Health Consultation

COALDALE MGP SITE

COALDALE, SCHUYLKILL COUNTY, PENNSYLVANIA

NOVEMBER 24, 2004

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

COALDALE MGP SITE

COALDALE, SCHUYLKILL COUNTY, PENNSYLVANIA

Prepared by:

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

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Executive Summary

At the request of the Pennsylvania Department of Environmental Protection (PADEP), the Pennsylvania Department of Health (PADOH) prepared this health consultation to determine whether, through inhalation of the air in their homes, residents near the Coaldale MGP Site were exposed to volatile organic compounds (VOCS) at levels that would harm their health. The PADOH developed this health consultation under a cooperative agreement with the Agency of Toxic Substances and Disease Registry (ATSDR).

PADOH determined that children and adults living in the homes discussed in this health consultation would not currently experience a health risk from exposure to the contaminants detected in their indoor air. Relatively low levels of acetone, chloroethane, chloromethane, toluene, xylenes, and other VOCs were detected in the residents' basement air. These concentrations were below health-screening values and did not require further evaluation. Concentrations of acrolein, benzene, carbon tetrachloride, and hexachlorobutadiene were detected in the indoor air of residences throughout the site, and they were further evaluated because the detected levels of these contaminants exceeded health-based screening values. Dichlordifluoromethane, 1,2,4-trichlorobenzene, and 1,2,4-trimethylbenzene were also detected in the indoor air of these residences and further assessed, given that no health-based screening values were available for these chemicals. Upon completion of the public health evaluation, PADOH concluded that none of the chemicals detected in the indoor air of homes at this site currently represent a health threat for children or adults living in the sampled homes. Because information is not available regarding possible historical levels, potential past exposure to these chemicals is an indeterminate health hazard.

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

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Background and Statement of Issues

Site Description and History

The Coaldale MGP Site (the site) is approximately five acres in size and is located in a residential area of Coaldale Township, Schuylkill County, Pennsylvania (Figures 1–3). The site was historically used for a Manufactured Gas Plant (MGP); it was later redeveloped into a residential apartment complex by Schuylkill County Housing Authority [1] and remains occupied by tenants. The apartments were constructed on a concrete slab with no basement. The site is bordered by Pennsylvania State Route 209 to the north, East Street to the east, residential dwellings to the west, and an athletic field to the south. A drainage ditch traverses near the site's western edge, eventually feeding into a tributary to Panther Creek. The drinking water for the on-site residences is from a municipal water supply that draws its water from an area unaffected by the site. The groundwater underneath the site is not used for drinking water purposes.

Large quantities of complex mixtures of coal tar, sludges, oils, and other chemicals were by-products of the production of coal gas. Coal tar and other waste products from the gasification plants were commonly disposed of on the plant site in unlined pits, or in some cases injected underground through injection wells. These practices have left behind subsurface coal tar contamination at many former MGP sites. Coal tar is the most common contaminant at MGP Sites. About 300 chemicals have been identified in coal tar creosote, but as many as 10,000 other chemicals could be in this mixture [2]. The composition of coal tar varies, but is usually a mixture of

1. polycyclic aromatic hydrocarbons (PAHs), such as benzo-pyrene, naphthalene, anthracene, acenaphthene, and phenathrene;
2. phenolic compounds, including phenol and methylphenols;
3. light aromatic compounds, such as benzene, toluene, ethyltoluene, and xylenes, which are also referred to as VOCs; and,
4. miscellaneous quantities of inorganic compounds, such as iron, lead, copper, zinc, various sulfides, cyanides and nitrates.

Coal tar is somewhat denser than water and tends to migrate downward in the subsurface until it reaches an impermeable stratum. There it resides in an immobile state or spreads slowly, continuously sourcing groundwater contamination, given that PAHs and other constituent compounds solubilize slowly [3].

PADEP began investigating the Coaldale MGP site in 2002. Until that time, no environmental studies had been performed at the Coaldale MGP Site to evaluate the potential for soil or groundwater contamination from the former coal gas site. For this reason, the potential for past exposures to coal-tar related contaminants cannot be evaluated and represents an indeterminate public health hazard. Using the results of the sampling performed in the site characterization study, coal-tar contaminants such as VOCs, semivolatile organic compounds (SVOCs), and heavy metals were identified in the soils and shallow groundwater at the Coaldale MGP Site. The concentrations of these compounds were detected both below and in excess of the regulatory standards established by the PADEP. The concentrations of the coal-tar related VOCs were identified at depths greater than six feet [4]. To determine potential human exposure to the identified VOCs, indoor air samples were collected from residential locations dispersed throughout on the site.

For this health consultation, PADOH, at the request of PADEP, evaluated the results of indoor air samples collected at the site. The samples were collected from the first floors of the on-site residences and analyzed for the presence of VOCs. PADOH's objective throughout this health consultation is to determine whether exposures to these contaminants are at levels that would be considered a health hazard.

Site Visits

On November 20, 2003, two PADOH staff and an ATSDR representative made an initial site visit with PADEP. On April 27, 2004, two PADOH staff again viewed the site with the PADEP Project Officer. The coal tar contamination was delineated, and results of the Site Characterization were discussed. PADOH staff took notes, photographs, and discussed site background information with the PADEP Project Officer. Also, during this second site visit, PADOH met with residents to discuss their first round of air sampling results. During this site visit, PADEP's consultants, AMEC, collected a second round of indoor air samples.

Sample Events

On December 15, 2003 and April 27, 2004, PADEP's consultant conducted indoor air sampling at nine of the private residences on the site. The purpose of the indoor air sample collection was to determine whether VOCs were present in the indoor air at detectable concentrations, and any possible significance for public health. PADEP consultants utilized a summa canister to collect 8-hour time integrated air samples from inside each sampled residential location. These air samples were submitted to an independent laboratory and analyzed for VOCs using EPA methodology.

Sample Results

Low levels of acetone, acrolein, benzene, carbon tetrachloride, dichlorodifluoromethane, hexachlorobutadiene, 1,2,4-trichlorobenzene, 1,2,4-trimethylbenzene, toluene, xylenes, and other VOCs were detected in the indoor air in all or some of the sample locations on the site [5,6]. Benzene was detected at a maximum concentration of 2 parts per billion by volume (ppbv) in the indoor air of an on-site residential location. The following chemicals were also found at maximum concentrations: acetone (253 ppbv), acrolein (4 ppbv), dichlorodifluoromethane (8 ppbv), 1,2,4-trimethylbenzene (2 ppbv), toluene (8 ppbv) and total xylenes (1 ppbv). During the December and April sampling events, 1,2,4-trichlorobenzene was detected in one residential location's indoor air at concentrations of 2.7 ppbv and 1.3 ppbv. During the April 2004 sampling event, carbon tetrachloride was also detected in one residence at a concentration of 1.6 ppbv. In this health consultation, PADOH evaluated these indoor air sampling results and determined the public health significance of the data.

Quality Assurance and Quality Control

ATSDR and PADOH are limited to the credibility of the information provided in the referenced documents. It is expected that adequate quality assurance and quality control measures were adhered to regarding data gathering, chain of custody, laboratory procedures, and data reporting. In addition, during all aspects of sample collection, analyses, and reporting, extreme care is required to ensure high quality data and the best applicable science. ATSDR and PADOH expect that the laboratory only used certified, clean-sample collection devices. Once samples were collected, we expect they were stored according to the method protocol and were delivered to the analytical laboratory within the limits of method protocol. Finally, we expect laboratory standard operating procedures and other procedures and guidance for sample analysis, reporting, and chains of custody were followed. If ATSDR and PADOH believe the laboratory data were flawed in any way, further evaluation of the quality assurance and quality control procedures was conducted. Any analyses, conclusions, and recommendations in this health consultation are limited by the completeness and reliability of the referenced documents.

Discussion

In this section, PADOH evaluates the indoor air data and determines whether the residents are being exposed to harmful levels of the detected VOCs. PADOH considers how occupants came into contact with the VOCs as well as the frequency of exposure. PADOH also considers whether the contaminants were present at harmful levels.

To determine the likelihood of possible health effects of site-specific chemicals, ATSDR has developed health-based comparison values (CVs). These CVs include Minimal Risk Levels (MRLs) for non-cancerous health effects, Cancer Risk Evaluation Guides (CREGs) for cancerous health effects, and Environmental Media Evaluation Guides (EMEGs).

ATSDR established MRLs after evaluating the toxicological literature for given substances. MRLs are not thresholds of toxicity; rather, they are inteded as screening tools, below which non-cancer adverse health effects are unlikely. In that framework, a lifetime of exposure below a chronic MRL would not be expected to result in adverse health effects. On the other hand, exposure to levels above the MRL might not in itself necessarily lead to adverse health effects. There is a wide range of uncertainty between levels known to cause adverse health effects and the MRLs. Therefore, the MRL does not establish the maximum “safe” level, nor is it intended to imply that exposure is not likely to be harmful. If environmental exposures occur at concentrations exceeding the MRL, further evaluation is necessary to determine the health risks of those exposures.

In certain cases, when ATSDR-derived CVs are not available to screen a site-specific chemical, PADOH uses other sources to evaluate the contaminants that were detected in samples. In the following section, when ATSDR CVs were not available for a specific chemical, the PADOH utilized the United States Environmental Protection Agency (USEPA) Region III Risk-Based Concentration (RBC) Table. The RBC Table contains Reference Doses (RfDs) and Cancer Slope Factors for 400 – 500 chemicals. The RfD is an estimate of a daily oral exposure to the human population that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. At exposures increasingly greater than the RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. These toxicity factors have been combined with “standard exposure” scenarios to calculate RBCs or chemical concentrations corresponding to fixed levels of risk in multiple types of sample media that include water, air, fish tissue, and soil [7].

Contaminant Evaluation

Sample results indicated that exposures to acetone, benzene, carbon tetrachloride, toluene, and total xylenes in the indoor air were below their corresponding MRLs for chronic or intermediate exposure [8] and should not cause non-cancerous effects to the residents at the levels detected (Table 1). Therefore, these contaminants, with the exception of benzene and carbon tetrachloride, will not be further addressed in this health consultation. Benzene is a known carcinogen [9] and was detected in concentrations exceeding the chronic CREG for benzene (0.03 ppbv), which necessitates further evaluation. Carbon tetrachloride was also detected in a concentration higher than its corresponding chronic CREG (0.01 ppbv) and was evaluated further in this section.

Hexachlorobutadiene was also detected in concentrations in excess of the chronic CREG for hexachlorobutadiene (0.005 ppbv). Using sufficient animal studies EPA guidelines have identified carbon tetrachloride is a probable human carcinogen. Using limited animal studies, those same guidelines identify hexachlorobutadiene as a possible human carcinogen.

Acrolein was detected in indoor air in concentrations exceeding the intermediate exposure MRL and therefore chosen for further assessment; it also exceeds the acute exposure MRL (0.05 ppbv). Dichlorodifluoromethane, 1,2,4-trichlorobenzene, and 1,2,4-trimethylbenzene were also detected in the on-site residential air samples and selected for further evaluation — health-based screening values were not available for these contaminants.

It was noted that at least one smoker was living in each of the sampled homes. These contaminants, specifically benzene and acrolein, are found as constituents in second-hand cigarette smoke. It is more likely that cigarette smoke contributed to the concentrations of benzene and acrolein detected in the residential indoor air than contamination that originated from the site.

Benzene

Benzene is commonly found in the environment, and industrial processes are the main sources. Benzene levels in the air can increase from emissions from burning coal and oil, benzene waste and storage operations, motor vehicle exhaust, and evaporation from gasoline service stations. Because tobacco smoke contains elevated levels of benzene, it is another source of benzene in air. It can also pass into air from benzene-contaminated water and soil surfaces. Once in the air, benzene reacts with other chemicals and breaks down within a few days [10].

Although a chronic MRL for benzene does not currently exist, the maximum concentration of benzene (2 ppbv) detected in one of the homes is below a level that ATSDR and PADOH consider a threat to health. The range of detected benzene concentrations falls within the normal background concentrations (0.02 to 34 ppbv) that have been reported for ambient air [10]. Exposure to benzene at the levels found in the indoor air would not be expected to cause adverse health effects to residents.

PADOH estimates the maximum excess cancer risk for lifetime exposure (24 hours per day) to benzene at 2 ppb is one additional cancer per 100,000 persons or a no-apparent increased risk [11]. Our calculation is based on the assumption no level of exposure to a chemical that causes cancer is safe. Nevertheless, the calculated risk is not exact and tends to overestimate the actual risk associated with exposures that might have occurred. Also assuming that residents spend less than 24 hours per day in their homes, the overall cancer risk would further decrease. Given the relatively low level of the maximum detected concentration of benzene (2 ppbv) in comparison to studies that associated benzene to leukemia, and given an intermittent residential exposure environment, it is unlikely that the estimated exposure would result in increased cancer risk.

Carbon Tetrachloride

In the past, carbon tetrachloride has been produced to make refrigeration fluid and propellants for aerosol cans. Carbon tetrachloride was also used in cleaning agents, fire extinguishers, and pesticides. The production of this chemical is being phased out because of its ability to destroy the earth's ozone layer [12].

Only one sample in the April 2004 sampling event yielded a detectable concentration of carbon tetrachloride, which was 1.6 ppbv. Because this sample result was well below the chronic EMEG/MRL (Table 1), PADOH and ATSDR would not expect non-carcinogenic health effects to occur with chronic inhalation exposures to this level of carbon tetrachloride in the indoor air. The analysis of the air samples indicated that no other samples had detectable concentrations of this compound.

Because carbon tetrachloride is a probable human carcinogen [reference], PADOH calculated the quantitative risk for cancer if lifetime exposures to this compound were 1.6 ppbv. PADOH estimates that the maximum excess cancer risk for lifetime exposure (24 hours per day) to carbon tetrachloride at 1.6 ppbv is one additional cancer per 100,000 persons, or a no apparent increased risk [11].

Hexachlorobutadiene

Hexachlorobutadiene (HCBD) does not occur naturally in the environment. It is formed during the processing of other chemicals such as PCE, trichloroethylene (TCE), and carbon tetrachloride. HCBD is an intermediate in the manufacture of rubber compounds and lubricants. It is used as a fluid for gyroscopes, a heat transfer liquid, or a hydraulic fluid. Outside of the United States it is used to kill soil pests [13].

No information is available regarding the acute and chronic noncarcinogenic effects of HCBD in humans from inhalation or oral exposure. No studies were located regarding cancer in humans or animals after inhalation exposure to HCBD [13]. Still, the EPA has derived a cancer inhalation unit risk of 2.2E-05 $(\mu g/m^3)^{-1}$, based on oral exposure data [14].

PADOH estimates the maximum excess cancer risk for lifetime exposure (24 hours per day) to HCBD at 5.6 ppbv (the maximum on-site level detected) is one additional cancer per 10,000 persons or a low increased risk. Our calculation is based on the assumption there is no safe level of exposure to a chemical that may cause cancer. As stated earlier, however, the calculated risk is not exact and tends to overestimate the actual risks with exposures that might have occurred. Also assuming that residents spend less than 24 hours per day in their homes, the overall cancer risk would further decrease. Again, no information is available on the health effects of HCBD in humans, and there is no evidence that HCBD is carcinogenic through inhalation. The chronic CREG for inhalation exposure was based on an extrapolation of oral exposure data. The effects of breathing low levels of HCBD are not known, and therefore it cannot be accurately determined that the estimated exposure would result in increased cancer risk.

Acrolein

Acrolein can be formed and can enter the air when organic matter such as tobacco and fuels such as gasoline and oil are burned. Acrolein can also be formed when fats are heated and can be found in fried foods, cooking oils, and roasted coffee [15]. Acrolein can make up 3 – 10% of total vehicle exhaust aldehydes. Smoking one cigarette yields 3 – 228 micrograms (μg) acrolein or can lead to concentrations of 450 – 840 $\mu g/m^3$ (196 – 366 ppbv) acrolein in 10 – 13 minutes of burning. Average ambient levels of acrolein of up to approximately 6.5 ppbv and maximum levels of up to 14 ppbv have been measured in urban air. Levels that are 10 to 100 times higher can occur in the vicinity of exhaust pipes [16].

No information is available on the carcinogenic effects of acrolein in humans. Limited animal cancer data are available. One inhalation study in rats reported no evidence of tumors in the respiratory tract or in other tissues and organs, while another study reported an increased incidence of adrenocortical tumors in female rats exposed to acrolein in drinking water [15, 17].

The major effects from chronic inhalation exposure to acrolein in humans consist of general respiratory congestion and eye, nose, and throat irritation [15, 18].

Lowest-Observed-Adverse-Effect Levels (LOAELs) in humans were identified at concentrations of 170 ppbv acrolein. Acute inhalation exposures to 170 ppbv acrolein for 40 minutes resulted in eye irritation. Acute inhalation exposures to 260 ppbv acrolein for 40 minutes resulted in nose irritation, and 430 ppbv acrolein for 40 minutes resulted in sore throat for a less serious LOAEL (effect) in human studies. Another study in humans indicated a less serious LOAEL of 810 ppbv and a more serious LOAEL of 1,220 ppbv. In this study, acute inhalation exposures to these concentrations resulted in varying degrees of eye irritation after 5 – 10 minutes of exposure.

In other studies, the threshold levels of acrolein causing irritation and health effects through inhalation are 30 ppbv for odor perception, 57 ppbv for eye irritation, 130 ppbv for nasal irritation and eye blinking, and 300 ppbv for decreased respiratory rate. As the level of acrolein rarely exceeds 13 ppbv in urban air, in normal circumstances it is not likely to reach annoying or harmful levels [16].

During the December 2003 and April 2004 sampling events at the site, acrolein was detected in all residential indoor air samples up to a maximum concentration of 4 ppbv acrolein. According to information gathered during the site visit, at least one cigarette smoker occupies each of the residential locations that were sampled. PADOH does not expect exposures to acrolein at the maximum level observed at this site (4 ppbv) to result in adverse health effects in humans.

Dichlorodifluoromethane

Dichlorodifluoromethane is used as a refrigerant gas, an aerosol propellant, and as a leak-detecting agent [19]. It is a colorless gas or a liquid when pressurized. Dichlorodifluoromethane was prohibited for use in aerosol sprays in 1979 because of its depleting effect on the earth's ozone layer. This chemical has not been manufactured in the United States since 1995 [19].

According to information currently available to PADOH and ATSDR, dichlorodifluoromethane has been tested and has not been shown to cause cancer or to affect reproduction. Other long-term health studies indicated dichlorodifluoromethane did not result in statistically significant health effects to animals or humans [18]. Acute exposure to elevated concentrations of dichlorodifluoromethane could result in irritation and burning to the skin, eyes, mouth, nose and throat. At even greater concentrations the gas can cause the heart to beat irregularly or — from an acute exposure — to stop.

USEPA Region III's RBC for dichlorodifluoromethane in air is 180 $\mu g/m^3$ (approximately 36 ppbv) [20]. On-site indoor air samples yielded much lower results ranging from detected, yet estimated, concentrations of 0.6 ppbv to detected concentrations of 8 ppbv (Table 1). Given the relatively low toxicity and concentrations found, adverse health effects would not be expected.

1,2,4-Trichlorobenzene

Major uses of 1,2,4-trichlorobenzene include solvents in chemical manufacturing, production of dyes, dielectric fluids, transformer oils, lubricants, heat-transformer medium, and insecticides. It was also used in the manufacturing of other chlorinated benzenes, and herbicides. Some other sources of 1,2,4-trichlorobenzene are in degreasing agents, septic tank and drain cleaners, wood preservatives, and abrasive formulas [18].

According to the USEPA, 1,2,4-trichlorobenzene is not classifiable as to human carcinogenicity. At elevated concentrations (3,000 to 5,000 ppbv) of 1,2,4-trichlorobenzene in air, studies have indicated that acute exposures can cause throat irritation in certain people. At even higher concentrations, chlorinated benzenes are irritating to the skin, conjunctiva, and mucous membranes of the upper respiratory tract. Individuals who suffer from skin, liver, kidney, or chronic respiratory disease are at an increased risk if they are exposed to chlorobenzenes [19].

USEPA Region III's RBC for 1,2,4-trichlorobenzene in air is 3.7 $\mu g/m^3$ (approximately 0.5 ppbv) [20]. An on-site indoor air sample collected during the December 2003 yielded a result of 2.7 ppbv 1,2,4-trimethylbenzene, and a different location during the March 2004 sampling event had a detected concentration of 1.3 ppbv (Table 1). Because the detected concentrations exceeded the USEPA's RBC for dichlorodifluoromethane, an estimated exposure dose was calculated for the maximum detected concentration and compared to the inhalation RfD for 1,2,4-trichlorobenzene. Lifetime exposure to 1,2,4-trichlorobenzene at concentrations of 2.7 ppbv would result in an exposure dose of 0.00548 mg/kg/day for an adult. The RfD for inhalation of 1,2,4 trichlorobenzene is 0.001 mg/kg/day [20].

The RfD for inhalation exposure was developed with many uncertainties and tends to overestimate levels of exposure not considered to result in health effects. The RfD for 1,2,4-trichlorobenzene was based on an experimental NOAEL of 100 ppm or 14.8 mg/kg/day. An uncertainty factor of 10 was used to account for extrapolation from laboratory studies to humans. An additional factor of 10 was used to allow for sensitive populations among humans. An additional factor of 10 was used to account for a lack of chronic studies, and another factor of ten was used to extrapolate from oral to inhalation exposure studies. This results in a total uncertainty factor of 10,000 for this substance [21]. Given the high level of margin of safety in developing the health screening values and health studies researched by PADOH, exposure to 2.7 ppbv of 1,2,4-trichlorobenzene would not be expected to result in adverse health effects.

1,2,4-Trimethylbenzene

The primary use of 1,2,4-trimethylbenzene is as a gasoline additive, which is approximately 99% of its production volume. Uses of the remaining 1% include those as a solvent in coatings, cleaners, pesticides, printing, and inks [22]. 1,2,4-trimethylbenzene is also found in the production of coal tar oils [18].

At elevated concentrations (5,000,000 – 9,000,000 ppbv), acute exposure to 1,2,4-trimethylbenzene in air can cause headache, fatigue, and drowsiness. Short-term inhalation of vapor can also cause chemical pneumonitis [18]. Long-term or chronic exposure to solvents containing 1,2,4-trimethylbenzene could cause nervousness, tension, and bronchitis. Trimethylbenzene might also cause alterations in blood clotting [22]. No information or studies were found on the carcinogenicity of 1,2,4-trimethylbenzene.

USEPA Region III's RBC for 1,2,4-methylbenzene in air is 6.2 $\mu g/m^3$ (approximately 1.3 ppbv) [20]. All air samples collected during the December 2003 and April 2004 sampling events yielded a detectable concentration of 1,2,4-trimethylbenzene, with a maximum concentration of approximately 2 ppbv (Table 1). Because some of the detected concentrations exceeded the USEPA's RBC for 1,2,4-trimethylbenzene, an estimated exposure dose was calculated for the maximum detected concentration and compared to the inhalation RfD for 1,2,4-trichlorobenzene. Lifetime exposure to 1,2,4-trichlorobenzene at concentrations of 2 ppbv would result in an estimated exposure dose of 0.00274 mg/kg/day for an adult. The inhalation RfD for 1,2,4 trichlorobenzene is 0.00170 mg/kg/day [20].

As mentioned previously, high levels of uncertainty are incorporated into the development of RfD's for some chemicals like 1,2,4-trimethylbenzene. Lack of chronic studies, extrapolation of animal studies to human studies, and projections of health effects from different routes of exposure all tend to increase the level of uncertainty in the RfD. Given the high level of margin of safety in developing the health screening values and health studies researched by PADOH, exposure to 2 ppbv of 1,2,4-trimethylbenzene would not be expected to result in adverse health effects.

Child Health Considerations

PADOH and ATSDR recognize that infants and children can be more vulnerable to chemical exposure than adults. As part of the Child Health Initiative, PADOH and ATSDR are committed to evaluating children's special interests. With regard to exposure to indoor residential air near the Coaldale MGP Site, children could have an increased vulnerability due to many factors including:

1. children weigh less than adults, resulting in higher doses of chemical exposure relative to body weight,
2. children have higher rates of respiration,
3. metabolism and detoxification mechanisms differ in both the very young and very old and may increase or decrease susceptibility, and
4. the developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages.

PADOH and ATSDR considered child-specific doses in the analysis for this health consultation.

Conclusions

PADOH and ATSDR conclude that the presence of benzene, hexachlorobutadiene, acrolein, and other VOCs detected in indoor air currently represent no apparent health hazard for children or adults living in the homes discussed in this health consultation. Because historical data are lacking, past exposures to VOCs in the residential locations on the site represent an indeterminate health hazard .

Recommendations

At this time, no further health recommendations for the Coaldale MGP Site.

Public Health Actions Completed

1. PADOH and PADEP contacted the affected residents identified in this health consultation and discussed the public health significance of their exposure to VOCs in their indoor air. PADOH and PADEP encouraged proper use, storage, and disposal of household products containing VOCs. PADOH also discussed with the some of the residents the likelihood of cigarette smoking contributing to the VOC contamination in the indoor air. PADOH suggested if the residents could not quit smoking, they should choose not to smoke indoors. PADOH will continue to answer residents' health questions regarding this Site.
2. PADEP fully characterized the site, with special emphasis on defining the groundwater contamination plume, to determine whether VOCs or other contaminants are present in groundwater. PADOH and PADEP identified residents that were potentially impacted through indoor air vapor intrusion and were addressed in this health consultation.

Public Health Actions Planned

ATSDR and PADOH will make this health consultation available to the residents at the Coaldale MGP Site. If requested, the PADOH will provide information to residents on proper use, storage, and disposal of VOCS, and available programs for cessation of tobacco smoking.

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Certification

This health consultation, for the Coaldale MGP Site, was prepared by the Pennsylvania Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was prepared in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

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

Roberta Erlwein
Lead, Cooperative Agreement Team, SPAB, DHAC, ATSDR

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TABLE 1. SUMMARY OF DATA FOR SELECTED VOCS DETECTED IN AIR SAMPLES COLLECTED IN THE VICINITY OF THE COALDALE MGP SITE

Compound	Sampling Event	Sample Locations	Frequency of Detection	Range of Concentrations Detected		ATSDR Comparison Value (CV) – ppbv	CV Source(s)*
				mg/m^3	ppbv		
acetone	December 2003	Residences	8/9	0.02 – 0.6	8 – 253	13000	Chronic EMEG/MRL
	April 2004	Residences	9/9	0.02 – 0.1	8 – 42		
	December 2003	Ambient	1/1	0.005 J	2 J		
	April 2004	Ambient	1/1	0.07	29		
acrolein	December 2003	Residences	9/9	**0.002 J – 0.01**	**0.9 J – 4**	0.009	Intermediate EMEG/MRL
	April 2004	Residences	9/9	**0.002 J – 0.006**	**0.9 J – 2.6**		
	December 2003	Ambient	0/1	ND	ND		
	April 2004	Ambient	1/1	**0.005**	**2.2**		
benzene	December 2003	Residences	9/9	**0.001 J – 0.007**	**0.3 J – 2**	0.03	Chronic CREG
	April 2004	Residences	9/9	**0.001 J – 0.003**	**0.3 J – 0.9 J**		
	December 2003	Ambient	1/1	**0.002 J**	**0.6 J**	4	Intermediate MRL
	April 2004	Ambient	1/1	**0.001 J**	**0.3 J**		
carbon tetrachloride	December 2003	Residences	0/9	ND	ND	0.01	Chronic CREG
	April 2004	Residences	1/9	**0.01**	**1.6**		
	December 2003	Ambient	0/1	ND	ND	30	Chronic EMEG/MRL
	April 2004	Ambient	0/1	ND	ND		
chloroethane	December 2003	Residences	0/9	ND	ND	3800	Intermediate RfC
	April 2004	Residences	2/9	0.0009 J – 0.02	0.3 J – 7.6		
	December 2003	Ambient	0/1	ND	ND		
	April 2004	Ambient	0/1	ND	ND		
chloromethane	December 2003	Residences	9/9	0.001 J – 0.01	0.5 J – 4.8	50	Chronic EMEG/MRL
	April 2004	Residences	9/9	0.002 J – 0.005	1 J – 2.4		
	December 2003	Ambient	1/1	0.001 J	0.5 J		
	April 2004	Ambient	1/1	0.001 J	0.5 J		
dichlorodifluoromethane	December 2003	Residences	9/9	0.002 J – 0.04	0.6 J – 8	n/a	n/a
	April 2004	Residences	9/9	0.003 J – 0.02	0.6 J – 4		
	December 2003	Ambient	1/1	0.002 J	0.4 J		
	April 2004	Ambient	1/1	0.003 J	0.6 J		
hexachlorobutadiene	December 2003	Residences	1/9	**0.06**	**5.6**	0.005	Chronic CREG
	April 2004	Residences	1/9	**0.03**	**2.8**		
	December 2003	Ambient	0/1	ND	ND		
	April 2004	Ambient	0/1	ND	ND		

Table 1 is continued on to the next page

TABLE 1, continued. SUMMARY OF DATA FOR SELECTED VOCS DETECTED IN AIR SAMPLES COLLECTED IN THE VICINITY OF THE COALDALE MGP SITE

Compound	Sampling Event	Sample Locations	Frequency of Detection	Range of Concentrations Detected		ATSDR Comparison Value (CV) – ppbv	ATSDR CV Source(s)*
				mg/m^3	ppbv		
1,2,4-trichlorobenzene	December 2003	Residences	1/9	0.02	2.7	n/a	n/a
	April 2004	Residences	1/9	0.01	1.3		
	December 2003	Ambient	0/1	ND	ND		
	April 2004	Ambient	0/1	ND	ND		
1,2,4-trimethylbenzene	December 2003	Residences	9/9	0.002 J – 0.01	0.4 J – 2	n/a	n/a
	April 2004	Residences	9/9	0.002 J	0.4 J – 1.6		
	December 2003	Ambient	1/1	0.005 J	1 J		
	April 2004	Ambient	1/1	0.001 J	0.2 J		
toluene	December 2003	Residences	9/9	0.002 J – 0.02	0.5 – 5	80	Chronic EMEG/MRL
	April 2004	Residences	9/9	0.003 J – 0.02	0.5 J – 8		
	December 2003	Ambient	1/1	0.009	2		
	April 2004	Ambient	1/1	0.004	1		
xylenes (total)	December 2003	Residences	9/9	0.002 J – 0.025	0.2 J – 1.9	100	Chronic EMEG/MRL
	April 2004	Residences	9/9	0.002 J – 0.013	0.2 J – 1		
	December 2003	Ambient	1/1	0.014	1.1		
	April 2004	Ambient	1/1	0.004 J	0.3 J		

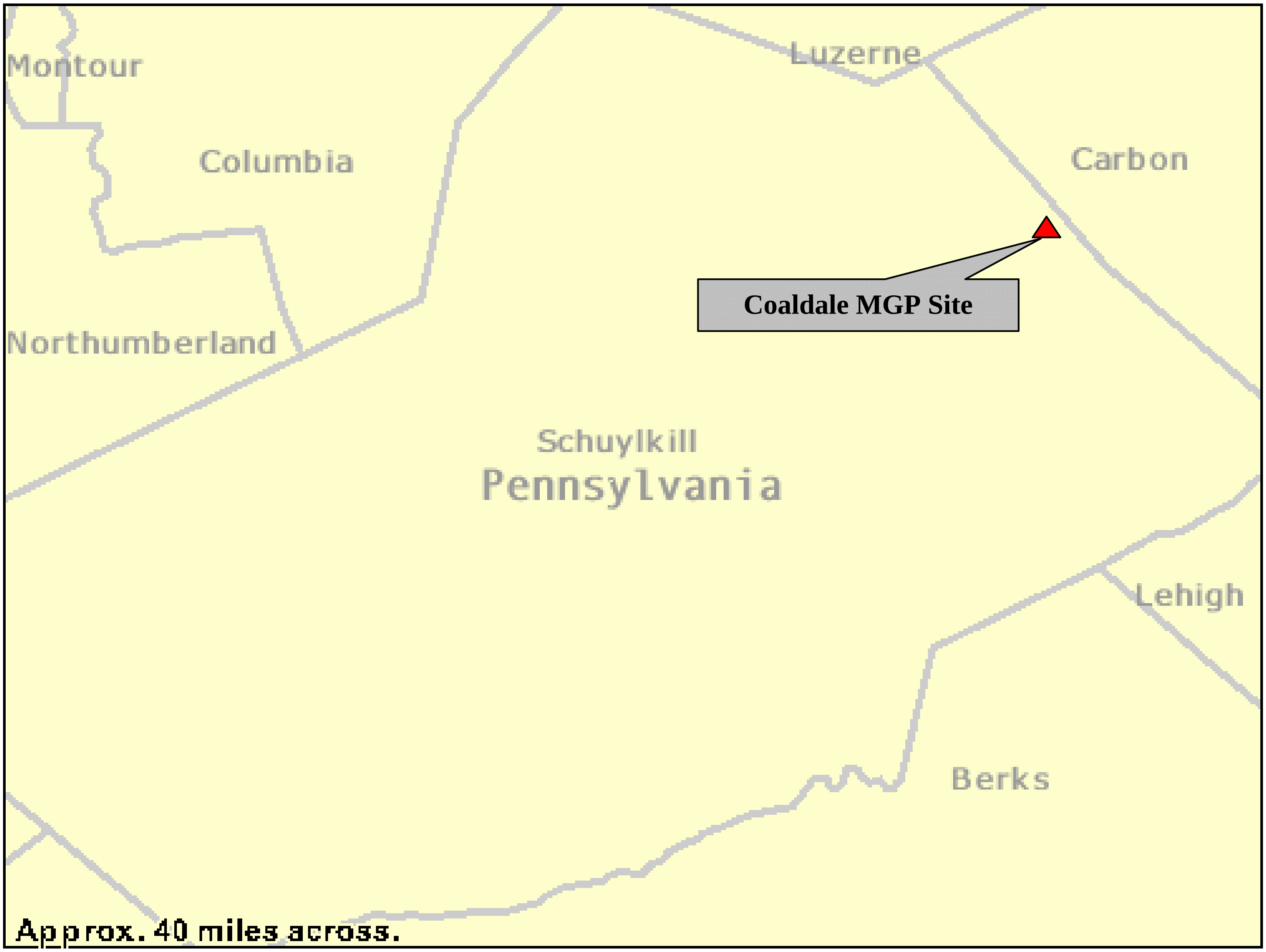
ND = Compound was not detected
J = Compound was detected, but is estimated below quantitation limit
n/a = not available
D = Analysis of diluted sample
Bolded = Result exceeds CV

***ATSDR COMPARISON VALUE (CV) DEFINITIONS**

CREG	Cancer Risk Evaluation Guide for 1 X 10^{-6} excess cancer risk
EMEG	Environmental Media Evaluation Guide
MRL	Minimal Risk Level
RfC	Reference Concentration (EPA)

Figure 1

Coaldale MGP Site Location Map



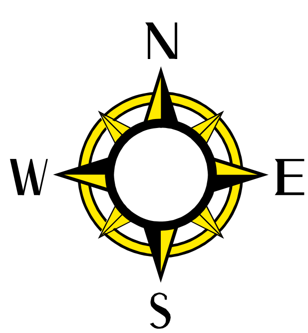
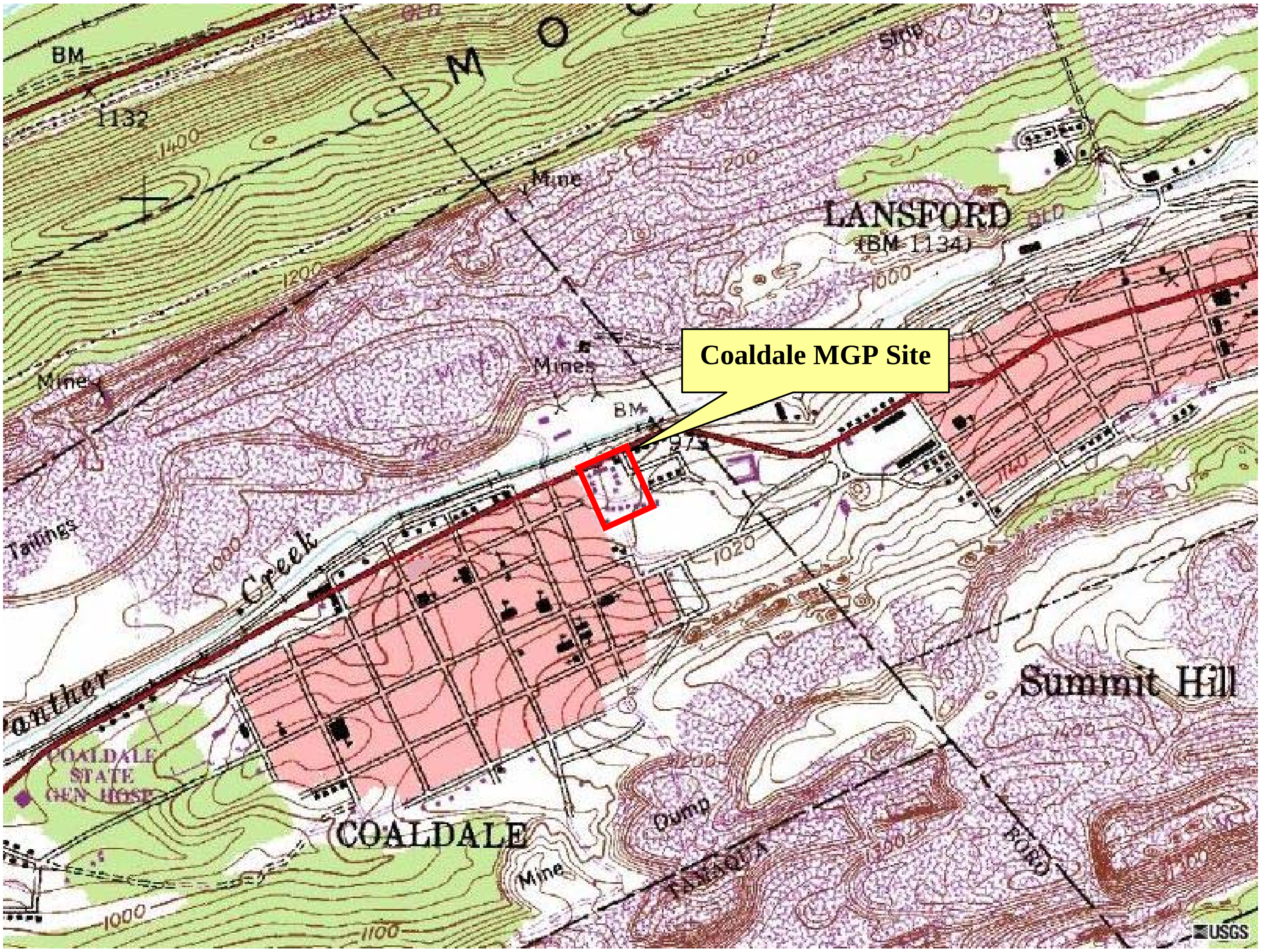
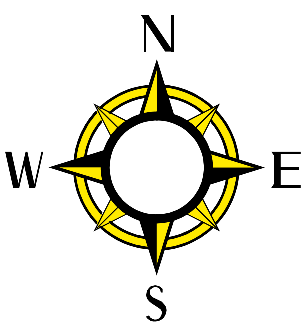


Figure 2

Coaldale MGP Site
USGS Topographic Map (July 1992)

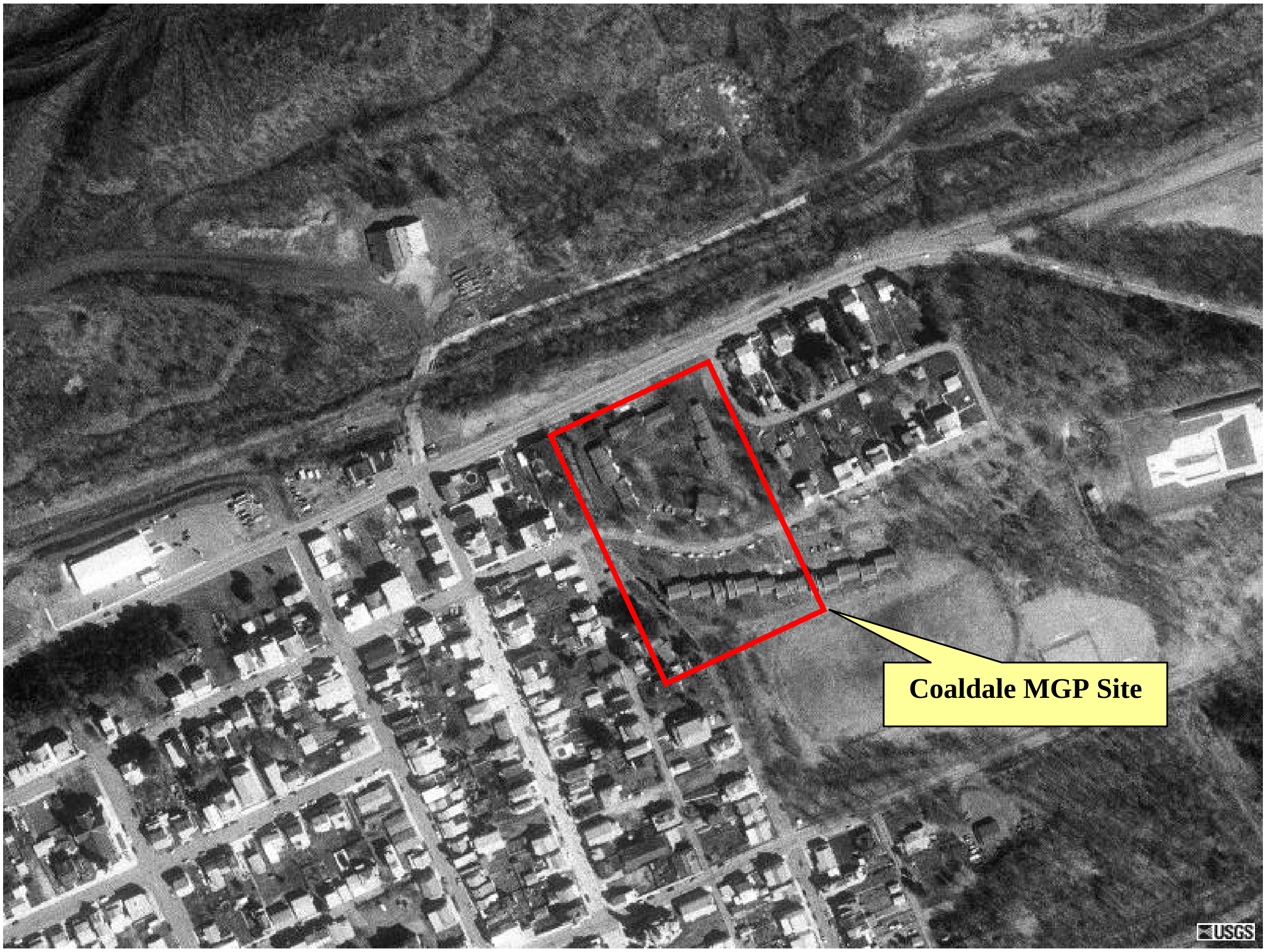


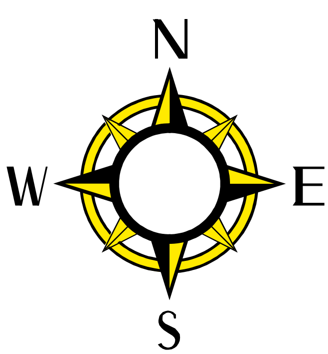


Scale: 1 inch = 0.25 mile

Figure 3

Coaldale MGP Site From USGS Aerial Photograph (April 1999)





Scale: 1 inch = ~125 yards