Health Consultation

Exposures Associated with Air Emissions from Gerdau Ameristeel Plant
Sayreville, Middlesex County, New Jersey

March 31, 2013

Prepared by:

New Jersey Department of Health
Public Health Services
Consumer, Environmental and Occupational Health Service
Environmental and Occupational Health Surveillance Program

Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Summary

Introduction	The New Jersey Department of Health (NJDOH) prepared this Health Consultation for the Gerdau Ameristeel Plant to review and evaluate the public health implications of long-term exposure pathways of concern associated with metals and particulates based on air monitoring results and air dispersion modeling.
Conclusion	*The NJDOH concludes that inhalation of ambient air at nearby residences poses no expected risk of adverse health effects.*
Basis for Conclusion	There were completed exposure pathways to area residents via the inhalation of ambient air. The estimated metal concentrations detected in the ambient air did not exceed the health guideline CVs for non-cancer health effects. For cancer health effects, lifetime excess cancer risks (LECRs) were calculated based on likely exposure scenarios. The estimated LECRs associated with ambient air exposures were considered to pose no apparent increased cancer risk.
Next Step	The NJDOH does not propose any follow-up and/or recommendations for the Gerdau Ameristeel site.
For More Information	Questions about this health consultation should be directed to the NJDOH Environmental and Occupational Health Surveillance Program (609) 826-4984.

Statement of Issues

In September 2007, members of the Gerdau Ameristeel Community Advisory Panel (GACAP) raised concern about area children's blood lead levels (BLLs) and the long-term impact of particulates and metals released from the plant. The Gerdau Ameristeel Plant has been operating for over 100 years and manufactures reinforcement bars (or, rebar) and other products. Contaminant emissions from the site include metals and particulates. The New Jersey Department of Health (NJDOH), with cooperation and assistance of the Agency for Toxic Substances and Disease Registry/National Center for Environmental Health (ATSDR/NCEH) completed a health consultation (HC) to address the blood lead level issue (ATSDR 2008).

NJDOH prepared this HC for the Gerdau Ameristeel Plant to evaluate the public health implications of long-term exposure pathways of concern associated with metals and particulates, based on air monitoring results and air dispersion modeling.

Background

The metal recycling plant Gerdau Ameristeel Plant located on North Crossman Road in Sayreville, Middlesex County, NJ, began operating over 100 years ago and has been part of Gerdau Ameristeel since October 2002. The plant is an active facility that receives and processes over 600,000 tons of scrap metal annually in the production of rebar and other products. The plant is located approximately 750 feet west of the nearest residence within the Horseshoe Road neighborhood, 1,000 feet northeast of the nearest residence in the Kimball Drive neighborhood; and approximately 3,200 feet east of the nearest residence of the Sheffield Towne Square neighborhood. It is also located approximately 500 feet to the southwest of the Horseshoe Road/Atlantic Resources Superfund site. Dust and particulate matter, noise and odors emanating from the plant have resulted in numerous complaints by area residents. In order to work with its neighbors and other stakeholders (i.e., the Sayerville Environmental Commission, the borough, the business community, employees and regulators), the plant established GACAP.

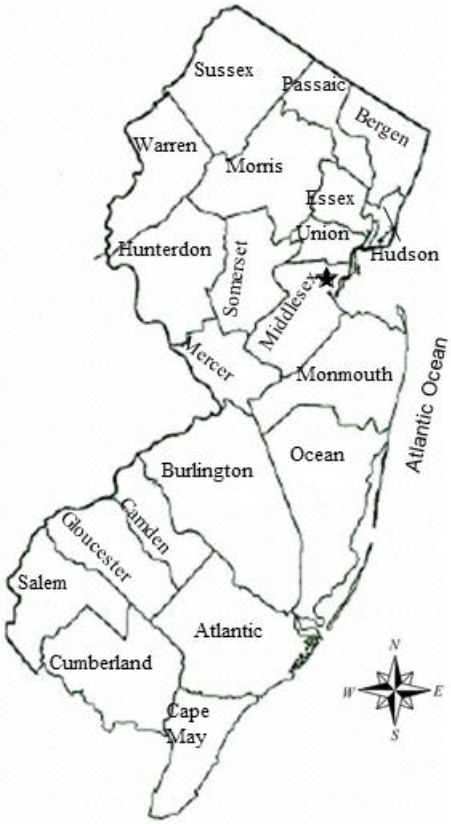

Figure 1: Location of Gerdau Ameristeel Recycling Site

GACAP's organizing meeting took place on August 9, 2007. At the September 2007 meeting, the members along with NJDOH developed and prioritized a list of concerns relating to the plant.

Past ATSDR/NJDOH Activities

The citizen members of GACAP asked the NJDOH if children living near the plant had higher blood lead levels (BLLs) than other children. Based on an analysis of children BLLs reported to the NJDOH Childhood Lead Poisoning Prevention Program from July 1999 through April 2008, it did not appear that children in the two communities to the west of the plant were exposed to unusual amounts of lead, compared to borough and state levels. The NJDOH and ATSDR concluded that there was no apparent public health hazard for the exposure to airborne lead from the Gerdau Ameristeel plant (ATSDR 2008).

Environmental Contamination

An evaluation of site-related environmental contamination consists of a two tiered approach: 1) a screening analysis; and 2) a more in-depth analysis to determine public health implications of site-specific exposures. First, maximum concentrations of detected substances are compared to media-specific environmental guideline comparison values (CVs). When media-specific concentrations are unavailable, the concentrations may be estimated using mathematical modeling. If concentrations exceed the environmental guideline CV, these substances, referred to as Contaminants of Concern (COC), are selected for further evaluation. Contaminant levels above environmental guideline CVs do not mean that adverse health effects are likely, but that a health guideline comparison is necessary to evaluate site-specific exposures. Once exposure doses are estimated, they are compared with health guideline CVs to determine the likelihood of adverse health effects.

Environmental Guideline Comparison

There are a number of CVs available for the screening environmental contaminants to identify COCs. These include ATSDR Environmental Media Evaluation Guides (EMEGs) and Reference Media Evaluation Guides (RMEGs). EMEGs are estimated contaminant concentrations that are not expected to result in adverse noncarcinogenic health effects. RMEGs represent the concentration in water or soil at which daily human exposure is unlikely to result in adverse noncarcinogenic effects. If the substance is a known or a probable carcinogen, ATSDR's Cancer Risk Evaluation Guides (CREGs) were also considered as comparison values. 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). In the absence of an ATSDR CV, other comparison values may be used to evaluate contaminant levels in environmental media. These include New Jersey Maximum Contaminant Levels (NJMCLs) for drinking water, and USEPA Region 3 Risk-Based Concentrations (RBCs).

RBCs are contaminant concentrations corresponding to a fixed level of risk (i.e., a Hazard Quotient[1] of 1, or lifetime excess cancer risk of one in one million, whichever results in a lower contaminant concentration) in water, air, biota, and soil. For soils and sediments, other CVs include the NJDEP Residential and Non-Residential Direct Contact Soil Cleanup Criteria (RDSCC, NRDSCC). Based primarily on human health impacts, these criteria also take into account natural background concentrations, analytical detection limits, and ecological effects.

Substances exceeding applicable environmental guideline CVs were identified as COCs and evaluated further to determine whether these contaminants pose a health threat to exposed or potentially exposed receptor populations. In instances where an environmental guideline CV was unavailable, the substance may be retained for further evaluation.

On-site Ambient Air Monitoring

Beginning in December 2007, in order to characterize airborne particulate (i.e., $PM_{2.5}$ and PM_{10}) and lead emissions of concern to the Horseshoe Road neighborhood, Gerdau Ameristeel operated three air monitoring stations in the vicinity of the plant (one to the northwest of the mill, one to the northeast, and one on a residential property on Modzelewski Terrace in the Horseshoe Road neighborhood to the east of the mill). The $PM_{2.5}$ was monitored daily for six months and the PM_{10} was monitored for the first few months.

During the first eight weeks of air monitoring, the $PM_{2.5}$ standard [USEPA, 2012a] was exceeded only once at a location on the steel mill property. All PM_{10} and lead results were within the National Ambient Air Quality standard (NAAQS).

Off-Site Contamination: *Ambient Air*

The air emission data for the plant (including the stack parameters) were obtained from the NJDEP Air Quality Permits Program. For the years 2004 through 2009, the annual metal and particulate emissions reported for the Gerdau Ameristeel plant were obtained (see Table 1). A USEPA air dispersion model, (i.e., AERMOD) was used to estimate ambient contaminant concentrations at residential areas located to the east, west and southwest of the plant. The AERMOD is a steady-state Gaussian plume model which can be used to estimate contaminant concentrations from a wide variety of sources (USEPA 2012b). This model takes into account a number of factors including the settling and dry deposition of particles, point, area, line, and volume sources, and limited terrain adjustment. AERMOD inputs used for predicting contaminant concentrations associated with the Gerdau Ameristeel Plant are provided below:

[1]The ratio of estimated site-specific exposure to a single chemical from a site over a specified period to the estimated daily exposure level at which no adverse health effects are likely to occur.

Input Parameters Used in the AERMOD Model*	
Averaging time	Annual
Release height	30.5 meters
Meteorological data	1/1/1991 - 12/31/1995 (Philadelphia Airport)
Modeled distance	2,000 meters

The model was run using the input parameters and a unit contaminant release rate from the stack. The results are used to plot the concentration isopleths (i.e., lines connecting points of equal concentration) (see Figure 3). The concentration isopleths show the quantitative values of the annual average metal concentrations at the residential areas located to the east, west and southwest of the plant.

Estimated maximum contaminant concentration of PM_{10}, $PM_{2.5}$, lead, arsenic and mercury at the residential areas located to the east, west and southwest of the plant were also calculated (see Table 2, 3 and 4). The mean concentration of PM_{10}, $PM_{2.5}$, lead, and mercury were below their respective environmental guideline CV (see Table 2, 3 and 4). The mean arsenic concentration exceeded the environmental guideline CV at residential areas located to the east and west of the plant (see Table 2 and 3) and was designated as the COC for the site.

A brief discussion of the toxicologic characteristics of arsenic is presented in Appendix A.

Discussion

The method for assessing whether a health hazard exists to a community is to determine whether there is a completed exposure pathway from a contaminant source to a receptor population and whether exposures to contamination are high enough to be of health concern (ATSDR 2005). Site-specific exposure doses can be calculated and compared with health guideline CVs.

Assessment Methodology

An exposure pathway is a series of steps starting with the release of a contaminant in environmental media and ending at the interface with the human body (ATSDR 2005). A completed exposure pathway consists of five elements:

1. source of contamination;
2. environmental media and transport mechanisms;
3. point of exposure;
4. route of exposure; and
5. receptor population.

Generally, the ATSDR considers three exposure pathway categories: 1) completed exposure pathways, that is, all five elements of a pathway are present; 2)

potential exposure pathways, that is, one or more of the elements may not be present, but information is insufficient to eliminate or exclude the element; and 3) eliminated exposure pathways, that is, one or more of the elements is absent. Exposure pathways are used to evaluate specific ways in which people were, are, or will be exposed to environmental contamination in the past, present, and future.

Completed Exposure Pathway

Results of ambient air modeling at the residences located to the east and west of the plant indicated elevated levels of arsenic. Residents (including children) were exposed through inhalation of arsenic present in the ambient air.

Public Health Implications

Once it has been determined that individuals have or are likely to come in contact with site-related contaminants (i.e., a completed exposure pathway), the next step in the public health assessment process is the calculation of site-specific exposure doses. This is called a health guideline comparison, which involves looking more closely at site-specific exposure conditions, the estimation of exposure doses, and the evaluation with health guideline comparison values (CVs). Health guideline CVs are based on data drawn from epidemiological/toxicological literature and often include uncertainty or safety factors to ensure that they are amply protective of human health. Completed human exposure pathways associated with the site include the inhalation of contaminated ambient air.

Health Guideline Comparison - Non-Cancer Health Effects

To assess non-cancer health effects, ATSDR has developed Minimal Risk Levels (MRLs) for contaminants that are commonly found at hazardous waste sites. An MRL is an estimate of the daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of adverse, non-cancer health effects. MRLs are developed for a route of exposure, i.e., ingestion or inhalation, over a specified time period, e.g., acute (less than 14 days); intermediate (15-364 days); and chronic (365 days or more). MRLs are based largely on toxicological studies in animals and on reports of human occupational (workplace) exposures. MRLs are usually extrapolated doses from observed effect levels in animal toxicological studies or occupational studies, and are adjusted by a series of uncertainty (or safety) factors or through the use of statistical models (ATSDR 2005). In toxicological literature, observed effect levels include:

- no-observed-adverse-effect levels (NOAELs); and,
- lowest-observed-adverse-effect levels (LOAELs).

To ensure that MRLs are sufficiently protective, the extrapolated values can be several hundred times lower than the observed effect levels in experimental studies. When MRLs for specific contaminants are unavailable, other health based comparison values such as the USEPA Reference Dose (RfD), USEPA Screening Level Reference

Dose oral (RfD_o) or USEPA Region 10 Preliminary Remediation Goals (PRGs) may be used.

Inhalation – Ambient Air

The risk of non-cancer health effects for residents (located to the east of the plant) associated with exposure to arsenic (see Table 2) was assessed by comparing the ambient air levels with health guideline CVs. The estimated ambient air arsenic levels were lower than its corresponding health guideline CV (see below) and, therefore, are unlikely to cause adverse non-cancer health effects.

Comparison of estimated ambient air arsenic concentration with Non-cancer Health Guideline Values

Estimated Mean Concentration ($\mu g/m^3$)	Health Guideline CV ($\mu g/m^3$)	Non-cancer Effects
0.00027	0.03 (RfC_i, CalEPA)	No

Health Guideline Comparison - Cancer Health Effects

The site-specific lifetime excess cancer risk (LECR) indicates the cancer potential of exposure to contaminants. LECR estimates are usually expressed in terms of excess cancer cases in an exposed population in addition to the background rate of cancer. For perspective, the lifetime risk of being diagnosed with cancer in the United States is 46 per 100 individuals for males, and 38 per 100 for females; the lifetime risk of being diagnosed with any of several common types of cancer ranges approximately between 1 in 100 and 10 in 100 (SEER 2005). Typically, health guideline CVs developed for carcinogens are based on a lifetime risk of one excess cancer case per 1,000,000 individuals. ATSDR considers estimated cancer risks of less than one additional cancer case among one million persons exposed as insignificant or no increased risk (expressed exponentially as 10^{-6}).

According to the United States Department of Health and Human Services (USDHHS), the cancer class of contaminants detected at a site is as follows:

1 = Known human carcinogen
2 = Reasonably anticipated to be a carcinogen
3 = Not classified

The NJDOH uses the following cancer risk descriptions for health assessments:

Public Health Assessment/Health Consultation
Risk Description for New Jersey

LECR	Risk Description
$\geq 10^{-3}$	Increase
10^{-4} to $<10^{-3}$	Low increase
10^{-6} to $<10^{-4}$	No apparent increase
$< 10^{-6}$	No expected increase

Inhalation – Ambient Air

The inhalation LECRs associated with air exposures were calculated by using the following formula:

$$\textit{Inhalation Cancer Risk} = C \times EF \times \frac{ED}{AT} \times IUR \qquad (4)$$

where C = concentration of contaminant in air ($\mu g/m^3$);
EF = exposure factor representing the site-specific exposure scenario;
ED = exposure duration (year);
AT = averaging time, 70 years;
IUR = inhalation unit risk $(\mu g/m^3)^{-1}$.

Inhalation unit risk IUR is defined as 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.

The cancer class of arsenic is given in the following table. Based on the mean concentration of arsenic estimated in the ambient air, the calculated LECR is one additional cancer case among one million persons exposed which is considered no apparent increased cancer risk.

Estimated Mean Concentration ($\mu g/m^3$)	DHHS Cancer Class	IUR* $(\mu g/m^3)^{-1}$	LECR*
0.00027	1	0.0043	1.2×10^{-6}

*Using EF=1, ED=70 years, AT=70 years, LECR = 1.2×10^{-6}

Child Health Considerations

The NJDOH and ATSDR recognize that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination in their environment. Children are at greater risk than adults from certain types of exposures to hazardous substances. Their lower body weight and higher intake rate results in a greater

dose of hazardous substance per unit of body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most important, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

The NJDOH and ATSDR evaluated the potential risk for children residing in the area who were exposed to arsenic in the ambient air. Based on the mean arsenic concentration estimated in the ambient air, exposures were found to have no potential to cause non-cancer adverse health effects including in children.

The potential cancer health effects associated with exposure to site-related contaminants were evaluated. Based on the mean concentrations of arsenic estimated in the ambient air, the calculated LECR was one additional cancer case in 1,000,000 (including exposure to children) which is considered no apparent increased cancer risk.

Conclusion

Manufacturing operations since 1902 have resulted in the on- and off-site release of contaminants to the environmental media. Primary contaminants of concern were particulates and metals. The exposed population is area residents in the vicinity of the site. There is a completed exposure pathway via the inhalation of ambient air at the Gerdau Ameristeel site. Based on a review of site-related air emission data and information, the NJDOH reached the following conclusion for the site:

The NJDOH concludes that inhalation of ambient air at nearby residences poses no apparent risk of adverse health effects. There were completed exposure pathways to area residents via the inhalation of ambient air. The estimated metal concentrations detected in the ambient air did not exceed the health guideline CVs for non-cancer health effects. For cancer health effects, lifetime excess cancer risks were calculated based on likely exposure scenarios. The estimated LECRs associated with ambient air exposures were considered to pose no apparent increased cancer risk.

Recommendations

The NJDOH does not propose any follow-up and/or recommendations for the Gerdau Ameristeel site.

Public Health Action Plan (PHAP)

The purpose of a PHAP is to ensure that this Health Consultation not only identifies public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of NJDOH to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by the NJDOH are as follows:

Public Health Actions Undertaken by NJDOH and ATSDR

1. ATSDR and NJDOH evaluated the exposures associated with stack emissions (metals, particulates, and other contaminants) at Gerdau Ameristeel site.

2. ATSDR and NJDOH completed a Health Consultation that analyzed children blood lead levels.

3. ATSDR and NJDOH conducted several site visits, attended several GACAP meetings to identify community concerns, and to provide information to residents about exposure pathways and the contaminants of concern.

Public Health Actions Planned by NJDOH and ATSDR

1. Copies of this Health Consultation will be provided to concerned residents in the vicinity of the site via the township library and the Internet.

References

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Table 1: Annual Air Emissions from the Gerdau Ameristeel plant

Contaminant	Annual Emissions (lbs/yr)[a]					
	2004	2005	2006	2007	2008	2009
PM_{10}[b]	41.87	32.86	28.49	25.05	31.36	8.17
$PM_{2.5}$[c]	41.87	26.45	20.84	17.16	29.10	7.62
Lead	0.17	0.14	0.16	0.22	0.43	0.18
Arsenic	1.95	1.86	2.09	2.06	3.01	0.30
Mercury	140.60	118.55	133.09	181.29	44.99	3.69

[a]Pounds per year; [b]Coarse particles with a diameter between 2.5-10 micrometers, formed from large solids/droplets, and lasting from minutes to hours; [c]Fine particles with a diameter less than 2.5 micrometers, formed from gases, and lasting from days to weeks.

Table 2: Estimated Ambient Concentrations (due to the stack) at the residential properties located to the east of the Gerdau Ameristeel Plant

Contaminant	Annual Average Concentrations ($\mu g/m^3$)[a]							Environmental Guideline CV[b] ($\mu g/m^3$)	COC[c]
	2004	2005	2006	2007	2008	2009	Mean		
PM-10[d]	0.006	0.005	0.004	0.0037	0.004	0.001	0.004	150 (NAAQS)[e]	No
PM-2.5[f]	0.006	0.004	0.003	0.002	0.004	0.001	0.003	15 (NAAQS)	No
Lead	0.00002	0.00002	0.00002	0.00003	0.00006	0.00002	0.00003	0.15 (NAAQS)	No
Arsenic	0.00028	0.00027	0.0003	0.0003	0.0004	0.00004	0.00027	0.0002 (CREG)[g]	**Yes**
Mercury	0.02	0.017	0.019	0.026	0.006	0.0005	0.015	0.2 (EMEG)[h]	No

[a]micrograms per cubic meter; [b]Comparison Value; [c]Contaminant of Potential Concern; [d]Coarse particles with a diameter between 2.5-10 micrometers, formed from large solids/droplets, and lasting from minutes to hours; [e]EPA National Ambient Air Quality Standard; [f]Fine particles with a diameter less than 2.5 micrometers, formed from gases, and lasting from days to weeks; [g]ATSDR Cancer Risk Evaluation Guide for chronic exposure; [h]ATSDR Environmental Media Evaluation Guideline

Table 3: Estimated Ambient Concentrations at the residential properties located to the west of the Gerdau Ameristeel Plant

Contaminant	Annual Average Concentrations ($\mu g/m^3$)[a]							Environmental Guideline CV[b] ($\mu g/m^3$)	COC[c]
	2004	2005	2006	2007	2008	2009	Mean		
PM-10[d]	0.004	0.003	0.003	0.003	0.0033	0.00083	0.003	150 (NAAQS)[e]	No
PM-2.5[f]	0.0043	0.003	0.0023	0.002	0.003	0.0008	0.002	15 (NAAQS)	No
Lead	0.00002	0.00001	0.00001	0.00002	0.00004	0.00002	0.00002	0.15 (NAAQS)	No
Arsenic	0.0002	0.000195	0.000219	0.00022	0.00032	0.00003	0.0002	0.0002 (CREG)[g]	No
Mercury	0.01	0.01	0.01	0.02	0.004	0.0004	0.014	0.2 (EMEG)[h]	No

[a]micrograms per cubic meter; [b]Comparison Value; [c]Contaminant of Potential Concern; [d]Coarse particles with a diameter between 2.5-10 micrometers, formed from large solids/droplets, and lasting from minutes to hours; [e]EPA National Ambient Air Quality Standard; [f]Fine particles with a diameter less than 2.5 micrometers, formed from gases, and lasting from days to weeks; [g]ATSDR Cancer Risk Evaluation Guide for chronic exposure; [h]ATSDR Environmental Media Evaluation Guideline

Table 4: Estimated Ambient Concentrations at the residential properties located to the southwest of the Gerdau Ameristeel Recycling Plant

Contaminant	Annual Average Concentrations ($\mu g/m^3$)[a]							Environmental Guideline CV[b] ($\mu g/m^3$)	COC[c]
	2004	2005	2006	2007	2008	2009	Mean		
PM-10[d]	0.463	0.463	0.463	0.46	0.46	0.46	0.46	150 (NAAQS)[e]	No
PM-2.5[f]	0.009	0.007	0.006	0.006	0.007	0.002	0.006	15 (NAAQS)	No
Lead	0.007	0.0047	0.0037	0.004	0.003	0.0009	0.004	0.15 (NAAQS)	No
Arsenic	0.00004	0.00003	0.00004	0.00005	0.0001	0.00004	0.00005	0.0002 (CREG)[g]	No
Mercury	0.0004	0.0004	0.0005	0.000476	0.0007	0.00007	0.0004	0.2 (EMEG)[h]	No

[a]micrograms per cubic meter; [b]Comparison Value; [c]Contaminant of Potential Concern; [d]Coarse particles with a diameter between 2.5-10 micrometers, formed from large solids/droplets, and lasting from minutes to hours; [e]EPA National Ambient Air Quality Standard; [f]Fine particles with a diameter less than 2.5 micrometers, formed from gases, and lasting from days to weeks; [g]ATSDR Cancer Risk Evaluation Guide for chronic exposure; [h]ATSDR Environmental Media Evaluation Guideline

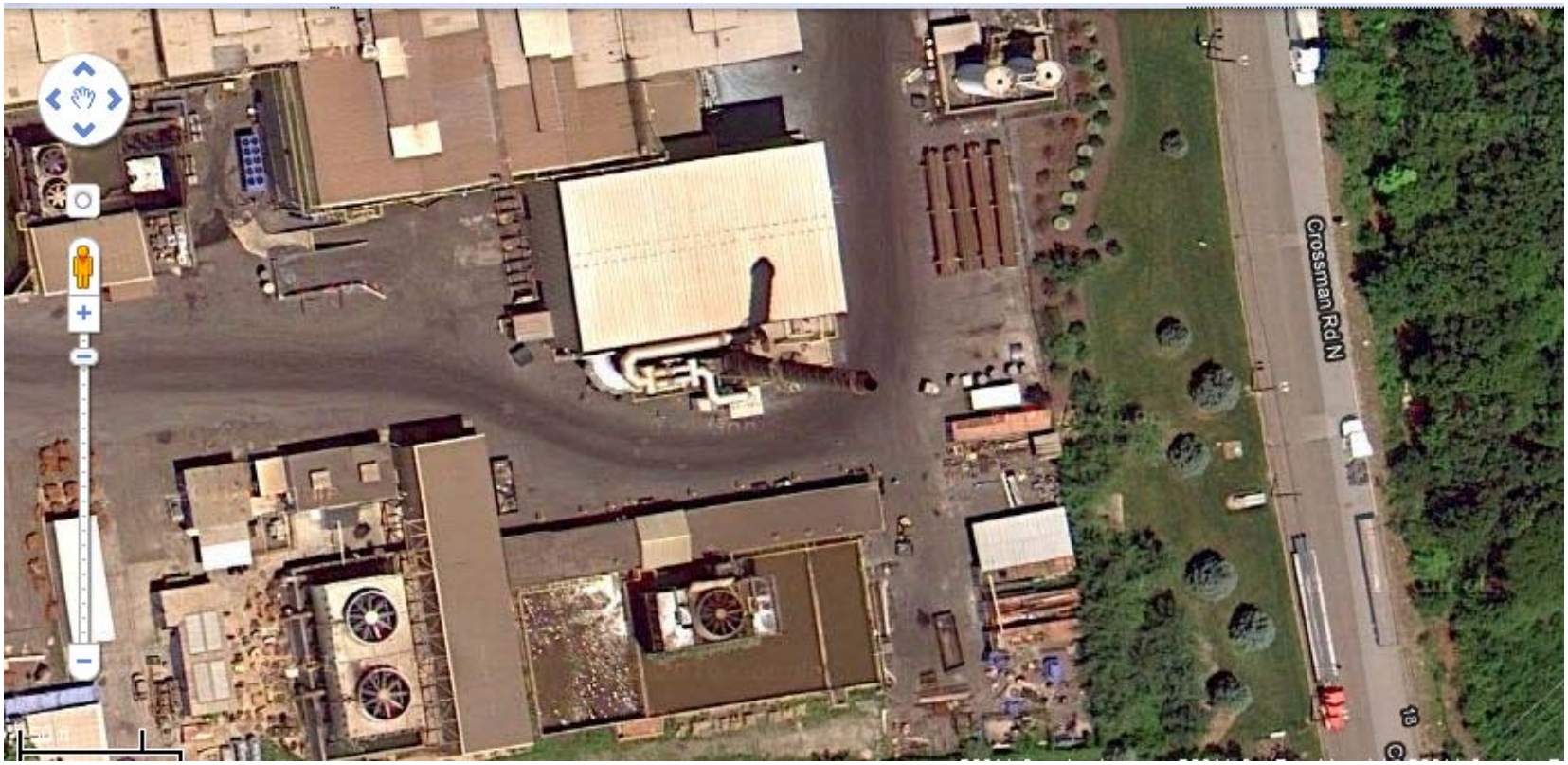

Figure 2: Location of the stack at the Gerdau Ameristeel Recycling Plant

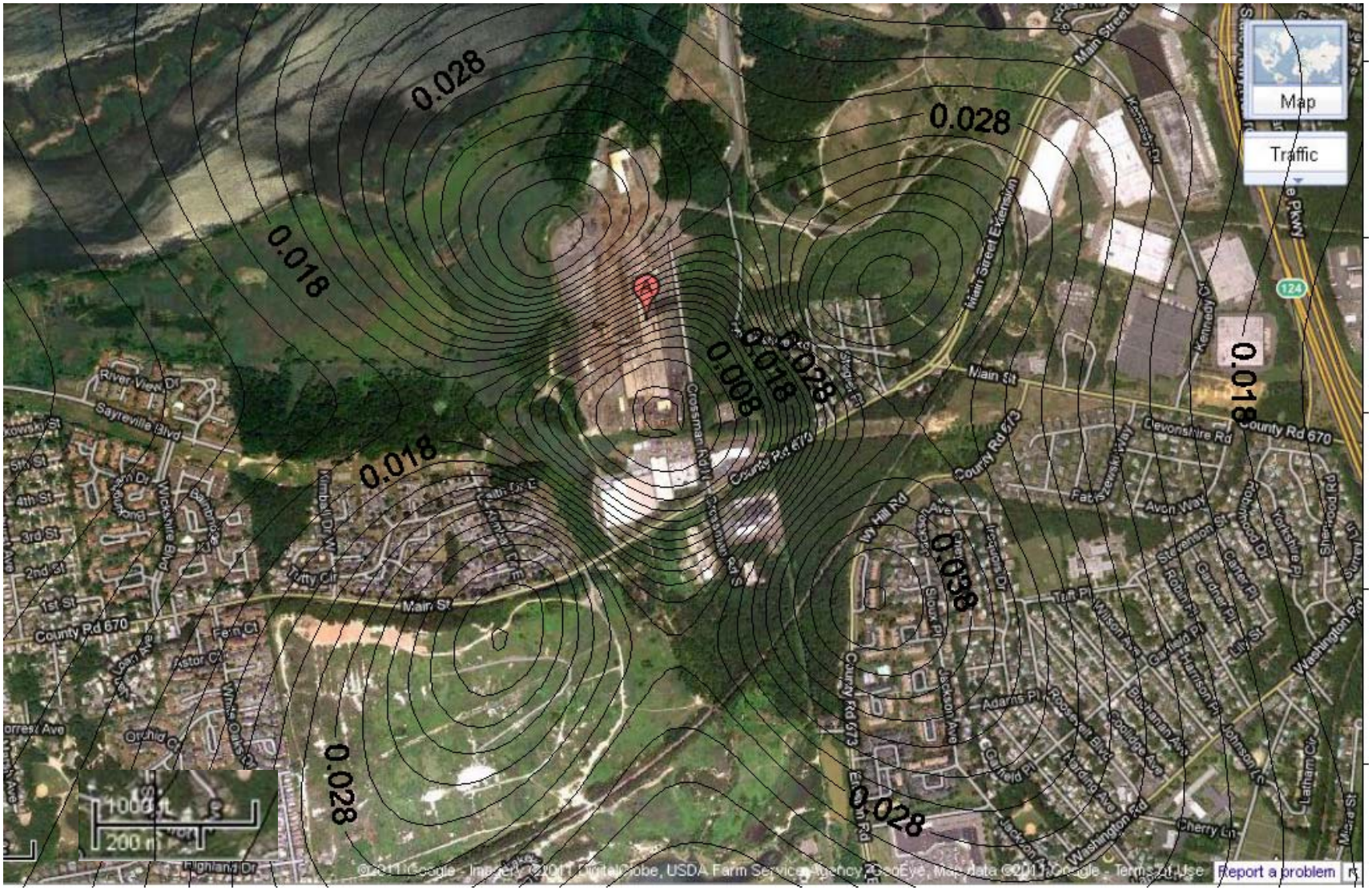

Figure 3: Iso-concentration lines ($\mu g/m^3$) for unit stack emission (gm/sec) for the Gerdau Ameristeel Recycling Plant

Appendix A

Toxicologic Summaries

The toxicological summaries provided in this appendix are based on ATSDR's ToxFAQs (http://www.atsdr.cdc.gov/toxfaq.html). Health effects are summarized in this section for the chemicals of concern found at the site. The health effects described in the section are typically known to occur at levels of exposure much higher than those that occur from environmental contamination. The chance that a health effect will occur is dependent on the amount, frequency and duration of exposure, and the individual susceptibility of exposed persons.

Arsenic Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso. Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are used as pesticides, primarily on cotton plants. Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as those caused by inorganic arsenic.

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the USDHHS, and the USEPA have determined that inorganic arsenic is a human carcinogen.