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**SUMMARY REPORT AND COMMENTS**

on a review of the

**Hazardous Substances Source Identification Study**

**Palmerton Zinc CERCLA NPL Site**  
**Carbon County, Pennsylvania**  
EPA-330/2-94-029

issued by:

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for:

**The Palmerton Citizens For A Clean Environment**

In Response To Task Schedules #10 (1) and #11 (1)

## AUTHORIZATION

The following report has been prepared in response to a request from the Palmerton Citizens for a Clean Environment (PCCE) for a review of the June, 1994 Hazardous Substances Source Identification Study, in accordance with Task Schedules #10 (1) and #11 (1), issued August 3, 1994 and October 7, 1994 respectively. The observations and conclusions contained herein are those of the MKA Project Team.

Task Schedule #10 requests that the MKA Project Team perform the following tasks:

1. Review the NEIC study and provide a written report to PCCE which would be suitable for release to the press. This task should be completed by 8/31/94.
2. Provide written comments from MKA on both the public and private sessions of the symposium, also suitable for release to the press. Please distinguish review pertaining to the public session from comments by Dr. Bruns on the private session. If possible this should be completed by 8/10/94.

Task Schedule #11 requests that the MKA Project Team perform the following tasks:

1. Complete MKA's written review of the National Enforcement Investigation Center's speciation report. We would like this report by Friday, October 14, 1994. This is an extension on the original time frame.
2. Respond to recent correspondence mailed to the PCCE and Dr. Dale Bruns Ph.D. by the USEPA, requesting comments on the upcoming risk assessment work plan to be prepared for OU #3. As you will note, the deadline for our responses is November 15, 1994. Please prepare a letter to EPA discussing the important aspects of the risk assessment from a technical viewpoint.

## REVIEW AND COMMENTS ON THE NEIC SOURCE IDENTIFICATION STUDY

### REVIEW

The Introduction section of the report describes the Palmerton Superfund Site, and provides an overview of the plant history and the industrial processes that have occurred there over the last 96 years. According to the report, the raw materials used for primary zinc smelting from 1898 to 1980 came from a variety of sources, including: Franklin, New Jersey; Friedensville, Pennsylvania; Austinville, Virginia; Gilman, Colorado; Hanover, New Mexico; and other areas including Canada. Current operations include the recycling of Electric Arc Furnace (EAF) dust, a listed hazardous waste (KO61) produced as emission control dust from scrap steel melting furnaces. The EAF dust is used to produce a "zinc calcine" concentrate, which is then sent elsewhere for final zinc recovery. Also discussed is a characterization of the Cinder Pile. Much of the material in the Cinder Pile is in the form of briquettes from the vertical retorts and contains residual metals as well as carbonaceous materials. The NEIC report quotes a study conducted by the Natural Resources group of Gulf & Western, which estimated that the 27,500,000 ton cinder pile is composed of 16% carbon, 2.7% zinc, 0.36% lead, 0.33% copper, 0.025% cadmium, 1.0% silver, 0.6% indium, and 0.008% gold per ton of residue. This estimate appears to suggest that less than 25% of the Cinder Pile is residual material.

The principal objective of the USEPA National Enforcement Investigations Center (NEIC) Hazardous Substances Source Identification Study of the Palmerton Zinc CERCLA NPL Site was to determine whether or not hazardous substances present at the site can be attributed unequivocally to releases and/or disposals by potentially responsible parties (PRP's). The potentially responsible parties were identified within two general categories, according to the different types of industrial processes that have occurred at the facilities, including: Previous operators of the primary zinc smelting process at the East and West Plants that occurred from 1898 to 1980; and post 1980 operators of the secondary zinc recovery process currently in operation at the East Plant. Of specific concern was a determination of the sources of hazardous substances found in the following three receptors:

1. Residential soil and dust.
2. Soils at unpopulated sites such as the Appalachian Trail.
3. Contemporary airborne particulate matter in and around Palmerton.

The basic methodology of the study involved collecting samples from potential sources such as: the East Plant, the West Plant, the Cinder Bank, and residential paint chips; and comparing their physical and chemical characteristics with samples collected from the receptor sites of interest, including: residential soil, dust, and tap water, soil from the Appalachian Trail area, and air monitoring samples collected by the Pennsylvania Department of Environmental Resources. In addition, environmental samples from Palmerton were also compared with environmental samples collected at Jim Thorpe, and from other locations along Blue Mountain (such as at Wind Gap to the east, and near Snyders where Route 309 crosses over Blue Mountain to the west); as well as at remote locations such as Allentown and Essington, Pennsylvania (Essington is located near the Philadelphia International Airport). Although it is not explicitly stated in the narrative, Table 2-5 suggests that at least 23 residences were sampled in the vicinity of Palmerton. Three principal types of comparative analyses were applied, these include: a comparison of lead isotope ratios, elemental composition - concomitant tracer - based methods, and individual particle analysis. The results of these analyses were then subjected to a battery of statistical procedures, to assist in interpretation, and to evaluate the significance of the data.

The NEIC Hazardous Substances Source Identification study also briefly discusses some of the previous studies that have been conducted at Palmerton. Of specific mention is the work of Jordan (aka. Buchauer) who published reports in 1973 and 1975; Beyer et.al., 1984 and 1985; Nash, 1972 and 1975; Strojan, 1978; and R.E. Wright Associates, Inc., (REWAI) who published a draft Remedial Investigation and Risk Assessment for Gulf & Western in 1988. The NEIC authors are critical of the work performed by REWAI because they collected their soil samples from the underlying mineral soil and ignored the higher concentrations of contaminants present in the litter horizons. According to the NEIC report this is the reason why the REWAI study did not report levels of environmental contamination to be as high as were reported by other studies.

Considerable effort was applied towards explaining the analytical methodology behind the NEIC Hazardous Substances Source Identification Study. A brief overview is provided below:

### **Lead Isotope Ratio Method**

The basis for the Lead Isotope Ratio Method of source identification is the well documented fact that lead has four isotopes:  $^{204}\text{Pb}$ ,  $^{206}\text{Pb}$ ,  $^{207}\text{Pb}$ , and  $^{208}\text{Pb}$ . These isotopes differ only in the number of neutrons that the lead nucleus possesses. The number of neutrons is not affected by common (non-nuclear) chemical processes. The three radiogenic isotopes  $^{206}\text{Pb}$ ,  $^{207}\text{Pb}$ , and  $^{208}\text{Pb}$  originate from the radioactive decay of  $^{238}\text{U}$ ,  $^{235}\text{U}$ , and  $^{232}\text{Th}$ , respectively.  $^{204}\text{Pb}$  has no known radioactive parent. The relative ratio of lead isotopes in lead bearing rocks is the result of two primary factors; the age of the rock, and the ratios of the original radioactive parent materials. As a result of these properties, lead minerals in the earth's crust exhibit significant variability in their lead isotopic composition. In brief, this means that lead ores from different sources have different and relatively distinct isotopic ratios, which can be used as signatures for source identification studies. Although there are some limitations, the use of lead isotope ratios has been applied extensively to peer-reviewed source identification studies, with considerable success. More recently, the use of lead isotope ratios has been extended to biomedical applications, for identifying the sources and pathways of human exposure.

### **Elemental Composition - Concomitant Tracer - Based Methods**

The basis for the Elemental Composition - Concomitant Tracer - Based Method is the observation that elements released from various sources contain varying groups of concomitant (or associated) elements. A simple explanation (presented by the NEIC study authors) is that lead originating from the combustion of leaded gasoline is associated with a concomitant increase in the level of bromine, since organobromine compounds are added to the fuel to ensure volatilization of the lead containing combustion products. Similarly, samples containing high levels of lead based paint typically contain high levels of barium and titanium, since barium sulfate and titanium dioxide are common paint components. This type of analysis has been applied successfully for determining the source of contamination from a zinc mining and smelting operation at Bunker Hill Idaho, as well as lead and zinc smelter sites in Trail British Columbia, and Flin Flon Manitoba. Typical concomitant tracers from nonferrous metal smelting activities include antimony, arsenic, cadmium, copper, gold, indium, mercury, nickel, selenium, silver, and zinc. One of the concomitant elements most associated with smelter activities at Palmerton is indium. The use of indium bearing ores at the former Palmerton zinc smelters is well documented, and other sources of indium at Palmerton other than the former smelting operations ought to be insignificant.

## **Individual Particle Analysis**

Individual particle analysis involves an examination of the elemental, chemical, and morphological characteristics of the hazardous substances of concern. Commonly used technologies for acquiring this type of information includes scanning electron microscopy (SEM), coupled with collection of an X-ray emission spectrum; and/or transmission electron microscopy (TEM) coupled with X-ray emission and/or electron diffraction (ED). Individual Particle Analysis (IPA) provides many different pieces of information for each sample analyzed. According to the NEIC authors, IPA techniques are well-established as a means of studying sources of pollutants in the ambient environment.

A considerable portion of the NEIC Hazardous Substances Source Identification Study report is dedicated to describing in detail the various methods for collecting and analyzing both source and receptor category samples. In brief, whenever samples were collected on property owned by the PRP's, they were provided with duplicate samples. Ten (10) different multiple procedures were applied to the chemical preparation (digestion) and analysis of the samples. The results of the different preparatory and analytical procedures were compared statistically to identify any experimental errors or anomalies. According to the NEIC study authors, no significant bias was indicated by comparing the results from the multiple procedures.

The NEIC Hazardous Substances Source Identification Study concludes with a summary of findings. The findings are organized into two general categories: Source category sample findings, and receptor category sample findings. A recapitulation of the summary of findings for each general category is provided on the following pages:

### **SUMMARY OF SOURCE CATEGORY SAMPLE FINDINGS**

#### **EAST PLANT FINDINGS:**

1. Several areas with the potential for releasing hazardous materials, and the actual release of potentially hazardous materials were observed by NEIC personnel during their visit to the East Plant facility in February of 1992.
2. Samples collected from the East Plant clearly demonstrate the existence of high concentrations of hazardous substances such as cadmium, lead, and zinc.
3. Many distinctive minor constituents are found in Electric Arc Furnace dust above crustal (geologic) and/or expected environmental levels, including antimony, bismuth, chromium, copper, silver, tellurium, and tin. The suite of enriched and depleted elements found in the EAF dust as well as the lead isotope ratio data allows for the following findings:
  - \* High concentrations of cadmium, lead and zinc are present in the materials handled at the East Plant.
  - \* The distinctive minor constituents (elements) can be used as tracers of EAF dust contamination. Of these, bismuth was chosen as the primary indicator (of EAF dust) for this study.
  - \* The indium levels of EAF dust allow indium to be used in apportionment of lead to other sources (i.e. smelting).
  - \* The barium and titanium levels in EAF dust allow these elements to be used in the apportionment of lead to other sources (i.e. crustal, Cinder Bank, and paint).
  - \* The lead isotope ratios of the East Plant materials are distinctively more radiogenic than those of the Cinder Bank.

## **WEST PLANT FINDINGS:**

1. At the time NEIC personnel visited the West Plant (February 1992), it was in the process of being demolished. The large quantities of lead chloride that were being stored in bags at the West Plant facility at that time only posed a remote possibility of generating fugitive dust. However, exterior ground areas, various piles, and the floor areas inside buildings were considered potential sources for fugitive hazardous substances. Because activities related to demolishing the West Plant facility have since ceased, findings presented by NEIC, relative to the West Plant site, are considered relevant only within the time frame of their visit to Palmerton.
2. Many of the materials sampled at the West Plant facility possessed the Toxicity Characteristic Leaching Procedure (TCLP) hazardous waste characteristics for cadmium (D006), and nearly all the materials exhibited high levels of one or more of the hazardous substances, cadmium, lead, or zinc. Given the history of the West Plant, and NEIC's observational and analytical findings, the following can be stated:
  - \* Hazardous materials containing cadmium, lead, and zinc are present at the West Plant.
  - \* Most of the hazardous substances released from the West Plant are the result of historical processes related to zinc smelting.
  - \* Because the West Plant has not been involved in primary zinc smelting since 1980, no smelting emissions or raw materials could be collected by NEIC. Therefore, based on historical, process, and chemical knowledge, the best estimate of the West Plant as a source of environmental contamination is the Cinder Bank.
  - \* The contamination of the Palmerton area by many of the hazardous materials found on the West Plant ground areas, various piles, and buildings at the time of the NEIC visit cannot be fully assessed because both EAF dust recycling and zinc smelting related materials were present.

## **CINDER BANK FINDINGS:**

1. Reports published by the New Jersey Zinc Company indicate that the Cinder Bank is primarily composed of residues from historic processes at Palmerton. Therefore, the Cinder Bank provides the best record of contamination resulting from zinc smelting, and was found to have high concentrations of the hazardous substances cadmium, lead and zinc.
2. Composite samples indicate that barium is the most obvious tracer for nonvolatile contaminants originating from the Cinder Bank. The elemental results from the Cinder Bank also indicate that the high indium values of the Cinder Bank give lead/indium, cadmium/indium, and zinc/indium ratios which are unique in comparison to the indium based ratios of other sources at Palmerton. These facts allow for the following findings:
  - \* High concentrations of cadmium, lead and zinc are present in the Cinder Bank.
  - \* The Cinder Bank lead isotopic composition is the best estimate of that associated with zinc smelting contamination.
  - \* The Cinder Bank is enriched in nonvolatile elements. Of these barium is the most obvious tracer.
  - \* Indium based contaminant ratios of the Cinder Bank are useful in apportioning lead contamination to zinc smelting.

## **SUMMARY OF RECEPTOR CATEGORY SAMPLE FINDINGS**

### **APPALACHIAN TRAIL AND RELATED SAMPLE FINDINGS:**

1. Based upon the results presented in Section 3 of the NEIC report, the following summary statements were made:
  - \* As expected from previous studies, the environment on Blue Mountain, Stony Ridge, and other areas in and around the Palmerton CERCLA Site are extensively contaminated with the hazardous substances cadmium, lead, and zinc.
  - \* Soil samples from contaminated areas show a clear trend of decreasing concentrations of cadmium, lead and zinc as well as numerous trace elements with increasing depth within the soil profile.
  - \* The levels of hazardous substances in contaminated areas of Blue Mountain, Stony Ridge, and several other locations in and around the Palmerton CERCLA Site, are much higher than the levels of these contaminants in distant locations, such as the Wind Gap area and the intersection of Pennsylvania Route 309 with Blue Mountain (near Snyders).
  - \* The levels of numerous trace elements are elevated in the contaminated areas relative to both distant locations and crustal (i.e. geologic) abundances.
  - \* Covariance of high statistical significance exists between contaminants in samples obtained from Blue Mountain and related areas. This is consistent with a single source, or limited sets of sources, of contamination.
  - \* Various methods of source apportionment attribute greater than 90% of the cadmium, lead, and zinc to zinc smelting.

### **RESIDENTIAL SOILS AND DUSTS FINDINGS:**

1. Based upon the results presented in Section 3 of the NEIC report, the following summary statements were made:
  - \* The levels of numerous trace elements are elevated in the contaminated areas relative to both distant locations and crustal abundances.
  - \* Similar, but less pronounced, patterns of cadmium, lead, and zinc contamination and concomitant tracers exist in the Palmerton residential soils and dusts as were found for the Appalachian Trail.
  - \* By comparing the Palmerton residential soil concentration data with soil concentration data from unpopulated areas in and around Palmerton, it is clear that soil concentrations at residences do not reflect the total historical burden of hazardous substances deposition. A plausible explanation for this finding is that most residential soils have been replaced one or more times over the last century.
  - \* The majority of the lead found in two porch dust specimens is attributable to lead based paint.

- \* In general, Palmerton soil and house dust contaminant concentrations are less than those found in Palmerton attic dusts.
- \* Individual particle analysis indicates that house and attic dusts contain a large number of particles likely to be derived from historic East and West Plant processes (i.e. zinc smelting).
- \* Individual particle analysis demonstrated that the attic dust from two locations and the house dust from three locations in Palmerton contain lead-bearing particles which are most likely derived from the contemporary East Plant EAF dust recycling process.
- \* Zinc smelting and EAF dust recycling are about equal contributors to the lead contamination found in the disturbed residential soils at Palmerton, while zinc smelting is a greater contributor to cadmium and zinc contamination.
- \* Zinc smelting is the major contributor to cadmium, lead, and zinc contamination in attic dusts, with some contribution from EAF dust recycling.
- \* EAF recycling is a greater contributor to lead contamination in house dust than zinc smelting, and about an equal contributor to zinc smelting for the cadmium and zinc contamination.
- \* Lead attributable to paint was found to be an insignificant component of the lead contamination of the majority of the attic and house dust samples. It was, however, indicated to be a significant component of the lead contamination of the attic dust of one residence, the house dust of two other residences, and the porch dust of another residence.

#### **PALMERTON AREA PADER TSP FILTERS AND DUST FALLOUT JAR FINDINGS**

1. Based upon the results presented in Section 3 of the NEIC report, the following summary statements were made:
  - \* High concentrations of cadmium, lead, and zinc are present in the airborne particulate matter in and around Palmerton.
  - \* The levels of cadmium, lead, and zinc in the airborne particulate matter cannot be explained solely through contributions from contaminated residential and nonresidential soils in and around Palmerton.
  - \* Individual particle analysis of three PADER TSP filter specimens indicated the presence of "Waelz oxide" and "lead chloride". The co-occurrence of these two materials indicates EAF dust recycling as a major source of lead contamination.
  - \* The high lead and bismuth levels in the airborne particulate matter suggests that EAF dust recycling is a major contributor to lead contamination.
  - \* The lead isotope ratios of the airborne particulate matter suggests that EAF dust recycling is a major contributor to lead contamination.
  - \* The indium based elemental ratios of the airborne particulate matter suggests that EAF dust recycling is a major contributor to cadmium, lead, and zinc contamination.

## JIM THORPE AND RELATED SAMPLE FINDINGS:

1. Based upon the results presented in Section 3 of the NEIC report, the following summary statements were made:
  - \* The high concentrations of lead present in the Jim Thorpe soils and street dust specimens are not from Palmerton zinc smelting or EAF recycling operations. Discordance of trace element to lead ratios between the Jim Thorpe and Palmerton specimens, and the fact that the lead found in the Jim Thorpe specimens is less radiogenic than the lead in Palmerton residential soil, substantiate this finding.
  - \* The lead to bismuth ratio of the Jim Thorpe specimens is similar to those of two Essington street dusts. The lead to bismuth ratio is suggestive of a similar source, such as tetraethyl lead or lead based paint.
  - \* The cadmium to indium ratio of the Jim Thorpe specimens is similar to that typical of Palmerton zinc smelting materials, perhaps suggestive that much of the cadmium and indium is from this source.

## COMMENTS

1. The objectives of the study are well defined and clearly stated (page 3). The rationale behind the various analytical techniques were explained with sufficient detail to provide a clear understanding of the study design (section 1.4). Furthermore, in defining the source identification methods, the authors provide good documentation and support for their approach by citing the published literature, including a good number from excellent peer-reviewed technical journals. Several of the techniques have been used for quite a few years and continue to be employed and reported in published peer-review journals at the current time. For example, a team of scientists (Makal et. al., July 1993) recently published a study in Environmental Science and Technology that identified the various sources of lead in urban air at eighteen Asian cities.
2. The receptor category sampling was sufficient to routinely accomplish the objectives of the study; however, given the defensive posture typically exhibited by the PRP's, the authors should have anticipated that the study and report would be received with cautious scrutiny and severe criticism. This concern is especially pertinent to the issue of lead based paint, which the PRP's have incessantly argued is the primary source of lead contamination in the Palmerton area. In light of the level of controversy that should have been anticipated regarding these issues, there seemed to be a deficiency in the number of paint samples collected and analyzed. Similarly, no quantitative characterization (i.e. signature) was provided for historic contamination caused by leaded gasoline (outside of the anecdotal characterization provided in the description of methods, 1.4.1.). Otherwise, the sampling of a wide range of receptor media including air, soil and water provides a suitable cross section of exposure pathways to the Palmerton environment, that can be applied toward development of a comprehensive risk assessment.
3. The use of three types of analyses, especially the combination of Lead Isotopes, Elemental Composition - Concomitant Tracers, and Individual Particle Analysis methods is an effective technique for verifying contaminant sources. While there do appear to be some limitations to each of the three methods when evaluated independently, the fact that there is significant concurrence between the results of the three methodologies lends a strong measure of credibility to the overall conclusions of the study. Similarly, the data appears to have been appropriately exploited through the use of multivariate computational and graphical analyses. This is clearly stated by the authors in section 3.2. paragraph 3, which reads "Each approach, when examined alone, is associated with some degree of ambiguity; however, ambiguity is diminished and scientific merit is achieved by agreement among the approaches."

4. One apparent technical inaccuracy that was noted, though purely academic, involves the discussion of the lead isotope ratio analysis (page 29, section 3.2.2). The study measured only the three radiogenic isotopes and compared them in the form of two ratios:  $^{207}\text{Pb}/^{206}\text{Pb}$  and  $^{208}\text{Pb}/^{206}\text{Pb}$ . The authors stated that "...both sets of the measured lead ratios are greater for geologically older ores..." (3.2.2, paragraph 1), which is true only of the first ratio. This can be seen more clearly if the radioactive precursors of the lead isotopes are identified.  $^{207}\text{Pb}$  derives from  $^{235}\text{U}$ ,  $^{206}\text{Pb}$  comes from  $^{238}\text{U}$ , and  $^{208}\text{Pb}$  results from the radioactive decay of  $^{232}\text{Th}$ . Rocks are dated using the  $^{207}\text{Pb}/^{206}\text{Pb}$  ratio which reflects the different decay rates of the two uranium isotope precursors. This can be done because at any given point in time, the ratio of  $^{235}\text{U}$  to  $^{238}\text{U}$  is known. Since the rate of radioactive decay for  $^{235}\text{U}$  is very different from  $^{238}\text{U}$ , the change in the ratio of their lead isotope by-products can be used to determine the age of the rock. The  $^{208}\text{Pb}/^{206}\text{Pb}$  ratio is comparing lead generated from a uranium isotope to lead generated from a thorium isotope. Although the rate of radioactive decay is known for both  $^{232}\text{Th}$  and  $^{238}\text{U}$ , the ratio of these materials at the time the source materials were formed can be different. Consequently, two rocks of identical ages could have very different  $^{208}\text{Pb}/^{206}\text{Pb}$  ratios because they started out with a different  $^{232}\text{Th}/^{238}\text{U}$  ratio. This apparent inaccuracy is being reported for academic reasons, to clarify an issue that some readers may find confusing, and does not suggest that there was an error in the application of lead isotope ratios for identifying the source of environmental contaminants at Palmerton. The methodology is still valid, since the ratio of lead isotopes from those samples analyzed will still be unique to their original source materials, regardless of their age.
5. The reader needs to be made aware that some analyses require certain assumptions. For example, the report clearly stated that the higher indium concentrations are attributable to zinc smelting. Indium concentrations for the Cinder Bank (the source assumed to most likely reflect primary zinc smelting) seem to be consistently higher than other source categories, but once again it is important to consider that the Cinder Bank is composed of a mixture of materials, and that it would be reasonable to expect a variety of different indium levels from that source.
6. The use of multivariate statistics such as factor analysis is a valuable tool for addressing complex environmental conditions, like those at Palmerton. In these factor analyses, the question of lead paint is given adequate attention, both in terms of the data presented and analyzed, and in terms of the discussion provided. Here the NEIC report gives good consideration to identifying various potential sources of metals at Palmerton, and lead in paint is given due attention. These findings seem to indicate that there are still a few houses in Palmerton with lead based paint, but that overall sources of environmental contamination from industrial activities are more important to the community at large.
7. Recently, Horsehead Resources Development Corporation held a press conference challenging the findings of the NEIC study. One of the more interesting statements they offered, to refute the NEIC report, is that the wind predominantly blows from the west, and that the Borough of Palmerton is located upwind of the East Plant facility. Once again, the industries claims are unfounded. First of all, the wind doesn't always blow in the same direction; this is especially true for narrow valleys such as the Palmerton area. A review of historic meteorological records would reveal that the winter of 1992, when the NEIC study was conducted, was characterized by several strong Northeasters; storms that blow strongly from the East Plant facility towards the Borough of Palmerton. Furthermore, the notion that it is acceptable to release air pollutants when the wind is blowing away from the center of town ignores the fact that somebody always lives downwind.

8. The high levels of heavy metals contamination from historic smelter emissions that resulted in the defoliation of Blue Mountain are a fact that no informed citizen of the Palmerton community can deny. The NEIC Hazardous Substances Source Identification study clearly identifies industrial pollution as the major source of contamination. The PRP's have argued that lead based paint is the primary source of lead contamination in the Palmerton area. Years of scientific study, make it very difficult to conclude that the source of lead contamination on Blue Mountain is significantly different from the source of lead contamination in populated areas of the Palmerton valley. Similarly, the reality of frequent releases of fugitive emissions from the EAF dust process at the East Plant are well documented by the dozens of notices of violation issued by the PaDER between February 1991 and March of 1992.
9. In conclusion, the NEIC study is an important contribution toward understanding the nature of environmental problems in the Palmerton area. Overall the study seems technically competent and appropriate, using standard techniques with strong support from the peer-reviewed technical literature. While there are some issues that need to be clarified (as suggested in the comments above), and some elements of the study are more compelling than others, the study is consistent in its main findings, considering the different analytical approaches employed.