

Health Consultation

KEYSER AVENUE AIR MONITORING STATION

(a/k/a ALLIANCE LANDFILL SITE)

TAYLOR BOROUGH, LACKAWANNA COUNTY, PENNSYLVANIA

EPA FACILITY ID: PAD982366148

FEBRUARY 28, 2008

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 Health
Division of Environmental Health Epidemiology
under cooperative agreement with the
Agency for Toxic Substances and Disease Registry

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I. EXECUTIVE SUMMARY

At the request of a concerned community member to the Agency for Toxic Substances and Disease Registry (ATSDR), the Pennsylvania Department of Health (PADOH), working under a cooperative agreement with ATSDR, prepared this health consultation (HC) in an attempt to evaluate if residents near the Alliance Landfill Site (the Site) are being exposed to harmful levels of particulate matter and metals due to site activities. The Pennsylvania Department of Environmental Protection (PADEP) has been monitoring the air quality at one sampling point near the Site since June 2006. This air monitoring station, known as the Keyser Avenue Air Monitoring Station (KAMS), has been monitoring for Total Suspended Particulates (TSP), hydrogen sulfide, sulfur dioxide and various metals such as: arsenic, beryllium, cadmium, lead, manganese, nickel, and zinc. ATSDR and PADOH have previously determined that even though the sampling results of this air monitoring station are adequate to describe regional air quality, more monitoring stations, as well as expansion of the sampling parameters, would be needed to better evaluate if activities at the Site are having a negative environmental public health impact on the surrounding community. Therefore this health consultation evaluated a year's worth of data collected from the KAMS as an indicator for regional air quality but PADOH can not make any conclusions regarding the Site's impact on the surrounding community. ATSDR and PADOH are currently discussing with the Alliance Landfill management additional data needed to provide adequate information to determine what health impacts, if any, the site may have on nearby residents.

Since 2002, the Pennsylvania Department of Environmental Protection (PADEP) has responded to over 176 odor incidents reported by residents. Operating permits for the facility are issued by PADEP to control the types of waste the landfill may accept. PADEP also inspects the landfill along with collecting monthly data from the Site regarding the amount of gas emissions and neutralization to prevent odors [1].

A third party cancer incidence review commissioned by Alliance Landfill and Waste Management Inc. was discussed in the January 2005 HC for the site [1, 2]. That HC recommended additional monitoring for landfill related total particulate matter (dust, PM_{2.5} and PM₁₀ were not specified), VOCs, hydrogen sulfide, and sulfur dioxide to evaluate the potential health impact on the nearby community. It was determined at that time that PADEP would continue to monitor the Site for continued compliance and record all odor complaints. The 2005 HC had characterized the Site as an *indeterminate public health hazard*.

Without information from additional nearby air monitoring stations, the air quality data from the single Keyser Air Monitoring Station (KAMS) can only be used to make conclusions regarding the area in the immediate vicinity of the KAMS. This one monitoring station is located at a busy location with other facilities and activities surrounding it and cannot be accurately utilized to evaluate emissions from the Alliance landfill. **Given these limitations and based on the available data, the levels evaluated at the KAMS seem to indicate that exposure in air to levels of Total Suspended Particulates (TSP) are an *indeterminate public health hazard* due to the lack of speciation or composition of PM₁₀ and PM_{2.5} for these particulates. The recorded measured air quality data detected at the KAMS for sulfur dioxide (SO₂), arsenic (As), cadmium (Cd), chromium (Cr), and lead (Pb) represent *no apparent public health hazard*.**

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The community petitioner requested a health consultation on the air quality and emissions from the Alliance Landfill and any potential effects on the residents' health. **At this time, the Alliance Landfill site continues to be categorized as an *indeterminate public health hazard* because the data available are not specific or representative of the Alliance Landfill and its emissions.**

II. BACKGROUND AND STATEMENT OF ISSUES

ATSDR requested PADOH involvement in the Site at the request of a community resident. The Alliance Landfill Site, formerly known as "Empire Sanitary Landfill", began operating in the 1960s in the borough of Taylor and Ransom Township, Taylor, Lackawanna County, Pennsylvania. The landfill is located on the side of a mountain approximately 2.5 miles south to southwest of Scranton, Pennsylvania. The Alliance Landfill encompasses 196 acres of a 512.9 acre parcel of land. The property was purchased by Waste Management, Inc. in 1996 [1]. According to PADEP, at this time Waste Management is seeking to expand the facility activities to the borders of the site. The site is bordered by three communities to the south, east and northeast. At least one other landfill, the ESRI landfill, is located within a 1 mile radius of the Alliance Landfill site. The Pennsylvania Turnpike is nearby and is likely to contribute to some of the contaminants recorded at the monitoring station known as the KAMS (Figures 1-2).

The nearest occupied residence is within 1500 feet of the landfill's permit boundary [1]. According to the 2000 Census, 6,475 people live in approximately 2700 households within Taylor borough. Of the 6,475 individuals, 3,468 are female and 3,007 are male. Approximately 5 % (320/6,475) are children under the age of 5 years, and 6% (393/6475) are children ages 5 to 9 years. At least 98.3 (6367/6475) of the population is white, 0.34 % (22/6475) of the population is black or African American, 0.62 % (40/6475) Asian, 0.63 % (41/6475) mixed races or another race, and 0.08% of American Indian or Alaskan descent. The majority of the population work within a 20 minute drive of their homes with at least 2,404 individuals driving to work alone compared with the 426 reported carpoolers. Although a bus and limo business established in 2002 is near the monitoring station, it does not provide local public transportation. Information gathered from these households determined the number of homes in Taylor borough built before 1970 was 2200 [3].

A. Previous to April 14, 2003

The Site received its operating permit from PADEP in 1986 [1]. The landfill is not permitted to and does not accept hazardous, liquid, or infectious medical waste. The landfill accepted ash from Union County, New Jersey that has been analyzed and been deemed non-hazardous. The landfill is double-lined with a leachate collection and treatment system in place. The leachate and groundwater are monitored quarterly. The landfill collects methane gas from capped areas of the landfill; which is purified and used for residential and commercial use. "Off-specification" gas is burned using flares (permitted by PADEP) and liquid impurities from the processing are removed and disposed off-site. An air permit was granted for many air pollution devices and processes in March 1999 [4]. The National Pollutant Discharge Elimination System (NPDES) permit requires 75 % of the landfill gas to be collected and odors not to leave the Site. Odor-neutralizing agents are used to help mitigate the odor problems [1].

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A third party evaluation of the landfill gas management operations was contracted by Waste Management in January 2000. The report found significant deficiencies in the gas collection and recovery systems. The site exceeded the 500 parts per million (ppm) surface methane emissions for six months in 1999. The landfill operators must visually monitor dust leaving the property, and take corrective action and prevent the particulate matter from leaving the Site. PADEP requires that any “dust” event be recorded [1].

A total of 60 violations and 176 odor complaints from neighbors since March 2002 led to an investigation by PADEP regarding the Site. The investigation resulted in PADEP citing the landfill for leachate treatment failure, blockages in gas collection lines, and ineffective cover material as causes of odor violations. On April 14, 2003, the landfill closed for one month to address PADEP concerns [1].

B. April 15, 2003 to January 10, 2005 (First HC)

The HC previously mentioned was issued by ATSDR on January 10, 2005 [1]. During this time frame of April 15, 2003 to January 14, 2005 the Site was not cited by PADEP for violations [1]. A group from ATSDR visited and toured the site in May 2003 as part of the activities for that HC.

C. January 10, 2005 to Present

The current HC developed by PADOH in conjunction with ATSDR is a review of sampling data from the Keyser Avenue Monitoring Station (KAMS) and events since the first HC. Since 2005 at least 40 odor reports have been documented by PADEP but the odors were not confirmed off-site and/or did not result in violations [5].

III. SITE VISIT

Members from PADOH Health Assessment Section met with ATSDR and PADEP representatives on December 12, 2006 and conducted a site visit. The group toured the KAMS and the surrounding neighborhoods, as well as discussed and observed site aspects and issues. The group then met with Alliance personnel, Waste Management personnel and Waste Management’s Environmental Consultants later in the day to tour the site, receive the modeling data developed by these parties, review a history of the site, discuss the possible need for more monitoring stations, discuss issues pertaining to the site, and discuss the health consultation process [6].

IV. DISCUSSION

Pathway Analysis

PADOH evaluated residents’ exposure to possible hazardous materials and odors by looking for a completed exposure pathway. For an exposure pathway to be completed, all the following elements must be present:

- 1) a source of contamination;
- 2) transport through an environmental medium;
- 3) a point of exposure;
- 4) a route of human exposure, and;
- 5) a receptor population.

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Completed pathways for the contaminants found are listed below.

Source of Contamination	Transport via Environmental Medium	Point of Exposure	Route of Exposure	Receptor Population
Alliance Landfill, turnpike, roads, and other landfills and industrial businesses	Air	Ambient Outdoor Air	Inhalation	Residents near the KAMS
Arsenic, Cadmium, Chromium, Lead dust (Source unknown)	Air	Ambient Outdoor Air	Inhalation	Residents near the KAMS

A. Sampling Events

PADEP installed the Keyser Air Monitoring Station (KAMS) and started collecting data for various metals, total suspended particles (TSP), sulfur dioxide gas, and hydrogen sulfide gas on June 2, 2006. Quartz air filters are tested for the following metals: arsenic, beryllium, cadmium, chromium, lead, manganese, and nickel. Sulfur dioxide and hydrogen sulfide are sampled hourly. An entire year of data for this monitoring station has been collected for analysis and evaluation [5,7].

B. Sample Results

The sample results evaluated for this health consultation are the approximately 12 months' worth of data from the KAMS. The monitoring station is located near by Alliance Landfill to the west, another landfill (i.e. ESRI Landfill) to the east, the turnpike, and other commercial businesses along a major road. It is presumed by PADOH and ATSDR that Alliance Landfill is not the sole contributor to the air quality and air sampling results collected via the KAMS at this location. It should be noted that occasional problems with snow or power outages were marked and flagged on the reporting data from the KAMS collector.

Sulfur dioxide and hydrogen sulfide were recorded every hour. TSP and the metals, arsenic, beryllium, cadmium, chromium, lead, manganese, and nickel were analyzed by pre-weighing the quartz filter, re-weighing the filter at the lab, and then cutting the filter into 1 inch strips for digestion for metal analysis on a weekly basis. The filters were put in a drying apparatus prior to weighing to remove any water moisture from the air to prevent interference with the results. The sampling duration was 24 hours.

Beryllium, manganese, nickel, zinc, and hydrogen sulfide results were below the comparison values or not detected from the KAMS sampling events. Comparison values (CVs) for chromium and lead were not available. Comparison values along with the average and maximum sample results obtained from the KAMS sampling events can be found in Appendix B, Table 1.

To determine the likelihood of possible health effects of site-specific chemicals, ATSDR has developed health-based comparison values (CVs) to determine likelihood of possible health effects of site-specific chemicals. CVs are health guidelines or environmental guidelines set well below levels that are known or anticipated to result in adverse health

effects. ATSDR developed these values to help health assessors make consistent decisions about what substance concentrations or dose levels associated with site exposures might require further assessment and evaluation. PADOH also considers whether the contaminants were present at harmful levels.

Comparison values are not thresholds of toxicity. CVs should not be used to predict adverse health effects. These values serve only as guidelines to provide an initial screen of the site specific chemicals. Although concentrations at or below the relevant comparison value may reasonably be considered safe, it does not automatically follow that any environmental concentration that exceeds a comparison value would be expected to produce adverse health effects.

Health guidelines are derived based on data drawn from the epidemiologic and toxicologic literature with many uncertainty or safety factors applied to ensure that they are amply protective of human health. ATSDR's minimal risk level (MRL) and EPA's reference doses (RfD), reference concentrations (RfC), and cancer slope factors (CSF) are the health guidelines most commonly used in the public health assessment screening process.

Minimal Risk Levels (MRLs)

An MRL is an estimate of daily human dose to a substance (in milligrams per kilogram per day [mg/kg/day] for oral exposures and parts per billion [ppb] or micrograms per cubic meter [$\mu\text{g}/\text{m}^3$] for inhalation exposures) that is likely to be without noncarcinogenic health effects during a specified duration of exposure based on ATSDR evaluations.

Environmental guidelines are derived from the health guidelines and represent concentrations of a substance (e.g., in water, soil, and air) to which humans may be exposed via a particular exposure route during a specified period of time without experiencing adverse health effects. ATSDR's environmental guidelines include environmental media evaluation guides (EMEGs) and cancer risk evaluation guides (CREGs).

In general, comparison values are derived for substances for which adequate toxicity data exist for the exposure route of interest. Where possible, comparison values are generally available for three specified exposure periods: acute (14 days or less), intermediate (15 to 365 days), and chronic (more than 365 days). Comparison values are also generally available for two exposure routes: ingestion and inhalation.

ATSDR has developed environmental guidelines for substances in drinking water, soil, and air. ATSDR's environmental guidelines include environmental media evaluation guides (EMEGs), cancer risk evaluation guides (CREGs), and reference dose media evaluation guides (RMEGs). These guidelines are derived in a uniform way using health guidelines and standard default exposure assumptions. These default exposure assumptions generally represent high estimates of exposure (greater than the mean, approaching the 90th percentile), based on observed ranges of human activity patterns

(e.g., water ingestion rates, residence times). Guidelines are available to evaluate both child and adult exposures.

Environmental Media Evaluation Guides (EMEGs)

EMEGs are estimated contaminant concentrations that are not expected to result in adverse noncarcinogenic health effects based on ATSDR evaluation. EMEGs are based on ATSDR MRLs and conservative assumptions about exposure, such as intake rate, exposure frequency and duration, and body weight.

Reference Dose Media Evaluation Guides (RMEGs)

ATSDR derives RMEGs from EPA's oral reference doses, which are developed based on EPA evaluations. RMEGs represent the concentration in water or soil at which daily human exposure is unlikely to result in adverse noncarcinogenic effects.

Cancer Risk Guides (CREGs)

CREGs are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) persons exposed during their lifetime (70 years). ATSDR's CREGs are calculated from EPA's cancer slope factors (CSFs) for oral exposures or unit risk values for inhalation exposures. These values are based on EPA evaluations and assumptions about hypothetical cancer risks at low levels of exposure.

Cancer risk for inhalation was determined using the EPA risk based concentration table (RBC) and ATSDR cancer risk evaluation guide (CREG) numbers. If no CREG was available, the EPA cancer slope factor was used. Cancer risk is usually calculated for 30 years using adult parameters as defaults in the calculations unless an individual assessment is needed for a specific time frame or using different factors. Sometimes sample collection problems, the testing equipment, dilution factor, outside contaminants and such need to be addressed and evaluated for validity. Non-carcinogenic chemical exposure results were evaluated using child factors and assumptions such as 10 m³/day inhalation rate and 16 kg body weight. The highest concentration found for each chemical from the lab results was used to calculate the highest possible exposure from a conservative perspective. Cancer risk calculations were determined using the highest contaminant concentration in ug/m³ and multiplied by the inhalation unit risk (IUR) factor in (ug/m³)⁻¹ whenever available. If the CREG was then available, then the risk was calculated using that value to estimate the cancer risk exposure. The formula is as follows:

$CR = ED \times IUR \times EY/70 \text{ years,}$	
CR = Cancer Risk	ED = Exposure Dose in ug/m ³
IUR = Inhalation Unit Risk in (ug/m ³) ⁻¹	EY = Exposure in years
It is assumed the longest time lived in one place is 30 years.	

The highest contaminant concentration in ug/m^3 was multiplied by the inhalation unit risk factor in $(\text{ug}/\text{m}^3)^{-1}$, multiplied by 30 years and then divided by 70 years.

Risk assessors typically categorize theoretical lifetime cancer risk estimates into different groups. PADOH interprets a cancer risk of 1×10^{-6} or one additional cancer per 1 million people as an “insignificant or no increased risk”. The higher the number, the greater the increased risk for cancer. For example, $1 \times 10^{-5} = 1$ in 100,000 is considered “no apparent increased risk” but $1 \times 10^{-4} = 1$ in 10,000 is considered a “low increased risk” [8].

Chemicals Considered for Further Public Health Evaluation

Using the screening process described above, the compounds that exceeded a health based screening value or did not have an appropriate health-based screening value were retained for further public health evaluation in the sections below are sulfur dioxide, total suspended particles, arsenic, cadmium, chromium and lead.

Sulfur Dioxide (SO₂)

The maximum and average sulfur dioxide results from the Keyser Avenue Monitoring Station can be found in Appendix B., Table 2. The two highest sulfur dioxide results recorded for hourly readings were 60 ppb and 56 ppb during November and December of 2006. The monthly averages for these months were 3 ppb and 5 ppb respectively. The highest recorded monthly average was the 5 ppb in December 2006. Using the monthly average results calculated from KAMS, the annual sulfur dioxide recorded was 2.6 ppb. All recorded sulfur dioxide results were well below the National Ambient Air Quality Standards (NAAQS) of 140 ppb for a 24-hour period and 30 ppb annually [9]. The new Minimum Risk Level (MRL) of non-cancer health effects for acute exposures (i.e. from 1-14 days) for sulfur dioxide is 10 ppb. Although the monthly averages are below 10 ppb in the KAMS data set reviewed for this report, the hourly readings reveal higher numbers during the daylight hours, some of which are above 10 ppb.

Sulfur dioxide has not been classified as a human carcinogen, as general scientific studies have been inconclusive. Asthmatics have also been shown to be sensitive to the respiratory effects of low concentrations of sulfur dioxide. Most studies show that 100 ppb sulfur dioxide or more cause respiratory problems for asthmatics [10]. Studies have shown sulfur dioxide may potentially increase allergies and respiratory infections in children but the particulate matter effects can not be separated from sulfur dioxide exposure [11]. Reproductive, cardiological, hematological, gastrointestinal, and ocular effects have been documented for concentrations at 40,000 ppb or higher.

PADOH and ATSDR's ability to evaluate the public health significance of sulfur dioxide levels reported in the air near this site is limited. Although hourly average concentrations are available, shorter-term peak exposures (e.g., 10 minutes) during that hour may have been elevated, and this kind of subhourly monitoring information is not available for this site. Subhourly sulfur dioxide exposures are an area of active scientific inquiry. ATSDR scientists are currently reassessing available studies on the effects of low levels of sulfur

dioxide on the health of sensitive individuals, particularly asthmatics, and EPA is in the process of evaluating the latest scientific information on health and environmental effects of sulfur oxides that provide scientific bases for its NAAQS. With these limitations in mind, sulfur dioxide levels recorded and evaluated for this health consultation do *not appear to be an apparent public hazard* based on the KAMS one year sampling data.

Total Suspended Particles

The maximum and average total suspended particles were 67.1 ug/m^3 and 29.7 ug/m^3 respectively, found in Appendix B., Table 4. Total suspended particulates (TSP) are the aggregate of solid or liquid matter in air. Particles vary in size (up to 45 micrometers in diameter) and may remain suspended in the air a few seconds to several months. Particulate emissions come from coal-burning power plants, industrial processes, mining operations, municipal waste incinerators and fuel combustion. They also are produced by natural sources such as forest fires and volcanoes. The smaller of these particles are breathed into the lungs, where they can aggravate or cause respiratory ailments. These smaller particles also can carry other pollutants into the lungs. The federal ambient air quality standard for particulate matter was revised to reflect the adverse health effects of smaller particulate matter (PM) less than 10 microns in size known as (PM₁₀). There is no federal or state air quality standard for TSP [12]. Measured concentration of total suspended particles are considered and determined to be an *indeterminate health hazard* based on the review of the data available and evaluated for this health consultation. This consideration and classification of *indeterminate health hazard* is due to the fact that the speciation or composition of the TSP regarding what percentage or amount is PM₁₀ and what percentage or amount is PM_{2.5} is not available. Additional testing using PM₁₀ and PM_{2.5} would have to be implemented to better determine the air quality and potential human health effects of the air surrounding and analyzed by the KAMS.

Particles less than 10 micrometers in diameter (PM₁₀) pose a health concern because they can be inhaled into and accumulate in the respiratory system. The National Ambient Air Quality Standard (NAAQS) for PM₁₀ is 150 ug/m^3 over a 24 hour period. An annual PM₁₀ standard does not exist at this time. Particles less than 2.5 micrometers in diameter (PM_{2.5}) are referred to as "fine" particles and are believed to post the largest health risks. Because of their small size, fine particles can lodge deeply into the lungs. The NAAQS for (PM_{2.5}) is 35 ug/m^3 for a 24 hour period and 15 ug/m^3 annually [13]. Determining the different particle sizes would help determine the air quality impact at the KAMS on the nearby residents.

Metals

Arsenic (As)

The background levels of naturally occurring arsenic found in outdoor air range from $0.001 - 0.003 \text{ ug/m}^3$ in rural areas to $0.02 - 0.1 \text{ ug/m}^3$ in urban areas [14]. The KAMS arsenic findings were within the typical arsenic background levels. The maximum arsenic

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particulate reading found was 0.0078 ug/m^3 and the average was found to be 0.00097 ug/m^3 respectively. Both readings are above the CREG of 0.0002 ug/m^3 although over half the readings were non-detects for the year. The calculated excess cancer risk using the average reading is $1.4 \text{ E-}5$, or an excess cancer risk of 1 case per 100,000 persons exposed, and is interpreted and classified as *no apparent increased cancer risk* based on the data evaluated

Arsenic occurs naturally in the soil. Rain and snow remove arsenic dust particles. Organic arsenic is used to pesticides for cotton seed plants. Inorganic arsenic is in lead and copper smelting and to make copper chromated arsenic (CCA) is used to make "pressure-treated" lumber for industrial use and residential use in the past. Inorganic arsenic had been documented to cause cancer and is a known carcinogen causing lung cancer. Not enough information has been found to associate inhaled arsenic with other types of cancer. Adult bodies can metabolize some inorganic arsenic to the less harmful organic arsenic. Arsenic has been documented crossing the placenta and in breast milk. There is some information suggesting that children may be less efficient at converting inorganic arsenic to the less harmful organic forms [15]. Most studies of noncancerous arsenic effects are from occupational workers inhaling arsenic (mostly inorganic arsenic) leading to respiratory, cardiological, gastrointestinal, dermatitis (such as keratosis), ocular, and neurological effects. Arsenic exposure has been linked to stillbirths, decreased birth weight, and malformations in female smelter employees[14]. The lowest no observable adverse effect level (NOAEL) found in literature for chronic inhalation of arsenic is 0.06 ug/m^3 and a serious low observable adverse effect level (LOAEL) of 0.7 ug/m^3 increases the risk of stillbirths [15]. The maximum concentration of arsenic sampled was 0.0078 ug/m^3 is well below the NOAEL and LOAEL mentioned. The arsenic levels recorded and evaluated in the air surrounding the KAMS are considered *not an apparent health hazard* based on data evaluated.

Cadmium (Cd)

The maximum and average concentrations of cadmium 0.00044 ug/m^3 and 0.00022 ug/m^3 respectively were below the CREG value of 0.0006 ug/m^3 from the KAMS sample results. Using the IUR to calculate excess cancer risk after 30 years of exposure, the resulting value of $3.4 \text{ E-}7$, or an excess cancer risk of less than 1 case per 1,000,000 persons exposed, is interpreted and classified as presenting *an insignificant or no increased* additional excess cancer risk, based on the data evaluated.

Cadmium is a naturally occurring element found in small particles floating in the air. Concentrations of cadmium in ambient air are very low, generally less than $5.0 \text{ E-}9 \text{ ug/m}^3$, but concentrations up to $5.0 \text{ E-}7 \text{ ug/m}^3$ have been detected in air near cadmium-emitting facilities [16]. Cadmium is usually found with other metals. Weathering of rocks, burning forests, volcanoes, burning fossil fuels, and extracted by-product removed during the production of other metals. Cadmium is used in fertilizers, batteries, pigments, metal coatings, plastics, and some metal alloys [16]. Comparison value for non-cancer effects was not available. Studies on workers inhaling cadmium fumes found respiratory problems, calcium deficiency, and kidney problems (target organ), along with yellow

teeth and chromosomal changes. Cadmium may lower sperm production and pregnant women may give birth to babies with lower birth weights. Scientific studies are inconclusive about cadmium and hematological effects. In some studies, renal problems were observed by an employee working with at 17 ug/m^3 of cadmium dust for 30 years, and respiratory problems were reported by four workers with 25 ug/m^3 cadmium fumes for 24 years. Cadmium is classified as a probable human carcinogen, linked with lung cancer and prostate cancer [16]. The cadmium results from the KAMS were well below the 17 ug/m^3 and 25 ug/m^3 mentioned for chronic exposure to cadmium dust and fumes. Cadmium air levels recorded and evaluated in the air in the vicinity of the KAMS are considered *not an apparent public health hazard* based on the data evaluated.

Chromium (Cr)

The maximum and average concentrations of total chromium from the KAMS were 0.00815 ug/m^3 and 0.00022 ug/m^3 respectively. Atmospheric total chromium is less than 0.01 ug/m^3 in rural areas and between 0.01 to 0.03 ug/m^3 in urban areas [18]. The lowest observable adverse effect level was 2.0 ug/m^3 from an occupational worker with nasal problems and decreased lung function [18]. The concentrations from the KAMS were well below 2.0 ug/m^3 . Chromium VI has a CREG of 0.00008 ug/m^3 and an intermediate EMEG of 1.0 ug/m^3 . The air sampling results did not separate the types of chromium so it can not be determined the exact amount of chromium VI dust if any. Measured chromium air levels are an *indeterminate public health hazard* to the residents in the vicinity of the KAMS based on the data evaluated.

Chromium is a naturally occurring element found in rocks, animals, plants, soil, and in volcanic dust and gases. Chromium is present in the environment in several forms. The most common forms are elemental chromium(0), chromium(III), and chromium(VI). Chromium(III) occurs naturally in the environment and is an essential nutrient. Chromium(VI) and chromium(0) are generally produced by industrial processes. The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving. Most of the chromium compounds, usually chromium (III) and chromium (VI), form fine dust in the air and settle on the ground or water. Chromium (III) helps the body use sugar, protein and fat. Inhaling high levels of chromium (VI) may lead to nosebleeds, ulcers and holes in the nasal septum. Using the assigned IUR value of 0.12 ug/m^3 for chromium (VI), *assuming all the chromium measured was chromium (VI)*, the calculated excess 30 year cancer risk is $4.2 \text{ E-}5$ (rounded up to $1.0 \text{ E-}4$), or an excess cancer risk of 1 case per 10,000 persons exposed, would be a *low increased risk*. Lung cancer has been documented from occupational exposure to Chromium (VI) [19].

Lead (Pb)

The average and maximum lead concentrations from the KAMS were 0.00294 ug/m^3 and 0.1122 ug/m^3 respectively for one year. EPA has established standards designed to limit the amount of lead in air. Over a three-month period, the amount of air that the public inhales cannot contain more than 1.5 micrograms of lead per cubic meter of air (1.5

ug/m³) [20]. Considering the maximum and average lead concentrations were one to several orders of magnitude below the EPA three-month limit, lead air levels measured at the KAMS are *not an apparent health hazard* based on data evaluated. Most human studies determine exposure to lead using blood lead levels after lead exposure.

Lead naturally occurs in the environment. When lead particles land on soil, they usually stick to the soil. Lead is released into the environment by burning fuels, mining, and manufacturing. Lead is currently used in batteries, ammunition, metal products (solder and pipes), stained glass, and devices to shield X-rays. In the past, lead was used in paint, gasoline, ceramics, pipe solder, and caulking. Many products using lead in the past still exist and may chip, releasing lead dust into the air [21]. Lead levels in ambient air range from 7.6 E-5 ug/m³ in remote areas such as Antarctica to above 10 ug/m³ near stationary sources such as smelters. Monitoring data from a composite of 147 sampling sites throughout the United States indicated that the maximum quarterly average lead levels in urban air were 0.36 ug/m³ during 1984 and 0.2–0.4 ug/m³ during 1986 [22].

Lead affects almost every organ of the body and is reasonably anticipated to be a carcinogen [22]. Lead accumulates and is usually found in the kidneys, liver, brain, bones, teeth, and bone marrow. Most of the lead found in the human body is in the bone and tissue which is why blood lead levels are used to look for lead exposure [23]. Adults exposed to lead may suffer from neurological problems or possibly cancer in the stomach, kidney, lung, and brain [24]. Lead has been classified as a probable human carcinogen [25]. Although lead usually stays in place, it has been known to cross the placenta. Low birthweights, health effects, both mental and physical, have been associated with lead exposure in the womb. Lead causes hearing problems, neurological problems such as lower I.Q., and behavior problems such as easily distracted and short attention spans [26].

C. Quality Assurance and Quality Control

In preparing this health consultation, ATSDR and PADOH relied on the information provided in the referenced documents. ATSDR and PADOH reviewed the quality assurance and quality control measures that were followed regarding data gathering, chain-of-custody, laboratory procedures, and data reporting. ATSDR and PADOH expected and presumed that to ensure the accuracy of the data, care was taken during all aspects of sample collection. ATSDR and PADOH also assumed that the laboratory only used certified, clean sampling collection devices. Once samples were collected, ATSDR and PADOH expected they were stored according to the method protocol and were delivered to the analytical laboratory as soon as possible. Finally, ATSDR and PADOH presumed that laboratory Standard Operating Procedures and other procedures and guidance for sample analysis, reporting, and chains of custody were followed. The analyses, conclusions, and recommendations in this health consultation are valid only if the reference documents are complete and reliable.

V. CHILD HEALTH CONSIDERATIONS

PADOH and ATSDR recognize that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination of environmental media. In general, children may be more sensitive to the effects of contaminants, presumably because of a higher body burden. However, there is no evidence that the pharmacokinetics (absorption, distribution, metabolism, and excretion) of sulfur dioxide, total suspended particles, arsenic, cadmium, and/or chromium, differ in children. Although arsenic and lead have been documented or shown to cross the placenta, levels detected at the KAMS are not high enough to be a health concern. Children under the age of 6 are particularly sensitive to exposures to lead. A common practice to protect children from lead exposure is to remove lead sources within a child's reach such as removing toys with leaded paint.

VI. CONCLUSIONS

PADOH and ATSDR conclude the following:

1. The community petitioner had requested a health consultation on the air quality and emissions from Alliance Landfill and any potential effects on the residents' health. **At this time, the Alliance Landfill site continues to be categorized as an *indeterminate public health hazard* because the data available are not specific or representative of the Alliance Landfill and its emissions.**
2. Conclusions regarding the air quality data from the Keyser Air Monitoring Station (KAMS) can only be made for the area in the immediate vicinity of the KAMS. Assumptions can be made regarding regional air quality data and exposures with less accuracy and reliability. This single monitoring station at a busy location with other facilities and activities surrounding it can not be accurately utilized to evaluate emissions from the Alliance landfill. **Given these limitations and based on the available data, the levels evaluated at the KAMS seem to indicate that exposure in air to levels of Total Suspended Particulates (TSP) are an *indeterminate public health hazard* due to the lack of speciation or composition of PM₁₀ and PM_{2.5} for these particulates. The recorded measured air quality data detected at the KAMS for sulfur dioxide (SO₂), arsenic (As), cadmium (Cd), chromium (Cr), and lead (Pb) represent *no apparent public health hazard*.**
3. Additional sampling points and stations are needed around Alliance Landfill and in the surrounding areas and neighborhoods to be able to better evaluate potential impact to the residents and public health concerns regarding emissions from the landfill itself. Optimally, the sampling stations should not be located near busy roadways and industries which may contribute contaminants to the air samples. A comprehensive sampling plan to address these and other issues would be necessary.
4. Additional parameters such as PM₁₀, PM_{2.5}, sulfur dioxide, hydrogen sulfide, and mercury should be sampled, whether at the Keyser Avenue Monitoring Station (KAMS) or at other location(s) per point #2 above. Further investigation is necessary to confirm whether particulate matter sizes are at levels of health concern that would affect the public and

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residents. Although landfill management has determined that mercury is not a likely contaminant of concern from this site, mercury is included in this list because of the community's specific concern about mercury emissions from the landfill and sampling for this contaminant would assist in alleviating this concern.

5. Further investigation and data collection would be needed to determine if exposure to contaminants of concern as identified by the community petitioner and residents are present at levels of health concern and if such exposures are affecting residents (not evaluated in this HC) near the Alliance Landfill and KAMS site.

VII. PUBLIC HEALTH RECOMMENDATIONS

PADOH and ATSDR recommend the following:

1. ATSDR and PADOH plan to discuss with representatives of Waste Management Inc. and Alliance Landfill topics regarding the possible installation of additional air monitoring sites and the development of a comprehensive sampling plan near the landfill to sample sulfur dioxide, hydrogen sulfide, PM₁₀ and PM_{2.5}, and metals (arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, nickel, and zinc) to help to better evaluate the air quality, exposure levels, and potential health effects for the community.
2. PADEP will continue to operate the Keyser Air Monitoring Station (KAMS), and will investigate the feasibility of collection of PM₁₀ and PM_{2.5}, and mercury as requested by ATSDR and the residents.
3. PADEP should continue maintaining a record of all odor complaints to characterize the nature, location, time, and frequency of such complaints.
4. Management at the landfill and PADEP should ensure continued compliance with required landfill gas emission controls and odor-control practices.

VIII. PUBLIC HEALTH ACTIONS COMPLETED AND PLANNED

1. PADOH will plan to meet with the community at a public meeting to discuss the air sampling results and this HC. PADOH will continue to be available to answer residents' health questions as more information becomes available.
2. Additional air monitoring stations may potentially be installed in several locations by Waste Management in accordance with or in consideration of ATSDR and PADOH recommendations to attempt to better determine the full extent of air quality and potential health effects for residents in the community surrounding Alliance landfill.
3. PADOH will evaluate future sampling results and if feasible and appropriate prepare a health consultation that addresses the public health significance of the data.

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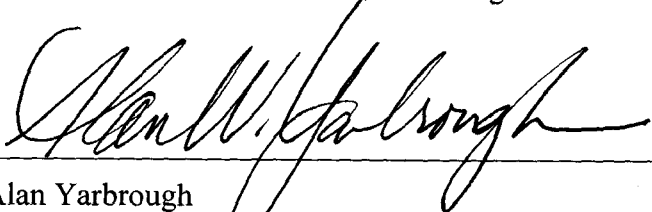
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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



Alan Yarbrough

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APPENDIX A. FIGURES

Figure 1. – Alliance Landfill Site

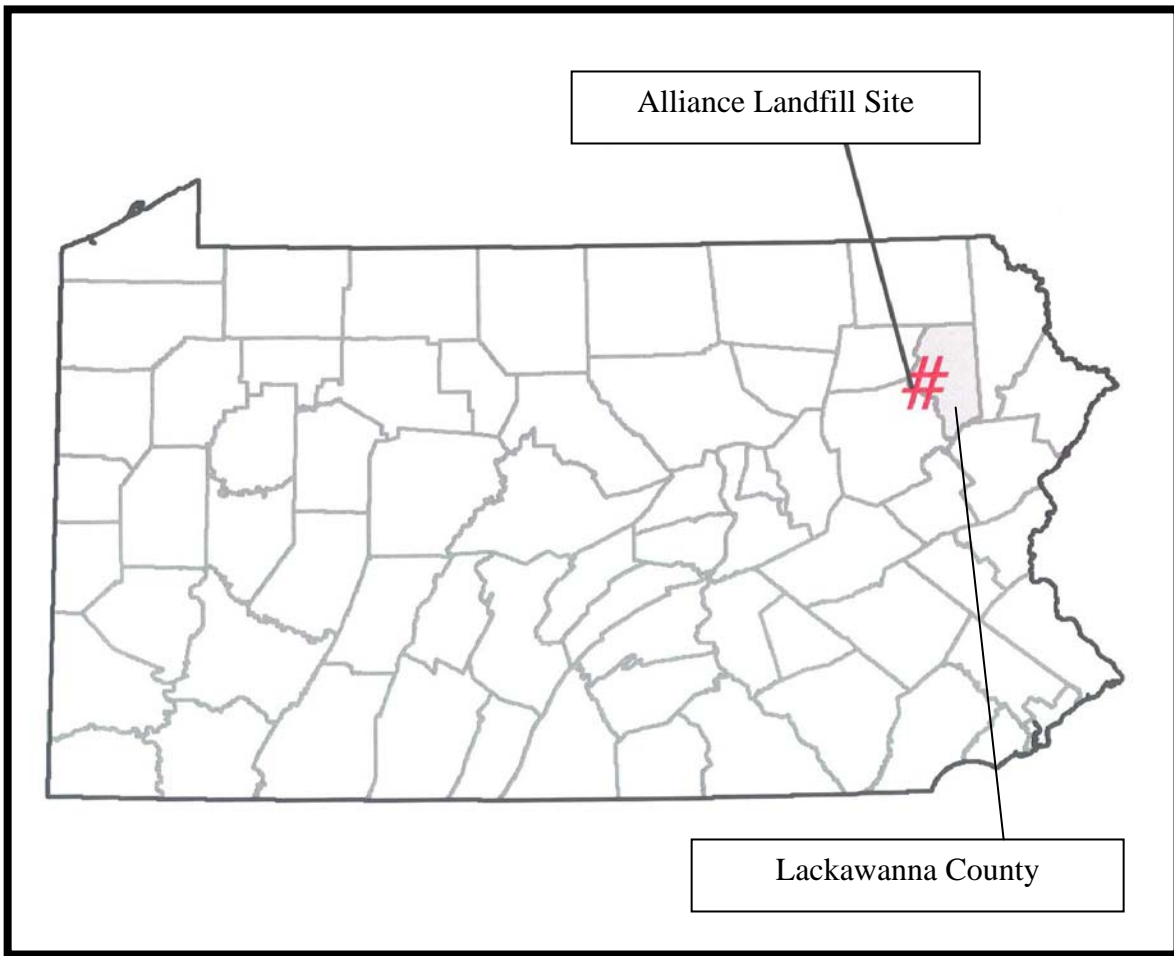
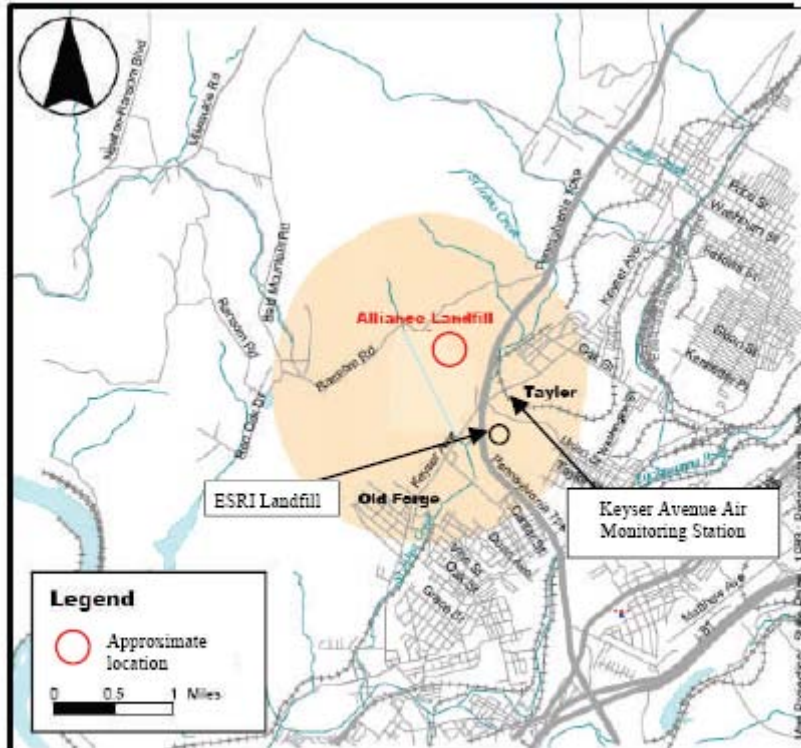


Figure 2. – Alliance Landfill and Surrounding Areas



Alliance Landfill

APPENDIX B. TABLES

Table 1. CVs of Compounds Sampled at Keyser Avenue Monitoring Station for One Year

Compound	Lowest Reporting Limit in ug/m ³	Average Concentration in ug/m ³	Maximum Concentration in ug/m ³	IUR (Inhalation Unit Risk) (ug/m ³) ⁻¹	Comparison Values		Calculated Excess 30 Year Cancer Risk
					Noncancer (Source) ug/m ³	Cancer (CREG) ug/m ³	
Arsenic	0.00040 (ND)	0.00097	0.0078	0.0043	NV	0.0002	1.4 E -5
Beryllium	0.00010 (ND)	0.00011 (ND)	0.00011 (ND)	0.0024	0.02 (Int. RMEG)/RfC	0.0004	1.0 E-7
Cadmium	0.00005 (ND)	0.00022	0.00044	0.0018	NV	0.0006	3.4 E-7
Chromium	0.00201 (ND)	0.00261	0.00815	0.012	0.1 (Chronic EMEG)/1.0 (Int. RMEG/RfC)	0.00008	4.2 E-5
Lead	0.00201 (ND)	0.00294	0.01122, 0.00551 maximum 3 month average	NV	1.5 – 3 month NAAQS average	NV	NV
Manganese	0.00267	0.01225	0.03824	NV	0.04 (Chronic EMEG)/0.05 (Int.RMEG)/RfC	NV	NV
Nickel	0.00100 (ND)	0.00028	0.00319	NV	0.2 (Int.EMEG), Chronic EMEG 0.09	NV	NV
Zinc	0.01366	0.04345	0.18228	NV	1100 (EPA Region III)	NV	NV
TSP	7.63146	29.66323	67.11018	NV	150 - 24 hr NAAQS	NV	NV
H ₂ S	0	0.63/0.42 ppb	7.5 / or 5 ppb	NV	100 (Acute MRL), 2 (Chronic RfC), 30 (Int. MRL)/ Or 20 ppb *	NV	NV
SO ₂	0	7.8/ 2.6 ppb	180 / or 60 ppb	NV	30 (Acute MRL)/ Or 10 ppb +	NV	NV

* 5 ppb - PADEP 24-hour air standard

MRL - Minimum Risk Level

NV – No Value

RMEG - Reference Dose Media Evaluation Guide

ND – Not Detected

EMEG - Environmental Media Evaluation Guides

NAAQS – National Ambient Air Quality Standards Int. - Intermediate

+ ug/m³ converts to ppb (the same value, different units) by using the equation:

$$\text{Compound ppb} = \frac{\text{Compound (ug/m}^3\text{)} \times (24.45 \text{ L/mol})}{\text{compound molecular weight in grams/mol}}$$

where 24.45 L/mol is the molar volume

Table 2. Sulfur Dioxide Monthly Averages from Keyser Avenue Monitoring Station for 1 Year

Keyser Avenue Monitoring Station Sulfur Dioxide (SO ₂)		
Date (Month,Year)	Monthly Average, ppb	Maximum Concentration Found, ppb
June, 2006	4.5	27
July, 2006	3	41
August, 2006	2	19
September, 2006	2	23
October, 2006	1	20
November, 2006	3	60
December, 2006	5	56
January, 2007	2	31
February, 2007	3	33
March, 2007	1	30
April, 2007	1	25
May, 2007	4	16

Table 3. Hydrogen Sulfide Monthly Averages from Keyser Avenue Monitoring Station for 1 Year

Keyser Avenue Monitoring Station Hydrogen Sulfide (H ₂ S)		
Date (Month,Year)	Monthly Average, ppb	Maximum Concentration Found, ppb
June, 2006	1	2
July, 2006	0	0
August, 2006	0	1
September, 2006	2	4
October, 2006	0	5
November, 2006	0	2
December, 2006	0	2
January, 2007	0	1
February, 2007	0	2
March, 2007	0	2
April, 2007	1	2
May, 2007	1	2

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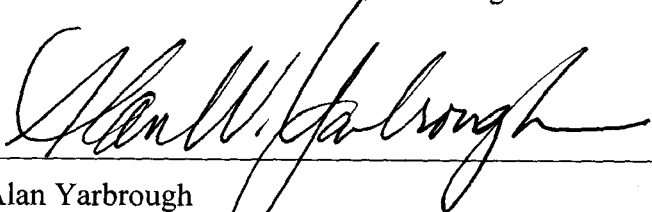
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