Health Consultation

SUNOCO SERVICE STATION

GREENSBURG, WESTMORELAND COUNTY, PENNSYLVANIA

EPA FACILITY ID: PAD982362626

OCTOBER 18, 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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Prepared by:

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

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Executive Summary

In response to a public request to the Agency for Toxic Substances and Disease Registry (ATSDR), the Pennsylvania Department of Health (PADOH), working under a cooperative agreement with the ATSDR, prepared this health consultation to determine whether residents near the Sunoco Site, located at the intersection of Mount Pleasant Street and South Urania Avenue in Greensburg, Pennsylvania (the Site), were exposed to volatile organic compounds (VOCs) in their homes at levels that would harm their health.

Tetrachloroethylene (PCE) was detected in soil-gas on the subject Site and a residential location. However, we are unable to make conclusions about health effects from soil-gas data. The soil-gas measurement technique can be used only for screening contaminants that may be present and indirectly measures underlying contamination that in some cases has yielded false-negative results. In addition, PADOH can make no conclusions regarding the public health hazard or significance of the on- and off-site soil-gas data because they have been determined to be insufficient.

Acetone, acrolein, ethyl acetate, ethylbenzene, hexachlorobutadiene, methylene chloride, m/p and o xylenes, pentane, propene, toluene, 1,2,4-trichlorobenzene, 1,2,4-trimethlybenzene, 1,3,5-trimethylbenzene, 2-butanone, and 4-ethyltoluene were detected in the indoor air of the residence at relatively low concentrations. However, PADOH can make no conclusions regarding a public health hazard in relation to the indoor air of the residential location because these sample data also are lacking.

PADOH and ATSDR recommended that the PADEP continue to follow up with the investigation of the potential source and fully characterize the PCE contamination plume detected in the soil-gas survey. This ongoing investigation also should identify potential receptors of the PCE contamination plume and any other VOC contaminants. Any residential location situated within the identified contamination plume should be investigated for possible vapor intrusion effects. PADOH will be available to review these results in a future health consultation, as needed.

The interpretation, conclusions, and recommendations regarding the Sunoco 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 Sunoco Site (the Site) is in a mixed residential and commercial area of Greensburg, Westmoreland County, Pennsylvania (Figures 1-3). The Site, which contains a food market and four gasoline pump islands, is bordered to the north by the Euclid Avenue, to the east by railroad tracks, to the south by Mount Pleasant Street, and to the west by South Urania Avenue. The Site is owned by Sunoco, and is used for commercial gasoline sales and a convenience store. The area of particular concern for this health consultation (HC) is one of the nearby residential locations in the general vicinity of the Site. Possible residential exposure to volatile organic compounds (VOCs) may have occurred or may still be occuring through subsurface vapor intrusion into the indoor air of the residence. The occupants of this nearby residence have sporadically observed odors, which they believe to have caused various adverse health effects since they have resided in this dwelling. Residential locations near the Site use the municipal water supply for potable water and, therefore, do not receive their drinking water from the potentially contaminated aquifer. This HC addresses a request ATSDR received directly from a concerned resident near this Site. PADOH, at the request of ATSDR, evaluated the results of a soil-gas survey and indoor air samples collected from the nearby dwelling where the residents observed the odors.

On April 14, 2004, Chad M. Clancy of PADOH conducted a Site (PA ID#65-08614) file review at the Pennsylvania Department of Environmental Protection (PADEP) Southwest Regional Office in Pittsburgh, PA to obtain additional Site history. The following summary of relevant historical events were obtained through this Site file review [2]:

- Pre-1985: Site owned by Ashland Oil, which operated a retail service and repair facility that sold gasoline and other petroleum products. (No earlier Site information was located in the file.)

- August 1985: Groundwater and Environmental Services, Inc. (GES) installed four groundwater monitoring wells in response to reports of gasoline vapors in the Site building and basements of residents located on Mount Pleasant Street. All four monitoring wells were subsequently destroyed during Site reconstruction activities in April 1988.

- 1989: Gasoline was released from the Site from a car either colliding with a product dispenser or pulling away from the dispenser with the fill hose attached to the car's gas tank. Released gasoline product migrated across the Site and into both the telephone and combination sanitary/storm water sewer manholes located beneath Mount Pleasant Street. Resultant vapors migrated through the combination sanitary/storm sewer piping into the basement floor drains of the residences located across Mount Pleasant Street. The sewer line systems located at both Mount Pleasant Street locations did not contain traps at the time.

- February 1991: Gasoline was released from the Site during underground storage tank (UST) filling operations. Excess gasoline remaining in the fill hose after completion of the UST filling operations was unintentionally released onto the pavement. The released gasoline migrated across the Site pavement and into both the telephone and combination sanitary/storm sewer manholes located beneath Mount Pleasant Street. Resultant vapors migrated through the combination sanitary storm sewer piping into the basement floor drains of some of the residences located along Mount Pleasant Street.

- January 1992: Groundwater Technology, Inc. (GTI) responded to reports of gasoline vapors within the Site building and basements of two residences across Mount Pleasant Street. Vapor screening was conducted of the Site building, utility manholes, and residents' basements. Results of the vapor screening revealed photo-ionization detector (PID) readings ranging from 45 units to 225 units in the Site building; from 0.0 (telephone manhole) to 455 units (combination sanitary/storm manhole) in the utility manholes at the intersection of Mount Pleasant Street and Urainia Avenue; and from 25 units to 200 units in basement floor drains of residences along Mount Pleasant Street.

- January 1992: L & A conducted tightness testing of the USTs and product delivery lines in response to the vapor reports. The UST and product delivery lines passed the tightness testing.

- March 1993: GTI responded to reports of gasoline vapors within the Site building and basements of residences across Mt. Pleasant Street. A venting system was installed within the air vent grate located along the southern wall of the Site building. The City of Greensburg Fire Department installed temporary exhaust fans in the basements of two residences along Mount Pleasant Street. In addition, the basement floor drains were temporarily capped to prevent additional vapors from traveling into the basements. Vapor monitoring of the Site building, monitoring wells, utility manholes, and residents' basements was conducted periodically through August 1993. The venting system was decommissioned and removed from the Site, and residents' drains were uncapped at the end of August 1993 when the vapor monitoring revealed non-detectable PID readings of the influent air stream at the monitoring locations.

- October 1993 through February 1994: GTI responded to reports of gasoline vapors within the Site building and basements of residences across Mt. Pleasant Street. The basement floor drains in the same residential locations were re-capped to prevent migration of additional vapors in the basements. Vapor screening of the Site building was conducted periodically through February 1994. The residence's drains were uncapped at the end of February when the vapor revealed non-detectable PID readings of the influent air stream and the monitoring locations.

- December 1995: GTI responded to reports of gasoline vapors within the Site building and basements of two of the residences across Mount Pleasant Street. The basement floor drains of the residential locations were temporarily re-capped to prevent migration of additional vapors into the basements. The residence's drains were uncapped at the end of

June 1996 when the PID readings of the influent air stream revealed non-detectable readings.

- February 1997: Fluor Daniel GTI (FDGTI) requested a Determination of Groundwater Attainment Standards and discontinuance of the groundwater monitoring program from the PADEP.

- March 4, 1997: PADEP granted that no further remediation or assessment activities are required at the facility.

- December 2 – 3, 1997: Sunoco responded to complaints of vapors within the basement of a residence across Mount Pleasant Street. Sunoco conducted vapor screening of the basement floor drains and fruit cellar foundation walls. No detectable readings were observed.

- January 5, 1998: FDGTI and PADEP responded to reports of gasoline vapors within the Site building, the sanitary sewer manhole behind Mount Pleasant Street, and a basement of a structure along Mount Pleasant Street. PADEP installed a temporary venting fan within the combination sanitary/storm sewer manhole located behind the Mount Pleasant Street building to prevent vapors from migrating through the sewer system into the basement floor drains of this structure, located along Mount Pleasant Street. FDGTI conducted vapor screening of the Site building, monitoring wells, utility manholes and residents' basements. The venting system was re-installed on an existing monitoring well.

- January 6, 1998: FDGTI sampled the Site monitoring wells and conducted vapor screening. Sunoco maintenance personnel discovered that a copper "feeder line" to a product dispenser was cracked and released gasoline. Sunoco maintenance personnel repaired the "feeder line." The venting system was moved from the monitoring well location to the catch basin situated in Urainia Avenue.

- January 7 – 8, 1998: L & A excavated the petroleum-impacted soil in the vicinity of the product dispenser and the Site French drain system. Approximately 0.5 tons of soil was excavated. Sunoco replaced the PADEP venting fan in the combination sanitary/storm manhole located behind a Mount Pleasant Street residential location with a permanent fan.

- January 19, 1998: Greater Greensburg Sewage Authority conducted a dye test of the sewer system to determine the area combination sanitary/storm sewer layout.

- March 1998: Sunoco installed a pump in the tankfield observation well to address groundwater seepage in roadway near the intersection of Mount Pleasant Street and Urainia Avenue.

- May 1998: Sunoco removed the pump from the tankfield observation well.

- November 1998: Sunoco re-installed a pump in the tankfield observation well to drain the Site and prevent groundwater seepage in roadway near the intersection of Mount Pleasant Street and Urainia Avenue.

- February 1999: Sunoco purchased the residential property located along Mt. Pleasant Street.

- April 1999: Sunoco shut down de-watering system. The pump was removed from the tankfield observation well.

- September 1999: Sunoco conducted dye tests of the basement floor drains and downspouts of the former residence at along Mount Pleasant Street. The dye test confirmed that one of the basement floor drains and roof down spouts are connected to the sewer line past the trap previously installed by Sunoco. The dye from all tests conducted was not observed in the manhole in the backyard. A "down hole camera" later confirmed the layout of the sewer system. The sewer system was observed in poor condition; sections of the pipe were cracked and separating from one another.

- November 1999: Sunoco replaced the sewer line piping at the Mount Pleasant Street address to eliminate the sewer system piping as a migration pathway for vapors from area combination sanitary/sewer to basement floor drains.

- November 2000: Sunoco responded to reports of vapors within a residential location across Mount Pleasant Street. Inspection of the residence revealed sewer gas vapors from a basement floor drain and an open pit, containing the residence sewer line. No gasoline odors were detected at the inspection. Sunoco installed a trap on the sewer line and sealed the open pit at this residential location.

- April – June 2003: Sunoco, PADEP, and the local gas company responded to reports of vapors within a residence along Mount Pleasant Street across from the Site. Reports indicated that no odors or explosive levels were observed. The residents indicated that the odors come and go sporadically and dissipated before the investigators arrived.

The aforementioned chain-of-events [2] occurred before ATSDR's and PADOH's involvement with the Site. During the summer of 2003, residents on Mount Pleasant Street across the street from the Site requested ATSDR's involvement to evaluate their health concerns about vapors at their property. Since the residents moved into this property, they have reportedly experienced multiple adverse health effects, which they believe are linked to the pungent odors they have experienced after moving into their home.

Sample Events

On August 6, 2003, in response to the residents' reports of vapors in their home, Sunoco's environmental consultants conducted an active soil-gas survey of the residential property and the southwestern corner of the Site. An approximately ½-inch diameter borehole was created with a slam bar to approximately three (3) feet below surface grade at five (5) sampling

locations, four of which were collected at the residential location; one sample was collected from the southwestern corner of the Site. A perforated stainless steel sampling rod was inserted to each borehole, sealed at surface grade to prevent short-circuiting and connected to a vacuum sampling device. A sample of the soil-gas was drawn and collected within 40 milliliter (mL) septa sealed glass vials and transported to an independent laboratory for analysis. These samples were analyzed for the presence of VOCs [3].

In addition to the soil-gas survey on the Site and residential property, on September 9, 2003, Sunoco's consultants sampled indoor air at the private residence. The purpose of the indoor air sample collection was to determine whether VOCs were entering the indoor air of the residence through vapor intrusion at detectable concentrations. Sunoco's consultants used a summa canister to collect one air sample from inside the residence. According to the resident, this indoor air sample was collected from the first floor, and the summa canister was deployed for a total collection period of less than five minutes [4].

Sample Results

The soil-gas survey found no evidence of gasoline constituent compounds. All other compounds, with the exception of tetrachloroethylene (PCE), were not detected in any of the samples. Three of the four soil-gas samples collected from the residential property and the sample collected on the southwestern corner of the Sunoco Site revealed the presence of PCE [3]. The maximum concentration of PCE detected in the Soil Gas Survey was 25 parts per billion by volume (ppbv) at the Sunoco Site sampling location. The three detectable concentrations of PCE at the residential sampling locations ranged from 6 to 18 ppbv PCE.

Low levels of acetone, acrolein, ethyl acetate, ethylbenzene, hexachlorobutadiene (HCBD), methylene chloride, m/p and o xylenes, pentane, propene, toluene, 1,2,4-trichlorobenzene, 1,2,4-trimethlybenzene, 1,3,5-trimethylbenzene, 2-butanone, and 4-ethyltoluene were detected in the indoor air sample collected in the basement of the residence (Table 1) [4]. Contradictory to the soil-gas survey, PCE was not detected in the indoor air sample, but gasoline constituent compounds, ethylbenzene, toluene, and xylenes were found at relatively low levels in the indoor air of the residence. In this HC, PADOH evaluated these indoor air sampling results and determined the public health significance of the data.

Site Visits

On April 14, 2004, Chad M. Clancy, Environmental Health Specialist from PADOH, conducted a site visit with Edward Gursky, Professional Geologist, PADEP, and Bill Sayley, aid to Pennsylvania Senator Allen Kukovich. Mr. Clancy, Mr. Gursky, and Mr. Sayley met with the residents who had noticed odors in the indoor air of their home and discussed Site history and relevant issues.

Discussion

In this section, PADOH evaluates the soil-gas survey and indoor air data and attempts to determine whether the residents are being exposed to harmful levels of the VOCs detected in the indoor air of their homes. 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. Sampling collection and Quality Assurance/Quality Control (QA/QC) procedures are also considered when making a public health determination.

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). If EMEGs cannot be established because of lack of health data, other CVs such as Reference Concentations (RfCs) that are established by the United States Environmental Protection Agency (EPA).

ATSDR established MRLs on the basis of an evaluation of the toxicology literature for a given substance. MRLs are established, not as thresholds of toxicity, but 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. However, exposure to levels above the MRL may not necessarily lead to adverse health effects. A wide range of uncertainty exists between levels known to cause adverse health effects and the MRLs. Therefore, the MRL does not establish the maximum "safe" level, nor does it imply that exposure is not likely to be harmful. If environmental exposures occur at concentrations exceeding the MRL then further evaluation is necessary to determine the health risks of those exposures.

Soil-Gas Survey

The results of the soil-gas survey indicated the presence of PCE, which is a synthetic material that is used widely for dry cleaning of fabrics and for metal degreasing operations. The current operations at the Sunoco Site do not include the use of PCE [3]. However, before 1985, the Site use included repair service, which may have included the use of PCE [2]. The three detectable concentrations of PCE at the residential soil-gas sampling locations were 6 – 18 ppbv. The maximum concentration of PCE detected was 25 ppbv at the Sunoco Site sampling location. Because the most elevated PCE soil-gas concentration (25 ppbv) was located at the upgradient survey point, which is on the Site, PADEP decided that further investigation is necessary to determine and possibly address the source of PCE [2].

Tetrachloroethylene (PCE)

Acute (short-term) inhalation exposure to PCE at elevated levels (10,000 – 1,000,000 ppbv) can cause health effects that include intense irritation of the upper respiratory tract and eyes, kidney dysfunction, and neurologic effects such as reversible mood and behavioral changes, impairment of coordination, and anesthetic effects. The major non-cancerous effects from

chronic (long-term) inhalation exposure to (10,000 – 20,000 ppbv) PCE in humans are neurologic effects, including headaches, and impairment of memory, concentration, and intellectual function. Other effects noted in humans include cardiac arrhythmia, liver damage, and possible kidney effects [5]. The International Agency for Research on Cancer has classified PCE as a Group 2A, probably carcinogenic to humans (limited human evidence; sufficient animal evidence), and the National Toxicology Program classifies PCE as a Group 2, reasonably anticipated to be a carcinogen [6, 7].

Since site-specific factors influence contaminant concentrations detected in soil-gases, a quantitative correlation between soil-gas concentrations and actual exposures in indoor air cannot be determined. The soil-gas measurement technique can be used only to screen for contaminants that may be present and is and to indirectly measure underlying contamination, which in some cases has yielded false negative results [1].

Even though no other VOCs were detected in the soil-gas survey, other VOCs, including gas constituent compounds, potentially could intrude to a depth near the base of the basement foundation. This particular soil-gas collection took place at a depth of approximately three (3) feet below the ground surface for each sample location. The base of the basement foundation ranged from 4 – 7 feet below ground surface for this particular residential location. In addition, there was no indication that the sampling points at the residential location were adjacent to the building foundation, where source vapor would accumulate and enter the basement.

Indoor Air Sample

The indoor air sample results for acetone, ethylbenzene, methylene chloride, and xylenes in the indoor air were below their corresponding MRLs or CVs [8] (Table 1). However, this sample was reportedly collected for approximately 5 minutes as opposed to 8 or 24 hours, as is most appropriate for evaluating residential exposures. Therefore, PADOH will not further evaluate the contaminants detected in this sample in this HC. Actual exposures to VOCs may differ from those measured in this sample because of the insufficient collection time. Due this deficiency in the sample data, PADOH cannot determine that the residential exposures to VOCs discussed in this HC would or would not cause adverse health effects to the residents of this location.

Since the limited indoor air sample data indicated acrolein was detected in concentrations exceeding the acute exposure MRL, for assessment purposes, acrolein was chosen for further evaluation. HCBD, a possible human carcinogen [9], was detected in concentrations that were in exceedance of the chronic CREG for HCBD (0.005 ppbv), which also calls for further evaluation.

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 also can be formed when fats are heated and is found in fried foods, cooking oils, and roasted coffee [10]. Acrolein may make up 3%-10% of total vehicle exhaust aldehydes. Smoking one cigarette can lead to concentrations of 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. Close to exhaust pipes, levels that are 10 to 100 times higher than average ambient levels may occur [11].

No information is available about the carcinogenic effects of acrolein in humans. Limited studies on animal cancer and data are available. One inhalation study in rats reported no evidence of tumors in the respiratory tract or in other tissues and organs; another study reported an increased incidence of adrenocortical tumors in female rats exposed to acrolein in drinking water [10, 12]. The major effects from chronic inhalation exposure to acrolein in humans consist of general respiratory congestion and eye, nose, and throat irritation [10, 13].

Acrolein was detected in residential indoor air in the September 2003 sampling event at a concentration of 2 ppbv (Table 1). Based on an interview PADOH conducted with the residents during the Site visit, no one smokes in the sampled household. This particular home, where acrolein was detected, was not indicative of at least one smoker present in the household. The potential source of acrolein detected in the indoor air is indeterminate at this time due to the lack of ambient (outside) air and basement indoor air samples.

EPA's RfC for acrolein is 0.02 $\mu g/m^3$ (0.009 ppbv), which is based on squamous metaplasia and neutrophilic infiltration of nasal epithelium in rats [12]. ATSDR's Intermediate EMEG/MRL is based on this value. EPA has medium confidence in the studies on which the intermediate exposure RfC was based because an inadequate sample size was used, only three sections of the nasal cavities were examined, and there was a lack of incidence data; low to medium confidence in the database due to the lack of chronic data and adequately conducted reproductive or developmental studies; and, consequently, medium confidence in the RfC. In addition, an uncertainty factor of 1,000 was used in developing the RfC for acrolein because an interspecies extrapolation was used, since this factor embodies two areas of uncertainty: pharmocokinetics and pharmocodynamics [12].

The lowest-observable-adverse-effect-levels (LOAELs) in humans were identified in concentrations at a minimum 170 ppbv acrolein. Acute inhalation exposures to 170 ppbv acrolein for 40 minutes resulted in eye irritation; 260 ppbv acrolein for 40 minutes resulted in nose irritation; and 430 ppbv acrolein for 40 minutes resulted in throat irritation for a less serious LOAEL (effect) in humans. Another study in humans indicated a less serious LOAEL of 810 ppbv and a more serious LOAEL of 1,220 ppbv,

causing varying degrees of eye irritation, for acute inhalation exposure of 5-10 minutes at these corresponding concentrations of acrolein [10].

In other studies, the threshold levels of acrolein causing irritation and health effects through inhalation are 0.07 mg/m^3 (30 ppbv) for odor perception, 0.13 mg/m^3 (57 ppbv) for eye irritation, 0.3 mg/m^3 (130 ppbv) for nasal irritation and eye blinking, and 0.7 mg/m^3 (300 ppbv) for decreased respiratory rate. As the level of acrolein rarely exceeds 0.3 mg/m^3 (13 ppbv) in urban air, it is not likely to reach annoyance or harmful levels in normal circumstances [11].

Hexachlorobutadiene

HCBD does not occur naturally in the environment. It is formed during the processing of other chemicals such as PCE, trichloroethylene, 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 [14].

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 [14]. However, the EPA has derived a cancer inhalation unit risk of 2.2E-05 $(\mu g/m^3)^{-1}$, based on oral exposure data [15].

PADOH estimates the maximum excess cancer risk for lifetime exposure (24 hours per day) to HCBD at 2 ppbv is one additional cancer per 10,000 people or a low increased risk. Our calculation is based on the assumption that there is no safe level of exposure to a chemical that could cause cancer. However, the calculated risk is not exact and tends to overestimate the actual risks with exposures. 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 about the health effects of HCBD in humans, and no evidence exists 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, cannot be accurately determined whether the estimated exposure would increase the risk for cancer.

Child Health Considerations

ATSDR and PADOH recognize that children are especially sensitive when exposed to many contaminants. This sensitivity results from the following factors:

- Children are more likely than adults to be exposed to certain media (e.g., soil, sediment, air, surface water or water from springs) because they play outdoors and generally are more likely to put their fingers and objects into their mouths.

- Children are shorter than adults, which means they can breathe dust, soil, and vapors close to the ground.

- Children are smaller; therefore childhood exposure results in higher doses of chemicals per body weight.

Children can sustain permanent damage if these factors lead to toxic exposure during critical growth stages. ATSDR is committed to evaluating their special interest at sites such as the Sunoco Site. PADOH and ATSDR considered child-specific doses in addition to adult-specific doses in the analysis for this HC.

Conclusions

PADOH and ATSDR conclude the presence of the VOCs in indoor air at the residential location in the vicinity of the Site represent an indeterminate public health hazard because sample data are lacking. Given the historical Site use and insufficient off-site residential data, a follow-up investigation is required to determine the potential for a public health hazard.

Recommendations

PADOH and ATSDR recommend a more exhaustive approach in determining whether VOCs are might be entering the indoor air of residences near the Site. Most importantly, because the worst-case conditions at this residential location are not known and odors that are observed are sporadic, a time-integrated sample should be collected. PADOH recommends at least two separate indoor air sampling events of a 24-hour time-integrated sample (summa canister) using EPA Method TO-15 analysis. To better estimate residential exposure, ATSDR and PADOH suggest air from the following sample locations, but not limited to these locations, be collected during each sampling event [16]:

- *Air from lowest livable space* – collect a sample from breathing zone height in a living area of the home. This sample represents the air quality at a common point of exposure. However, multiple samples over time taken at multiple locations are needed to estimate actual exposure.

- *Basement air* – collect a sample from an area where vapor entry is expected or from a central location if an obvious point of entry is not known. A sample of basement air can be used to demonstrate whether soil vapor is impacting the air of the home.
- *Sub-slab vapor* – EPA recommends that a sample be collected from beneath the slab at a central location away from foundation walls. This sample provides the last point of monitoring to demonstrate whether contaminants are in fact migrating from the source to the home. A small hole must be drilled through the slab to collect this sample.
- *Ambient (outdoor) air sample* – Collect a sample from an upwind location of the house, away from obvious VOC sources (e.g., automobiles, lawn mowers, garage). This sample is very important in conjunction with the indoor air sample because indoor air contaminants can originate from outdoor air.

PADOH and ATSDR also recommend that PADEP continue to follow up with the investigation of the potential source and characterization of the PCE detected in the soil-gas survey. This ongoing investigation also should identify potential receptors of the PCE contamination plume. Any residence situated within the identified contamination plume should be investigated for possible vapor intrusion effects. PADOH is available to review these results in a future HC, as needed.

Interim Public Health Recommendations

1. Residents can take measures in their homes to further reduce odors. When feasible, opening windows, particularly in the basement, will assist in keeping the home well ventilated. Closing basement cold-air returns, heat registers, and basement doors will help limit the amount of vapors traveling from the basement to other parts of the house.

2. If residents believe they are experiencing adverse health effects from vapors that are potentially migrating in their homes, they should contact their personal physician or a specialist in occupational and environmental health medicine. PADOH is available for consultation with family physicians, if warranted.

Public Health Actions Completed

PADOH and PADEP contacted and met with the residents identified in this HC and discussed their exposure to VOCs in their indoor air. PADOH will continue to be available to answer residents' health questions.

Public Health Actions Planned

1. ATSDR and PADOH will ensure that the residents in the vicinity of the Sunoco Site are aware of the findings in this HC.

2. PADEP plans to investigate the source of the PCE detected on the Site and the residential location as a result of the soil-gas survey.

3. PADOH will review and evaluate future analysis data when it becomes available and present the findings through another HC.

References

1. United States Environmental Protection Agency, Soil-Gas Measurement Fact Sheet. Available at URL: http://www.epa.gov/esd/factsheets/soil-gas.pdf. Updated March 2003. Accessed April 20, 2004

2. Pennsylvania Department of Environmental Protection South West Regional Office. Central Files. Site ID#: 65-08614. Information obtained from File Review conducted by Chad M. Clancy on April 14, 2004.

3. Shaw Environmental & Infrastructure, Inc., Soil-Gas Survey Report. August 25, 2003.

4. Shaw Environmental & Infrastructure, Inc., Results of Indoor Air Sampling. Data Package Received by Pennsylvania Department of Health on March 17, 2004.

5. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Tetrachloroethylene, (Update) Atlanta, Georgia: DHHS, U.S. Public Health Service, ATSDR, 1997.

6. International Agency for Research on Cancer, IARC Monographs Database on Carcinogenic Risks to Humans. Tetrachlorethylene. Volume 63, 1995. Available through URL: http://www.iarc.fr. Accessed April 20, 2004.

7. United States Department of Health and Human Services, Public Health Service, National Toxicology Program, 10th Annual Report on Carcinogens. Tetrachloroethylene Available at URL: http://ehp.niehs.nih.gov/roc/tenth/profiles/s169tetr.pdf. Accessed April 20, 2004.

8. Agency for Toxic Substances and Disease Registry, Minimal Risk Levels (MRLs) for Hazardous Substances, Atlanta, Georgia: DHHS, U.S. Public Health Service, ATSDR, Available at URL: http://www.atsdr.cdc.gov/mrls.html. Accessed March 29, 2004.

9. United States Environmental Protection Agency, Air Toxics Website, Hexachlorobutadiene. Available at URL: http://www.epa.gov/ttn/atw/htlthef/hexa-but.html. Accessed April 21, 2004.

10. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Acrolein, Atlanta, Georgia: DHHS, U.S. Public Health Service, ATSDR, 1990.

11. World Health Organization, Environmental Health Criteria for Acrolein, WHO Task Group on Environmental Health Criteria for Acrolein, EHC 127, 1991. Available at URL: http://www.inchem.org/documents/ehc/ehc/ehc127.htm. Accessed March 16, 2004.

12. United States Environmental Protection Agency, Integrated Risk Information System for Acrolein. Available at URL: http://www.epa.gov/iris/subst/0364.htm. Accessed April 2, 2004.

13. United States Department of Health and Human Services, Hazardous Substances Data Bank (HSDB, online database), National Toxicology Information Program, National Library of Medicine, Bethesda, MD. Available at URL: http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~XfyiZQ:1. Accessed April 7, 2004.

14. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Hexachlorobutadiene, Atlanta, Georgia: DHHS, U.S. Public Health Service, ATSDR, 1994.

15. United States Environmental Protection Agency, Integrated Risk Information System for Hexachlorobutadiene. Available at URL: http://www.epa.gov/iris/subst/0058.htm. Accessed April 21, 2004.

16. State of Wisconsin, Department of Health and Family Services, Division of Public Health, Chemical Vapor Intrusion and Residential Indoor Air – Guidance for Environmental Consultants and Contractors. Madison: Wisconsin, DHFS February 13, 2003.

Authors, Technical Advisors:

Pennsylvania Department of Health
Health Assessment Program
Division of Environmental Health Epidemiology

Authors:

Chad M. Clancy, BS, Environmental Science
Environmental Health Specialist

Ronald Tringali, PhD, RN,
Epidemiologist/Program Director

ATSDR Reviewers:

Alan Parham, MS
Technical Project Officer
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

and

Lora Werner, MPH
Environmental Health Scientist
ATSDR Region 3

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Certification

This Health Consultation for the Sunoco 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 is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

LCDR Alan G. Parham, REHS, MPH

Technical Project Officer, SPAB, DHAC

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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