Public Health Assessment for

MATTEO & SONS, INC. SITE
THOROFARE, GLOUCESTER COUNTY, NEW JERSEY
EPA FACILITY ID: NJD011770013
AUGUST 29, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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PUBLIC HEALTH ASSESSMENT

MATTEO & SONS, INC. SITE

THOROFARE, GLOUCESTER COUNTY, NEW JERSEY

EPA FACILITY ID: NJD011770013

Prepared by:

New Jersey Department of Health and Senior Services
Public Health Services
Consumer and Environmental Health Services

Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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Summary

On April 19, 2006, the United States Environmental Protection Agency proposed to add the Matteo & Sons, Inc. site, Thorofare, Gloucester County, New Jersey, to the National Priorities List. Waste materials including crushed car batteries, residues from the smelting operation and unknown industrial and domestic solid waste, were reportedly deposited on-site and buried over a period of several decades. Contaminants, particularly polychlorinated biphenyls and lead, have been detected in the soil, sediment and biota associated with Woodbury Creek and Hessian Run that border the site. These waterways are used for fishing and recreation purposes. The Matteo & Sons, Inc. site was easily accessible in the past and was used for recreational purposes. Presently, there is a permanent eight-foot chain-link fence around the Matteo & Sons, Inc. site to restrict access to the site.

When a site is proposed to the National Priorities List the New Jersey Department of Health and Senior Services (NJDHSS) and the Agency for Toxic Substances and Disease Registry/National Center for Environmental Health (ATSDR) develop a Public Health Assessment to learn if a contaminated site could harm people's health. For the Matteo site, the NJDHSS and the ATSDR evaluated:

- the chemicals that were or are present on or near the site;
- how people may have been (or are) exposed to the contaminants; and,
- the potential health risks from those exposures.

The major contaminants of concern found on the site are lead and polychlorinated biphenyls (PCBs). Other contaminants include vinyl chloride, bis(2-ethylhexyl)phthalate, aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, mercury, nickel, thallium and zinc in surface soil, sediment, groundwater and biota. The completed exposure pathways include accidental ingestion of contaminated surface soil, drinking potable well water and through ingestion of biota.

The NJDHSS and ATSDR determined that past exposures to lead in off-site soil may have been harmful to children's health. As such, the site represented a ***Public Health Hazard*** in the past for this exposure pathway. Potential for adverse health effects from past exposures to polychlorinated biphenyls, antimony, arsenic and lead in on-site soil and from polychlorinated biphenyls and lead exposures in biota is not likely for children and adults. Additionally, past exposures from ingestion of private potable well water are also unlikely to cause adverse non-cancer health effects. The calculated lifetime excess cancer risk for this pathway was a very low to low increased risk when compared to the background risk for all or specific cancers. Therefore, NJDHSS and ATSDR conclude that incidental ingestion of contaminants in on-site surface soil and ingestion of vinyl chloride and arsenic in the off-site potable well posed a ***No Apparent Public Health Hazard*** in the past.

NJDHSS and ATSDR cannot evaluate exposure and risk from other off-site private potable wells as it is not clear how many are currently in use. Therefore, this represents an ***Indeterminate Public Health Hazard.*** Once this information becomes available, NJDHSS and

ATSDR will assess the public health implications of this pathway. Currently, access to on-site soil has been restricted by permanent fencing around the site, which decreases contact with contaminated soil. The off-site potable well at the automobile repair shop is not used currently for drinking water. At the present time, NJDHSS and ATSDR conclude that the exposures at the Matteo and Sons, Inc. site will not result in adverse health effects. Exposures in the past are unlikely to occur in the present time since actions have been taken to reduce and/or eliminate exposures.

Community concerns were largely limited to the contaminated soil at the Willow Woods Manufactured Home Facility, adjacent to the Matteo and Sons, Inc. site. This soil has been excavated and replaced with clean soil. A review of health outcome data (e.g., adverse pregnancy outcomes, cancers, deaths) was not conducted due to the small number of individuals exposed; such an evaluation of available health data is unlikely to produce interpretable results. The data on blood lead tests were evaluated for children living in the Thorofare area, especially those living close to the site on Crown Point Road, because of the potential for exposure to lead in contaminated site media. The average blood lead value was slightly higher in the Crown Point Road area compared to all Thorofare children. However, the number of children screened for lead was small, and the difference was not statistically significant (that is, may be due to chance).

Recommendations for the site include continuing to restrict access to the Matteo & Sons, Inc. site to ensure that all contaminated areas remain fenced, and more complete characterization of the use of off-site potable wells in the area to evaluate if people are being exposed to contaminated drinking water.

Copies of this report will be made available to concerned residents in the vicinity of the site via the township library and the internet. Public meetings will be scheduled with area residents to discuss the findings of this report and to address any remaining community concerns. As additional (environmental and health outcome) data become available, the New Jersey Department of Health and Senior Services and the Agency for Toxic Substances and Disease Registry will evaluate the public health implications and provide assistance to residents in reducing exposures to chemicals.

Statement of Issues

On April 19, 2006, the United States Environmental Protection Agency proposed to add the Matteo & Sons, Inc. site, Thorofare, Gloucester County, New Jersey, to the National Priorities List (NPL). Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986, the federal Agency for Toxic Substances and Disease Registry (ATSDR) is required to conduct public health assessments of sites listed or proposed to be added to the NPL. The New Jersey Department of Health and Senior Services (NJDHSS), in cooperation with the ATSDR, prepared the following public health assessment to review environmental data obtained from the site, evaluate potential human exposure to contaminants, and to determine whether the exposures are of public health concern.

Background

Site Description and Operational History

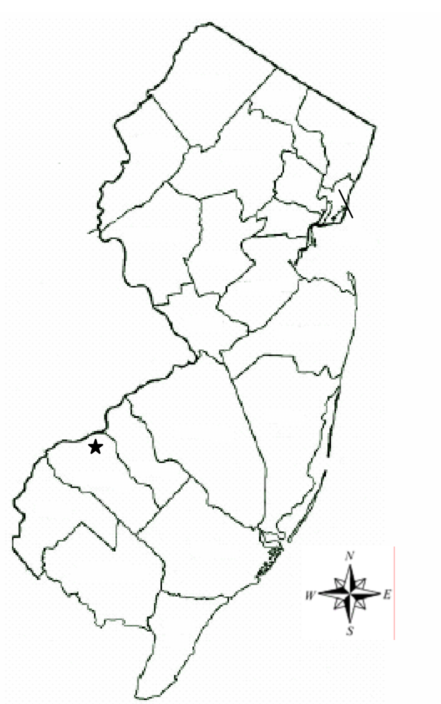

Figure 1: Location of Matteo & Sons, Inc. site

The Matteo & Sons, Inc. (Matteo) site is located at 1708 U.S. Highway 130 in Thorofare, Gloucester County, New Jersey (see Figure 1). The Matteo site currently consists of a scrap metal recycling facility, a junkyard, and an inactive landfill. The southeastern portion of the property (approximately 5 acres) is partially paved and contains several buildings used for the scrap metal recycling business. The remainder of the property (approximately 75 acres) consists predominantly of heavily vegetated, undeveloped land that borders Woodbury Creek to the west, Hessian Run to the north, and a residential trailer park (Willow Woods Manufactured Home Community) to the south (see Figure 2). Additionally, two utility lines (Colonial Oil and Public Service Electric & Gas) are located on the northwestern portion of the property.

The Matteo family acquired the property in 1947 and has operated an unregistered landfill and junkyard and a metals recycling facility at the site under various names (James Matteo & Sons, Inc.; Matteo Trucking Company; Thorofare Trucking and Trash Company; Matteo Iron and Metal) since at least 1961 (NJDEP 2004). In 1971, the New Jersey Department of Environmental Protection (NJDEP) approved Matteo's request to operate an incinerator to burn copper wire. From 1971 until 1985, Matteo recovered lead from car batteries using a metal separation process called "sweating" (USEPA 2005). In 1972, the NJDEP observed piles of crushed battery casings in an wetland area adjacent to Hessian Run, along the northern boundary of the Matteo property. This dumping activity was apparently performed in conjunction with the lead recovery operation. Historical aerial photographs revealed the possible presence of battery casings (dark debris) in the northeast portion of the property since 1959 (NJDEP 2004). By 1975, the northern boundary of the casings extended into Hessian Run. Waste materials deposited in the battery casing waste area include: batteries, battery casings, household waste, fabric, metal, glass, tires, and wood. Another area of concern at the site is the inactive landfill dumping area where Matteo disposed of waste material to a depth of at least five feet in the north-central portion of the site. Waste materials deposited in the landfill portion of the Matteo property include roof shingles, wood, drums, plastic, lumber, glass, rubber, construction materials, metal debris, rubber, household trash, tires, lead car battery components, and white and yellow residue and powder. In January 1984, NJDEP issued an Administrative Consent Order to Matteo for solid waste violations and required Matteo to cease waste disposal at the site. The eastern portion of the property is currently used as a scrap metal recycling facility.

Site Geology and Hydrogeology

The Matteo site is located within the Lower Delaware River watershed, at the confluence and within the 100-year floodplain of Woodbury Creek and its tributary, Hessian Run (see Figure 2). Both streams are tidally influenced at this location and both waterways are used for fishing and recreation (NJDEP 2004). The Delaware River is located 1.2 miles to the northwest from the site.

The main aquifer in this area is the Potomac-Raritan-Magothy aquifer, which is heavily pumped, especially in the summer months when groundwater is used for irrigation of farms. The groundwater table was encountered at approximately 10 feet below ground surface across the Matteo site. The groundwater data collected during the Remedial Investigation indicated primary flow to the southeast (NJDEP 2004). In addition to this horizontal gradient, a vertical downward gradient was also measured. These observations were consistent with the expected influence of inland pumping centers. In addition to the general groundwater flow at the site, a perched water table condition was observed on-site on the eastern and southern portions of the site. The perched groundwater on the eastern portion of the site flows towards Hessian Run. The remainder of the perched water flows to the regional water table. The regional water table is at a lower elevation than the surrounding surface waters; therefore, the surface waters are also interpreted to discharge to the regional groundwater.

There are no drinking water intakes on surface waters within 15 miles downstream (or upstream in tidal areas) of the site (NJDEP 1997). Groundwater in the area is used for drinking water by public supply wells. Public water to the area has been available since 1966. The municipal supply, which serves most area residents, draws water from the Potomac-Raritan-Magothy aquifer. There are three municipal wells situated within one mile of the Matteo site. The West Deptford Municipal Well No.6 is located 0.6 miles southeast of the Matteo site and is 356 feet in depth. National Park Borough operates two wells approximately 280 feet in depth, 0.9 miles northwest of the site. On the basis of a well survey, there are approximately 20 private potable wells within 2½-miles of the site; however, it is not clear how many are currently in use. Public water to the area has been available since 1966. There are three private water supply wells in the immediate area of the site: scrap yard (considered as on-site), the private residence located adjacent to the scrap yard to the east and the automobile repair shop located adjacent to the scrap yard to the southwest (both wells considered as off-site). The latter of these wells is 103 in depth. The depths of the other two wells are unknown. It is reported that the wells at the scrap yard and the automobile repair shop are not used for potable purposes (USEPA 2005). The private residential well has a treatment system consisting of a 5-micron filter and a three-stage charcoal and sand filter (NJDEP 2004). NJDEP has also documented that the Gloucester County Health Officer stated that "very few" private potable wells are in use in the area (NJDEP 1996).

The main surface water features in the area are Woodbury Creek, Hessian Run and the Delaware River (see Figure 2). These are all used for fishing and recreation purposes. Woodbury is known to be used as a fishery. The area includes wetland frontage in Hessian Run and a bald eagle foraging habitat within Hessian Creek and Woodbury Creek (USEPA 2006). There is evidence of battery casings on the southern bank of Hessian Run, along the entire length of the site. There are no flood containment measures present at the facility and it appeared as though some of the crushed battery casings have been transported by Hessian Run to the center of the channel which is visible at low tide. The battery casing waste is situated within emergent wetlands along most of the northern boundary of the property.

Regulatory and Remedial History

Matteo, under NJDEP oversight, conducted limited investigation including sampling of drums and other wastes, a geophysical investigation in the landfill area, excavating test pits and collecting soil and aqueous samples from the test pits. It was found that the wastes associated with crushed battery casings exhibited high levels of lead contamination, while site soils exhibited widespread contamination with levels of petroleum and lead exceeding one percent of total volume (NJDEP 2004).

In 1997, the USEPA conducted an investigation limited to the "battery disposal area" to estimate the volume of battery casings along Hessian Run and to estimate lead concentration in surface water, sediment and soil samples (NJDEP 2004). The battery casings are located along the northern boundary of the Matteo site. Results of this investigation revealed that lead was present in all water samples, soil samples contained lead at concentration on the order of 1,000 milligram per kilogram of soil (mg/kg) and the concentration of lead in sediment samples ranged from non-detect to 1,000 mg/kg. The volume of battery casings was estimated to be approximately 235,000 cubic feet.

The NJDEP conducted Remedial Investigation (RI) at the Matteo site and surrounding off-site areas from September 2000 to October 2002 (NJDEP 2004). The RI analytical results documented the presence of lead and PCBs in site soils and in sediment samples collected from Hessian Run and Woodbury Creek.

USEPA sampling in 2005 and 2006 revealed crushed battery casings and lead contamination in soils adjacent to and in the residential trailer park (Weston 2005, 2006). In February 2006, the USEPA conducted an extensive sampling investigation near the boundary of the Matteo site and the Willow Woods Manufactured Home Community (MHC), and at a single family residence located adjacent to the scrap yard on Crown Point Road. The contaminated areas were primarily in an open, unpaved area used for parking, storage, and recreational activity between the northern edge of the homes and a wooded area leading into the Matteo site. At the time, the USEPA installed a snow fence and warning signs as a temporary measure (USEPA 2006b). In July 2006, the USEPA excavated an estimated total of 425 tons of soil from the contaminated area and backfilled with certified clean soil. Subsequently, an eight-foot chain-link fence was constructed through the excavation area and around the Matteo site (USEPA 2006c).

Prior ATSDR Involvement

In March 2006, a Letter of Technical Assistance (LTA) was prepared in response to a USEPA Region 2 request that the NJDHSS evaluate potential health risks posed by lead soil contamination detected at two residential properties located adjacent to the site (see Appendix A). These properties were homes located in the Willow Woods MHC, located to the south and a single family residence (leased to private individuals by the owners of Matteo) located to the northeast of the site. NJDHSS recommended that the USEPA immediately notify residents of the Willow Woods MHC and the Crown Point Road private residence of the soil lead contamination detected in the sampled areas. Residents were advised that children should not be permitted to come into contact with the soil in this area and adults were also advised to stay away from the contaminated area to avoid tracking lead-contaminated soil into homes and automobiles.

In July 2006, a health consultation was prepared to address the above request in a more detailed manner (see Appendix B). Results from the United States Environmental Protection Agency Integrated Exposure Uptake Biokinetic Model for Lead in Children indicated that if young children (aged 6 - 84 months) were to be exposed to levels of the mean concentrations of lead in soil at the contaminated area, blood lead levels of concern could result in some children. The report concluded that the soil lead concentrations detected in sampling from February 2006 posed a ***Public Health Hazard***, especially for past exposures (ATSDR 2006b).

Land Use and Demographics

The land near the Matteo site is mixed residential and industrial use. The 2000 Census data indicate that nearly 11,650 people reside within a 1-mile radius of the site (see Figure 3) (ATSDR 2000). Although the operations portion of the Matteo facility is fenced, access in the past could be obtained through a network of trails which connect the adjacent Willow Woods Manufactured Home Community to the northwestern portion of the property. Currently, access has been restricted via installation of a chain-link fence.

Site Visits

The first site visit to the Willow Woods MHC was conducted on February 21, 2006. Present were: Tariq Ahmed, Somia Aluwalia, and Julie Petix of the NJDHSS; Leah Escobar of the ATSDR; representatives from the Gloucester County Department of Health, NJDEP and the USEPA. The USEPA representative mentioned that the residents of the community were given USEPA flyers and fact sheets by the owner of the Manufactured Home Community discussing sampling that occurred the week of February 6th. The community is not age-restricted; children and evidence of children living in the community (example play equipment, bikes) was observed. There are approximately 100 homes in this community and some of these homes have been present since the 1950s.

The USEPA representative showed the area where soil samples were taken two weeks prior to the site visit. This area encompassed the backyard of several mobile homes and also represented the possible boundary between the Matteo site and the mobile home community. At the time of the site visit, there was no fence between the Matteo site and the mobile home community property. Numerous playground equipment (swings, slide, toy car) was observed in the backyard area. The ground was predominantly bare earth, with grass cover in a few places. It appeared that this area serves as a play area for the surrounding homes. Crushed lead battery casings were noted in the common backyard area. One side of this common backyard was at the end of a street. It was mentioned that this end acted as a cul-de-sac; i.e., was used as an area where vehicles turned around to get back on the main driveway. The highest lead concentration from the previous sampling round was from this driveway. The area immediately behind the backyard was densely wooded and is part of the Matteo site. One well-marked trail was observed leading from the backyard into the wooded area of the Matteo site. The private residence on the Matteo site was observed next. This residence is bordered by Crown Point road. Currently, it is rented out to an individual; however, prior occupancy history is unknown at this point. The area of high lead contamination detected in the previous sampling round was noted. Other nearby businesses includes a truck depot and an auto repair shop.

On November 1, 2006, a second site visit of the Matteo site was conducted. Present were: Tariq Ahmed and Somia Aluwalia of the NJDHSS; Leah Escobar of the ATSDR; and a representative from the USEPA. Access was gained from the scrap yard business currently on the property. A chain-line fence was noted around the site, restricting access from the Willow Woods MHC. Trails were observed leading to the center and the shore-line. Evidence of trespassers was noted, as indicated by beverage bottles and a stone camp fire ring. The area of battery casings near the shore-line was observed next.

Pictures from the second site visit are catalogued in Appendix C.

Community Concerns

The USEPA held an information session on March 13, 2006 and NJDHSS were in attendance. The USEPA had requested a limited audience with five specific families/households, based on proximity to the area with elevated soil lead levels. Of these five families, four were present at the information session. None of the residents present at this information session specified any health concerns. One resident said that her grandchildren (ages 4 months and age of other not specified) get dropped off at her residence for babysitting. Some expressed opinions about the use of bare ground area for parking and turning-around as being a necessity, especially utilities such as garbage collectors and oil trucks that routinely utilize this area.

A second USEPA availability session was held on March 16, 2006. At the time of this meeting, snow fencing had been erected at the boundary between the residences and the Matteo site to restrict access to the contaminated areas. There were some health related concerns posed to the NJDHSS by two Willow Woods MHC residents. A woman was concerned about her nine year old daughter who played in the contaminated areas from the age of five. A couple planning a family in the near future was particularly interested in remediation efforts.

Environmental Contamination

An evaluation of site-related environmental contamination consists of a two tiered approach: a screening analysis and a more in-depth analysis to determine the public health implications of site-specific exposures. First, maximum concentrations of detected substances are compared to media specific comparison values (known as environmental guideline comparison values). If substance concentrations exceed the comparison value, these substances, known as Contaminants of Concern (COC), are selected for further evaluation. This evaluation is conducted by comparing estimated exposure doses, derived from site-specific exposure conditions, to dose-based comparison values (known as health guideline comparison values).

Environmental Guideline Comparison

A compilation of environmental sample results for the Matteo site is provided in the following section. Media reviewed included surface soil, sediment, groundwater, surface water and biota. These data were organized by the NJDHSS as on-site (Matteo) versus off-site (Hessian Run and Woodbury Creek). The chronic ATSDR Environmental Media Evaluation Guide (EMEG), Reference Dose Media Evaluation Guide (RMEG) and Cancer Risk Evaluation Guide (CREG) were selected as the environmental guideline comparison values (CVs). EMEGs are estimated contaminant concentrations that are not expected to result in adverse non-carcinogenic health effects. ATSDR derives RMEGs from USEPA's oral reference doses, which are developed based on USEPA toxicological evaluations. RMEGs represent the concentration in water or soil at which daily human exposure is unlikely to result in adverse non-carcinogenic effects. CREGs are media-specific comparison values that are used to identify concentrations of cancer-causing substances that are likely to result in an increase of cancer rates in an exposed population. Where the ATSDR CVs were unavailable, USEPA Region 3 Risk Based Concentrations (RBCs) or NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) were used for comparison purposes. RBCs are chemical concentrations corresponding to a fixed level of risk (i.e., a Hazard Index of 1, or lifetime excess cancer risk of one in one million, whichever results in a lower concentration) in water, air, biota, and soil. Based on site utilization and potential future use considerations, New Jersey RDCSCC were used as CVs. They are primarily based on human health impacts but also consider natural background concentrations, analytical detection limits and ecological effects. For groundwater and surface water, the New Jersey Groundwater Quality Standards (NJGWQS) and New Jersey Drinking Water Standards (NJDWS) are used as CVs. In the case of biota, the USEPA Screening Values were used. These are all health based standards.

Substances exceeding applicable environmental guideline CVs were identified as Contaminants of Concern (COC) and were evaluated further to determine whether these contaminants pose a health threat to exposed or potentially exposed receptor populations. If environmental guideline CVs are unavailable, these substances are also selected for further evaluation.

Limited investigations and sampling have been conducted at the Matteo site over several years. In 1991 during a test pit study conducted by the NJDEP, lead was detected at 39,200 mg/kg at a depth of four feet, and total petroleum hydrocarbons were identified at a depth of three feet at 44,600 mg/kg (NJDEP 2004). Surface soil sampling conducted in the junkyard in 1996 by the NJDEP identified the following analytes with their maximum concentrations: lead (19,900 mg/kg), copper (21,100 mg/kg), cadmium (49.6 mg/kg), and arsenic (59.2 mg/kg). Test pit sampling conducted in 1996 identified the presence of lead at 47,900 mg/kg at a depth of 12 feet where battery casings were known to be buried. Sediment sampling conducted in 1997 identified lead (8,500 mg/kg) and PCBs (78 mg/kg) in Hessian Run adjacent to the central portion of the crushed battery casing area (NJDEP 1997). The NJDEP conducted a comprehensive RI during the period of September 2000 to October 2002. As part of the RI, the NJDEP also completed an ecological study in the summer of 2003 and issued the Final Aquatic Biota Study in December 2004. Summarized below are the results from the RI study and USEPA sampling that was undertaken to support the NPL listing.

<u>On-site Contamination</u>

The NJDEP soil samples were analyzed for Full Target Compound List (TCL) Organic Compounds including pesticides and polychlorinated biphenyls (PCBs) and Target Analyte List (TAL) Metals.

Surface Soil

As part of the RI, four main types of soil investigations were conducted site-wide: PCB delineation in surface soils, shallow and deep monitoring well borings, Junkyard/Lead Sweating area Geoprobe® borings and test pit investigations (NJDEP 2004). Soil samples were collected at various depth intervals (0-0.5 feet, 1-1.5 feet, 2-2.5 feet and 3-3.5 feet). Tables 1 and 2 present the combined analytical results from the NJDEP sampling event; the range and mean of contaminant concentrations detected are provided. Results from 0-0.5 feet are presented in Table 1 as this depth is most pertinent when considering human contact with contaminated soil.

Analytical results indicated the presence of benzene and total PCBs above their respective environmental guideline CVs. Among the PCB mixtures, Aroclors 1254, 1260 and 1248 were detected, with 1254 being predominant. Elevated levels of metals detected in the soil samples included antimony, arsenic, cadmium, copper, lead, mercury, nickel, thallium and zinc (see Table 1).

In April 2005, the USEPA observed flooding at the Matteo site and collected surface (depth < 2 feet) samples from areas that were observed to be flooded. Analytical results indicated lead concentrations similar to what was observed in the NJDEP RI study; the lead concentration ranged from 15,100 to 27,900 mg/kg (USEPA 2006). The PCBs ranged from 2.6 to 200 mg/kg.

The COCs for on-site surface soil are total PCBs, antimony, arsenic, cadmium, copper, lead, mercury, nickel, thallium and zinc.

Sediment

A total of 416 sediment samples were collected from the Hessian Run and Woodbury Creek estuary surrounding the site (NJDEP 2004). The samples were collected at 145 locations distributed over 28 transects and 14 discrete locations from depths of 0-6 inches, 12-24 inches, and 24 to 36 inches. The samples were analyzed for lead, PCBs, and a TAL Metals analysis. Table 3 presents a summary of samples collected from the 0-2 feet interval.

Analytical results indicated the presence total PCBs and metals (antimony, arsenic, beryllium, cadmium, copper, lead and zinc) above their respective environmental guideline CVs. The highest concentrations of lead were detected along the central portion of the north shoreline of the site. Concentrations over 15,000 mg/kg were detected in all three depth intervals, with the highest observed in the 1-2 feet depth interval (35,200 mg/kg). These results are apparently attributable to the battery casing buried along this shoreline.

The COCs for sediment are total PCBs, antimony, beryllium, cadmium, copper, lead and zinc. Arsenic is excluded for reasons explained in the previous section.

Groundwater

NJDEP installed 26 monitoring wells to characterize the groundwater at the site; 18 shallow and eight deep (approximately 55 to 65 feet below mean sea level). Three rounds of groundwater sampling and analysis (Round 1: December 2000; Round 2: January 2001; and Round 3: April 2002) were performed to characterize the quality of the groundwater at the site. The results from unfiltered samples are summarized in Tables 4 (shallow monitoring wells) and 5 (deep monitoring wells). The analytical results were compared to the NJDEP Ground Water Quality Criteria (GWQC) in addition to the ATSDR environmental guideline CVs.

Metals (primarily aluminum, arsenic, cadmium, chromium, lead, manganese and zinc) were detected above the environmental guideline CVs and/or the GWQC in shallow monitoring wells throughout the site. These detections are believed to be attributable to suspended sediments in the samples. These inorganics were greatly reduced in concentration, or not detected, in filtered samples from the same event.

As with the shallow monitoring wells, metals (primarily aluminum, arsenic, lead and manganese) were detected above GWQC in the deep monitoring wells throughout the site. In addition, vinyl chloride and bis(2-ethylhexyl)phthalate were detected above the environmental guideline CVs and/or the GWQC.

Samples of groundwater seeping from the shoreline were collected at 10 locations along Hessian Run and Woodbury Creek and analyzed for lead. The results of all unfiltered samples exceeded the GWQS for lead (10 micrograms per liter, µg/L), with concentrations ranging from 29.1 µg/L to 2,370 µg/L.

The COCs for groundwater are bis(2-ethylhexyl)phthalate, aluminum, cadmium, chromium, lead and nickel. Arsenic was not considered a COC since it is believed not to be a site related contaminant.

Groundwater/Potable Well

Samples were collected from the on-site potable well, designated as the Matteo well (which supplied the Matteo office and garage buildings) during round 1 and 2 of groundwater sampling events (NJDEP 2004). Iron, manganese and sodium were present at levels exceeding the NJDWS; however, the secondary drinking water standards for these metals are not health based standards. Therefore, there are no COCs present in the on-site potable well.

<u>Off-site Contamination</u>

Surface Water

In 1996, NJDEP collected eight surface water samples in Hessian Run and Woodbury Creek as part of Preliminary Assessment and Site Investigation (NJDEP 1997). The results were non-detects for volatile and semi-volatile organic compounds. Lead was detected and ranged from 4 – 244 µg/L. In November 2000, NJDEP collected additional surface water samples as part of the RI. Surface water samples were collected at 12 locations in Hessian Run and Woodbury Creek and were analyzed for lead (NJDEP 2004). The levels were below the New Jersey Action Level for lead (see Table 6). Therefore, there are no COCs for surface water for the Matteo site.

Groundwater/Potable Wells

Samples were collected from two nearby off-site potable wells during the RI: one at the automobile repair shop located southwest to the site; and one at the adjacent residence east of the scrap yard area designated as the residential house well (NJDEP 2004). The samples were analyzed for the volatile organic chemicals, semi-volatile organic chemicals, TAL Metals and pesticides/PCBs.

The results are summarized in Table 7. The only contaminants detected above the CV were vinyl chloride and arsenic; both were detected in the potable well located at the automobile repair shop. Both samples collected from this potable well indicated concentrations of vinyl chloride and arsenic (4.8 µg/L and 15 µg/L, respectively), above NJDWS. Vinyl chloride was also detected in three of the on-site deep monitoring wells located in the central to southeastern portions of the site. The RI reports that the estimates drawn from the data collected support the likelihood that the dissolved solvents observed in the deep groundwater could have been released to the site in the areas of land disturbance/landfilling that occurred during the 1960's and 1970's (NJDEP 2004). Therefore, vinyl chloride and arsenic are the COCs for the one of the off-site potable wells.

Biota

In order to assess the potential biological impact of lead and PCB contamination in sediment and soil, an aquatic toxicity study was conducted in the summer of 2003. The study included water and sediment quality investigations, sediment toxicity assessments, fish and benthic macroinvertebrate community assessments, and tissue contaminant sampling on earthworms, fish, shellfish, and wetland plants. Table 8 summarizes the results from tissue analysis in pumpkinseed, *Lepomis gibbosus*, a fish sometimes consumed by humans. Due to the small size of this fish, it was not possible to sample edible portions of this species, so whole fish were analyzed. Both lead and total PCBs were present with concentrations ranging from 0.2 to 0.6 mg/kg. Total PCBs was elevated above the USEPA Region3 RBCs for total PCBs in fish. Both lead and total PCBs were selected as the COCs for biota.

Surface Soil

See previous health consultation attached in Appendix B for discussion on off-site soil contamination.

<u>Summary of Contaminants of Concern</u>

The COC are those contaminants that are present at levels higher than the media-specific standards/criteria or the environmental comparison values. The COC present in soil, sediment groundwater, and biota are as follows:

	Media	**VOCs/SVOCs**	**Metals**
On-site	Soil	Total PCBs	Antimony, arsenic, barium, cadmium, copper, lead, mercury, nickel, thallium, zinc
	Sediment	Total PCBs	Antimony, arsenic, beryllium, cadmium, copper, lead, zinc
	Groundwater (monitoring wells)	Bis(2-ethylhexyl)phthalate, vinyl chloride	Aluminum, arsenic, cadmium, chromium, lead, nickel
Off-site	Groundwater (potable wells)	Vinyl chloride	Arsenic
	Biota	Total PCBs	Lead
	Soil		Lead

Discussion

Exposure Pathway Analysis

An exposure pathway is a series of steps starting with the release of a contaminant in a media and ending at the interface with the human body. 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. a receptor population.

Generally, the ATSDR considers three exposure 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.

Based on sampling data and knowledge of accessibility of the site to the population, exposure pathways for individuals who live (or lived) in the vicinity of the Matteo site were identified as follows (see Table 9):

Completed Pathways

<u>Ingestion of contaminated soil from Matteo site (past):</u> Incidental ingestion of contaminated soil in the past is a completed exposure pathways for the Matteo site. Surface soils on the site are contaminated with metals and PCBs. The contaminated soil is located throughout the Matteo property. Although the site is currently fenced from Crown Point Road and the Willow Woods manufactured home facility, access could have been obtained in the past through trails connecting the Willow Woods manufactured home facility to the southwestern boundary of the Matteo property.

<u>Ingestion of contaminated biota from the Woodbury Creek (past, present and future)</u>: Biota (e.g., fish) in the Woodbury Creek and Hessian Run are exposed to contaminated sediment. The inactive landfill portion of the Matteo property is situated within the 100-year floodplain of the Woodbury Creek and Hessian Run. Waters of Hessian Run and Woodbury Creek are in direct contact with the inactive landfill portion of the site during flooding events. A site walk was completed after a major rain event and the landfill portion of the property was observed to be flooded, and there are no flood containment measures present at the facility. Since PCBs bioconcentrate in the fatty tissues of aquatic animals, contaminants of concern may have been introduced into the aquatic food chain. The RI reported information for a population analysis of fish within Woodbury Creek and Hessian Run, identifying 17 species of fish at 12 sampling points within the creeks. The majority (13) were primarily freshwater species. Of these, five species were game fish, including pumpkinseed, brown bullhead catfish, white perch, carp and

black crappie (NJDEP 2004). The Delaware River, located 1.2 miles to the northwest, is considered a fishery and supports populations of blueback herring, smallmouth bass, American shad, hickory shad, river herring, and channel catfish. An advisory is in effect for the Delaware River regarding the consumption of striped bass, channel catfish, white sucker, largemouth bass, smallmouth bass and American eel due to PCB, dioxin and mercury contamination (NJDEP 2006a).

Fishing activity has been observed along this portion of Woodbury Creek (USEPA 2006a). It has been stated that it was not uncommon to see people with buckets of catfish or river herring, and that other species such as largemouth bass, bluegill and carp are fished mainly for sport from Woodbury Creek (USEPA 2006a). Though Woodbury Creek is a popular location, the area adjacent to the Matteo site has limited access, primarily by boat. It is estimated that 100-1,000 pounds of fish are harvested each year from this area (USEPA 2006a). Hazardous contaminants such as heavy metals and PCBs have been identified at the site, although contamination of the adjacent surface waters cannot be solely attributable to the Matteo site.

<u>Ingestion of water from off-site potable wells (past)</u>: There are three private water supply wells in the immediate area of the Matteo site: the scrap yard (on-site), the residence located adjacent to the scrap yard to the east, and the automobile repair shop located adjacent to the scrap yard to the southwest (the latter two classified as off-site wells). It is reported that the wells at the scrap yard and the adjacent automobile repair shop are not used for potable purposes; however it can be assumed that they may have been used in the past for potable purposes (USEPA 2005). Sampling has indicated that there are no COCs present in the on-site potable well at the scrap yard and the off-site residential well; therefore exposures from these two wells are not evaluated further. The contaminants detected in the potable well located at the automobile repair shop will evaluated for public health implications.

Potential Pathway

<u>Ingestion of water from potable wells (present and future):</u> The potential receptors of the contaminants in the deep groundwater are the private potable wells located downgradient of the identified contamination. According to the NJDEP, the Gloucester County Health Officer has indicated that “very few” private potable wells are in use in the area (NJDEP 1996). Well records indicate that there are approximately 20 private potable wells within 2½-miles of the site; however, it is not clear how many are currently in use. Off-site potable well use data is needed to evaluate the public health implications of this pathway.

Eliminated Pathways

<u>Ingestion of sediment from Hessian Run and Woodbury Creek (past, present and future):</u> Although the sediment is contaminated with metals and PCBs, contact with it is not expected to occur to an extent that may lead to adverse heath effects. The site was accessible in the past; however, the shoreline is not expected to be frequented by site visitors or trespassers because of the remote location. The possibility of fishers/anglers contacting the sediment is greater but even

this scenario is very incidental. Therefore, this pathway is classified as being eliminated in the past, present and future.

Ingestion of water from municipal wells: There are no drinking water intakes within 15 miles downstream (or upstream in tidal areas) of the site (NJDEP 1997). Groundwater is the source of drinking water within a four-mile radius of the Matteo site. Municipal wells provide the vast majority of potable water. There are three municipal wells situated within one mile of the Matteo site. Public water to the area has been available since 1966. The West Deptford Municipal Well No.6 is located 0.6 miles southeast of the Matteo site and is 356 feet in depth. National Park Borough operates two wells approximately 280 feet in depth, 0.9 miles northwest of the site. Records show that the West Deptford public well was installed in 1973 and is 356 feet deep, with a screened interval from approximately 346 to 356 feet below ground surface; this supply well screen depth is approximately 250 feet deeper than the deepest monitoring wells installed and samp1ed during the Matteo site RI (NJDEP 2004). This municipal well has no treatment for VOCs, and no VOCs of concern have ever been detected in distribution system samples collected at the wellhouse. In September 2004, additional deep groundwater sampling was conducted down gradient of the site, situated between the eastern edge of the site and the West Depford Supply Well. The results did not indicate contamination of the down gradient public supply well (NJDEP 2006b). Therefore this pathway is classified as eliminated.

Public Health Implications of Completed Pathways

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 the epidemiologic and toxicologic 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 Matteo site include the incidental ingestion of soils and consumption of biota from Hessian Run and Woodbury Creek and ingestion of off-site potable well water. Since there is insufficient information available on the nature and magnitude of potential exposures associated with consumption and usage of off-site potable water, the public health implications of this potential pathway could not be determined at this time.

Health Guideline Comparison – Non-Cancer Health Effects

To assess the public health implications of site-specific exposures, estimated exposure doses, derived from site-specific exposure conditions, are compared to dose-based comparison values. 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. In toxicological literature, observed effect levels include:

- no-observed-adverse-effect level (NOAEL); and
- lowest-observed-adverse-effect level (LOAEL).

NOAEL is the highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals. LOAEL is the lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

If site-specific exposure dose estimates exceed the health guideline CV, this dose is compared to the NOAEL or LOAEL. If the site-specific exposures are well below a NOAEL that is based on a human study, the likelihood for adverse health effects in the exposed population would be low. If, however, the NOAEL is based on an animal study, exposure doses near the NOAEL could be of concern because of uncertainty in the relative sensitivity of animals as compared to humans. In the instance where the MRL is derived from a LOAEL, the likelihood of adverse health effects increases as site-specific exposures approach a LOAEL derived from either a human or animal study. For this analysis, relevant literature values and professional judgment is used in weighing what is known and unknown, including uncertainties and data limitations.

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 may be used, such as USEPA Reference Dose (RfD). The RfD is an estimate of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

Past Incidental Ingestion of Surface Soil

Local residents and trespassers reportedly use the site for recreational purposes (i.e., hunting, camping, hiking and fishing). Exposures are based on ingestion of contaminated media; non-cancer exposure doses were calculated using the following formula:

$$\textit{Exposure Dose (mg/kg/day)} = \frac{C \times IR \times EF}{BW} \times \frac{ED}{AT}$$

where, mg/kg/day = milligrams of contaminant per kilogram of body weight per day;
C = concentration of contaminant in soil (mg/kg);
IR = soil ingestion rate (kg/day);

EF = exposure factor representing the site-specific exposure scenario;
ED = exposure duration (years);
AT = averaging time (years); and
BW = body weight (kg)

Based on the USEPA Exposure Factors (USEPA 1997) and site-specific conditions, the following assumptions were used to calculate exposure doses for children and adults:

Media	Receptor Population	Ingestion Rate (mg/day)	No. of Days of Exposure Per Year	Body Weight (kg)
Soil	Child	200	78 days (3 days per week, 6 months per year)	21
	Adult	100		70

Table 10 presents calculated doses, expressed in scientific notation, which is simply a method for expressing either very large or very small numbers. For example, 1,000,000 can be expressed in scientific notation as 1.00E06; and 0.001 can be expressed as 1.00E-03, respectively.

As presented in Table 10, maximum and mean exposure doses of on-site surface soil COCs were compared with the corresponding chronic health guideline CVs.

Based on maximum concentrations of arsenic, barium, cadmium, copper, mercury, nickel, thallium and zinc detected in surface soil, chronic exposure doses calculated for children and adults were lower than the corresponding health guideline CVs. As such, exposures to these COCs are unlikely to cause non-cancer adverse health effects.

Based on maximum concentrations of total PCBs and antimony detected in surface soil, chronic exposure doses calculated for children were higher than the corresponding health guideline CVs. A brief evaluation of non-cancer health implications for these contaminants and lead is presented below.

<u>PCBs</u>. Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. The chronic oral RfD for Aroclor 1254, one of the PCB congeners, is 0.00002 mg/kg/day, and is based on inflammation of eyelids, distorted growth of fingers, and suppressed immune response in monkeys (ATSDR 2000). A LOAEL of 0.005 mg/kg/day and an uncertainty factor of 300 were used to calculate the oral RfD. Based on the maximum concentration of total PCBs detected in the soil (0 – 0.5 feet depth), the exposure dose calculated for children (0.00044 mg/kg/day) and adults ((0.000066 mg/kg/day) exceeded the RfD (0.00002 mg/kg/day) (see Table 10). The maximum exposure dose was about 11 times lower than the LOAEL. Based on the mean concentration of total PCBs detected in the soil (more likely

exposure scenario), the child exposure dose (0.000009 mg/kg/day) was lower than the RfD. As such, non-cancer adverse health effects associated with exposure to total PCBs detected in the on-site soil (0 - 0.5 feet depth) are not expected.

Antimony. Ingesting large doses of antimony can cause vomiting. Long-term chronic animal studies have also reported liver damage and blood changes (ATSDR 1992). Although information on the toxic effects of chronic oral exposure to antimony is limited, antimony appears to affect heart muscle, the gastrointestinal tract, and the nervous system. The chronic oral RfD for antimony (0.0004 mg/kg/day) is based on reduced longevity, blood glucose, and altered cholesterol levels of a group of male and female rats in an oral bioassay study. A LOAEL of 0.35 mg/kg/day and an uncertainty factor of 1,000 were used to calculate the oral RfD. Based on the maximum concentration of antimony detected in the soil (0 – 0.5 feet depth), the exposure dose calculated for children (0.00177 mg/kg/day) exceeded the RfD (0.0004 mg/kg/day) whereas the adult exposure dose (0.000265 mg/kg/day) was lower than the RfD (see Table 8). Based on the mean concentration of antimony detected in the soil (more likely exposure scenario), the child exposure dose (0.000206 mg/kg/day) was lower than the RfD. As such, non-cancer adverse health effect associated with exposure to antimony detected in the on-site soil (0 – 0.5 feet depth) is not expected.

The RI reports that site activities are expected to be a minor source of metals, other than lead observed above criteria in the soils and or groundwater. The majority of the metals are believed to be from a naturally occurring source associated with the geologic formations below the site. Arsenic, in particular, is known to naturally occur at relatively high levels in the geologic formations of the type present at the Matteo site (NJDEP 2004).

Lead. As previously indicated, the maximum and mean concentration of lead (20,700 and 2,904 mg/kg) detected in the surface soil exceeded the New Jersey RDCSCC (400 mg/kg). No MRL or RfD is available for lead. Accumulation of lead in the body can cause damage to the nervous or gastrointestinal system, kidneys, or red blood cells (ATSDR 2006). Children, infants, and fetuses are the most sensitive populations. Lead may cause learning difficulties and stunted growth, or may endanger fetal development. Health effects associated with lead exposure, particularly changes in children's neurobehavioral development, may occur at blood lead levels so low as to be essentially without a threshold (i.e., no NOAEL or LOAEL is available). In addition, it is necessary to evaluate a child's total exposure to lead from multiple sources. As such, lead exposures to children accessing the Matteo site were evaluated and are presented below.

Incidental Ingestion of Biota

Fishing activity has been observed close to the Matteo site. Exposures are based on ingestion of contaminated biota; non-cancer exposure doses were calculated using the following formula:

$$\textit{Exposure Dose (mg/kg/day)} = \frac{\text{C x IR x EF}}{\text{BW}} \text{ x CR x } \frac{\text{ED}}{\text{AT}}$$

where, mg/kg/day = milligrams of contaminant per kilogram of body weight per day;
C = concentration of contaminant in fish tissue (mg/kg);
IR = fish ingestion rate (kg/day);
CR = cooking reduction assumed to be 30 percent (ATSDR 2006)
EF = exposure factor representing the site-specific exposure scenario;
ED = exposure duration (years);
AT = averaging time (years); and
BW = body weight (kg)

Based on the USEPA Exposure Factors (USEPA 1997) and site-specific conditions, the following assumptions were used to calculate exposure doses for children and adults:

Media	Receptor Population	Ingestion Rate (g/day)	No. of Days of Exposure Per Year	Body Weight (kg)
Biota (fish)	Child	1.86	365	21
	Adult	6		70

It should be noted that the assumptions used for biota exposure doses are conservative due to the uncertainties associated with small sample size, the use of regional fish consumption data and use of entire fish tissue analyses (rather than only the edible portions). As presented in Table 11, maximum and mean exposure doses from consumption of fish were compared with the corresponding chronic health guideline CVs. Health guideline CVs are unavailable for lead.

PCBs. Based on the maximum concentration of total PCBs detected in the fish tissue, the exposure dose calculated for children (0.0000398 mg/kg/day) and adults (0.0000396 mg/kg/day) exceeded the RfD (0.00002 mg/kg/day) (see Table 11). The exposure doses calculated for children and adults based on mean total PCBs (0.0000247 and 0.0000246 mg/kg/day, respectively) were slightly elevated above the RfD. The chronic oral RfD for Aroclor 1254, one of the PCB congener, (0.00002 mg/kg/day) is based on inflammation of eyelids, distorted growth of fingers, and suppressed immune response in monkeys. The LOAEL was established at 0.005 mg/kg/day. The maximum and the mean exposure dose were about 126 and 202 times, respectively, lower than the LOAEL. As such, non-cancer adverse health effects associated with exposure to total PCBs detected in fish are not expected.

Lead. The USEPA Integrated Exposure Uptake Biokinetic (IEUBK) model was used to calculate the geometric mean of lead in blood in children, aged up to 84 months (USEPA 1994a). The model also provides the probability estimate (expressed as P_{10}) that a typical child will have a blood lead level greater or equal to the level of concern established by the U.S. Centers for Disease Control and Prevention (10 µg/dL). This P_{10} estimate should be at or below a protection level of five percent, i.e., $P_{10} \leq 5$ percent, as recommended by the USEPA Office of Solid Waste and Emergency Response (USEPA 1994b).

Lead exposures associated with the recreational (i.e., intermittent) use of the Matteo site by children was evaluated using the IEUBK model (USEPA 2003a). Since it is more plausible that children aged 60-84 months access the site, the blood lead level as contributed by lead contaminated on-site soil ingestion was evaluated for this age interval. Furthermore, the IUEBK model was also used to estimate the contribution from ingestion of lead contaminated fish in Hessian Run and Woodbury Creek. This estimate included all age intervals up to 84 months.

The assumptions for the lead exposure scenario for children aged up to 84 months are as follows:

1. Children were exposed to soil containing lead each time the Matteo site was visited. Children aged 6-60 months were assumed to not to visit the site; their exposures to lead are limited to the default residential soil lead concentration. The visit frequency was assumed to be three days per week over six months of the year.
2. THE USEPA Exposure Factors Handbook was used to derive fish and meat consumption rates for the appropriate age intervals. The average daily fish intake rate for children 0-9 yrs was assumed to be 1.86 g/day. The fraction of fish per all meat consumed daily was assumed to be 2 percent based on default total meat intake rates (USEPA 1997).
3. IEUBK model default values were used for all other variables (USEPA 2002).

The predicted geometric mean blood lead levels and the probability of blood lead levels exceeding 10 µg/dL (P_{10}) for children are shown in the following table:

Exposure Scenario		
Age (months)	**Blood Lead Level[a] (µg/dL)**	**P_{10} (%)[b]**
6 -12[c]	3.9	2.4
12 – 24[c]	4.3	3.7
24 – 36[c]	4.1	2.8
36 – 48[c]	3.9	2.2
48 – 60[c]	3.3	0.97
60 – 72[d]	9.7	47
72 – 84[d]	8.6	38

[a]Geometric mean as calculated by the IEUBK model;
[b]Probability of blood lead level > 10 µg/dL;
[c]Soil lead concentration (residence only) = 200 ppm;
[d]Weighted soil lead concentration (includes site and residence) = 1,359 mg/kg
Calculated as follows: (2,904 mg/kg x 3 days/7 days) + (200 mg/kg x 4 days/7 days) = 1,359 mg/kg

The blood lead levels for children aged up to 84 months are below the action level (10 µg/dL). The P_{10} value for the 6-60 months age group interval was below the recommended protection level of five percent. There is no lead associated health risk for this age group from ingesting fish caught in Hessian Run and Woodbury Creek. For the exposure scenario of three site visits per week for ages 60 – 84 months, although the blood lead level was below 10 µg/dL, the P_{10} value ranged from 38 to 47 percent, elevated above the protection level of five percent. Therefore, it can be concluded that if children (aged 60- 84 months) were to visit the Matteo site at a frequency of three days per week, they may have health effects associated with that exposure.

An adult blood lead model estimated a geometric mean blood lead level of 4.5 µg/dL for adult workers. The calculated 95th percentile blood lead levels among fetuses of adult workers was 9.6 µg/dL (USEPA 2003b). The probabilities of fetal blood lead levels exceeding 10 µg/dL are 4.3 percent. As such, the potential for adverse health effects to adults associated with lead exposures from the Matteo site are not expected.

Past Ingestion of Potable Well Water

In order to assess past exposures from ingestion of off-site potable well water contaminants, an exposure dose was calculated using the following formula:

$$\textit{Exposure Dose (mg/kg/day)} = \frac{\mathrm{C \times IR \times EF}}{\mathrm{BW}} \times \frac{\mathrm{ED}}{\mathrm{AT}}$$

where mg/kg/day = milligrams of contaminant/kilogram of body weight/day;
C = concentration of contaminant in water (mg/L);
IR = ingestion rate (L/day);
EF = exposure factor representing the site-specific exposure scenario;
ED = exposure duration (years);
AT = averaging time (years); and
BW = body weight (kg).

The following exposure assumptions (USEPA 1997) were used to calculate contaminant doses.

Media	Receptor Population	Ingestion Rate (L/day)	No. of Days of Exposure Per Year	Body Weight (kg)
Groundwater	Child	1	365	21
	Adult	2		70

The estimated exposure dose was compared to health guideline CVs. Based on the concentration of vinyl chloride detected in the potable well located off-site at the automobile repair shop, the chronic exposure doses calculated for adults and children were lower than the corresponding health guideline CVs (see Table 12). As such, past exposures associated with ingestion of water from this well are unlikely to cause non-cancer adverse health effects.

Health Guideline Comparison – Cancer Health Effects

The site-specific lifetime excess cancer risk (LECR) indicates the cancer potential of 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

Exposure doses for cancer risk assessment were calculated using the following formula:

$$\textit{Cancer Exposure Dose (mg/kg/day)} = \frac{C \times IR \times EF}{BW} \times \frac{ED}{AT}$$

where C = concentration of contaminant in soil (mg/kg);
IR = soil ingestion rate (kg/day);
EF = exposure factor representing the site-specific exposure scenario;
ED = exposure duration (year);
BW = body weight (kg); and,
AT = averaging time (year).

Based on the USEPA Exposure Factors (USEPA 1997) and site-specific conditions, the following assumptions were used to calculate the exposure doses and the corresponding LECRs for adults:

Media	**Receptor Population**	**Ingestion Rate (mg/day)**	**No. of Days of Exposure Per Year**	**Years Exposed**	**Body Weight (kg)**
Soil	Adult	100	78 days (3 days per week, 6 months per year)	30	70

Past Incidental Ingestion of Surface Soil

The USDHSS cancer classification of the COCs detected in the soil (0 – 0.5 feet) of on-site areas is presented in Table 13. Antimony, barium, copper, mercury, thallium and zinc are not classified as carcinogens. Limited epidemiologic studies have indicated that exposure to cadmium in food or drinking water is not carcinogenic and quantitative estimate of carcinogenic risk from oral exposure to copper was not assessed (USEPA 2007).

Based on previously described exposure assumptions, LECR was calculated by multiplying the exposure dose by the cancer slope factor. LECRs based on maximum contaminant concentrations detected in the soil, biota and potable wells are presented in Table 13; LECR values in parentheses are based on mean contaminant concentrations. The cancer slope factor for nickel is currently unavailable.

Based on maximum concentration of total PCBs detected in on-site soil, the calculated LECR was approximately six in 100,000. At the mean soil contaminant concentration (more likely exposure scenario) for total PCBs, an excess cancer risk of approximately one cancer case per 1,000,000 individuals was determined. This calculated LECR is considered a very low to low increased risk when compared to the background risk for all or specific cancers.

Based on maximum arsenic concentration in soil, the calculated LECR was approximately 10 in 1,000,000. At the mean soil contaminant concentration (more likely exposure scenario) for arsenic, an excess cancer risk of approximately three cancer cases per 1,000,000 individuals was determined. This calculated LECR is considered a very low to low increased risk when compared to the background risk for all or specific cancers.

Lead has been classified as a carcinogen by the USDHHS[1] and the USEPA[2]. The carcinogenicity of inorganic lead and lead compounds has been evaluated by the USEPA (USEPA 1986, 1989). The USEPA has determined that data from human studies are inadequate for evaluating the carcinogenicity of lead, but there are sufficient data from animal studies which demonstrate that lead induces renal tumors in experimental animals. In addition, there are some animal studies which have shown evidence of tumor induction at other sites (i.e., cerebral gliomas; testicular, adrenal, prostate, pituitary, and thyroid tumors). A cancer slope factor has not been derived for inorganic lead or lead compounds, so no estimation of LECR can be made for lead exposure.

Incidental Ingestion of Biota

Based on maximum and mean total PCBs concentrations in fish tissue, the calculated LECRs are approximately three and two in 100,000, respectively (see Table 13). The cancer risk associated with lead exposures are discussed earlier. This estimate includes the following uncertainties: small sample size, the use of national fish consumption data and use of entire fish tissue analyses (rather than only the edible portions).

Past Ingestion of Potable Well Water

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[1]Lead and Lead Compounds are listed in the Eleventh Edition of the Report on Carcinogens as "reasonably anticipated to be human carcinogens" (NTP 2006)
[2]Probable human carcinogen (B2)

Based on maximum and mean concentrations of vinyl chloride detected in the off-site potable well, the calculated LECR was approximately eight and seven in 100,000, respectively (see Table 13). The LECRs based on the maximum and mean arsenic levels were calculated to be approximately 30 and 20 in 100,000, respectively. It was assumed that the water was used for potable purposes for a period of 30 years. This is a conservative assumption based on the fact that public water has been available in the area since 1966 and the well has not been reportedly used for drinking water (USEPA 2005). The reader is cautioned that the LECRs for past exposures provided for this pathway is not evidence-based due to the lack of information regarding actual ingestion of the well water necessary to interpret past exposures.

Health Outcome Data

Based on a review of data available from the USEPA and NJDEP, a completed exposure pathway existed for the Matteo site by area residents accessing the contaminated soil present throughout the site. Exposures may have continued for years until fences were installed and the pathway was partially interrupted. A review of health outcome data (e.g., adverse pregnancy outcomes, cancers, deaths) may be conducted to assess the public health significance of these completed exposure pathways. However, due to the small number of individuals exposed, an evaluation of available health data is unlikely to produce interpretable results.

Because of the potential for exposure to lead in contaminated site media, data on blood lead tests were evaluated for children living in the Thorofare area, especially those living close to the site on Crown Point Road. Information from the NJDHSS' Childhood Lead Poisoning Surveillance System is summarized below.

Blood lead is an excellent indicator of exposure to lead. Current state regulations, in accordance with federal Centers for Disease Control and Prevention (CDC) guidelines, require health care providers to do a blood lead test on all one and two year old children. This is the age at which lead poisoning is most damaging to the developing nervous system. State regulation requires all clinical laboratories to report the results of all blood lead tests to the NJDHSS. Prior to July 1999, only blood lead tests above 20 micrograms per deciliter (μg/dL) were reportable. While the current CDC blood lead guideline is 10 μg/dL, all blood-lead test data are reportable to the NJDHSS' Childhood Lead Poisoning Prevention Surveillance System.

Data from the Childhood Lead Poisoning Prevention Surveillance System was reviewed for the period July 1999 through March 2007 for Thorofare. A total of 355 Thorofare children were tested during this period. The age range for children tested was 0.4 to16.4 years. The range of blood lead levels in Thorofare children was 0.4 to 37 μg/dL. Six children were found to have a blood lead level above the CDC guideline during this time period. The geometric blood lead average was 2.9 μg/dL with a 95% confidence interval of 2.8 to 3.1 μg/dL. The blood lead levels measured in Thorofare area children are similar to statewide average levels.

In the mobile home park immediately adjacent to the Matteo site, 21 children had blood lead tests during this time period. The age range for these children was 0.8 to11.7 years. The range of blood lead levels was 2.0 to 9.0 μg/dL. No children were found to have a blood lead level above the CDC guideline. The geometric blood lead average was 3.7 μg/dL with a 95% confidence interval of 3.0 to 4.7 μg/dL. While the blood lead average value was slightly higher for these children compared to all Thorofare children, the difference was not statistically significant and may be due to the relatively small number of children in this neighborhood.

Child Health Considerations

The NJDHSS and ATSDR recognize that infants and children may be more sensitive to exposures than adults in communities with contamination in water, soil, air, or food. This sensitivity is the result of a number of factors. Children are more likely to be exposed because they play outdoors and they sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than adults, which mean they breathe dust, soil, and heavy vapors close to the ground. Children are also smaller, potentially resulting in higher doses of chemical exposure per unit body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

The NJDHSS and ATSDR evaluated the potential risk for children residing in the area who were exposed to site contaminants. The exposures doses calculated for children based on the maximum concentrations of PCBs and antimony in surface soil, PCBs in biota, and arsenic and vinyl chloride in potable wells indicate that adverse non-cancer health effects in children are not expected.

The maximum concentrations of lead detected in surface soil (20,700 mg/kg) considerably exceeded the New Jersey RDCSCC (400 mg/kg). Although no MRL or RfD is available for lead, these levels are of concern. Environmental exposure to lead has long been recognized as a public health problem particularly among children. Excessive concentration of lead in soil has been shown to increase blood lead levels in young children (ATSDR 1999). Some of the health effects of lead exposure on various organ systems are permanent or latent and may appear after exposure has ceased. Signs and symptoms associated with lead toxicity include decreased learning and memory, lowered Intelligence Quotient (IQ), speech and hearing impairment, fatigue, and lethargy. The Centers for Disease Control and Prevention (CDC) action level for children up to 84 months of age is 10 µg/dL (ATSDR 2006; CDC 1991). In other words, CDC considers children to have an elevated level of lead if the amount of lead in the blood is at least 10 µg/dL. Based on the mean lead contamination in on-site soil and biota, it can be concluded that children (aged 60- 84 months) potentially visiting the Matteo site at a frequency of three days per week may have potential health effects associated with that exposure.

The potential cancer health effects associated with exposure to site-related contaminants were evaluated. The pathways evaluated were past ingestion of on-site soil, ingestion of biota and past ingestion of potable well water. Based on the maximum and mean concentrations of contaminants detected, the total calculated LECRs were estimated to be approximately four and three excess cancer cases per 10,000 individuals (including exposure to children), respectively (see Table 13). The calculated LECR is primarily driven by the presence of arsenic in well water. This estimate, as mentioned earlier, is not evidence-based due to the lack of information regarding actual ingestion of the well water necessary to interpret past exposures. As such, the actual cancer risk is estimated to be lower than the calculated theoretical risk shown in Table 13.

Public Comment

The public comment period for this public health assessment was from May 21 to June 21, 2008. No comments were received during this period.

Conclusions

The Matteo site is contaminated due to past site operations and waste disposal practices at the site. Waste materials including crushed batteries casings, residues from the smelting operation and unknown industrial and domestic solid wastes that were reportedly deposited on-site and buried over a period of several decades.

Contaminants of concern identified for the site were total PCBs, vinyl chloride, bis(2-ethylhexyl)phthalate, aluminum, antimony, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, thallium and zinc detected in the surface soil, sediment, groundwater and biota. There are completed exposure pathways via the incidental ingestion of contaminated surface soil, potable well water and ingestion of biota.

NJDHSS and ATSDR reached three important conclusions about the Matteo & Sons, Inc. site. First, NJDHSS concludes that the site represented a ***Public Health Hazard*** in the past for lead exposures present in off-site soil. Children live in the vicinity of the lead-contaminated off-site area. Results from the U.S. Environmental Protection Agency Integrated Exposure Uptake Biokinetic Model for Lead in Children indicated that if young children (aged 6 - 84 months) were to be exposed to levels of the mean concentrations of lead in soil at the contaminated area, blood lead levels of concern could result in some children. Data on blood lead tests were evaluated for children living in the Thorofare area, especially those living close to the site on Crown Point Road, because of the potential for exposure to lead in contaminated site media. While the blood lead average value was slightly higher for these children compared to all Thorofare children, the difference was not statistically significant and may be due to the relatively small number of children in this neighborhood. Presently, the lead-contaminated soil has been excavated and removed from the off-site areas.

Second, NJDHSS and ATSDR conclude that incidental ingestion of PCBs in on-site surface soil, ingestion of PCBs in biota and ingestion of vinyl chloride and arsenic in the off-site potable well posed a ***No Apparent Public Health Hazard*** in the past. The calculated LECRs are considered a very low to low increased risk when compared to the background risk for all or specific cancers. Currently, access to on-site soil has been restricted by permanent fencing around the site, which decreases contact with contaminated soil. This estimated cancer risk from ingestion of biota has many uncertainties such as small sample size, the use of national fish consumption data and use of entire fish tissue analyses (rather than only the edible portions). The off-site potable well at the automobile repair shop is not used currently for drinking water.

Third, NJDHSS and ATSDR cannot evaluate exposure and risk from other off-site private potable wells as it is not clear how many are currently in use. Therefore, this represents an ***Indeterminate Public Health Hazard***. Once this information becomes available, NJDHSS and ATSDR will assess the public health implications of this pathway.

At the present time, NJDHSS and ATSDR conclude that the exposures at the Matteo and Sons, Inc. site will not result in adverse health effects. Exposures in the past are unlikely to occur in the present time since actions have been taken to reduce and/or eliminate exposures. Furthermore, evaluation of exposures from ingesting PCB-contaminated biota indicated risks of approximately three and two excess cancer cases per 100,000 individuals, respectively. However, the assumptions used for biota exposure doses are conservative due to the uncertainties associated with small sample size, the use of regional fish consumption data and use of entire fish tissue analyses (rather than only the edible portions). Actual exposures are probably less frequent and to lower concentrations.

Recommendations

1. The USEPA should continue to restrict access to the Matteo site. The USEPA should continue to require and ensure that all contaminated areas remain fenced with posted signs where appropriate; and conduct site inspections to ensure the integrity of the fencing around the property.

2. The use of potable wells in the area should be more completely characterized to evaluate if people are being exposed to contaminated drinking water.

Public Health Action Plan (PHAP)

The purpose of a PHAP is to ensure that this health assessment 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 ATSDR and NJDHSS to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by the NJDHSS and the ATSDR are as follows:

Public Health Actions Undertaken by NJDHSS and ATSDR

1. The NJDHSS and ATSDR reviewed available environmental data and other relevant information for the Matteo site to determine human exposure pathways and public health issues.

2. A Letter of Technical Assistance was prepared and issued by the NJDHSS recommending immediate notification of residents of Willow Woods MHC and the single family residence of the surface soil lead contamination (see Appendix A).

3. On March 13, 2006, the NJDHSS attended a USEPA information session which involved meeting a group of residents living adjacent to the contaminated area to discuss health concerns.

4. On March 16, 2006, the NJDHSS and the ATSDR participated in USEPA public availability sessions to provide public education materials about the hazards of lead exposure to area residents.

5. A health consultation was prepared and issued by the NJDHSS evaluating public health implications of surface soil lead contamination at the Willow Woods Manufactured Home Community and a single family residence (see Appendix B).

6. The NJDHSS and ATSDR conducted two site visits and met with local health and public officials to identify community concerns.

Public Health Actions Planned by NJDHSS and ATSDR

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

2. In cooperation with the USEPA, public meetings will be scheduled to discuss the findings of this report and to determine and address any additional community concerns.

3. As additional off-site contamination data (e.g., from private wells) become available, the NJDHSS and ATSDR will prepare health consultation(s) in order to evaluate the public health implications of potential contamination.

4. New environmental, toxicological, or health outcome data, or the results of implementing the recommendation and proposed actions, may determine the need for additional actions at this site. The ATSDR and the NJDHSS will reevaluate and expand the PHAP as warranted.

References

[ATSDR] Agency for Toxic Substances and Disease Registry. 1992a. Toxicological profile for Antimony. US Department of Health and Human Services, Atlanta, Georgia.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2000. Toxicological profile for Polychlorinated Biphenyls. US Department of Health and Human Services, Atlanta, Georgia.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2006. Toxicological profile for Lead. US Department of Health and Human Services, Atlanta, Georgia.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2006. Public Health Assessment for Polychlorinated Biphenyl (PCB) Releases: Oak Ridge Reservation (USDOE) Oak Ridge, Anderson County, Tennessee (Public Comment). November 2006. Available from: URL: http://www.atsdr.cdc.gov/HAC/PHA/pcb_releases/pcb_releases_part4.pdf

[CDC] Centers for Disease Control. 1991. Preventing lead poisoning in young children. U.S. Department of Health and Human Services, October.

[NJDEP] New Jersey Department of Environmental Protection. Record of Telephone Discussion regarding potable well usage in the Matteo Area between Nick Sodano, NJDEP and Bill Atkinson, Health Officer for Gloucester County Health Department. May 8, 1996.

[NJDEP] New Jersey Department of Environmental Protection. 1997. Preliminary Assessment and Site Investigation Report – James Matteo & Sons, Inc. Site, West Depford township, Gloucester County.

[NJDEP] New Jersey Department of Environmental Protection. 2004. Final Remedial Investigation Report – Matteo Iron and Metal, West Depford, New Jersey. May 2004.

[NJDEP] New Jersey Department of Environmental Protection. 2004. Final Aquatic Biota Study Report – Matteo Iron and Metal, West Depford, New Jersey. December 2004.

[NJDEP] New Jersey Department of Environmental Protection. 2006a. A Guide to Fish Advisories for Eating Fish and Crabs Caught in New Jersey Waters. Available from: URL: http://www.state.nj.us/dep/dsr/2006fishadvisorybrochure.pdf

[NJDEP] New Jersey Department of Environmental Protection. 2006b. Final Remedial Investigation Report Addendum: Additional Well Installation and Sampling for Matteo Iron and Metal, West Depford, New Jersey. April 2006.

[USEPA] United States Environmental Protection Agency. 1994a. Guidance Manual for the IEUBK Model for Lead in Children. Office of Solid Waste and Emergency Response. OSWER Directive #9285.7-15-1. February 1994.

[USEPA] United States Environmental Protection Agency. 1994b. Memorandum: OSWER Directive: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive #9355.4-12. August 1994.

[USEPA] United States Environmental Protection Agency. 1997. Exposure Factors Handbook. EPA/600/P-95/002Fb. August 1997.

[USEPA] United States Environmental Protection Agency. 2000. Guidance for Assessing Chemical 2 Contaminant Data for Use in Fish Advisories. Washington (DC): Document No. EPA 823-B-00-008. November 2000. Available from: URL: http://www.epa.gov/waterscience/fishadvice/volume2/index.html

[USEPA] United States Environmental Protection Agency. 2002. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows® Version – 32 Bit Version. Office of Solid Waste and Emergency Response. OSWER Directive #9285.7-42. May 2002.

[USEPA] United States Environmental Protection Agency. 2003a. Assessing Intermittent or Variable Exposures at Lead Sites. Office of Solid Waste and Emergency Response. OSWER Directive #9285.7-76. November 2003.

[USEPA] United States Environmental Protection Agency 2003b. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, EPA-540-R-03-001, January 2003.

[USEPA] United States Environmental Protection Agency. 2005. Action Memorandum from Nick Magriples to George Pavlou, concerning document approval for a CERCLA removal action at the Matteo Iron and Metal Site, West Depford, Gloucester County, New Jersey. September 30, 2005.

[USEPA] United States Environmental Protection Agency. 2006a. HRS Documentation Record for Matteo & Sons, Inc.

[USEPA] United States Environmental Protection Agency. 2006b. Matteo Iron and Metal Site – Removal Action Update, March 2006.

[USEPA] United States Environmental Protection Agency. 2006c. Pollution Report on Matteo Iron and Metal Site – Emergency and Remedial Response Division, September 20, 2006.

[USEPA] U.S. Environmental Protection Agency 2007. Integrated Risk Information System (IRIS) database. Accessed on March 10, 2007 at: http://www.epa.gov/iris/subst/0141.htm.

Weston Solutions, Inc. Region 2 Removal Support Team (RST), 2005. Sampling Trip Report, Matteo Iron and Metal Site, May 12, 2005.

Weston Solutions, Inc. Region 2 Removal Support Team (RST), 2006. Soil Sampling Trip Report - Matteo Iron and Metal Site, March 3, 2006.

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CERTIFICATION

The public health assessment for the Matteo & Sons, Inc. site, Gloucester County, New Jersey was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures' existing at the time the public health assessment was initiated. Editorial review has been conducted by the cooperative agreement partner.

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Agency for Toxic Substances and Disease Registry

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

Alan Yarbrough
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Agency for Toxic Substances and Disease Registry

Table 1: Contaminant Concentration in On-site Surface Soil (0-0.5 feet) samples site-wide (sampling dates: September to November 2000; October 2001; April and June 2002)

Contaminant	No. of Detected Samples	Concentration (mg/kg)			Environmental Guideline Comparison Value (mg/kg)	New Jersey RDCSCC[1] (mg/kg)	Retained for Further Evaluation
		Minimum	Maximum	Mean			
Semi-Volatile Organic Compounds							
Total PCBs	99	0.046	216	4.43	0.32 (RBC[2])C	0.49	**Yes**
Metals							
Aluminum	17	0.13	8,040	3,486	100,000 (EMEG[3])	NA[4]	No
Antimony	7	0.36	865	183	20 (RMEG[5])	14	**Yes**
Arsenic	12	2.60	55	14	20 (EMEG)	20	**Yes**
Barium	6	122	2,940	803	5,500 (RBC)N	700	**Yes**
Cadmium	7	5.40	33	15	10 (EMEG)	1	**Yes**
Copper	11	7.00	2,590	839	60 (EMEG)	NA	**Yes**
Lead	16	3.60	20,700	2,904	NA	400	**Yes**
Manganese	16	18.3	1,140	324	3,000 (RMEG)	NA	No
Mercury	9	0.10	22	4	NA	14	**Yes**
Nickel	8	14.6	294	152	1,000 (RMEG)	250	**Yes**
Silver	1	2.40	2	2	300 (EMEG)	110	No
Thallium	2	2.60	6	4	5.5 (RBC)N	2	**Yes**
Zinc	16	15	16,200	2,065	600 (EMEG)	1,500	**Yes**

[1]Residential Direct Contact Soil Cleanup Criteria; ; [2]USEPA Region 3 Risk-Based Concentrations (N: Non-carcinogenic effects, C: Carcinogenic effects); [3]Environmental Media Evaluation Guide; [4]NA - Not Available; [5]Reference Media Evaluation Guide

Table 2: Contaminant Concentration in On-site Surface Soil (0-2 feet) samples site-wide (sampling dates: September to November 2000; October 2001; April and June 2002)

Contaminant	No. of Detected Samples	Concentration (mg/kg)			Environmental Guideline Comparison Value (mg/kg)	New Jersey RDCSCC[1] (mg/kg)	Retained for Further Evaluation
		Minimum	Maximum	Mean			
Volatile Organic Compounds							
Benzene	1	44	44	44	10 (CREG)[2]	3	**Yes**
Xylenes	2	32	560	296	30,000 (EMEG[3])	410	**Yes**
Semi-Volatile Organic Compounds							
Total PCBs	40	0.049	216	8.90	0.32 (RBC[4])C	0.49	**Yes**
Metals							
Aluminum	49	0.125	25,700	4,151	100,000 (EMEG)	NA[5]	No
Antimony	22	0.36	865	101	20 (RMEG[6])	14	**Yes**
Arsenic	41	1.9	55	10.2	20 (EMEG)	20	**Yes**
Barium	16	1.44	2,940	586	5,500 (RBC)N	700	**Yes**
Cadmium	15	1.4	33.3	10.4	10 (EMEG)	1	**Yes**
Copper	38	4.2	4,350	534	60 (EMEG)	NA	**Yes**
Lead	57	2	31,300	3,338	NA	400	**Yes**
Manganese	48	10.6	1,350	244	3,000 (RMEG)	NA	No
Mercury	26	0.09	22.3	2.19	NA	14	**Yes**
Nickel	18	10.4	502	133	1,000 (RMEG)	250	**Yes**
Silver	3	2.4	5.1	3.4	300 (EMEG)	110	No
Thallium	3	0.84	5.9	3.11	5.5 (RBC)N	2	**Yes**
Zinc	48	13.3	16,200	1,028	600 (EMEG)	1,500	**Yes**

[1]Residential Direct Contact Soil Cleanup Criteria; [2]Cancer Risk Evaluation Guideline; [3]Environmental Media Evaluation Guide; [4]USEPA Region 3 Risk-Based Concentrations (N: Non-carcinogenic effects, C: Carcinogenic effects); [5]NA - Not Available; [6]Reference Media Evaluation Guide

Table 3: Contaminant Concentration in Sediment (0-2 feet) (sampling dates: October and November 2000)

Contaminant	No. of Detected Samples	Concentration (mg/kg)			Environmental Guideline Comparison Value (mg/kg)	New Jersey RDCSCC[1] (mg/kg)	Retained for Further Evaluation
		Minimum	Maximum	Mean			
Semi-Volatile Organic Compounds							
Total PCBs	49	0.066	5.7	0.475	0.32 (RBC[2])C	0.49	**Yes**
Metals							
Aluminum	45	3,530	22,500	14,740	100,000 (EMEG[3])	NA[4]	No
Antimony	1	37.2	37.2	37.2	20 (RMEG[5])	14	**Yes**
Arsenic	43	4.1	104	16.7	20 (EMEG)	20	**Yes**
Barium	37	60.3	232	144	5,500 (RBC)N	700	No
Beryllium	7	1.3	3.1	2.1	100 (EMEG)	1	**Yes**
Cadmium	20	1.1	6	3.32	10 (EMEG)	1	**Yes**
Copper	45	7	195	72.8	60 (EMEG)	NA	**Yes**
Lead	132	8.5	20,250	492	NA	400	**Yes**
Manganese	45	24.5	1,390	469	3,000 (RMEG)	NA	No
Mercury	28	0.15	8.46	0.92	NA	14	No
Nickel	42	10.8	49.7	31.1	1,000 (RMEG)	250	No
Zinc	44	66.2	1,750	435	600 (EMEG)	1,500	**Yes**

[1]Residential Direct Contact Soil Cleanup Criteria; [2]USEPA Region 3 Risk-Based Concentrations (N: Non-carcinogenic effects, C: Carcinogenic effects); [3]Environmental Media Evaluation Guide; [4]NA - Not Available; [5]Reference Media Evaluation Guide

Table 4: Contaminant Concentration in On-site Monitoring Wells (4 – 17 feet) (sampling dates: December 2000, Jan-Feb 2001, April 2002)

Contaminant	No. of Detected Samples	Concentration (µg/L)			Environmental Guideline Comparison Value (µg/L)	NJ Groundwater Quality Standards (µg/L)	Retained for Further Evaluation
		Minimum	Maximum	Mean			
Semi-Volatile Organic Compounds							
Bis(2-Ethylhexyl)phthalate	1	7	7	7	NA[1]	3	**Yes**
Metals							
Aluminum	37	166	18,900	3,523	20,000 (RMEG[2])	200	**Yes**
Arsenic	12	7.4	83	27	0.02 (CREG[3])	3	**Yes**
Barium	2	366	402	384	700 (RMEG)	2,000	No
Cadmium	2	6.9	8.6	7.8	2 (EMEG[4])	4	**Yes**
Chromium	19	10	164	33	NA	70	**Yes**
Copper	4	35	137	94	300 (EMEG)	NA	No
Iron	40	190	64,900	11,659	NA	300	**Yes**
Lead	21	3	6,050	647	NA	5	**Yes**
Manganese	34	15.2	871	145	500 (RMEG)	50	**Yes**
Mercury	2	0.49	0.49	0.49	NA	2	No
Nickel	3	46	174	96	200 (EMEG)	100	**Yes**
Zinc	29	23	1,760	279	2,000 (EMEG)	2,000	No

[1]NA - Not Available; [2]Reference Media Evaluation Guide; [3]Cancer Risk Evaluation Guide; [4]Environmental Media Evaluation Guide

Table 5: Contaminant Concentration in On-site Monitoring Wells (55 - 65 feet) (sampling dates: December 2000, Jan-Feb 2001, April 2002)

Contaminant	No. of Detected Samples	Concentration (µg/L)			Environmental Guideline Comparison Value (µg/L)	NJ Groundwater Quality Standards (µg/L)	Retained for Further Evaluation
		Minimum	Maximum	Mean			
Volatile Organic Compounds							
cis-1,2-Dichlorothene	3	10	17	14	3,000 (RMEG[1])	70	No
Vinyl Chloride	5	11	17	14	0.03 (CREG[2])	1	**Yes**
Semi-Volatile Organic Compounds							
Bis(2-Ethylhexyl)phthalate	3	14	35	24	NA[3]	3	**Yes**
Metals							
Aluminum	13	236	1,410	525	20,000 (RMEG)	200	**Yes**
Arsenic	9	23.6	58.9	37.8	0.02 (CREG)	3	**Yes**
Barium	1	39.7	39.7	39.7	700 (RMEG)	2,000	No
Chromium	1	14.5	14.5	14.5	NA	70	No
Iron	17	912	57,000	26,085	NA	300	**Yes**
Lead	4	3.8	15.2	7.13	NA	5	**Yes**
Manganese	17	7.3	871	340	500 (RMEG)	50	**Yes**
Zinc	5	20.8	46.4	29.9	2,000 (EMEG[4])	2,000	No

[1]Reference Media Evaluation Guide; [2]Cancer Risk Evaluation Guide; [3]NA - Not Available; [4]Environmental Media Evaluation Guide

Table 6: Contaminant Concentration in surface water in Hessian Run and Woodbury Creek (sampling date: November 2000)

Contaminant	No. of Detected Samples	Concentration (µg/L)			Environmental Guideline Comparison Value (µg/L)	NJ Drinking Water Standards (µg/L)	Retained for Further Evaluation
		Minimum	Maximum	Mean			
Lead	24	2.25	6.86	2.72	NA	15[1]	No

[1]NJ Action Level for Lead in drinking water

Table 7: Contaminant Concentration in off-site Potable Wells (sampling dates: December 2000, January 2001, October and November 2001)

Contaminant	No. of Detected Samples	Concentration (µg/L)			Environmental Guideline Comparison Value (µg/L)	NJ Drinking Water Standards (µg/L)	Retained for Further Evaluation
		Minimum	Maximum	Mean			
Volatile Organic Compounds							
Acetone	2	2.4	2.6	2.5	9,000 (RMEG[1])	NA[2]	No
cis-1,2-Dichloroethene	2	2.2	2.4	2.3	3,000 (RMEG)	70	No
Methyl tert butyl ether	2	0.41	0.70	0.56	3,000 (RMEG)	70	No
Vinyl Chloride	2	3.5	4.8	4.15	0.03 (CREG[3])	2	**Yes**
Metals							
Arsenic	2	9	15	12	0.02 (CREG)	5	**Yes**
Zinc	6	43	110	71	2,000 (EMEG[4])	5,000	No

[1]Reference Media Evaluation Guide; [2]NA - Not Available; [3]Cancer Risk Evaluation Guide; [4]Environmental Media Evaluation Guide

Table 8: Contaminant Concentration in fish (*L. Gibbosus*) (sampling date: August and September 2003)

Contaminant	No. of Detected Samples	Concentration (mg/kg)			Environmental Guideline Comparison Value (mg/kg)	USEPA Screening Value[1] (mg/kg)	Retained for Further Evaluation
		Minimum	Maximum	Mean			
Lead	5	0.28	0.61	0.50	NA	NA	**Yes**
Total PCBs	18	0.23	0.66	0.41	0.0016[2]	0.02	**Yes**

[1]USEPA recommended screening value for total PCBs for recreational fishers; [2]USEPA Region 3 Risk-Based Concentrations (N: Non-carcinogenic effects, C: Carcinogenic effects)

Table 9: Summary of Exposure Pathways

Medium	Point of Exposure	Exposure Route	Exposed Population	Exposure Pathway Classification		
				Past	Present	Future
Surface soil	Matteo site	Ingestion, skin	Residents, hunters, trespassers	Completed	Eliminated[a]	Eliminated[a]
Groundwater	Off-site (Potable well)	Ingestion, inhalation, skin	Residents	Completed	Potential[b]	Potential[b]
Biota	Hessian Run Woodbury Creek	Ingestion	Residents, hunters, anglers	Completed	Completed	Completed

[a]Interrupted by the installation of a fence
[b]Data unavailable for all off-site wells

Table 10: Comparison of surface soil exposure doses with the Health Guideline CVs for the Matteo site

Contaminants of Concern	Maximum (mg/kg)	Mean (mg/kg)	Maximum Exposure Dose (mg/kg/day)		Health Guideline CVs[c] (mg/kg/day)	Potential for Non-cancer Health Effects
			Child[a]	Adult[b]		
Soil						
Total PCBs	216	4.43	4.41E-04 (9.04E-06[d])	6.61E-05 (1.36E-06)	2.00E-05 (RfD[e])	**Yes**
Antimony	865	183	1.77E-03 (3.73E-04)	2.65E-04 (5.60E-05)	4E-04 (RfD)	**Yes**
Arsenic	55	14	1.12E-04 (2.86E-05)	1.68E-05 (4.29E-06)	3E-04 (MRL)	No
Barium	2,940	803	6.00E-03	9.00E-04	6E-01 (MRL)	No
Cadmium	33.3	15	6.80E-05	1.02E-05	2E-04 (MRL[f])	No
Copper	2,590	839	5.29E-03	7.93E-04	1E-02 (MRL[g])	No
Lead	20,700	2,904	4.22E-02	6.34E-03	NA[h]	**Yes**
Mercury	22	4	4.49E-05	6.73E-06	2E-03 (MRL[i])	No
Nickel	294	152	6.00E-04	9.00E-05	2E-02 (RfD)	No
Thallium	5.9	4	1.22E-05 (8.16E-06)	1.84E-06 (1.22E-06)	7E-05 (RfD)	No
Zinc	16,200	2,065	3.31E-02	4.96E-03	3E-01 (MRL)	No

[a]Child exposure scenario: 3 days/week, 6 month/year, 200 mg/day ingestion rate and 21 kg body weight; [b]Adult exposure scenario: 3 days/week, 6 month/year, 100 mg/day ingestion rate and 70 kg body weight; [c]Comparison Value; [d]Based on mean contaminant concentration; [e]EPA Reference Dose, based on Aroclor 1254; [f]ATSDR Minimal Risk Level for intermediate exposures; [g]ATSDR Minimal Risk Level; [h]Not Available; [i]ATSDR Minimal Risk Level for intermediate exposures to mercuric chloride

Table 11: Comparison of biota exposure doses with the Health Guideline CVs for the Matteo site

Contaminants of Concern	Maximum (mg/kg)	Mean (mg/kg)	Maximum Exposure Dose (mg/kg/day)		Health Guideline CVs[c] (mg/kg/day)	Potential for Non-cancer Health Effects
			Child[a]	Adult[b]		
Total PCBs	0.66	0.41	3.98E-05 (2.47E-05)	3.96E-05 (2.46E-05)	2.00E-05 (RfD)	**Yes**
Lead	0.61	0.50	3.62E-05 (3.01-05)	3.60E-05 (3.00E-05)	NA	**Yes**

[a]Child (2-9 yrs) exposure scenario: 7 days/week, 12 months/year, 8 years exposure duration,1.86 g/day ingestion rate and 21 kg body weight and 30% cooking reduction; [b]Adult exposure scenario: 7 days/week, 12 months/year, 30 years exposure duration, 6 g/day ingestion rate and 70 kg body weight and 30% cooking reduction; [c]Comparison Value

Table 12: Comparison of ingestion of water from off-site potable wells exposure doses with the Health Guideline CVs

Contaminants of Concern	Maximum (µg/L)	Mean (µg/L)	Maximum Exposure Dose (mg/kg/day)		Health Guideline CVs[c] (mg/kg/day)	Potential for Non-cancer Health Effects
			Child[a]	Adult[b]		
Vinyl chloride	4.8	4.2	4.57E-04 (4.00E-04)	6.86E-05 (6.00E-05)	3.00E-03 (MRL)	No
Arsenic	15	12	1.43E-03 (1.14E-03)	2.14E-04 (1.71E-04)	3.00E-04 (MRL)	**Yes**

[a]Child (2-9 yrs) exposure scenario: 7 days/week, 12 months/year, ,1 L/day ingestion rate and 21 kg body weight; [b]Adult exposure scenario: 7 days/week, 12 months/year, 2 L/day ingestion rate and 70 kg body weight

Table 13: Calculated LECR associated with the contaminants detected in the Matteo site surface soil, potable wells and biota (*L. Gibbosus*)

Contaminants of Concern	Max. Conc.	DHHS[a] Cancer Class	Exposure Dose (mg/kg/day)	CSF $(mg/kg/d)^{-1}$	LECR[b]
Soil (mg/kg)					
Total PCBs	216	2	2.83E-05[c] (5.81E-07)	2	5.67E-05 (1.16E-06[d])
Antimony	865	3	1.13E-04		
Arsenic	55	1	7.22E-06 (1.84E-06)	1.5	1.08E-05 (2.76E-06)
Barium	2,940	3	3.86E-04		
Cadmium	33	1[e]	4.37E-06		
Copper	2,590	3	3.40E-04		
Lead	20,700	2[f]	2.72E-03		
Mercury	22	3	2.89E-06		
Nickel	294	2[g]	3.86E-05		
Thallium	5.9	3	7.87E-07		
Zinc	16,200	3	2.13E-03		
Biota (mg/kg)					
Total PCBs	0.66	2	1.70E-05[h] (1.05E-05)	2	3.39E-05 (2.11E-05)
Lead	0.61	2[f]	7.50E-05		
Potable wells (µg/L)					
Vinyl chloride	4.8	1	5.88E-05[i] (5.14E-05)	1.4	8.23E-05 (7.20E-05)
Arsenic	15	1	1.84E-04 (1.47E-04)	1.5	2.76E-04 (2.20E-04)
				Sum=	**3.58E-04 (2.92E-04)**

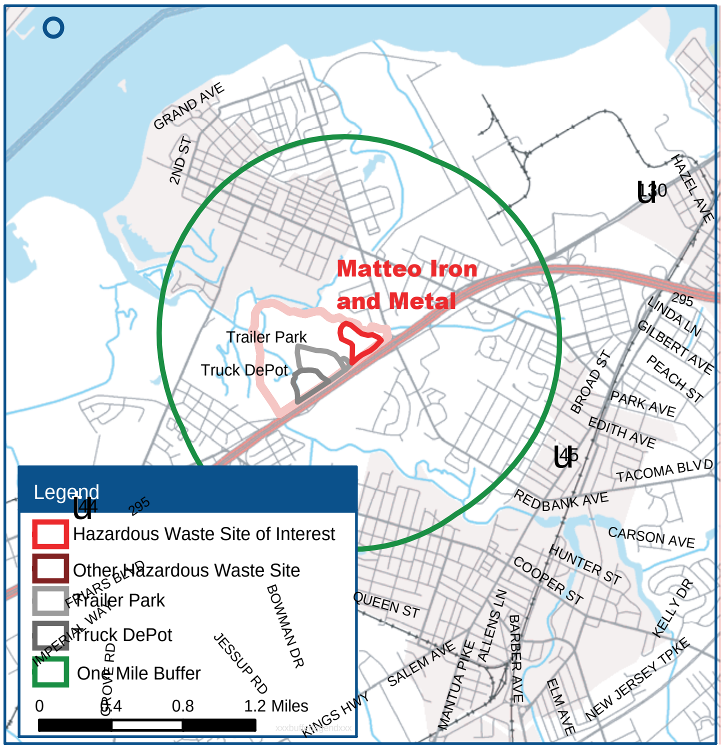
[a]Department of Health and Human Services Cancer Class: 1 = known human carcinogen; 2 = reasonably anticipated to be a carcinogen; 3 = not classified; [b]Lifetime Excess Cancer Risk; [c]Adult exposure scenario: 3 days/week, 6 months/year, 100 mg/day ingestion rate, 70 kg body weight and 30 year exposure duration; [d]Based on mean contaminant concentration; [e]Limited epidemiologic studies have indicated that exposure to cadmium in food or drinking water is not carcinogenic; [f]Cancer Slope Factor is unavailable for lead; [g]Cancer Slope Factor is unavailable for nickel; [h]Adult exposure scenario: 7 days/week, 12 month/year, 6 g/day ingestion rate, 70 kg body weight, 30% cooking reduction and 30 year exposure duration; [i]Adult exposure scenario: 7 days/week, 12 months/year, 2 L/day ingestion rate, 70 kg body weight and 30 year exposure duration

Figure 2: Map showing the Matteo & Sons, Inc. site and the surrounding area

Matteo Iron And Metal

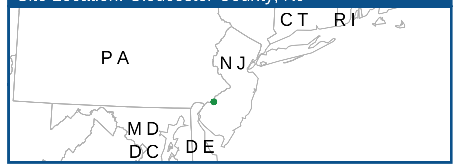
West Deptford Township, NJ

EPA Facility ID: NJD011770013



Base Map Source: Geographic Data Technology, May 2005.
Site Boundary Data Source: ATSDR Public Health GIS Program, May 2005.
Coordinate System (All Panels): NAD 1983 StatePlane New Jersey FIPS 2900 Feet

Site Location: Gloucester County, NJ



Demographic Statistics

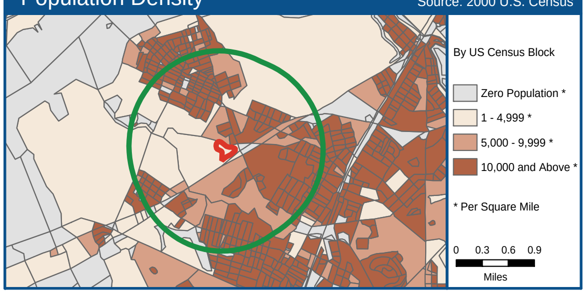
Within One Mile of Site*

Total Population	10,028
White Alone	9,502
Black Alone	306
Am. Indian & Alaska Native Alone	21
Asian Alone	86
Native Hawaiian & Other Pacific Islander Alone	0
Some Other Race Alone	42
Two or More Races	71
Hispanic or Latino**	127
Children Aged 6 and Younger	880
Adults Aged 65 and Older	1,217
Females Aged 15 to 44	2,214
Total Housing Units	3,797

Demographics Statistics Source: 2000 U.S. Census
* Calculated using an area-proportion spatial analysis technique
** People who identify their origin as Hispanic or Latino may be of any race.

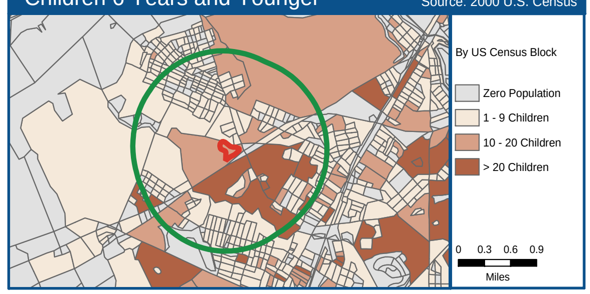
Population Density

Source: 2000 U.S. Census



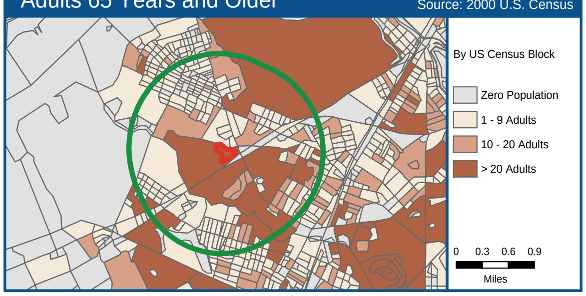
Children 6 Years and Younger

Source: 2000 U.S. Census



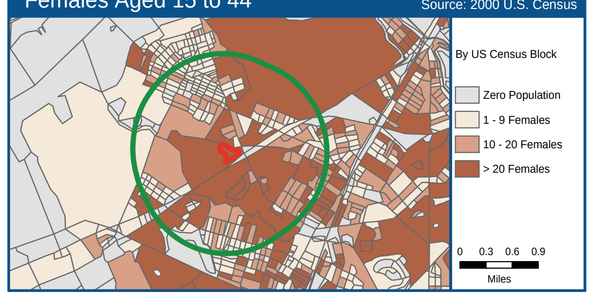
Adults 65 Years and Older

Source: 2000 U.S. Census



Females Aged 15 to 44

Source: 2000 U.S. Census



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FOR INTERNAL AND EXTERNAL RELEASE

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY | UNITED STATES DEPARTMENT OF HEALTH AND HUMAN SERVICES

Figure 3: Demographic Information of Matteo Iron and Metal site based on 2000 U.S. Census

Appendix A
Letter of Technical Assistance

State of New Jersey
DEPARTMENT OF HEALTH AND SENIOR SERVICES
CONSUMER AND ENVIRONMENTAL HEALTH SERVICES
PO BOX 369
TRENTON, N.J. 08625-0369
www.nj.gov/health

JON S. CORZINE
Governor

FRED M. JACOBS, M.D., J.D.
Commissioner

March 10, 2006

Mr. Nicholas Magriples
On-Scene Coordinator, Removal Action Branch
U.S. Environmental Protection Agency, Region 2
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679

Dear Mr. Magriples:

This Letter of Technical Assistance is in response to a United States Environmental Protection Agency (USEPA) Region 2 request that the New Jersey Department of Health and Senior Services (NJDHSS), through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), evaluate potential health risks posed by lead soil contamination detected at two residential properties located adjacent to the Matteo Iron and Metal site, West Deptford, Gloucester County, New Jersey. These properties are the Willow Woods Manufactured Home Community (MHC), 1762 Crown Point Road and a single family residence (leased to private individuals by the owners of Matteo Iron and Metal) located at 1686 Crown Point Road. Lead results of surface soil samples (0 - 3 inches depth) collected from these properties during the week of February 6, 2006 are as follows:

Location	No. Samples Collected	Average Lead Concentration (mg/kg)*	Maximum Lead Concentration (mg/kg)	USEPA Residential Soil Guidance Value (mg/kg)
Willow Woods MHC	42	812	4,900	400**
Private Residence	11	896	1,600	

*mg/kg = milligrams of lead per kilogram of soil
**Also the New Jersey Department of Environmental Protection Residential Direct Soil Cleanup Criteria for lead.

The average and maximum lead surface soil concentrations detected at the Willow Woods MHC were approximately two and 12 times higher than the USEPA Residential Soil Guidance Value (RSGV) of 400 milligrams of lead per kilogram of soil, respectively; the average and maximum surface soil lead concentrations detected at the private residence were about two and four times higher than the USEPA RSGV.

The NJDHSS, in cooperation with the ATSDR, consider the lead soil contamination in the sampled areas to pose a public health hazard. Environmental exposure to lead has long been recognized as a public health problem, and children less than six years of age are particularly vulnerable to the toxic effects of lead. Exposure to lead in soil has been shown to increase lead levels in children. Lead toxicity can cause decreased learning and memory, lowered Intelligence Quotient (IQ), speech and hearing impairment, fatigue, and lethargy. Maternal blood lead can cross the placenta and put the fetus at risk of low birth weight or premature birth.

Based on observations made by the NJDHSS during a February 22, 2006 site visit, there are completed exposure pathways to area residents (including children) via incidental soil and dust ingestion and dust inhalation. No continuous fence exists between the Matteo Iron and Metal site and the adjacent residential community. Toddler play equipment and toys (e.g., tire swing, swing set, toy car, sliding board, tricycle) were observed on property located between the MHC and the site. A significant portion of the ground surface within the contaminated area is bare soil. Crushed battery casings were observed mixed in the surface soil. The road leading to this area is used for vehicular traffic potentially resulting in the generation of contaminated dust. Although most adults walking through this area may not be at risk, they may track lead contamination on shoes or clothing into their automobiles and homes, potentially exposing sensitive persons such as children and pregnant women.

As such, NJDHSS recommends that the USEPA immediately notify residents of the Willow Woods MHC and the Crown Point Road private residence of the soil lead contamination detected in the sampled areas. Residents should be advised that children should not be permitted to come into contact with the soil in this area. Adults should also stay away from the contaminated area to avoid tracking lead-contaminated soil into homes and automobiles. Parents who suspect that their children have come in contact with contaminated soil should make sure that they:

- Have their children's hands washed often, especially before they eat and before nap and bed times.

- Have their children remove shoes before entering residences to avoid tracking in lead contamination from the soil.

- Wash toys, floors, and other interior surfaces often to reduce potential exposures to lead dust.

We support USEPA's plan to install temporary fencing as an interim action to demarcate and limit access to contaminated areas.

A more detailed and comprehensive evaluation will be provided to the USEPA in a health consultation being prepared for the site. Please contact me at 609-584-5367 or Julie.Petix@doh.state.nj.us if you have any questions. Public inquiries regarding this matter may be referred to Ms. Leah Escobar, Associate Regional Representative, ATSDR Region II at 732-906-6932 or Escobar.Leah@epamail.epa.gov. Thank you.

Yours truly,

Julie R. Petix, MPH, CPM, HO
Project Manager,
Health Assessment and Consultation Unit
Hazardous Site Health Evaluation Program

c: Gregory Ulirsch, Technical Project Officer, ATSDR
Arthur Block, Senior Regional Representative, ATSDR Region II
Jerald Fagliano, MPH, PhD, Program Manager, NJDHSS
Thomas Budroe, Team Leader/ERRD, USEPA
Larry Quinn, Case Manager, NJDEP
Donald Benedik, Health Officer, Gloucester County Department of Health
William Atkinson, Chief Sanitary Inspector, Gloucester County Department of Health

Appendix B
Health Consultation

Health Consultation

Public Health Implications of Surface Soil Lead Contamination at the Willow Woods Manufactured Home Community and a Single Family Residence

Matteo Iron and Metal Site
West Deptford, Gloucester County, New Jersey

USEPA Facility ID: NJD011770013

Final

Summary

The New Jersey Department of Health and Senior Services, in cooperation with the Agency for Toxic Substances and Disease Registry, evaluated potential health risks posed by surface soil lead contamination detected at the Willow Woods Manufactured Home Community and a single family residence located adjacent to the Matteo Iron and Metal site, West Deptford, Gloucester County, New Jersey. The Matteo Iron and Metal site had operated as a junkyard, an unregistered landfill and a metals recycling facility since 1961. The southern edge of the landfill area is adjacent to the Willow Woods Manufactured Home Community.

Results from the February 2006 United States Environmental Protection Agency sampling event at these two residential properties indicated that the mean and maximum concentration of lead detected in the surface soil in and around the Willow Woods Manufactured Home Community and the single family residence were higher than the New Jersey Department of Environmental Protection soil clean-up criteria for lead.

Based on review of the February 2006 soil lead data and observations made during the site visit, there are completed exposure pathways in the past to area residents (including children) via incidental soil and dust ingestion and dust inhalation. Results from the United States Environmental Protection Agency Integrated Exposure Uptake Biokinetic Model for Lead in Children indicated that if young children (aged 6 - 84 months) were to be exposed to levels of the mean concentrations of lead in soil at the contaminated area, blood lead levels of concern could result in some children. The New Jersey Department of Health and Senior Services and the Agency for Toxic Substances and Disease Registry conclude that the soil lead concentrations detected in sampling from February 2006 poses a ***Public Health Hazard***, especially for past exposures. Present and future pathways of exposure via inhalation and incidental ingestion have been partially interrupted by the installation of temporary high-visibility fencing directly behind the residences facing the open area. The United States Environmental Protection Agency and/or the potential responsible party have initiated the installation of a permanent eight-foot chain-link fence and have begun excavation of contaminated soil around the Matteo Iron and Metal site.

It is recommended that blood lead screenings be made available to all children residing at the Willow Woods Mobile Home community. The environmental agencies should continue to remediate lead contaminated soils and restrict public access to the lead contaminated areas in and around the Willow Woods Mobile Home Community and the single family residence. Residents of Willow Woods Manufactured Home Community and the single family residence should take steps to reduce child lead exposures inside the homes by cleaning floors, window frames, window sills and other surfaces frequently. The New Jersey Department of Health and Senior Services and the Agency for Toxic Substances and Disease Registry will evaluate additional sampling results from this site as appropriate, including an evaluation of childhood blood lead data from this community. Additionally, public availability sessions will be held to discuss results from this health consultation.

Statement of Issues

In February 2006, the United States Environmental Protection Agency (USEPA) requested assistance from the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate potential health risks posed by surface soil lead contamination detected at two residential properties located adjacent to the Matteo Iron and Metal site, West Deptford, Gloucester County, New Jersey (see Figure 1, below). In response to this request and through a cooperative agreement with the ATSDR, the New Jersey Department of Health and Senior Services (NJDHSS) prepared the following health consultation to assess the public health implications associated with surface soil lead contamination detected during a February 2006 USEPA sampling event at these two residential properties.

Background

Figure 1: Location of the Matteo Iron and Metal site

The residential properties are the Willow Woods Manufactured Home Community (hereinafter referred to as Willow Woods MHC), 1762 Crown Point Road and a single family residence located at 1686 Crown Point Road. They are located northeast and southwest, respectively, of the Matteo Iron and Metal (hereinafter referred to as Matteo), Inc. (see Figure 2). The single family residence is leased to private individuals by the owner of Matteo, Inc. Currently, Matteo, Inc. operates a scrap metal recycling facility on a portion of the Matteo site closest to Crown Point Road. The Matteo site had operated as a junkyard, an unregistered landfill and a metals recycling facility since 1961 (The Louis Berger Group, Inc. 2004). The unregistered landfill accepted crushed automotive battery casings and industrial and domestic waste. The southern edge of the landfill area is adjacent to the Willow Woods MHC (USEPA 2005). Trails are present throughout the Matteo site from off-site areas. Most of these trails lead directly to or near the Willow Woods MHC. USEPA site visit observations noted the remnants of a campfire situated at the end of a trail leading directly from the Willow Woods MHC, indicating that the Matteo site is accessed and used for recreational purposes.

Demographics

Based on 2000 United States Census data, the ATSDR estimates that there are approximately 10,030 individuals residing within a one mile radius of the Matteo site (see Figure 3).

Site Investigations

Prior to 2004, the NJDEP, the USEPA and Matteo, Inc. conducted limited investigations for waste characterization at the Matteo site. Lead was found to be the primary contaminant of concern in the surface soils, surface waters, sediments, and groundwater. Polychlorinated biphenyl (PCB) compounds were also identified in some of the surface soils and sediments.

In 2004, the NJDEP conducted a Remedial Investigation (RI) of the Matteo site to delineate the lead and PCB contamination identified during previous investigations (The Louis Berger Group, Inc. 2004). Results from surface soils samples indicated the presence of PCBs and heavy metals including lead, antimony, arsenic and barium. In addition, low levels of chlorinated solvents (primarily vinyl chloride) and arsenic were detected in the groundwater.

In April 2005, the USEPA conducted environmental sampling for placement on the National Priorities List. The sampling included collection of 82 surface soil samples (0 – 6 inches depth) from the Matteo site, the Willow Woods MHC and the single family residence located adjacent to the scrap yard to the northeast. Field screening results from the Willow Woods MHC and the single family residence indicated a mean and maximum soil lead concentration of 144 and 906 milligrams of lead per kilogram of soil (mg/kg), respectively. Based on field screening results, nine samples were selected for laboratory confirmation analysis. Results from laboratory analyses indicated a mean and maximum surface soil lead concentration of 358 and 1,520 mg/kg, respectively.

In February 2006, the USEPA conducted an extensive soil (0 - 3 inches depth and 6 - 12 inches depth at some locations) sampling in the open area present around the Matteo site and the Willow Woods MHC, and at the single family residence. This sampling was conducted to delineate the extent of lead contamination detected in surface soil in the earlier sampling event.

Prior ATSDR/NJDHSS Involvement

There has been no prior ATSDR and NJDHSS involvement at the site.

Site Visit

The site visit was conducted on February 21, 2006. Present were Tariq Ahmed, Somia Aluwalia, and Julie Petix from NJDHSS; Leah Escobar from ATSDR; and representatives from the NJDEP, the USEPA, and the Gloucester County Department of Health. The Willow Woods MHC has been present since the 1950s and there are approximately 100 homes in this community. The Willow Woods MHC is bordered by Crown Point road to the south; the Matteo site to the northeast; and Woodbury Creek to the west (see Figure 2 and Photographs 1 and 2).

The property boundary between the Matteo site and Willow Woods MHC was unclear. At the time of the site visit, no continuous fence existed between the Matteo site and the Willow Woods MHC. Residents were using the open area around the property boundary as their backyard (see Photographs 3 and 4). Toddler play equipment and toys (e.g., tire swing, swing set, toy car, sliding board, tricycle) were observed in this area. It was noted that this open area might have been used as a common play area for children for several surrounding homes in the Willow Woods MHC. A significant portion of the ground surface within the contaminated area was bare soil. Crushed battery casings were observed mixed in the surface soil (see Photographs 5 and 6). It was evident that a portion of this open area was being used as a turnaround and parking by area residents, potentially generating contaminated dust (see Photograph 7). The highest lead concentration from the previous sampling event was near this area. Trails were observed leading from this open area into the wooded area of the Matteo site. The USEPA representative indicated that an eight foot chain-link fence is proposed to be constructed along the entire Matteo site boundary. The single family residence was visited next, located adjacent to Matteo, Inc. (see Figure 2 and Photograph 8). Currently it is rented out to an individual; however prior occupancy history is unknown. The location of previously sampled areas was noted.

Based on observations made during the site visit and review of available soil data, a letter of technical assistance was issued by NJDHSS on March 10, 2006 recommending immediate notification of residents of Willow Woods MHC and the single family residence of the surface soil lead contamination (see Appendix).

Community Concerns

On March 13, 2006, the USEPA held an information session to disseminate fact sheets to five specific families/households, based on proximity to the area with elevated soil lead levels. Of these five families, four were present at the information session and also received copies of the ATSDR ToxFAQs for lead. The information session was attended by representatives of the ATSDR, NJDHSS and the NJDEP. None of the residents present at this information session specified any health concerns. It was expressed by some residents that the bare ground area was essential in its use for parking and turning around. Additionally, public utility companies routinely utilize this area.

On March 16, 2006, the USEPA held a public availability session, attended by representatives of the ATSDR, NJDHSS and the NJDEP. Prior to this meeting, temporary high-visibility fencing had been installed behind the residential homes near the property boundary with the Matteo site (see Photograph 9). It was estimated that not more than eight Willow Woods MHC residents and two non-local residents attended the availability sessions. There were some health related concerns posed to the NJDHSS by two Willow Woods MHC residents. A woman was concerned about her nine year old daughter who played on the tire swing in the contaminated areas from the age of five onwards. A couple planning a family in the near future was particularly interested in remediation efforts.

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). If concentrations exceed the environmental guideline CVs, these substances, referred to as Contaminants of Concern (COC), are selected for further evaluation. Contaminant levels above environmental guideline CVs do not indicate 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.

For this report the NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) were used as CVs. They are primarily based on human health impacts but also consider natural background concentrations, analytical detection limits and ecological effects.

Environmental Guideline Comparison

In February 2006, the USEPA conducted an extensive soil (at 0 - 3 inches and 6 -12 inches depth) sampling of the backyard area around the Matteo site and the Willow Woods MHC, and the single family residence. This sampling was conducted to delineate the extent of lead contamination in the Willow Woods MHC detected in the earlier April 2005 sampling event. Results of surface soil (0-3 inches) sampling are as follows:

Location	**No. Samples Collected**	**Mean Lead Concentration (mg/kg)**	**Maximum Lead Concentration (mg/kg)**	**NJDEP RDCSCC (mg/kg)**
Willow Woods MHC	42	812	4,900	400
Private Residence	11	896	1,600	

The mean and maximum lead concentrations were compared to the NJDEP RDCSCC for lead, which is the same value as the USEPA Soil Screening Guidance Level. The mean and maximum concentration of lead detected in the surface soil at the Willow Woods MHC were approximately two and 12 times higher than the NJDEP RDCSCC of 400 mg/kg, respectively. The mean and maximum surface soil lead concentrations detected at the single family residence were about two and four times higher than the NJDEP RDCSCC, respectively.

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. 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. 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.

During the February 22, 2006 site visit, it was noted that no continuous fence existed between the Matteo site and the Willow Woods MHC. Toddler play equipment and toys were observed on this area, and a significant portion of the ground surface within the contaminated area was bare soil. The road leading to this area was being used for vehicular traffic potentially resulting in the generation of contaminated dust. Individuals walking through this area may have tracked lead-contaminated soil on shoes or clothing into their automobiles and homes, potentially exposing sensitive persons such as children and pregnant women.

Occupancy information is available for 14 homes located in the immediate area near the boundary around the Matteo site and the Willow Woods MHC. This information indicates there are two residences with small children; one with one child aged five and the other residence has two children aged three and five, respectively. One other residence has two children aged 12 and 16, respectively.

Based on a review of USEPA soil sampling data and observations during the site visit, the following completed exposure pathways were identified and are discussed in the following section.

Completed Pathways

Incidental Ingestion of Contaminated Soil and Dust (past): There is a completed exposure pathway in the past from ingestion of lead in surface soil to area residents including children. Children playing in the area near the boundary around the Matteo site and the Willow Woods MHC came in contact with contaminated soil. The contaminated soil could have been potentially tracked indoors (with shoes, clothes and hair) and presented an additional source of dust exposures to children inside the residences. Furthermore, dusts generated by vehicular traffic accessing the contaminated area could have infiltrated into the homes and be potentially ingested by children through hand to mouth behavior.

Inhalation of Contaminated Dust (past): There is a completed exposure pathway in the past from inhalation of dust in ambient and indoor air to area residents (including children). A significant portion of the ground surface within the contaminated area is bare soil resulting in wind-generated dust that potentially infiltrated into residences. Dust was also generated via vehicular traffic that accessed this area, thereby presenting a route of exposure to children playing outside.

Present and future pathways of exposure via inhalation and incidental ingestion have been partially interrupted by the installation of temporary high-visibility fencing directly behind the residences facing the open area. This minimizes children from directly accessing the main source of contaminated soil near the residences. Additionally the fencing prevents dust generation by vehicular traffic although exposures from wind-generated dust are still possible. The USEPA and/or the potential responsible party has initiated the installment of a permanent eight-foot chain-link fence around the Matteo site following the completion of a survey to determine the property line between the Willow Woods MHC and the Matteo site.

Public Health Implications of Completed Pathways

Health Guideline Comparison

Non-Cancer Health Effects

To assess the public health implications of site-specific exposures, estimated exposure doses, derived from site-specific exposure conditions, are compared to dose-based comparison values. To this end, ATSDR has developed Minimal Risk Levels (MRLs) for contaminants that are commonly found at hazardous waste sites. MRLs are based largely on toxicological studies in animals and on reports of human occupational (workplace) exposures. ATSDR has not derived MRLs for lead exposure for inorganic lead and lead compounds. This is because clear dose-response relationships cannot be established using environmental concentrations of lead (ATSDR 1999).

The USEPA developed the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children (USEPA 2002). The IEUBK model can be used to predict the risk of elevated blood lead levels in children (under the age of 84 months) that are exposed to environmental lead from many sources. Blood lead levels are indicators of recent exposure, and are also the most widely used index of internal lead body burdens associated with potential health effects. The model also calculates the probability (or P_{10}) that children's blood lead levels will exceed a level of concern. The Centers for Disease Control and Prevention (CDC) level of concern for children up to 84 months of age is 10 micrograms of lead per deciliter of blood or 10 µg/dL (CDC 1991, ATSDR 1999). In using the model, the USEPA recommends that the lead concentration in site soil does not result in a five percent probability of exceeding a blood lead concentration of 10 µg/dL (USEPA 1994).

The potential for lead exposures associated with exposure to contaminated soil and dust at the Willow Woods MHC and the single family residence was evaluated using the IEUBK model.

Air monitoring data is unavailable for this site. However, an upper bound lead concentration in dust due to disturbances created by recreational activities may be calculated using mean lead concentration in the soil (812 mg/kg). It is also assumed that all dust created by recreational activities and/or vehicular traffic disturbances that a child might breathe in would contain lead at the mean concentration measured in the surface soils. To estimate upper bound ambient lead concentration associated with dust particles, a dust loading factor of 2×10^{-7} kg of soil per cubic meter of air (kg/m^3) was used (ATSDR 2003). This dust loading factor is two to three orders of magnitude greater than the default value for wind erosion of residential soils (to 7.6 x 10^{-10} kg/m^3) and is considered conservative. The mean ambient air lead concentration that a person might breathe in, in microgram per cubic meter (µg/m^3), is given by:

$$C_{lead,\ air} = C_{lead,\ surface\ soil} \times MLF \times CF$$

where $C_{lead,\ surface\ soil}$ = average concentration of lead in surface soil in mg/kg,
MLF = soil mass loading factor in kg/m^3 and
CF = conversion factor (1000 µg/mg).

Using the mean concentration of lead detected in the surface soil (812 mg/kg), the ambient lead concentration in dust may be estimated as 0.16 µg/m^3.

The model inserts default values whenever site-specific information is not used. This model uses standard age-weighted exposure parameters for consumption of food, drinking water, soil, and dust, and inhalation of air, matched with site-specific concentrations of lead in these media, to estimate exposure for the child. The daily dietary lead intake values for each age apply to a typical U.S. child in a typical setting in the United States after 1990. The water lead concentration is set to a typical 1990 urban value of four micrograms of lead per one liter of water (µg/L). The default value for total intake of soil and dust depends on age, and ranges from 85 to 135 mg/day (USEPA 1994).

Using the site-specific air concentration and default model assumptions for other variables, the predicted geometric mean blood lead levels and the probability of blood lead levels exceeding 10 µg/dL (P_{10}) for children residing at the Willow Woods MHC are shown in the following table:

Age (months)	**Based on maximum soil concentration – 4,900 mg/kg**		**Based on mean soil concentration – 812 mg/kg**	
	Blood Lead Level[1] (µg/dL)	**P_{10} (%)[2]**	**Blood Lead Level (µg/dL)**	**P_{10} (%)**
6 -12	28	98	9.0	41
12 - 24	32	99	10	52
24 - 36	30	99	9.7	47
36 - 48	30	99	9.3	44
48 - 60	26	98	7.8	29
60 - 72	23	96	6.6	19
72 - 84	21	94	5.9	13

[1]Geometric Mean lead levels in blood; [2]probability of blood lead level > 10 µg/dL

Based on maximum soil lead concentrations, the model predicted that the blood lead levels for children aged 6 - 84 months were considerably elevated above 10 µg/dL. In addition, the probabilities of blood lead levels exceeding 10 µg/dL for children ages 6 - 84 months was near 100 percent. Therefore, for children exposed to maximum concentration of lead contaminated soil at the property located between the Willow Woods MHC and the Matteo site, the predicted blood lead levels would exceed the CDC level of concern. Based on mean soil lead concentrations, the model predicted that the blood lead levels for children aged 6 - 84 months would be at or below the level of concern (10 µg/dL). However, the percent of young children aged 6 - 84 months who are predicted to exceed a blood lead concentration of 10 µg/dL ranged from 13 to 52 percent. Thus, if young children were to be exposed to levels of the mean concentrations of lead in soil at the contaminated area, blood lead levels of concern could result in some children.

Although according to the USEPA, children do not currently reside at the single family residence, the IEUBK model was used to predict potential child blood lead levels in the event of future residency. Based on mean and maximum soil lead concentrations (896 and 1,600 mg/kg, respectively) at the single family residence, it can be concluded that if young children were to be exposed to levels of the average and maximum concentrations of lead in soil at the property, blood lead levels of concern could result in some children.

No health guidelines or threshold levels have been established for the health effects resulting from exposure to lead in various environmental media. There is strong evidence linking health effects in children to blood lead levels (ATSDR 2005; CDC 1991). Levels of 10 µg/dL and perhaps even lower, in children's blood have been associated with small decreases in IQ and slightly impaired hearing and growth (ATSDR 2005; CDC 1991). Concentrations of 20 µg/dL and greater are associated with changes in nerve conduction velocity. Vitamin D metabolism, which is important in bone development, can suffer at concentrations of 30 µg/dL (CDC 1991). In children, lead begins to affect hemoglobin synthesis at 40 µg/dL.

Fetuses are at even greater risk from lead exposure than children (ATSDR 2005; CDC 1991). Because lead crosses the placenta, a woman exposed during pregnancy can transmit lead to her fetus. Lead in the bones of women who were exposed before pregnancy may be mobilized because of the physiological stresses of pregnancy resulting in exposure to the fetus. Studies of lead exposure to children and the developing fetus have demonstrated an association between lead and several health effects (ATSDR 1999, 2005; CDC 1991). These health effects include physical and mental impairments, hearing difficulties, impaired neurological development, and reduced birth weight and gestational age.

Adults are believed to be less susceptible to adverse effects of chronic, low level exposures to lead. Some health effects attributed to lead exposure are interference with Vitamin D production, neurobehavioral toxicity, renal dysfunction, increases in blood pressure (particularly in middle-aged and older people) and, at higher exposures, dysfunction of cardiovascular, hepatic, gastrointestinal, and endocrine systems (ATSDR 1999).

Cancer Health Effects

The site-specific lifetime excess cancer risk (LECR) indicates the cancer potential of contaminants. The LECR is calculated by multiplying the cancer exposure dose by the cancer slope factor (CSF), derived from animal and/or human cancer studies. Although lead has not been classified as a carcinogen by the US Department of Health and Human Services, the carcinogenicity of inorganic lead and lead compounds have been evaluated by the USEPA

(USEPA 1986, 1989). The USEPA has determined that data from human studies are inadequate for evaluating the carcinogenicity of lead, but there is sufficient data from animal studies which demonstrate that lead induces renal tumors in experimental animals. In addition, there are some animal studies which have shown evidence of tumor induction at other sites (i.e., cerebral gliomas; testicular, adrenal, prostate, pituitary, and thyroid tumors). However, a CSF has not been derived for inorganic lead or lead compounds, so no estimation of LECR can be made for lead exposure.

Child Health Considerations

The NJDHSS 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.

Lead and Health Effects in Children Six Years and Younger

In residential settings, children ages six years and younger are considered to be at greater risk for health effects from lead exposure than are older children and adults. The reasons for children's increased vulnerability include the following:

- children's developing nervous system;
- hand-to-mouth behavior exhibited by children which increases the opportunity for soil ingestion
- the efficiency of lead absorption from the gastrointestinal tract is greater for children than adults; and
- iron and calcium deficiencies, which are prevalent in children, may enhance the absorption and increase the toxic effects of lead (ATSDR 1999; Sedman 1989).

The occupancy survey for the Willow Woods MHC indicates that there are three children under the age of five residing near the boundary with the Matteo site. At the blood lead levels modeled from soil and dust lead concentrations, children aged 6 - 84 months living at the Willow Woods MHC may be at increased risk of lead exposure and consequent health effects.

Conclusions

The mean and maximum concentration of lead detected in the surface soil at the Willow Woods MHC and the single family residence exceeded the NJDEP RDCSCC. Based on review of USEPA soil lead data collected in February 2006 and observations made during the site visit, there are completed exposure pathways in the past to area residents (including children) via incidental soil and dust ingestion and dust inhalation. The review found that children's exposures to lead detected in surface soil have the potential to cause adverse health effects. These effects are likely to be seen in children who play in the open area (making regular contact with the contaminated soil through incidental ingestion). The NJDHSS and ATSDR conclude that the soil lead concentrations detected in sampling from February 2006 poses a ***Public Health Hazard***, especially for past exposures. Present and future pathways of exposure via inhalation and incidental ingestion have been partially interrupted by the installation of temporary high-visibility fencing directly behind the residences facing the open area. The USEPA and/or the potential responsible party have initiated the installation of a permanent eight-foot chain-link fence and have begun excavation of contaminated soil around the Matteo, Inc. site (USEPA 2006).

Adults are believed to be less susceptible to adverse effects of lead. Exposures to lead are most dangerous to young children and fetuses. Most children with lead poisoning have no obvious symptoms, and therefore, the condition often remains undiagnosed and untreated (CDC 1991). The neurotoxicity of lead is a particular concern. Some health effects, such as impaired academic performance and motor skills, may persist as a result of lead exposure, even when blood lead concentrations return to normal levels (ATSDR 2005).

Recommendations

1. Blood lead screenings for all children residing at the Willow Woods MHC should be made available by the Gloucester County Department of Health.

2. The environmental agencies should continue remediation of the lead contaminated soils at the Willow Woods MHC and should continue to restrict public access to the lead contaminated areas at the Willow Woods MHC and the single family residence.

3. Residents of Willow Woods MHC and the single family residence should clean floors, window frames, window sills, and other surfaces frequently using a mop, sponge, or paper towel dampened with warm water and a general all-purpose cleaner. These should be thoroughly rinsed after cleaning dirty or dusty areas. Children's hands should be washed often, especially before they eat and before nap time and bed time.

Public Health Action Plan (PHAP)

The purpose of a PHAP is to ensure that this health assessment 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 ATSDR and NJDHSS to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by the NJDHSS and the ATSDR are as follows:

Public Health Actions Undertaken by NJDHSS and ATSDR

1. A Letter of Technical Assistance was prepared and issued by the NJDHSS recommending immediate notification of residents of Willow Woods MHC and the single family residence of the surface soil lead contamination (see Appendix).

2. The NJDHSS and ATSDR reviewed available environmental data and other relevant information to identify and evaluate human exposure pathways and public health issues.

3. In cooperation with the ATSDR and the NJDEP, a site visit was conducted of the Willow Woods MHC and the single family residence.

4. On March 13, 2006, the NJDHSS attended a USEPA information session which involved meeting a group of residents located directly adjacent to the contaminated area to discuss health concerns.

5. On March 16, 2006, the NJDHSS and the ATSDR participated in USEPA public availability sessions to provide public education materials about the hazards of lead exposure to area residents.

Public Health Actions Planned by NJDHSS and ATSDR

1. The NJDHSS and ATSDR will evaluate additional sampling results from this site as appropriate, including an evaluation of childhood blood lead data from this community.

2. The NJDHSS and the ATSDR will conduct public availability sessions to discuss results from this health consultation.

3. This HC will be made available to residents of Willow Woods MHC and the single family residence. Materials will be provided to the residents of Willow Woods MHC and the single family residence giving guidance on protecting children from lead exposures around the home.

4. The NJDHSS will prepare a citizens' guide to this health consultation summarizing its findings and incorporating additional information on lead and children.

5. The NJDHSS will incorporate additional USEPA sampling results from Willow Woods MHC as part of the public health assessment prepared for the adjacent Matteo, Inc. Superfund site.

6. The NJDHSS and the ATSDR will update this public health action plan as warranted by additional data and/or conditions.

References

[ATSDR] Agency for Toxic Substances and Disease Registry. 1999. Toxicological profile for Lead. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2003. Health Consultation for Milltown Reservoir Operable Unit (a/k/a Milltown Reservoir Sediments) Milltown, Missoula County, Montana. August 19, 2003.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2005. Draft Toxicological profile for Lead; Update. Atlanta: US Department of Health and Human Services.

[CDC] Centers for Disease Control and Prevention. 1991. Preventing lead poisoning in young children. Atlanta: US Department of Health and Human Services.

Sedman RM. 1989. The development of applied action levels for soil contact: A scenario for the exposure of humans to soil in a residential setting. Environ Health Perspect 1989; 79:291–313.

The Louis Berger Group, Inc. 2004. Remedial Investigation and Remedial Action Selection Evaluations. Prepared for Matteo Iron and Metal, West Deptford, New Jersey. May 2004.

[USEPA] United States Environmental Protection Agency. 1994. Guidance Manual for the IEUBK Model for Lead in Children. Office of Solid Waste and Emergency Response. OSWER Directive #9285.7-15-1. February 1994.

[USEPA] Unites States Environmental Protection Agency. 1998. Clarification to the 1994 revised interim soil lead (Pb) guidance for CERCLA sites and RCRA corrective action facilities. Washington, DC: US Environmental Protection Agency. OSWER directive #9200.4-27P. Available at URL: http://www.epa.gov/superfund/programs/lead/products/oswer98.pdf

[USEPA] United States Environmental Protection Agency. 2002. Overview for the IEUBK model for lead in children. Washington, DC: August 2002. OSWER #9285.7-31. Available at URL: http://www.epa.gov/superfund/programs/lead/products/factsht5.pdf

[USEPA] United States Environmental Protection Agency. 2003. Superfund lead-contaminated residential sites handbook. Washington, DC: U.S. Environmental Protection Agency. August 2003. Available at: http://www.epa.gov/superfund/programs/lead/products/handbook.pdf

[USEPA] United States Environmental Protection Agency. 2005. Action Memorandum from Nick Magriples to George Pavlou, concerning request for a CERCLA Removal Action at the Matteo Iron and Metal Site, West Deptford, Gloucester County, New Jersey. September 30, 2005.

[USEPA] United States Environmental Protection Agency. 2006. Pollution Report for the Matteo Iron and Metal Site, Gloucester County, New Jersey. May 24, 2006.

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Technical Project Officer
Superfund Site Assessment Branch
Division of Health Assessment and Consultation

Any questions concerning this document should be directed to:

New Jersey Department of Health and Senior Services
Consumer and Environmental Health Services
Hazardous Site Health Evaluation Program
3635 Quakerbridge Road
P.O. Box 369
Trenton, New Jersey 08625-0369

CERTIFICATION

The health consultation for the Matteo Iron and Metal site, Gloucester County, New Jersey was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

Gregory V. Ulirsch, MS, PhD
Technical Project Officer, CAT, SPAB, DHAC
Agency for Toxic Substances and Disease Registry

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

Alan Yarbrough
Team Leader, CAT, SPAB, DHAC
Agency for Toxic Substances and Disease Registry

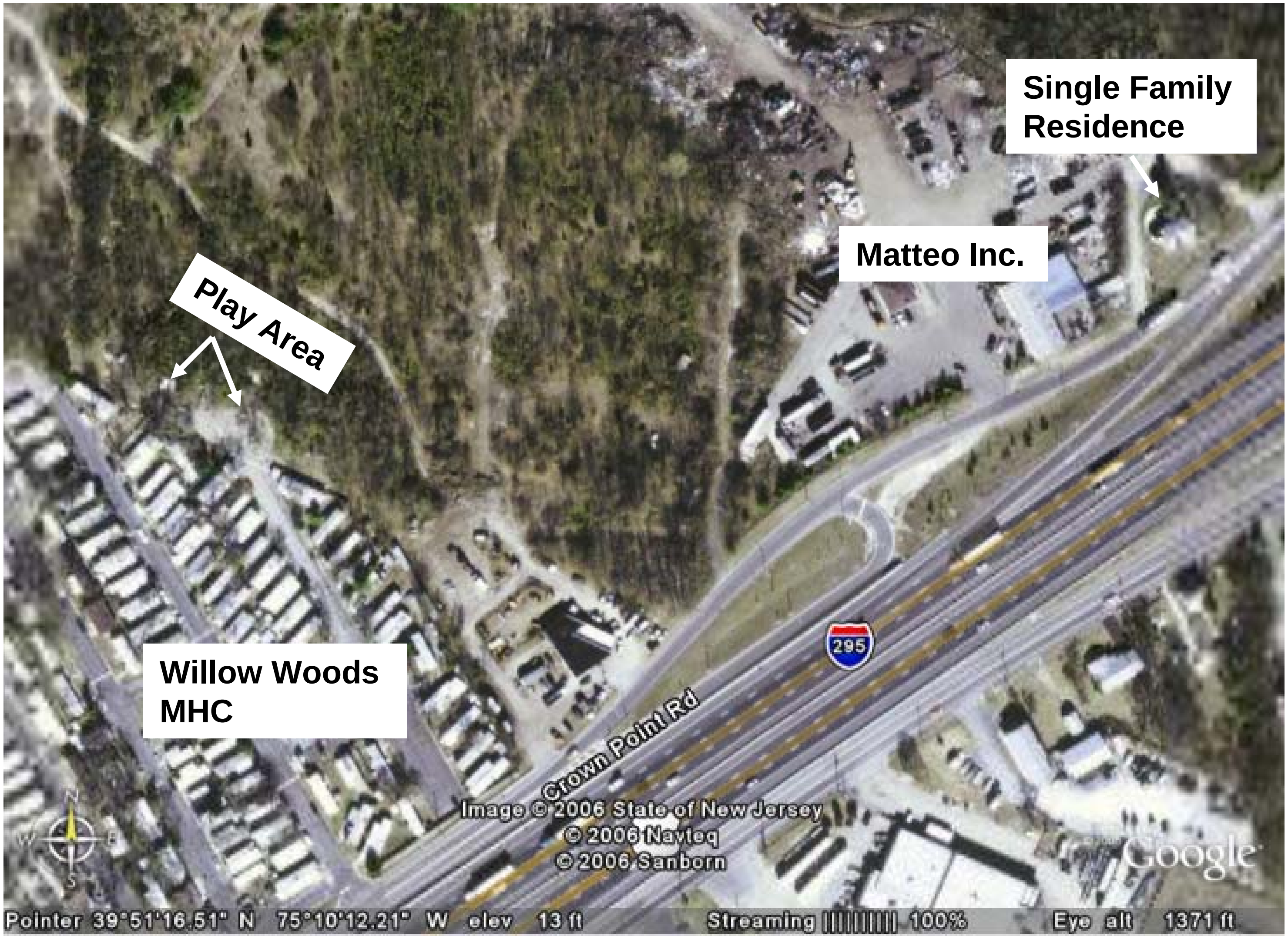
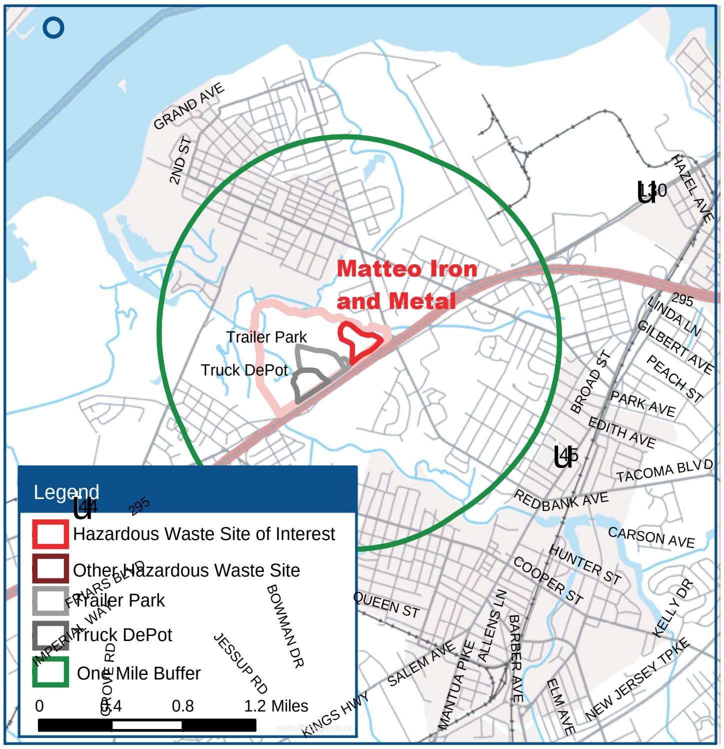


Figure 2: Site map showing the location of Willow Woods MHC and the single family residence

Matteo Iron And Metal

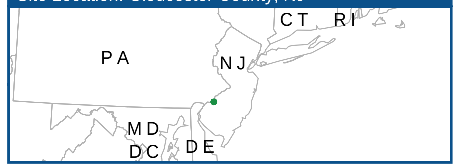
West Deptford Township, NJ

EPA Facility ID: NJD011770013



Base Map Source: Geographic Data Technology, May 2005.
Site Boundary Data Source: ATSDR Public Health GIS Program, May 2005.
Coordinate System (All Panels): NAD 1983 StatePlane New Jersey FIPS 2900 Feet

Site Location: Gloucester County, NJ



Demographic Statistics

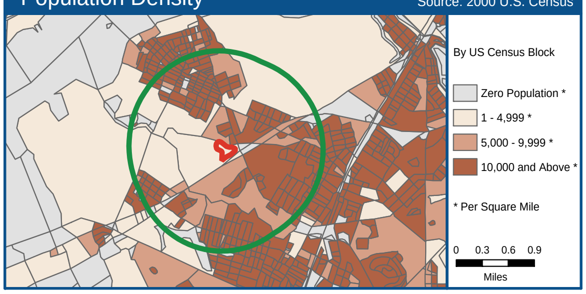
Within One Mile of Site*

Total Population	10,028
White Alone	9,502
Black Alone	306
Am. Indian & Alaska Native Alone	21
Asian Alone	86
Native Hawaiian & Other Pacific Islander Alone	0
Some Other Race Alone	42
Two or More Races	71
Hispanic or Latino**	127
Children Aged 6 and Younger	880
Adults Aged 65 and Older	1,217
Females Aged 15 to 44	2,214
Total Housing Units	3,797

Demographics Statistics Source: 2000 U.S. Census
* Calculated using an area-proportion spatial analysis technique
** People who identify their origin as Hispanic or Latino may be of any race.

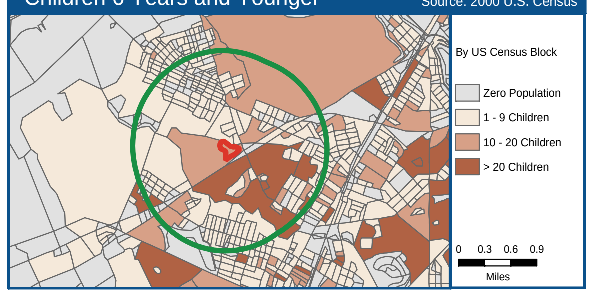
Population Density

Source: 2000 U.S. Census



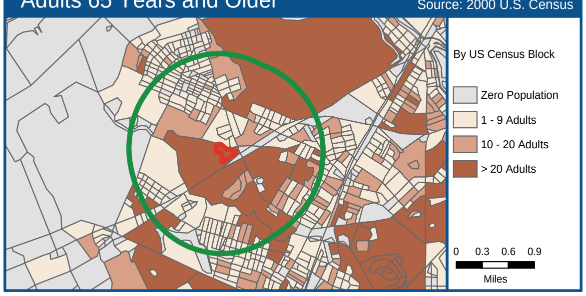
Children 6 Years and Younger

Source: 2000 U.S. Census



Adults 65 Years and Older

Source: 2000 U.S. Census



Females Aged 15 to 44

Source: 2000 U.S. Census

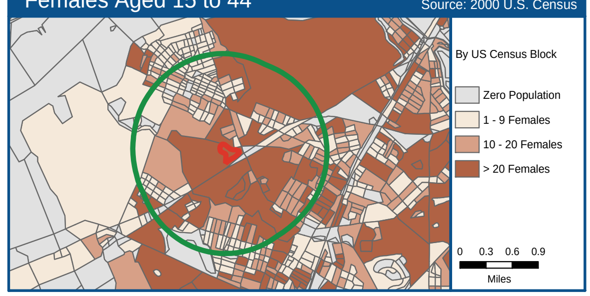


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Figure 3: Demographic Information of Matteo Iron and Metal site based on 2000 U.S. Census

Photograph 1: Matteo Iron and Metal, West Deptford, Gloucester County, NJ

Photograph 2: Willow Woods MHC located adjacent to Matteo Iron and Metal

Photographs 3 and 4: Open area present behind some Willow Woods MHC residences

Photograph 5: Surficial crushed battery casings in the open area present in the Willow Woods MHC

Photograph 6: Part of battery casing found in the open area behind homes in the Willow Woods MHC

Photograph 7: Road leading to the open area behind Willow Woods MHC residences

Photograph 8: Crushed battery in Matteo’s loading dock area adjacent to single family residence

Photograph 9: Temporary fencing restricting access to the open area present behind the homes in the Willow Woods MHC

Appendix

State of New Jersey
DEPARTMENT OF HEALTH AND SENIOR SERVICES
CONSUMER AND ENVIRONMENTAL HEALTH SERVICES
PO BOX 369
TRENTON, N.J. 08625-0369
www.nj.gov/health

JON S. CORZINE
Governor

FRED M. JACOBS, M.D., J.D.
Commissioner

March 10, 2006

Mr. Nicholas Magriples
On-Scene Coordinator, Removal Action Branch
U.S. Environmental Protection Agency, Region 2
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679

Dear Mr. Magriples:

This Letter of Technical Assistance is in response to a United States Environmental Protection Agency (USEPA) Region 2 request that the New Jersey Department of Health and Senior Services (NJDHSS), through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), evaluate potential health risks posed by lead soil contamination detected at two residential properties located adjacent to the Matteo Iron and Metal site, West Deptford, Gloucester County, New Jersey. These properties are the Willow Woods Manufactured Home Community (MHC), 1762 Crown Point Road and a single family residence (leased to private individuals by the owners of Matteo Iron and Metal) located at 1686 Crown Point Road. Lead results of surface soil samples (0 - 3 inches depth) collected from these properties during the week of February 6, 2006 are as follows:

Location	No. Samples Collected	Average Lead Concentration (mg/kg)*	Maximum Lead Concentration (mg/kg)	USEPA Residential Soil Guidance Value (mg/kg)
Willow Woods MHC	42	812	4,900	400**
Private Residence	11	896	1,600	

*mg/kg = milligrams of lead per kilogram of soil
**Also the New Jersey Department of Environmental Protection Residential Direct Soil Cleanup Criteria for lead.

The average and maximum lead surface soil concentrations detected at the Willow Woods MHC were approximately two and 12 times higher than the USEPA Residential Soil Guidance Value (RSGV) of 400 milligrams of lead per kilogram of soil, respectively; the average and maximum surface soil lead concentrations detected at the private residence were about two and four times higher than the USEPA RSGV.

The NJDHSS, in cooperation with the ATSDR, consider the lead soil contamination in the sampled areas to pose a public health hazard. Environmental exposure to lead has long been recognized as a public health problem, and children less than six years of age are particularly vulnerable to the toxic effects of lead. Exposure to lead in soil has been shown to increase lead levels in children. Lead toxicity can cause decreased learning and memory, lowered Intelligence Quotient (IQ), speech and hearing impairment, fatigue, and lethargy. Maternal blood lead can cross the placenta and put the fetus at risk of low birth weight or premature birth.

Based on observations made by the NJDHSS during a February 22, 2006 site visit, there are completed exposure pathways to area residents (including children) via incidental soil and dust ingestion and dust inhalation. No continuous fence exists between the Matteo Iron and Metal site and the adjacent residential community. Toddler play equipment and toys (e.g., tire swing, swing set, toy car, sliding board, tricycle) were observed on property located between the MHC and the site. A significant portion of the ground surface within the contaminated area is bare soil. Crushed battery casings were observed mixed in the surface soil. The road leading to this area is used for vehicular traffic potentially resulting in the generation of contaminated dust. Although most adults walking through this area may not be at risk, they may track lead contamination on shoes or clothing into their automobiles and homes, potentially exposing sensitive persons such as children and pregnant women.

As such, NJDHSS recommends that the USEPA immediately notify residents of the Willow Woods MHC and the Crown Point Road private residence of the soil lead contamination detected in the sampled areas. Residents should be advised that children should not be permitted to come into contact with the soil in this area. Adults should also stay away from the contaminated area to avoid tracking lead-contaminated soil into homes and automobiles. Parents who suspect that their children have come in contact with contaminated soil should make sure that they:

- Have their children's hands washed often, especially before they eat and before nap and bed times.

- Have their children remove shoes before entering residences to avoid tracking in lead contamination from the soil.

- Wash toys, floors, and other interior surfaces often to reduce potential exposures to lead dust.

We support USEPA's plan to install temporary fencing as an interim action to demarcate and limit access to contaminated areas.

A more detailed and comprehensive evaluation will be provided to the USEPA in a health consultation being prepared for the site. Please contact me at 609-584-5367 or Julie.Petix@doh.state.nj.us if you have any questions. Public inquiries regarding this matter may be referred to Ms. Leah Escobar, Associate Regional Representative, ATSDR Region II at 732-906-6932 or Escobar.Leah@epamail.epa.gov. Thank you.

Yours truly,

Julie R. Petix, MPH, CPM, HO
Project Manager,
Health Assessment and Consultation Unit
Hazardous Site Health Evaluation Program

c: Gregory Ulirsch, Technical Project Officer, ATSDR
Arthur Block, Senior Regional Representative, ATSDR Region II
Jerald Fagliano, MPH, PhD, Program Manager, NJDHSS
Thomas Budroe, Team Leader/ERRD, USEPA
Larry Quinn, Case Manager, NJDEP
Donald Benedik, Health Officer, Gloucester County Department of Health
William Atkinson, Chief Sanitary Inspector, Gloucester County Department of Health

Appendix C
Photographs

Battery casings on the northeastern shore of the Matteo site

Woodbury Creek

Evidence of trespassing on the Matteo site

Fence surrounding the Matteo site

Signs on the fence near the Willow Woods MHC

Appendix D

Toxicologic Summaries

The toxicological summaries provided in this appendix are based on ATSDR's ToxFAQs (http://www.atsdr.cdc.gov/toxfaq.html). 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.

Aluminum. Aluminum occurs naturally and makes up about 8% of the surface of the earth. It is always found combined with other elements such as oxygen, silicon, and fluorine. Aluminum metal is silver-white and flexible. It is often used in cooking utensils, containers, appliances, and building materials. It is also used in paints and fireworks; to produce glass, rubber, and ceramics; and in consumer products such as antacids, astringents, buffered aspirin, food additives, and antiperspirants.

Low-level exposure to aluminum from food, air, water, or contact with skin is not considered harmful. Aluminum, however, is not a necessary substance for our bodies and too much may be harmful. People exposed to high levels of aluminum in air may develop respiratory problems including coughing and asthma from breathing dust. Although some studies show that people with Alzheimer's disease have more aluminum than usual in their brains, the relationship between Alzheimer's disease and aluminum is unknown. Aluminum may cause skeletal problems. Some sensitive people develop skin rashes from using aluminum chlorohydrate deodorants.

The DHHS, the IARC, and the EPA have not classified aluminum for carcinogenicity. Aluminum has not been shown to cause cancer in animals.

Antimony Antimony is a silvery-white metal that is found in the earth's crust. Antimony ores are mined and then mixed with other metals to form antimony alloys or combined with oxygen to form antimony oxide. As alloys, it is used in lead storage batteries, solder, sheet and pipe metal, bearings, castings, and pewter. Antimony oxide is added to textiles and plastics as fire retardant. It is also used in paints, ceramics, and fireworks, and as enamels for plastics, metal, and glass.

Antimony is released to the environment from natural sources and from industry. In the air, antimony is attached to very small particles that may stay in the air for many days. Most antimony particles settle in soil, where it attaches strongly to particles that contain iron, manganese, or aluminum.

Breathing high levels for a long time can irritate eyes and lungs and can cause heart and lung problems, stomach pain, diarrhea, vomiting, and stomach ulcers. In short-term studies, animals that breathed very high levels of antimony died. Animals that breathed high levels had lung, heart, liver, and kidney damage. In long-term studies, animals that breathed very low levels of antimony had eye irritation, hair loss, lung damage, and heart problems. Problems with fertility were also noted. In animal studies, fertility problems were observed when rats breathed very high levels of antimony for a few months.

Ingesting large doses of antimony can cause vomiting. Other effects of ingesting antimony are unknown. Long-term animal studies have reported liver damage and blood changes when animals ingested antimony. Antimony can irritate the skin if it is left on it.

Lung cancer has been observed in some studies of rats that breathed high levels of antimony. No human studies are available. The DHHS, the International Agency for Research on Cancer, and the EPA have not classified antimony as to its human carcinogenicity.

Barium. Barium is a silvery-white metal which exists in nature only in ores containing mixtures of elements. It combines with other chemicals such as sulfur or carbon and oxygen to form barium compounds. Barium compounds are used by the oil and gas industries to make drilling muds, which make it easier to drill through rock by keeping the drill bit lubricated. They are also used in paint, bricks, ceramics, glass, and rubber.

The health effects of the different barium compounds depend on water solubility or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful. Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time. Some people who eat or drink amounts of barium above background levels found in food and water for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Eating or drinking very large amounts of barium compounds that easily dissolve can cause changes in heart rhythm or paralysis and possibly death. Animals that drank barium over long periods had damage to the kidneys, decreases in body weight, and some died.

The DHHS and the IARC have not classified barium as to its carcinogenicity. The EPA has determined that barium is not likely to be carcinogenic to humans following ingestion and that there is insufficient information to determine whether it will be carcinogenic to humans following inhalation exposure.

Beryllium. Beryllium is a naturally occurring, hard, grayish metal naturally found in mineral rocks, coal, soil, and volcanic dust. Beryllium compounds are commercially mined, and the beryllium is purified for use in nuclear weapons and reactors, aircraft and space vehicle structures, instruments, x-ray machines, and mirrors. Beryllium ores are used to make specialty ceramics for electrical and high-technology applications. Beryllium alloys are used in automobiles, computers, sports equipment (golf clubs and bicycle frames), and dental bridges.

The adverse effect of beryllium through inhalation depends on the extent of exposure. Air levels greater than 1000 $\mu g/m^3$ can result in an acute condition. This condition resembles pneumonia and is called acute beryllium disease. Individuals can (1-15%) become sensitive to beryllium and may develop an inflammatory reaction in the respiratory system called chronic beryllium disease (CBD). CBD can occur many years after exposure to higher than normal levels of beryllium (greater than 0.5 $\mu g/m^3$). This disease can make you feel weak and tired, and can cause difficulty in breathing, anorexia, weight loss, and may also lead to right side heart enlargement and heart disease in advanced cases. Some people who are sensitized to beryllium may not have any symptoms. Ingestion of beryllium has not been reported to cause adverse effects in humans because very little beryllium is absorbed from the stomach and intestines. Ulcers have been seen in dogs ingesting beryllium in the diet. Beryllium contact with skin that has been scraped or cut may cause rashes or ulcers.

Long term exposure to beryllium can increase the risk of developing lung cancer in people. The DHHS and the IARC have determined that beryllium is a human carcinogen. The EPA has determined that beryllium is a probable human carcinogen. EPA has estimated that lifetime exposure to 0.04 µg/m^3 beryllium can result in a one in a thousand chance of developing cancer.

Bis(2-ethylhexyl)phthalate Bis(2-ethylhexyl)phthalate is a colorless oily liquid that is extensively used as a plasticizer in a wide variety of industrial, domestic and medical products. It is an environmental contaminant and has been detected in ground water, surface water, drinking water, air, soil, plants, fish and animals.

Animal studies have indicated that the primary target organs are the liver and kidneys; however, higher doses are reported to result in testicular effects and decreased hemoglobin and packed cell volume. The primary intracellular effects of bis(2-ethylhexyl)phthalate in the liver and kidneys are an increase in the smooth endoplasmic reticulum and a proliferation in the number and size of peroxisomes. An epidemiological study reported no toxic effects from occupational exposure to air concentrations of bis(2-ethylhexyl)phthalate up to 0.16 mg/m^3. Other studies on occupational exposures to mixtures of phthalate esters containing bis(2-ethylhexyl)phthalate have reported polyneuritis and sensory-motor polyneuropathy with decreased thrombocytes, leukocytes and hemoglobin in some exposed workers. Developmental toxicity studies with rats and mice have shown that bis(2-ethylhexyl)phthalate is fetotoxic and teratogenic when given orally during gestation. Oral exposure has also been shown to result in decreased sperm count in rats.

Bis(2-ethylhexyl)phthalate is known to induce the proliferation of peroxisomes, which has been associated with carcinogenesis. Dose-dependent, statistically-significant increases in the incidences of hepatocellular carcinomas and combined carcinomas and adenomas were seen in mice and rats exposed to bis(2-ethylhexyl)phthalate in their diet for 103 weeks. An increased incidence of neoplastic nodules and hepatocellular carcinomas was also reported in rats. The EPA has classified antimony as a probable human carcinogen, on the basis of an increased incidence of liver tumors in rats and mice.

Cadmium: Cadmium is a natural element in the earth's crust. All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics. Exposure to high levels of cadmium severely damages the lungs and can cause death. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea. Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones. Skin contact with cadmium is not known to cause health effects in humans or animals.

Chromium Chromium is a naturally occurring element found in rocks, animals, plants, soil, and in volcanic dust and gases. Chromium is present in the environment in several different forms: chromium (0), chromium (III), and chromium (VI). No taste or odor is associated with chromium compounds. The metal chromium, which is the chromium (0) form, is used for making steel. Chromium (VI) and chromium (III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

Chromium enters the air, water, and soil mostly in the chromium (III) and chromium (VI) forms. In air, chromium compounds are present mostly as fine dust particles which eventually settle over land and water. Chromium can strongly attach to soil and only a small amount can dissolve in water and move deeper in the soil to underground water. Fish do not accumulate much chromium from water.

Breathing high levels of chromium (VI) can cause nasal irritation, such as runny nose, nosebleeds, and ulcers and holes in the nasal septum. Ingesting large amounts of chromium (VI) can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death. Skin contact with certain chromium (VI) compounds can cause skin ulcers. Allergic reactions consisting of severe redness and swelling of the skin have been noted.

Several studies have shown that chromium (VI) compounds can increase the risk of lung cancer. Animal studies have also shown an increased risk of cancer. The WHO has determined that chromium (VI) is a human carcinogen. The DHHS has determined that certain chromium (VI) compounds are known to cause cancer in humans. The EPA has determined that chromium (VI) in air is a human carcinogen.

It is unknown whether exposure to chromium will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to chromium(VI). It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

Cobalt. Cobalt is a naturally occurring element found in rocks, soil, water, plants, and animals. Cobalt is used to produce alloys used in the manufacture of aircraft engines, magnets, grinding and cutting tools, artificial hip and knee joints. Cobalt compounds are also used to color glass, ceramics and paints, and used as a drier for porcelain enamel and paints. Radioactive cobalt is used for commercial and medical purposes. 60Co (read as cobalt sixty) is used for sterilizing medical equipment and consumer products, radiation therapy for treating cancer patients, manufacturing plastics, and irradiating food. 57Co is used in medical and scientific research.

Cobalt can benefit or harm human health. Cobalt is beneficial for humans because it is part of vitamin B12. Exposure to high levels of cobalt can result in lung and heart effects and dermatitis. Liver and kidney effects have also been observed in animals exposed to high levels of cobalt. Exposure to high levels of radioactive cobalt can damage cells. Individuals may experience acute radiation syndrome that includes nausea, vomiting, diarrhea, bleeding, coma, and even death.

Nonradioactive cobalt has not been found to cause cancer in humans or animals following exposure in food or water. Cancer has been shown, however, in animals that breathed cobalt or when cobalt was placed directly into the muscle or under the skin. Based on the laboratory animal data, the IARC has determined that cobalt and cobalt compounds are possibly carcinogenic to humans. Exposure to high levels of cobalt radiation can cause changes in the genetic materials within cells and may result in the development of some types of cancer.

Copper. High levels of copper can be harmful. Breathing high levels of copper can cause irritation of nose and throat. Ingesting high levels of copper can cause nausea, vomiting, and diarrhea. Very-high doses of copper can cause damage to liver and kidneys, and can even cause death.

Exposure to high levels of copper will result in the same type of effects in children and adults. We do not know if these effects would occur at the same dose level in children and adults. Studies in animals suggest that the young children may have more severe effects than adults, but we don't know if this would also be true in humans. There are a very small percentage of infants and children who are unusually sensitive to copper.

Birth defects or other developmental effects of copper in humans are unknown. Animal studies suggest that high levels of copper may cause a decrease in fetal growth.

The most likely human exposure pathway is through drinking water, especially if the water is corrosive and copper pipes are used for plumbing. One of the most effective ways to reduce copper exposure is to let the water run for at least 15 seconds first thing in the morning before drinking or using it. This reduces the levels of copper in tap water dramatically.

Copper is found throughout the body; in hair, nails, blood, urine, and other tissues. High levels of copper in these samples can show copper exposures. However, these tests can not predict occurrence of harmful effects. Tests to measure copper levels in the body require special equipment.

Human carcinogenicity of copper is unknown. The EPA has determined that copper is not classifiable as to human carcinogenicity.

Lead. Lead is a naturally occurring metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing. Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. People may be exposed to lead by eating food or drinking water that contains lead, spending time in areas where lead-based paints have been used and are deteriorating, and by working in a job or engaging in a hobby where lead is used. Small children are more likely to be exposed to lead by swallowing house dust or soil that contains lead, eating lead-based paint chips or chewing on objects painted with lead-based paint.

Lead can affect many organs and systems in the body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the reproductive system. The effects are the same whether it is breathed or swallowed. At high levels, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory. Lead may cause anemia, a disorder of the blood. It can also damage the male reproductive system. The connection between these effects and exposure to low levels of lead is uncertain.

Children are more vulnerable to lead poisoning than adults. A child, who swallows large amounts of lead, for example by eating old paint chips, may develop blood anemia, severe stomachache, muscle weakness, and brain damage. A large amount of lead might get into a child's body if the child ate small pieces of old paint that contained large amounts of lead. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, however, lead can affect a child's mental and physical growth. Exposure to lead is more dangerous for young children and fetuses. Fetuses can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead.

The DHHS has determined that two compounds of lead (lead acetate and lead phosphate) may reasonably be anticipated to be carcinogens based on studies in animals. There is inadequate evidence to clearly determine whether lead can cause cancer in people.

Mercury Mercury is a naturally occurring metal which has several forms. Metallic mercury is a shiny, silvery liquid which, when heated, can be a colorless, odorless gas. Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments. People are commonly exposed to mercury by eating fish or shellfish contaminated with methylmercury, breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels, the release of mercury from dental work, working with mercury, or practicing rituals that include mercury.

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems. Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

Young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also pass to a nursing infant through breast milk, although the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Harmful effects due to mercury that passes from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems with their nervous and digestive systems, and kidney damage.

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

Nickel. Nickel is a very abundant natural element. Pure nickel is a hard, silvery-white metal and can be combined with other metals, such as iron, copper, chromium, and zinc, to form alloys. These alloys are used to make coins, jewelry, and items such as valves and heat exchangers. Most nickel is used to make stainless steel. Nickel can combine with other elements such as chlorine, sulfur, and oxygen to form nickel compounds. Many nickel compounds dissolve fairly easy in water and have a green color. Nickel compounds are used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions.

The most common harmful health effect of nickel in humans is an allergic reaction. Approximately 10-20% of the population is sensitive to nickel. People can become sensitive to nickel through contact with the skin for a long time. Once sensitized to nickel, further contact may produce skin. Less frequently, sensitive individuals may have asthma attacks following exposure to nickel. Some sensitized people react when they consume food or water containing nickel or breathe dust containing it. Long term occupational inhalation exposures have resulted in chronic bronchitis and reduced lung function. Ingestion of water containing high amounts of nickel caused stomach ache and adverse effects on blood and kidneys. Damage to the lung and nasal cavity has been observed in rats and mice breathing nickel compounds. Eating or drinking large amounts of nickel has caused lung disease in dogs and rats and has affected the stomach, blood, liver, kidneys, and immune system in rats and mice, as well as their reproduction and development.

Cancers of the lung and nasal sinus have resulted from occupational exposures to dust containing high levels of nickel. The DHHS has determined that nickel metal may reasonably be anticipated to be a carcinogen and that nickel compounds are known human carcinogens. The IARC has determined that some nickel compounds are carcinogenic to humans and that metallic nickel may possibly be carcinogenic to humans. The EPA has determined that nickel refinery dust and nickel subsulfide is human carcinogens.

Polychlorinated biphenyls (PCBs) PCBs are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known anthropogenic sources of PCBs. PCBs can exist as oily liquids, solids or vapor in air. Many commercial PCB mixtures are known by the trade name Aroclor. The majority of PCBs were used in dielectric fluids for use in transformers, capacitors, and other electrical equipment. Since PCBs build up in the environment and can cause harmful health effects, PCB production was stopped in the U.S. in 1977.

PCBs enter the environment during their manufacture, use, and disposal. PCBs can accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water. The most commonly observed health effects associated with exposures to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals administered with large PCB dose for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The DHHS has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the IARC have determined that PCBs are probably carcinogenic to humans.

Thallium. Thallium is a bluish-white metal that is found in trace amounts in the earth's crust. It is used mostly in manufacturing electronic devices, switches, and closures, primarily for the semiconductor industry. It also has limited use in the manufacture of special glass and for certain medical procedures. Thallium enters the environment primarily from coal-burning and smelting, in which it is a trace contaminant of the raw materials. Exposure to thallium may occur through eating food contaminated with thallium, breathing workplace air in industries that use thallium, smoking cigarettes, or contact with contaminated soils, water or air.

Exposure to high levels of thallium can result in harmful health effects. A study on workers exposed on the job over several years reported nervous system effects, such as numbness of fingers and toes, from breathing thallium. Studies in people who ingested large amounts of thallium over a short time have reported vomiting, diarrhea, temporary hair loss, and effects on the nervous system, lungs, heart, liver, and kidneys. High exposures can cause death. It is not known what the reproductive effects are from breathing or ingesting low levels of thallium over a long time. Studies in rats exposed to high levels of thallium showed adverse reproductive effects, but such effects have not been seen in people. Animal data suggest that the male reproductive system may be susceptible to damage by low levels of thallium.

The DHHS, IARC, and the EPA have not classified thallium as to its human carcinogenicity. No studies are available in people or animals on the carcinogenic effects of breathing, ingesting, or touching thallium.

Vinyl Chloride. Vinyl chloride is a colorless gas. It burns easily and it is not stable at high temperatures. It has a mild, sweet odor. It is a manufactured substance that does not occur naturally. It is a biodegradation intermediate of trichloroethane, trichloroethylene, and tetrachloroethylene. Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.

Breathing high levels of vinyl chloride can cause dizziness. Breathing very high levels can cause you to pass out, and breathing extremely high levels can cause death.

Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. People are more likely to develop these changes if they breathe high levels of vinyl chloride. Some people who work with vinyl chloride have nerve damage and develop immune reactions. The lowest levels that produce liver changes, nerve damage, and immune reaction in people are not known. Some workers exposed to very high levels of vinyl chloride have problems with the blood flow in their hands. Their fingers turn white and hurt when they go into the cold.

It has not been proven that vinyl chloride causes birth defects in humans, but studies in animals suggest that vinyl chloride might affect growth and development. Animal studies also suggest that infants and young children might be more susceptible than adults to vinyl chloride-induced cancer. Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes.

The DHHS has determined that vinyl chloride is a known carcinogen. Studies in workers who have breathed vinyl chloride over many years showed an increased risk of liver cancer; brain cancer, lung cancer, and some cancer of the blood have also been observed in workers.

Zinc. Zinc is a naturally occurring element. Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass, and bronze. Acute health effects associate with ingesting o flarge doses are stomach cramps, nausea, and vomiting. Low level chronic exposures to zinc can cause anemia and decrease the levels of good cholesterol. Effect of zinc on human reproductive system is unknown; infertility was observed in animal studies at large doses,

Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever. Chronic effects of breathing high levels of zinc are unknown. Zinc can cause skin irritation. The DHHS and the IARC have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.