Health Consultation

PORTNEUF VALLEY AIR TOXICS
Ambient Air Data Evaluation & Health Assessment,
POCATELLO, CHUBBUCK AND SURROUDING AREAS
BANNOCK COUNTY, ID

August 2007

Prepared by

Idaho Department of Health and Welfare
Division of Health
Bureau of Community and Environmental Health
Under Cooperative Agreement with
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Foreword

The Bureau of Community and Environmental Health (BCEH), Division of Health, Idaho Department of Health and Welfare jointly prepared this public health consultation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to environmental contaminants. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The health consultation is an approach used by ATSDR and BCEH to respond to requests from concerned residents for health information on hazardous substances in the environment. The health consultation process evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

For more information about ATSDR, contact the ATSDR Information Center at 1-888-422-8737 or visit the agency's Web site: www.atsdr.cdc.gov/.

Summary

What is the purpose of this health consultation?
Poor air quality is a concern for both citizens and environmental and public health agencies. It can have an impact on the health of individuals and may adversely impact sensitive populations such as children, the elderly, and those with asthma, respiratory disease, and heart disease. The Portneuf Valley, comprised of Pocatello, Chubbuck and surrounding areas in southeast Idaho, is not exempt from air quality problems. Periods of poor air quality in the Portneuf Valley may be due in part to its valley location, population growth, an increase in vehicles, factory emissions, wood stove burning, agricultural production, and airborne dusts from dry soils.

This health consultation resulted from a recommendation made by the Agency for Toxic Substances and Disease Registry (ATSDR) in their 2000 health consultation of air contamination at Eastern Michaud Flats to further examine the air contaminants to determine if they might pose risks for chronic health effects. To understand if the air quality might pose these chronic (long-term) health concerns for area residents, the Bureau of Community and Environmental Health (BCEH) within the Idaho Department of Health and Welfare (IDHW) worked with the Idaho Department of Environmental Quality (IDEQ) to determine the type of contaminants and the levels of contaminants in the air. To determine the types and levels of contaminants, IDEQ collected air samples near the Garrett and Gould (G&G) intersection in Pocatello from 2003-2005. These samples were sent to a lab for analysis. BCEH then looked at the lab results to determine if there were any health risks due to breathing air with these levels of contaminants.

What are the results?
The levels of contaminants found at the monitoring site at G&G are considered to be low and are not considered to pose a risk to human health. Also, exposure to all but one of the contaminants is not considered to increase the chance of someone developing cancer. The one exception is arsenic which shows a very small increased cancer risk for those who breathe the air for 24-hours per day for 70 years. However, since the risk is very low, BCEH does not consider this to be a public health hazard. This does not imply that arsenic levels should be ignored in the Portneuf Valley. Air sampling should be continued and levels of contaminants monitored on a regular basis to determine if levels are increasing and posing a health risk.

What are the recommendations of this health consultation?
To address the air quality issues in the Portneuf Valley, BCEH recommends that IDEQ continue air monitoring in the Portneuf Valley. BCEH will continue to work with IDEQ to identify sources of contaminants that increase risk to human health, particularly arsenic, and will continue to work with IDEQ to assess health effects from exposure to these contaminants in the Portneuf Valley. BCEH will also work with IDEQ to provide educational materials and activities to concerned citizens to answer questions and provide information on these contaminants and any possible health effects.

Where can I get more information?
If you have questions or comments, please contact the Bureau of Community and Environmental Health at 208-334-5508 or bceh@dhw.idaho.gov.

Purpose and Statement of Issues

The Bureau of Community and Environmental Health (BCEH), Division of Health, Idaho Department of Health and Welfare (IDHW) has a cooperative agreement with the Federal Agency for Toxic Substances and Disease Registry (ATSDR) to conduct public health assessments and consultations for sites in Idaho. This health consultation was done as part of this cooperative agreement.

It is well known that air quality has an impact on the health of individuals. Protecting air quality is a goal for environmental and health agencies. One Idaho site where environmental and health agencies have worked together to better understand the possible health impacts of air pollution is the Eastern Michaud Flats Superfund Site near Pocatello. On March 15, 2000 ATSDR released its "Health Consultation for Air Contamination at the Eastern Michaud Flats Contamination, Pocatello, Bannock County, Idaho." In that report ATSDR determined that eight contaminants (metals and inorganics) exceeded their corresponding health-based comparison value (CV) for short term exposure on at least one occasion. Since the air monitoring filters were not routinely analyzed to determine what contaminants were in the air, ATSDR recommended that IDEQ have the filters analyzed to find what contaminants and what level of each were in the air. From these results, an annual average level of contaminants could be calculated. The annual average is necessary to fully evaluate health concerns related to chronic exposure. To achieve the goal of addressing chronic exposure of the public to these contaminants, air sampling filters from the Garrett & Gould Monitoring Site (G&G) in Pocatello were analyzed to determine the types of contaminants and annual average concentrations. This report evaluates the chemical contaminants, their concentrations, and the risk they pose to residents in the Portneuf Valley.

Background

Site Description

The Portneuf Valley in southeast Idaho contains 96.6 square miles and includes the cities of Pocatello, Chubbuck, and the surrounding areas. The Portneuf River flows to the Northwest through the valley, ending in the American Falls Reservoir. The combined population of the area is approximately 76,000. The Portneuf Valley is adjacent to the Fort Hall Indian Reservation, which is not in attainment (compliance) with the U.S. Environmental Protection Agency's air quality standard for particulate matter less than 10 microns in diameter (PM_{10}). The Portneuf Valley was previously a non-attainment area for PM_{10}, however the area has been re-designated as an attainment area as of August 14, 2006. The area also includes a portion of the Eastern Michaud Flats (EMF) Superfund Site. (See Figures 1-3). Urban areas within a valley such as this one are particularly prone to contaminants being trapped by inversions and other meteorological conditions.

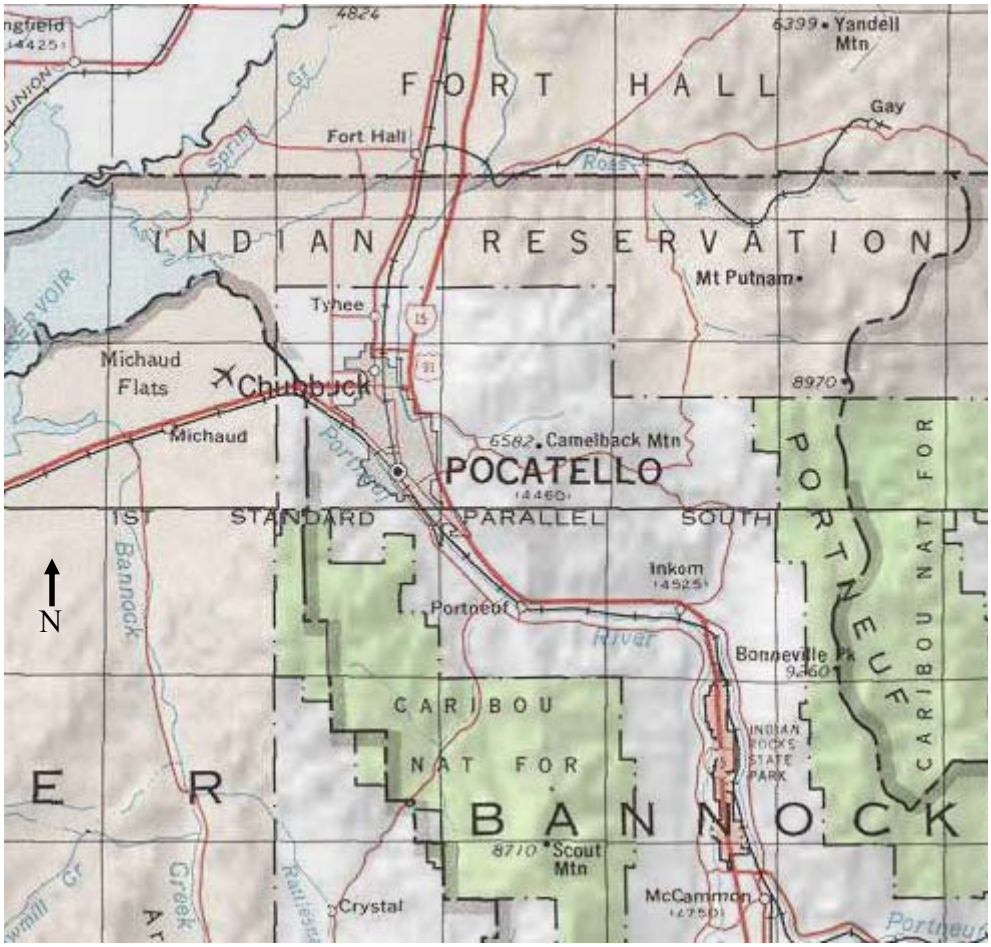

Figure 1: Map of the entire Portneuf Valley.

Figure 2: Three-dimensional view of the urbanized area of the Portneuf Valley looking North toward Pocatello from Wild Horse Mountain. The yellow circle indicates the Garrett & Gould air monitoring station.

Sources of Contamination/Contaminants of Concern

There are a number of potential sources of air toxics in the Portneuf Valley. These include vehicle emissions and emissions from fixed sources such as home and commercial furnaces, wood burning, and industrial combustion. Dusts from soil deposits throughout the valley and manufacturing processes are also potential contributors to the measured air toxic concentrations in the Valley. The Valley has one large industrial plant, a phosphate fertilizer plant located on the west end of Pocatello.

The eight elements that exceeded the screening CV for short term exposure as reported in the 2000 ATSDR report were: aluminum, arsenic, barium, beryllium, cadmium, chromium, manganese, and vanadium. It is important to remember that while these elements exceeded the screening CV level, none of them exceeded either the No-Observed-Adverse-Effect Level (NOAEL) or the Lowest-Observed-Adverse-Effect Level (LOAEL) for short term exposure. Therefore, it was determined that any adverse health effects were not likely from exposure to these eight contaminants. However, due to

sampling limitations, it was suggested that further air monitoring be completed and yearly averages of contaminants be quantified so that a better estimate of risk, especially chronic risk, could be established.

Air Sampling

Within the airshed, air quality surveillance is conducted by both IDEQ (Portneuf Valley air quality) and the Shoshone-Bannock Tribes (Fort Hall air quality).

This health consultation is specific to the monitoring station operated by IDEQ near the corner of Garrett and Gould (G&G) streets in the city of Pocatello (Figures 2 and 3). Between 2003 and 2005, PM_{10} was sampled every 6th day at the G&G Monitoring Site. The filters used in the monitoring were later analyzed to determine what specific contaminants comprised the chemical composition of the PM_{10} and the amount of those contaminants.

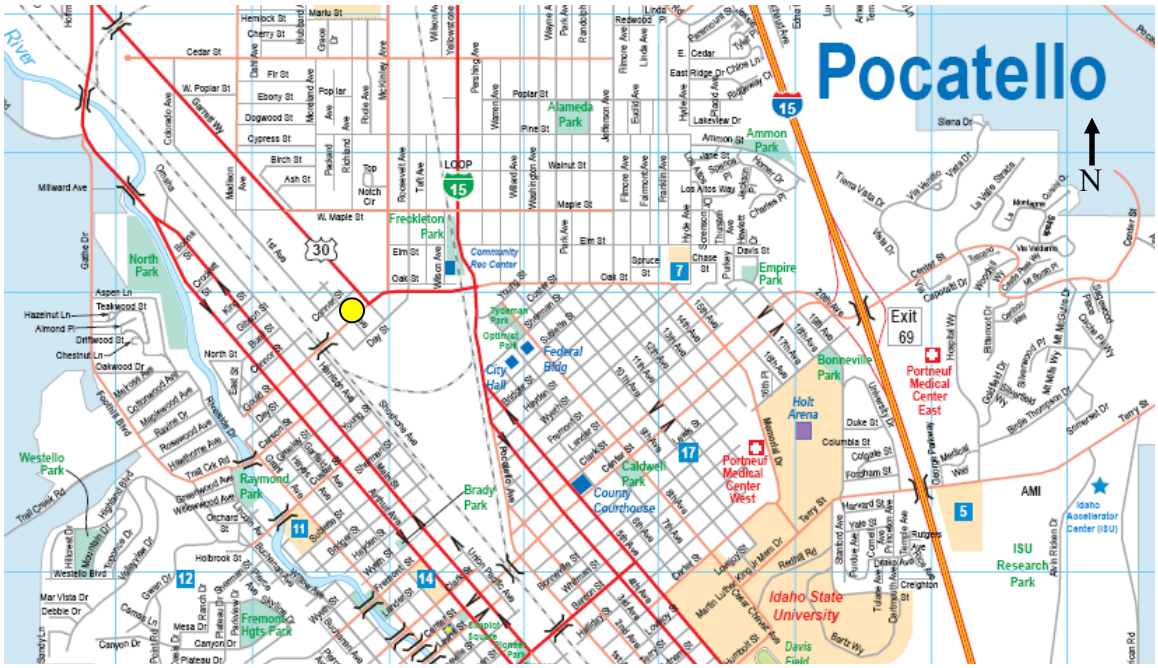

Figure 3: Map of Central Pocatello showing the Garrett & Gould monitoring site (represented by yellow circle). Blue shading represents area outside the city limits.

Analysis

Health Assessment Methodology

Only exposure to air contaminants via inhalation was considered since deposition of contaminants from air was not expected to significantly contribute to surface loading. In order to evaluate public health issues related to air contamination in the Portneuf Valley, BCEH followed a two-step methodology. First, BCEH obtained air quality data for the area. Second, BCEH used health-based CVs to screen out those contaminants that are unlikely to cause adverse health effects. For the remaining contaminants that exceeded their health-based CVs, BCEH made further determinations to evaluate whether the level of environmental contamination and exposure indicated an elevated public health risk. CVs are derived separately for air, water, and soil. CVs reflect an estimated contaminant

concentration level for which an exposure at or below that level is *not expected* to cause adverse health effects.

*CVs **are not** thresholds for adverse health effects*. That is, CVs do not represent a level at which a person exposed to a contaminant level above the CV will likely suffer health consequences. This is because CVs are typically set at levels many times lower than the levels at which health effects were observed in experimental animals or in human epidemiologic studies. CVs are also deemed protective because they include safety or protective factors that account for more sensitive populations, such as young children.

For non-cancer risk CV's, BCEH uses the Environmental Protection Agency's (EPA) reference concentration (RfC), ATSDR's environmental media evaluation guides (EMEGs), and the health-based National Ambient Air Quality Standards (NAAQS). The RfC is the concentration of a contaminant in air at or below which it is very unlikely to have adverse non-carcinogenic (non-cancer) health effects if breathed continuously over a lifetime. Based on ATSDR's evaluation, EMEGs are estimated contaminant concentrations that are not expected to result in adverse non-carcinogenic health effects if air concentrations are at or below this concentration. NAAQS are established by the EPA and are exposure limits for contaminants in air intended to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

For cancer risk CVs, BCEH uses ATSDR's Cancer Risk Evaluation Guides (CREGs), EPA Regions 6's human health medium-specific screening levels, and Region 9's cancer risk-based Preliminary Remediation Goals (PRGs). CREGs are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) people exposed during their lifetime (70 years). Human health medium-specific screening levels and PRGs are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) people exposed over 25 years. For the contaminants considered in this study, the most recent Region 9 CVs were more protective than the Region 6 CVs, so Region 9 CVs were chosen.

Again, if the concentration of a chemical is less than its CV, it is unlikely that exposure would result in adverse health effects, and further evaluation of exposures to that chemical is not necessary. If the concentration of a chemical exceeds a CV, adverse health effects from exposure are not automatically expected, but potential exposures to that chemical from the site should be further evaluated.

Laboratory Analysis

Following the recommendations of ATSDR, IDEQ had 177 quartz Hi-Vol PM_{10} filters from 2003, 2004, and 2005 analyzed by the Desert Research Institute (DRI). DRI, the environmental research campus of the Nevada System of Higher Education (NSHE), is engaged in full-time basic and applied research in the earth and environmental sciences and operates EPA certified laboratories. The filters were analyzed by X-Ray Fluorescence (XRF); thermal/optical reflectance for organic and elemental carbon; ion chromatography for anions; automated colorimetry for ammonium and ammonia; and by atomic absorption for K^+, Na^+, and Mg^+. Since beryllium cannot be analyzed from a quartz filter it will not be addressed in this health consultation. It should be noted that the 2000 ATSDR Health Consultation for air contamination at EMF concluded on page 43 that: "[t]he maximum level of beryllium detected during the RI (remedial investigation)

was at least 400,000 times lower than the lowest acute LOAEL for respiratory and other effects in animals." Therefore, it is unlikely that beryllium levels would result in adverse health effects.

Results

Samples were collected at the G&G urban monitoring site in Pocatello. Table 1 shows that none of the contaminant concentrations exceeded their respective CVs for acute exposure. Table 2 shows that arsenic, cadmium, chromium, and manganese had one or more single days that exceeded the CV for chronic exposure for these contaminants. Figures 4-6 show the episodes where arsenic exceeded the ATSDR chronic cancer CV. Table 3 shows that the 3-year average for arsenic also exceeded the ATSDR chronic cancer CV.

Table 1: Maximum Contaminant Concentration For Seven Elements Analyzed From 2003-2005 Compared To *Acute* Comparison Values

Element	Acute CV ($\mu g/m^3$)	Maximum Observed ($\mu g/m^3$)	Acute CV Exceeded?	CV Source
Aluminum	5000†	0.734	No	NIOSH
Arsenic	0.03	0.0037	No	EPA
Barium	510†	0.0274	No	NIOSH
Cadmium	5†	0.0014	No	NIOSH
Chromium	0.1◊	0.0050	No	EPA
Manganese	200†	0.055	No	NIOSH
Vanadium	50†	0.005	No	NIOSH

†Occupational 8 hour Time Weighted Average—no acute environmental CV available.
◊Hexavalent Chromium (+6) CV used—actual sampled chromium not speciated.

Table 2: Individual 24 Hour Averages For Seven Elements Analyzed From 2003-2005 Compared To *Chronic* Comparison Values

Element	Chronic CVs ($\mu g/m^3$)	Cancer CV?	Maximum Observed	# days over CV	% Days over CV	CV Source
Aluminum	5.1	No	0.734	0	0%	EPA Reg. 9
Arsenic	0.0002*	Yes	0.0037	42	24%	ATSDR
Barium	0.51	No	0.0274	0	0%	EPA Reg. 9
Cadmium	0.0006*	Yes	0.0014	15	8%	ATSDR
Chromium◊	0.00008*	Yes	0.0050	116	66%	ATSDR
Manganese	0.04	No	0.055	2	1%	ATSDR
Vanadium†	0.2	No	0.005	0	0%	NIOSH

*Denotes CV is based on 1-in-a-million cancer risk and derived from the EPA cancer slope factor.
◊Hexavalent Chromium (+6) CV used—actual sampled chromium not speciated.
† Occupational 8 hour Time Weighted Average-- no chronic or intermediate CV exists for this element.

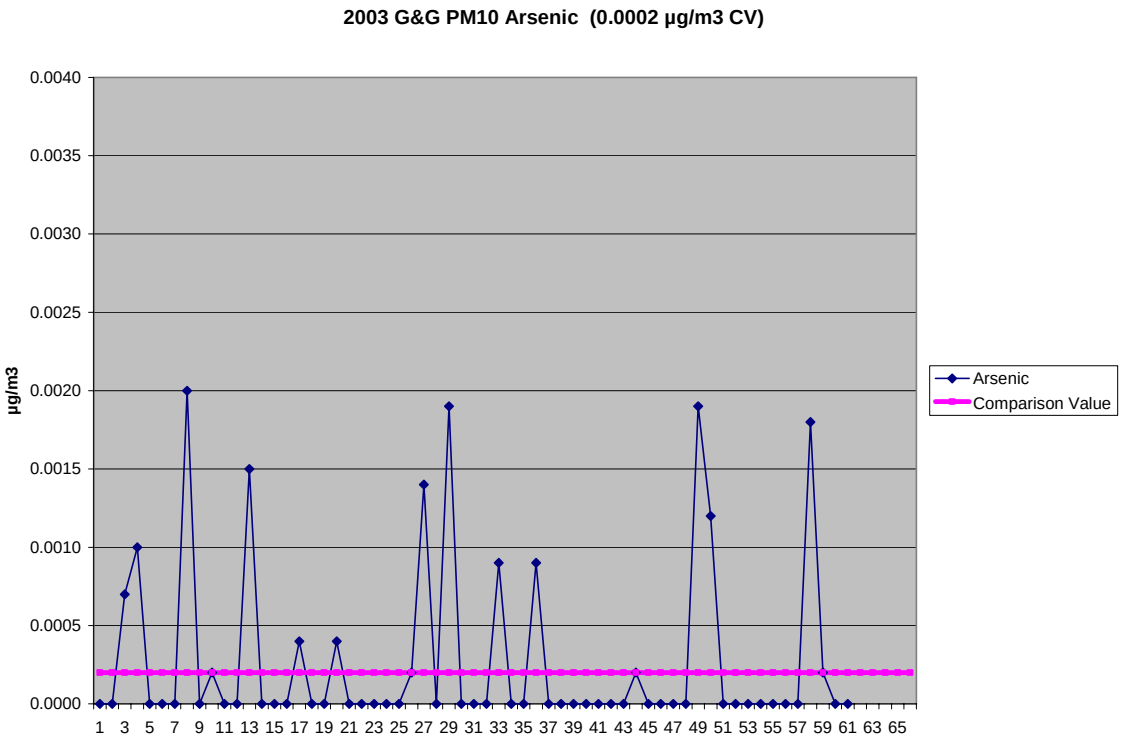

Figure 4: 2003 G&G PM_{10} Arsenic concentrations in relation to the *Chronic* CV.

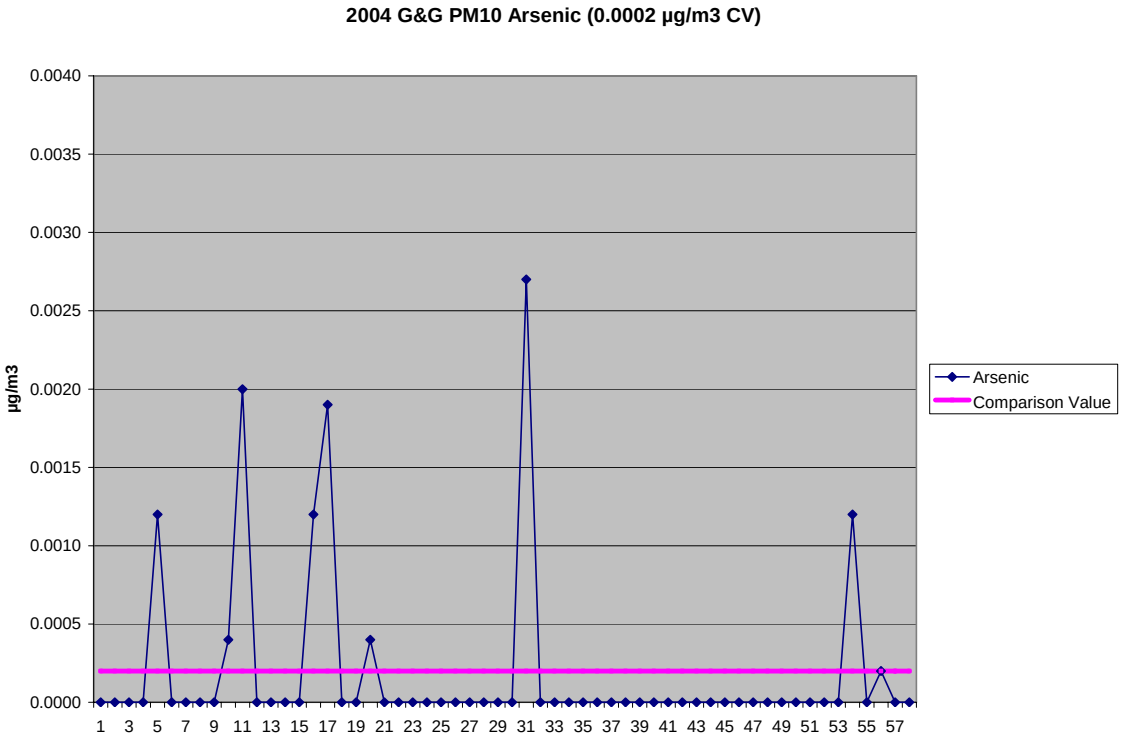

Figure 5: 2004 G&G PM_{10} Arsenic concentrations in relation to the *Chronic* CV.

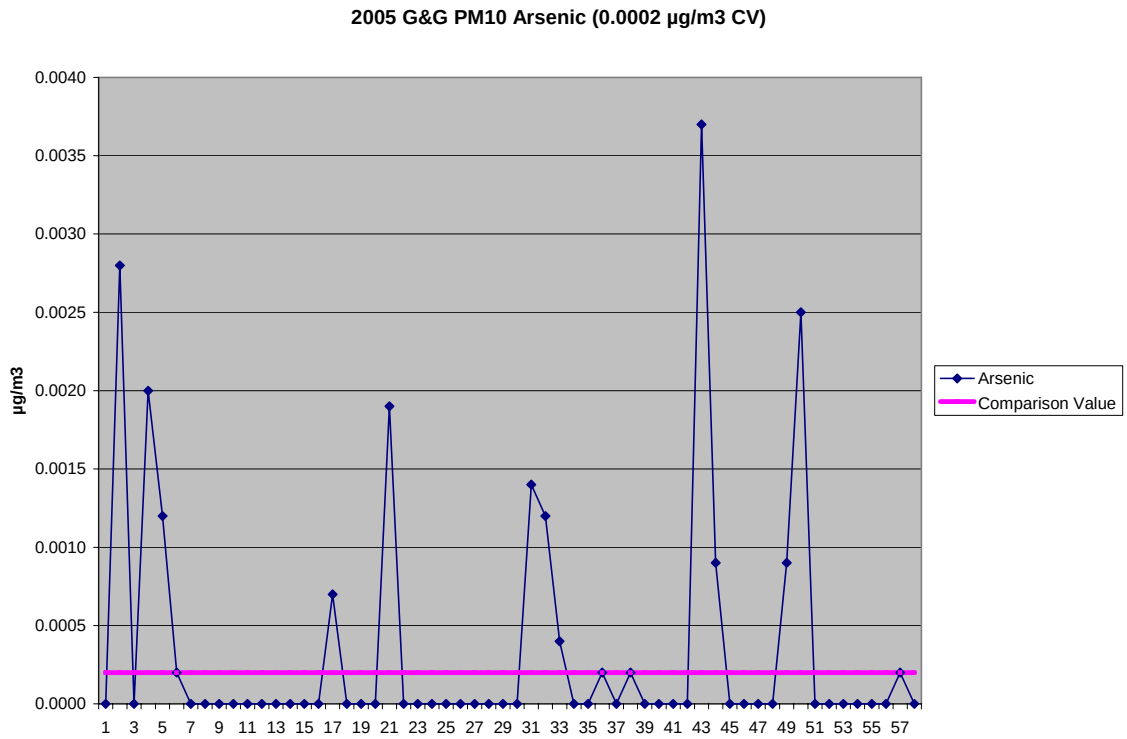

Figure 6: 2005 G&G PM_{10} Arsenic concentrations in relation to the *Chronic* CV.

Table 3: 3-Year Average Concentration For 2003-2005 Compared To *Chronic* Comparison Values

Element	CV (µg/m^3)	Cancer CV?	3-year Average (µg/m^3)	Exceeds CV? (Y/N)	CV Source
Aluminum	5.1	No	0.0700	No	EPA Reg. 9
Arsenic	0.0002*	Yes	0.0003	Yes	ATSDR
Barium	0.51	No	0.0125	No	EPA Reg. 9
Cadmium	0.0006*	Yes	0.0001	No	ATSDR
Chromium◊	0.00008*	Yes	0.0007	No	ATSDR
Manganese	0.04	No	0.0084	No	ATSDR
Vanadium	0.2	No	0.0003	No	NIOSH

*Denotes CV is based on 1-in-a-million cancer risk and derived from the EPA cancer slope factor.

◊Hexavalent Chromium (+6) CV used—actual sampled chromium not speciated.

Arsenic is highlighted to show it exceeded the chronic CV.

Exposure Pathways

To determine whether people are, were, or could be exposed in the future to the contaminants listed in Tables 1-3, the environmental and human components that lead to exposure were evaluated. Exposure is said to exist if the five elements of an exposure pathway exist, have existed, or may exist in the future. An exposure pathway is composed of: 1) a source of contamination; 2) a movement of the contamination through air, water, and/or soil; 3) human activity where the contamination exists; 4) human contact with contaminant through touching, breathing, swallowing and/or drinking; and,

5) a population that can potentially be exposed. If all five elements are present, an exposure pathway is said to exist.

Based on the exposure pathway analysis and environmental data, it was determined that an inhalation exposure pathway exists for residents of the Portneuf Valley. This means it is currently possible for residents to be exposed to the contaminants listed in Tables 1-3 through breathing the ambient air.

Discussion

Acute Exposure. Average levels of contaminants in the air measured at G&G were all below CVs for acute non-cancerous health effects. Also, the maximum levels of contaminants recorded were also below their CVs for acute effects. Thus, the contaminants measured are unlikely to cause any acute adverse non-cancer health effects. The acute CVs are all based on non-cancer health effects. When the exposure is brief (8 hours or less) the health effects of concern are generally immediate problems, not chronic disease like cancer.

Intermediate Exposure. There are no relevant intermediate exposure CVs for the contaminants detected at G&G.

Chronic Exposure. While none of the contaminants exceeded non-cancer CVs, there were several contaminants that had one-time readings above their chronic cancer CV. Note that contaminants with non-cancer CVs do not have cancer comparison values, and vice-versa (Tables 2 and 3). CVs are noted in Table 2 for the purpose of screening only—these one-time readings represent *acute* exposures, not chronic exposures. This idea is also illustrated in Figures 4-6. The purpose of comparing these acute exposures to chronic CVs is simply to help understand the trends of contaminants over time and no health effect can be inferred or implied from these comparisons. Arsenic, barium, and chromium were all detected in one-time readings that were higher than their respective chronic CVs. This prompts a closer look at these three contaminants when considering their average levels throughout time. Upon looking at the three-year averages for these three contaminants (Table 3), it was found that there was only one contaminant, arsenic, that had an average air concentration above its chronic (cancer-related) CV. This CV is an ATSDR Cancer Risk Evaluation Guideline (CREG). CREGs are estimated contaminant concentrations that would be expected to cause no more than 1 excess cancer in 1 million over a period of 70 years. Since the CV is based on chronic (long-term) exposure, this means that the average concentration is more important for this risk calculation than the one-time maximum readings.

The three-year average for arsenic was 50% higher than the CREG of 0.0002 $\mu g/m^3$. The measured three-year average for arsenic of 0.0003 $\mu g/m^3$ can be used to calculate how much *excess risk* of cancer a group of people might have from being exposed to this level of arsenic in the air for a lifetime. The cancer endpoint for arsenic inhalation is lung cancer. The CVs for cancer risk do not establish a level where people exposed above the comparison value are expected to get cancer. The CVs only provide an estimate of the number of unexpected cancers that might be caused if a group of people were exposed to contaminant levels above the comparison value every day, 24 hours a day, for an entire lifetime. The ATSDR chronic exposure scenario includes daily constant exposure for

extended periods of time for a lifetime to provide a cautious or conservative estimate of exposure.

These calculations are shown in Appendix A. ATSDR assumes continual 24 hour-a-day exposure for 70 years when calculating the chronic cancer CV cited here.

The cancer risk level for this continual exposure to arsenic is 1.3×10^{-6} when calculated using EPA's Inhalation Unit Risk method. The Inhalation Unit Risk is the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 $\mu g/m^3$ in air. This means that it is possible that for every million people there could only be 1.3 excess (unexpected) cases of lung cancer in people exposed under these circumstances. It is important to note that cancer risk estimates do not provide definitive answers about whether or not a person will get cancer; rather, they are measures of chance (probability). Cancer is a common illness, with many different forms that result from a variety of causes; not all are fatal. According to the American Cancer Society, nearly half of all men and one-third of all women in the U.S. population will develop cancer at some point in their lives. Since cancer is very common and the highest risk estimate for this estimated exposure is 1.3 excess cancers per one million people exposed, *BCEH believes that no public health hazard exists.* This does not imply that arsenic levels should be ignored in the Portneuf Valley. Regions and municipalities should always strive to attain ambient air quality below CVs.

Uncertainties. The data reviewed in this health consultation were collected at a single fixed-position monitoring station (G&G) and, thus, only reflect air quality at this location. The location was chosen based on particulate matter contamination levels, and based on dispersion modeling that predicted the highest concentrations and largest impact for community exposure would occur at G&G. However, it is possible that other parts of the valley that have not been sampled could have higher concentrations of air contaminants such as those measured and reported here, and that others could be lower. Arsenic, in particular, might be higher in other parts of the valley that are less urban or closer to the edge of town. Dust and fine soils are often a contributor to airborne arsenic and more soil surface is exposed in less urban areas. In particular, the Eastern Michaud Flats Superfund Site, located on the far Southwestern edge of the valley, is known to contain high levels of arsenic and other elements in surface soils (ATSDR 1998). The prevailing wind blows from the Southwest to the Northeast and is expected to carry dust and fine soils into Pocatello and the town of Chubbuck if winds are sufficiently strong (ATSDR 1998). It is believed that arsenic levels in air are likely to decline now that one of the phosphate plants on the Southwestern edge of town has closed and been dismantled.

Another uncertainty is that the sample filters were analyzed for total arsenic, not for individual types, or species, of arsenic. Different arsenic species have different human toxicities. There is no data to inform this health consultation about which species of arsenic were present in the sample filters. Inorganic arsenic compounds (containing no carbon) have two different valence states, or forms, that have different amounts of positive charge: As +3 and As +5. These form arsenite (+3) and arsenate (+5) rapidly in the environment. Organic arsenic compounds (arsenic compounds containing carbon) can exist in the environment in many different forms. Estimates for human health risk from total arsenic are based on an assumed typical distribution of the various arsenic species within a sample. It is possible for there to be more or fewer of the higher toxicity

species. It is more likely that there will be fewer, however, since the typical distribution is intended to be somewhat conservative.

Children's Health Considerations

ATSDR Child Health Concerns

ATSDR and BCEH recognize that children may be more sensitive to contaminant exposures than adults. This sensitivity is a result of several factors: 1) children may have greater exposures to environmental toxicants than adults because, pound for pound of body weight, children drink more water, eat more food, and breathe more air than adults; 2) children play outdoors close to the ground, increasing their exposure to toxicants in dust, soil, water, and air; 3) children have a tendency to put their hands in their mouths while playing, thereby exposing them to potentially contaminated soil particles at higher rates than adults (also, some children ingest non-food items, such as soil, a behavior known as "pica"); 4) children are shorter than adults, meaning that they can breathe dust, soil, and any vapors close to the ground; and 5) children grow and develop rapidly; they can sustain permanent damage if toxic exposures occur during critical growth stages.

As discussed earlier, exposure to the measured contaminants in ambient air is unlikely to result in any adverse non-carcinogenic public health effects to children or adults. The main concern is an increased risk of cancer in the exposed population. Since cancer risk is based on a lifetime exposure, the risk is the same for both adults and children. The levels found are considered to represent a low increased risk of cancer and, therefore, represent no apparent public health hazard.

Conclusions

None of the measured air concentrations from the G&G monitoring site in Pocatello exceeded their respective acute comparison values (CVs). There are no intermediate CVs for the contaminants measured. None of the contaminants exceeded their chronic non-cancer CVs. Single day measurements for four of the contaminants exceeded their respective chronic cancer CVs, but this does not allow for risk calculation from chronic exposure, thus average values for the whole sampling period were used. Upon examination of the 3-year average concentrations, arsenic was the only contaminant that exceeded its cancer CV. Since cancer is very common and the highest risk estimate for this estimated exposure to arsenic in air is 1.3 excess cancers per one million people exposed, *BCEH believes that no apparent public health hazard exists.* While exposure to arsenic is occurring, no measurable effects are expected or evident. This does not imply that arsenic levels should be ignored in the Portneuf Valley. Urban areas within a valley such as this one are particularly prone to air contaminants being trapped by inversions and other meteorological conditions. Therefore, IDEQ should continue to monitor air in the Portneuf Valley and continue to work toward keeping all contaminants below CVs.

Recommendations

BCEH recommends that IDEQ continue air monitoring in the Portneuf Valley.

BCEH recommends that BCEH work with IDEQ to address air pollution in the Portneuf Valley through educational activities.

BCEH recommends that BCEH work with IDEQ to identify the sources of contaminants/pollutants that are at levels higher than their CVs, particularly arsenic.

Public Health Advice/Public Health Action Plan

BCEH will continue to work with IDEQ to assess health effects from exposure to ambient air in the Portneuf Valley on an as-needed basis determined by IDEQ.

Appendix A

Risk Calculation

ARSENIC: using measured 3 year average concentration

Lifetime

70-year Risk Using Cancer Slope Factor

$$\text{Dose (mg/kg per day)} = \frac{\text{C (µg/m3) x CF (mg per g) x IR (m3 per day)}}{\text{BW}}$$

$$= \frac{0.0003 \times 0.001 \times 15}{70}$$

$$= 6.4 \times 10^{-8} \text{ mg/kg per day}$$

where
C = ambient air concentration
CF = conversion factor
IR = inhalation rate (average, as defined by EPA)
BW = body weight (average adult, as defined by EPA)

Cancer Slope Factor, PRG Region 6 and 9 (CSF) = 15 mg/kg-day^{-1}

Risk = Dose (mg/kg-day) x CSF (mg/kg-day^{-1}) = $6.4 \times 10^{-8} \times 15 = 9.6 \times 10^{-7} = 0.96 \times 10^{-6}$

NOTE: using an IR of 20 m3 per day, Risk = 1.3×10^{-6}

70-year Risk Using Unit Risk

Inhalation Unit Risk = 0.0043 (µg /m3)$^{-1}$

Risk = Concentration (µg /m3) x Unit Risk (µg /m3)$^{-1}$ = $3 \times 10^{-4} \times 0.0043 = 1.3 \times 10^{-6}$

NOTE: THE CREG IS SET LOWER THAN EPA's PRG SCREENING LEVEL
CREG = 0.0002 µg /m3 (70 year)
EPA PRG = 0.00045 µg /m3 (25 year)

Cancer Risk Comparison Levels = **1×10^{-6}**

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Certification

This health consultation, the Portneuf Valley Air Toxics: Ambient Air Data Evaluation and Risk Assessment, Bannock County, ID was prepared by the Bureau of Community and Environmental Health (BCEH), Division of Health, Idaho Department of Health & Welfare, under a cooperative agreement with the Federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by ATSDR.

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Glossary

Acute Occurring over a short time.

Agency for Toxic Substances and Disease Registry (ATSDR)
The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.

Airshed A part of the atmosphere that behaves in a coherent way with respect to the dispersion of contaminants.

Cancer Slope Factor A number assigned to a cancer causing chemical that is used to estimate its ability to cause cancer in humans.

Carcinogen A substance that causes cancer.

Chronic Occurring over a long time (more than 1 year).

Comparison value (CV) Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Contaminant A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Dose The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Exposure Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [**acute**], of intermediate duration [**intermediate**], or long-term [**chronic**].

Hazardous substance Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.

IDEQ The Idaho Department of Environmental Quality.

Indeterminate public health hazard The category used in ATSDR's health consultation documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

Inhalation rate The amount of an environmental medium which could be inhaled typically on a daily basis. Units for inhalation rate are typically in cubic meters per day.

Inhalation unit risk. The upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 ug/m 3 in air.

Intermediate Occurring over a time more than 14 days and less than one year.

Lowest Observed Adverse Effect Level (LOAEL) The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Media Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.

No apparent public health hazard
A category used in ATSDR's health consultation reports for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

No Observed Adverse Effect Level (NOAEL)
The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

No public health hazard
A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

Oral Reference Dose (RfD) An amount of chemical ingested into the body (i.e., dose) below which health effects are not expected. RfDs are published by EPA.

Organic Compounds composed of carbon, including materials such as solvents, oils, and pesticides which are not easily dissolved in water.

Plume A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Public Health Hazard A category used in ATSDR's health consultation reports for sites that pose a risk to health because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances that could result in harmful health effects.

Remedial investigation The process of determining the type and extent of hazardous substance contamination at a site.

Route of exposure The way people come into contact with a hazardous substance. Three routes of exposure are breathing [**inhalation**], eating or drinking [**ingestion**], or contact with the skin [**dermal contact**].