

Health Consultation

AIR PRODUCTS SITE

ALLENTOWN, LEHIGH COUNTY, PENNSYLVANIA

EPA FACILITY ID: PAD003001195

SEPTEMBER 28, 2006

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

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HEALTH CONSULTATION

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EPA FACILITY ID: PAD003001195

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), working under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), prepared this health consultation for the Air Products site. Specifically, PADEP requested that the ATSDR and PADOH review the most recent and past PADEP sampling data for on-site and off-site monitoring wells, Little Lehigh River (Creek), and Bogerts Bridge Spring (also called a trout pond and a weir) on the Allentown Municipal Credit Union's property.

The chemicals at issue on-site and off-site are trichloroethylene (TCE) and tetrachloroethene (PCE). These compounds have contaminated the underground aquifer off-site for at least one mile in one direction and have contaminated a spring leading into the Little Lehigh River (Creek). The Pennsylvania Department of Environmental Protection believes that the nearby Air Products facility is the source of these chemicals. In 1999, the Environmental Protection Agency performed an analysis on fish tissue samples from two trout taken from the Bogerts Bridge Spring (trout pond) as part of an ecological *Risk Assessment* on this area of the Little Lehigh River (Creek). At some point after this assessment, 'No Trespassing' signs were placed around the spring (trout pond) and the raceway (outlet from the spring to the Little Lehigh River) to keep children from playing in the water in this area. These signs were also intended to keep people from eating the fish in the spring (trout pond). Allentown Municipal Credit Union members feed and raise the fish, but the members no longer eat the fish, though they have an interest in doing so if the fish are determined to be safe for eating.

The ATSDR and PADOH conclude that currently there is *no apparent public health hazard* related to exposures to the trichloroethylene or TCE and tetrachloroethene or PCE at this site. The agencies conclude that: 1) Evaluation of the exposures of children to the surface water at the maximum concentration of 13.7 ppb PCE and 1.9 ppb TCE by ATSDR and PADOH yields that there is *no public health hazard*; 2) The occasional ingestion of the fish poses *no apparent public health hazard*. Even though the levels in the water were extremely low and TCE and PCE do not significantly bioaccumulate in fish, fish tissue samples should be collected and analyzed for PCE and TCE to strengthen this conclusion; and 3) The PCE and TCE plume should be fully characterized off-site by PADEP. There is a possibility that the levels of PCE and TCE traveling off-site could have resulted in vapor intrusion issues in the indoor air of homes between the site and the spring and the Little Lehigh River. The levels of TCE and PCE in the ground water aquifer under the residences are *currently unknown*, so a determination or modeling of possible indoor air vapor intrusion can not accurately be completed.

The ATSDR and PADOH recommend that: 1) As part of prudent public health practice, the Air Products Company should consider installing a better aeration system in the raceway, especially since this is a known "point source" and currently the Allentown City

Air Products Site, Allentown, Pennsylvania
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public water system has “backup” intakes about 2 miles downstream in the Little Lehigh River (Creek); 2) At a minimum, additional surface water samples should be collected from the spring (trout pond or weir) and analyzed for PCE and TCE. The last sampling occurred in 2003. Additional fish tissue samples should be collected from the spring (trout pond or weir) and analyzed for PCE (and possibly TCE) to strengthen this conclusion. The levels in the water were extremely low, TCE and PCE are not known to significantly bioaccumulate in fish, and the community that raises the fish would like to eat the trout, occasionally or annually; and 3) The PCE and TCE plume should be fully characterized by Air Products. Specifically, monitoring wells should be installed at or near the corner of the residential area on the northwest side of the railroad tracks and directly down gradient from the present monitoring wells with the highest concentration at the nearby ARBOR property. Ground water and headspace sampling should be done at any future monitoring wells and at the ARBOR monitoring wells to determine (through concentrations in the ground water and/or modeling) if vapor intrusion might be an issue for the residents in this down gradient area. The most ideal location for these additional monitoring wells would be in the residential area, but between the railroad tracks and Lehigh Street, which is an area just down gradient from the site, would be a good intermediate location.

Introduction

The Pennsylvania Department of Health (PA DOH), working under cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), was requested by the Pennsylvania Department of Environmental Protection (PA DEP), to review the most recent and past PA DEP sampling data, reports, and information for the Air Products site and the affected off-site Bogerts Bridge Spring (trout pond) on the Allentown Municipal Credit Union's property [1]. The contaminants are tetrachloroethene (PCE) and trichloroethylene (TCE). PCE and TCE contamination was discovered on-site in 1986. Included in the off-site data is a 1999 U.S. Environmental Protection Agency (EPA) study with fish tissue samples from two trout from Bogerts Bridge spring (trout pond) [2]. The Allentown Municipal Credit Union owns this spring (trout pond). It is adjacent to and part of a municipal park along the Little Lehigh River (Creek) where children play and people use the public picnic tables. The water from the spring (trout pond) empties into the Little Lehigh River (Creek) by way of a raceway spill (outlet from the spring) through the southern side of the park. At some point after the 1999 study, 'No Trespassing' signs were placed around the spring (trout pond) and the raceway to keep children from playing in the water in this area. These signs were also intended to keep people from eating the fish in the spring (trout pond). Allentown Municipal Credit Union members feed and raise the fish, but they no longer eat the fish. The members have an interest in consuming the fish if they are determined to be safe for occasional consumption.

Site Location, Description, and Facility History

The Air Products Site is located at 2801 Mitchell Avenue, within the city of Allentown, Lehigh County, Pennsylvania (see Figure 1). There is contamination of the ground water beneath and near the original Air Products plant or APCI (the location is currently that of the ACME Cryogenics plant). The Air Products site is close to the junction of the railroad tracks, route 309, and the end of Mitchell Avenue – a short street just off 28th street (see Figure 2). Directly down gradient of the site and on the northwest side of the railroad tracks is Lehigh Street. A 10-block residential area begins at Lehigh Street and continues at the Northeast ends of Moravian and Diamond Streets to Alton and Pear Streets (see Figures 2 and 3). Beginning in 1951, Air Products used the site for a small shop and laboratory operation. In 1968 the company began manufacturing welding supply equipment. In 1994, the facility was sold to ACME Cryogenics, though Air Products retains property ownership. Air Products predominantly used the volatile organic chemicals (VOCs) PCE and TCE in its operations. As a result, ground water under this area of Allentown is contaminated, especially down gradient of the site. The contaminant plume continues for about one mile and surfaces as the spring water entering the Bogerts Bridge Spring (trout pond) located at the Allentown Municipal Credit Union (see Figures 3 and 4). From the spring the water enters a raceway spill and enters the Little Lehigh River (Creek). A certain amount of natural aeration does occur to the water before it enters the Little Lehigh River.

Geology

The Air Products site is located in the Appalachian Valley section of the Ridge and Valley Physiographic Province. A fairly broad belt of Cambro-Ordovician age limestones, dolomites, and shales underlies this valley. According to the *Atlas of Preliminary Geological Quadrangle Maps of Pennsylvania*, the bedrock underlying the site is part of the Leithsville Formation. Dark gray, dolomitic limestones, as well as calcareous phyllitic shales characterize the Leithsville Formation. The lithology encountered at the site consists predominantly of phyllitic shale [3].

Hydrogeology

The Leithsville Formation has median yields of 100 gallons per minute. Larger yields are common in areas where solution activity has occurred. According to PADEP, based on water measurements taken during previous work performed at the same site, the ground water flow direction is to the north. The piezometric surface lays approximately 50 feet below ground surface, consequently having no impact on the shallow soils [3].

Site Contamination and Environmental Sampling History

In 1986, accidental releases on-site were discovered during an investigation of a sewer line break. PADEP discovered the organic solvents in the soil and in four on-site monitoring wells placed on-site. About 75 cubic yards of impacted soil were removed and disposed. In 1989, seventeen additional monitoring wells were installed on-site and off-site. In 1997, on-site ground water levels were as high as 25,000 parts per billion (ppb) concentrations of PCE with much lower levels of TCE. General ground water flow was determined to be towards the north/northwest [3]. Off-site contamination was confirmed especially in the ground water under the off-site adjacent business, ARBOR (a maximum concentration of 1,470 ppb PCE was detected in 1999). In 1998, it was determined that PCE and TCE had traveled underground to the Bogerts Bridge Spring (trout pond), directly down gradient from the Air Products site (see Figure 4). In 1999, maximum PCE concentrations of 19 ug/L and TCE of 18 ug/L were detected in this spring (trout pond) [1]. In 1999, the EPA performed analysis on fish tissue samples from two trout taken from the Bogerts Bridge Spring (trout pond) in conjunction with a *Screening Ecological Risk Assessment*. The assessment included evaluation of the spring (trout pond) and the Little Lehigh River in this area [2]. By 2003 (the most recent data), the maximum concentrations of PCE at 13.7 ug/L and TCE at 1.9 ug/L were detected in the spring and in the raceway below the cement blocks. Earlier, Air Products had placed cement blocks in the raceway in an attempt to aerate the water and to lower the VOC concentrations before the water entered the Little Lehigh River. Some aeration (mainly from the action of the water running through the length of the raceway) does take place in the raceway to reach a PCE concentration of about 2.5 ug/L and a TCE concentration of about 0.37 ug/L near the entrance to the Little Lehigh River. The Allentown Borough (Allentown City) has “backup” intakes for the public water system (PWS) downstream of this area in the Little Lehigh River.

Site Visit

On March 29, 2005, two PADOH staff persons visited the Air Products Site with staff from PADEP to view the sampling locations on-site and off-site. The layout of the business relating to the residential areas, Bogerts Spring (trout pond), the Little Lehigh River, and the topography of this area of Lehigh County were observed.

Demographics

The Air Products site is located in Allentown, Pennsylvania. According to year 2000 census records, the borough has a total population of 106,632 persons. About 48 percent of the population is male and 52 percent female. Approximately twenty-five percent of the population are children and 7 percent are under the age of 5. Fifteen percent of the population are 65 years or over. The median age is 34.5 years. Demographics for Allentown (city), Pennsylvania may be found on the 2000 census Web Pages [4].

Discussion

The contaminants of concern at Air Products site are PCE and TCE. TCE and PCE have been released from a number of industries in the past in Pennsylvania. Without remediation, contamination of underground aquifers may take years to remedy itself and may spread to other underground areas and aquifers, as well as to springs and rivers, as in this case of the Air Products site. According to PADEP, no private wells are still in use, and all the residents in this area are using the City of Allentown's water system, a public drinking water consistently in compliance with state and federal regulations (the Consumer Confidence Report may be found on-line at <http://www.allentownwater.org/atownccr.pdf> and basic information may be viewed at <http://www.drinkingwater.state.pa.us/dwrsbroker/broker.exe>, last accessed May 2006).

Pathway Analysis

PADOH evaluated the environmental and human components (or exposure pathways) that *could* lead to human exposures and public health hazards. Exposure pathways are descriptions of the ways that a chemical moves from its source (where it began) to where and how people can come into contact with (or become exposed to) the chemical. For a chemical-specific adverse health effect to occur, ATSDR and PADOH recognize that five components of a completed exposure pathway must first occur: a source of the contaminant; the fate and transport of the contaminant into media (water, soil, air, or food); an exposure point (drinking water, soil contact, inhalation in air, or other); an exposure route (ingestion, dermal contact, inhalation); and a receptor population.

Possible exposure points as a result of the contamination at this site include:

- *Spring (trout pond or weir) and Raceway – Surface Water:* Currently ‘No Trespassing’ signs are posted. The Allentown Credit Union would like to remove the signs, if there is no Public Health Hazard.
- *Spring (trout pond or weir) – Fish Tissue:* Currently no fish are eaten, though fish used to be eaten approximately once per year. Community members at the Allentown Credit Union would like to resume eating the fish again if PADOH determines that they are safe to consume. TCE and PCE do not significantly bioaccumulate in fish, but the community and PADEP feel that re-evaluation of the fish tissue would definitively reveal whether or not the fish are safe to eat at the present time.
- *River – Public Water System (PWS) Drinking water:* Currently there is a “backup” intake downstream on the Little Lehigh River (Creek).
- *Vapor Intrusion (into residential homes from the contaminated aquifer under homes) – Ground water:* Currently it is unknown if there are any completed pathways from vapor intrusion, especially since the plume has not been completely defined off-site.

Toxicological Evaluation of the Sampling Data

Spring (trout pond) and Raceway Surface Water – We conservatively assumed that a child might consume an amount of water between 0.5 and 0.0003 liters of water per day while playing in the spring and raceway. We also assumed that a child would have limited dermal contact with this surface water and would inhale vapors volatilizing from the surface water. Using the maximum concentrations detected in the December 2003 spring and raceway sampling results to reflect the current situation (PCE at 13.7 at ppb and TCE at 1.9 ppb) and the assumptions above, a child’s exposure doses from regular contact with the contaminated surface waters, would be 6 to 7 orders of magnitude below the lowest observable adverse effect levels (LOAELs) and no observable adverse effect levels (NOAELs) reported in the medical and scientific literature for these chemicals. These estimated exposure dose levels are also well below the EPA reference dose (RfD) for PCE of 0.01 mg/kg/day and for TCE of 0.0003 mg/kg/day [5,6,7]. Neither TCE nor PCE has been shown to be a cause of cancer in people, though both are proven animal carcinogens [5,7]. We would not expect an increase in the risk of cancer to people regularly or intermittently exposed to these levels of TCE or PCE in the surface water at this site [6].

Fish Tissue (Exposures by Ingesting the Fish) – In the Water Quality Toxics Management Strategy, Human Health Criteria, listed in the Pennsylvania code 25 Section 16.102, the human health criteria are 0.8 ppb for PCE and 2.7 ppb for TCE [8]. These levels are considered protective of a person that regularly eats 6.5 grams of fish per day from Pennsylvania surface waters [8]. The PCE levels in the spring (trout pond) are above these listed for human health criteria (the December 2003 PCE sample result maximum is 13.7 ppb), but the fish in this case would be ingested far less than a daily basis by the community. ATSDR and PADOH determine that annual or very occasional ingestion of fish in the spring would most likely not be a problem, based on occasional ingestion and on a single round of fish tissue data from 1999. However, this conclusion would be strengthened if another round of fish tissue sampling at this site was completed. The original analysis completed for PADEP in 1999 on two trout yielded the following results:

<i>Chemical</i>	<i>Fish #1</i>	<i>Laboratory Qualifiers</i>	<i>Fish #2</i>	<i>Laboratory Qualifiers</i>
Trichloroethylene (TCE)	490 ug/ kg	J	500 ug/kg	-
Tetrachloroethene (PCE)	2,900 ug/kg	J	3,000 ug/kg	-

ug/kg = Units are in micrograms chemicals per kilogram fish

J = Analyte present. Reported value is estimate and outside the range of accurate quantitation.

ATSDR note to the reader – There are concerns about the validity of the reported fish tissue sampling results. The PCE and TCE results are higher than what we would expect to see in fish in surface waters with the low levels of contamination found at this spring. This is particularly true given the clear evidence in the scientific literature that these contaminants do not bioaccumulate in fish. Furthermore, the detections are approximately at the level of the sampling method’s level of detection.

River – Public Water System (PWS) Drinking water - The PCE and TCE maximum contaminant levels (MCLs) of 5 ppb for each chemical are in effect, thus no significant exposures by this route should be occurring from this site [9]. An MCL is the maximum level of a contaminant allowed by EPA in the public drinking water. The Allentown City public water system did not have any MCL violations (PCE and TCE were less than or equal to 5 ppb) in 2003 or 2004 for PCE or TCE. The PWS did note an average detect of 1.4 ppb PCE in their 2004 Consumer Confidence Report (this is not necessarily due to this intake and the water is safe and in compliance) [9].

Community Health Concerns

Potential exposures to TCE and PCE by way of the surface water and fish routes are a community concern. ‘No Trespassing’ signs were placed around the spring (trout pond) and the raceway to keep children from playing in the water in the picnic area. The Allentown Municipal Credit Union members have an interest in eating the trout if they were to be determined to be safe for occasional consumption.

Health Outcome Data

It appears that there is no public health hazard related to the detection of TCE and PCE in the spring or raceway, and no private wells are being used in the area of the Air Products facility, so currently no investigation of health outcome data is warranted.

Child Health Considerations

ATSDR and PADOH recognize that children may be especially sensitive when exposed to many contaminants. ATSDR and PADOH evaluated the likelihood that children playing in the picnic

area at Bogert's spring and park were exposed to PCE and TCE and at what levels they might be exposed (especially in the spring and raceway).

Conclusions

The Agency for Toxic Substances and Disease Registry and the Pennsylvania Department of Health conclude that currently there is *no apparent public health hazard* related to exposures to the trichloroethylene or TCE and tetrachloroethene or PCE at this site. Specifically the agencies conclude that:

1. Evaluation of the exposures of children to the surface water (i.e., the spring and raceway) at the maximum concentration of 13.7 ppb PCE and 1.9 ppb TCE by ATSDR and PADOH yields that there is *no public health hazard* due to exposures by way of skin contact, a very small amount of ingestion, and inhalation.
2. The current PCE and TCE concentrations in the fish tissue are unknown, and there are some concerns about the validity of the 1999 fish tissue data from this site. The 1999 TCE fish tissue sample results were below levels of state health concern for daily ingestion, while the PCE fish tissue sample results were above levels of state health concern for daily ingestion. However, PADOH and ATSDR feel it is unlikely the fish would have enough PCE in their tissues and pose *no apparent public health hazard* from *occasional* ingestion of cooked trout. This conclusion would be strengthened if another round of fish tissue sampling at this site was completed to determine the actual PCE (and TCE) levels in the fish.
3. The PCE and TCE plume should be fully characterized off-site by PADEP. There is a remote possibility that the levels of PCE and TCE traveling off-site could result in vapor intrusion issues in the indoor air of homes between the site and the spring or weir (trout pond) and the Little Lehigh River (Creek). It is important to note that conditions at this site are different from some other sites showing vapor intrusion as this site has a much lower water table and a greater distance to the residences from the original contamination source on-site. The levels of TCE and PCE in the ground water aquifer under the residences are *currently unknown*, thus, a determination or modeling of possible indoor air vapor intrusion can not accurately be completed.

Recommendations

PADOH and ATSDR recommend that:

1. As part of prudent public health practice, Air Products should consider installing a better aeration system in the raceway, especially since this is a known "point source" and currently the Allentown City PWS has backup intakes about 2 miles downstream in the Little Lehigh River (Creek).

2. At a minimum, additional surface water samples should be collected from the spring (trout pond or weir) and analyzed for PCE and TCE. The last sampling occurred in 2003. Even though the levels in the water were extremely low and TCE and PCE are not known to significantly bioaccumulate in fish, fish tissue samples should be collected and analyzed for PCE (and TCE) to strengthen our conclusion that the fish are safe for occasional ingestion. Also the 'No Trespassing' signs should be removed in the community park.

3. The PCE and TCE plume should be fully characterized by Air Products. Specifically, monitoring wells should be installed at or near the corner of the 10-block residential area on the northwest side of the railroad tracks and directly down gradient from monitoring wells with the highest concentration at ARBOR. Ground water and headspace sampling should be done at the ARBOR monitoring wells and at any future monitoring well to determine (through concentrations in the ground water and/or modeling) if vapor intrusion might be an issue for the residents in this down gradient area. The most ideal location for future monitoring wells would be in the residential area, but between the railroad tracks and Lehigh Street, which is an area just down gradient from the site, would be a good intermediate location.

Public Health Action Plan

Ongoing or Planned Actions

PADOH will evaluate the data after any additional sampling of the fish tissue is completed and will make any further necessary recommendations concerning whether the fish could occasionally and/or annually be eaten by the community that raises the trout. Results from monitoring well samples will also be evaluated by PADOH and a determination made with PADEP as to whether there is a need for indoor air sampling (due to vapor intrusion) in the residents' homes.

References

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Certification

This health consultation for the Air Products site was prepared by the PADOH under a cooperative agreement with ATSDR. 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.

Alan W. Yarbrough, MS
Lead, Cooperative Agreement Team, SPS, CAPEB, DHAC, ATSDR

Appendix - Figures

Figure 1 – Air Products Site in Allentown, Pennsylvania

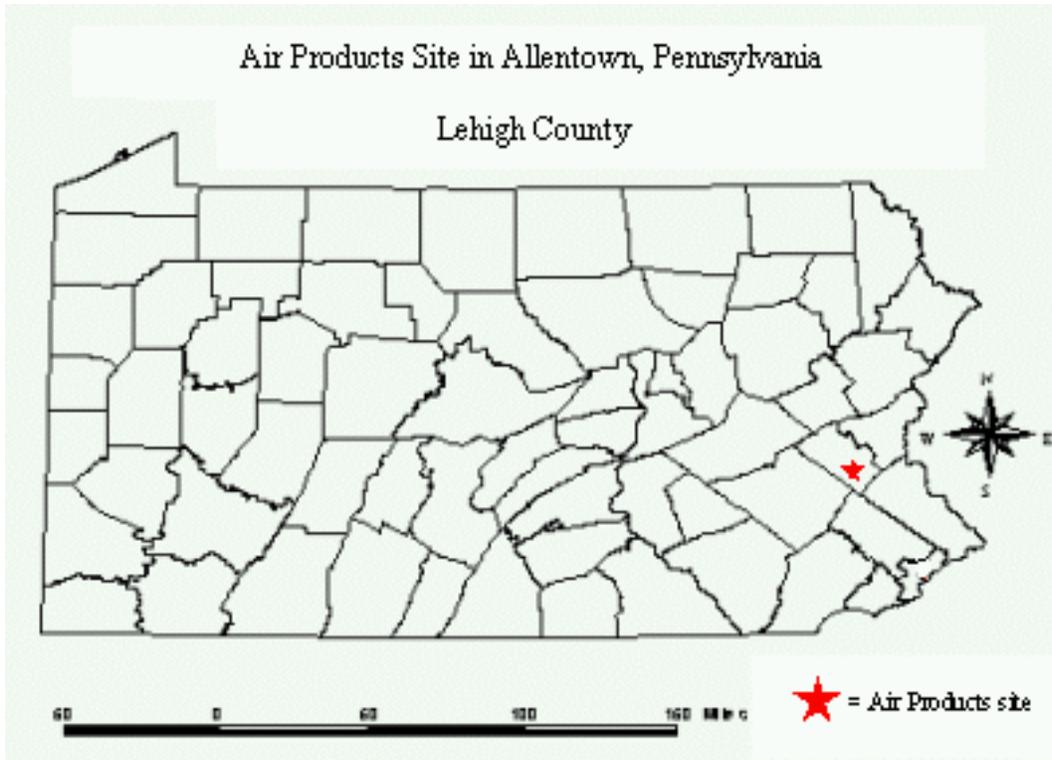
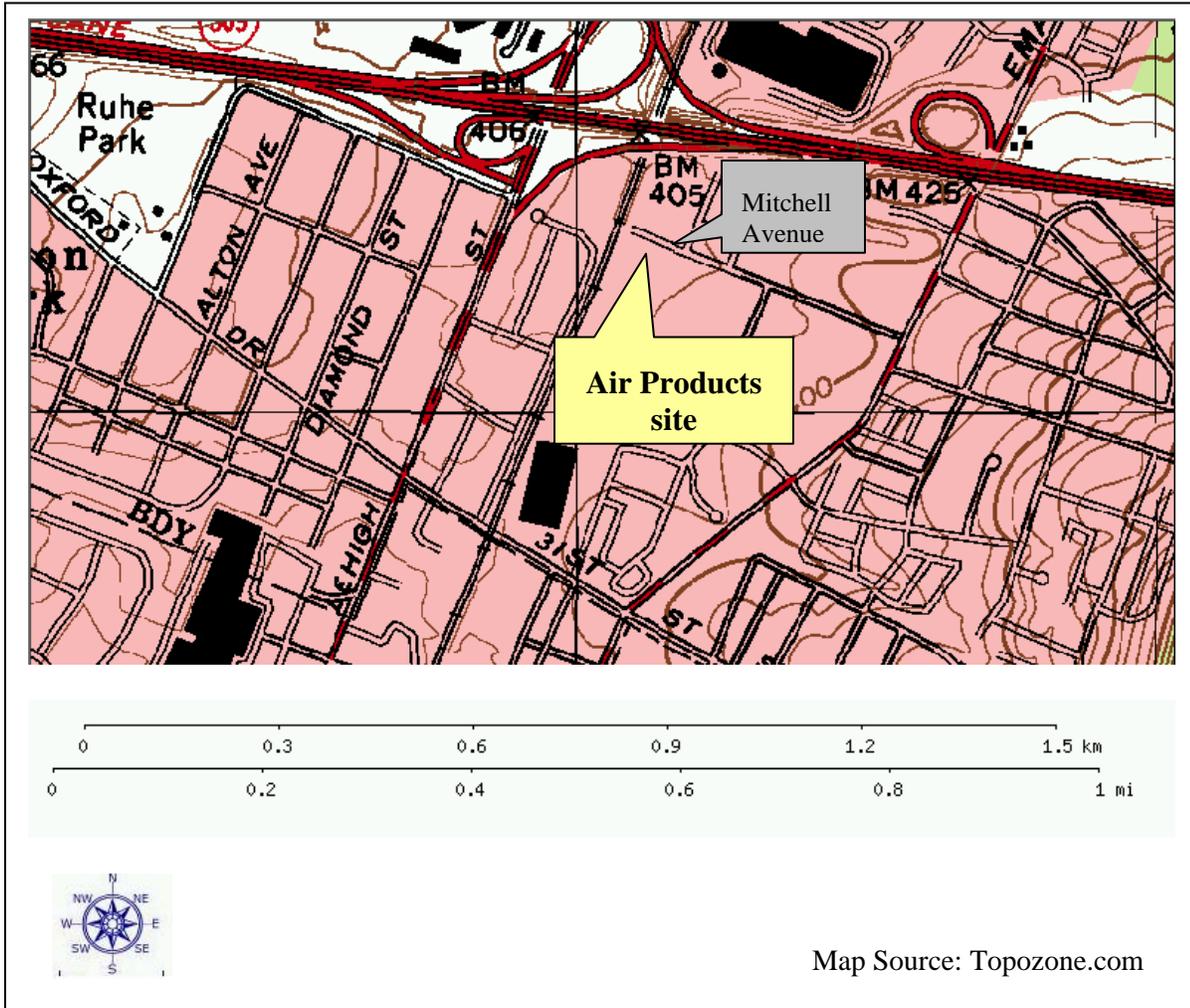


Figure 2 – Air Products site in Allentown, Pennsylvania



Map Source: Topozone.com

Figure 3 - Residential Area Down Gradient of Air Products Site



Figure 4 – Bogerts Bridge Spring in Allentown, Pennsylvania

