarding gardens in the area, stream sediment being used in gardens, domestic game raised downstream, and game animals near the site was brought up during the meeting on June 28, 1993. Based on that information, ATSDR has, in this addendum, addressed garden produce and domestic and game animals as a potential, instead of an eliminated, exposure pathway.

REFERENCES

43. Travis CC and AD Arms. "Bioconcentration of Organics in Beef, Milk, and Vegetation." *Environmental Science and Technology* 1988; 3:271-274.
44. Travis CC and HA Hattemer-Frey. "Uptake of Organics by Aerial Plant Parts: A call for Research." *Chemosphere* 1988; 2:277-283.
45. ATSDR. Toxicological Profile for Selected PCBs (Aroclor-1260, -1254, -1248, -1242, -1232, -1221, and -1016. April 1993.

APPENDIX A

CONCERNED CITIZENS TO SAVE FAYETTE COUNTY, INC. 1985
P. O. Box 75 - Minden, WV 25879 - (304) 469-6247

Chair. [REDACTED]
Vice-Chair. [REDACTED]
Second Vice-Chair [REDACTED]
Third Vice-Chair. [REDACTED]
Secretary [REDACTED]
Treasurer [REDACTED]
Technical Advisor [REDACTED]
Medical Advisor [REDACTED]

RECEIVED
8-9-93
L.O. Askew
DHAC/OD



[REDACTED]

(1985-1991)

7/28/93

Lydia Ogden Askew
Community Involvement Liaison
ATSDR-Division of Health Assessment and Consultation
1600 Clifton, Road, NE (E32)
Atlanta, Georgia 30333

Dear Lydia,

I am writing you on behalf of Concerned Citizens To Save Fayette and the residents of Minden, West Virginia to express appreciation for members of the ATSDR travelling to Minden on the June 28, 1993 for the meeting to explain the Public Health Assessment for the Shaffer Equipment Company with the residents. However, as stated in the meeting, the Concerned Citizens as well as the residents reject the findings of the ATSDR as to potential danger of the Shaffer site to the community and the possible ill health effects of PCB's on the residents.

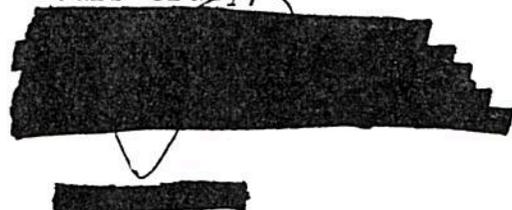
We formally request a new health assessment be made on the community of Minden based on a new analysis that will be fair and just. The new analysis must include an accurate interpretation of health data that has been collected by Concerned Citizens over the past eight years, an investigation of the new sampling that the EPA has agreed to conduct (all inpute on where and how to sample should be directed to the

*"Eight Years Struggling for Economic & Social Justice:
Fighting to insure Fayette County a clean, safe, and healthy environment."*

EPA by August 27,1993), an examination into the health concerns of the residents to be conducted by the ATSDR and the West Virginia State Health Department by using a well established protocol that reflects adverse health conditions of PCB exposure and physical examinations, assistance by the agencies to the Concerned Citizens in their efforts to conduct a health registry (produced by the Environmental Health Network,Inc., Great Bridge Station P.O. 16267 Chesapeake, Va. 16267) of all Minden residents and former Shaffer employees as to discern the possible health effects of PCB's on the community, a reanalysis of all data previously submitted by the EPA relating to the sampling process of the area based on the ill fated and fraudulent direction of On-Site Coordinator Bob Caron, and an intense examination of the site relaing to possible exposure pathways to the community of PCB's and the residual amounts of PCBs in the area of Minden.

I would like to note that the Shaffer site is not secure, that we believe that the community is at a dire health threat from the PCB contamination, and that the health assessment that was presented to community was saturated with inaccuracies. It is hoped that the ATSDR will conduct a new health assessment that reflects the degree of econmic and social justice that the Minden residents deserve.

Yours truly,

A large rectangular area of the document is completely blacked out, redacting the signature and name of the sender. A small, thin horizontal line is visible below the main redacted block.

cc: Jeff Church
Charles Walters
Senator Bob Holliday
Senator Jay Rockefeller
Senator Robert Byrd
Congressman Rahall
Steering Committe of Concerned Citizens to Save Fayette
County



Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

SEP 9 1993

[REDACTED]
Concerned Citizens to Save Fayette County
P.O. Box 75
Minden, West Virginia 25879

Dear [REDACTED]:

I am writing in regard to the public meeting held in Minden, West Virginia, on June 28, 1993, by the Agency for Toxic Substances and Disease Registry (ATSDR). This meeting was held to discuss ATSDR's final Public Health Assessment of the Shaffer Equipment Company. In addition, our agency has received your letter of July 28, 1993, which you addressed to Ms. Lydia Ogden-Askew.

My staff has informed me that you and other attendees raised several issues of concern at that meeting, some of which you have also reiterated in your recent letter. Specifically, these five primary concerns have been expressed:

- o People have been exposed to site-related contaminants through gardens, farm animals, and game.
- o A health survey, by Dr. Charles Merritt, was referenced in the public health assessment, but it did not encompass The Minden Area and did not belong in the document.
- o A door-to-door health survey was not conducted as part of the public health assessment.
- o A health study was not conducted as part of the public health assessment.
- o For these reasons, the document is invalid and should be completely redone.

I would like to briefly discuss each of these five issues.

ATSDR staff did not observe any gardens, farms, or game animals around the site during their August 25, 1989, and May 29, 1990, site visits and therefore discussed the food chain as an eliminated pathway. No information that addressed the issue of PCB exposure to the public through food was provided to ATSDR during the document's public comment period. We first learned this was a concern during the public meeting, at which time we were told chickens and hogs are raised downstream of the site,

gardens are raised downstream in the flood plain, sediments dredged in the past from the Arbuckle creek were sometimes used in gardens, and game animals access the site. Research has indicated that polychlorinated biphenyls (PCBs) are bioaccumulated (stored) in fat. Therefore, garden vegetables and fruits are not likely to be a source of exposure. However, domestic and game animals could become contaminated. They can be addressed as a potential pathway in the same manner that snapping turtles were addressed in the document. Specifically, ATSDR's first recommendation on page 27 states, "Because it is not clear whether snapping turtles are being eaten from the area of the site, the general population and especially pregnant women and women who breast feed infants should be cautioned not to eat aquatic life (snapping turtles from the site vicinity until a bioassay (chemical analysis) is performed to determine if the PCB levels in edible tissues are safe (below regulatory standards)." ATSDR will addend the document as needed to address these new food chain issues.

Regarding the concern about the health survey, ATSDR is uncertain how the study, which was pointed out in the meeting as being a part of another site, was represented as part of the Shaffer Equipment Company file. Regardless, ATSDR stated in the Health Outcome Data section of the public health assessment (p. 23) that "...the survey did not encompass the Minden area.... Therefore, ATSDR was not able to draw any conclusions for this public health assessment." In other words, it did not affect ATSDR's conclusions and recommendations. However, ATSDR will addend the petitioned public health assessment to reflect the fact that the survey should not be included in the document.

The third and fourth issues raised during the meeting, regarding a door-to-door health survey and a health study, need further clarification. I have enclosed an ATSDR flier that briefly explains what a petitioned public health assessment is and what it does. As stated in the flier, I will reiterate that a public health assessment is not the same thing as a medical exam or a community health study, but it evaluates environmental contamination, exposure pathways, and adverse health effects that might occur. A public health assessment provides the basis for further actions, including health surveys and studies, if needed. Based on the current information and data reviewed, ATSDR's assessment of the Shaffer Equipment Company site indicates that neither a door-to-door health survey nor a health study are warranted at this time.

Lastly, ATSDR does not believe that the document is invalid or that it should be completely reconducted. The Shaffer Equipment Company Petitioned Public Health Assessment was conducted using data and information collected during the site visit, public meetings, public comment period, interviews with former Shaffer employees, from the Concerned Citizens to Save Fayette County,

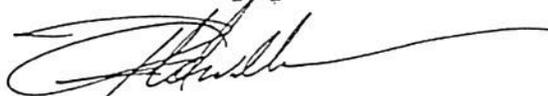
West Virginia Bureau of Public Health, the United States Environmental Protection Agency, and other sources of information as referenced in the petitioned public health assessment. Therefore, based on the data and information evaluated at that time, ATSDR believes that its assessment was accurate and appropriate.

However, based on information provided regarding the "Food Chain" pathway and the survey by Dr. Merritt, ATSDR will issue an addendum to the final release of the Shaffer Equipment Company Petitioned Public Health Assessment. This addendum will reflect changes brought about as a result of the June 28, 1993, meeting. However, the new information provided and addended, does not support any change in the conclusion category. The conclusion category for the site will remain, a public health hazard on-site and an indeterminate public health hazard for the general off-site population.

The addendum will be released for a 30-day public comment period. Any comments received during the comment period will be addressed and included in the addendum. The addendum; therefore, will contain an explanation of the addendum, how and where the original document is being addended, a copy of this letter, a copy of your letter to Ms. Ogden-Askew, and the public comments with responses.

If you have any further questions, please feel free to contact Mr. Jeff Church or Ms. Ogden-Askew of my staff.

Sincerely yours,



Robert C. Williams, P.E., DEE
Director
Division of Health Assessment
and Consultation

Enclosure



Petitioned Public Health Assessments

ATSDR developed this fact sheet to provide the public with information about its Petitioned Public Health Assessments. You may have questions the fact sheet doesn't answer or need more information about ATSDR and its activities. A contact person is listed at the end of the fact sheet.

What is ATSDR?

ATSDR is the **Agency for Toxic Substances and Disease Registry**, a federal public health agency. ATSDR is part of the Public Health Service in the U.S. Department of Health and Human Services. ATSDR is not a regulatory agency like the U.S. Environmental Protection Agency. Created by Superfund legislation in 1980, ATSDR's mission is to **prevent or mitigate adverse human health effects and diminished quality of life resulting from exposure to hazardous substances in the environment**. Through its programs -- including surveillance, registries, health studies, environmental health education, and applied substance-specific research -- and by working with other federal, state, and local government agencies, ATSDR acts to protect public health.



What is a Public Health Assessment?

An ATSDR Public Health Assessment is **not** the same thing as a medical exam or a community health study. It can sometimes lead to those things, as well as other public health activities. ATSDR conducts a Public Health Assessment for every site on or proposed for the National Priorities List (also known as the Superfund list). ATSDR can also be petitioned to conduct a Public Health Assessment for other sites.

A Public Health Assessment reviews information about hazardous substances at a site and evaluates whether exposure to those substances might cause any harm to people. Public Health Assessments consider —

- what the levels (or "concentrations") of hazardous substances are
- whether people might be exposed to contamination and how (through "exposure pathways" such as breathing air, drinking or contacting water, contacting or eating soil, or eating food)
- what harm the substances might cause to people (or the contaminants' "toxicity")
- whether working or living nearby might affect people's health
- other dangers to people, such as unsafe buildings, abandoned mine shafts, or other physical hazards

To make those determinations, ATSDR looks at three primary sources of information —

- **environmental data**, such as information available on the contaminants and how people could come in contact with them
 - **health data**, including available information on community-wide rates of illness, disease, and death compared with national and state rates
 - **community concerns**, such as reports from the public about how the site affects their health or quality of life
- How Can I Petition for a Public Health Assessment?

The petition process is very simple. All you have to do is write to:

Assistant Administrator, ATSDR (CHB)
1600 Clifton Road, NE (E28)
Atlanta, GA 30333

In your letter, you **must** include the following information:

- your name, address, and phone number
- the name of the group you represent, if any
- the name, location, and description of the facility or release
- information you have about people's exposure to a toxic substance
- a request that ATSDR perform a Public Health Assessment

This information is also helpful to ATSDR, but not required:

- anything else you can provide about the facility or release — such as the chemical you are concerned about, the amount in the environment now or in the past, or the parties you believe may be responsible
- exposure pathways
- how many people might be exposed — particularly how many older persons and children
- other government agencies you have contacted or which have investigated already*

What Happens After ATSDR Gets My Petition?

When ATSDR receives a petition, a team of environmental scientists, physicians, toxicologists, and other staff members is assigned to work on it. This team begins to gather information available on the site. Team members visit the site to see it first-hand and talk with the community. After that, the team evaluates all site information and presents the results to the ATSDR petition committee. That committee decides whether ATSDR will perform a Public Health Assessment or if some other action — such as a Public Health Advisory or Health Consultation or community environmental health education — would better meet the community's needs, or if no action is needed. Petitioners are informed of ATSDR's decision and the reasons for it in writing.

Fact sheets are available on Public Health Advisories, Health Consultations, and other ATSDR activities. If you want to know more about ATSDR, please contact the person listed below.

For more information, call or write:

Lydia Ogden Askew
Community Involvement Liaison
ATSDR-Division of Health Assessment and Consultation
1600 Clifton Road, NE (E32)
Atlanta, Georgia 30333
404/330-9543 (24 hours)

* This data collection has been reviewed and approved by the Office of Management and Budget in accordance with the Paperwork Reduction Act and assigned the control number 0920-0204.

APPENDIX B

**Comments Received During the ATSDR Public Comment Period
September 27 - November 6, 1993**

Note: The comments are taken directly from a letter written to ATSDR in response to the public comment draft of the Shaffer Equipment Company Petitioned Public Health Assessment Addendum. No changes were made to spelling, wording, or sentence structure to avoid misrepresentation of the comment.

Comment 1: The Concerned Citizens fully supports the comments made to ATSDR by the Environmental Health Network and Director, Linda King relating to the Addendum to Minden.

Response to Comment 1: ATSDR has not received comments directly from the Environmental Health Network, Inc. However, ATSDR was copied on a letter from the Environmental Health Network, Inc., to the Concern Citizens to Save Fayette County. Your comments largely parallels the contents of that letter and are addressed as follows.

Comment 2: The past soil and water analysis by the EPA has been flawed (based upon Bob Caron's fraudulent work and the method of analysis using Archlor 1260 as the comparison base in the gas chromatograph instead of 1254 and other derivatives of PCB's found on the site-point put forth time and time again by Technical Advisor, Paul McGhee).

Response to Comment 2: ATSDR reviewed the Aroclor data submitted by EPA and found that the majority of the samples were analyzed for all aroclor congeners including 1254. Aroclor 1260, in the majority of the cases, appears to be the most predominant and most concentrated Aroclor detected. Furthermore, for health evaluation purposes, ATSDR does not distinguish between Aroclor 1254 and 1260 or any of the other Aroclors, since the toxic effects of the Aroclors are essentially identical at similar concentrations.

Comment 3: There are gardens that lie in the direct pathway of contamination and crops grown in contaminated PCB do in fact retain and absorb levels of contamination. Dr. Marvin Legator, University of Texas Medical Branch and Dr. Theo Colburn, World Wildlife Fund, both concur that resident have and will retain levels of PCB's that will be detrimental to their health. Gardens are a primary source of food in Minden.

Response to Comment 3: ATSDR has addressed gardens as a potential exposure pathway in this petitioned public health assessment addendum (page 2). PCBs are not readily taken up into plant tissue or fruits and vegetables. Although plants can uptake PCBs from the soil, they have a very low bioconcentration factor (i.e., they do not result in significant contamination) (45). Contamination of fruits and vegetables can occur through deposition of contaminated soil onto plants and its fruits or vegetables, which could ultimately result in higher levels of PCB

contamination. However, based on the relatively low levels of PCBs detected in off-site soils, which appear to indicate that minimal levels of PCBs are migrating off site by the air or other means, it is unlikely that significant contamination of fruits and vegetables will result.

Comment 4: Many residents do in fact eat wild game from the Minden area and some do have livestock which probably are polluted by PCB's.

Response to Comment 4: ATSDR addressed this issue in this petitioned public health assessment addendum (page 2). In the addendum, ATSDR acknowledges the use of livestock and wild game by addressing this as a potential exposure pathway. Based on the relatively low levels of PCBs detected in off-site soil and sediment, significant contamination of livestock appears unlikely. Wild game feeding on site could potentially be exposed to greater levels of contamination. Therefore, in this addendum ATSDR has recommended (Recommendation 1, page 3) that the general population and especially pregnant women and women who breast feed infants should be cautioned not to eat aquatic life (snapping turtles) or wild game from the site vicinity until a bioassay (chemical analysis) is performed to determine if the PCB levels in edible tissues are safe (below regulatory standards).

Comment 5: The tree bark samples should be analyzed for PCDF's and Dioxin an analysis included in the assessment.

Response to Comment 5: ATSDR forwarded EPA the comment, regarding tree bark sampling that was made to ATSDR under the public comment period for the June 1, 1993, petitioned public health assessment (Comment 1, page 72). ATSDR will evaluate any tree bark sampling deemed necessary by EPA. However, the potential for tree bark to be significantly contaminated and the subsequent use of wood resulting in significant exposures to polychlorinated dioxins and furans does not appear to be a likely pathway based upon on- and off-site characterization.

Comment 6: There is no "Burm" or protective measure to stop PCB's from migrating from the site and being ditributed throughout the community.

Response to Comment 6: PCBs bind tightly to soil and do not readily leach into the groundwater or dissolve in surface water under normal conditions (45). However, PCBs adsorbed to soil particles can migrate off-site as a result of soil erosion. ATSDR discussed this issue in the petitioned public health assessment under the Completed Exposure Pathways subsection (page 16). In that subsection, ATSDR determined that the migration of PCBs from the site appears to have occurred, but that concentrations in the off-site sediment have decreased with time. As discussed in the Toxicological Evaluations subsection (page 19), exposure to current levels of PCBs in off-site sediment are not believed to pose a significant public health threat. In a September 1, 1993, letter to EPA, ATSDR recommended that precautions and/or actions be taken to prevent contaminant migration, if the current condition of the soil or vegetative cover is disturbed.

Comment 7: The site is not secure.

Response to Comment 7: ATSDR reported in the petitioned public health assessment that the site is not secure and recommended (Recommendation 3, page 27) that access to the site be restricted. ATSDR still recommends that access to the site be restricted to prevent possible exposures with elevated levels of PCBs, until adequate surface soil sampling indicates otherwise or other actions are taken to prevent possible exposures to any on-site contamination.

Comment 8: The main dumping area, the "Pit", has not been analyzed by core sampling.

Response to Comment 8: ATSDR has no data regarding dumping or contamination at the dumping area referred to as the "Pit." Specific information and/or data are needed to determine whether this dumping pit poses a health threat. ATSDR has forwarded this comment to EPA for any necessary actions needed to obtain this data. Any further information or documentation (location, history, etc.) regarding the dumping pit should be provided to EPA.

Comment 9: The sediment of Minden Mine #3 has not been analyzed.

Response to Comment 9: Based upon on- and off-site environmental data and completed and potential exposure pathways, ATSDR has made recommendations for additional sampling. In this petitioned public health assessment, ATSDR recommended (recommendation 5, page 27) sampling of raw water supplies based on reports of PCB dumping in mine shafts that are used for raw water supplies. ATSDR is not aware of any pathways of exposure to sediment in mine shafts or the need for such sampling. ATSDR has forwarded this comment to EPA. Any further information or documentation should be provided to EPA.

Comment 10: The ATSDR needs to work with Dr. Hassan Amjad (Oak Hill, WV) in order to conduct an in-depth health survey of the Minden residents.

Response to Comment 10: In the development of the petitioned public health assessment, ATSDR reviewed various environmental, toxicological, and health outcome data. The health outcome data, as discussed in the Health Outcome Data Evaluation subsection (page 21), reviewed includes adipose (fat) samples for 20 former Shaffer employees and residents (1986-87), 10 serum (blood) samples (1986-87), 43 additional serum samples (1990), a health survey conducted by Vanderbilt University's Appalachian Student Health Coalition (1986), and cancer mortality data for Fayette County. Based on that information, it was concluded (Conclusions 6, 7, 9, 10; page 26) that the serum and adipose samples do not indicate an increased exposure to PCBs in comparison to other populations; an increased rate of respiratory deaths for Fayette County (in comparison to U.S. rates) exist, but also existed prior to operation of Shaffer Equipment Company; no clear relationship could be established between PCB contamination and the significantly different observed rates of the four symptoms surveyed in the *Vanderbilt Study*; and that overall the toxicological and health information do not currently indicate high levels of

exposure to PCBs or increases in health outcomes that can be linked to PCB exposure. In addition, ATSDR's Health Activities Recommendation Panel reviewed the petitioned public health assessment. Based on their review, no additional surveys or studies were recommended.

Comment 11: The ATSDR should in fact support the Concerned Citizens in their effort to complete a five year health registry of the Minden Residents and former Shaffer employee, (in conjunction with EHN, Inc.).

Response to Comment 11: ATSDR does not currently have a PCB Subregistry. ATSDR's National Exposure Registry is composed of chemical-specific subregistries as opposed to site-specific subregistries. The primary purpose of the National Exposure Registry is to assess the possible relationship of adverse health effects of an exposed population to their exposure to a specific chemical. This is accomplished by collecting health data on exposed persons at selected sites where the exposure occurred to that chemical. ATSDR has not yet determined which chemicals will be selected for future subregistries; PCB, as will all chemicals found at waste sites, will be considered for selection. The criteria for selection are contained in the "National Exposure Registry Policies and Procedures Manual." Trichloroethylene, Benzene, and Dioxin Subregistries have been established. Chromium and radioactive substances subregistries will be established next year.

APPENDIX C - PETITIONED PUBLIC HEALTH ASSESSMENT

Public Health Assessment for

PETITIONED PUBLIC HEALTH ASSESSMENT
SHAFFER EQUIPMENT COMPANY
MINDEN, FAYETTE COUNTY, WEST VIRGINIA
CERCLIS NO. WVD981038300
JUNE 1, 1993

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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Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services

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SUMMARY

The Shaffer Equipment Company (SEC) site, located in Fayette County, Minden, West Virginia constructed electrical substations for area coal mines from the period 1970 to 1984. The site is approximately one acre and has one building (SEC Equipment Building) that served as both a warehouse and office. Electrical equipment such as transformers, switches, circuit breakers, and capacitors were stored on the site. Dielectric oils that contained polychlorinated biphenyls (PCBs) and 1,2,4-trichlorobenzene were found in on- and off-site soils and sediments. Because PCBs are on site and PCB-contaminated oils reportedly were burned as starter fuel in the warehouse/office building, on- and off-site soil samples and on-site sediment samples were analyzed for polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzo-p-furans (PCDFs). On- and off-site soil and on-site sediment concentrations of PCDDs and PCDFs were not judged by the Agency for Toxic Substances and Disease Registry (ATSDR) to be at levels of public health concern. Sampling for PCDD/PCDF and PCB contamination was not conducted for the warehouse/office building.

There is a great deal of community concern and interest about the SEC site. There have been several studies, surveys and reports on the site regarding excess cancers and other adverse health effects. In addition, the Concerned Citizens to Save Fayette County (CCSFC) arranged to have blood and adipose tissue sampling/analysis for PCBs from residents of the area. ATSDR requested that data from the CCSFC. The information has been included in this public health assessment.

A past, completed PCB-exposure pathway was identified for on-site SEC workers and their families. Routes of exposure may have been: 1) dermal contact (contact with contaminated soil, sediments, occupational exposure from handling dielectric oils, secondary exposures of family members primarily through washing clothes contaminated with dielectric oils), 2) inadvertent ingestion (ingestion of small amounts of contaminated soils, sediments from soiled hands during eating, smoking, drinking and other activities), and 3) inhalation of contaminated airborne dusts. This past, completed pathway does not currently exist because SEC is no longer an active, operating facility.

Several past, potential PCB-exposure pathways were also identified for on-site workers and off-site residences that used PCB-contaminated oils as starter fuel for coal igniting. The routes of exposure may have been: 1) inhalation (incomplete burning of PCBs and formation of PCDD and PCDF compounds), 2) dermal contact (handling of PCB-contaminated oils), and 3) inadvertent ingestion (ingestion of contaminants from soiled hands). Those past, potential pathways no longer exist, as PCB-contaminated oils are no longer available from SEC.

Other potential pathways that have been identified as past, present, and future concerns involve trespassers onto the SEC site, children playing in yards and Arbuckle Creek, on-site workers in the SEC Equipment Building, and persons that eat snapping turtles from the area.

Of special concern are individuals who eat snapping turtles that may have been PCB-contaminated from the SEC site. Snapping turtles may bioaccumulate PCBs in the flesh; therefore, pregnant women and nursing mothers are cautioned not to eat snapping turtles caught in the site vicinity until such turtles are caught, bioassayed, and determined safe to eat. Sensitive subpopulations to chemical contamination are fetuses and breast-fed infants who may receive PCB exposure from across the placental barrier or through mother's milk.

Surface water from Arbuckle Creek is contaminated with fecal coliform bacteria associated with the improper disposal of human wastes. The fecal coliform source has not been identified. If analyses do not find PCB contamination in turtles, aquatic life from Arbuckle Creek should still not be eaten until the source of the fecal coliform bacteria is removed or unless the food is thoroughly cooked. Recreational uses of the creek should be restricted until further testing indicates fecal coliform counts are within public health guidelines.

ATSDR has determined that the SEC site (on-site) continues to pose a public health hazard for trespassing adults and children, and for on-site workers. These groups are at risk of inadvertently ingesting, inhaling, and or having dermal contact/absorption with on-site surface soils and sediments that were highly contaminated with PCBs in the past and where contamination may still exist. Based on recent off-site PCB sampling in the vicinity of SEC, ATSDR believes the SEC site is an indeterminate public health hazard for the general off-site population under current conditions because complete PCB data were not available for off-site surface water and off-site groundwater contamination. There is no significant human exposure evident in regard to off-site soils, sediments and air pathways.

ATSDR has made recommendations to eliminate or reduce the potential for future exposures. Recommendations have also been made for additional on-site characterization, specifically for surface soil sampling. ATSDR's Health Activities Recommendation Panel made recommendations for follow-up investigation and possible retesting of an infant/child showing levels of PCBs in serum, referral of the final public health assessment to the National Institute for Occupational Safety and Health for review, and possible investigation of past worker exposures, and environmental health education for local public health professionals and the medical community.

ATSDR released a draft of this public health assessment, for public comment, from January 25 - February 23, 1993. ATSDR addressed those comments in Appendix 4 of this document. A public meeting is planned to follow the release of the final Shaffer Equipment Company Public Health Assessment.

BACKGROUND

A. Site Description and History

The Shaffer Equipment Company (SEC) site is in Fayette County, Minden, West Virginia (Figure 1), off Old Minden Road (Route 17). The facility constructed electrical substations for area coal mining industries from 1970 to 1984. SEC stored unneeded, damaged, or outdated transformers, capacitors, switches, and voltage regulation/distribution devices on site. Leaks from that equipment, possible spills, and dumping practices appear to be responsible for the on-site polychlorinated biphenyl (PCB) contamination. Local newspapers reported on a public meeting held by EPA and attended by ATSDR (May 29, 1990) that PCB oils (oils contaminated with PCBs) were burned on site and may have been given away or sold as fuel. ATSDR interviews (1) with several former Shaffer employees also indicated that this may have occurred.

PCBs are commercial compounds that were widely used for insulation and lubrication in electrical cables, transformers, and other equipment. There are 209 individual PCB compounds. Commercial manufacture of PCBs was stopped in the United States in 1977. Use of PCBs was halted because of the persistence of these compounds in the environment and the potential for adverse health effects from exposure to PCBs (2,3).

The site size is approximately one acre and contains one building (SEC Equipment Building) that served as both warehouse and office (Figure 2). The site is in a valley and is surrounded by hills. The immediate site is flat and is bordered to the northwest by Arbuckle Creek. Arbuckle Creek experiences occasional flooding, which is accompanied by sediment migration. Arbuckle Creek flows to the northeast. The site is bounded on the south by hills, north by Arbuckle Creek, and on the southwest and northeast by fencing. Although access to the southwest part of the property near the warehouse/office was restricted by a chain-link fence and locked chain-link gate, the northeast portion of the property is easily accessed through a cattle gate. Not all of the PCB-contaminated property is fenced. Most of the area that EPA excavated and reclaimed during emergency removal operations of PCB-site contamination in 1984-1985 is not fenced. That includes some property of the Berwind Land Company. There are reports of vandalism and recreational use of the site. Heavy brush and trees cover most of the site, although some areas are cleared for parking and turn-around. No concrete or asphalt pavings are present. There are residences across Arbuckle Creek from the site, both up- and downstream. The Minden wastewater treatment plant is about a mile upstream from the Shaffer site. The plant is permitted to discharge wastewater into Arbuckle Creek.

The West Virginia Department of Natural Resources (WVDNR) visited the site in September 1984. An inspection of the site revealed several hundred transformers and capacitors. A composite surface soil sample and a grab-sample of soil/sediment from a site drainage ditch

into Arbuckle Creek indicated PCB concentrations of 26,749 parts per million (ppm) and 1,136 ppm, respectively.

Subsequent sampling of soil and sediment by EPA in late 1984 indicated PCB contamination ranging from less than 1 ppm to greater than 200,000 ppm. There were approximately 150 transformers and about 50 capacitors on the site; some showing evidence of oil leakage. PCBs had either migrated from the site during occasional flooding or had been spilled into Arbuckle Creek because PCB concentrations of up to 190 ppm were found in creek sediments.

The Centers for Disease Control (CDC) certified in December 1984 that an imminent threat to public health existed because of high levels of PCBs in the environmental media (4). EPA approved funds for an emergency removal of PCBs from the environment and the removal of PCB-contaminated equipment in late December 1984. PCB-contaminated soils were excavated and placed in a clay-lined staging area for treatment. An innovative process for extracting PCBs from soil using freon and methanol was tried without success until November 1985, when the process was terminated. EPA contracted for the removal of the waste pile (4735 tons) by trucking to a hazardous waste landfill in Emelle, Alabama. Removal activities began in September 1987 and ended in November 1987. EPA site operations were declared complete in December 1987.

In April 1989, 19 drums containing paints, solvents, and waste oils were discovered on the site. Those drums were to be previously disposed of by the property owner in an agreement with EPA. The property owner declined responsibility and EPA initiated removal of the drums in May 1989.

On May 24, 1989, ATSDR received a petition from the West Virginia Department of Health (WVDOH) to conduct a public health assessment for the SEC site. ATSDR subsequently accepted the petition.

In March 1990, EPA conducted additional on- and off-site sampling for volatile and semivolatile organic compounds, PCBs, and inorganic chemicals from surface soil, subsurface soil, surface water, sediment, and raw water (water used for public water supplies from the Minden Mine intake and the Rocklick Mine intake). That action was in response to a request from the Agency for Toxic Substances and Disease Registry (ATSDR) for additional off-site sampling. On-site and off-site soil samples were also collected for polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzo-p-furan (PCDF) analyses. Approximately 19 on-site and 5 off-site surface soil/subsoil samples, 6 surface water samples, 7 sediment samples, 1 spring surface water sample, and 2 raw water samples were taken.

In May 1990, EPA resampled for verification purposes, a number of the same locations that tested positive for PCBs from the March 1990 soil/sediment sampling event.

In June 1990, EPA performed additional sampling of three areas near the Shaffer Equipment building in response to reports made by the Concerned Citizens to Save Fayette County (CCSFC) at the May 29, 1990 public meeting.

EPA conducted another emergency removal action from November 1990 to January 1991 to remove soil from the remaining areas containing high levels of PCBs. Sampling was conducted before, during, and following the removal actions.

ATSDR's evaluation of the 1990-91 sampling results, which are the most detailed and includes on- and off-site sampling, will be the primary focus of this public health assessment.

B. Site Visits

ATSDR staff (Lynn Wilder and Donald Joe) visited the Shaffer site on August 25, 1989 and on May 29, 1990. Site conditions were noted including accessibility, demographics, and proximity of any residences to the site. ATSDR met with representatives from the West Virginia Department of Health (WVDOH) and the Fayette County Health Department.

C. Demographics, Land Use and Natural Resource Use

Minden, West Virginia is a small coal mining town of approximately 2,000 inhabitants. During ATSDR's site visit in August 1989, it was noted that the only elementary school in Minden had been closed. There were no schools, parks, playgrounds, nursing homes, or hospitals within a 1-mile radius of Minden. The racial character of Minden was estimated during the site visit to be 90% Caucasian and 10% African-American. There are many elderly people and children in Minden. The average age for the area was estimated to be 30 years. Approximately 65-75 people live within 400-500 feet of the site. In the past, coal mining was prevalent, but many of the coal mines have closed. Homes and yards are well-kept. The general area is economically depressed. Current land use in the vicinity of the site is residential.

In the 1980 census, Fayette County had a population of 57,863. The majority (eighty-four percent) of the population lives in rural areas of the county. Sixty-two percent of those in the county have lived in the same house for at least five years. An additional twenty-three percent have lived in the county for this period but in several different homes (5,6).

Sixteen percent of the county's 19,889 households had annual incomes of less than \$5,000. Seventeen percent of the county residents live below the poverty level compared to twelve percent of the residents in the state. The per capita income in the county was \$5,295 in 1980. (5,6) Reports from the citizens' group (CCSFC) in Minden indicated that the per capita income in Minden is \$4,000.

The racial make-up of the county is predominantly white (93 percent). Eight percent (4,505) of the county residents are under age five and nine percent (4,952) are over the age of sixty-five. In 1980, 15,858 persons over the age of sixteen were employed. Of those, 3,194 (20 percent) were employed in the mining industry. (5,6)

The population figures from 1986 indicated the county's population was falling with a 4.1 percent net loss. In 1984, the percent of persons under age five remained relatively stable at seven percent while the percentage of those over age 65 rose to 14 percent. The birth rate for the county in 1984 was similar to that of the state (12.5 to 12.6 per 1000 population). The crude death rate was 10.6 in the county and the state death rate was 9.8. The infant mortality rate for the county was 7.0 per 1000 live births. This is much lower than the rate of 11.0 per 1000 live births in the state. (7)

D. Health Outcome Data

The evaluation of health outcome data may give a general picture of the health of a community. Those data may confirm the presence of excess disease or illness. However, elevated rates of a particular disease may not be due to hazardous substances in the environment. Other factors such as socio-economic and personal habits may have a tremendous influence in the potential development of disease. In contrast, even if elevated rates are not found, a contaminant may still have caused illness or disease. ATSDR must depend on previously gathered data to perform a public health assessment. There were several sources of health outcome data available for ATSDR review and these are listed as follows:

ATSDR reviewed the 1980 Census for Minden and the Riggans Cancer Mortality Data for Fayette County, West Virginia. (5,6,7,8)

In 1983, the West Virginia Department of Health conducted an examination of cancer mortality statistics for the Oak Hill, W.V. area. ATSDR reviewed the report, *Oak Hill, W.V. Investigation -- Stage I: Initial Assessment*. (9)

In 1986, the Appalachian Student Health Coalition of Vanderbilt University assisted the local citizen's group, CCSFC in conducting a health survey of the residents of Minden. In 1989, CCSFC and the Virginia Student Environmental Health Project conducted a similar survey of the residents of Page, West Virginia to use as a cohort/control population to compare with the Minden survey. ATSDR reviewed both of these surveys. (10)

In 1989, a Beckley, West Virginia gynecologist, who was a member of the Health Department Board of Directors, conducted a health survey and provided the results to the ATSDR Division of Health Studies for evaluation. (11)

Several former employees were contacted by ATSDR by phone to obtain information about health concerns. (1)

At a meeting on May 29, 1990, CCSFC informed ATSDR that blood samples from several volunteers had been analyzed for PCBs. Concurrently, ATSDR was also informed that adipose (fat) tissue was in the process of being sampled and analyzed for PCBs under the direction of the CCSFC. ATSDR requested the results of the blood and fat sampling (results were expected to be available near the end of June 1990). A spokesperson for the CCSFC indicated that the members of CCSFC would have to vote to release the sampling results; however, no problems were foreseen in giving ATSDR the information. ATSDR received the results in February 1991. They have been included in this public health assessment.

In December, 1990, CCSFC took another set of blood samples (approximately 43) and analyzed them for PCBs. ATSDR received the results of those analyses in July 1991. They have been included in this public health assessment.

A review and discussion of the above studies, surveys, and reports are contained in the Public Health Implications Section of this public health assessment.

COMMUNITY HEALTH CONCERNS

ATSDR met with citizens of Minden, West Virginia on May 29, 1990 to discuss community health concerns about the SEC site. Additional community concerns were gathered through interviews with former Shaffer employees (8). The following is a summary of those community concerns:

Residents have repeatedly expressed concerns about the health effects of exposures to PCBs. They are especially concerned about the effects on the liver, kidney, skin and respiratory tract.

Currently and throughout the EPA removal process, CCSFC, the local citizens' group has been actively seeking performance of a health study on previous workers and downstream residents.

The citizens have also expressed a great deal of frustration at the duration and extent of the clean-up process. They feel that not all sources of PCB contamination have been investigated and that local water supplies have been contaminated by PCBs.

These community health concerns will be evaluated and discussed further in the Public Health Implications Section of this public health assessment.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The tables in Appendix 2 list contaminants in each medium. Those contaminants are evaluated in subsequent sections of the public health assessment to determine whether exposure to them has public health significance. ATSDR selects and discusses contaminants based upon several factors. They include concentrations on and off site, the quality of the field and laboratory data, sample design, comparison of on- and off-site concentrations to background concentrations (if available), comparison of on- and off-site concentrations to public health assessment comparison values for noncarcinogenic and carcinogenic endpoints, and community health concerns.

The listing of a contaminant in the tables does not mean that it will cause adverse health effects if exposure occurs at the specified concentrations. The listing of contaminants in the tables means that those contaminants are further evaluated in this public health assessment. The potential for adverse health effects resulting from exposure to contaminants without a comparison value, those that exceed the comparison value, and those of health concern is discussed in the Public Health Implications Section.

Comparison values for ATSDR public health assessments are contaminant concentrations in specific media that are used to select contaminants for further evaluation. ATSDR and other agencies developed those values to provide guidelines for estimating the media concentrations of a contaminant that are unlikely to cause adverse health effects, given a standard daily ingestion rate and standard body weight. See Appendix 3 for a description of the comparison values used in this public health assessment.

A. On-Site Contamination

SURFACE SOIL AND SUBSURFACE SOIL

Sixteen on-site samples and one duplicate on-site sample taken in March 1990 indicated that some PCB contamination remains on site (Table 1). PCB concentrations ranged from not detected to 240 mg/kg in soil. The on-site soils are contaminated, to a minor extent, with other volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) (Table 1).

Of the VOCs, no ATSDR soil comparison values were exceeded and therefore VOCs in surface and subsurface soils will not be considered further.

Of the SVOCs, no soil comparison values were found for, 2-methylnaphthalene, acenaphthylene, dibenzofuran, and di-n-octyl phthalate. In addition, comparison values were

exceeded for benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene. These compounds will be retained for further evaluation in the Public Health Implications Section.

In March 1990, thirteen on-site samples and one duplicate on-site sample were analyzed for PCDDs and PCDFs. The analyses included PCDD and PCDF congeners that were assigned a toxicity equivalency factor (TEF) associated with the most toxic dioxin--2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The TEF was used to calculate the total toxicity associated with all PCDD and PCDF congeners found. ATSDR did not find any PCDD or PCDF levels in the soil samples, except for one sample and its' duplicate sample, that exceeded the ATSDR comparison value EMEG (non-pica child). The sample and its' duplicate were taken from a depression east of the Shaffer Equipment Building. A TEF of 0.128 ug/kg was calculated for the sample and a TEF of 0.801 was calculated for the duplicate sample.

In May 1990, EPA took 14 soil samples (Table 8), four of which were random samples at locations different than those in March 1990. Those random samples showed PCB levels ranging from 0.148 mg/kg to 374 mg/kg. (12)

During a meeting held on May 29, 1990, the CCSFC reported PCB contamination in additional areas of the site. Thirty additional samples were taken near the Shaffer Equipment building and near a shale pile in June 1990. PCB concentrations ranged from "not detected" to 40,300 mg/kg (Table 1A). Four of the 30 soil samples were also analyzed for SVOCs (Table 1B). All of the compounds for which a comparison value was available did not exceed the comparison values and will not be considered further. A comparison value was not available for 2-methylnaphthalene; therefore, this compound will be retained for further evaluation in the Public Health Implications Section.

In November 1990, EPA conducted 58 soil samples which were analyzed for PCBs along with an additional three confirmation and four duplicate samples. These samples were taken prior to and during EPA removal actions. The PCB concentrations ranged from 0.3 to 10500 mg/kg (Table 10), with no PCBs being detected in four of the samples using a detection limit of 0.1 mg/kg.

Post sampling was conducted on January 24, 1991, at the excavated areas. The PCB concentrations ranged from 0.44 to 1020 mg/kg (Table 11). The sampling consisted of 53 samples that were separated into 9 related areas and analyzed as composites from the original samples. Four additional samples were taken from areas on site that were believed to be unimpacted by PCB contamination. One of those four samples revealed a detectable PCB concentration at 0.33 mg/kg. A 1-3 foot cover of soil, taken from the unimpacted areas, was used to fill the excavated areas. The major areas of PCB contaminated soil is believed to have been removed and backfilled; however, it has not been determined that all areas of the site are free from surface soil contamination.

ON-SITE SEDIMENTS

Two on-site sediment samples collected in March 1990 indicated some PCB, VOC, and SVOC contamination at the site (Table 2). The highest PCB level of 660 mg/kg was found in the sediments of the excavated area drainage ditch, located in the area where EPA had previously initiated and completed the 1984-1985 emergency removal of PCBs. Sediment comparison values were not available for the compounds 2-methylnaphthalene and dibenzofuran. Sediment comparison values were exceeded for the compounds benzo(a)anthracene, benzo(a)pyrene, and PCBs. Those compounds with no available comparison values and those that exceed the comparison values will be analyzed further in the Public Health Implications Section.

Two on-site sediment samples (March 1990) were also analyzed for PCDDs and PCDFs, including congeners. ATSDR determined that PCDD or PCDF levels associated with the sediment samples did not exceed the ATSDR EMEG comparison value.

In May 1990, two sediment samples were taken from the same locations as those collected in March of 1990 and analyzed for PCBs only. The May 1990 sampling revealed PCBs at a concentration of 112.1 mg/kg at the building area drainage ditch and 39.2 mg/kg at the excavated area drainage ditch.

AIR

No air sampling data were available for ATSDR's evaluation.

PCB contamination at the Shaffer site are found primarily in soil. The rate of PCB volatilization from soils (i.e., the migration of PCBs by evaporation from the soil into the air) is very small because of soil binding of PCBs (2). The rate of PCB volatilization from surface water into the air is much higher (2); however, PCBs were not detected in surface water samples at the Shaffer site. Because of these factors, PCBs are not expected to be present in ambient air at levels of health concern. When additional site monitoring was conducted in March 1990, EPA and ATSDR decided not to perform air monitoring for PCBs at the Shaffer site (13). However, EPA scanned the site with a field instrument (HNu) in March 1990 to investigate VOCs and SVOCs in the air at the site. That instrument did not detect any organic vapors (VOCs, SVOCs).

GROUNDWATER

No groundwater samples (other than from an on-site spring discussed below) were taken by EPA or were available for ATSDR's evaluation.

An on-site spring (no known uses) that flows into Arbuckle Creek was sampled for VOCs, SVOCs, and PCBs. Nothing was found above the laboratory measuring instrument's limits of detection. However, the PCB detection limits (0.5 $\mu\text{g/l}$ and 1.0 ug/l) of the measuring instrument was higher than the ATSDR CREG comparison value of 0.0045 ug/l , therefore it cannot be stated with certainty that PCBs are or are not a problem. The spring was not analyzed for PCDDs or PCDFs; however, because PCDDs and PCDFs have a high affinity for soils, sediments and have low solubility in water, they are not expected to be present in groundwater or springwater.

SURFACE WATER

No on-site surface water (except for a spring discussed under on-site groundwater) exists.

B. Off-Site Contamination

SOIL

Off-site (residential) surface soils were found to be PCB-contaminated at a maximum concentration of 15 mg/kg in December 1984. In March 1990, five off-site surface soil (but no subsurface soil) samples (Table 3) were taken. Those samples consisted of one background soil sample, three soil samples from residential yards in the area (from two homes that yielded levels of PCBs during an earlier sampling event and one home that had a potential for PCB contamination), and one sample from the mouth of the old Minden Mine. Again, there was some contamination from PCBs, VOCs and SVOCs. The PCB contamination in the samples taken from the yards of three homes and the Minden Mine area ranged from 0 to 2.1 mg/kg .

Comparison values were not available for the compounds 2-methylnaphthalene, acenaphthylene, and dibenzofuran. Comparison values were exceeded for benzo(a)pyrene and PCBs. Those compounds that did not exceed the comparison values will not be considered further. The others with no comparison values available or that exceed comparison values will be further evaluated in the Public Health Implications Section.

Four off-site soil samples taken in March were analyzed for PCDDs and PCDFs and their congeners. No sample exceeded ATSDR's PCDD or PCDF EMEG comparison value.

SURFACE WATER

Five surface water samples (two upstream and three downstream from the site) were collected and analyzed for PCBs, VOCs and SVOCs (Table 4). PCBs were not found in the

surface water samples above the level of the detection limit of the laboratory's measuring instruments. However, as under on-site groundwater, the PCB detection limits of the measuring instrument was higher than ATSDR's comparison value. Some VOC and SVOC surface water contamination was found both upstream and downstream of the site. Some of these chemicals (eg., methylene chloride, acetone) are common laboratory artifacts or contaminants introduced by laboratory handling, as evidenced by their presence in laboratory blank samples. The reported levels of all contaminants except methylene chloride were not above comparison values; therefore these surface water contaminants will not be considered further in this health assessment. Methylene chloride is will also not be considered further. ATSDR believes the elevated concentrations were the result of laboratory contamination.

No surface water sampling for PCDD or PCDF was performed during March sampling. Although no PCDD and PCDF analyses were conducted for surface water, those compounds are not expected to be found in surface water in any appreciable amounts due to their physical and chemical characteristics. PCDDs and PCDFs will normally leave surface water and adsorb onto sediment that tightly bind the compounds (14). Because PCDD and PCDF were not found above ATSDR's comparison values in on-site soil or sediment, levels are not expected to be found in surface water.

SEDIMENT

Five off-site sediment samples were collected in March 1990 and analyzed for PCBs, VOCs, and SVOCs (Table 5). PCBs were found above the comparison value in the off-site sediments at a maximum of 5.2 mg/kg. Benzo(a)anthracene, benzo(b)fluoranthene, and benzo(a)pyrene were also found above the sediment comparison value. Comparison values were not available for 2-methylnaphthalene, dibenzofuran, and di-n-octyl phthalate. Those compounds that did not exceed the comparison values will not be considered further.

No off-site sediment sampling for PCDD or PCDF was performed during any sampling. However, because on-site soils and sediments did not contain PCDDs and PCDFs at levels above comparison values, off-site sediments are not expected to contain levels of PCDDs/PCDFs that came from the site above comparison values.

AIR

No off-site air samples were taken during any sampling period.

GROUNDWATER

Two raw water supplies at the Minden Mine intake (West Virginia American Water Company) and the Rocklick Mine intake (Arbuckle Public Service District) were sampled for

PCBs, VOCs, and SVOCs (Table 6). This action was taken by EPA in response to concerns by the CCSFC and the community that PCBs were disposed in the mine shafts. All results were below the detection limits except for levels of methylene chloride, which ATSDR considered a result of laboratory contamination ("B" identifier in the Table indicates that methylene chloride was found in the laboratory sample blank). However, the PCB detection limits (0.5 ug/l and 1.0 ug/l) of the measuring instrument was higher than the ATSDR CREG comparison value of 0.0045 ug/l, therefore it cannot be stated with certainty that PCBs are or are not a health concern.

PCBs are rarely found in groundwater because PCBs have an affinity for soils, sediments, and organic matter. PCBs also have low leaching potential under normal soil conditions (2).

No PCDD or PCDF analyses were performed on the raw water samples above. No other groundwater samples were taken during the March sampling.

As discussed in surface water, PCDDs and PCDFs are not expected in any appreciable amounts in groundwater due to their physical and chemical characteristics. These compounds will separate out of groundwater and adsorb onto soil particles that tightly bind the compounds. Because PCDD and PCDF were not found above comparison values in the soil, high levels are not expected to be found in the groundwater.

BIOTA

No data are available on PCB levels in aquatic biota (snapping turtles). It is not certain whether there are snapping turtles in the site vicinity. No PCB sampling of fish has been performed. EPA has stated that there are no edible species of fish in Arbuckle Creek.

Some PCBs are highly resistant to degradation and may bioaccumulate in aquatic species. The concentration of PCBs in fish, shrimp, and oysters can reach 26,000 to 660,000 times their concentrations in water. Area residents have reportedly eaten snapping turtles taken from the area (15,16). There is evidence in the literature that PCBs bioconcentrate in snapping turtles (reptiles)(14).

OTHER SOURCES OF ENVIRONMENTAL SAMPLING DATA

ATSDR received a copy of a report entitled *Community Health and PCB Exposure in Minden, West Virginia* dated September 1989 (10) that contained additional PCB sampling data. The data are in Table 7 and the sampling locations are stated in Figure 3. Those results agreed closely with the EPA sampling results from March 1990. Reported on-site PCB levels were lower than discovered by EPA (64.4 mg/kg [soil] versus 240 [soil] and 660

mg/kg [sediment]). Off-site PCB concentrations (soil and sediment) in the report were similar to EPA values.

C. Quality Assurance and Quality Control (QA/QC)

The results of this Petitioned Health Assessment are based on an evaluation of the sampling data obtained from the March 1990, May 1990, and June 1990 sampling conducted by EPA and the data obtained from the *Community Health and PCB Exposure in Minden, West Virginia* report dated September 1989 (10). Some of the data that ATSDR reviewed, showed methylene chloride (Tables 4, 6) and acetone (Table 4) contamination. ATSDR believes detection of methylene chloride and acetone was the result of contamination by the laboratory of samples with common solvents used in preparation of the samples for analysis. The validity of the analysis and conclusions drawn for this Petitioned Health Assessment are determined by the availability and reliability of the referenced information.

In May 1990, EPA resampled several on-site locations previously sampled in March 1990 to verify PCB concentrations in the soil/sediment (Tables 8, 9). Data from each sampling locations are not listed in Tables 8 and 9. Only the minimum, lowest positive, and maximum PCB concentration of all the samples are given.

In comparing the raw PCB data taken in May and March 1990, several discrepancies in PCB concentrations were noted for samples that were taken from the same location. Ideally, samples from the same location should indicate the same concentration of contaminant. However, when the same locations were resampled, anomalies in the sampling results occurred between the two dates. For comparison, on-site soil PCB concentrations (110 mg/kg) identified in the March 1990 sampling was 9.6 mg/kg in the May 1990 sampling. In another comparison, an on-site soil PCB concentration of 17 mg/kg identified in March 1990 was 538.9 mg/kg in May 1990 for the same sampling location. The reasons for the discrepancies are unknown. It is very probable that differences in sampling technique, sampling depth, physical changes because of weather and finding the exact same sampling spot would have had a profound effect on sampling outcome.

EPA, in May 1990, also resampled several on-site locations sampled in March 1990 to verify PCB concentrations in the sediments (Table 9--note that only the minimum, lowest positive and maximum concentrations are given). Again, several discrepancies were noted. A PCB concentration (660 mg/kg) identified in the March 1990 sampling was 39.2 mg/kg in May 1990. Again, the reasons for the discrepancies are unknown.

D. Physical and Other Hazards

ATSDR health assessors saw no apparent physical hazards at the site.

TOXIC RELEASE INVENTORY

In order to identify other possible facilities that might contribute to the release of contaminants into the environment near Minden, ATSDR searched the most recent data in the Toxic Chemical Release Inventory (TRI). EPA developed TRI from the chemical release (air, water, and soil) information provided by specified industries. For any of the 300 - plus toxic chemicals in TRI, EPA requires that the manufacturing industry report annual estimated releases to the environment. TRI data are those releases from manufacturing, processing, and otherwise use of toxic chemicals. The database does not distinguish spills or unintentional releases from routine releases. TRI showed no facilities in the Minden area that released PCBs to the environment.

PATHWAYS ANALYSIS

To determine whether people are exposed to contaminants released from the SEC site, ATSDR evaluated the environmental and human components that lead to human exposure. This pathways analysis consists of five elements: 1) source of contamination, 2) environmental medium in which the contaminants may be present or may migrate, 3) points of human exposure, 4) routes of human exposure such as ingestion, inhalation, or dermal absorption, and 5) receptor population. ATSDR identifies exposure pathways as completed, potential, or eliminated. A completed exposure pathway exists in the past, present, or future if all five elements of an exposure pathway link the contaminant source to a receptor population. Potential pathways, however, are defined as situations in which at least one of the five elements is missing, but could exist. Potential pathways indicate that exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future. Pathways are eliminated when at least one of the five elements is missing and will never be present. Completed and potential pathways may also be eliminated when they are unlikely to exist, or to be significant. All completed, potential, and eliminated exposure pathways at SEC are presented in Table 14 of Appendix 2.

A. Completed Exposure Pathways

A past, completed exposure pathway for the on-site workers was identified at the SEC site. While SEC was operating, plant workers could have been exposed to PCBs during the handling, recycling, refurbishing, and removal of liquid and filling of PCB-type transformers, capacitors, and switchgear. However, the concentration of PCBs reaching the workers is unknown because no environmental sampling was done during active facility operations. Indirectly, the workers may have exposed their families to PCBs by returning home with PCB-soiled clothing.

ON-SITE WORKERS

SEC employees were probably exposed to PCBs during plant operation via inhalation, dermal contact, and inadvertent ingestion. Interviews by ATSDR with several former SEC employees indicated that safe handling practices of PCB oils were lax (1). Some employees' hands were soaked in PCB oils while they changed transformer taps. Other employees stated that by the end of the day their clothes were soaked with PCB oils and that washing did not always remove the oils. Washing PCB-soaked clothes with other family members' clothes would contaminate those clothes, exposing other family members to PCB oils primarily through dermal contact and inadvertent ingestion. Those employees worked at the SEC site for an estimated average of 5-7 years. ATSDR believes employees and their families are the people most likely to have been exposed to significant levels of PCBs, although the actual duration and magnitude of exposure are not known.

OFF-SITE SURFACE SOILS, SEDIMENTS

Off-site (residential) surface soils were PCB-contaminated at a maximum concentration of 15 mg/kg in December 1984. Later sampling results in March 1990 indicate a maximum of 2.1 mg/kg of PCBs in residential soils. PCBs adhering to surface soils can migrate or be transported by surface-water runoff and erosion from on-site sources. PCBs found in the sediments of Arbuckle Creek (190 ppm, November 1984; 5.2 ppm, March 1990) and in the off-site soil of flood-prone areas downstream (2.1 ppm, March 1990) of the Shaffer site indicate that migration of PCBs has occurred. The concentrations of PCBs in sediments appeared to have decreased over time as transport mechanisms took effect. Arbuckle Creek flows at an average rate of 3000 gallons per minute. Heavily contaminated sediments were probably washed downstream to the New River, reducing PCB concentrations in the remaining sediments. The decrease in PCB concentrations from the November 1984 samples to the March 1990 samples indicate this possibility.

A potential exists for PCB exposure to children playing in contaminated residential soils and the contaminated sediments of Arbuckle Creek. PCB concentrations in both the residential soil and sediments appear to have decreased with time. Children playing in PCB-contaminated soils or sediments may be exposed through inhalation of airborne dusts (soil), dermal contact (soil and sediment), or inadvertent ingestion from soiled hands (soil and sediment).

B. Potential Exposure Pathways

OFF-SITE USE OF PCB-CONTAMINATED OIL AS FUEL

PCB-contaminated oils were also reported to be given away or sold as starter fuel to the general population (1). If so, exposure could occur from handling PCB-contaminated oils

and possibly inhaling the PCB, PCDF, and PCDDs generated from incomplete combustion of the PCBs. Inadvertent ingestion might also occur if PCB-soiled hands were used in eating, smoking, or drinking. No data exist on the amounts of PCB-contaminated oils that were sold or given away, who burned the PCBs, who were possibly exposed to PCBs, PCDFs and PCDDs, or the severity of the exposure. Because these events took place in the past, it would be difficult, if not impossible, to quantify PCB, PCDF and PCDD exposure.

ON-SITE USE OF PCB-CONTAMINATED OIL AS FUEL IN SEC EQUIPMENT BUILDING

PCB-contaminated oils were also reported by former employees to be used in the past as a fuel to start coal fires in the Shaffer Equipment Building (1). As above, exposure to on-site workers in the Shaffer Equipment Building could have occurred from handling PCB-contaminated oils and possibly inhalation of the PCB, PCDD, and PCDDs from incomplete combustion of the oils. Inadvertent ingestion could occur if PCB-soiled hands were used in eating, smoking, or drinking. No documentation exists on the quantity of PCB-contaminated oils used as starter fuel, the duration of use, or the amount of worker exposure that may have occurred.

FOOD CHAIN

Early reports from the community stated that residents might have consumed snapping turtles in the area (15,16). Snapping turtles have not been analyzed for PCBs, PCDDs, and PCDFs.

The EPA does not believe that snapping turtles are consumed from this area. At a public meeting on May 29, 1990, EPA asked the audience if snapping turtles were being eaten; there was no response. However, because of limited attendance, a lack of response did not necessarily indicate that turtles were not eaten. Because of the uncertainty surrounding the use of turtles for food and the lack of data regarding turtle contamination, ATSDR could not evaluate if exposure to these contaminants are actually occurring by ingestion. If turtles are being eaten and without data to negate contamination, their ingestion would be considered a potential human exposure pathway.

ON-SITE SURFACE SOILS, SEDIMENTS

Although a fence (part chain-link, part cattle) surrounds part of the site, children and adults may easily gain access to the site. Some parts of the fence prevent only large animals from entry. On-site workers and trespassers may be exposed to PCBs from dermal contact with on-site soil and sediment, inhalation of contaminated airborne particulates from soil, and

from inadvertent ingestion of on-site soil and sediment from soiled hands by playing, eating, smoking, and other activities.

SEC EQUIPMENT BUILDING

It is not known if the SEC Equipment Building is currently used for a business or commercial activity, although some activity has been noted at the site. Both PCDD/PCDF and PCB sampling have not been conducted inside the building. On-site workers, if any, may be exposed to PCBs via inhalation, dermal contact, or inadvertent ingestion from soiled hands by working in the SEC Equipment Building, if the building is contaminated. Because PCB-contaminated oils were reportedly burned as a starter fuel in the building (1), incomplete combustion may have generated PCDD and PCDF compounds.

C. Eliminated Exposure Pathways

REMEDIAL WORKERS

Remedial workers could have been, are, or will be exposed to contaminants in a variety of environmental media while conducting on-site activities in the past, present, and future, respectively. It is unlikely that such exposures would be at levels of concern however, provided appropriate work practices, as defined by the state or federal regulatory or permitting authorities, such as the Occupational Safety and Health Administration (OSHA), are followed. Those include worker education, certification, supervision and training, and use of personal protective equipment.

FOOD CHAIN

Because no farm animals or vegetable gardens were seen in the site vicinity, human exposure should not be occurring through consumption of contaminated plants or farm animals. EPA has documentation stating there are no game and edible species of fish in Arbuckle Creek. Except for snapping turtles, the food chain (fish, vegetable gardens, and farm animals) was eliminated as an exposure pathway.

PUBLIC HEALTH IMPLICATIONS

A. Toxicological Evaluations

Adults and children who trespass can gain access to the Shaffer site, and may be exposed to polychlorinated biphenyl compounds (PCB) through dermal contact, dust inhalation, and

inadvertent ingestion of contaminated soils. Exposure to contaminated on-site soils would be intermittent, and therefore, represents a minimal potential exposure. Children who played in off-site residential yards and those who played in Arbuckle Creek may have been exposed to contaminated soils and sediments. Past PCB sediment concentrations were high. Nothing is known about the frequency and duration of exposure. Therefore, ATSDR could not evaluate the public health implications of this exposure. Current concentrations of PCBs in sediment and residential soil appear to be low and decreasing with time; therefore exposures are thought to have minimal public health consequences. Remedial and other workers on the site have the same potential routes for exposure; however, remedial workers normally follow appropriate work practices and use personal protective equipment. There are some concerns regarding possible exposure through the ingestion of snapping turtles from Arbuckle Creek. Past on-site workers and their families were probably exposed to levels of PCBs; however, no data exist to quantify exposure. The public health implications of this exposure cannot be assessed.

There was vandalism and recreational use of the site prior to EPA emergency removal operations. Activities may have resulted in children and adults being exposed to high levels of PCBs; however, the extent, duration, and magnitude of exposure cannot be quantified. It would be difficult for ATSDR to assess public health implications of this past exposure without quantitative data.

ATSDR has received reports that PCB-contaminated oils were used in the past as a starter fuel to ignite coal for heat at the SEC Equipment Building and for off-site residential use. Therefore, the equipment building and residences that used the PCB-contaminated oil may be contaminated with PCBs, PCDDs, and PCDFs. Sampling inside the building was not performed. Contamination inside the building would most likely affect employees and would best be assessed by the Occupational Safety and Health Administration (OSHA) and the National Institute of Occupational Safety and Health (NIOSH). For residences that used the PCB-contaminated oils, no environmental data were available and the extent, duration, and magnitude of exposure could not be quantified. Without this information, these past exposures cannot be assessed by ATSDR.

At this time, there is not enough evidence to state that PCBs are carcinogenic in humans. EPA has classified PCBs as probable human carcinogens and recommends that all commercial PCB mixtures be considered to have similar carcinogenic potential. The International Agency for Research on Cancer (IARC) has classified PCBs in Group 2B based on sufficient evidence in animals, inadequate evidence in humans, and inadequate evidence for mutagenicity. IARC places chemicals into groups based on their evaluation of the cancer risk to humans from exposure to the chemical. Group 2 are those chemicals felt to be probably carcinogenic for humans. Group 2 is divided into two subgroups A and B with A having stronger evidence to indicate carcinogenicity than those in group B. In addition, NIOSH has recommended that PCBs be regarded as potential human carcinogens in the workplace (2,17).

Studies in animals and occupationally exposed groups have indicated that the liver and skin are the major target organs. Increased serum levels of liver enzymes have been seen in some studies of workers (2,18,19). Other studies have not shown a large number of workers with high enzymes (20,21,22). Increased levels of liver enzymes detectable in the serum are an easily measured marker of liver damage. Dermatological effects such as chloracne, pigmentary changes, rashes, and swelling or thickening have been described (2,20,21,23,24,25). Chloracne is a chronic skin condition produced by environmental exposures to certain compounds containing chemicals such as chlorine or bromine. There are two predominant skin lesions seen in chloracne cases: the chloracne cyst and the comedo. The chloracne cyst is a skin colored sac with a central opening. The comedo is a blackhead. Most studies in workers indicated that those with chloracne also have some evidence of liver injury (22,26).

PCBs have been shown to cross the placenta, thus there may be PCB exposure to fetuses of women who have increased PCB exposure. There have been several reports of effects on development in children of mothers who were occupationally exposed to PCBs during pregnancy or were consumers of PCB-contaminated fish during pregnancy. Those effects have included decreased birth weight, gestational age, and cognitive functioning (2,27,28). One subpopulation sensitive to PCBs are nursing infants. PCBs are fat soluble so they tend to concentrate in the areas of the body with high fat content. Breast milk has a high fat content so PCBs are excreted through the milk. Infants may maintain higher levels of PCBs in their bodies. There have not been many studies to determine the effects of exposure from PCB-contaminated breast milk. One study that was conducted by Gladen et. al. did not demonstrate any effect on infant psychomotor responses associated with exposure through breast feeding (29). During ATSDR's site visit, it was noted that there were many children in the vicinity of the site. The number of women in the area who breast-feed their children is not known. It must be emphasized that ATSDR does not know if fetal exposure to PCBs through breast milk or during pregnancy is occurring and that such exposures are speculative. For those exposures to occur, mothers must eat contaminated turtles or breast-feed after eating contaminated turtles. ATSDR has not been able to confirm or deny the hypothesis that contaminated turtles have been eaten from the site vicinity.

There have not been any studies of PCB levels in the general population, but there have been several small studies of specific groups (see references 2 and 22 for reviews). While differences in methodology make it difficult to directly compare these studies, they do give an indication of the ranges of PCB levels that have been seen. Tables 10 and 11 give a summary of some of these data which will be used in the discussion of health outcome data evaluation in this public health assessment.

The polynuclear aromatic hydrocarbons (PAHs) benzo(a)anthracene, benzo(b)fluorene, benzo(a)pyrene and dibenzo(a,h)anthracene were found at levels exceeding comparison values. PAHs are common contaminants at many sites, often associated with burning of combustible materials. These compounds have little acute effect but have been shown to cause cancer. Long-term exposure to levels exceeding comparison values may result in a

slight increased risk of cancer. However, exposure to these contaminants at SEC is mostly infrequent and sporadic, and is probably insufficient to have any effect.

Appropriate comparison values could not be determined for a 2-methylnaphthalene and acenaphthylene, dibenzofuran, and di-n-octyl phthalate. Therefore, we are unable to determine if the concentrations present are of public health concern. Comparison values may be unavailable for a number of reasons, including uncertainties and conflicting results in animal studies, lack of human studies, and scientific controversies. ATSDR is working to establish comparison values for compounds commonly found at contaminated sites.

Acenaphthylene and 2-methylnaphthalene are PAHs. No comparison values are available for these two PAHs. However, PAHs, in general, have little acute toxicity especially at the relatively low concentrations found at SEC. These two PAHs are not thought to cause cancer.

Dibenzofuran and di-n-octyl phthalate also have no comparison values, largely because the toxicity of these compounds has been little studied. Phthalates as a group have low acute toxicity, but some have been shown to be carcinogenic by non-genetic mechanisms. Di-n-octyl phthalate itself has not been adequately evaluated for carcinogenicity. Dibenzofuran is of low acute toxicity, while its long term effects are uncertain.

B. Health Outcome Data Evaluation

ATSDR has reviewed the results of PCB analysis of adipose (fat) tissue in 20 residents and former employees. In addition, the results from the 1986-1987 serum (blood) sampling was also evaluated (30,31). Those results are provided in the following table:

PCBs in Minden Residents

SAMPLE	NUMBER	AVERAGE	RANGE
Adipose	20	0.564 ppm	0.100 - 0.970 ppm
Serum	10	7.7 ppb	5 - 14 ppb

ppm = parts per million

ppb = parts per billion

The range and mean values seen in the Minden group are consistent with the levels seen in groups without occupational exposure (Table 12). A comparison with the above table and

Table 12 does not indicate increased exposure in Minden residents compared to other populations.

Regarding Table 12, the median PCB levels in blood serum of the general population of the United States without occupational exposure has been found in most studies to be less than 10 ng/mL (ppb), but sex and age of the population must be taken into account (32). Mean serum levels were usually between 4 and 8 ng/mL (ppb), and 95 percent of individuals had levels less than 20 ng/mL (ppb) (2). There have been fewer studies utilizing adipose samples in the population. While there is variation in groups studied, PCB levels in adipose tissue are between 100 and 200 times the levels in blood serum (22). Studies attempting to correlate serum and adipose levels with health effects have had inconsistent results (2).

Follow-up serum samples were drawn on 43 individuals in Minden in 1990. The results from those samples are consistent with other results. There were 30 persons with no detectable levels of PCBs in their sera (Detection limit was 3 ppb). The range of levels seen in persons with detectable PCBs was 3.2 - 11.0 ppb (Mean = 5.0 ppb) (33). The levels are consistent with those seen in the general population.

One infant/child (age unknown, but listed as "0" years when the blood sample was taken) in the 1990 sampling indicate a sera PCB level of 11.0 ppb. This PCB level is unusual for an infant and the accuracy of the test is suspect and should be verified. If the results are verified, further tests and investigation may be necessary to determine and eliminate the source of the PCB exposure.

There have been a few studies of populations surrounding hazardous waste sites in which exposure assessment has been done (Table 13). PCBs in Minden sera are not significantly higher than the ranges of PCBs seen in comparison populations.

A review of the census data for the area demonstrate the factors that may influence exposure and the risk from exposure. The census data indicate that the population is stable and the majority lives in rural areas. A large portion of the population are employed in the mining industry. Industry exposures must be considered when conducting health studies in the area. The per capita income for the Minden area is less than \$4,000. Income influences access to health care and the types of illnesses that the population experiences.

Several health studies were conducted in the Minden area by individuals or organizations. The West Virginia Department of Health (WVDOH) conducted a cancer mortality study of Oak Hill (Minden is on the outskirts of Oak Hill) for the period 1979-1981 (9). The study concluded that there was a greater rate of respiratory cancers in males in the Oak Hill population than in the United States. An evaluation of the study by ATSDR indicated several weaknesses that may have affected the conclusions of the study. One of the concerns is that the study chose to use the U.S. standardized mortality rates rather than West Virginia mortality statistics. Because many males in the area have a history of working in the coal mines, they have a higher risk for developing respiratory cancers. That additional exposure

would not be reflected in the rates for the United States. The results of ATSDR's evaluation of the study are found in Appendix 3. Another aspect of the cancer mortality information comes from data on the Riggans mortality tapes produced by EPA and National Cancer Institute (NCI). Review of the data indicates that Fayette county has had an increased rate of respiratory cancer deaths when compared to the U.S. The increase has been present since the decade of the sixties so factors such as age and occupation that may be associated with the increase would have existed at that time. This increase existed before SEC was operating; therefore, other factors (e.g., age, smoking status, socioeconomics) that could lead to this increase must be examined (8).

In the summer of 1986, the Concerned Citizens to Save Fayette County (CCSFC) sponsored *a health registry of random sampling of Minden and Rock Lick residents*. The study was conducted by Vanderbilt University's *Appalachian Student Health Coalition* and is commonly known as the *Vanderbilt Study*. In 1989, there was a survey of residents in Page, WV that was intended to provide a control group for the 1986 Vanderbilt Study. The survey in Page was part of a Virginia Student Environmental Health Project Intern Report (10). The reports indicated that certain health conditions such as shortness of breath, unexplained weight loss, persistent cough, and urinary tract infections occur at a higher rate in Minden than in Page, WV. The increased incidence of health problems described in the report for the Minden community does not correlate well with current PCB literature regarding symptoms and health effects associated with PCB exposure. ATSDR's Division of Health Studies reviewed the Vanderbilt study and noted the strengths and weaknesses of the surveys conducted in Minden (1986) and Page (1989). The full results of that review are in Appendix 3. ATSDR concluded that *a clear relationship could not be established between PCB contamination and the significantly different observed rates of the four symptoms* (described above). In addition there were variables such as age, smoking history, and history of working in the mines that may affect symptom prevalence. Those variables were not addressed in the two surveys. Socioeconomic and nutritional status should also be considered. *When such variables are not controlled for, one cannot determine what accounted for the findings* (Appendix 3). Although the surveys could not establish a definitive link between PCB contamination and specific health conditions, the surveys did serve to identify diseases of concern for the community such as those described earlier (shortness of breath, unexplained weight loss, persistent cough and urinary tract infections).

Another study was conducted by a Beckley, West Virginia gynecologist (11) who submitted a health survey to ATSDR in 1989 for an evaluation. Although the survey did indicate areas of health concern similar to those mentioned previously, the survey did not encompass the Minden area. The design and methodology of the study were obscure. Therefore, ATSDR was not able to draw any conclusions for this public health assessment.

Past occupational exposures to high concentrations of PCBs have been reported at the Shaffer site. A number of former Shaffer employees were interviewed by ATSDR by telephone to evaluate past work exposure to PCBs, and past and current health (1). One of six employees interviewed reported getting a skin rash while working with PCB oils. Most employees rated

their current health as generally good and could not relate any adverse health effects to working with PCBs. One of the employees participated in the CCSFC serum and adipose (fat) sampling in May 1990.

The area around Minden, West Virginia is economically depressed. Large portions of the population are employed in mining. Such factors must be taken into account when attempting to determine health consequences from possible exposure to PCBs. Previous health studies conducted in the area have identified health outcomes of concern (shortness of breath, unexplained weight loss, persistent cough, and urinary tract infections), but have not found outcomes that have been consistently linked to PCB exposure. The results of the serum and adipose tissue did not indicate body burdens of PCBs that are significantly different than those seen in other non-occupationally exposed populations. The review of the toxicological information and the health information do not indicate high levels of exposure to PCBs at the present time or increases in health outcomes that can be linked to PCB exposure.

C. Community Health Concerns Evaluation

1. What are the effects of PCB exposure on the liver, kidney, skin, and respiratory system?

A discussion of PCB effects on the liver and skin are contained in the Toxicological Evaluations portion of the Public Health Implication Section of this document. The effects of PCBs on the kidney and respiratory system occur mostly at exposures considerably higher than found at this site. PCBs may cause kidney damage (hydronephrosis) including swelling and structural damage. Little effect is seen in the lung, although the lung may be a major route of absorption. PCBs can damage lung membranes, and may lower tolerance to infection, but these effects are unlikely at the exposures seen at this site.

2. The Concerned Citizens to Save Fayette County, a local citizen's group representing a number of residents, has actively sought a health study to be conducted on previous workers and residents downstream (referring to Arbuckle Creek) from the SEC site.

As part of ATSDR's Planned Public Health Actions, ATSDR will contact the National Institute for Occupational Safety and Health (NIOSH) regarding concerns for worker health and provide NIOSH with a copy of the Shaffer Equipment Company Public Health Assessment in order that they may be advised of the potential for past PCB occupational exposures at Shaffer. Follow-up worker health studies, if deemed necessary, are under the purview of NIOSH. Because the latest sampling results indicate low levels of PCBs in residential soils (2.1 mg/kg, March 1990) that are not considered to be a public health hazard, and the results of the two PCB serum tests

indicate levels of PCBs in Minden residents not significantly higher than those seen in comparison populations, a health study of downstream residents does not appear to be beneficial or justified at the present time. Contaminants other than PCBs are not likely to present a health concern at the exposures likely to occur in the future or to have occurred in the past.

- 3. Residents believe that all sources of PCB contamination have not been investigated and that local water supplies have been contaminated with PCBs.**

Additional on- and off-site sampling was conducted by EPA in March 1990, May 1990, and again in June 1990 in response to reports made by the CCSFC. Further on-site sampling and removal actions were conducted between November 1990 and January 1991. EPA is also investigating other sites that were allegedly used to dispose of PCBs from the SEC. These other sites are distinct and separate from the SEC site and will not be addressed in this public health assessment. Local raw water supplies from the Minden Mine intake and the Rocklick Mine intake were sampled in March 1990 by EPA in response to reports by the CCSFC that PCBs were dumped into the mine shafts. All results were below detection limits except for levels of methylene chloride, which ATSDR considered a result of laboratory contamination. However, the PCB detection limits of the measuring instruments were higher than ATSDR's comparison values. Therefore, additional sampling is needed to determine if these raw water sources could affect public health.

CONCLUSIONS

1. The Shaffer Equipment Company site poses a public health hazard because of the on-site risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health effects. Human exposure to on-site PCBs may occur for trespassing adults and children, and on-site workers via inadvertent ingestion, inhalation, and dermal contact/absorption with on-site soils and sediments.
2. The Shaffer Equipment Company site is an indeterminate public health hazard for the general off-site population under current conditions because complete PCB data and information are not available for off-site groundwater and off-site surface water contamination. There is no significant human exposure evident in regard to off-site soils, sediments, or air pathways.
3. A potential health hazard exists for sensitive subpopulations such as fetuses and breast-fed infants if their mothers eat PCB-contaminated snapping turtles from the area. Currently, there are uncertainties as to the existence of snapping turtles at the SEC site.

4. Surface water from Arbuckle Creek is contaminated with fecal coliform bacteria. While ATSDR does not believe the contamination is related to the site, surface water should not be used until further testing indicates that coliform bacteria are within public health guidelines.
5. Based upon the EPA post removal sampling, on-site subsurface soils are still contaminated with PCBs. Since no post removal surface soil samples were conducted, some areas on-site might also still be contaminated. Former workers at the SEC site would normally be the most likely population highly exposed to PCBs. Because PCB-contaminated oils were reportedly burned, on- and off-site soil and on-site sediment sampling and analysis for PCDD and PCDF were conducted. The levels of PCDDs and PCDFs that were found do not represent a public health concern.
6. Serum samples from 1986-1987 and in 1990 on Minden residents that were analyzed for PCBs did not indicate an increased exposure to PCBs when compared to other populations. The levels are consistent with those seen in the general population.
7. Cancer mortality data indicates that Fayette County has had an increased rate of respiratory deaths when compared to the U.S. However, this increase existed before Shaffer was operating; therefore, other factors (e.g., age, smoking status, and socioeconomics) that could lead to this increase should be examined.
8. The PCB detection limit for the off-site raw water supplies, surface water and for the on-site spring were higher than ATSDR's comparison value. ATSDR cannot state with any certainty that the off-site groundwater and surface water pathways are not of public health concern until additional sampling is accomplished.
9. ATSDR evaluated the *Vanderbilt Study* and concluded that *a clear relationship could not be established between PCB contamination and the significantly different observed rates of the four symptoms* (shortness of breath, unexplained weight loss, persistent cough, and urinary tract infections).
10. ATSDR's review of the toxicological information and the health information do not currently indicate high levels of exposure to PCBs or increases in health outcomes that can be linked to PCB exposure. Contaminants other than PCBs are not likely to present a health concern at the exposures likely to occur in the future or to have occurred in the past.

RECOMMENDATIONS

A. Recommendations and HARP Statement

RECOMMENDATIONS

1. Because it is not clear whether snapping turtles are being eaten from the area of the site, the general population and especially pregnant women and women who breast feed infants should be cautioned not to eat aquatic life (snapping turtles) from the site vicinity until a bioassay (chemical analysis) is performed to determine if the PCB levels in edible tissues are safe (below regulatory standards). ATSDR could not conclude with any certainty that snapping turtles are not caught and eaten from the site vicinity.
2. Even if turtles are not contaminated with PCBs, no aquatic life from Arbuckle Creek should be eaten unless thoroughly cooked, because of the fecal coliform bacteria contamination of Arbuckle Creek. Arbuckle Creek should be posted. Recreational uses of Arbuckle Creek should be restricted and surface water from Arbuckle Creek should be sterilized before being used. Such actions are recommended until the source of the elevated fecal coliform bacteria counts is identified and levels are brought below regulatory standards.
3. Due to the unknown condition of the on-site surface soil and sediment following the 1990-91 EPA soil removal action, additional fencing to restrict access is recommended for areas of the site yet remaining unfenced. Surface soil sampling for PCBs would be necessary in order to characterize the site and determine appropriate future uses and restrictions.
4. Based on PCB concentrations in subsurface soil, restriction of future site use and activities particularly regarding the excavation of subsurface soil should be considered in an effort to reduce the potential of human exposure to PCBs.
5. Existing PCB data for on-site groundwater (on-site spring), off-site groundwater (raw water supplies) and off-site surface water, does not indicate contamination with PCBs and the conclusions of this public health assessment are based on those results. However, the PCB detection limits of the measuring instruments were higher than ATSDR's comparison values. Therefore, ATSDR cannot state with any certainty that the groundwater and surface water pathways are not of public health concern until the spring and the raw water supplies are resampled and analyzed with a PCB detection limit of 0.001 ug/l or less.
6. Remedial workers should be provided with adequate personal protective equipment, as required by the Occupational Safety and Health Administration (OSHA), to prevent exposures to contaminants during remedial activities. Also, workers should be required

to follow all other applicable National Institute for Occupational Safety and Health and Occupational Safety and Health Administration guidelines, advisories, and regulations.

7. One child was reported with 11.0 ppb PCBs in the serum. This may have been a laboratory error. The child, if identifiable, should be retested. If the serum PCB levels remain high, intervention to reduce PCB levels and exposure should be taken.
8. When indicated by public health needs, and as resources permit, ATSDR will evaluate additional relevant health outcome data and community health concerns when available.

HARP STATEMENT

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, the data and information associated with the Shaffer Equipment Company Site have been evaluated for appropriate public health actions. There is currently no indication that people are being exposed to contaminants associated with the SEC site at levels of public health concern. Although exposures may have occurred in the past, there is insufficient information to document exposure duration or levels. ATSDR's Health Activities Recommendation Panel (HARP) has determined that an environmental health education program is recommended to advise public health professionals and the local medical community of the nature and possible consequences of exposure to contaminants at the Shaffer Equipment site. The value of obtaining a complete and accurate exposure history will be stressed as part of the program. In addition, information that is provided on PCBs may include, but not be limited to, the physical nature of the contaminant, potential exposure pathways (i.e., soil, water, air, food) and exposure routes (i.e, inhalation, ingestion, dermal), potential health effects, symptoms of exposure and testing and treatment.

In addition, HARP recommends that the public health assessment be forwarded to the National Institute for Occupational Safety and Health for their review and possible investigation of past worker exposure to PCBs at the Shaffer Site.

The Shaffer Equipment Company data that has been evaluated for follow-up health activities included copies of laboratory results from the Pacific Toxicology Laboratories and the National Health Laboratories, Inc. Based on this information, HARP recommends that the results of the PCB level of the infant/child with a PCB level of 11 mcg/l be evaluated for accuracy. If this result is correct, the child should have a repeat test and a case investigation to determine possible exposure routes to PCB materials, including in-utero exposures.

B. Public Health Actions

ACTIONS PLANNED

1. The Division of Health Education in conjunction with the local medical community will provide an environmental health education program to advise health professionals and the local medical community of the nature and possible consequences of exposure to contaminants at the Shaffer Equipment Site.
2. The Division of Health Assessment and Consultation will contact the National Institute for Occupational Safety and Health (NIOSH) regarding concerns for worker populations/families and will provide NIOSH with a copy of the Shaffer Equipment Company Public Health Assessment in order that they be advised of the potential for past occupational exposure to PCBs at Shaffer.
3. The Division of Health Assessment and Consultation will review any new data when it is available to ATSDR and will amend the Shaffer Equipment Company Public Health Assessment if new findings are significant. ATSDR will reevaluate and expand the Public Health Actions when needed. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed actions determine the need for additional actions at this site.
4. The Division of Health Assessment and Consultation will notify the CCSFC and the WVDOH of the HARP recommendation that the results of the PCB level of the infant/child with a PCB level of 11 mcg/l be evaluated for accuracy. If the result is correct, the test should be repeated and a case investigation initiated to determine possible exposure routes to PCB materials, including in-utero exposures.
5. The Division of Health Assessment and Consultation will hold a public meeting, as requested by the CCSFC, following the release of the final Shaffer Equipment Company Public Health Assessment.

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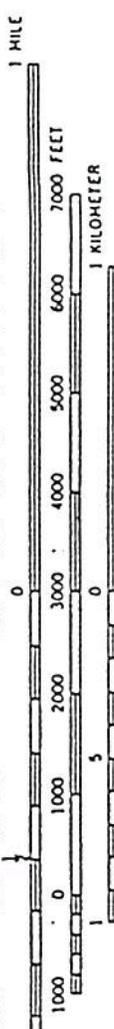
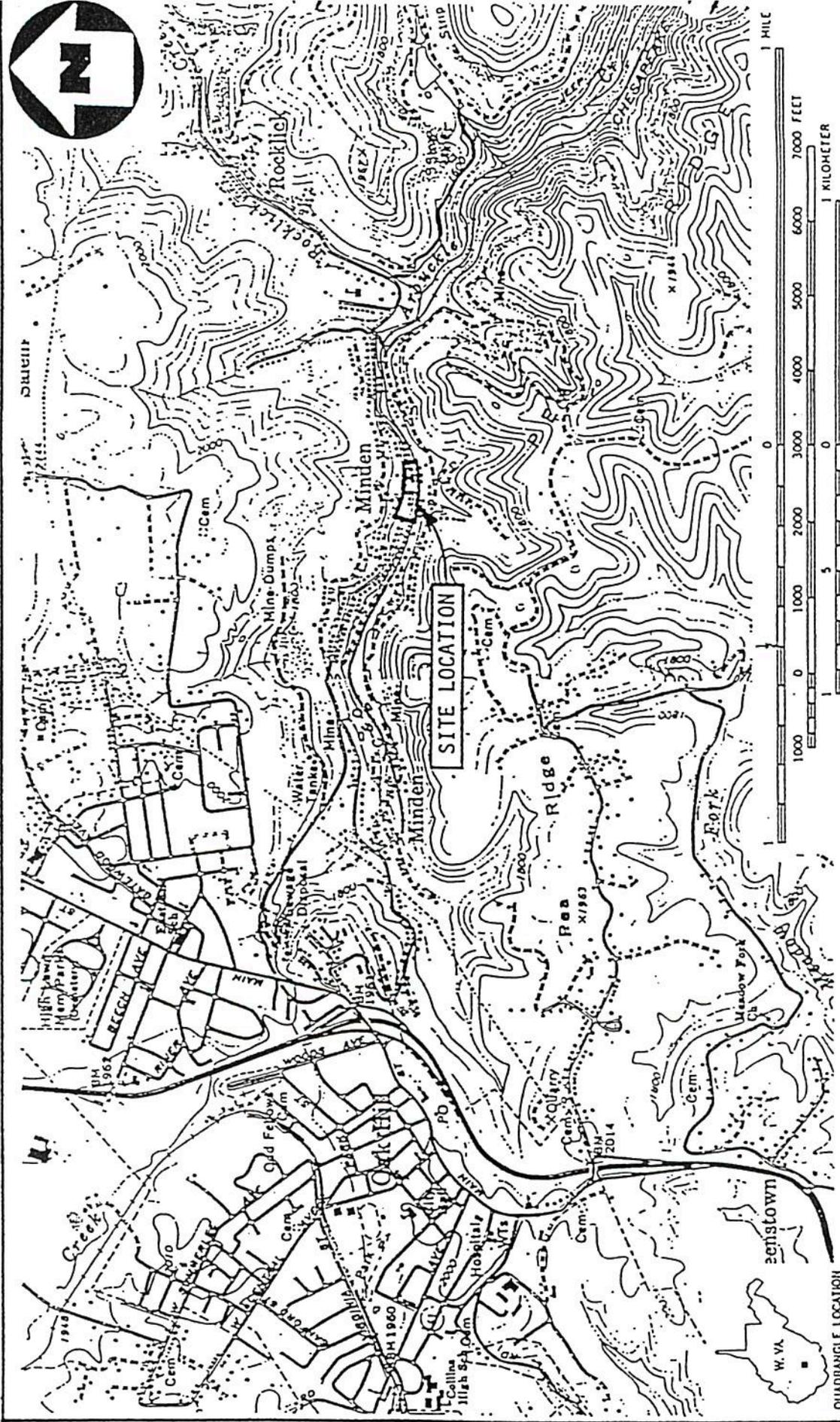
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APPENDIX 1 - FIGURES

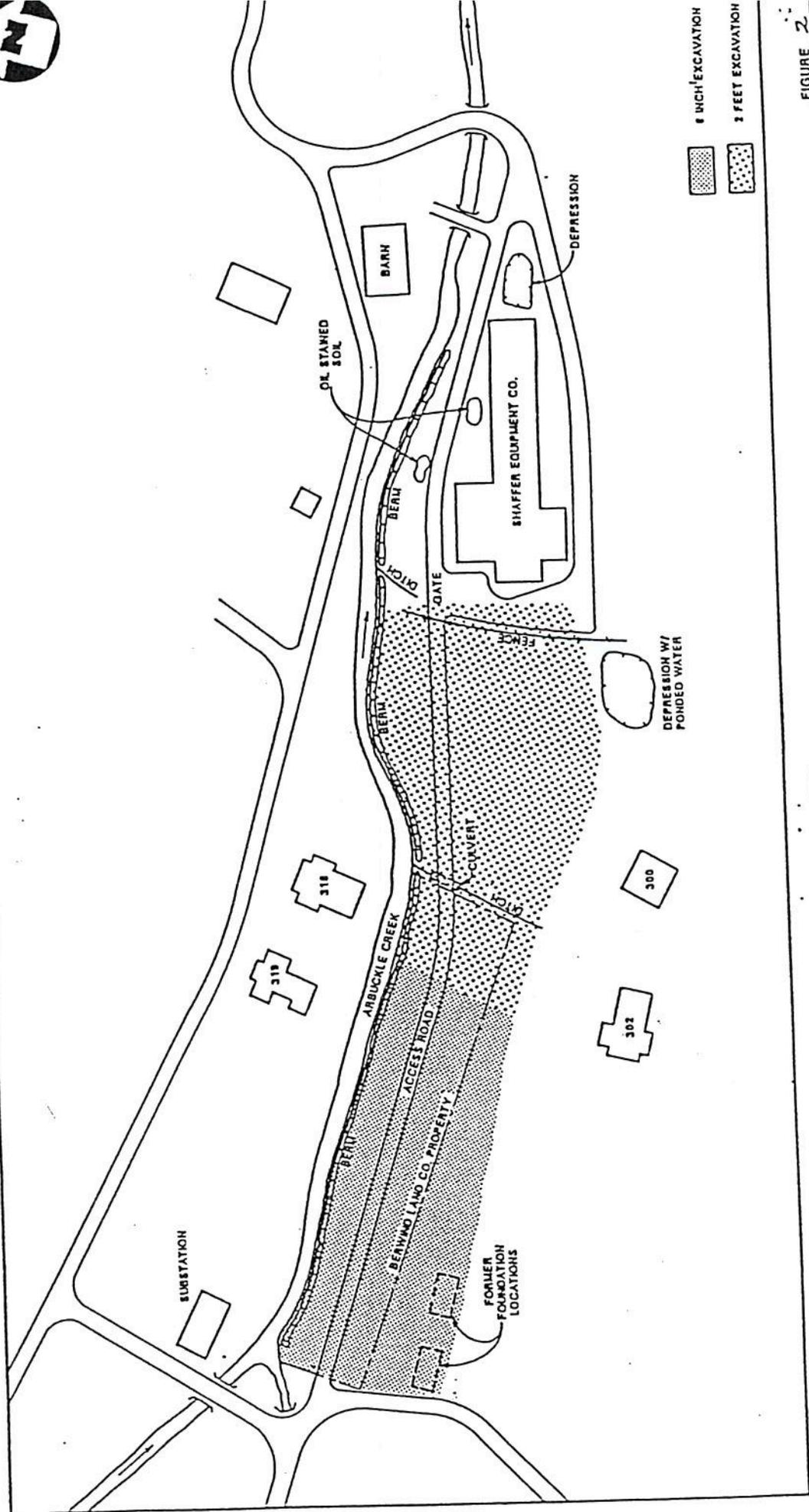


SOURCE: (7.5 MINUTE SERIES) U.S.G.S. OAK HILL & THURMOND, WV QUADS.

SITE LOCATION MAP.
SHAFFER EQUIPMENT CO., MINDEN, WV

SCALE 1: 24000





8 INCH EXCAVATION
 3 FEET EXCAVATION

FIGURE 2

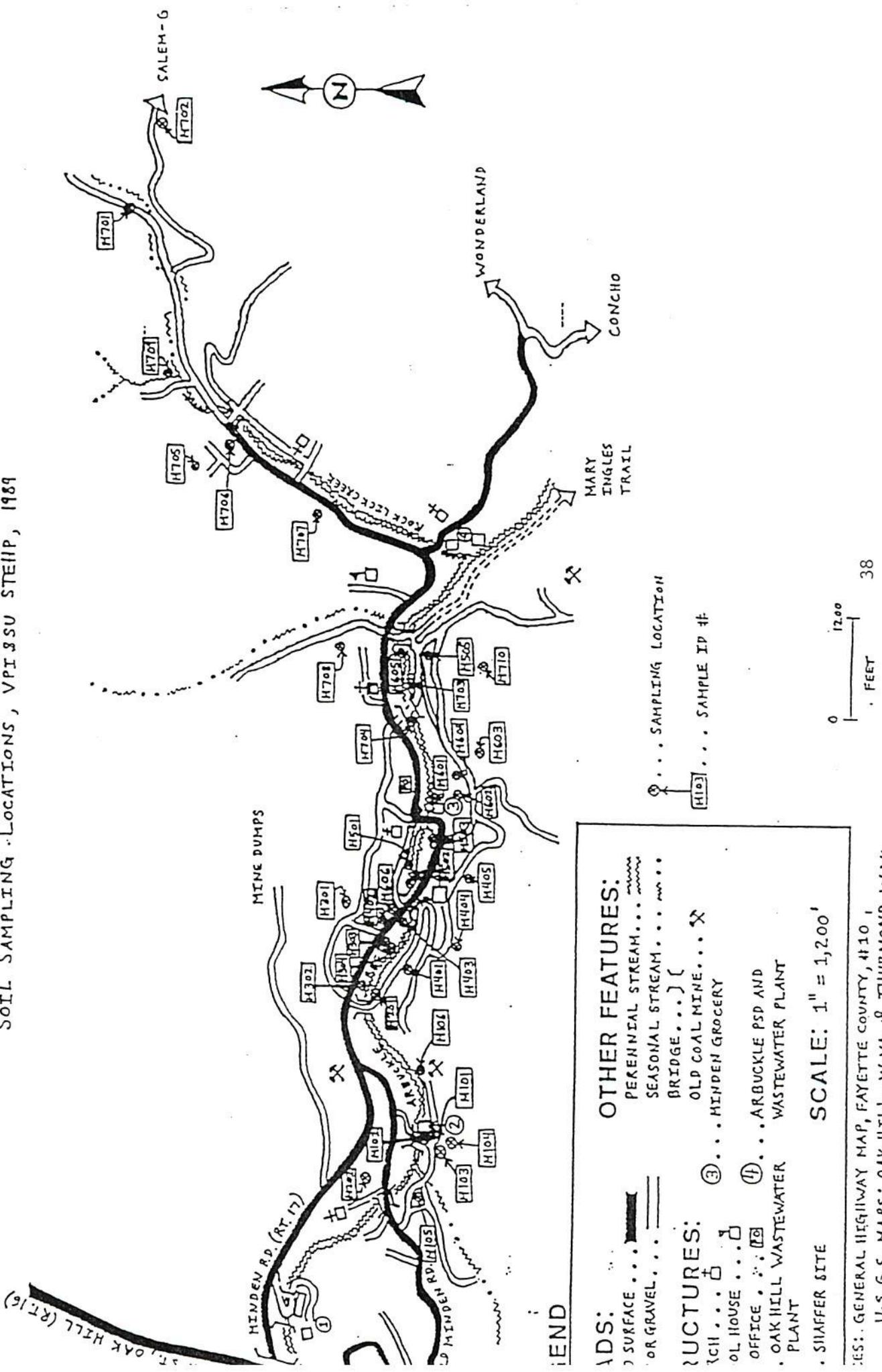


SITE SKETCH
 SHAFER EQUIPMENT CO., MINDEN, WV
 (NO SCALE)

MAP #3

MINDEN AND ROCK LICK, WEST VIRGINIA

SOIL SAMPLING LOCATIONS, VPI & SU STEHP, 1989



OTHER FEATURES:

- PERENNIAL STREAM
- SEASONAL STREAM
- BRIDGE
- OLD COAL MINE X
- HINDEN GROCERY
- ARBUCKLE PSD AND WASTEWATER PLANT

STRUCTURES:

- CH
- OL HOUSE
- OFFICE
- OAK HILL WASTEWATER PLANT

ROADS:

- GENERAL HIGHWAY MAP, FAYETTE COUNTY, 410
- U.S.G.S. MAPS: OAK HILL, W.VA. & THURMOND, W.VA. (PLOT REVISIED 1976)

SCALE: 1" = 1,200'

SAFFER SITE

APPENDIX 2 - TABLES

TABLE 1 ON-SITE SURFACE SOIL AND SUBSURFACE SOIL CONTAMINATION

CONTAMINANT	SURFACE SOIL AND SUBSURFACE SOIL			REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	CONCENTRATIONS (mg/kg)				
	minimum	lowest positive	maximum		
VOLATILES					
methylene chloride	ND	0.003B	0.011	40	93, CREG, "B2"
acetone	ND	0.004J	0.079B	40	5000, Rfd
1,1-dichloroethane	ND	0.170J	0.170J	40	Est 5000, Rfd, "C"
1,1,1-trichloroethane	ND	0.001J	1.900	40	Est 4500, Rfd, "3"
SEMIVOLATILES					
phenol	ND	0.210J	0.470J	40	30000, Rfd
1,4-dichlorobenzene	ND	ND	ND	40	Est 29, oral slope, "C"
4-methylphenol	ND	0.140J	0.350J	40	Est 2500, Rfd
benzoic acid	ND	0.960J	0.960J	40	200000, Rfd
1,2,4-trichlorobenzene	ND	0.150J	7.100	40	Est 500, Rfd
naphthalene	ND	0.040J	3.800	40	Est 2000, Rfd, "D"
4-chloroaniline	ND	ND	ND	40	200, Rfd
2-methylnaphthalene	ND	0.070J	6.500	40	N/A
acenaphthylene	ND	0.051J	0.290	40	N/A
acenaphthene	ND	0.099J	0.110J	40	3000, Rfd
dibenzofuran	ND	0.100J	1.300	40	N/A
fluorene	ND	0.052J	0.230J	40	2000, Rfd, "D"
pentachlorophenol	ND	1.300L	1.300L	40	5.8, CREG, "B2"
phenanthrene	ND	0.074J	4.100	40	Est 1500, Rfd
anthracene	ND	0.039J	0.620	40	15000, Rfd
fluoranthene	ND	0.059J	4.400	40	2000, Rfd, "3"
pyrene	ND	0.060J	4.100	40	1500, Rfd, "3"

TABLE 1 CONTINUED—SURFACE SOIL AND SUBSURFACE SOIL CONTAMINATION

butylbenzyl phthalate	ND	0.051J	0.280J	40	10000, Rfd, "3"
benzo(a)anthracene	ND	0.046J	1.700	40	Est 0.83, oral slope, "B2"
chrysene	ND	0.043J	1.800	40	Est 27, oral slope, "B2"
bis(2-ethylhexyl)phthalate	ND	0.044B	7.100	40	50, CREG, "B2"
di-n-octyl phthalate	ND	0.082J	1.800	40	N/A
benzo(b)fluoranthene	ND	0.064J	1.800	40	Est 0.86, oral slope, "B2"
benzo(k)fluoranthene	ND	0.077J	1.100	40	Est 1.83, oral slope, "B2"
benzo(a)pyrene	ND	0.096J	1.200	40	Est 0.12, CREG, "B2"
ideno(1,2,3-cd)pyrene	ND	0.100J	0.480	40	Est 0.52, oral slope, "B2"
dibenz(a,h)anthracene	ND	0.046J	0.130J	40	Est 0.11, oral slope, "B2"
benzo(g,h,i)perylene	ND	0.065J	0.400	40	Est 5.46, oral slope, "3"
PCBs					
aroclor 1260	ND	0.240	240.000	40	0.091, CREG, "B2"

Sampling date for all samples is March 1990 (Sample numbers CDF20, CDF21, CDF22, CDF23, CDF24, CDF25, CDF26, CDF27, CDF28, CDF29, CDF30, CDF31, CDF32, CDF33, CDF41, CDF42, CDF43).

mg/kg = milligrams per kilograms

B = Not detected substantially above the level reported in laboratory or field blanks.

J = Analyte present. Reported value may not be accurate or precise.

L = Analyte present. Reported value may be low. Actual value is expected to be higher.

ND = Not detected.

N/A = Currently none available

"B2" = EPA classified probable human carcinogen

"C" = EPA classified possible human carcinogen

"D" = EPA—inadequate data to evaluate carcinogenicity

"3" = IARC group—not classifiable as to carcinogenicity

Est = Estimated comparison value from Rfd or oral slope factor

minimum = Lowest concentration of contaminant sampled for all evaluated samples in the table.

lowest positive = If a contaminant is detected, this would be the lowest concentration found for the contaminant that is above "not detected".

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

TABLE 1A ON-SITE PCB SURFACE SOIL CONTAMINATION NEAR SEC BUILDING

SAMPLE NUMBER	SURFACE SOIL	REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	PCB CONCENTRATIONS (mg/kg)		
S01	8.7	41	0.091, CREG, "B2"
S02	4.0	41	
S03	ND	41	
S04	1.5	41	
S05	0.9	41	
S06	ND	41	
S07	1.7	41	
S08	2.1	41	
S09	ND	41	
S10	297.0	41	
S11	4318.5	41	
S12	148.0	41	
S13	467.9	41	
S14	164.2	41	
S15	1297.0	41	
S16	29.0	41	
S17	347.2	41	
S17	79.2	41	
S19	39.7	41	
S20	74.7	41	
S21	864.1	41	
S22	50.9	41	
S23	72.1	41	
S24	2.3	41	
S25	383.1	41	
S26	40302.8	41	
S27	17.3	41	
S27	178.4	41	
S29	10.3	41	
S30	2.6	41	

Sampling date for all samples is June 1990

mg/kg = milligrams per kilograms

ND = Not detected

"B2" = EPA classified probable human carcinogen

maximum = Maximum concentration of contaminant detected

TABLE 1B ON-SITE SURFACE SOIL CONTAMINATION--AREAS 1, 2, AND 3

CONTAMINANT	SURFACE SOIL			REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	CONCENTRATIONS (mg/kg)				
	minimum	lowest positive	maximum		
SEMIVOLATILES					
phenol	ND	ND	ND	41	30000, Rfd
1,4-dichlorobenzene	ND	11.90	11.90	41	Est 29, oral slope, "C"
4-methylphenol	ND	ND	ND	41	Est 2500, Rfd
benzoic acid	ND	ND	ND	41	200000, Rfd
1,2,4-trichlorobenzene	ND	1.08	314.53	41	Est 500, Rfd
naphthalene	ND	1.36	7.13	41	Est 2000, Rfd, "D"
4-chloroaniline	ND	ND	ND	41	200, Rfd
2-methylnaphthalene	ND	2.31	5.80	41	N/A
acenaphthylene	ND	ND	ND	41	N/A
acenaphthene	ND	ND	ND	41	3000, Rfd
dibenzofuran	ND	ND	ND	41	N/A
fluorene	ND	0.50	0.50	41	2000, Rfd, "D"
pentachlorophenol	ND	ND	ND	41	5.8, CREG, "B2"
phenanthrene	ND	0.91	2.00	41	Est 1500, Rfd
anthracene	ND	ND	ND	41	15000, Rfd
fluoranthene	ND	0.50	1.23	41	2000, Rfd, "3"
pyrene	ND	0.57	0.77	41	1500, Rfd, "3"
butylbenzyl phthalate	ND	ND	ND	41	10000, Rfd, "3"
benzo(a)anthracene	ND	ND	ND	41	Est 0.83, oral slope, "B2"
chrysene	ND	0.52	1.07	41	Est 27, oral slope, "B2"
bis(2-ethylhexyl)phthalate	ND	2.53	2.53	41	50, CREG, "B2"

TABLE 1B CONTINUED—ON-SITE SURFACE SOIL CONTAMINATION

di-n-octyl phthalate	ND	ND	ND	ND	41	N/A
benzo(b)fluoranthene	ND	ND	ND	ND	41	Est 0.86, oral slope, "B2"
benzo(k)fluoranthene	ND	ND	ND	ND	41	Est 1.83, oral slope, "B2"
benzo(a)pyrene	ND	ND	ND	ND	41	Est 0.12, CREG, "B2"
indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	41	Est 0.52, oral slope, "B2"
dibenz(a,h)anthracene	ND	ND	ND	ND	41	Est 0.11, oral slope, "B2"
benzo(g,h,i)perylene	ND	ND	ND	ND	41	Est 5.46, oral slope, "3"

Table is compiled from four samples—S19, S25, S26, S28.
 Sampling date of all samples is June 1990

ND = Not detected

N/A = Currently none available

"B2" = EPA classified probable human carcinogen

"C" = EPA classified possible human carcinogen

"D" = EPA—inadequate data to evaluate carcinogenicity

"3" = IARC Group—not classifiable as to carcinogenicity

Est = Estimated comparison value from Rfd or oral slope factor

TABLE 2 ON-SITE SEDIMENT CONTAMINATION

CONTAMINANT	SEDIMENT		REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	CONCENTRATIONS (mg/kg)			
	BLDG AREA DRAIN DITCH	EXCAV AREA DRAIN DITCH		
VOLATILES				
methylene chloride	ND	ND	40	93, CREG, "B2"
acetone	0.003J	ND	40	5000, Rfd
1,1-dichloroethane	ND	ND	40	Est 5000, Rfd, "C"
1,1,1-trichloroethane	ND	ND	40	Est 4500, Rfd, "3"
SEMIVOLATILES				
phenol	ND	ND	40	30000, Rfd
1,4-dichlorobenzene	0.200J	ND	40	Est 29, oral slope, "C"
4-methylphenol	ND	ND	40	Est 2500, Rfd
benzoic acid	ND	ND	40	200000, Rfd
1,2,4-trichlorobenzene	3.700	45.000	40	Est 500, Rfd
naphthalene	0.170J	0.460J	40	Est 2000, Rfd, "D"
4-chloroaniline	ND	ND	40	200, Rfd
2-methylnaphthalene	0.660	0.820J	40	N/A
acenaphthalene	ND	ND	40	N/A
acenaphthene	ND	ND	40	3000, Rfd
dibenzofuran	0.680J	ND	40	N/A
fluorene	0.059J	ND	40	2000, Rfd, "D"
pentachlorophenol	ND	ND	40	5.8, CREG, "B2"
phenanthrene	0.470J	1.700J	40	Est 1500, Rfd
anthracene	ND	ND	40	15000, Rfd
fluoranthene	0.270J	1.200J	40	2000, Rfd, "3"

TABLE 2 CONTINUED--ON-SITE SEDIMENT CONTAMINATION

pyrene	0.230J	1.100J	40	1500, Rfd, "3"
butylbenzyl phthalate	0.049B	ND	40	10000, Rfd, "3"
benzo(a)anthracene	0.120J	1.000J	40	Est 0.83, oral slope, "B2"
chrysene	0.250J	1.500J	40	Est 27, oral slope, "B2"
bis(2-ethylhexyl)phthalate	0.220J	ND	40	50, CREG, "B2"
di-n-octyl phthalate	ND	ND	40	N/A
benzo(b)fluoranthene	0.180J	0.750J	40	Est 0.86, oral slope, "B2"
benzo(k)fluoranthene	0.120J	0.630J	40	Est 1.83, oral slope, "B2"
benzo(a)pyrene	0.110J	0.500J	40	Est 0.12, CREG, "B2"
indeno(1,2,3-cd)pyrene	0.087J	ND	40	Est 0.52, oral slope, "B2"
dibenz(a,h)anthracene	ND	ND	40	Est 0.11, oral slope, "B2"
benzo(g,h,i)perylene	0.083J	ND	40	Est 5.46, oral slope, "3"
PCBs				
aroclor 1260	110.00C	660.00C	40	0.091, CREG, "B2"

Sampling date for all samples is March 1990 (Sample numbers CDF35, CDF36).

mg/kg = milligrams per kilograms

B = Not detected substantially above the level reported in laboratory or field blanks.

J = Analyte present. Reported value may not be accurate or precise.

ND = Not detected.

N/A = Currently none available

"B2" = EPA classified probable human carcinogen

"C" = EPA classified possible human carcinogen

"D" = EPA--inadequate data to evaluate carcinogenicity

"3" = IARC Group--not classifiable as to carcinogenicity

Est = Estimated comparison value from Rfd or oral slope factor

TABLE 3 OFF-SITE SURFACE SOIL CONTAMINATION

CONTAMINANT	SURFACE SOIL			REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	CONCENTRATIONS (mg/kg)				
	minimum	lowest positive	maximum		
VOLATILES					
methylene chloride	ND	0.004B	0.015B	40	93, CREG, "B2"
acetone	ND	0.024B	0.027B	40	5000, Rfd
1,1-dichloroethane	ND	ND	ND	40	Est 5000, Rfd, "C"
1,1,1-trichloroethane	ND	0.002J	0.016	40	Est 4500, Rfd, "D"
SEMIVOLATILES					
phenol	ND	ND	ND	40	30000, Rfd
1,4-dichlorobenzene	ND	ND	ND	40	Est 29, oral slope, "C"
4-methylphenol	ND	0.250J	0.250J	40	Est 2500, Rfd
benzoic acid	ND	ND	ND	40	200000, Rfd
1,2,4-trichlorobenzene	ND	0.170J	0.170J	40	Est 500, Rfd
naphthalene	ND	0.100J	0.120J	40	Est 2000, Rfd, "D"
4-chloroaniline	ND	ND	ND	40	200, Rfd
2-methylnaphthalene	0.100J	0.100J	0.210	40	N/A
acenaphthylene	ND	0.057J	0.089J	40	N/A
acenaphthene	ND	ND	ND	40	3000, Rfd
dibenzofuran	ND	0.050J	0.061J	40	N/A
fluorene	ND	0.100J	0.100J	40	2000, Rfd, "D"
pentachlorophenol	ND	ND	ND	40	5.8, CREG, "B2"
phenanthrene	0.260J	0.260J	0.490J	40	Est 1500, Rfd
anthracene	ND	0.058J	0.087J	40	15000, Rfd
fluoranthene	0.069J	0.069J	0.680	40	2000, Rfd, "3"

TABLE 3 CONTINUED—SURFACE SOIL CONTAMINATION

pyrene	0.120J	0.120J	0.580	40	1500, Rfd, "3"
butylbenzyl phthalate	ND	ND	ND	40	10000, Rfd, "3"
benzo(a)anthracene	ND	0.110J	0.420	40	Est 0.83, oral slope, "B2"
chrysene	0.230J	0.230J	0.560	40	Est 27, oral slope, "B2"
bis(2-ethylhexyl)phthalate	0.096BJ	.096B	0.240B	40	50, CREG, "B2"
di-n-octyl phthalate	ND	ND	ND	40	N/A
benzo(b)fluoranthene	0.094J	0.094J	0.580	40	Est 0.86, oral slope, "B2"
benzo(k)fluoranthene	ND	0.099J	0.370J	40	Est 1.83, oral slope, "B2"
benzo(a)pyrene	0.096J	0.096J	0.430	40	Est 0.12, CREG, "B2"
ideno(1,2,3-cd)pyrene	ND	0.049J	0.260J	40	Est 0.52, oral slope, "B2"
dibenz(a,h)anthracene	ND	0.053J	0.053J	40	Est 0.11, oral slope, "B2"
benzo(g,h,i)perylene	ND	0.044J	0.240J	40	Est 5.46, oral slope, "3"
PCBs					
aroclor 1260	ND	0.960	2.100C	40	0.091, CREG, "B2"

Sampling date for all samples is March 1990 (Sample numbers CDF37, CDF38, CDF39, CDF40, CDF44).

mg/kg = milligrams per kilograms

B = Not detected substantially above the level reported in laboratory or field blanks.

C = Confirmed by GC/MS.

J = Analyte present. Reported value may not be accurate or precise.

L = Analyte present. Reported value may be low. Actual value is expected to be higher.

ND = Not detected.

N/A = Currently none available

"B2" = EPA classified probable human carcinogen

"C" = EPA classified possible human carcinogen

"D" = EPA—inadequate data to evaluate carcinogenicity, "3" = IARC Group—not classifiable as to carcinogenicity

Est = Estimated comparison value from Rfd or oral slope factor

minimum = Lowest concentration of contaminant sampled for all evaluated samples in the table.

lowest positive = If a contaminant is detected, this would be the lowest concentration found for the contaminant that is above "not detected".

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

TABLE 4 OFF-SITE SURFACE WATER CONTAMINATION OF ARBUCKLE CREEK

CONTAMINANT	SURFACE WATER						REFERENCES	COMPARISON VALUE (ug/l) AND SOURCE
	CONCENTRATIONS (ug/l)							
	UPSTREAM OF SEC		DOWNSTREAM OF SEC					
	maximum	minimum	lowest positive	maximum	minimum	maximum		
VOLATILES								
methylene chloride	5.00B	4.00B	4.00B	11.00B		40	4.7, CREG, "B2"	
acetone	39.00B	26.00B	26.00B	31.00B		40	1000, Rfd	
1,1-dichloroethane	N/A	N/A	N/A	N/A		40	Est 1000, Rfd, "C"	
1,1,1-trichloroethane	ND	ND	ND	ND		40	200, LTHA, "3"	
SEMIVOLATILES								
phenol	N/A	N/A	N/A	N/A		40	6000, Rfd	
1,4-dichlorobenzene	ND	ND	ND	ND		40	75, LTHA, "C"	
4-methylphenol	N/A	N/A	N/A	N/A		40	Est 500, Rfd	
benzoic acid	N/A	N/A	N/A	N/A		40	40,000, Rfd	
1,2,4-trichlorobenzene	ND	ND	ND	ND		40	9, LTHA	
naphthalene	N/A	N/A	N/A	N/A		40	20, LTHA, "D"	
4-chloroaniline	N/A	N/A	N/A	N/A		40	40, RFD	
2-methylnaphthalene	ND	ND	ND	ND		40	N/A	
acenaphthylene	N/A	N/A	N/A	N/A		40	N/A	
acenaphthene	N/A	N/A	N/A	N/A		40	600, Rfd	
dibenzofuran	N/A	N/A	N/A	N/A		40	N/A	
fluorene	N/A	N/A	N/A	N/A		40	400, Rfd, "D"	
pentachlorophenol	N/A	N/A	N/A	N/A		40	0.29, CREG, "B2"	
phenanthrene	N/A	N/A	N/A	N/A		40	Est 290, Rfd	
anthracene	ND	ND	ND	ND		40	3000, Rfd	

TABLE 4 CONTINUED—OFF-SITE SURFACE WATER CONTAMINATION OF ARBUCKLE CREEK

fluoranthene	ND	ND	ND	ND	ND	40	400, Rfd, "3"
pyrene	ND	ND	ND	ND	ND	40	300, Rfd, "3"
butylbenzyl phthalate	ND	ND	ND	ND	ND	40	2000, Rfd, "3"
benzo(a)anthracene	ND	ND	ND	ND	ND	40	0.1, PMCL, "B2"
chrysene	ND	ND	ND	ND	ND	40	0.2, PMCL, "B2"
bis(2-ethylhexyl)phthalate	2.00B	1.00B	1.00B	2.00B	2.00B	40	2.5, CREG, "B2"
di-n-octyl phthalate	N/A	N/A	N/A	N/A	N/A	40	N/A
benzo(b)fluoranthene	ND	ND	ND	ND	ND	40	0.2, PMCL, "B2"
benzo(k)fluoranthene	ND	ND	ND	ND	ND	40	0.2, PMCL, "B2"
benzo(a)pyrene	ND	ND	ND	ND	ND	40	0.2, PMCL, "B2"
indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	40	0.4, PMCL, "B2"
dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A	40	0.3, PMCL, "B2"
benzo(g,h,i)perylene	ND	ND	ND	ND	ND	40	Est 0.273, oral slope, "3"
PCBs							
aroclor 1260	ND	ND	ND	ND	ND	40	0.0045, CREG, "B2"

Sampling date for all samples is March 1990.

Upstream sample size = 2 (Sample numbers CDF52, CDF53).

Downstream sample size = 3 (Sample numbers CDF54, CDF55, CDF56).

ug/l = micrograms per liter

B = Not detected substantially above the level reported in laboratory or field blanks.

N/A = None available

J = Analyte present. Reported value may not be accurate or precise.

ND = Not detected.

"B2" = EPA classified probable human carcinogen

"D" = EPA -inadequate data to evaluate carcinogenicity

Est = Estimated comparison value from Rfd or oral slope factor

minimum = Lowest concentration of contaminant sampled for all evaluated samples in the table.

lowest positive = If a contaminant is detected, this would be the lowest concentration found for the contaminant that is above "not detected".

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

N/A = Currently none available

"C" = EPA classified possible human carcinogen

"3" = IARC Group—not classifiable as to carcinogenicity

TABLE 5 OFF-SITE SEDIMENT CONTAMINATION IN ARBUCKLE CREEK

CONTAMINANT	SEDIMENT					REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	CONCENTRATIONS (mg/kg)						
	UPSTREAM OF SEC maximum	DOWNSTREAM OF SEC			maximum		
		minimum	lowest positive	maximum			
VOLATILES							
methylene chloride	ND	ND	ND	ND	ND	40	93, CREG, "B2"
acetone	0.160B	ND	0.033B	0.033B	0.033B	40	5000, Rfd
1,1-dichloroethane	ND	ND	ND	ND	ND	40	Est 5000, RFD, "C"
1,1,1-trichloroethane	ND	ND	ND	ND	ND	40	Est 4500, Rfd, "3"
SEMIVOLATILES							
phenol	ND	ND	ND	ND	ND	40	30000, Rfd
1,4-dichlorobenzene	0.630	ND	0.140J	0.150	0.150	40	Est 29, oral slope, "C"
4-methylphenol	ND	ND	ND	ND	ND	40	Est 2500, Rfd
benzoic acid	ND	ND	ND	ND	ND	40	200000, Rfd
1,2,4-trichlorobenzene	ND	ND	0.160J	0.160J	0.160J	40	Est 500, Rfd
naphthalene	0.059J	ND	ND	ND	ND	40	Est 2000, Rfd, "D"
4-chloroaniline	0.940	ND	ND	ND	ND	40	200, Rfd
2-methylnaphthalene	0.240J	0.066	0.066J	0.098J	0.098J	40	N/A
acenaphthylene	ND	ND	ND	ND	ND	40	N/A
acenaphthene	0.094J	ND	0.047J	0.047J	0.047J	40	3000, Rfd
dibenzofuran	0.100J	ND	ND	ND	ND	40	N/A
fluorene	0.140	ND	0.064J	.064J	.064J	40	2000, Rfd, "D"
pentachlorophenol	ND	ND	ND	ND	ND	40	5.8, CREG, "B2"
phenanthrene	1.300	0.096J	0.096J	0.600J	0.600J	40	Est 1500, Rfd

TABLE 5 CONTINUED—OFF-SITE SEDIMENT CONTAMINATION IN ARBUCKLE CREEK

anthracene	0.290J	ND	0.087J	0.100J	40	15000, Rfd
fluoranthene	2.100	0.110J	0.110J	0.830	40	2000, Rfd, "3"
pyrene	2.000	0.099J	0.099J	0.750	40	1500, Rfd, "3"
butylbenzyl phthalate	0.280J	ND	0.051J	0.051J	40	10000, Rfd, "3"
benzo(a)anthracene	0.870	0.048J	0.048J	0.330J	40	Est 0.83, oral slope, "B2"
chrysene	1.100	0.082J	0.082J	0.390J	40	Est 27, oral slope, "B2"
bis(2-ethylhexyl)phthalate	4.000	0.270J	0.270J	1.000	40	50, CREG, "B2"
di-n-octyl phthalate	0.170J	ND	0.066J	0.066J	40	N/A
benzo(b)fluoranthene	1.400	0.065J	0.065J	0.400J	40	Est 0.86, oral slope, "B2"
benzo(k)fluoranthene	0.970	ND	0.240J	0.270J	40	Est 1.83, oral slope, "B2"
benzo(a)pyrene	0.830J	0.056J	0.056J	0.310	40	Est 0.12, CREG, "B2"
indeno(1,2,3-cd)pyrene	0.370J	ND	0.140J	0.140J	40	Est 0.52, oral slope, "B2"
dibenz(a,h)anthracene	ND	ND	ND	ND	40	Est 0.11, oral slope, "B2"
benzo(g,h,i)perylene	0.290	ND	0.110J	0.130J	40	Est 5.46, oral slope, "3"
PCBs						
aroclor 1260	ND	ND	5.200	5.200	40	0.091, CREG, "B2"

Sampling date for all samples is March 1990.

Upstream sample size = 2 (Sample numbers CDF47, CDF48)

Downstream sample size = 3 (Sample numbers CDF49, CDF50, CDF51)

ug/kg = micrograms per kilograms

B = Not detected substantially above the level reported in laboratory or field blanks.

J = Analyte present. Reported value may not be accurate or precise.

ND = Not detected.

N/A = Currently none available

"B2" = EPA classified probable human carcinogen

"C" = EPA classified possible human carcinogen

"D" = EPA—inadequate data to evaluate carcinogenicity

Est = Estimated comparison value from Rfd or oral slope factor

minimum = Lowest concentration of contaminant sampled for all evaluated samples in the table.

lowest positive = If a contaminant is detected, this would be the lowest concentration found for the contaminant that is above "not detected".

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

"3" = IARC Group—not classifiable as to carcinogenicity

TABLE 6 PUBLIC WATER SUPPLIES RAW WATER SOURCE CONTAMINATION

CONTAMINANT	PUBLIC RAW WATER SOURCE INTAKES			REFERENCES	COMPARISON VALUE (ug/l) AND SOURCE
	MAXIMUM CONCENTRATIONS (ug/l)				
	ROCKLICK MINE	MINDEN MINE			
VOLATILES					
methylene chloride	2.00B	2.00B		40	4.7, CREB, "B2"
acetone	ND	ND		40	1000, Rfd
1,1-dichloroethane	ND	ND		40	Est 1000, Rfd, "C"
1,1,1-trichloroethane	ND	ND		40	200, LTHA, "3"
SEMIVOLATILES					
phenol	ND	ND		40	6000, Rfd
1,4-dichlorobenzene	ND	ND		40	75, LTHA, "C"
4-methylphenol	ND	ND		40	Est 500, Rfd
benzoic acid	ND	ND		40	40000, Rfd
1,2,4-trichlorobenzene	ND	ND		40	9 LTHA
naphthalene	ND	ND		40	20, LTHA, "D"
4-chloroaniline	ND	ND		40	40, Rfd
2-methylnaphthalene	ND	ND		40	N/A
acenaphthylene	ND	ND		40	N/A
acenaphthene	ND	ND		40	600, Rfd
dibenzofuran	ND	ND		40	N/A
fluorene	ND	ND		40	400, Rfd, "D"
pentachlorophenol	ND	ND		40	0.029, CREG, "B2"
phenanthrene	ND	ND		40	Est 290, Rfd
anthracene	ND	ND		40	3000, Rfd

TABLE 6 CONTINUED--PUBLIC WATER RAW WATER SOURCE CONTAMINATION

fluoranthene	ND	ND	40	400, Rfd, "3"
pyrene	ND	ND	40	300, Rfd, "3"
butylbenzyl phthalate	ND	ND	40	2000, Rfd, "3"
benzo(a)anthracene	ND	ND	40	0.1, PMCL, "B2"
chrysene	ND	ND	40	0.2, PMCL, "B2"
bis(2-ethylhexyl)phthalate	ND	ND	40	2.5, CREG, "B2"
di-n-octyl phthalate	ND	ND	40	N/A
benzo(b)fluoranthene	ND	ND	40	0.2, PMCL, "B2"
benzo(k)fluoranthene	ND	ND	40	0.2, PMCL, "B2"
benzo(a)pyrene	ND	ND	40	0.2, PMCL, "B2"
ideno(1,2,3-cd)pyrene	ND	ND	40	0.4, PMCL, "B2"
dibenz(a,h)anthracene	ND	ND	40	0.3, PMCL, "B2"
benzo(g,h,i)perylene	ND	ND	40	Est 0.273, oral slope, "3"
PCBs				
aroclor 1260	ND	ND	40	0.0045, CREG, "B2"

Sampling date for all samples is March 1990 (Sample numbers CDF45, CDF46).

ug/l = micrograms per liter

B = Not detected substantially above the level reported in laboratory or field blanks.

ND = Not detected.

Est = Estimated comparison value from Rfd or oral slope factor

"B2" = EPA classified probable human carcinogen

"C" = EPA classified possible human carcinogen

"D" = EPA--inadequate data to evaluate carcinogenicity

"3" = IARC Group--not classifiable as to carcinogenicity

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

TABLE 7 OFF-SITE PCB SURFACE SOIL CONTAMINATION

SAMPLE NUMBER	SURFACE SOIL	REFERENCES	COMPARISON VALUE (ppm) AND SOURCE
	PCB CONCENTRATIONS (ppm)		
	maximum		
M101	20.4	##	0.091, CREG, "B2"
M102	64.4		
M103	ND		
M104	1.6		
M105	ND		
M106	3.1		
M201	8.4		
M202	ND		
M301	ND		
M302	ND		
M303	ND		
M304	ND		
M401	ND		
M402	ND		
M403	1.9		
M404	ND		
M405	ND		
M501	2.7		
M502	1.2		
M503	ND		
M504	ND		
M505	ND		
M601	1.4		
M601	ND		
M603	ND		
M604	ND		
M605	1.6		
M606	ND		

TABLE 7 CONTINUED—PCB SURFACE SOIL CONTAMINATION

M701	ND		
M702	ND		
M703	1.5		
M704	ND		
M705	ND		
M706	ND		
M707	ND		
M708	ND		
M709	ND		
M710	ND		

Sampling date is unknown.

– Sampling data are from the report "Community Health and PCB Exposure in Minden, West Virginia dated September 1990, a Virginia Student Environmental Health Project Intern Report.

ppm = parts per million = mg/kg = milligrams per kilograms

ND = Not detected

"B2" = EPA classified probable human carcinogen

maximum = Maximum concentration of contaminant detected

Sample levels adjusted to dry weight

Sample levels not adjusted for % recovery, actual levels are slightly higher

**TABLE 8 ON-SITE PCB SURFACE SOIL CONTAMINATION
INCLUDING RESAMPLE OF MARCH 1990 LOCATIONS**

CONTAMINANT	SURFACE SOIL			REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	CONCENTRATIONS (mg/kg)				
	minimum	lowest positive	maximum		
PCBs					
aroclor 1260	0.148	0.148	538.920	12	0.091, CREG, "B2"

Sampling date for all samples is May 1990 (14 samples).

mg/kg = milligrams per kilograms

minimum = Lowest concentration of contaminant sampled for all evaluated samples in the table.

lowest positive = If a contaminant is detected, this would be the lowest concentration found for the contaminant that is above "not detected".

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

"B2" = EPA classified probable human carcinogen

**TABLE 9 ON-SITE PCB SEDIMENT CONTAMINATION
RESAMPLE OF MARCH 1990 LOCATIONS**

CONTAMINANT	SEDIMENT		REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	MAXIMUM CONCENTRATIONS (mg/kg)			
	BLDG AREA DRAINAGE DITCH	EXCAVATED AREA DRAINAGE DITCH		
PCBs				
aroclor 1260	112.1	39.2	12	0.091, CREG, "B2"

Sampling date for all samples is May 1990 (Sample numbers CDF35 and CDF36 in March compared with sample numbers S08 and S04).

Bldg Area Drainage Ditch = Sample S0-8

Excavated Area Drainage Ditch = Sample S0-4

mg/kg = milligrams per kilograms

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

"B2" = EPA classified probable human carcinogen

TABLE 10 ON-SITE PCB SOIL CONTAMINATION PRIOR TO AND DURING REMOVAL ACTIONS

CONTAMINANT	SURFACE SOIL			REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	CONCENTRATIONS (mg/kg)				
	minimum	lowest positive	maximum		
PCBs					
aroclor 1260	ND	0.30	10500	42	0.091, CREG, "B2"

Sampling date for all samples is November 1990 (58 samples).

mg/kg = milligrams per kilograms

ND = Not detected

minimum = Lowest concentration of contaminant sampled for all evaluated samples in the table.

lowest positive = If a contaminant is detected, this would be the lowest concentration found for the contaminant that is above "not detected".

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

"B2" = EPA classified probable human carcinogen

TABLE 11 ON-SITE PCB SOIL CONTAMINATION AFTER REMOVAL ACTIONS

CONTAMINANT	SURFACE SOIL			REFERENCES	COMPARISON VALUE (mg/kg) AND SOURCE
	CONCENTRATIONS (mg/kg)				
	minimum	lowest positive	maximum		
PCBs					
aroclor 1260	0.44	0.44	1020	42	0.091, CREG, "B2"

Sampling date for all samples is January 1991 [9 composite samples and (composites were made up of 5 or 7 samples from a related area)]

mg/kg = milligrams per kilograms

minimum = Lowest concentration of contaminant sampled for all evaluated samples in the table.

lowest positive = If a contaminant is detected, this would be the lowest concentration found for the contaminant that is above "not detected".

maximum = Maximum concentration of contaminant detected for all evaluated samples in the table.

"B2" = EPA classified probable human carcinogen

Table 12

PCB Levels in Serum and Adipose Tissue of Selected Populations

	Number	Blood Serum (ppb) *		# Adipose Tissue (ppm)	Group Tested Reference			
		Mean	Median			Range		
Present Transformer Workers	35	53.7	43.7	4.3 - 253	5.4	3.2	0.03 - 58	Fait (34)
Past Transformer Workers	17	38.6	30.0	1.5 - 143	1.2	0.8	0.08-3.1	
Unexposed Comparison Group	56	20.0	16.1	0.5 - 181	1.5	0.9	0.0008-20	
Currently Exposed	37	12.2	12.0	<1.0 - 300	2.08	2.20	<0.2 - 33	Emmett (35)
Exposed in the Past	17	5.9	7.0	<1.0 - 30	0.83	0.75	0.3 - 5.1	
Comparison Group	54	4.6	6.0	<1.0 - 15	0.60	0.60	<0.2-3.0	
Canton, MA: Volunteer	10	7.1		1 - 18				Kreiss 1985 (32)
Jefferson, OH: Volunteers	59	5.8		1 - 45				
Fairmont, WV: Volunteers	40	6.7		1 - 23				
Norwood, MA: Volunteers	990	4.9		2 - 30				
Michigan PBB Cohort	1631	7.7		<1 - 57				Kreiss (30)
Michigan 4 years olds	205	4.18		1 - 19.4				Jacobson (37)
Fish Exposure	80	4.82		1 - 23.3				
Farm Exposure	8				1.04		0.38-2.33	Jensen (38)
Monroe, LA: 1980	10				1.23		0.65-1.96	
Monroe, LA: 1984								

Adipose Tissue = Fat

* Note: Serum levels are in parts per billion (ppb) and adipose tissue levels are in parts per million (ppm). One part per million is 1000 parts per billion.

Table 13

Environmental and Serum Levels of PCBs in Areas where Exposure Assessment was done
Adapted from Stehr-Green, Burse, and Welty, 1988. (39)

Location	On Site		Soil (ppm)	Soil (ppm)	Off Site Surface Water (ppb)	Food Chain	#	Potentially Exposed Population			
	Soil (ppm)	Surface Water (ppb)						Range (ppb)	Mean* < 20ppb	% < 100	Notes
Sebastian, AR	Contaminated oils sprayed in residential area.		133,000	NA	NA	NA	20	2-11	5.8	100	
Wayne, GA	3,436	1.5	149	8.5 (rainwater runoff)	NA	NA	16	3-348	20.9	69	Total Group
Monroe, IN (3 sites)	330,000	18 (water) 520 (sediment)	3,500	12.2	200 (fish)	NA	4	3-11	5.1	100	Nonworkers only
Newport, MA	99,000	400 (storm sewer) 22,000 (sediment)	NA	6,100 (water) 66,500 (sediment)	730 (fish)		61	3-75	10.9	80	Total Group
Norfolk, MA	220,000	NA	3	350,000 (sediment)	NA		51	3-51	9.0	90	Nonworkers only
Ashtabula, OH	NA	8,390,000 (sludge)	0.1	7.0	1.9 (plants)		55	3-47	9.0	84	Random Sample
Allegheny, PA	32,000	NA	1,106	300,000 (sediment)	NA		51	2-343	18.1	65	Total Group
Chester, PA	36,000 (soil) 420,000 (work area)	NA	6,400	86,000 (sediment)	6.6		42	2-68	12.9	79	Nonworkers only
Pickens, SC	NA	77,200 (sludge) PCBs discharged into area surface waters.	130	0.9	0.3 (vegetables) 15 (fish)		90	1-30	4.2	99	Total Group
Marion, WV	22,226	NA	205	17	1.7 (chicken)		89	1-13	4.1	100	Nonworkers only
							59	1-45	4.4	97	Total group
							57	1-15	4.1	100	Nonworkers
							9	ND-5	2.7	100	Includes 5 children
							23	1-79	5.9	91	Total Group
							22	1-31	5.3	95	Nonworkers only
							66	1-24	4.4	92	Random Sample
							27	ND-30	2.6	96	Quantitated as Aroclor 1254
							24	1-23	5.0	96	

NA = Results not available or samples not collected

ND = Result below detection levels

* = Means are geometric. Non-detectable serum concentrations were assumed to be 1/2 the detection limit for calculation geometric means.

TABLE 14 EXPOSURE PATHWAYS

PATHWAY NAME	EXPOSURE PATHWAY ELEMENTS				TIME	
	SOURCE COCs	MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE		EXPOSED POPULATION
COMPLETED EXPOSURE PATHWAYS						
On-site workers	PCB oils	Air, Direct contact	Plant operations	Dermal, Inhalation, Ingestion	SEC workers, estimated 30-50 and worker's families	Past
Off-site soils, sediments	PCB	Residential yards, Arbuckle Creek sediments	Arbuckle Creek	Inhalation, Dermal, Ingestion	Children playing in yards, creek-unknown number and frequency of exposure	Past, Present, Future
POTENTIAL EXPOSURE PATHWAYS						
Off-site use of PCB contaminated oil as fuel	PCB contaminated oils, PCDD/PCDF	Air, Direct contact	Handling, Incomplete burning of PCB contaminated oil	Inhalation, Dermal, Ingestion	Off-site residences-unknown number	Past
On-site use of PCB contaminated oil as fuel in SEC building	PCB contaminated oils, PCDD/PCDF	Air Direct contact	Handling, Incomplete burning of PCB contaminated oil	Inhalation, Dermal, Ingestion	SEC workers, estimated 30-50	Past
Food chain	PCB contaminated snapping turtles	Turtle meat	Cooking for human consumption	Ingestion	Persons eating turtles- unknown number	Past, Present, Future
On-site SEC surface soils, sediment	PCB contaminated soils, sediment	Soil, Sediment, Fugitive dust	Contaminated SEC soils, sediment	Inhalation, Dermal contact, Ingestion	Trespassers- unknown number and unknown activities, On-site workers	Past, Present, Future
SEC Equipment Building	PCB, PCDD/PCDF	Air, Dust	Inside Building surfaces	Inhalation, Dermal, Ingestion	Workers- unknown number	Past, Present, Future

TABLE 14 CONTINUED—EXPOSURE PATHWAYS

ELIMINATED EXPOSURE PATHWAYS						
Remedial workers	PCB	Soil, Air, Sediments	Remedial activities	Inhalation, Dermal, Ingestion	Remedial workers-unlikely because appropriate safety measures required for on-site activities	Past, Present, Future
Food chain	PCB	Fish, farm animals, gardens	Arbuckle Creek	Ingestion	No fish, farm animals, gardens exist	Past, Present, future

COCs = Contaminants of concern

APPENDIX 3 - COMPARISON VALUES AND EVALUATION OF HEALTH STUDIES

APPENDIX 3. Comparison Values

Comparison values for ATSDR public health assessments are contaminant concentrations in specific media that are used to select contaminants for further evaluation. The values provide guidelines used to estimate a dose at which health effects might be observed. Comparison values used in the Environmental Contamination and Other Hazards and the Public Health Implications sections of this public health assessment are listed and described below.

- * CREG= Cancer Risk Evaluation Guides
- * DWEL = Drinking Water Equivalent Level ($\mu\text{g/L}$)
- * EMEG= Environmental Media Evaluation Guides
- * MCL = Maximum Contaminant Level ($\mu\text{g/L}$)
- * MCLG= Maximum Contaminant Level Goal ($\mu\text{g/L}$)
- * MRL = Minimal Risk Level (mg/kg/day)
- * PEL = Permissible Exposure Limit (mg/m³)
- * RfD = Reference Dose (mg/kg/day)
- * ppm = milligrams per liter (mg/L water)
milligrams per kilogram (mg/kg soil)
- * ppb = micrograms per liter ($\mu\text{g/L}$ water)
micrograms per kilogram ($\mu\text{g/kg}$ soil)

- * kg= kilogram
- * mg= milligram
- * μg = microgram
- * pg= picogram
- * L= liter
- * m³= meters cubed

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10E-6) persons exposed over a lifetime. CREGs are calculated from EPA's cancer slope factors.

EPA has not established a final cancer slope factor for benzo(a)pyrene. Therefore, the comparison value used for carcinogenic PAHs is based on an interim cancer slope factor.

The drinking water equivalent level (DWEL) is a lifetime exposure level specific for drinking water (assuming that all exposure is from that medium) at which adverse, noncarcinogenic health effects would not be expected to occur.

Environmental Media Evaluation Guides (EMEGs) are based on ATSDR minimal risk levels (MRLs) and factor in body weight and ingestion rates.

Maximum Contaminant Levels (MCLs) represent contaminant concentrations that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of 2 liters of water per day (for an adult).

Maximum Contaminant Level Goals (MCLGs) are drinking water health goals set at levels at which no known or anticipated adverse effect on the health of persons occurs and which allows an adequate margin of safety. Such levels consider the possible impact of synergistic effects, long-term and multi-stage exposures, and the existence of more susceptible groups in the population. When there is no safe threshold for a contaminant, the MCLG should be set at zero.

A Minimal Risk Level (MRL) is an estimate of daily human exposure to a chemical (in mg/kg/day) that is likely to be without an appreciable risk of deleterious effects (noncarcinogenic) over a specified duration of exposure. MRLs are based on human and animal studies and are reported for acute (≤ 14 days), intermediate (15-364 days), and chronic (≥ 365 days) exposures. MRLs are published in ATSDR Toxicological Profiles for specific chemicals.

The Occupational Safety and Health Administration's Permissible Exposure Limit (PEL) in air is an 8-hour, time-weighted average developed for the workplace. The level may be exceeded, but the sum of the exposure levels averaged over 8 hours must not exceed the limit.

EPA's Reference Dose (RfD) is an estimate of the daily exposure to a contaminant that is unlikely to cause adverse health effects. However, RfDs do not consider carcinogenic effects.



Memorandum

(404) 639-0563

Date July 4, 1990

From Medical Officer, HIB, DHS

Subject: Health Study Investigation of Oak Hill, W.V., in regards to petitioned health assessment on Shaffer Equipment Company in Minden, W.V.

To: Donald Y. Joe, P.E., Environmental Engineer, DHAC, EEB

As requested, the Health Investigations Branch has reviewed a report of the cancer mortality statistics in Oak Hill, Fayette County, West Virginia for 1979-1981 prepared by the West Virginia Department of Health issued January 11, 1983. Forty-four deaths due to malignant neoplasms were reported in the 3-year time period. The total number of cancer deaths was stratified by sex and by two site-specific cancer groupings (respiratory cancer and all others). Crude and age adjustment methods are not presented in this report.

The expected number of deaths was calculated based upon U.S. mortality rates using an "indirect method" of age standardization for each sex. The Standardized Mortality Rates (SMR) were calculated to compare observed to expected numbers of cancer mortality. These comparisons were made utilizing a p-value. However no confidence intervals were calculated at the 95% level.

According to the authors, the rates of Oak Hill were then compared to U.S. mortality rates as these rates were felt by the authors to be a more reasonable and reliable standard than the West Virginia age-specific mortality rates. It is not clear why West Virginia rates were not used, and why the U.S. mortality rates were considered to be more reasonable.

It is also noteworthy that the original time period of this study consists of three years, whereas the U.S. mortality rates are calculated on an annual basis. It would be important to clarify whether the U.S. mortality rates are for a three year period.

The authors found that there was a greater rate of respiratory cancers in males in the Oak Hill population than in the entire United States. Based on this data, recommendations were made for further investigations.

It should be borne in mind that in a community such as Oak Hill, which is located in the mining region of West Virginia, it would be expected that the male inhabitants would have a probable history of working in the local coal mines. This is considered to be a risk factor for developing respiratory cancers. Other significant contributory factors for respiratory tract cancer mortality would be smoking habits and this should also be addressed. West Virginia ranks among those states with lower per capita income than the entire United States. Socio-economic factors

should also be considered as risk factors such as should wood and oil burning stoves as sources for heat be considered as risk factors for respiratory cancers.

Summary

The author's report shows an increase in the rate of respiratory cancers in males in Oak Hill West Virginia. However we are concerned about the conclusions drawn from this study. One concern is the use of a p-value alone to determine statistical significance. It would be more appropriate to calculate 95% confidence intervals, in order to visualize and better understand the significance of these statistics.

Another important concern is comparing statistics from a three-year interval to annual mortality statistics. No data are provided to demonstrate this and it does not appear the author has taken the difference in the two time periods into consideration.

A third concern is the choice of the U.S. standardized mortality rates. While these rates show an increase, due to the probable confounder such as mining, smoking, and other risk factors West Virginia statistics would have been more appropriate.



Gale Savage, M.D., M.P.H.

REVIEW OF COMMUNITY HEALTH STUDY IN MINDEN,
WEST VIRGINIA

Executive Summary

The Health Investigation Branch has been asked to review two studies conducted in 1986 and 1989.

While each study taken independently provides useful information within the limitations of the techniques used, the time separating the data collection of the two studies limits the utility of comparing the results. Additional data collection might be helpful if it is performed in accordance with accepted epidemiologic practice.

Vanderbilt Study

In the summer of 1986, the Concerned Citizens to Save Fayette County (CCSFC), West Virginia, sponsored "a health registry of random sampling of Minden and Rock Lick residents." CCSFC is a local citizens' voluntary organization, formed in 1985 to monitor the Environmental Protection Agency's (EPA's) activities at the Shaffer Manufacturing site in Minden, West Virginia. This study was conducted by Vanderbilt University's Appalachian Student Health Coalition, and is commonly known as the "Vanderbilt Study." It was a symptom-and-disease prevalence study and consisted of surveying residents of Minden with a health status questionnaire.

Soil sampling for PCBs and water sampling for fecal coliforms were carried out at the time of the survey at each residence. The analysis of the samples was done by laboratories at Virginia Tech. Analytical methods for water and soil samples were well documented. This portion of the study established the presence and degree of PCB contamination in the Minden township.

Strengths This study indicated a direction for future investigations of Minden with regard to possible diseases for closer attention.

Weaknesses Questions concerning smoking habits and occupation were not included in the survey instrument.

Random sampling methods were not used. (Sampling every third house in one neighborhood was not true randomization). There is no indication that the sample was representative of the total Minden population.

No pre-study workshop was conducted for the Minden residents as was done in the later (Page) study.

Page Study

During the summer of 1989 the CCDSC community group sponsored a "follow up health survey in Page, West Virginia, a community demographically similar to Minden but without a PCB contamination problem".

For this study, a different questionnaire was administered, which requested information regarding smoking habits and occupational history not asked on the Minden study. Soil and water PCB concentration were not measurable.

The data from both studies were then compared and conclusions were drawn based upon this comparison. Four diseases or symptoms (shortness of breath, unexplained weight loss, persistent cough, kidney/bladder) infections were found to be statistically significant.

Strengths Questions concerning smoking and occupation were included in the survey instrument of this study.

This study identified diseases of concern to the community.

Weaknesses The same survey instrument was not used as in the original study.

There was a three-year time gap between the two studies.

No environmental sampling was carried out to definitively establish the lack of PCB in the Page environment.

A workshop was conducted for the Page community to explain survey methodology, materials and interviewing practices in order to avoid potential biases. However, this increased the difference in access to information between the two communities.

Socioeconomic status and nutritional status were not addressed in the Page study.

Conclusions

This comparative study examined the populations of two towns within the same geographic region and compared them with respect to symptom-and-disease prevalence. However, a clear relationship could not be established between PCB contamination and the significantly different observed rates of the four symptoms.

In this type of study, it is essential to account for confounding factors such as age, smoking or a history of working in mines, all of which may affect symptom prevalence, independent of PCB. Such variables as age, socioeconomic status and nutritional status should also be considered.

These variables were not addressed in the two surveys. When such variables are not controlled for, one cannot determine what accounted for the findings.

The Health Investigations Branch provides technical assistance or consultation to State health agencies or other groups concerning studies of this nature, and will gladly review subsequent proposals or reports related to this study.

APPENDIX 4 - PUBLIC COMMENTS

**Comments Received During the ATSDR Public Comment Period
January 25 - February 23, 1993**

Note: The commenters' comments are taken directly from the letters written to ATSDR. No changes were made to spelling, wording, or sentence structure to avoid misrepresentation of the comment.

Comment 1: In April 1989 the EPA and the state of West Virginia met with Senator John D. Rockefeller IV and the citizens of Minden. the EPA made a commitment to the Senator and the community to take samples of the bark and core of the trees in a three mile radius and to this present day the EPA has not lived up to this commitment. The trees in this area are used for firewood in heating homes. Also Woodchipper Operation operates in this vicinity making wood chips that are used by Dupont as a catalyst for making special metal. During cold weather when firewood is burned for heating homes the cold weather temperature inversion holds the smoke from this combustion in the communities of Minden and Rock Lick. The PCDDs and PCDFs become a major health problem. Enclosing letters of said commitment of 1989 of the three mile radius study AR300010, AR300016, and AR300025. (supporting documents AR300010, AR300016, and AR300025 are in Appendix 5 of this document)

Response to comment 1: ATSDR has forwarded this comment and the supporting documents to EPA.

Comment 2: Samplings done on March 20-21, 1990; May 22, 1990; and November 27, 1990 confirms the inadequacy of the first cleanup and in no way is this new dumping as stated by the OSC. Sampling done November 27, 1990, 12 to 15 inches deep confirms the underground water flow. Said samples were not done on the water AR100562. (supporting document AR100562 is in Appendix 5 of this document)

Response to comment 2: ATSDR conclusions regarding the site's potential impact on public health involves the evaluation of all available past and present data. ATSDR evaluated the data from the above mentioned samples and subsequent samples conducted at the site to formulate the conclusions and recommendations made in this petitioned public health assessment.

Comment 3: The dumping pit east of the Shaffer building said pit as stated by workers 60 ft. x 20 ft. deep where thousands of gallons of PCBs were dumped poses a greater health threat due to combustion of said slate pile. This pit is a disaster waiting to happen and one of the reasons that we have a Federal Surface Mine Reclamation Program for abandon mining operations. If this slag pile ignites it will be a disaster not only to the people of the community but also the people that have to reclaim it.

Response to comment 3: ATSDR has no data regarding dumping or contamination at the dumping pit/slate pile/slag pile. Specific information and or data are needed to determine whether this dumping pit/slate pile/slag pile poses a health threat. ATSDR has forwarded this comment to EPA for any necessary actions needed to obtain this data. Any further information or documentation (location, history, etc.) regarding this dumping pit/slate pile/slag pile should be provided to EPA.

Comment 4: PCB-1260 is the main PCB on this site is a false statement. The highest concentration of PCB on this site is PCB-1254 (which was directly over the main water line which broke) at a concentration of 260,000 PPM.

Response to comment 4: ATSDR believes that this comment refers to the PCB concentration of 260,000 ppm which was discussed in the June 29, 1990, report prepared by the NUS Corporation. That concentration represented soil at the site prior to EPA removal actions in 1987. ATSDR, in this public health assessment evaluated more recent data which includes the current (January 1991) maximum on-site soil concentration of aroclor 1260 at a concentration of 1020 mg/kg (or ppm). Furthermore, for health evaluation purposes ATSDR does not distinguish between aroclor 1254 and 1260 or any of the other aroclors since the toxic effects of the aroclors are essentially identical at similar concentrations.

Comment 5: Home gardening for supplement food still continues in Minden; therefore continuing to pose as a health hazard.

Response to comment 5: Based on ATSDR's site visit, it was noted that there were no farm animals or vegetable gardens observed in the vicinity of the site and that exposure pathway was eliminated in the Pathways Analysis section. The food chain can become contaminated only if it comes in contact with contaminated media (i.e., soil, water, air). Since there is no evidence of gardens in the vicinity of the site where they could come in contact with contaminated media at levels which can result in bioaccumulation, this pathway was determined to be an eliminated pathway.

Comment 6: Fecal Coliform Bacteria of the surface water flowing through Minden in Arbuckle Creek as well as Piney Creek in Raleigh County is over 28, 000 count, 70 times above what is allowed which is 400 count. Both of these creeks flow into the New River which is used for recreational white water rafting and game fishing.

Arbuckle Creek also contains two different types of leeches not native to this area. This is why OSC refused to cleanup the 190 PPM PCBs in the sediment of Arbuckle Creek. Flooding continues on the average of three times a year into the community and homes presenting major health hazards.

Response to comment 6: ATSDR has recognized the presence of high fecal coliform counts in Arbuckle Creek and has made recommendations based on that information. The high fecal coliform counts in Piney Creek has not been addressed in this public health assessment. ATSDR cannot determine the impact that these streams might have on the water quality of the New River without actual water quality analyses. But the fecal coliform counts should decrease greatly when those tributaries empty into the New River. However, your comments regarding Piney Creek and the New River, as well as, a copy of this public health assessment with its recommendations regarding Arbuckle Creek will be forwarded to the local authorities.

In regard to the second part of comment 6, ATSDR has addressed the issue of PCBs in sediment in the Pathways Analysis and the Public Health Implication sections as a completed exposure pathway. Current data (March 1990) shows sediment in Arbuckle Creek with a maximum PCB (aroclor 1260) concentration of 5.2 mg/kg (or ppm).

Comment 7: Early 1985 the EPA Contract Laboratory on Record Keeping Mr. Gary M. Hacker, Environmental Scientist Monitoring Applications Divisions, Versar Inc., Springfield, Virginia interviewed workers (present and past at the time) and documented all operations of the site.

Response to comment 7: ATSDR notes the comment that workers have been interviewed and that site operations have been documented. If further information is needed regarding worker interviews or site operations, ATSDR will contact Versar Inc.

Comment 8: Failure of EPA in its investigation of a junk dealer in Raleigh County who had bought transformers from Mr. Shaffer to get the copper his site also being a Superfund Action site by burying his PCB contaminated soil on private property.

Response to comment 8: ATSDR has forwarded this comment to EPA.

Comment 9: ATSDR statement of the "potential" health hazard exists for the subpopulation such as fetuses and breast-fed infants "if" the mother is exposed to PCBs. There is no doubt that the mothers were exposed to PCBs emphasis 11 PPB in the one child.

Response to comment 9: The accuracy of the test that for the child showing a sera PCB level of 11 ppb is questioned in paragraph 5 of the Health Outcome Data Evaluation subsection. Therefore, based on the suspect data there is some question as to whether the child's blood shows PCB contamination, in which case exposure to the child's mother is also in question. Actions to be taken to verify the level of PCBs in that child by followup testing and further health followup actions to be taken, if elevated PCB levels are verified, are made in recommendation number 7. This is also addressed under number 4 in the Public Health Action Plan.

Comment 10: It is a sad day in America when the ATSDR makes its public health assessment totally on the hard work done by the people of the community of Minden, knowing that all the community's efforts in working with other groups establishing their health and contamination problems. The ATSDR and the EPA know this very well because this was not sanctioned nor financed by any agency of the federal government, knowing that it has no validity because it was neither sanctioned nor financed by any agency of the government. Each year the Secretary of Health and the Secretary of Internal Revenue must report to the House of Representatives and the U.S. Senate on Healthcare cost containment, as long as the government continues in this frame of mind we will never address the health problems of Minden as well as the rest of the communities of America. As it has been stated by every Surgeon General and other agencies of the government in the past and present smoking and/or chewing tobacco, the use of alcohol, promiscuous life style, and AIDS draws a clear picture of said government agencies view of "BLAME THE VICTIM FOR HIS HEALTH" while they coverup their own inadequacies while covering corporate

America's backside in their detriment to their workers and communities. As long as we continue with this attitude there will be no controlling the healthcare cost nor providing healthcare for our people.

Response to comment 10: ATSDR has used all data available in an effort to evaluate the Shaffer Equipment Company site for any evidence of actual or theoretical threat to public health using current science. ATSDR is an independent agency funded under CERCLA (Superfund Act) and owes no allegiance to any governmental, private, commercial, or industrial concerns. ATSDR remains committed and true to its mission to prevent or mitigate adverse human health effects and diminished quality of life resulting from exposure to hazardous substances in the environment.

Comment 11: In reviewing the above referenced report, I found one recommendation on page 28, item 2 of the Recommendations and HARP Statement to be misleading.

The recommendation reads as follows:

"Even if turtles are not contaminated with PCBs, no aquatic life from Arbuckle Creek downstream of the Oak Hill Wastewater Treatment Plant should be eaten unless thoroughly cooked, because of the fecal coliform bacteria contamination of Arbuckle Creek. Arbuckle Creek downstream of the treatment plant should be posted. Recreational uses of Arbuckle Creek should be restricted and surface water from Arbuckle Creek should be sterilized before being used. Such actions are recommended until fecal coliform bacteria levels are below regulatory standards."

If I had no knowledge of the workings of the Minden Wastewater Treatment Plant, I would gather from reading Recommendation No. 2 that the fecal coliform content found below the treatment plant was being placed into Arbuckle Creek as a result of improper treatment of the plant. Was sampling not done above the plant site: If sampling was performed on Arbuckle Creek at any point above the plant, I would imagine high levels of fecal coliform bacteria would be found.

This is primarily due to areas outside the corporate limits, such as the five-street area encircled in yellow on the enclosed map (see Appendix 5), not being sewerred. This area drains into a tributary (see green highlight) of Arbuckle Creek (see pink highlight), which flows through the City of Oak Hill and down into Minden, past our newly constructed wastewater treatment plant. Comments such as that made in Recommendation No. 2 would lead one to believe that the Minden plant was discharging effluent into Arbuckle Creek that did not meet the requirements of our National Pollutant Discharge Elimination System (NPDES) permit, when, in fact, our effluent quality is well within the regulatory standards as set forth in our permit.

Response to comment 11: ATSDR acknowledges that the source of fecal coliform in Arbuckle Creek has not been identified. Based upon comment 11, ATSDR will restate recommendation number 2 of this public health assessment so that the upstream wastewater treatment plant is not implicated as the source.

APPENDIX 5 - SUPPORTING DOCUMENTATION FOR PUBLIC COMMENTS

United States Senate

WASHINGTON, DC 20510-4802

Hum

July 17, 1990

Dear Ted,

I have received a letter from Larry Rose of the Concerned Citizens to Save Fayette County. In this letter Mr. Rose raises a number of concerns regarding the three mile radius study that EPA committed to do in response to my request in April 1989.

There seem to be a variety of activities occurring at the Schaffer site. To ensure that all parties have a thorough understanding of the activities undertaken by EPA at Minden, it would be helpful to have a listing of completed tasks and those that remain.

I am forwarding a copy of Mr. Rose's letter to you. My staff has informed me that you are aware of the contents of the letter and have begun responding to the concerns that have been raised.

Ted, the satisfactory resolution of the situation at Minden is a top priority. If you need additional information or assistance, please do not hesitate to contact me or Kiens Smith of my staff.

Sincerely,



John D. Rockefeller IV

Mr. Edwin Erickson
Regional Administrator
Environmental Protection Agency
841 Chesnut
Philadelphia, Pennsylvania 19107

AR300016

United States Senate

WASHINGTON, DC 20510-4802

June 5, 1990

Dear Ted,

As you know my staff, members of your pre-remedial response team, and the Citizens to Save Fayette County met and toured the Shaffer facility and the surrounding community of Minden, West Virginia. The purpose of the meeting and the subsequent tour was to permit the citizens to show EPA the areas that they wanted to have included in the sampling process.

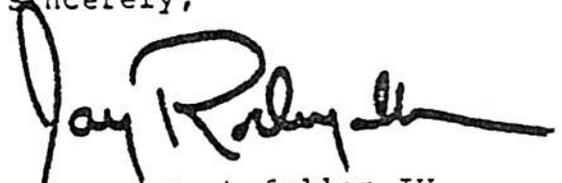
I am very pleased that EPA involved the community in this effort. However, I would like to be sure that the three mile sampling that was promised in April 1989 will be performed. I am concerned about reports from my staff that lead me to believe that future sampling efforts may hinge on the results of the confirmatory samples taken in May.

These samples taken in March and then confirmed in May were only on the Shaffer site, not from a three mile radius. I will not be satisfied that the commitment made to me and the residents of Minden in April of 1989 has been upheld if further sampling is not performed.

The matter of the contamination inside the building continues to be a problem. Will EPA be able to collect samples from inside the building?

Ted, this situation has to be resolved and I implore you to make every effort to do so. If my office can be of assistance, please do not hesitate to call me or Kiena Smith of my staff.

Sincerely,



John D. Rockefeller IV

Mr. Edwin Erickson
Regional Administrator
Environmental Protection Agency
841 Chesnut
Philadelphia, Pennsylvania 19107

sent
AR500011



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

9/19/90

Honorable John D. Rockefeller, IV
United States Senate
Washington, DC 20510

Dear Senator Rockefeller:

Thank you for calling me yesterday to convey the anxiety felt by residents of Minden concerning the Environmental Protection Agency's commitment to proceed with the Superfund cleanup of the Shaffer Equipment site.

As we discussed, the Environmental Protection Agency discovered several PCB-contaminated locations at the Shaffer site, and we have scheduled the removal of these contaminated soils for late October or early November of this year. I have concurred in the documentation to support the funding for this cleanup, and have every reason to believe that it will be approved at EPA Headquarters in the very near future.

I learned yesterday that a media report speculated about the potential impact of a substantial sequestration of federal funds on the Minden project. While no one knows for sure how a sequestration will affect specific Superfund activities, EPA intends to move forward with the cleanup as soon as we can. Should a sequestration require a delay in the cleanup, I will immediately inform you about it:

I hope that our telephone conversation and this letter are helpful to you. Your communication with the citizens of Minden has been appreciated.

Sincerely,


Edwin B. Erickson
Regional Administrator

AR300025



Environmental Technology, Inc.

A Waste Company

To: Bob Caron, EPA-OSC
THRU: Craig Hill - *cal*
From: Clay Mullican *CM*
Subject: PCB Soil Sampling to determine depth of contamination
Date: November 30, 1990

On tuesday, November 27, 1990 three hours were spent purchasing, gathering, and loading supplies needed to perform PCB soil sampling at the Shaffer site. Wednesday at 0545 hours Clay Mullican and Lee Baumgardner of ETI departed Richmond in route to the Shaffer site in Minden, West Virginia. At 12 noon, ETI personnel arrived on site. The area to be sampled was measured and found to be approximately 32' x 40'. The faded grid markings from a previous sampling effort were re-painted and the sampling equipment and supplies were set up. At 1235 hours TAT member Mona Khail arrived on site.

All sampling equipment was decontaminated prior to and between each sample being taken. Decontamination consisted of a five step process. Those steps were: 1) soapy wash; 2) distilled water rinse; 3) hexane wash; 4) distilled water rinse; 5) distilled water rinse.

Sixteen Soil samples were taken. Figure A shows the grids, there corresponding numbers, and sample locations indicated by letter. All grids are approximately 5' x 8' except grid number nine which is 4' x 10'. Table 1 shows the sample number, the time at which the sample was taken, grid location and depth sample was taken. Samples S05, and S08 will be split at the laboratory and spike duplicates run. Sample S12 is a field duplicate. S14 is a background sample taken on the surface 20 yards from the dirt pile on the side opposite of the contaminated areas.

While attempting to dig to the clay layer, water collected in the holes of sample points A, C, F, and G. The water level was found at a depth of 12-15 inches at each of the sample locations. At sampling locations where water was found, soil samples were taken just above the water level.

No water samples were taken. ETI completed soil sampling at 1700 hours and completed the decontamination of all equipment at 1730 hours. At 1730 hours ETI and TAT personnel departed the site.

Samples were sent via overnight mail to MDS laboratories in Reading, Pennsylvania on thursday, November 29, 1990. A seven working-day turn around time was requested.

AR100562

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TABLE 1
Sampling Data

<u>Sample</u>	<u>Time</u>	<u>Location</u>
S01	1348	A2 - Sec 10 - 6 inches (a)
S02	1352	A2 - Sec 10 - 1 foot (a)
S03	1402	A2 - Sec 6 - 6 inches (b)
S04	1405	A2 - Sec 6 - 1 foot (b)
S05 (spike duplicate)	1415	A2 - Sec 9 - 6 inches (c)
S06	1423	A2 - Sec 9 - 1 foot (c)
S07	1446	A2 - Sec 7 - 6 inches (e)
S08 (spike duplicate)	1503	A2 - Sec 7 - 1 foot 5 inches (e)
S09	1512	A2 - Sec 11 - 6 inches (f)
S10	1530	A2 - Sec 11 - 1 foot 6 inches (f)
S11	1545	A2 - Sec 13 - 6 inches (g)
S12 (field duplicate)	1547	A2 - Sec 13 - 6 inches (g)
S13	1610	A2 - Sec 13 - 1 foot (g)
S14 (background)	1620	AB - Sec 01 - surface (h)
S15	1640	A2 - Sec 8 - 6 inches (i)
S16	1649	A2 - Sec 8 - 1 foot 4 inches (i)

AR100563

