Health Consultation

CROWN INDUSTRIES SITE

LACKAWAXEN TOWNSHIP, PIKE COUNTY, PENNSYLVANIA

JUNE 12, 2007

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

Health Consultation: A Note of Explanation

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

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

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HEALTH CONSULTATION

CROWN INDUSTRIES SITE

LACKAWAXEN TOWNSHIP, PIKE COUNTY, PENNSYLVANIA

Prepared By:

Pennsylvania Department of Health
Division of Environmental Health Epidemiology
under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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Executive Summary

The Pennsylvania Department of Health (PADOH) prepared this health consultation to determine whether residents in six homes near the Crown Industries Site are exposed to tetrachloroethylene (PCE), trichloroethylene (TCE) and/or other volatile organic compounds (VOCs) in their private well water at levels that would harm their health. The Pennsylvania Department of Environmental Protection (PADEP) made the request for this health consultation. The PADOH prepared this health consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

Residential wells near the Crown Industries Site were sampled and evaluated in this health consultation for the presence of volatile organic compounds. Samples were taken by PADEP from these homes from as early as 1988 to March 25, 2006. PCE and other volatile compounds were detected in samples taken from six homes. These homes were given bottled water from October 4, 1989 until November 4, 1994, at which point PADEP installed carbon filter systems on the six residential wells. For five of these wells, PADOH finds that the levels of volatile organic compounds detected were low and below levels of health concern. PADOH does not find that PADEP needs to continue to support the use of carbon filtration systems on these five home wells, based on the historical record of sampling for these wells. One residence well (#10) has had concentrations above 5 ppb of PCE constantly over the last 18 years of testing. The PCE levels in #10 have ranged from 27 ppb to 0.95 ppb, with an average value of 6.59 ppb. Based on this available monitoring information, PADOH determined that it is not likely that the residents using #10 have experienced any cancer or non-cancer health effects from their exposure to PCE in their well water. However, PADOH supports the continued use and maintenance by PADEP of a carbon filtration system on #10 as a precautionary measure, because the levels in this residential well have consistently exceeded the federal Maximum Contaminant Level (MCL) for PCE of 5 ppb.

Previous concerns about contamination in residential wells prompted PADEP to provide bottled water and carbon filters to the impacted residences. PA DEP has been monitoring the area by environmental sampling twice a year. The chemicals found in the groundwater have been breaking down and dissipating for almost two decades. Currently, groundwater exposure to the Crown Industries Site represents "*no apparent public health hazard*".

The interpretation, conclusions, and recommendations regarding the Crown Industries Site are site-specific and do not necessarily apply to any other site.

Background and Statement of Issues

Site Description and History

The Crown Industries Site (the site) is located in a rural area in Lackawaxen Township, Pike County, Pennsylvania (Appendix A Figure 1). The site is accessible by a dirt road known as Quarry Road off Urbane Road. Residences nearby are located on Rheingold (Ringold) Blvd, Route 590, and O'Kane Road. The Crown Industries Site operated as a metal recovery operation from the 1960s until approximately 1988 [1]. Metals, mainly copper, were salvaged through open burning and incineration of electrical equipment and materials. Materials consisted of fluorescent light ballasts, transformers, coated electrical wire strippings with oil-soaked paper, copper strips, and other material. Fuel sources for burning included diesel oil, hydraulic fluid, and a kerosene/hydraulic fluid mixture. Drums of pitch from boiler tar have been buried on site. This area of the site sits next to a quarry surrounded by dense woods. The site had an ash pile, scrap metal piles, a pond downhill from the incinerator (on bedrock), another pond, and several discarded vehicles, which all have been remediated or removed [2].

The area that is of potential health concern consists of six homes that are in proximity to the site and not connected to municipal water lines. Residents in these six homes near the site have been and are still using drinking water from the unconfined aquifer for drinking, showering, cooking, etc. VOC contamination was first discovered in these private wells in 1988. The Pennsylvania Department of Environmental Protection (PADEP), formerly known as the Pennsylvania Department of Environmental Resources, deemed the site necessary for a Prompt Interim response action under the Hazardous Sites Cleanup Act in 1989. Detections of VOCs in the samples from the six contaminated wells led to the residences using bottled water from October 1989 until carbon filters were installed on the wells by PADEP by November 1994.

The site has since been remediated under several different clean up actions by PADEP. The soil and groundwater of the monitoring wells on site had detectable concentrations of metals, PCE, TCE, dioxin, and PCBs [3]. Much of the copper found in the surface and subsurface soil has been removed at the site. Discarded vehicles, an incinerator, and other materials that have been recycled were sent to an approved disposal facility. Some of the soil was capped to prevent further contamination at the Crown Industries Site.

PADEP arranged for the installation of monitor wells surrounding the site in January 1991 and were able to better characterize and monitor the PCE groundwater contamination plume at the site (Appendix A: Figure 1). In mid-2005, PADEP requested that PADOH evaluate the residential well sampling results. This health consultation responds to this request.

Site Visits

On September 19, 2006, PADOH Health Assessment Program representatives viewed the site with PADEP representatives. During this site visit, PADOH took notes and photographs regarding the site, and discussed the groundwater and soil contamination relevant for this health consultation. On September 22, 2006, PADOH Health Assessment Program representatives reviewed the Crown Industries Site files at the PADEP Northeast Regional Office (NERO).

Sample Results

The laboratory results of the groundwater samples collected from six monitoring wells at the site can be found in Table 1 (Appendix B). Hydrogeology and other features in the site area will impact the movement of contaminants. PCE has a greater density than water and will tend to move downward under the influence of gravity. The PCE decomposition products found at the site were 1, 2-DCE and TCE. MW-1S and MW-2 show a decreasing trend in PCE levels and MW-1D is showing an increasing trend in PCE with the breakdown products [4]. No one was exposed to the water in these monitoring wells surrounding the Crown Industries Site.

The drinking water sample results from three of the six residential wells that were sampled within the last six years can be found in Table 2 (Appendix B). The other three residential wells have been below the ATSDR health-based Comparison Values (CVs) for years. The highest concentration of PCE found was 27 ppb in HW-10. HW-10 is located to the north of the site, hydrogeologically and topographically down-gradient of the site. The bedrock dips to the northwest sending the groundwater towards HW-10. The next highest detectable levels of PCE were found in HW-9. The highest concentration of PCE found was 5.2 ppb. HW-9 is topographically and hydrogeologically down-gradient to the east of the Site. Residential well HW-9 has consistently been below the ATSDR health-based CVs for PCE the last few years. Residential well HW-9a is an unused aquifer by HW-9. No detectable levels of PCE were found in any of the four rounds of groundwater samples collected from these other five remaining residential wells. TCE was never detected in drinking water samples collected from HW-10. TCE was discovered in HW-9a, but not detected in the other five residential wells for the last four years.

Acetone was found in all six homeowner well samples taken in April 2006 [5]. Acetone was not detected previously in the past rounds of sampling. Acetone is a common lab contaminant. The highest concentration of acetone in the April 2006 drinking water samples was 187 ppb and well below the health-based screening value of the EPA's Chronic Oral Reference Dose (RfD) of 0.9 mg/kg/day, or 9,000 ppb (child) and 30,000 ppb (adult).

The EPA Chronic Oral RfD for PCE is 0.03 mg/kg/day or 100 ppb (child) and 500 ppb (adult). PCE is classified as a probable carcinogen to humans based on sufficient evidence in animals. The EPA's Maximum Contaminant Level (MCL) for PCE for public water supply systems is 5 ppb.

The MCL in drinking water for TCE is 5 ppb, and it is classified as a human carcinogen based on animal studies. The MCL in drinking water for cis 1,2- DCE is 70 ppb and it is not classified as a human carcinogen. Naphthalene is classified as a Group C carcinogen. Group C carcinogens are considered possible human carcinogens based on limited animal studies (no human studies exist for naphthalene). It has an EPA Chronic Oral RfD of 0.02 mg/kg/day or 200 ppb (child) and 700 ppb (adult).

The following table (Table 1) summarizes the results of the private well samples collected near the Crown Industries Site:

Table 1
Concentration Range of Contaminants in the Residential Wells with Carbon Filters, Dosage, Cancer Class, and Source

Chemical	*Concentration Range found in Residential Wells in ppb*	*MCL in ppb*	*Child Dose RMEG in ppb*	*Adult dose RMEG in ppb*	*Cancer Class EPA,NTP,IARC*	*Source*
Tetrachloroethylene (PCE)	DL to 27.0	5	100	400	C,3,3	EPA's Chronic Oral RfD PWS EPA
Trichloroethylene (TCE)	DL to 0.2	5			B2, 2, 2A	PWS EPA
Naphthalene	DL to 4.5		200	700	C, 3, 2B	EPA's Chronic Oral RfD
cis 1,2-Dichloroethene	DL to 0.37 J	5			No	PWS EPA
1,4 Dichlorobenzene	DL to 2.3	75	700 †	2000 †	C, 2, 2B	EPA's Chronic Oral RfD PWS EPA

DL – Detection Level
RMEG – Reference Dose Media Evaluation Guide
J – Indicates an estimated value, below the quantification limit, but above the method detection limit.
EPA Chronic Oral RfD – Environmental Protection Agency Chronic Oral Dose
IARC – International Agency for Research on Cancer
NTP – National Toxicology Program
PWS EPA – Public Water Supply Environmental Protection Agency
† - Intermediate Reference Dose Media Guide

Cancer Class:
EPA (based on 1986 cancer assessment guidelines)
B2 = probably human carcinogen (inadequate human, sufficient animal studies)
C = Possible human carcinogen (no human, limited animal studies)
NTP 2 = Reasonably anticipated to be a carcinogen
3 = Not classified

IARC 2A = Probably carcinogenic to humans (limited human evidence; sufficient evidence in animals)
IARC 2B = Possibly carcinogenic to humans (limited human evidence; less than sufficient evidence in animals)
IARC 3 = Not classifiable

Discussion of Contaminants

Tetrachloroethylene (PCE)

Tetrachloroethylene is a manufactured chemical used in dry cleaning and metal degreasing. Much of the PCE that gets into the soil or surface water evaporates into the air. PCE can be broken down by sunlight into other chemicals or brought back to the soil and water by rain. It does not appear to bioaccumulate in fish or other animals that live in water. Irritation may result from extended and repeated skin contact. In industry, women workers are more prone to miscarriages and menstrual problems from inhaling PCE. Experimental evidence indicates PCE exposure can cause developmental toxicity and kidney and liver damage [6]. In the study used as the basis to derive the ATSDR's Minimal Risk Level (MRL) for acute oral exposures for humans, mice were

fed specific doses of PCE. The lowest dose that changes were observed in the behavior of the mice was (5 mg/kg/day). An MRL is the ATSDR estimate of daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. These substance specific estimates, which are intended to serve as screening levels. ATSDR calculated this MRL to be 0.05 mg/kg/day for a Lowest-Observable-Adverse-Effects-Level (LOAEL), which was hyperactivity [7]. EPA's Chronic Oral reference dose (RfD) for PCE is 0.01 mg/kg/day. An RfD is defined as an EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans. The MCL is defined as the maximum permissible level of a contaminant in water delivered to any user of a public system. MCLs are enforceable standards. The EPA MCL for PCE in drinking water is 5 ppb [8]. PCE is anticipated to be a carcinogen. PCE has been shown to cause liver tumors in mice and kidney tumors in male rats.

Trichloroethylene (TCE)

TCE is a colorless liquid used as a solvent for cleaning metal parts. It is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers. It does not naturally occur in the environment. TCE can remain in ground water a long time. TCE quickly evaporates from surface water but evaporates less easily from soil. TCE may stick to particles in water which then settle to the bottom sediment. It does not build up significantly in plants and animals. Inhaling TCE may cause headaches, lung irritation, poor coordination, dizziness, difficulty concentrating, cause unconsciousness, heart problems and death. Chronic inhalation of TCE may cause nerve, kidney, and liver damage. Drinking enough TCE in concentrations above 5 ppb may cause nausea, liver damage, unconsciousness, impaired heart function, or death. Chronic drinking of TCE in water may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women. Skin contact may cause skin rashes [9]. The MRL for TCE was derived from a LOAEL from an animal study. Uncertainty factors were used to derive the MRL for oral acute human exposure, 0.2 mg/kg/day [10]. Some studies of people drinking water with TCE were classified "increased risk of cancer". The National Toxicology Program (NTP), in its 9th report on Carcinogens, has determined TCE is "reasonably anticipated to be a human carcinogen". The EPA has set the MCL for TCE at 5 ppb.

Naphthalene

Naphthalene is a white solid that evaporates easily. It is found in fuels such as petroleum and coal. It is used to manufacture polyvinyl chloride (PVC) plastics, moth repellants, and toilet deodorant blocks. It is also produced from burning tobacco and wood. Naphthalene can dissolve in water. It becomes weakly attached to soil and will pass through the soil into underground water. Naphthalene may be broken down by bacteria in water or evaporate into the air. Naphthalene does not accumulate in fish or animals [11]. Exposure to 20 ppb naphthalene may cause nausea, vomiting, diarrhea, blood in urine, and yellow skin coloring [12]. Exposure to naphthalene may also damage or destroy some red blood cells and cause hemolytic anemia. Symptoms that may be incurred are restlessness, lack of appetite, and pale skin. There is no direct evidence that states naphthalene causes cancer in humans; however it is found to cause cancer in animals. Based on animal studies, International Agency for Research on Cancer (IARC) concluded that naphthalene is a possible human carcinogen.

There are no studies of how naphthalene affects humans. Naphthalene has been found in some breast milk and blood in low concentrations. The EPA recommends that children not drink water greater than 5 ppb naphthalene for more than 10 days or over 4 ppb longer than 7 years. Adults should not drink water with concentrations of more than 10 ppm for more than 7 years. For water consumed over a lifetime (70 years), the EPA suggests that it contain no more than 1 ppb naphthalene. The derived MRL using uncertainty factors such as extrapolation from animal to human, minimal use of LOAEL, and human variability found the oral acute human exposure and oral intermediate exposure to naphthalene was 0.6 mg/kg/day [13].

Cis 1,2 – Dichloroethene (1,2 DCE)

1,2 DCE is a colorless liquid used to produce solvents and chemical mixtures. 1,2 DCE evaporates rapidly in air. Most 1,2 DCE in surface soil and bodies of water will evaporate into the air. 1,2 DCE can travel through soil or dissolve in groundwater. It is possible that 1,2 DCE will break down into vinyl chloride which is more toxic than 1,2 DCE [14]. The MRL was derived using uncertainty factors such as the No Observable Adverse Effect Level (NOAEL) to calculate the human oral acute dose as 1 mg/kg/day and the human oral intermediate dose was 0.3 mg/kg/day [15]. Cis 1,2 DCE has the ability to cause liver defects and decreased numbers of red blood cells. The EPA has determined cis 1,2 DCE is not classifiable as a human carcinogen [16].

1,4 - Dichlorobenzene (1,4-DCB)

1,4-dichlorobenzene is found in mothballs and toilet-deodorizer blocks. Dichlorobenzene is soil is not easily broken down by soil organisms. Evidence suggests plants and fish absorb dichlorobenzenes. Dichlorobenzenes do not dissolve easily into water. People who ingest 1,4 dichlorobenzene regularly over a long period of time develop skin blotches and anemia. 1,4-dichlorobenzene may be anticipated to be a carcinogen from animal studies resulting in liver and kidney tumors [17]. 1,4-dichlorobenzene was detected in HW-10 five times between May 1994 until May 1997. It has not been detected since then or the other five residential wells except once in HW-14 at a concentration of 0.966 ppb in August 2005. The April 2006 residential well results did not detect any 1,4 dichlorobenzene.

Minimal Risk Levels (MRL)s are derived using data based on exposure, dose, and target organ to be exposed to a chemical without experiencing an adverse non-cancer effect. Non-cancer effects are generally based on the level at which no health adverse health effects (or the lowest level associated with health effects) found in animal or human studies along with other factors. MRLs are derived for acute (l-14 days), intermediate (15-364 days), and chronic (365 days and longer) durations and for the oral and inhalation routes of exposure. Serious health effects are not based on establishing MRLs. A person exposed to a chemical above the MRL does not mean an adverse health effects will occur. Most studies are based on animals with few human studies available. Humans are assumed to be more sensitive than animals. An MRL may be as much as a hundred fold below levels that have been shown to be nontoxic in laboratory animals. Two classifications used to describe observable effects are No-Observed-Adverse-Effect-Level (NOEAL) and Lowest-Observed-Adverse-Effect-Level (LOAEL). NOAEL is the highest exposure level at which no harmful effects were seen in the organ system studied. LOAEL is the lowest dose used in the study that caused a harmful health effect.

The highest concentration for each of the chemicals listed in Table 1 was used to calculate (worst case) child and adult daily doses. Table 2 compares these calculated doses with the corresponding oral RfD and MRL for each chemical. The comparison shows that the calculated dose for each chemical was well below the RfD or MRL and therefore no adverse non-cancer health effects are expected from exposure to these chemicals at the levels detected.

Table 2
Highest Adult Chemical Dose from Residential Well Data Compared to the EPA RfD and ATSDR MRL Doses

Chemical	Child Calculated Dose based on Highest Concentration mg/kg/day	Adult Calculated Dose based on Highest Concentration mg/kg/day	EPA's Chronic Oral RfD mg/kg/day	ATSDR's Chronic Oral MRL mg/kg/day
Tetrachloroethylene	2.7 E-03	7.7 E-04	0.01	0.01, LOAEL
Trichloroethylene	2.0 E-05	5.7 E-06	None given	0.2, Oral Acute, LOAEL
Naphthalene	4.5 E-04	1.2 E-04	0.02	0.6 Oral Acute, NOEAL
cis 1,2 Dichloroethene	3.5 E-05	1.06E-05	None given	1.0, Oral Acute NOAEL
1,4 Dichlorobenzene	2.3 E-04	6.5 E-05	0.03 *	0.07 Oral Intermediate

* - proposed EPA Chronic Oral Dose
chronic = continuous exposure one year or longer
acute = 14 days or less
intermediate = 15 to 365 days

Some Chemicals Detected Once

Methyl Ethyl Ketone (2 – Butanone)

Methyl Ethyl Ketone (MEK) also known as 2-Butanone can be manufactured or present in the natural environment. MEK is released in to the air from vehicle exhausts, glues, cleaning agent, paints, and other coatings. MEK is made by some trees and found in fruits and vegetables. MEK does not bioaccumulate in fish or deposit in the bottom of rivers or lakes. No long-term studies with animals inhaling or drinking MEK exist at this time. MEK is not classified as a human carcinogen [18]. The current intermediate Reference Dose Media Evaluation Guide (RMEG) is 6,000 ppb child and 20,000 ppb adult. Over ten years ago MEK was detected once in HW-9 at 2.3 ppb. MEK was never detected in the other five residential wells. No adverse health effects are expected at the level detected.

Isopropylbenzene (Cumene)

Isopropylbenzene is used as a thinner for paints, lacquers and enamels. It is found in high octane fuels and crude oil. Isopropylbenzene can be released into the environment from combustion of

petroleum products. Long-term occupational exposure from inhalation may result in liver enzyme problems. Very little data was found on oral exposure to isopropylbenzene. NTP and EPA have not classified isopropylbenzene as a human carcinogen [19]. The RMEG value for children is 1,000 ppb. The adult RMEG value is 4,000 ppb. Only once was isopropylbenzene detected in HW-10 at 0.33 ppb. No adverse health effects are expected at the level detected.

n-Propylbenzene

N-Propylbenzene is found naturally in the petroleum and bituminous coal. It can also be released into the air from combustion from incinerators and engines. N-propylbenzene is used in dyeing and printing. Studies show n-propylbenzene degrades in soil and water [20]. N-Propylbenzene was detected once in HW-10 at 0.98 ppb. N-propylbenzene was never detected in the other five residential wells. No adverse health effects are expected at the level detected.

Theoretical Cancer Risks

It is assumed that the groundwater contamination started no earlier than 1960, when the site began operating, but sampling data was not available to analyze prior to 1988. The contaminants found with a cancer risk are tetrachloroethylene, trichloroethylene, and 1,4 – dichlorobenzene. The theoretical cancer risk was determined by averaging the contaminant results into a dosage of mg/kg/day. Assumptions used to factor the dosage included 2 liters per day of drinking water and 70 kg for average body weight. This dosage was then multiplied by the EPA Oral Cancer Slope Factor. This calculation estimates a theoretical excess cancer risk expressed as the proportion of a population that may be affected by a carcinogen during a lifetime of exposure. For example, an estimated cancer risk of 1×10^{-6} predicts the probability of one additional cancer over background in a population of 1 million. As the contaminants degrade over time, the theoretical cancer risk should decrease as the average concentrations decrease. The theoretical cancer risk estimate (less than 10^{-6}) indicates that the toxicology literature would support a finding that an insignificant or no excess cancer risk is interpreted as "*no apparent risk*". "*No apparent risk*" was determined for HW-10 for TCE based on the levels and data evaluated. No additional cancer risks are to be expected for the other wells based on the levels and data evaluated. The theoretical cancer risks are calculated in Table 3.

Table 3
Theoretical Cancer Risk for Contaminants in Residential Wells

		HW-10, 1988 - 2006			HW-9, 1988 - 2002			HW-9a 1995 - 2002		
Chemical	EPA Oral Cancer Slope Factor [mg/kg/day] $^{-1}$	Ave. Conc. ppb	Ave. Adult mg/kg/day	Theo. Cancer Risk	Ave. Conc. ppb	Ave. Adult mg/kg/day	Theo. Cancer Risk	Ave. Conc. ppb	Ave. Adult mg/kg/day	Theo. Cancer Risk
Tetrachloroethylene	0.052	6.56	1.87 E-04	1.0 E-05	2.9	8.3 E-05	4.0 E-06	1.23	3.5 E-05	1.8 E-06
Trichloroethylene	0.4	ND	------	------	0.06	1.7 E-06	6.9 E-07	0.44	1.3 E-05	5.0 E-06
1,4-Dichlorobenzene	0.024	0.25*	7.2 E-06	1.7 E-07	ND	------	------	ND	------	-----

Theo. – theoretical
Conc. – concentration
ND – Not detected
* - detected levels until June 1998

Child Health Considerations

PADOH and ATSDR recognize that infants and children may be more vulnerable to chemical exposure than adults. PADOH and ATSDR are committed to evaluating childhood exposures. Considering exposure to VOCs through drinking and showering, children may have an increased vulnerability, presumably because of a higher body burden. PADOH and ATSDR considered child-specific doses in the analysis for this health consultation and do not expect adverse health effects in children exposed to the detected levels of contaminants in the drinking water of these homes to be at an increased risk. Children have not lived at the residence with HW-10 within the past 20 years.

Conclusions

ATSDR and PADOH conclude the following:

1. Past exposure from the site using sampling data from 1988 until now showed *no apparent increased risk* of cancer. The dosages calculated, using the highest concentrations of groundwater contaminants from the early data, were well below the EPA and ATSDR's RfD for lowest observable adverse effects with *no apparent health hazard*. Current exposure to PCE, TCE, and other VOCs from private well water represents *no apparent health hazard* for all the residents utilizing their wells for drinking, showering, cooking, etc. in the homes discussed in this health consultation. Based on the data provided and evaluated, the residents are not being exposed to levels of health concern. All the exposures calculated were below levels likely to result in adverse health effects.

2. The source of the PCE has been removed. However, the groundwater at the site remains contaminated with PCE, TCE and other VOCs that are slowly degrading over time. It is not expected that the plume of contaminated groundwater will continue to impact the private wells near the site at levels that would be considered a public health threat.

Public Health Recommendations

ATSDR and PADOH make the following recommendations to PADEP:

1. The site has *no apparent health hazards* at this time. ATSDR and PADOH do not recommend that PADEP needs to continue to mitigate drinking water exposure to trace levels of VOCs detected in 5 of the 6 private wells monitored at this site. The filter may be kept on HW-10 because the PCE levels are above 5 ppb MCL drinking water standard as a precautionary measure.

2. If additional residential well samples are collected at the site, PADOH could evaluate the results and prepare a health consultation that addresses the public health significance of the data. If requested, PADOH will implement this recommendation following the receipt of future sampling results.

3. Continue future testing of the monitoring wells.

4. If site conditions change, restart monitoring the residential wells.

Public Health Actions Completed and Planned

1. PADEP characterized the groundwater contamination plume at the site and determined whether nearby residents that utilize residential wells are impacted by TCE or other VOC contamination at the site. PADEP has provided bottled water to 6 homes near this site for 5 years, followed by installation and maintenance of carbon filtration systems since 1989.

2. PADEP will continue monitoring the onsite monitoring wells, and will re-initiate monitoring of the nearby residential wells if onsite conditions change.

3. ATSDR and PADOH will make this health consultation available to the residents and will be available to answer the residents' health questions.

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Certification

This health consultation for the Crown Industries Site was prepared by the Pennsylvania Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the health consultation were initiated. Editorial review was completed by the cooperative agreement partner.

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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

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Appendix A: Figures

Figure 1

Residential Wells and Monitoring Wells
Surrounding the Crown Industries Site (7/1/1992)

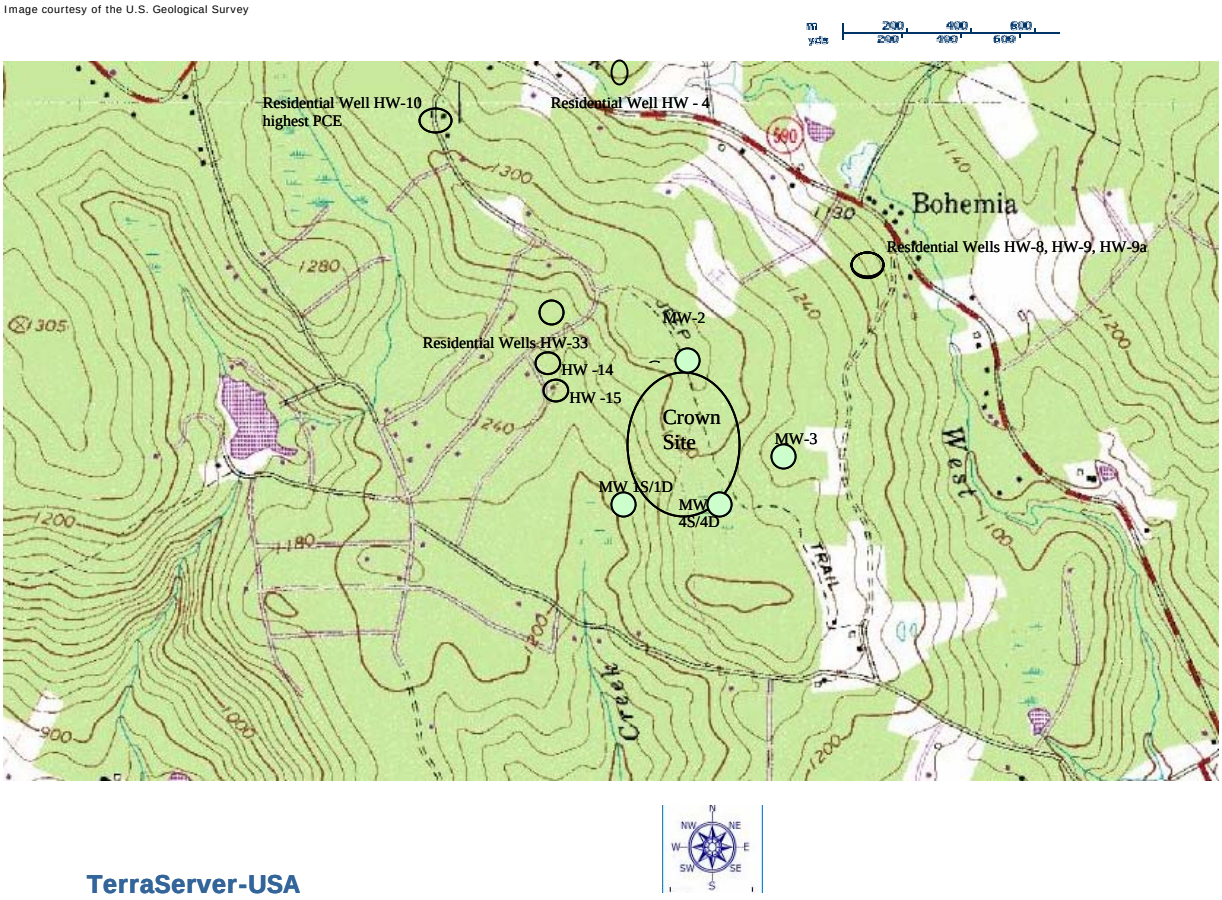

Figure 2

Aerial Photo of Crown Site with Possible Future Quarry Expansion (4/24/1999)

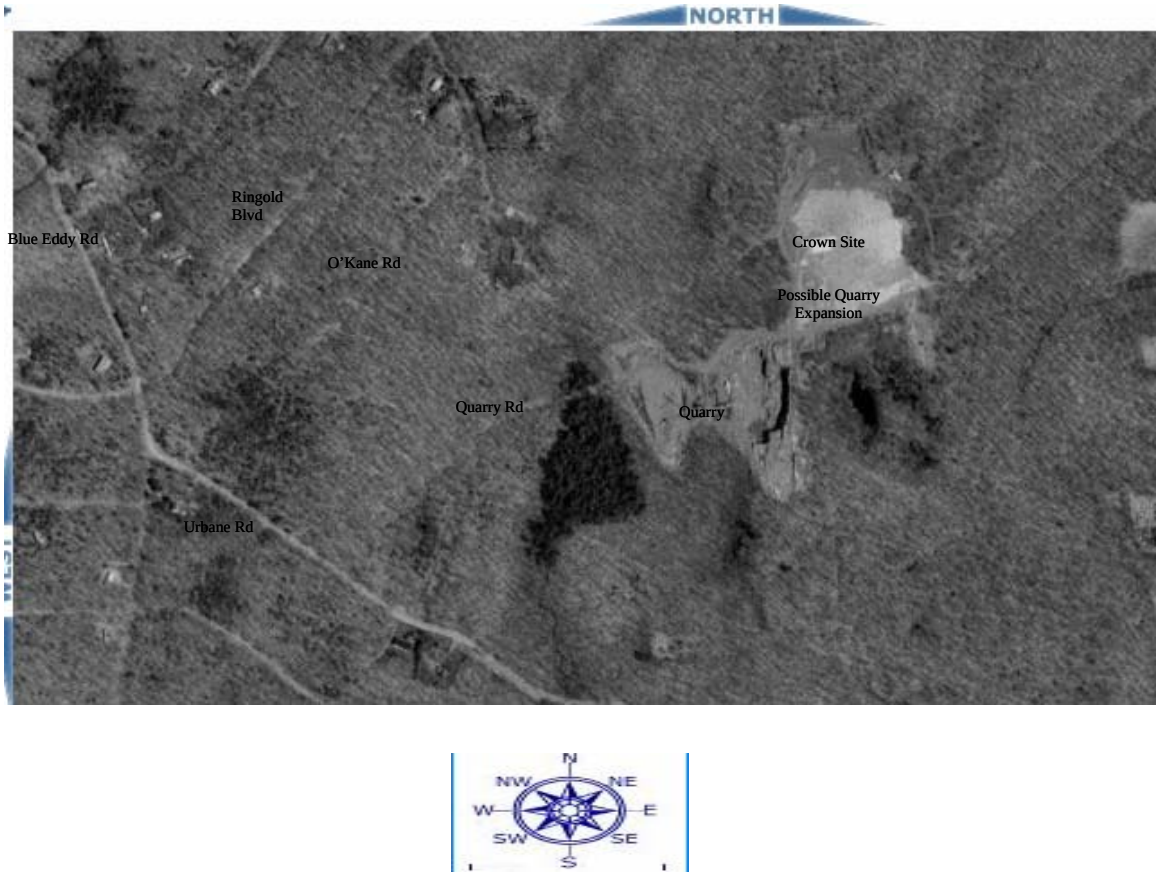

Image courtesy of the U.S. Geological Survey, Microsoft TerraServer

Appendix B: Tables

Table 1

Sample Results from Monitoring Wells at Crown Industries Site

Concentrations in ppb

Date	MW-1S	MW-1D	MW-2	MW-3	MW-4S	MW-4D
2/21/1991						
PCE	21.0	16.0	ND	6.0	ND	ND
1,2-DCE	5.0	5.0	4.0	1.0	ND	ND
TCE	2.0	2.0	ND	ND	ND	ND
1/29/1992						
PCE	13.0	ND	24.0	ND	ND	ND
1,2 DCE	ND	ND	ND	ND	ND	ND
TCE	ND	3.2	ND	ND	ND	ND
4/30/1992						
PCE	34.0	3.3	ND	ND	ND	ND
1,2-DCE	ND	ND	ND	ND	ND	ND
TCE	8.4	ND	ND	ND	ND	ND
12/4/1992						
PCE	5.0	8.0	3.0	ND	ND	ND
1,2-DCE	ND	3.0	ND	ND	ND	ND
TCE	ND	3.0	ND	ND	ND	ND
7/18/1994						
PCE	5.0	10.0	2.6	ND	ND	ND
1,2-DCE	ND	4.2	ND	ND	ND	ND
TCE	ND	3.0	ND	ND	ND	ND
8/15/1995						
PCE	NS	9.0	ND	0.4	NS	ND
1,2-DCE	NS	ND	ND	ND	NS	ND
TCE	NS	1.0	ND	ND	NS	ND

ND = Not Detected NS = Not Sampled

Table 2

Results from 3 of 6 Homeowner Wells near Crown Industries Site

Concentrations in ppb

	HW-9				HW-9a aquifer			HW-10				
	PCE	TCE	Cis 1,2 DCE	MEK	PCE	TCE	Cis 1,2 DCE	PCE	Isopropyl-benzene	Napthalene	n-Propyl-benzene	1,4-Dichloro-benzene
Apr-88								27		0		
May-88	5.1											
Jun-88								6.2		0		
Jun-89								12.6		0		
Mar-90	4							0		0		
Jun-91	3.8							9.8		0		0
Jan-92	5.2							10.9		0		0
Dec-92	4	0		0								
Feb-93								4.2		0.5		0
Jan-94	4							10				
May-94	2.7	0.2	0.2					6.8		0		0.5
Dec-94								4.2		4.5		2.3
Jan-95								7.4		2.2		0.2
May-95	2	0	0.1	0	3	0.2	0.1	7.77		3.67		0
Nov-95	1	0	0	0	1	0	0	6		0.5		0
May-96	1.8	0.11	0.09	2.3				5.4		0.75		0.21
Nov-96	1.3	0.09	0	0	1.4	0	0	6.8		0.29		0
May-97	2.3	0.17	0.14	0	1.6	0.1	0	8.5		0		0.02
Dec-97	2.28	0.1J	0.37 J	0	0.97 J	0	0	4.02		0		0
Jun-98	0.37	0	0	0	1	0	0	4.4		0.9		0
Dec-98								1.97		0		
Jun-99								2.7		0.45		
Aug-99	1.2	0	0	ND	0.8	0	0					
Feb-00	1.3	0	0	0	0.6	0	0					
Nov-00								0.95	0.33	0.64	0.98	ND
Jul-01								1.96	ND	1.69	ND	ND
Jun-02								2.28	ND	0.09	ND	ND
Sep-02	0	0	0.07	0	0.7	0.1	0.07					
Aug-03								3.22	ND	0.72	ND	ND
Mar-04								6.42	0	0	0	0
Aug-05								9.98	ND	ND	ND	ND
Apr-06								5.6	ND	ND	ND	ND

J - Estimated value
PCE – Tetrachloroethylene
TCE – Trichloroethylene
Cis 1,2 – DCE – Cis 1,2 – Dichloroethene
MEK – Methyl Ethyl Ketone