Public Health Assessment

Final Release

HORTON IRON & METAL NPL SITE

WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

EPA FACILITY ID: NCN000407480

Prepared by
North Carolina Department of Health and Human Services

MARCH 4, 2014

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR's Cooperative Agreement Partner 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's Cooperative Agreement Partner 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 60-day public comment period. Subsequent to the public comment period, ATSDR's Cooperative Agreement Partner 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's Cooperative Agreement Partner which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

PUBLIC HEALTH ASSESSMENT

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Prepared by:

North Carolina Department of Health and Human Services
Division of Public Health
Occupational and Environmental Epidemiology Branch
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U.S. Department of Health and Human Services
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Acronyms

AF	Attenuation factor
ATSDR	Agency for Toxic Substances and Disease Registry
CDC	Centers for Disease Control and Prevention
CF	Conversion factor
cm	Centimeter
CREG	ATSDR Cancer Risk Evaluation Guide
CR	Contact rate
CV	Comparison Value
DENR	N.C. Department of Environment and Natural Resources
DHHS	N.C. Department of Health and Human Services
DPH	N.C. DHHS Division of Public Health
DWM	N.C. DENR Division of Waste Management
DWQ	N.C. DENR Division of Water Quality
ED	Exposure duration
EF	Exposure frequency
EMEG	ATSDR Environmental Media Evaluation Guide
EPA	U.S. Environmental Protection Agency
HG	Health Guideline value
IR	Ingestion rate
IUR	Inhalation Unit Risk factor
kg	Kilogram
L	Liter
LOAEL	Lowest Observed Adverse Effect Level
LTHA	EPA's Lifetime Health Advisory Level for drinking water
MCLG	EPA's Maximum Contaminant Level Goal
MCL	EPA's Maximum Contaminant Level
M	Meter
MRL	ATSDR's Minimal Risk Level
mg	Milligram
µg	Microgram
µm	Micrometer
NA	Not applicable
NOAEL	No Observed Adverse Effect Level
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyls
ppm	Parts per million
ppb	Parts per billion
RfC	Reference Concentration
RfD	Reference Dose
RMEG	ATSDR Reference Dose Media Evaluation Guide
SVOC	Semi-volatile organic compound
VOC	Volatile organic compound

*** These acronyms may or may not be used in this report**

Foreword

The North Carolina Division of Public Health (N.C. DPH) Medical Evaluation and Risk Assessment Unit's Health Assessment, Consultation and Education (HACE) program has prepared this Public Health Assessment in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for the health issues related to hazardous waste. This health assessment was prepared in accordance with the methodologies and guidelines developed by ATSDR and N.C. DPH.

The purpose of this Public Health Assessment is to identify and prevent harmful health effects resulting from exposure to hazardous substances in the environment. Health assessments focus on health issues associated with specific exposures that have happened in the past, are currently occurring, or are believed to be possible in the future based on current site conditions. The HACE Program evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur in the future, reports any potential harmful effects, and then recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time this health assessment was conducted and may not be applicable if site conditions or land uses change in the future.

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SUMMARY

INTRODUCTION	The North Carolina Division of Public Health's (N.C. DPH) top priority is to make sure the community near the Horton Iron and Metal NPL site (EPA ID: NCN000407480) has the best science information available to safeguard its health. The Horton Iron & Metal National Priorities List (NPL) site is located at 2216 U.S. Highway 421 North, New Hanover County, Wilmington, NC. The Horton Iron & Metal property includes 37 acres. The NPL listing includes only the eastern-most 7.4 acres that are adjacent to the North East Cape Fear River. All samples reviewed for this health assessment were collected in the eastern-most 7.4 acres of the site. The basis of the NPL listing is contamination resulting from former fertilizer manufacturing that took place from 1911-1959, and ship breaking salvage operations that occurred in two boat slips in the 1960s and 1970s. The area includes documented soil, sediment and groundwater contamination with polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), pesticides, metals and asbestos. Currently, Horton Iron & Metal Co., Inc., a scrap iron and metal recycler, operates on the central portion of the property (not included in the NPL listing). The recycling operation employs approximately 12 persons.
OVERVIEW	**The N.C. DPH reached four important conclusions for the Horton Iron & Metal NPL site:**
CONCLUSION 1	**The N.C. DPH cannot currently conclude whether asbestos in the surface soils presents a breathing hazard to persons in the immediate area.**
	No air monitoring has been conducted to determine if respirable asbestos fibers (fibers of the size and shape that can be pulled into the lung) are being released from the soils into the air where they can be inhaled.
BASIS FOR DECISION	The U.S. Environmental Protection Agency's (EPA) Superfund guidance for asbestos states that asbestos levels in soil less than 1% may pose a health hazard and recommends air sampling to assess the hazard. Asbestos levels in soil have been reported at concentrations as high as 3-8% on the site. It is possible for asbestos in soil to be released into the air by human activity or normal environmental conditions. Persons can inhale (breathe) airborne asbestos fibers. Breathing asbestos fibers may cause lung cancer, mesothelioma (a cancer of the membrane lining of the chest, abdomen or heart) and non-cancerous lung damage (asbestosis). It is not possible to reliably predict the potential for respirable asbestos fibers to be released from specific soils, or the concentration released, into the air without testing during a variety of environmental conditions. While asbestos was detected in the area between and around the southern-most boat slip, exposure is expected to be minimal due to the dense vegetation and physical hazards which most likely discourages people from accessing the area. Because persons are working close to the site (Horton Iron

	& Metal Co. employees), the site is not secured, and persons may travel near the site on the North East Cape Fear River, N.C. DPH believes testing for airborne respirable asbestos fibers, or providing a means to prevent exposure, is warranted.
NEXT STEPS	The N.C. DPH makes the following recommendations: ▪ Place signs around the perimeter of the known asbestos-contaminated area to discourage access. Communicate the potential hazard to recycling facility employees (including the potential to carry the asbestos off-site on their clothing to where others may be exposed). DPH recommends additional physical barriers (such as fencing) to prevent access to the area. ▪ Determine if asbestos-containing fill material was deposited beyond the known area of asbestos-contaminated soil. ▪ Determine if an airborne asbestos hazard exists or eliminate the potential for an asbestos hazard. Hazard elimination may include removal of asbestos-contaminated soil or capping to prevent release followed by land-use restrictions. If airborne asbestos hazard identification is the selected alternative, collect respirable asbestos fiber samples around the perimeter of the contaminated area during a variety of typical weather conditions (wet and dry seasons). Include sampling during simulated site activities, including those of the recycling facility operations and potential future remediation efforts. ▪ Confirm the effectiveness of the selected remedy through confirmation sampling for airborne asbestos fibers (or an alternative confirmation method) under the range of typical environmental and site activity conditions. ▪ Provide N.C. DPH with all future environmental monitoring data and site reports for evaluation of potential human health risks.
CONCLUSION 2	**The N.C. DPH concludes that the other source area contaminants (other than asbestos) currently do not present a health hazard. However, as a general precaution, children and women that are pregnant or may become pregnant should avoid repeated exposure to the soils to prevent potential harm to unborn children.**
BASIS FOR DECISION	People do not currently have direct contact with the other types (non-asbestos) of source area contamination present in the soils, sediments and groundwater at a frequency adequate to cause harm. No one lives or works in the contaminant source area. Workers of the adjacent recycling operations do not routinely access the area. Contaminant concentrations in the contaminant source area are too low to negatively impact persons that may infrequently go into the source area. However, contaminated soil from the site can be carried off-site (such as to their residence) on the workers' clothing**.** Women or children could be exposed in the home. Women that are pregnant or may become pregnant should avoid repeated exposure (by ingestion or inhalation) to the elevated concentrations of lead in soil in the contaminant source area. Babies of women exposed to lead during pregnancy can be affected and there is currently no safe level of lead

	in the blood of children that is known to not cause damage to the nervous system and negatively impact intelligence.
NEXT STEPS	The N.C. DPH makes the following recommendations: ▪ N.C. DPH will continue to monitor the site environmental data collected during future investigations and remediation efforts, and provide input to the design of sampling strategies to insure the best information for evaluation of potential health effects to the community. ▪ Groundwater wells on the property should not be used as a drinking water source. The property owners should take steps to insure that workers on the site do not drink water from the process water well. ▪ Recycling company employees should be informed of the potential hazards to unborn and young children associated with carrying the lead contaminated soil on their clothing to their homes.
CONCLUSION 3	**The N.C. DPH cannot conclude whether the health of former workers of the fertilizer manufacturing or ship breaking salvage operations may have been harmed by substances they were exposed to during their employment.**
BASIS FOR DECISION	There is no data to evaluate potential asbestos inhalation exposures to former workers of the ship breaking operations or asbestos inhalation exposure to persons, such as family members, that may have been exposed by workers carrying the asbestos fibers to off-site locations. There is no analytical data available to evaluate other types of potential exposures (soil, surface water, sediment) for the periods when the former fertilizer manufacturing or ship breaking were in operation.
CONCLUSION 4	**The N.C. DPH cannot conclude whether the health of persons eating fin fish or shellfish caught downstream of the site may be harmed.**
BASIS FOR DECISION	N.C. DPH has not located pertinent fish tissue data for this area that has historically been influenced by a variety of commercial and industrial operations. There are known contaminant releases from the Horton NPL site to the NE Cape Fear River and likely other operations along this waterway.
NEXT STEPS	The N.C. DPH makes the following recommendations: ▪ Collect and analyze fillet portions of consumed species of shellfish and finfish downstream of industrialized areas on the NE Cape Fear River to assess the likelihood of exposures and the need for public health interventions. At a minimum, samples should be analyzed for mercury, PCBs, and PAHs. ▪ Use congener-based analytical methods for fish tissue PCB analyses. Congener-specific identification provides an unbiased quantitation of total PCB risk that is not possible with Aroclor pattern-matching analyses on weathered samples and biota.
FOR MORE	If you have concerns about your health as it relates to this site you should contact your health care provider. You can also call the N.C.

INFORMATION	Division of Public Health at (919) 707-5900, or send an e-mail to nchace@dhhs.nc.gov, and ask for information on the Horton Iron & Metal NPL Site Public Health Assessment.

PURPOSE AND HEALTH ISSUES

The Horton Iron & Metal site in New Hanover County, near Wilmington N.C., was added to the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL) in September 2011 because of environmental contamination. The Horton Iron & Metal property includes approximately 37 acres bordered on the east by the North East (NE) Cape Fear River and includes property to the east and west of U.S. Highway 421 North. The property currently includes a scrap metal recycling facility on the portion directly east of U.S. Highway 421 North. The NPL listing covers a portion of the property, approximately 7.4 acres, that is the site of a former fertilizer manufacturing operation and two ship-breaking boat slips. Addition to the NPL is a result of soil, groundwater, and boat slip sediment contamination with high levels of the metals arsenic and lead. This health assessment is limited to samples collected in the 7.4 acre NPL source area and does not include the remainder of the Horton property.

The objective of the N.C. Division of Public Health's (DPH) Public Health Assessment (PHA) is to determine if the Horton Iron & Metal NPL site presents a health hazard to the surrounding community. A public health assessment is written for the community that may be affected by the site. In a public health assessment, concentrations of substances contaminating a site in the soil, groundwater, surface water, drinking water, air or biota (animals and plants) are evaluated to determine if they may present a health hazard if persons come into contact with the contamination. An important component of a public health assessment is the determination of a person's possibility of coming into contact with any potentially harmful substances, how that contact may occur, and for how long that contact may have occurred in the past, or in the future. This information is used to determine whether past, current, or future contact with the contamination may result in harmful health effects. Highly health protective methods are used throughout the public health assessment process. These methods include using comparison and reference dose values that incorporate margins of safety. Use of highly health protective measures increases our ability to identify the potential for person's health to have been harmed, or to be harmed, by coming into contact with the site contaminants. This means that people will not necessarily become sick or experience negative health effects even when chemical concentrations are over the health-based screening levels.

DPH gathered and reviewed all known environmental data for the site and includes information collected by the N.C. Department of the Environment and Natural Resources (DENR) and the U.S. EPA, and their contractors from 1990 through 2009. DPH will continue to evaluate any additional environmental data that is collected in the future and is relevant to public health.

BACKGROUND

SITE DESCRIPTION AND HISTORY

The Horton Iron & Metal NPL site (EPA site NCN000407480) is located at 2216 U.S. Highway 421 North near Wilmington, New Hanover County, North Carolina (see Appendix A, Figures 1 and 2). The site was added to the NPL in September 2011. The Horton property encompasses approximately 37 acres. There are remnants of a former phosphate fertilizer manufacturing plant that operated on approximately 7.4 acres in the eastern most portion of the property from 1911 to 1954. This 7.4 acre area is the location of samples discussed in this assessment. In the 1960s and early 1970s Horton conducted ship-breaking and metal-salvage operations of former World War II ships in two boat slips that remain on the eastern portion of the site adjacent to the NE Cape Fear River. All environmental sample data discussed in this Public Health Assessment were collected in the 7.4 acre "contaminant source area". A scrap iron and metal recycler currently operates on the central portion of the site, located between U.S. 421 N to the west and railroad tracks to the east. The geographic coordinates for the 7.4 acre contaminated source area are 34° 15' 6" North latitude and 77° 57' 14" West longitude. The property is bordered on the east by the North East (NE) Cape Fear River, on the north by VC Chemical-Almont Works, and on the south by Sigma Recycling. U.S. Highway 421 N and railroad tracks run north to south through the western portion of the property. To the west, the site runs across U.S. 421 N, with 6 undeveloped acres located on the west side of the highway (see Appendix A, Figure 3). The contamination specified in the NPL is the result of prior operations that occurred on the site, the fertilizer manufacturing and ship breaking salvage operations. The environmental issues that resulted in addition to the NPL are known releases of source area contaminants (PCBs and metals) to the boat slip sediments and potential releases to the surface waters and sediments (PCBs, metals, asbestos) of the NE Cape Fear River area. Other contaminants that have been identified in the soil and slip sediment include: petroleum products, polynuclear aromatic hydrocarbons (PAHs), pesticides, semi-volatile and volatile organic compounds (SVOCs, VOCs) [HRS Record #5].

From 1911 until 1949 the property was owned by the fertilizer manufacturer American Agricultural Chemical Company, and then by Naco Fertilizer Company from 1949 through 1954. Records indicate that fertilizer operations began in 1915, and American Agricultural Chemical Company had a sulfuric acid chamber building on the northwest corner of the fertilizer operations (east of the current railroad tracks). W.R. Grace continued fertilizer manufacturing on the site while they owned the property from 1954 until 1959, when they sold the property to Horton Iron & Metal. During the time of fertilizer operations at the facility, acid chambers were typically lined with lead. Typical contaminants associated with these types of fertilizer operations during this period include: the metals arsenic, cadmium, copper, lead, mercury, vanadium, zinc, platinum; and, asbestos [HRS Record #5].

In 1962, Horton Iron & Metal leased the property to Horton Industries. In the 1960’s and 1970s, Horton Industries conducted ship breaking (salvage) of World War II ships in the two boat slips located on the east side of the property along the NE Cape Fear River. Typical contaminants associated with ship-breaking include: asbestos, PCBs, PAHs, barium, cadmium, chromium, copper, lead, nickel, and zinc [HRS Record #5].

Figure 4 (Appendix A) identifies the location of the lead acid chamber and remnants of other fertilizer operation structures east of the railroad tracks. Other landmarks on the site are also indicated including current structures associated with the metal recycling operations west of the railroad tracks [TetraTech 2005]. In the 1960’s, the boat slips were dredged, and the dredged material was placed on the property along the northern, western, and southern edges of the slips (see Appendix A, Figure 5). The source of the environmental contamination on the site is identified as the soils of the former lead acid chamber area, the former ship breaking operations, and areas where materials dredged from the slips were placed during the 1960s [HRS Record].

The National Priorities List (NPL) is a continuously updated list of the U.S. EPA’s most uncontrolled or abandoned hazardous waste sites. “Superfund” is the federal government’s program to clean-up the nation’s abandoned or uncontrolled hazardous waste sites that threaten to harm the environment or people. Superfund is administered through the U.S. EPA. Superfund also authorizes the Agency for Toxic Substances and Disease Registry (ATSDR), a federal agency under the U.S. Department of Health and Human Services (U.S. DHHS), to assist in evaluating public health impacts associated with Superfund sites and other releases of harmful substances to the environment. In North Carolina, ATSDR evaluations of NPL sites are conducted through a cooperative agreement program with the N.C. DPH, under the Health Assessment, Consultation and Education (HACE) program (http://www.epi.state.nc.us/epi/oee/hace.html).

CURRENT SITE CONDITIONS

Currently, a portion of the 37 acre site is occupied by Horton Iron & Metal Co., Inc., a metal recycling company. Recycling operations are conducted on a portion of the property not directly associated with the former fertilizer manufacturing or ship breaking. The recycling operations are located between U.S. Highway 421 N to the west and the railroad tracks to the east. The NPL site investigation is limited to the eastern-most 7.4 acres that lie adjacent to the North East Cape Fear River and is the location of the evaluated environmental samples.

A locked gate was installed in 2009 at the recommendation of the EPA on an unpaved road leading from the recycling operations to the former fertilizer manufacturing and ship breaking area to limit access to the contaminant source area. Currently there are no recycling operations in this area. It is not known if recycling operations workers and others may have accessed this area in the past. There are two private wells located in the recycling operations area which are currently in use as process waters for recycling operations and as the water supply for worker restroom facilities. These wells are located up gradient from the contaminant source area (see Appendix A, Figure 4). The property is not served by municipal water. Workers for the recycling operations are supplied with bottled water for drinking [HRS Record #5 and Personal Communication, June 2011].

The Horton property includes a third parcel of approximately six acres of undeveloped land on the west side of U.S. Highway 421 N (see Appendix A, Figure 2). The Horton Iron & Metal Co. property is fenced along U.S. Highway 421 N, and a gate at the entrance is locked during non-business hours. There is no fence along the north or south borders of the Horton property with adjacent commercial properties. Approximately 12 workers are employed by Horton Iron & Metal Co. recycling operations.

The east side of the Horton NPL site borders the NE Cape Fear River. The NE Cape Fear River is a tidally influenced coastal waterway identified as an active commercial and recreational fishery and nursery from upstream of the Horton site to the Cape Fear River (approximately 15 miles downstream of the property) [HRS Record #33]. The site border with the river is dominated by a sea wall approximately 4-5 feet above the river level and the two boat slips. Significant debris from the ship breaking salvage operations remains in both boat slips. Access to the site from the river would be treacherous and is unlikely.

Adjacent to the northern boundary of the property is VC Chemical-Almont Works, and Sigma Recycling borders the southern boundary. The area around the Horton property is dominated by industrial and commercial properties, with some residential and undeveloped areas (see Appendix A, Figures 1-3).

The closest residence to the Horton NPL site is a neighborhood approximately 4000 feet to the northwest across U.S. Highway 421 N (see Appendix A, Figure 2). These residences are served by municipal water [HRS Record 19]. The closest known private well is located on the second commercial property to the north of the Horton NPL site (approximate distance 1800 feet). This well is reportedly not used as a drinking water source and is located up gradient of the contaminant source area. The closest drinking water well system is located 1.5 miles northwest of the site and serves approximately 400 persons [HRS Record #19]. There are no surface water intakes downstream of the site on the NE Cape Fear or Cape Fear Rivers [HRS Record #5]. Due to their location relative to the Horton NPL site, none of these groundwater or surface water intakes would be impacted by the NPL site.

DEMOGRAPHICS

Census 2010 figures for the closest Census Blocks to the site show a residential population of 145 people. Appendix B, Figure 1 shows a map with the location of the site and the Census Blocks included. Appendix B, Table 1 includes Census 2010 figures for the state, county and study area. Twenty-six percent (26%) of the population is under 18 years of age and 12% is over 65 years of age. There are 58 housing units of which 88% are occupied. Of the total occupied housing units, 57% are occupied by a renter.

A comparison of the data from Census 2000 figures within ½ mile from the site, and the selected blocks for the Census 2010, reflects a significant shift in the minority population in the last ten years. The Latino population has increased from 0.9% to 28% while the African-American population has decreased from 50% to 4%.

SITE GEOLOGY AND HYDROGEOLOGY

Surface drainage from the NPL site flows to the southeast toward the NE Cape Fear River. There are currently two operating wells on the property, both used as process water for the recycling operations and as the water supply for worker restrooms. A third well was taken out of service in 2000 or 2001. Of the two remaining wells, one is 70+ feet deep and was installed in 1959. The second well is 30+ feet deep and was installed in 2000-2001. Recycling operation workers are supplied with bottled water for drinking [HRS Record #16]. Groundwater flow under the site moves from west to east toward the NE Cape Fear River. The on-site process water wells are up gradient of the former fertilizer manufacturing and ship breaking area.

Historical soil borings on the Horton property reveal fine calcareous sands and partially weathered limestone at 40-90 feet below the surface overlying fine-grained clayey silts. Other borings from adjacent properties indicate the upper 40 feet are relatively young (in geological terms) sediment consisting of silty sand with lenses of coarse-grained sand, clayey sand and organic silts.

Depth to groundwater locally is about 2 feet. The estimated hydraulic conductivity is 29 feet per day, with most discharge laterally to streams. Groundwater in a 4-mile radius around the property is in the surficial Castel Hayne and Pee Dee aquifers. The aquifers are predominantly unconfined, with local confining clay beds. The bulk of the aquifer recharge is through rainfall [TetraTech 2005].

SITE VISIT

The N.C. DPH Health Assessment, Consultation and Education (HACE) team visited the Horton NPL site on June 1, 2011, accompanied by the N.C. DENR Division of Waste Management (DWM) site manager. Activities included a walking tour of the former fertilizer manufacturing and ship breaking area. Photographs taken during the site visit are included in Appendix C. The locked gate on the unpaved access path from the recycling operations area leading to the contaminant source area is pictured in Appendix C, Photo 1. The surface soil in the area of the former fertilizer manufacturing and ship breaking area is predominantly sand. The former fertilizer manufacturing and ship breaking area is dominated by remnants of buildings from former operations, debris of various size and materials (primarily of metal, glass, or plastic composition), typical native coastal shrubs and grasses, the two boat slips, and a concrete pad and railroad line located between the two boat slips and extending to the river and making up the sea wall. Large remnants of ships or barges remain in both boat slips. The area around the two boat slips where the dredged sediments were deposited in the 1960s is mostly overgrown by the native shrubs and grasses (see Appendix C, Photos 1 - 5). During the site visit the only evidence observed of potential trespassers was tire tracks on the northern end of the site, an area remote from the contaminant source area. The tire tracks appeared to be from a dirt bike or small ATV. A silt fence was observed in the source area to control surface run-off to the river.

The area around the Horton NPL site is dominated by light to heavy commercial operations bordering the NE Cape Fear River and U.S. Highway 421 N. The closest residential area is a small, low density residential community approximately 0.75 miles north and 0.25 miles west of U.S. Highway 421 N. The community consists of approximately 50 older, single family residences. The community is surrounded by light to heavy commercial operations. NPL documents indicate this area is supplied by municipal water. This area is hydrogeologically up gradient of the site (groundwater flows from west of the site and under the area of contamination to the east toward the river) and the groundwater in this area would not be negatively impacted by contamination present on the NPL site.

DISCUSSION

THE ATSDR HEALTH EFFECTS EVALUATION PROCESS

This section provides a summary of the N.C. DPH and ATSDR health effects evaluation process. A more detailed discussion is provided in Appendix G.

The health effects evaluation process consists of two steps: a screening analysis of environmental monitoring data and evaluation of how the community may come into contact with the identified substances (the exposure pathway analysis). At some sites, based on the results of the screening analysis and community health concerns, a more in-depth analysis is undertaken to determine possible public health implications of site-specific exposure estimates.

The two step screening analysis process provides a consistent means to identify site contaminants to be evaluated more closely through the use of health-based “comparison values” (CVs). The first step of the screening analysis is the “environmental guideline comparison” which involves comparing site contaminant concentrations to water, soil, air, or food chain comparison values derived by ATSDR from standard exposure default values. The highest concentration of a chemical found in a particular sample type (such as air, drinking water, soil) is evaluated relative to the comparison value to provide a highly health protective “worst-case” exposure estimate. The average concentration for chemicals found in more than one sample of a particular type is also compared to comparison values to provide an average exposure estimate. An exposure dose is an estimate of the amount of a substance a person may come into contact with in the environment during a specific time period, expressed relative to body weight. The second step is the “health guideline comparison” and involves looking more closely at site-specific exposure conditions, estimating exposure doses, and comparing the exposure dose estimate to dose-based health-effect comparison values.

After completing a screening analysis, site contaminants are divided into two categories. Those not exceeding their CVs do not require further analysis. Contaminants exceeding CVs are selected for a more in-depth site-specific analysis to evaluate the likelihood of possible harmful health effects. When chemicals are found on a site at concentrations greater than the comparison values, it does not mean that harmful health effects would be expected. ATSDR’s comparison values are set at levels that are highly health protective, well below levels known or anticipated to result in adverse health effects. Contaminant concentrations exceeding the appropriate CVs are further evaluated against ATSDR health guidelines (minimal risk levels, “MRLs”). Health guidelines represent daily human exposure levels (“dose”) to a substance that is likely to be without appreciable risk of adverse health effects during specific exposure duration. To determine an exposure dose when site-specific information is not available, N.C. DPH uses standard assumptions about typical body weights, ingestion or inhalation rates, and duration of exposure. Important factors in determining the potential for adverse health effects include the concentration of the chemical, the duration of exposure, the frequency of the exposure, the route of exposure, and the health status of those exposed. Site contaminant concentrations and site-specific exposure conditions are used to calculate highly health protective estimates of site-specific exposure doses for children and adults. These values are then compared to ATSDR health guideline values (MRLs).

Exposure dose estimates are also compared to data collected in animal and human health effect studies for the chemicals of concern. The health study data is generally taken from ATSDR or EPA references that summarize data from studies that have undergone extensive validation review. Comparisons are made on the basis of the exposure route (ingestion/eating, inhalation/breathing, or dermal/skin contact) and the length of the exposure. Preference is given to human study data and chemical doses or concentrations where no adverse health effects were observed. If human data or no-adverse-effect data is not available, animal data or the lowest chemical dose where adverse health effects were observed, may be used.

There are limitations inherent to the public health assessment process. These include the availability of analytical data collected for a site, the type and quantity of health effect study information, and the risk estimation process itself. To overcome some of these limitations, highly health protective exposure assumptions are used to evaluate site data and interpret the potential for adverse health effects. ATSDR comparison values (CVs) and health guideline values incorporate large margins-of-safety to protect groups of the exposed population that may be particularly sensitive, such as children, the elderly, or persons with impaired immune response. Exposure doses are calculated using the highest and average concentrations of a chemical found in the water, soil or air on the site. Large margins-of-safety are also employed when comparing exposure doses to health effect study data. The assumptions, interpretations, and recommendations made throughout this public health assessment are selected to provide a high level of protection.

EXPOSURE PATHWAY ANALYSIS

An exposure to a chemical and the possibility of adverse health effects requires persons to come into contact with the chemical through:

- ingestion (eating the chemical),
- inhalation (breathing the chemical), or
- dermal exposure (absorbing the chemical through the skin)

Having contact with a chemical does not necessarily result in adverse (harmful) health effects. A chemical’s ability to result in adverse health effects is influenced by a number of factors in the exposure situation, including:

- how much of the chemical a person is exposed to (the dose)
- how long a time period a person is exposed to the chemical (the duration)
- how often the person is exposed (the frequency)
- the amount and type of damage the chemical can cause in the body (the toxicity of the chemical)

To result in adverse health effects, the chemical must be present at concentrations high enough and for long enough to cause harm. Exposures at concentrations or time periods less than these levels do not cause adverse health effects. Knowing or estimating the frequency with which people have contact with hazardous substances is essential to assessing the public health importance of these contaminants.

Responses of persons to potentially harmful substances may vary with the individual or particular groups of individuals, such as children, the elderly, or persons with weakened immune responses, or other chronic health issues. These susceptible populations may have different or enhanced responses as compared to most persons exposed at the same concentration to a particular chemical in the environment. Reasons for these differences may include:

- genetic makeup
- age
- health status
- nutritional status
- exposure to other toxic substances (like cigarette smoke or alcohol)

These factors may limit that person's ability to detoxify or eliminate the harmful chemicals from their body, or may increase the effects of damage to their organs or physiological systems. Child-specific exposure situations and susceptibilities are also considered in DPH health evaluations.

The exposure pathway (how people may come into contact with substances contaminating their environment) is evaluated to determine if people have come into contact with site contaminants, or if they may in the future. A completed exposure pathway is one that contains the following elements:

- a **source** of chemical of concern (contamination), such as a hazardous waste site or contaminated industrial site,
- movement **(transport)** of the contaminant through **environmental media** such as air, water, or soil,
- a **point of exposure** where people come in contact with a contaminated medium, such as drinking water, soil in a garden, or in the air,
- a **route of exposure**, or how people come into contact with the chemical, such as drinking contaminated well water, eating contaminated soil on homegrown vegetables, or inhaling contaminated air, and
- an **exposed population** (persons that have been in contact with the contaminants)

The elements of an exposure pathway may change over time, so the time frame of potential exposure (contact) is also considered. Exposure may have happened in the past, may be taking place at the present time, or may occur in the future. A **completed pathway** is one in which all five pathway components exist in the selected time frame (the past, present, or future). If one of the five elements is not present, but could be at some point, the exposure is considered a **potential exposure pathway.** The length of the exposure period, the concentration of the contaminants at the time of exposure, and the route of exposure (skin contact, ingestion, and inhalation), are all critical elements considered in defining a particular exposure event. If one of the five elements is not present and will not occur in the future, it is considered an **eliminated exposure pathway**.

SUMMARY OF SITE ENVIRONMENTAL ANALYTICAL INVESTIGATIONS

The following is a summary of the environmental investigations performed on samples collected on the Horton Iron & Metal NPL site.

2003 Expanded Site Inspection, N.C. DENR – Surface soil samples were collected from the areas of the former lead-acid chambers and former ship breaking operations. The depth of the "surface soil" samples ranged from 0-2 feet below the surface. Groundwater samples were collected from two existing on-site private (process) wells, 5 monitoring wells and 1 on-site background monitoring well. Sediment samples were collected from the two boat slips. Samples were analyzed for: VOCs, SVOCs, metals, pesticides, PCBs, PAHs, and asbestos. Contaminants detected included:

- Surface soils: metals, PAHs, PCBs, pesticides, and asbestos
- Groundwater: metals and pesticides
- Sediments: metals, PAHs, pesticides

2007 Final Removal Assessment, U.S. EPA Contractor – Ten surface soil samples (0-6 inches below ground surface) were collected in a focused area around the two boat slips. The samples were analyzed for the PCB Aroclors 1254 and 1262, and the metals arsenic and lead. PCBs, arsenic and lead were detected in all samples.

2010 Expanded Site Inspection Report, U.S. EPA Contractor – Samples included in this report were collected in 2009 within the 7.4 acre source area. Fourteen groundwater, 18 sediment, and 19 surface soil samples were collected. (The depth of collection of the "surface soil" samples is not specified in the report.) All samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals and cyanide. Contaminants detected included:

- Surface soils: metals, PAHs, PCBs, SVOCs, pesticides and VOCs
- Groundwater: metals
- Sediments: metals, PAHs, PCBs, SVOCs, pesticides and VOCs

For the above combined data sets 17 PAHs, 21 SVOCs, 20 pesticides, 6 VOCs, 29 metals, 6 PCB Aroclor mixtures and asbestos were detected in the former fertilizer manufacturing and ship breaking area soils. Detected contaminants are listed in Appendix D, Table 1.

SELECTION OF SITE ENVIRONMENTAL DATA FOR HUMAN HEALTH EVALUATION

The N.C. DPH reviewed all available relevant environmental analytical data generated by N.C. DENR, U.S. EPA, the former property owners, or their contractors. Waters from the on-site process wells were not evaluated for potential health effects associated with drinking the water since they are up gradient of, and thus not impacted by, the former fertilizer manufacturing and ship breaking area. In addition, these wells do not serve as a source of drinking water for the recycling company employees. The recycling company provides bottled water for their employees to drink. There are no drinking water receptors between the former fertilizer manufacturing and ship breaking area and the NE Cape Fear River, which serves as the discharge point for the local surficial groundwater. Potential health effects associated with exposure to the sediments collected in the two boat slips was not evaluated because it is unlikely that persons would come into direct contact with the sediments because of the physical hazards that exist in the slips (partially submerged remnants of ships/barges and alligators that inhabit the immediate area). Surface soils collected from depths beginning at the ground surface were considered as potential exposure sources. There were no soil sampling depths limited to 0-3 inches below ground surface, which is the preferred depth for evaluation of potential human health impacts.

Data sets reviewed for potential exposures associated with the former fertilizer manufacturing and ship breaking area include surface soils collected in 2003, 2007 and 2009. No air samples have been collected for the site. Appendix D, Table 1 lists the contaminants separated by chemical class detected in the source area surface soils on the Horton Iron & Metal NPL site.

THE POPULATION OF CONCERN AT SITE

The **populations of concern** for the Horton Iron & Metal NPL site are:

- Recycling company employees that could be exposed to contaminants in the surface soils in the contaminant source area;
- Persons trespassing on or near the site that could be exposed to contaminants in the surface soils in the contaminant source area;
- Persons living nearby that could be exposed to air borne contaminants or dust in the surface soils in the contaminant source area;
- Employees of the former fertilizer manufacturing and ship breaking operations and their families;
- Persons working on the site or persons living on the site in the future, after current regulatory and remediation activities are completed; and
- Persons that may ingest fish or shellfish that may have taken-up site contaminants.

EXPOSURE PATHWAY IDENTIFICATION

The NPL “site” is defined as the eastern-most 7.4-acres of the 37-acre Horton Iron & Metal property.

Completed exposure pathways for the site include:

1. **On-site surface soils** – Accidental/unintentional ingestion or inhalation of contaminated source area surface soils by persons working on the site or trespassing on the site.

Potential human exposure pathways for the site include:

1. **Off-site ambient air** - Inhalation of contaminants attached to or released from contaminated surface soils from the source area by persons not on the site, such as persons working or living nearby or persons recreating on the adjacent NE Cape Fear River.
2. **Consumption of fish or shellfish** from nearby waters that may have taken up site contaminants.

Eliminated human exposure pathways for the site include:

1. **On-site and off-site groundwater** – There are no groundwater receptors down gradient of the site.
2. **On-site and off-site surface water** – There are no surface waters on the site. Precipitation surface drainage from the site flows toward the adjacent NE Cape Fear River.
3. **On-site sediments –** The physical hazards, not to mention the local alligator population, associated with the two boat slips prevent persons from having any significant direct contact with the sediments.

4. **Off-site sediments of the NE Cape Fear River** – The size and depth of the river where it borders the Horton Iron & Metal NPL site, in addition to the physical hazards associated with the two boat slips, prevent persons from having direct access to the sediments of the NE Cape Fear River.

SITE-SPECIFIC EXPOSURE CONDITIONS USED FOR THE HEALTH EVALUATION

Table 2 (Appendix D) lists parameters selected to estimate potential site-specific exposures for the former fertilizer manufacturing and ship breaking area of the Horton Iron & Metal NPL site. Site-specific exposure scenarios are developed to quantify how much contact persons may have with contaminants that are known to be on the site. Two exposure scenarios were considered for the Horton Iron & Metal NPL site:

1. An adult male employee of the recycling company working on the contaminant source area for as long as 25 years (the “worker” scenario)
2. A 12-17 year old “trespasser” infrequently riding an ATV on the contaminant source area (the “12-17 yr old ATV trespasser” scenario)

The 12-17 year old ATV trespasser was selected because during the June 2011 site visit, tracks were observed on the north end of the site adjacent to the adjoining commercial property. The tracks appeared to be from a small ATV or motorcycle. Exposure parameter selection was based on values defined by N.C. DPH, ATSDR, the U.S. EPA Exposure Factors Handbook [EPA EFH] and professional judgment.

Contaminants detected in the former fertilizer manufacturing and ship breaking area surface soil samples were evaluated for possible adverse health effects resulting from an un-intentional ingestion (eating) exposure, such as may occur by hand-to-mouth activity while on the site. Two incidental soil ingestion rates were used for the worker scenario to simulate workers with “low” (100 milligrams per day, “mg/d”) and “high” (330 mg/d) exposures [EPA EFH]. These two “worker” ingestion scenarios were evaluated to provide quantitative indications of the potential differences in exposure dose estimates associated with realistic high-end exposure under likely current conditions (low) and higher exposures that could result from more frequent access to the contaminant source area. No air samples are available to evaluate inhalation (breathing) exposures to site contaminants that include asbestos.

PAH compounds detected in the former fertilizer manufacturing and ship breaking area soils were evaluated for cancer effects by adjusting the concentration of each individual PAH compound to the benzo(a)pyrene-equivalent concentration using toxicity equivalency factors (TEFs) developed by U.S. EPA or Nisbet and LaGoy [TEF 2002]. An estimated increase in cancer risk was calculated by summing the TEF-adjusted concentrations for all detected PAH compounds in a sample. Additional detail on the evaluation of sample data for potential health effects associated with PAHs is provided in Appendix G.

N.C. DPH evaluates potential cancer risks for all site contaminants that are known or suspected of causing cancer in humans and that exceed their cancer risk comparison value. Not all chemicals cause cancer. N.C. DPH evaluates cancer health effects in terms of possible estimated increased cancer risk. In North Carolina, 1 out of every 2 men (50%) and 1 out of every 3 women (30%) (about 40% for the combined N.C. population), will be diagnosed with cancer from a variety of causes in their life-time. This is referred to as the “background cancer risk”. The term “excess cancer risk” represents the risk in addition to the background cancer risk. A “one-in-a-million” excess cancer risk (“1/1,000,000” or “10^{-6}” increased cancer risk) represents: in 1,000,000 people exposed to the cancer-causing substance at the specified concentration every day of a 70 year life-time, one additional person <u>may</u> develop cancer above the background number of expected cancer cases. In numerical terms, the background number of cancers expected in 1 million people over their life-time is 400,000. If all 1 million are exposed to the cancer-causing substance daily throughout their life-time then 1 additional person may get cancer (or 400,001 people with cancer), rather than the background number of 400,000. The estimated cancer risk is not a prediction that cancer will occur, but represents the chance of additional cancers, and merely suggests that there is a possibility. The actual additional risk may be much lower, or there may be no risk. For specific investigations, N.C. DPH may use exposure periods of less than a 70-year life-time to provide a more site-specific estimation of the risks that are known or predicted to occur for a particular site. If information on the specifics of exposure situations at a particular site is not known, N.C. DPH will always use health protective values to estimate the maximum level of risk that we believe to be realistic. Additional discussion of cancer risks and risk estimates is provided in Appendix G or in HACE's *Cancer and the Environment* fact sheet (available at: http://www.epi.state.nc.us/epi/oee/hace/pdf/Hace_Cancer_Environ.pdf).

EVALUATION OF POTENTIAL PUBLIC HEALTH ISSUES

The substances detected in environmental samples collected at the site at concentrations greater than health comparison values are discussed below. Tables in Appendix D summarize the data used for the health evaluation. All PCB and PAH detections were summed and evaluated as "total PCB" and "total PAH" concentrations.

Table 3 (Appendix D) summarizes PCB (polychlorinated biphenyl), metal, SVOC (semi-volatile organic compounds), pesticide and PAH (polynuclear aromatic hydrocarbon) concentrations and health comparison values in surface soil samples collected in the site source area. Substances detected at concentrations greater than soil health screening values ("comparison values") were:

1. 5 Metals - mercury, antimony, arsenic, iron and lead
2. 2 SVOCs – carbazole and dibenzofuran
3. 3 Pesticides – 4,4'-DDT, dieldrin and toxaphene
4. Total PCBs as the combined concentration of all Aroclors detected
5. Total PAHs as the combined benzo(a)pyrene-equivalent concentration of all detected PAH compounds

Appendix D, Tables 4 and 5 summarize exposure dose estimates for the "adult male worker" and "12-17 year old ATV trespasser" scenarios selected for this site. Tables 4 and 5 also list the health-based non-cancer health guideline values and increased cancer risk estimates for contaminants known or suspected of causing cancer in humans.

The maximum concentration for the metal antimony at the "high contact" soil ingestion rate resulted in a "worker" dose estimate greater than the non-cancer adverse health effect guideline value. All other dose estimates for antimony are less that the non-cancer health guideline. The low soil ingestion exposure scenario is judged to be most representative of exposure conditions since recycling operations are not located in the source area and access to the source area is limited by the locked gate across the access path. Adverse health effects are not indicated for antimony in the surface soils.

The maximum concentration for the metal lead resulted in a "worker" ingestion dose estimate greater than the non-cancer adverse health effect guideline value listed by the U.S. National

Library of Medicine's International Toxicity Estimates for Risk ("ITER")[1] for both ingestion rates. All other ingestion dose estimates for lead are less that the non-cancer health guideline. DPH selected the ITER value since ATSDR and U.S. EPA do not currently provide a reference dose (RfD) for lead. Since persons are not working directly in the former fertilizer manufacturing and ship breaking area the most realistic exposure scenario for workers on the site uses the average contaminant concentration and low-contact soil ingestion rate. While comparison of the dose estimates to the ITER health guideline value indicate that adverse health effects associated with exposure to lead in the surface soils is not expected, the potential for adverse effects to adults and children associated with low-level exposure to lead have evolved since this value was determined. Recent reviews [NTP 2011] provide sufficient evidence that blood lead levels less than 5 micrograms per deci-liter (<5 µg/dL) are associated with decreased kidney function in adults and levels <10 µg/dL are associated with increased blood pressure, hypertension and increased cardiovascular-associated mortality. Blood lead levels <5 µg/dL in children (<18 years of age) are associated with attention deficit hyperactivity disorder (ADHD), behavioral problems, and decreased cognitive performance. Lead may be passed from a pregnant woman to her unborn baby. Available methods to estimate blood lead levels from exposure to contaminated environmental media involve a great deal of uncertainty. The most effective means to determine blood lead levels is by testing the blood. Some parts of the source area have soil lead concentrations greater than EPA's Industrial Regional Screening Level (800 mg/kg) [EPA PRG]. Testing blood lead levels of persons that are exposed to the site soils is the only means to determine with certainty if they have elevated blood lead levels. Since babies of women exposed to lead during pregnancy can be affected, women that are pregnant or may become pregnant should avoid repeated exposure (by ingestion or inhalation) to the elevated concentrations of lead in soil in the contaminant source area. Women and children could also be exposed by persons living in the same household carry the contaminated soil to the home on the clothing.

Eight of the contaminants detected at concentrations greater than health screening values are identified as suspected or known to cause cancer in humans (PAHs, PCBs, carbazole, 4,4'-DDT, dieldrin, toxaphene, arsenic and lead). There was no increased cancer risk estimate for soil ingestion exposures greater than 1 x 10^{-4} (1 additional cancer in 10,000 persons exposed, defined by DPH as a "low" level of risk) for the worker scenario. The worker scenario increased cancer risk estimate for arsenic, using the maximum detected soil concentration and high soil contact ingestion rate, was equal to 1 x 10^{-4}. (A discussion of qualitative classifications used for increased cancer risk estimates is included in Appendix G). The average arsenic concentration in soil was greater than 3 times the average site-specific background concentration (3x = 9.3 mg/kg arsenic), indicating that the arsenic concentrations in the source area soils are not likely naturally occurring. The worker scenario increased cancer risk estimates for contaminant average soil concentrations and the low ingestion rate are all "no apparent" or "very low" risk (risk range of <1 x 10^{-6} to 9 x 10^{-6}). Consideration of cumulative increased cancer risks to workers without regard to target organ or mode of action, using the average contaminant concentrations and low contact ingestion rate, indicates a cumulative increased cancer risk of 1 x 10^{-5}, a "very low" risk level.

There was "no apparent" increased cancer risk indicated for the "12-17 year old ATV trespasser" exposure scenario for soil ingestion exposures (all risk estimates <1 x 10^{-6} at the maximum detected contaminant concentration).

1. Accessed through TOXNET Toxicology Data Network of the National Library of Medicine. http://toxnet.nlm.nih.gov/index.html

No suitable health-based non-cancer comparison value was located for carbazole (Appendix D, Table 3), an organic compound detected in 11 of 14 surface soil samples. A cancer risk value was available for this chemical (cancer slope factor, CSF) and the increased cancer risk for the average carbazole concentration and low ingestion rate indicated no apparent increased cancer risk ($<1 \times 10^{-6}$). The cancer-screening value is also considered protective for non-cancer risks. No adverse health risks are indicated for carbazole.

Based on the above evaluation, and the limited contact with the former fertilizer manufacturing and ship breaking area, no adverse non-cancer or cancer health-effects are indicated for incidental ingestion of soils for adult male employees of the recycling operation or older children (12 years old or older) that may occasionally come onto the site. “Occasionally” in the context of children 12-17 years old potentially exposed on this particular site is defined as not more that 12 times per year over a 3 year period.

The “worker” exposure scenario provides a suitable evaluation of potential non-asbestos negative health effects to recycling facility workers that venture onto the former fertilizer manufacturing and ship breaking area. No adverse health impacts are indicated for incidental ingestion of soils contaminated with substances other than potentially asbestos during occasional trips into the contaminant source area.

Fish Tissue – It is not known if finfish or shellfish in the area have been impacted by the Horton NPL site. The site sits in an area historically dominated by commercial and industrial operations along the NE Cape Fear River, with multiple past potential sources of contaminant exposure. Separating the influences of the Horton NPL site from these other potential sources is not likely possible. N.C. DPH has issued a statewide fish consumption advisory for mercury. The advisory lists N.C. freshwater and ocean fish that are typically low or high in mercury and provides a recommended number of meals for the general population and population groups more sensitive to the effects of mercury (children and women 15-44 years of age). A copy of the advisory is provided in Appendix E. Following the recommendations of the fish consumption advisory will provide protection for adverse health effects associated with eating fish contaminated with mercury.

There are no other fish consumption advisories that include the NE Cape Fear River. N.C. DPH has not been able to locate any pertinent fish tissue data collected near the Horton NPL site. While following the recommendations of the mercury advisory will be protective for mercury exposure, the possibility of other contaminants in the fish exists. Collecting fin fish and shellfish tissue samples in the fisheries downstream of the predominately industrial areas on the NE Cape Fear and Cape Fear Rivers is recommended to assess potential human exposures to the combined contaminants that may exist in these areas. Recommended tissue analyses include at minimum mercury, PCBs, and PAHs. N.C. DPH recommends congener-based analytical methods for biota tissue PCB analyses. Congener-specific identification provides an unbiased quantitation of total PCB risk that is not available with Aroclor pattern-matching analyses on weathered samples or biota.

POTENTIAL HEALTH HAZARDS ASSOCIATED WITH ASBESTOS IN THE CONTAMINANT SOURCE AREA SOILS

Asbestos is known to cause cancer in humans. Site investigations have identified asbestos in the contaminant source area soils. The source of the asbestos is likely the former ship breaking salvage operations. It is documented that slip sediment was dredged and placed onto soils around the slips in the 1960s. In addition, asbestos likely fell to the soil as it was removed from the ships. Appendix A, Figure 6 identifies the concentration of asbestos determined in soils collected from the contaminant source area. Concentrations reported range from non-detect (<1% chrysotile or amosite asbestos fibers) to 3% amosite and 8% chrysotile asbestos fibers.

The greatest health risks associated with asbestos are related to inhalation of the fibers. The asbestos presents a potential inhalation health hazard if fibers of the size and shape that could be drawn into the lung ("respirable fibers") are released from the soil, become airborne and are inhaled. Potentially, persons on or near the Horton Iron & Metal NPL site could be exposed to airborne asbestos fibers. Persons may also be exposed to the soil asbestos by direct incidental ingestion of asbestos-containing soil particles or by transport of inhaled asbestos fibers to the stomach and gastrointestinal tract. Potentially exposed populations include employees of the recycling operations, site trespassers, persons adjacent to the site on the NE Cape Fear River, and site remediation workers. The U.S. EPA's 2008 Superfund guidance for investigating asbestos-contaminated sites states that soils reported at less than 1% asbestos (the typical reporting limit) may release high levels of asbestos fibers into the air. The guidance additionally identifies that weathering or human activity may over time increase the concentration of respirable fibers and thus increase the potential health hazard. EPA's guidance also states that the release of fibers from soils is variable and assumptions cannot be made regarding the release of fibers into the air from one site or soil type to another. The document specifically identifies that a 1% level of detection should not be used as a threshold for determination of further investigation or remediation [EPA Asbestos].

Soil contaminated with asbestos may also present a hazard through an incidental ingestion route for workers or trespassers. No health guideline values are available to quantify potential health risks for this route of exposure.

N.C. DPH recommends at minimum warning signs be placed around the perimeter of the known asbestos-contaminated areas to discourage access, or preferentially, asbestos contaminated areas be fenced to prevent access. The potential hazards associated with disturbing the soil in this area should be communicated to the employees of the adjacent recycling operations, including the potential to carry respirable fibers away from the site on their clothing where others (such as family members) could be exposed.

There are no data that indicate whether asbestos is or is not present beyond the contaminant source area. It was not uncommon in the past, prior to our knowledge of the adverse health effects associated with asbestos, for asbestos-containing waste material to be used as fill on roads or pathways, in wetlands, or for other "fill" purposes. Asbestos in soils in other areas of the property (other than the NPL area), where there is frequent human activity, could present an inhalation hazard. N.C. DPH recommends that surface soil samples be collected throughout the Horton property to determine if there is asbestos in other areas.

N.C. DPH also recommends either determining if an airborne asbestos hazard exists on the site or eliminating the potential for an asbestos hazard. Determination of an airborne asbestos hazard could include collection of airborne respirable asbestos fiber samples in the site source area (as well as any other areas where asbestos if found) during different environmental conditions and anticipated site activities. The objective of this testing is to determine if a potential asbestos inhalation health hazard exists to persons that may work near asbestos-contaminated soils or persons that frequent the area. Sampling during the wet and dry seasons is recommended to identify if environmental conditions impact asbestos release into the air. Collection of air samples during simulated soil-disturbing activities anticipated for the asbestos-contaminated soils is recommended. If future remediation work is planned for the source area (or any other areas where asbestos if found), activity based airborne asbestos sampling is recommended to identify if these activities will release asbestos fibers to the air and present an inhalation hazard. “Activity-based sampling” simulates a specific activity, in this case the anticipated remediation activities, to determine the exposure hazard associated with that activity. Eliminating an asbestos hazard could include excavation of asbestos-contaminated soils or capping the area to prevent release of the asbestos to the air. This type of remedy would likely require a means to insure that the cover was not disturbed in the future (such as deed restrictions). N.C. DPH leaves open the possibility of other alternatives for identification and/or elimination of an asbestos hazard at this site. It is recommended that the effectiveness of the chosen alternative be confirmed by the collection of follow-up air samples.

POTENTIAL HEALTH HAZARDS ASSOCIATED WITH FERTILIZER AND SHIP BREAKING OPERATIONS IN THE CONTAMINANT SOURCE AREA

There is no information in the site documents regarding historical worker activities at the time of the fertilizer manufacturing or ship breaking salvage activities in the contaminant source area. Fertilizer manufacturing ended on the site in 1959. Ship breaking took place in the 1960’s to 1970’s. The exposure to workers during these periods is not known. Waste-handling practices during these periods are not known. A major concern during the ship breaking would be the potential for workers to carry asbestos from the work area into their homes, where their families could be exposed to respirable fibers. As asbestos was torn away and broken up during the ship breaking salvage and disposal activities, workers would be exposed through inhalation of airborne fibers. A secondary exposure point is asbestos on clothing or skin that can later become airborne. This asbestos can be an exposure source to the families of workers that are exposed to the soiled clothing in the home. The health effects associated with inhalation of asbestos typically are not observed until many years or decades after the exposure.

At this time we do not know if it is possible to identify or locate former salvage workers or their families. If located, they could be alerted to the potential health effects associated with the inhalation of asbestos fibers and urged to notify their health-care providers so that appropriate health-monitoring is provided.

POTENTIAL HEALTH HAZARDS ASSOCIATED WITH FUTURE REMEDIATION ACTIVITIES

N.C. DPH urges the use of appropriate personal protective equipment and other controls to prevent exposures associated with contaminated soil disturbance during remediation activities, to protect both remediation workers and other near-by persons. In addition to the surface soil contaminants addressed in this assessment, elevated concentrations of metals, PCBs, PAHs and pesticides have been documented in the sub-surface soils and sediments and can be a potential exposure source. All applicable OSHA regulations, including those specific to working with asbestos-containing materials, should be followed for persons working on the site.

POTENTIAL FUTURE USE OF THE HORTON IRON & METAL NPL SITE

N.C. DPH knows of no current restriction on potential future use of the site. Should the site be proposed for use other than industrial/commercial operations (such as for residential or recreational use) N.C. DPH recommends that a comprehensive human health risk evaluation be completed for the site conditions at that time. The objective of the recommended evaluation is to determine if future users of the site under the anticipated exposure conditions could be exposed to contaminants that may remain on the site at levels that could cause adverse health effects. It is recommended that the results of this evaluation, if not completed by N.C.DPH should be reviewed by these agencies.

HEALTH EFFECTS OF SELECTED SITE CONTAMINANTS

Asbestos - Asbestos is the general name for a group of fibrous silicate minerals, including chrysotile (the main type used commercially) and fibrous amphibole-type minerals (including actinolite, anthophyllite, crocidolite, tremolite and amosite). For many years, asbestos (mainly chrysotile, amosite, and crocidolite) was mined and used in many commercial products, such as insulation, brake linings, building materials, and flooring. Release of asbestos fibers in soil into the air can occur through natural processes, such as erosion and weathering, or human activities, such as excavation, soil tilling, or automobile or foot traffic.

Inhalation of asbestos fibers is the primary health concern related to asbestos exposures. Breathing asbestos fibers into the lungs increases a person's risk of developing a rare cancer of the pleural lining called mesothelioma, lung cancer, laryngeal cancer, or certain types of nonmalignant respiratory diseases (such as asbestosis). Typically, these diseases do not appear until many years, even decades after the exposure. Health studies indicate that th0e physical dimensions of the asbestos fibers are an important indicator of the potential for harmful health effects. Fiber length affects the body's ability to clear the asbestos fibers from the lung, with longer or thicker fibers more difficult to clear.

Chrysotile-type asbestos has relatively long and flexible crystalline fibers, while amphibole minerals are brittle and have a rod- or needle-like shape. Many scientists believe that the amphibole varieties of asbestos are more potent in causing mesothelioma, and possibly other asbestos related diseases, than is the chrysotile variety. The possible increased potency of amphibole-type asbestos may be related to the amphibole fibers tendency to remain in the lungs longer.

Mesothelioma is cancer of the membrane lining the chest cavity and covering the lungs (pleura) or lining the abdominal cavity (peritoneum). The malignancy can spread to tissues surrounding the lungs or other organs. The great majority of mesothelioma cases are attributable to asbestos exposure. Lung cancer, also known as bronchogenic carcinoma, is cancer of the lung tissue. The combination of tobacco smoking and asbestos exposure greatly increases the risk of developing lung cancer. Laryngeal cancer is cancer of the epiglottis and vocal cords. Laryngeal cancer arises from the surface epithelium that lines the upper airways, which are in direct contact with inhaled asbestos fibers.

Non-cancer effects of asbestos inhalation exposure include: asbestosis, a restrictive lung disease caused by asbestos fibers scarring the lung; pleural plaques, localized areas of thickening of the pleura; diffuse pleural thickening, generalized thickening of the pleura; pleural calcification, calcium deposition on pleural areas thickened from chronic inflammation and scarring; and pleural effusions (fluid buildup in the pleural space between the lungs and the chest cavity).

The risk of harmful health effects resulting from the inhalation (breathing) of asbestos fibers increases as: the concentration of inhaled fibers increases; as the frequency and length of time over which fibers are inhaled increases; and, as the age of first exposure (inhalation) decreases. These effects have been observed primarily in individuals breathing a significant amount of airborne asbestos in the workplace or environmental exposures. Ingestion of asbestos causes little or no risk for non-cancer effects. However, there is some evidence from animal studies that ingestion of large amounts of asbestos fibers in a single event or several events over a short time period may lead to the development of lesions, and eventually colon cancer. Human studies of persons exposed to high concentrations of asbestos fibers in drinking water are inconsistent, but suggest a possible increase in cancers of the stomach, kidney and pancreas [ATSDR 2001b].

The influence of fiber length and health effects: Studies indicate that the physical dimensions of asbestos fibers are an important indicator of the potential to develop harmful health effects following inhalation. An expert panel coordinated by ATSDR concluded that fiber length plays an important role in toxicity. The role of fiber length appears to be related to the diminished efficiency in clearance of longer fibers by the lung. ATSDR concluded that fibers greater than 5 microns (>5 µm) in length are of a concern for cancer risk, but that fibers with lengths less than 5 microns (<5 µm) are unlikely to cause cancer in humans [ATSDR 2003].

While the risk of asbestos exposures resulting in disease generally increases with fiber length, exposure to asbestos fibers of all types and lengths may result in a negative health effect. The chemical characteristics of asbestos may also have an impact on potential health effects and disease development. Based on studies reviewed by ATSDR, amphibole type asbestos, which includes fibrous forms such as amosite, appears to be significantly more potent compared to chrysotile (forms which have a "serpentine" shape) in causing mesothelioma and pleural effects, and possibly in causing lung cancer. The differences in the toxicity of the different types of asbestos fibers may be related to a higher degree of bio-persistence, which is related to their chemical and physical make-up, and the reduced ability to clear amphibole fibers from the lungs [ATSDR 2001b].

ATSDR's *Asbestos ToxFAQs*™ fact sheet answers common health questions about asbestos. A copy of this document is provided in Appendix F.

Arsenic – Arsenic is a metal that occurs naturally in soil and in many kinds of rock, especially in minerals and ores that contain copper or lead. Arsenic is used as an alloying element in ammunition and solders, as an anti-friction additive to metals used for bearings, and to strengthen lead-acid storage battery grids. In the past, inorganic arsenic compounds were used as pesticides, but this use is no longer permitted. Inorganic arsenic is primarily used as a preservative for wood to make it resistant to rotting and decay. In 2003, the use of arsenic-containing wood preservatives was phased out for certain residential uses such as play structures, picnic tables, decks, fencing, and boardwalks. Arsenic wood preservatives are still used in industrial applications. Arsenic in soil may be transported by wind or in runoff or may leach into the subsurface soil. Arsenic is largely immobile in soils, therefore, it tends to concentrate and remain in upper soil layers indefinitely.

Inhalation of inorganic arsenic may cause respiratory irritation, nausea, skin effects, and increased risk of lung cancer. Long term oral exposure to low levels of inorganic arsenic may cause dermal effects (such as hyperpigmentation and hyperkeratosis, corns and warts) and peripheral neuropathy characterized by a numbness in the hands and feet that may progress to a painful "pins and needles" sensation. There may also be an increased risk of skin cancer, bladder cancer, and lung cancer. These types of effects would be expected in persons exposed to an elevated level of arsenic on a frequent basis, such as in an occupational exposure to elevated levels over many years. The estimated oral exposure dose calculated for this site using the soil average arsenic concentration and the low ingestion rate is more than 3,100 times lower than the lowest dose in human studies (ATSDR 2007) that led to an adverse effect (increased risk of pre-malignant skin lesions, >8 year oral exposure in water). The estimated dose using the maximum soil concentration and the high ingestion rate is more than 200 times lower than the health study value. There are no air concentrations for the site for inhalation exposure comparisons.

Lead – In January 2012 a science advisory group made recommendations to the Centers for Disease Control and Prevention (CDC) to change its "blood lead levels of concern" for children's health effects. Over the last several years a growing body of scientific evidence suggests lower levels of lead in the blood of children than previously recognized (<10 µg/dL) have been associated with irreversible declines to IQ and academic performance, as well as the ability to pay attention. The CDC now recommends that a level of 5 micrograms per deciliter (µg/dL) be used as the reference value to identify children with elevated blood lead. Studies have not revealed a level of lead in the blood of children that is considered safe and without potential health effects. CDC recommends preventing exposure as the best means to protect children's health.

Lead is a naturally occurring metal in soils and ores. Exposure to lead is most often associated with human activities including burning fossil fuels, mining and manufacturing. Lead is found in many products including lead-based paints, some batteries, ammunition and ceramics. Exposure may be through inhalation of dust containing lead, lead fumes (such as from lead-containing solder in older water pipes), or through ingestion of lead contaminated food or water. Lead can affect many parts of the body but the most common effects are usually seen in the nervous system of children or adults. Low level long-term lead exposure can cause muscle weakness, increased blood pressure and anemia. Long-term exposure to high concentrations can cause brain, kidney and reproductive system damage. Lead can be passed from a mother's body to negatively impact the health of her unborn child. Lead exposure can also cause a miscarriage. It is not known for certain if lead causes cancer in humans. Rats and mice fed large amounts of lead in their food developed kidney tumors. DHHS classifies lead as "reasonably anticipated" to cause cancer and EPA consider lead a "probable" cancer causing substance [ATSDR 2007c].

HEALTH OUTCOME DATA

In addition to studying exposure and chemical-specific toxicity data as part of the public health assessment process, N.C. DPH also considers health outcome data, such as mortality and morbidity data. The following criteria are evaluated when determining if a study of health outcome data is reasonable: (1) presence of a completed human exposure pathway, (2) high enough concentrations of contaminants to result in measureable adverse health effects, (3) sufficient numbers of exposed people in the pathway for effects to be measured, and (4) a health outcome database where disease rates for the population of concern can be identified.

Because of the lack of data regarding the potential exposures at the former fertilizer manufacturing and ship breaking area and the amount of time that has passed, the limited number of people that may have been exposed, the confounding impact of other near-by source area related exposures the N.C. DPH does not anticipate that evaluating health outcome data for this site will be achievable. No health outcome data is known to exist that is adequately specific to or focused on the relatively small population that may be by living near the Horton Iron & Metal NPL site. In addition, a list of persons that were employed in the ship-breaking operations is not available from the company due to the length of time that has passed.

COMMUNITY HEALTH CONCERNS

Over two days in December 2012 HACE conducted outreach activities in the community nearest the Horton Iron & Metal site. HACE talked to 19 residents (both English and Spanish speaking). Residents were given: an explanation of the main conclusions and recommendations of the PHA; copies of the site summary factsheet (Appendix J); an opportunity to ask questions about the site; and, HACE contact information if they had additional questions. A copy of the factsheet was left at the offices of Amigos International, Inc. which were closed at the time. At that time, a copy of the Public Comment Release PHA was delivered to the local public library and the New Hanover County Health Department, as well as the Horton Iron & Metal Co. facility.

In January 2013 HACE mailed the site summary factsheet (Appendix J) to 37 residents located in the community nearest the site. One person contacted HACE with health concerns not associated with the site. HACE provided information to this resident to assist her.

In February 2013 HACE staff attended an EPA public availability session conducted at the local library in Wilmington, N.C. No community members attended the meeting.

The NPL site "community" is also comprised of current employees of the recycling operations, as well as past employees of the recycling operations, the fertilizer manufacturing, and the ship breaking salvage operations. While there is no way of knowing what the exposure of past workers on the site may have been, it is possible the ship breaking workers were exposed to asbestos, and that they may have carried asbestos fibers on their clothing into their homes where other family members may have been exposed.

CHILD HEALTH CONSIDERATIONS

The ATSDR recognizes there are unique exposure risks concerning children that do not apply to adults. Children are at a greater risk than are adults to certain kinds of exposures to hazardous substances. Because they play outdoors and because they often carry food into contaminated areas, children are more likely to be exposed to contaminants in the environment. Children are shorter than adults and as a result, they are more likely to breathe more dust, soil, and heavy vapors that accumulate near the ground. They are also smaller, resulting in higher doses of chemical exposure for their body weight. If toxic exposures occur during critical growth stages, the developing body systems of children can sustain permanent damage. Probably most important, however, is that children depend on adults for risk identification and risk management, housing, and access to medical care. Because of this, adults should be aware of public health risks in their community, so they can guide their children accordingly. Child-specific exposure situations and health effects are taken into account in N.C. DPH health evaluations.

For this site, N.C. DPH evaluated site conditions and evidence of persons trespassing on the site. A site-specific exposure scenario was included that simulates the most likely means of highest exposure potential for persons younger than adults (12 to 17 years of age) on the site. Realistic yet health protective exposure parameters were selected for the health evaluation.

As noted, there is concern that the former workers of the ship breaking salvage operations may have provided an exposure route for asbestos fibers carried on their clothing to their homes, exposing family members to respirable asbestos fibers. Adverse health effects resulting from inhalation of respirable asbestos fibers by children or other family members may not develop for years or decade because of the latency period of asbestos fiber inhalation and development of recognizable adverse health effects.

UNCERTAINTIES AND LIMITATIONS

Uncertainties are inherent in the public health assessment process. These uncertainties fall into the following categories: 1) the imprecision of the risk assessment process, 2) the incompleteness of the information collected and used in the assessment, 3) present knowledge of the toxicological properties of the identified contaminants, and 4) the differences in opinion as to the implications of the information. These uncertainties can result in an over or under estimation of potential health risks. These uncertainties are addressed in public health assessments by using realistic health-protective assumptions when estimating or interpreting health risks. The health assessment calculations and screening values also incorporate margins of safety to accommodate these uncertainties. The assumptions, interpretations, and recommendations made throughout this public health assessment err in the direction of protecting public health.

Uncertainties and limitations specific to this site and health evaluation are:

1. There is no air monitoring data to determine the potential exposure to airborne contaminants, particularly the asbestos present in the soils.
2. The potential hazard associated with an ingestion exposure to asbestos-contaminated soil existing on the site is unknown.
3. The data do not exist to evaluate potential exposures to persons in the immediate vicinity that do not have direct contact with the former fertilizer manufacturing and ship breaking area, such as local workers, commuters, and boaters on the NE Cape Fear River.
4. Many of the soil analyses were reported as "J" flagged data, indicating that the reported concentration is an estimated value. Actual concentrations may be lower or higher than those reported, potentially impacting the results of this health evaluation.
5. There is no information on whether asbestos containing waste materials generated during ship breaking operations in the 1970's and prior were deposited in areas beyond the former fertilizer manufacturing and ship breaking area.
6. There is no information to evaluate past exposures of persons that were employed by the former fertilizer manufacturing or ship breaking operations.
7. N.C. DPH has not been able to locate data to verify that local fish and shellfish populations have not been contaminated and are safe to eat.
8. N.C. DPH is not able to evaluate the potential for adverse health impacts associated with the combined exposure to this site and other potential environmental contaminant sources in the area.
9. All conclusions and judgments presented in this assessment are based on the available data and assume the data are representative of the site conditions and contaminant concentrations.

CONCLUSIONS

N.C. DPH evaluated all available environmental data for the former fertilizer manufacturing and ship breaking area of the Horton Iron & Metal NPL site. The potential for adverse health effects to persons that are employed by the Horton Iron & Metal Co. recycling operations or for children 12-17 years of age that may occasionally access the site were identified as the likely exposure scenarios. Site-specific exposure doses were estimated for these 2 scenarios using health-protective parameters.

N.C DPH concluded:

1. **There is no data to identify if the asbestos documented in the former fertilizer manufacturing and ship-breaking area surface soil may be released to the air and become an inhalation hazard.**
   - The U.S. Environmental Protection Agency's (EPA) Superfund guidance for asbestos states that asbestos levels in soil less than 1% in soils may pose a health hazard and recommends air sampling to assess the hazard. Asbestos levels in soil have been reported at 3-8% in the area around the boat slips. It is possible for asbestos in soil to be released into the air by human activity or normal environmental conditions. Persons can inhale (breathe) airborne

asbestos fibers. Breathing asbestos fibers may cause lung cancer, mesothelioma (a cancer of the membrane lining of the chest, abdomen or heart) and non-cancerous lung damage (asbestosis). It is not possible to reliably predict the potential for respirable asbestos fibers to be released from specific soils, or the concentration released, into the air without testing during a variety of environmental conditions. Because persons are working close to the site (Horton Iron & Metal Co. employees), the site is not secured, and persons travel near the site on the North East Cape Fear River, N.C. DPH believes testing for airborne respirable asbestos fibers, or providing a means to prevent exposure, is warranted.

2. **Contaminants other than asbestos identified in the surface soils of the former fertilizer manufacturing and ship breaking area do not present a health hazard. However, as a general precaution, children and women that are pregnant or may become pregnant should avoid repeated exposure to the soils to prevent potential harm to unborn children.**
    - People do not currently have contact with the other types (non-asbestos) of source area contamination present in the soils, sediments and ground waters at a frequency adequate to cause harm. No one lives or works in the contaminant source area. Workers of the adjacent recycling operations do not routinely access the area. Contaminant concentrations in the contaminant source area are too low to negatively impact persons that may infrequently go into the source area.
3. **The data do not exist to determine if workers of the former fertilizer manufacturing or ship breaking salvage operations may have been harmed by substances they were exposed to during their employment.**
    - There are no data to evaluate potential asbestos inhalation exposures to former workers of the ship breaking operations or asbestos inhalation exposure to persons, such as family members, that may have been exposed by workers carrying the asbestos fibers to off-site locations. There are no analytical data available to evaluate other types of potential exposures (soil, surface water, sediment) for the periods when the former fertilizer manufacturing or ship breaking were in operation.
4. **The data do not exist to determine whether the health of persons eating fin fish or shellfish caught downstream of the site may be harmed.**
    - N.C. DPH has not located pertinent fish tissue data for this area that have historically been influenced by a variety of commercial and industrial operations. There are known contaminant releases from the Horton NPL site to the NE Cape Fear River and likely other operations along this waterway.

RECOMMENDATIONS

The N.C. DPH makes the following recommendations:

1. The responsible parties or EPA place signs around the perimeter of the known asbestos-contaminated area to discourage access. Communicate the potential hazard to recycling facility employees (including the potential to carry the asbestos off-site on their clothing to where others may be exposed). Physical barriers to prevent access to the asbestos-contaminated areas, such as fencing, are also recommended.
2. The responsible parties or EPA determine if asbestos-containing fill material was deposited beyond the known area of asbestos-contaminated soil.

3. The responsible parties or EPA determine if an airborne asbestos hazard exists or eliminate the potential for an asbestos hazard. Hazard elimination may include removal of asbestos-contaminated soil or capping to prevent release followed by land-use restrictions. If airborne asbestos hazard identification is the selected alternative, collect respirable asbestos fiber samples around the perimeter of the contaminated area during a variety of typical weather conditions (wet and dry seasons). Include sampling during simulated site activities, including those of the recycling facility operations and potential future remediation efforts. Confirm the effectiveness of the selected remedy through confirmation sampling for airborne asbestos fibers under the range of typical environmental and site activity conditions.
4. Groundwater wells on the recycling operations property currently used as process water should continue to not be used as a source of drinking water. Appropriate steps should be taken by the property owner to insure that workers are not drinking water from the on-site wells, or alternately have the water tested to insure that it meets state and federal regulatory standards for consumption.
5. The property owner should inform employees of the potential hazards to unborn and young children associated with carrying the lead contaminated soil on their clothing to their homes.
6. N.C. DPH will work with N.C. DENR to facilitate collection and analysis of shell fish and fin fish tissue downstream of the industrial areas on the NE Cape Fear River. This data will be used to determine the potential for persons to be exposed to environmental contaminants taken up by the species of fish commonly caught and consumed by anglers or commercial fishing operations. N.C. DPH will also work with local and state agencies to evaluate the local knowledge of fish consumption advisories and to increase awareness. Fish tissue analysis for PCBs should be by the 209-congener method to provide an unbiased quantitation of total PCB risk that is not possible with Aroclor pattern-matching analyses on weathered samples and biota.

PUBLIC HEALTH ACTION PLAN

The purpose of the Public Health Action Plan is to ensure that this Public Health Assessment provides a plan of action designed to mitigate or prevent potential adverse health effects.

A. Public Health Actions Completed

   1. N.C. DPH has evaluated all available environmental media analytical data for the 7.4-acre NPL source area and health effects information to determine the potential for the health of the local community to be adversely impacted by substances identified on the Horton Iron & Metal NPL site. These evaluations included consideration of persons employed on the associated recycling operations facility.
   2. N.C. DPH worked with N.C. DENR and U.S. EPA to develop a plan to address the asbestos in soil remaining at the site. The recommendations allow for air sampling to determine if a current inhalation hazard exists from asbestos in the ambient air or simply capping the soil to control release of asbestos from the site soil.

B. Public Health Actions Planned

   1. A draft copy ("Initial/Public Comment Release") of N.C. DPH's Public Health Assessment was made available to the local community, New Hanover County officials, N.C. DENR, and U.S. EPA prior to final publication through ATSDR. Copies were made available electronically from HACE and ATSDR web sites. Hard copies

were made available to the community at locations in selected document repositories.

2. The Horton Iron & Metal NPL Site Public Health Assessment – Initial/Public Comment Release document was released on October 11, 2012. A comment submission period of more than 60 days was provided. Comments were received from 3 sources. The comments are incorporated into the “Final” Public Health Assessment. Copies of the Final document will be available electronically from HACE and ATSDR web sites. Hard copies will be made available to the community at locations in selected document repositories. The site factsheet will also be finalized and made available through the same sources.
3. A summary factsheet in English and Spanish was mailed to residents in the nearby community, local organizations and local officials with information on how to access the Initial/Public Comment Release copy electronically or at the local library, and provided information on how to submit comments.
4. In July 10, 2012, the HACE health educator assisted EPA's community involvement staff in conducting interviews of Spanish speakers in order to capture resident's concerns regarding the contamination at the site.
5. HACE staff conducted outreach and education of the nearest residential community to the NPL site on December 12 and 13, 2012. A total of 12 homes were visited with a total of 19 individuals directly reached. Residents were provided with a copy of the site PHA factsheet and HACE program contact information.
6. A copy of the PHA was delivered to the Horton facility, the county health department and the local public library on December 12-13, 2012.
7. In January 2013 HACE staff mailed the site PHA factsheet in English and Spanish to 37 local residences.
8. The HACE health educator translated EPA's site fact sheet as well as the announcement of EPA’s public availability session held in February 12, 2013. Staff from HACE also attended the meeting. No community residents attended EPA’s meeting.
9. HACE staff will continue to communicate with U.S.EPA and N.C. DENR about upcoming meetings they may undertake that are intended to update the local community or New Hanover County officials on site activities or plans.
10. N.C. DPH will work with state and federal agencies with the goal to develop a fish tissue study for the NPL site area. N.C. DPH will work with local and state agencies to evaluate the local knowledge of fish consumption advisories and to increase the awareness as needed.
11. N.C. DPH will monitor the status of all other recommendations made in this Public Health Assessment to protect public health and work with the appropriate agencies or groups to facilitate their completion.
12. N.C. DPH will continue to monitor health, analytical data, or biological data generated by Federal, State, or County agencies, or other groups, relevant to this NPL site or potentially affected communities near the NPL site.
13. N.C. DPH or other appropriate agency or organization performs a follow-up public health risk assessment should the site be proposed for future post-remediation uses other than industrial/commercial operations.

CONTACT INFORMATION

Contact information for additional inquiries regarding the Horton Iron & Metal NPL Site Public Health Assessment - Public Comment Release, or to contact N.C. DPH Public Health physicians:

Web links to the PHA:
N.C. DPH HACE: http://epi.publichealth.nc.gov/oee/hace/by_site.html#H

ATSDR access: http://www.atsdr.cdc.gov/HAC/PHA/HCPHA.asp?State=NC

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REPORT PREPARATION

This Public Health Assessment/Health Consultation for the Horton Iron & Metal NPL site was prepared by the North Carolina Department of Public Health (N.C. DPH) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

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Appendix A

Figures

Figure 1. Location of the Horton Iron & Metal NPL site, New Hanover County, Wilmington, NC. Source: [HRS document record no. 26, 2007].

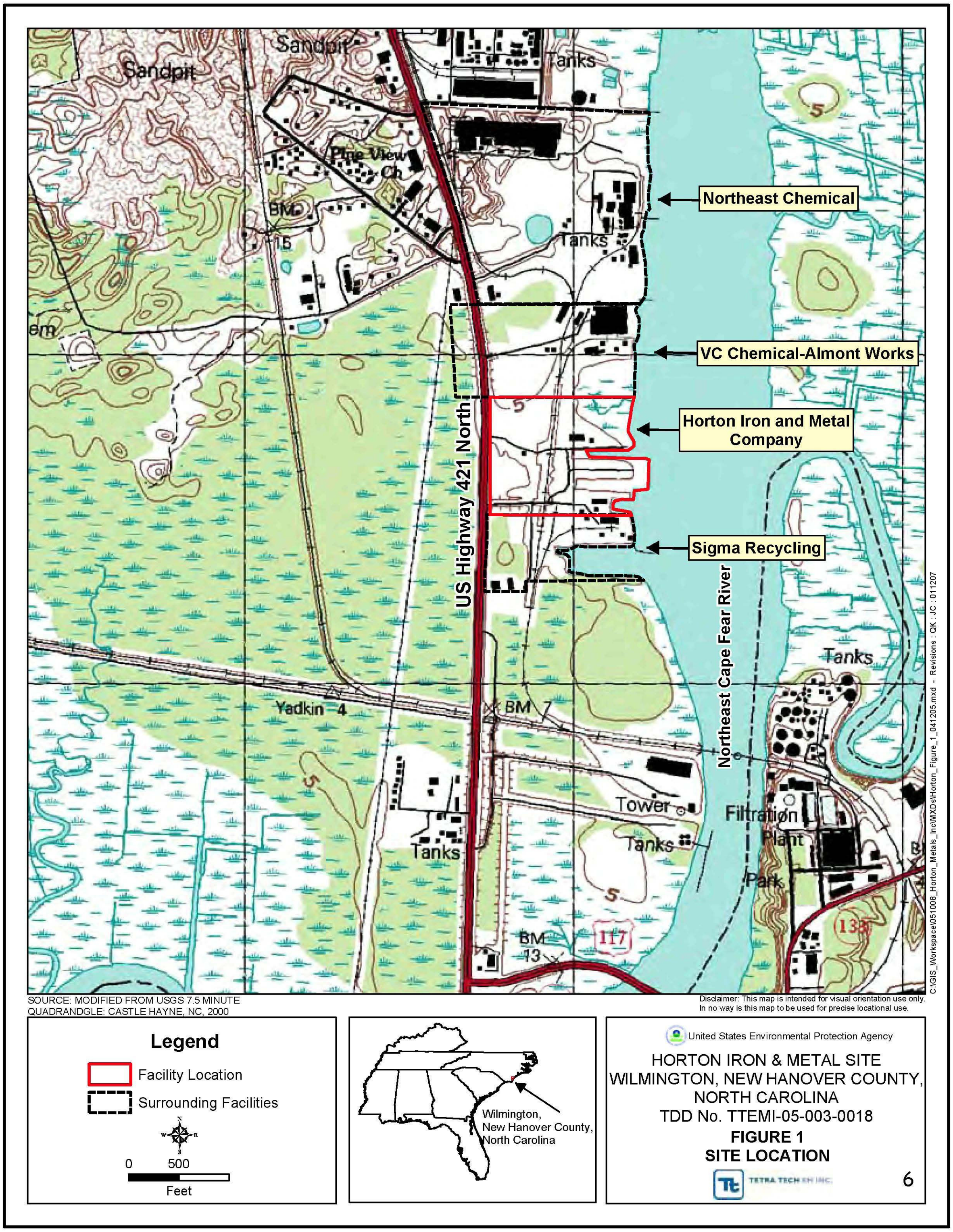


Figure 2. Location of the Horton Iron & Metal NPL site, New Hanover County, Wilmington, NC (pink and blue outline). A ½ mile radius around the site is indicated by the red circle. The nearest residential area to the site is to the northwest, outlined in white, just inside the ½ mile radius. Source: ATSDR, Sept. 2011.

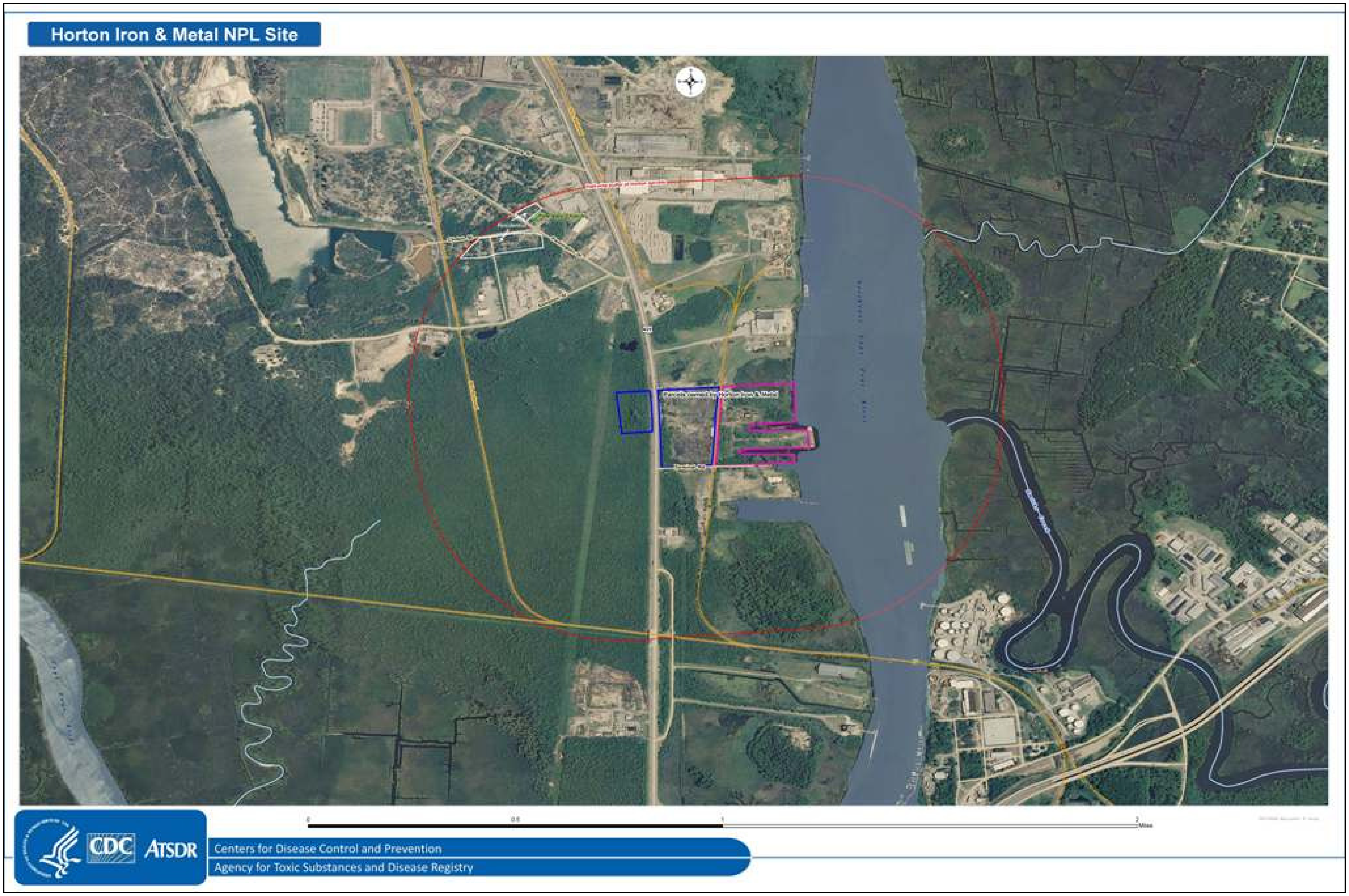


Figure 3. Satellite view outline of the Horton Iron & Metal NPL site (in red). Horton Iron & Metal Co.'s recycling and scrap metal operation is located on the middle of the 3 parcels. Source: [HRS record reference #5, 2010].

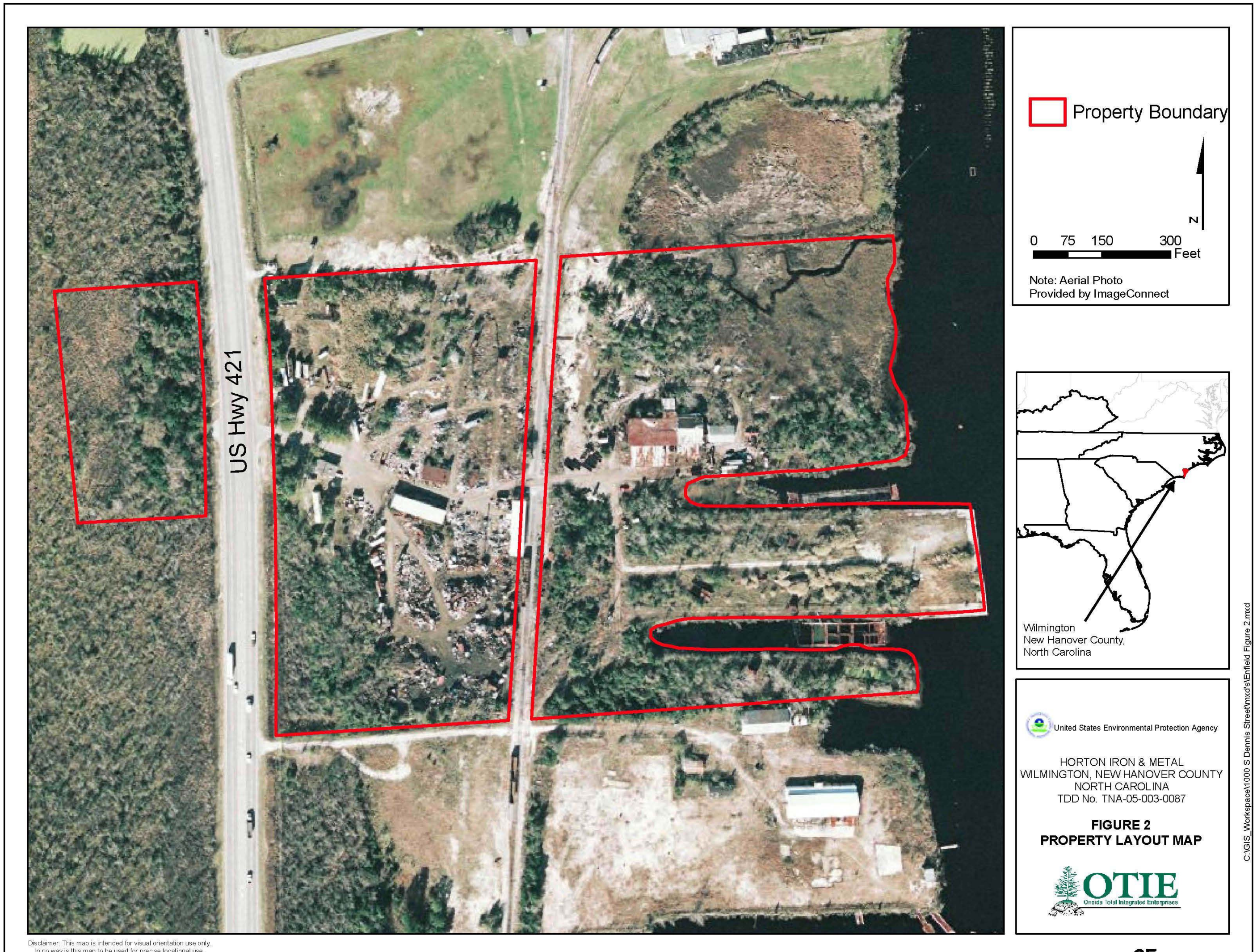


Figure 4. Layout of structures associated with historical and current operations on the Horton Iron & Metal NPL site. The former fertilizer manufacturing and ship-breaking salvage area is located east of the railroad tracks. The current recycling and scrap metal operations are located west of the railroad tracks and east of U.S. Highway 421 N. Source: [Preliminary Scoring Strategy, 2005].

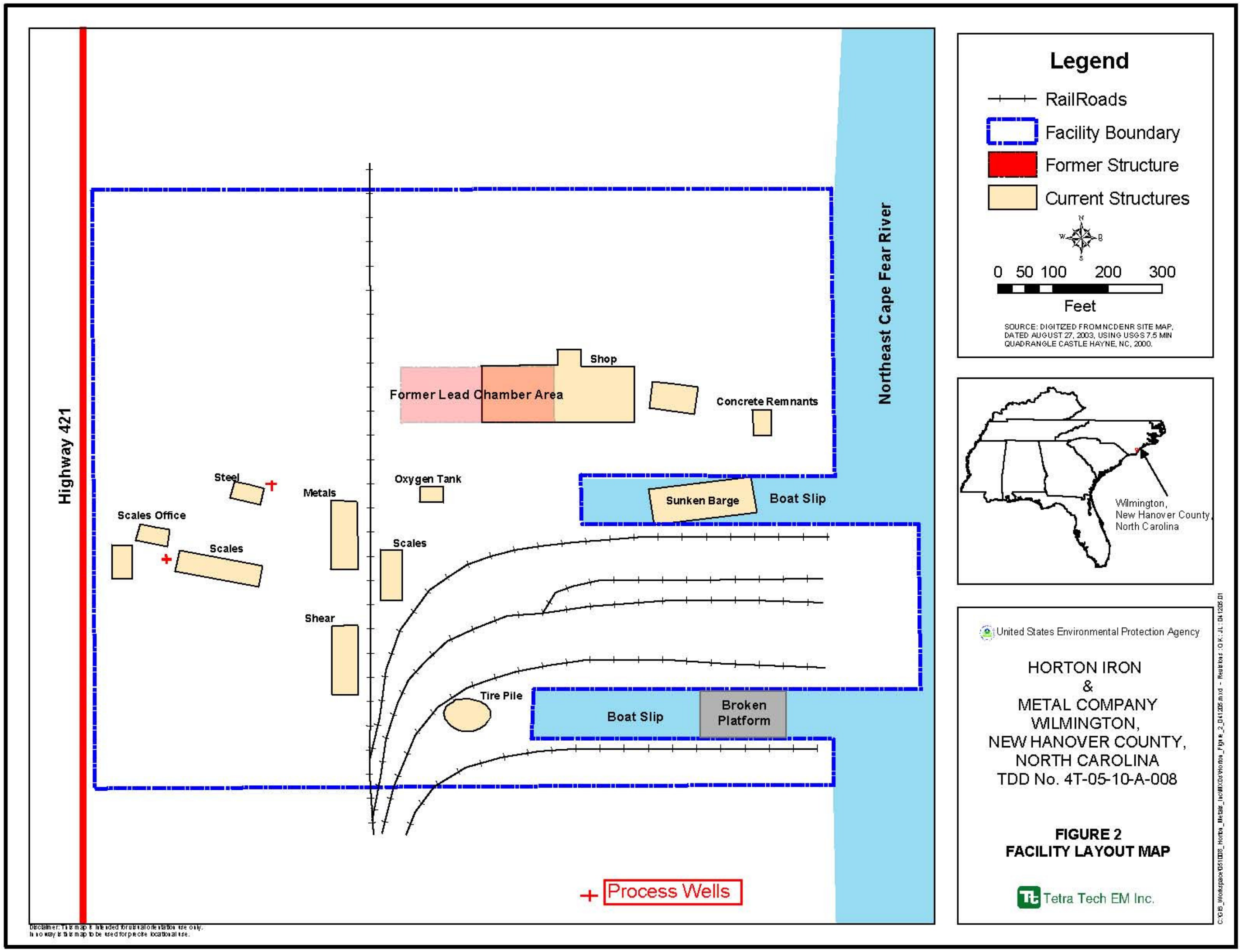


Figure 5. Horton Iron & Metal NPL site. Figure notes the location of on-site disposal of sediments dredged from 2 boat slips used for ship-breaking. Source: [HRS reference #15, 1961].

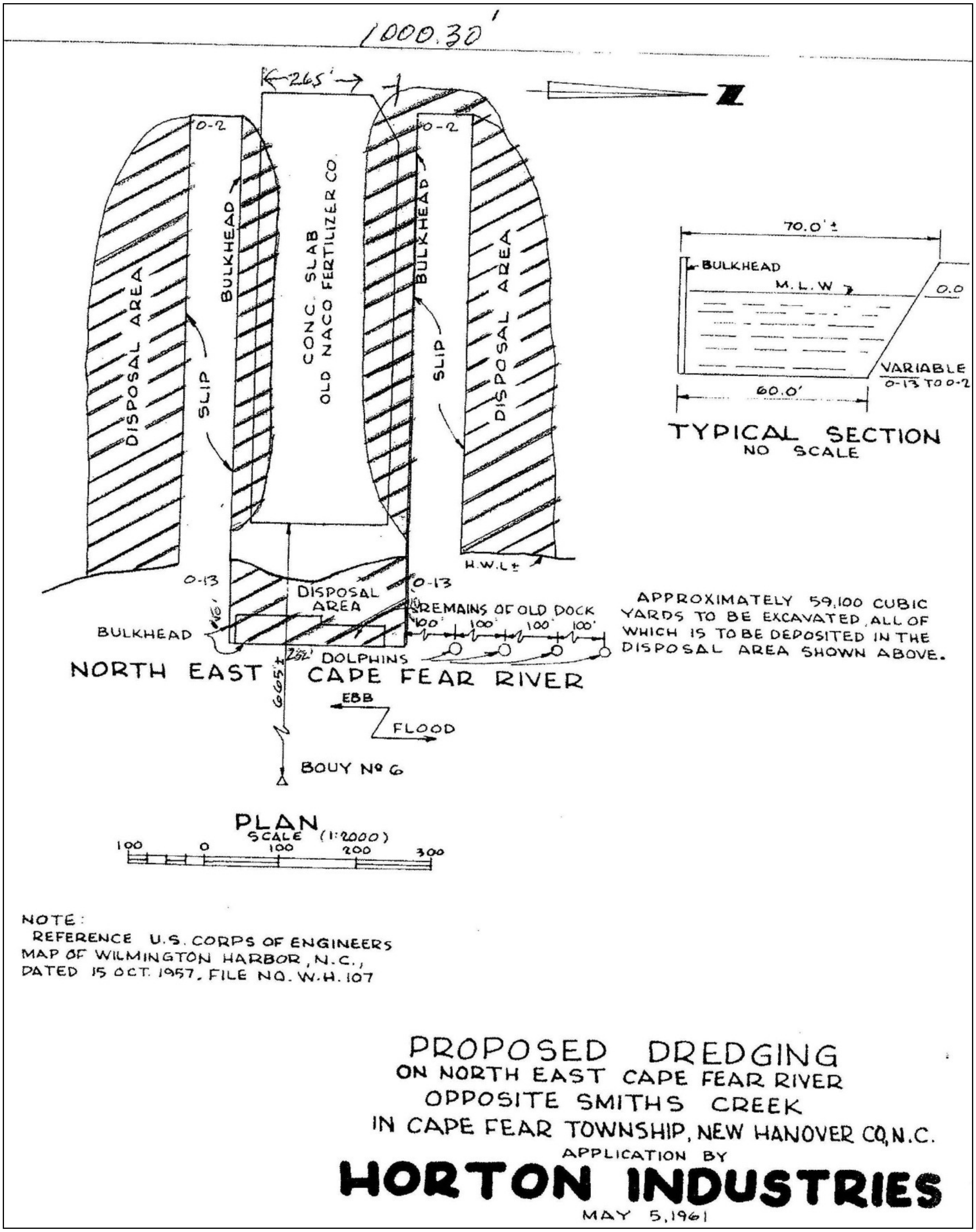
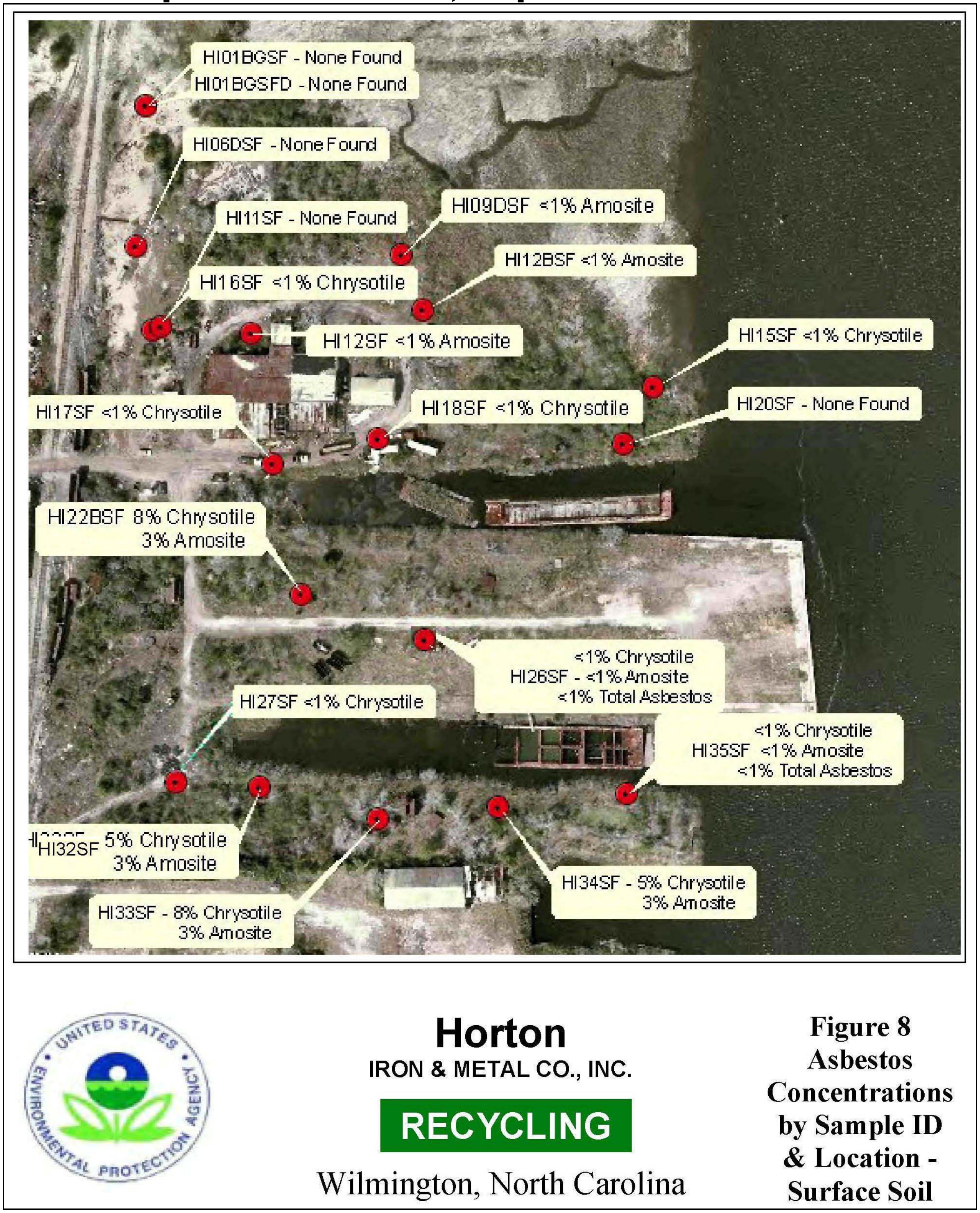


Figure 6. Horton Iron & Metal NPL site. Asbestos in soil data for the contaminant source area. Source: [HRS record reference #5, 2010].



Appendix B

Demographic Data

Figure 1. Horton Iron & Metal NPL site. Census Blocks Selected for Census 2010 figures: 2065, 2066, 2068, 2069.

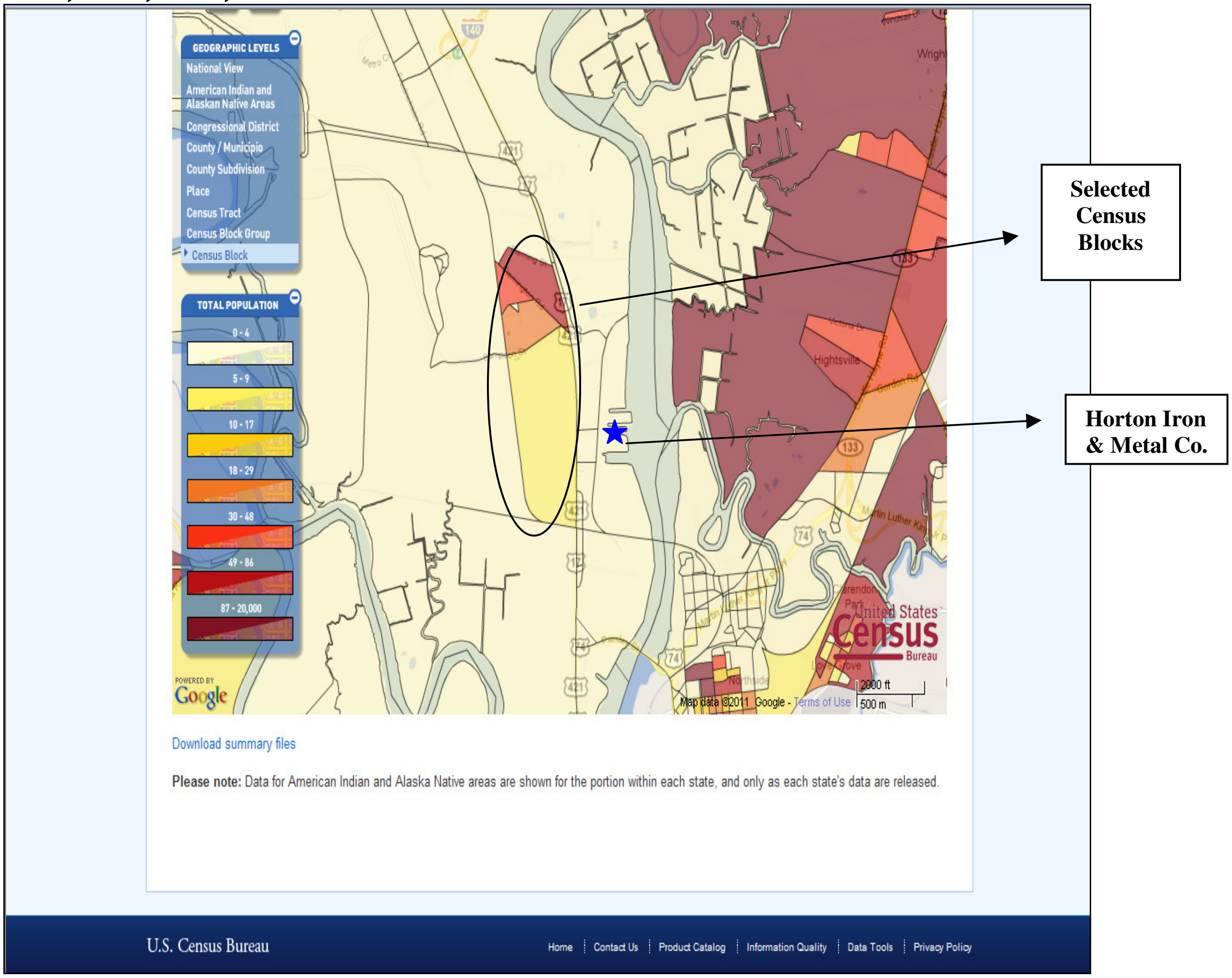


Table 1: Horton Iron & Metal NPL site. Demographics data based on Census 2010 figures (accessed September 2011).

	Blocks: 2065, 2066, 2068, 2069		New Hanover County		North Carolina		U.S.
Total population	145		202,667		9,535,483		308,745,538
Race							
White	89	61%	160,298	79%	6,528,950	68%	72.40%
African-American	6	4%	29,907	15%	2,048,628	21%	12.60%
Asians	8	6%	2,410	1%	208,962	2%	4.80%
American Indian and Alaska Native alone	2	1%	1,005	0%	122,110	1%	0.90%
Native Hawaiian and Other Pacific Islander	0	0%	130	0%	6,604	0%	0.20%
Other	38	26%	4,852	2%	414,030	4%	6.20%
Two or more races	2	1%	4,065	2%	206,199	2%	2.90%
Ethnicity							
Hispanic or Latino	41	28%	10,716	5%	800,120	8%	16.30%
Individuals below poverty level							
High school diploma or higher							
Less than 9th grade							
Number of housing units	58		101,436		4,327,528		
Occupied housing units	51	88%	86,046	85%	3,745,155	87%	
Renter occupied housing unit	29	57%	34,617	40%	1,247,255	33%	
Number of population under 18 years of age	37	26%	40,413	20%	2,281,635	24%	
Percentage of population over 65 years of age	18	12%	28,092	14%	1,234,079	13%	
Median household income							
Unemployment rate					9.8% (p) in Dec. 2010		9.4% in Dec. 2010

Appendix C

Site Photographs

Photo 1. Horton Iron & Metal NPL site visit June 2011. Looking east from recycling operations toward source area. Source: NC DPH HACE, June 2011.

Photo 2. Horton Iron & Metal NPL site visit June 2011. Building remnants and typical ground cover in former fertilizer manufacturing area. Source: NC DPH HACE, June 2011.

Photo 3. Horton Iron & Metal NPL site visit June 2011. View of barge remnant in southern most boat slip. View from NE Cape Fear River looking southwest. Source: NC DPH HACE, June 2011.

Photo 4. Horton Iron & Metal NPL site visit June 2011. Typical site ground cover of native coastal shrubs and grasses in eastern end of source area. Silt fence in foreground. Looking east toward NE Cape Fear River. Source: NC DPH HACE, June 2011.

Photo 5. Horton Iron & Metal NPL site visit June 2011. View looking north along NE Cape Fear River from eastern end of source area toward northern most boat slip. Source: NC DPH HACE, June 2011.

Appendix D

Tables

Table 1. Horton Iron & Metal NPL site.
Substances detected in source area surface soils.
Table continued on the next page.

Contaminant Type	Substance Detected
PAHs	Acenaphthene Acenaphthylene Anthracene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(g,h,i)perylene Chrysene Dibenzo(a,h)-anthracene Fluoranthene Fluorene Indeno(1,2,3-cd)-pyrene 2-Methylnaphthalene Naphthalene Phenanthrene Pyrene
PCBs	Aroclor 1242 Aroclor 1248 Aroclor 1254 Aroclor 1260 Aroclor 1262 Aroclor 1268
SVOCs	Acetophenone Benzaldehyde Benzyl butyl phthalate 1,1-Biphenyl Benzoic Acid Dibenzofuran Carbazole Bis(2-Chloroethyl)ether Diethylphthalate 2,4-Dimethylphenol Dimethylphthalate 2,4-Dinitrotoluene Bis(2-ethylhexyl) phthalate Hexachlorobenzene 3- or 4-Methylphenol 2-Nitrophenol n-Nitroso-diphenylamine Phenol 1,2,4-Trichlorobenzene 2,4,5-Trichlorophenol 2,4,6-Trichlorophenol

Table 1, Continued form the previous page. Horton Iron & Metal NPL site. Substances detected in source area surface soils. Table continued on the next page.

Contaminant Type	Substance Detected
Pesticides	alpha-BHC (HCH) delta-BHC (HCH) gamma-BHC (Lindane) alpha-Chlordane gamma-Chlordane 2,4’-DDT 4,4’-DDE 4,4’-DDD 4,4’-DDT Dieldrin Endosulfan I (alpha) Endosulfan II (beta) Endosulfan sulfate Endrin aldehyde Endrin ketone Heptachlor Heptachlor epoxide Hexachlorobenzene (HCB) Methoxychlor Toxaphene
VOCs	Acetone Benzene Chlorobenzene Tetrachloroethene Toluene Xylenes

Table 1, Continued form the previous page. Horton Iron & Metal NPL site. Substances detected in source area surface soils.

Contaminant Type	Substance Detected
Metals	Aluminum Antimony Arsenic Arsenic Barium Beryllium Cadmium Calcium Chromium Cobalt Copper Iron Lead Magnesium Manganese Mercury Molybdenum Nickel Potassium Selenium Silver Sodium Strontium Thallium Tin Titanium Vanadium Yttrium Zinc
Asbestos	Asbestos fibers Amosite/Chrysotile Asbestos

Table 2. Horton Iron & Metal NPL site. Site-specific exposure parameters used in the health evaluation.

Exposure Parameter	Adult Male Worker Scenario	12-17 Year-old "ATV Trespasser" Scenario
Years	≤25	3
Days per year	250	12
Hours per event	8	2
Body weight, kg (lbs)	76 (168)	48 (106)
Soil Ingestion Rate (IR), mg/d (oz/d)	Low contact: 100 (0.0035) High contact: 330 (0.012)	200 (0.0070)

Notes: ATV – "all terrain vehicle"
≤ = less than or equal to
kg = kilograms
lbs = pounds
mg/d = milligrams per day
oz/d = ounces per day

Table 3. Horton Iron & Metal NPL site. Surface soil contaminants detected at concentrations greater than health effect comparison values (CV). Table continued on the next page.

Soil Contaminant	Frequency of all detections	No. of detections > CV	Range of detections > CV (mg/kg) [1]	CV (mg/kg)	CV type	Average Concentration > CV (mg/kg) [1]
			PCBs [1]			
PCB-1242 (Aroclor-1242)	1/14	1	1.4	0.4	CREG	
PCB-1248 (Aroclor-1248)	2/22	2	0.550 J – 1.6			
PCB-1254 (Aroclor-1254)	19/32	9	0.078 – 3.8			
PCB-1260 (Aroclor-1260)	8/14	3	0.89 – 1.2			
PCB-1262 (Aroclor-1262)	8/10	4	0.040 – 1.90			
PCB-1268 (Aroclor-1268)	3/14	1	0.55			
As Total PCBs [1]			**0.023 – 5.40**			1.15
			Metals			
Mercury	23/25	0	0.15 – 97	310	EPA RSL	6.35
Antimony	22/25	11	20 - 420	20, 300	EPA RMEG	80.4
Arsenic	35/35	35	1.5 - 240	0.5	CREG	53.5
Iron	25/25	4	62,000 – 190,000	720,000	EPA RSL	34,000
Lead	35/35	24	800 - 23,000	800	EPA RSL	3280

Notes: > = Greater than
CV = Comparison value (ATSDR established health-effect screening values)
mg/kg = milligrams per kilogram
PCB = Polychlorinated Biphenyls
CREG = Cancer Risk Evaluation Guide, ATSDR
EPA = U.S. Environmental Protection Agency
RSL = Regional Screening Level, health-based value
RMEG = Reference Dose Media Evaluation Guide, ATSDR
[1] PCB data evaluation included all detections. Detections for individual Aroclors were summed for each sample and evaluated as "total PCBs"

Table 3. Table continued from the previous page. Horton Iron & Metal NPL site. Surface soil contaminants detected at concentrations greater than health effect comparison values (CV). Table continued on the next page.

Soil Contaminant	Frequency of all detections	No. of detections > CV	Range of detections > CV (mg/kg)	CV (mg/kg)	CV type	Average Concentration > CV (mg/kg)
SVOCs						
Carbazole	11/14	NA	0.05 – 1.2 [1]	NA [2]	----	0.328
Dibenzofuran	7/14	0.029 – 0.21	0	1000	EPA RSL	0.60
Pesticides						
4,4'-DDT	21/27	1	7.0	2.0	CREG	NA
Dieldrin	6/27	1	0.36	0.040	CREG	NA
Toxaphene	1/27	1	19	0.60	CREG	NA

Notes: > = Greater than
CV = Comparison value (ATSDR established health-effect screening values)
mg/kg = milligrams per kilogram
SVOC = Semi-volatile organic compound analysis
RSL = Regional Screening Level, health-based value
NA = not applicable
CREG = Cancer Risk Evaluation Guide, ATSDR
[1] Includes all detections greater than sample quantitation limits
[2] No health-based screening values available for this chemical

Table 3. Table continued from the previous page. Horton Iron & Metal NPL site. Surface soil contaminants detected at concentrations greater than health effect comparison values (CV).

Soil Contaminant	Frequency of all detections	No. of detections > CV	Range of detections > CV (mg/kg)	CV (mg/kg)	CV type	TEF	Average Concentration > CV (mg/kg)
PAHs							
Acenaphthene	7/14	NA	0.034 – 0.65	100	CREG [1]	0.001	
Acenaphthylene	10/14		0.024 – 0.50	100		0.001	
Anthracene	15/22		0.023 – 3.1	100		0.001	
Benzo(a)anthracene	18/22		0.023 – 13.0	1		0.1	
Benzo(a)pyrene	15/22		0.025 – 10.0	0.100		1.0	
Benzo(b)fluoranthene	17/22		0.040 – 11.0	1		0.1	
Benzo(g,h,i)perylene	14/22		0.039 – 3.20	10		0.01	
Benzo(k) fluoranthene	16/22		0.044 – 9.40	1		0.1	
Chrysene	18/22		0.044 – 13.0	10		0.01	
Dibenzo(a,h)anthracene	11/14		0.024 – 1.40	0.100		1	
Fluoranthene	19/22		0.047 – 27.0	100		0.001	
Fluorene	9/22		0.031 – 2.30	300,000; 100	CREG [1]	0.001	
Indeno(1,2,3)pyrene	14/22		0.034 – 7.10	1	CREG [1]	0.1	
2-Methylnaphthalene	5/14		0.029 – 0.260	100		0.001	
Naphthalene	7/14		0.044 – 0.500	100		0.001	
Phenanthrene	17/22		0.049 – 20.0	100		0.001	
Pyrene	8/22		0.045 – 8.30	100		0.001	
as Total PAHs			**0.599 - 131**	**0.100**	**CREG [1]**	**1.0**	**26.0**
Total PAHs as Benzo(a)pyrene equivalent			**0.0601 – 14.7**	**0.100**	**CREG [1]**	**1.0**	**2.67**

Notes: > = Greater than; CV = Comparison value (ATSDR established health-effect screening values)
mg/kg = milligrams per kilogram; TEF = Toxicity Equivalency Factor
PAH = Polynuclear aromatic hydrocarbon; NA = Not Applicable
[1] PAH data evaluated as sum of benzo(a)pyrene equivalent concentrations for each individual PAH detected

Table 4. Horton Iron & Metal NPL site. Adult male worker exposure scenario dose and increased cancer risk estimates. Dose estimates exceeding the ATSDR health guideline value are shaded.

Contaminant	Estimated Maximum Dose, (mg/kg-d)	Estimated Average Dose, (mg/kg-d)	Estimated Maximum Dose, (mg/kg-d)	Estimated Average Dose, (mg/kg-d)	HG (mg/kg-d)	CSF $(mg/kg\text{-}d)^{-1}$	Cancer Risk, @ Maximum Dose	Cancer Risk, @ Average Dose	Cancer Risk, @ Maximum Dose	Cancer Risk, @ Average Dose
	Low IR		High IR				Low IR		High IR	
Total PAHs [1]	4.4×10^{-6}	8.0×10^{-7}	1.5×10^{-5}	2.6×10^{-6}	NA	7.3	1×10^{-5}	2×10^{-6}	4×10^{-5}	7×10^{-6}
Total PCBs [2]	1.6×10^{-6}	3.4×10^{-7}	5.4×10^{-6}	1.1×10^{-6}	0.00002	2	1×10^{-6}	$<1 \times 10^{-6}$	4×10^{-6}	$<1 \times 10^{-6}$
Dibenzofuran	1.8×10^{-7}	8.7×10^{-9}	6.0×10^{-7}	2.9×10^{-8}	0.001 [3]	NA				
Carbazole [4]	3.6×10^{-7}	9.8×10^{-8}	1.2×10^{-6}	3.2×10^{-7}	NA	0.02	$<1 \times 10^{-6}$		$<1 \times 10^{-6}$	
4,4'-DDT	2.1×10^{-6}	NA	6.9×10^{-6}	NA	0.0005	0.34	$<1 \times 10^{-6}$		2×10^{-5}	
Dieldrin	1.1×10^{-7}	NA	3.6×10^{-7}	NA	0.00005	16	$<1 \times 10^{-6}$		$<1 \times 10^{-6}$	
Toxaphene	5.7×10^{-6}	NA	1.9×10^{-5}	NA	0.002	1.1	2×10^{-6}		5×10^{-5}	
Mercury	2.9×10^{-5}	1.9×10^{-6}	9.6×10^{-5}	6.3×10^{-6}	0.0004	NA				
Antimony	1.3×10^{-4}	2.4×10^{-5}	**4.2×10^{-4}**	8.0×10^{-5}	0.0004	NA				
Arsenic	7.2×10^{-5}	1.6×10^{-5}	2.4×10^{-4}	5.3×10^{-5}	0.0003	1.5	4×10^{-5}	9×10^{-6}	1×10^{-4}	3×10^{-5}
Iron	5.7×10^{-2}	1.0×10^{-2}	1.9×10^{-1}	3.4×10^{-2}	0.70 [5]	NA				
Lead	**6.9×10^{-3}**	9.8×10^{-4}	**2.3×10^{-2}**	3.2×10^{-3}	0.0036 [6]	8.5×10^{-3} [7]	2×10^{-5}	3×10^{-6}	7×10^{-5}	1×10^{-6}

Notes: mg/kg-d = milligrams per kilogram per day
HG = Health Guideline value, ATSDR
CSF = Cancer Slope Factor, from ATSDR Health Guideline Values document (U.S. EPA-determined values)
IR = Ingestion Rate
PAH = Polynuclear aromatic hydrocarbons
PCB = Polychlorinated chlorinated biphenyl
NA = Not Applicable

[1] PAH data evaluated as sum of benzo(a)pyrene equivalent concentrations for each individual PAH detected. CSF listed is for benzo(a)pyrene

[2] PCB data evaluation included all detections. Detections for individual Aroclors were summed for each sample and evaluated as "total PCBs"

[3] RfD from U.S. EPA Regional Screening Level (RSL)

[4] No health-based non-cancer screening values available for this chemical. CSF is EPA Health Effects Summary Tables (HEAST) value accessed from The Risk Assessment Information System (RAIS) (June 2012), http://rais.ornl.gov/

[5] RAIS (Risk Assessment Information System) toxicity database sub-chronic value

[6] TOXLINE ITER oral RfD, http://toxnet.nlm.nih.gov/index.html

[7] California EPA health value-oral exposure, accessed from The Risk Assessment Information System (RAIS) (June 2012), http://rais.ornl.gov/

Table 5. Horton Iron & Metal NPL site. Dose estimates and increased cancer risk estimates for 12-17 year old "ATV trespasser" exposure scenario.

Contaminant	Estimated Maximum Dose, (mg/kg-d)	Estimated Average Dose, (mg/kg-d)	HG (mg/kg-d)	CSF $(mg/kg\text{-}d)^{-1}$	Cancer Risk, Maximum Dose
Total PAHs [1]	1.7×10^{-7}	3.0×10^{-8}	NA	7.3	$<1 \times 10^{-6}$
Total PCBs [2]	6.2×10^{-8}		0.00003	2	$<1 \times 10^{-6}$
Dibenzofuran	6.8×10^{-9}		0.001	NA	
Carbazole	1.4×10^{-8}	3.7×10^{-9}	NA	0.02	$<1 \times 10^{-6}$
4,4'-DDT	8.0×10^{-8}		0.0005	0.34	$<1 \times 10^{-6}$
Dieldrin	4.1×10^{-9}		0.00005	16	$<1 \times 10^{-6}$
Toxaphene	2.2×10^{-7}		0.002	1.1	$<1 \times 10^{-6}$
Mercury	1.1×10^{-6}		0.0004	NA	
Antimony	4.8×10^{-6}	9.2×10^{-7}	0.0004	NA	
Arsenic	2.7×10^{-6}	6.7×10^{-7}	0.0003	1.5	$<1 \times 10^{-6}$
Iron	2.2×10^{-3}		0.70 [3]	NA	
Lead	2.6×10^{-4}	3.7×10^{-5}	0.0036 [4]	5.8×10^{-3}	$<1 \times 10^{-6}$

Notes: mg/kg-d = milligrams per kilogram per day
HG = Health Guideline value, ATSDR
CSF = Cancer Slope Factor, ATSDR
PAH = Polynuclear Aromatic hydrocarbons
PCB = Polychlorinated chlorinated biphenyl
NA = Not Applicable
[1] PAH data evaluated as sum of benzo(a)pyrene equivalent concentrations for each individual PAH detected. CSF listed is for benzo(a)pyrene
[2] PCB data evaluation included all detections. Detections for individual Aroclors were summed for each sample and evaluated as "total PCBs"
[3] RAIS (Risk Assessment Information System) toxicity database sub-chronic value
[4] TOXLINE ITER oral RfD, http://toxnet.nlm.nih.gov/index.html

Appendix E

N.C. Fish Consumption Advisory for Mercury

What Fish Are Safe To Eat?

Advice on Eating Fish

From the North Carolina Division of Public Health

Most fish are good to eat and good for you - high in protein and other nutrients, and low in fat. But some kinds of fish contain high amounts of mercury, which can cause health problems in people, especially children. To help you make the healthiest choices, North Carolina offers the following advice. For more information, see www.epi.state.nc.us/epi/fish/ or call (919)707-5900.

Avoid or limit fish consumption based on the following:

Women of childbearing age (15 to 44 years), pregnant women, nursing mothers and children under age 15	All other people
Do not eat fish from the HIGH in mercury list.	Eat only 1 meal of fish per week from the HIGH in mercury list.
Eat up to 2 meals per week of fish from the LOW in mercury list.	Eat up to 4 meals of fish per week from the LOW in mercury list.

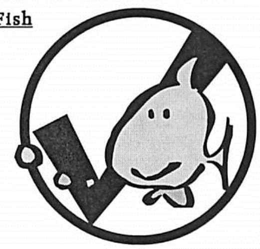
Eat Fish **LOW** in mercury

Ocean Fish

Black drum
Canned light tuna
Cod
Crab
Croaker
Flounder
Haddock
Halibut
Herring
Jacksmelt
Lobster
Mahi-mahi
Ocean perch
Oysters
Pollock
Pompano
Red drum
Salmon (canned, fresh or frozen)
Scallops
Sheepshead
Shrimp
Skate
Southern kingfish (sea mullet)
Spot
Speckled trout (spotted sea trout)
Tripletail
Whitefish
White grunt

Freshwater Fish

Bluegill sunfish
Farm-raised catfish
Farm-raised trout
Farm-raised crayfish
Tilapia
Trout



Avoid Fish **HIGH** in mercury

Ocean Fish

Albacore (white) tuna**
  fresh or canned
Almaco jack
Banded rudderfish
Cobia
Crevalle jack
Greater amberjack
South Atlantic grouper
  (gag, scamp, red
  and snowy)
King mackerel
Ladyfish
Little tunny
Marlin
Orange roughy
Shark
Spanish mackerel
Swordfish
Tilefish
Tuna, fresh or frozen**

Freshwater Fish

Blackfish (bowfin)*
Black crappie***
Catfish (caught wild)*
Jack fish (chain pickerel)*
Largemouth bass (statewide)
Walleye in Lake Fontana
  & Lake Santeetlah (Graham &
  Swain counties)
Warmouth*
Yellow perch*

*High mercury levels have been found in blackfish (bowfish), catfish, jack fish (chain pickerel), warmouth, and yellow perch caught south and east of Interstate 85.
**Different species from canned light tuna
***High mercury levels have been found in black crappie caught south and east of Interstate 95.

North Carolina Department of Health and Human Services ▲ Division of Public Health
Occupational & Environmental Epidemiology ▲ www.ncpublichealth.com
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Appendix F

The ATSDR *Asbestos ToxFAQs*™

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ASBESTOS
CAS # 1332-21-4

Division of Toxicology ToxFAQs™ September 2001

This fact sheet answers the most frequently asked health questions (FAQs) about asbestos. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, individual susceptibility and personal habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to asbestos usually occurs by breathing contaminated air in workplaces that make or use asbestos. Asbestos is also found in the air of buildings that are being torn down or renovated. Asbestos exposure can cause serious lung problems and cancer. This substance has been found at 83 of the 1,585 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is asbestos?

Asbestos is the name given to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur naturally in the environment. Asbestos minerals have separable long fibers that are strong and flexible enough to be spun and woven and are heat resistant. Because of these characteristics, asbestos has been used for a wide range of manufactured goods, mostly in building materials (roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products), friction products (automobile clutch, brake, and transmission parts), heat-resistant fabrics, packaging, gaskets, and coatings. Some vermiculite or talc products products may contain asbestos.

What happens to asbestos when it enters the environment?

Asbestos fibers can enter the air or water from the breakdown of natural deposits and manufactured asbestos products. Asbestos fibers do not evaporate into air or dissolve in water. Small diameter fibers and particles may remain suspended in the air for a long time and be carried long distances by wind or water before settling down. Larger diameter fibers and particles tend to settle more quickly.

Asbestos fibers are not able to move through soil. Asbestos fibers are generally not broken down to other compounds and will remain virtually unchanged over long periods.

How might I be exposed to asbestos?

We are all exposed to low levels of asbestos in the air we breathe. These levels range from 0.00001 to 0.0001 fibers per milliliter of air and generally are highest in cities and industrial areas.

People working in industries that make or use asbestos products or who are involved in asbestos mining may be exposed to high levels of asbestos. People living near these industries may also be exposed to high levels of asbestos in air.

Asbestos fibers may be released into the air by the disturbance of asbestos-containing material during product use, demolition work, building or home maintenance, repair, and remodeling. In general, exposure may occur only when the asbestos-containing material is disturbed in some way to release particles and fibers into the air.

Drinking water may contain asbestos from natural sources or from asbestos-containing cement pipes.

How can asbestos affect my health?

Asbestos mainly affects the lungs and the membrane that surrounds the lungs. Breathing high levels of asbestos fibers for a long time may result in scar-like tissue in the lungs and in the pleural membrane (lining) that surrounds the lung. This disease is called asbestosis and is usually found in workers exposed to asbestos, but not in the general public. People with asbestosis have difficulty breathing, often a cough, and in severe cases heart enlargement. Asbestosis is a serious disease and can eventually lead to disability and death.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry

ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html

Breathing lower levels of asbestos may result in changes called plaques in the pleural membranes. Pleural plaques can occur in workers and sometimes in people living in areas with high environmental levels of asbestos. Effects on breathing from pleural plaques alone are not usually serious, but higher exposure can lead to a thickening of the pleural membrane that may restrict breathing.

How likely is asbestos to cause cancer?

The Department of Health and Human Services (DHHS), the World Health Organization (WHO), and the EPA have determined that asbestos is a human carcinogen.

It is known that breathing asbestos can increase the risk of cancer in people. There are two types of cancer caused by exposure to asbestos: lung cancer and mesothelioma. Mesothelioma is a cancer of the thin lining surrounding the lung (pleural membrane) or abdominal cavity (the peritoneum). Cancer from asbestos does not develop immediately, but shows up after a number of years. Studies of workers also suggest that breathing asbestos can increase chances of getting cancer in other parts of the body (stomach, intestines, esophagus, pancreas, and kidneys), but this is less certain. Early identification and treatment of any cancer can increase an individual's quality of life and survival.

Cigarette smoke and asbestos together significantly increase your chances of getting lung cancer. Therefore, if you have been exposed to asbestos you should stop smoking. This may be the most important action that you can take to improve your health and decrease your risk of cancer.

How can asbestos affect children?

We do not know if exposure to asbestos will result in birth defects or other developmental effects in people. Birth defects have not been observed in animals exposed to asbestos.

It is likely that health effects seen in children exposed to high levels of asbestos will be similar to the effects seen in adults.

How can families reduce the risk of exposure to asbestos?

Materials containing asbestos that are not disturbed or deteriorated do not, in general, pose a health risk and can be left alone. If you suspect that you may be exposed to asbestos in your home, contact your state or local health department or the regional offices of EPA to find out how to test your home and how to locate a company that is trained to remove or contain the fibers.

Is there a medical test to show whether I've been exposed to asbestos?

Low levels of asbestos fibers can be measured in urine, feces, mucus, or lung washings of the general public. Higher than average levels of asbestos fibers in tissue can confirm exposure but not determine whether you will experience any health effects.

A thorough history, physical exam, and diagnostic tests are needed to evaluate asbestos-related disease. Chest x-rays are the best screening tool to identify lung changes resulting from asbestos exposure. Lung function tests and CAT scans also assist in the diagnosis of asbestos-related disease.

Has the federal government made recommendations to protect human health?

In 1989, EPA banned all new uses of asbestos; uses established before this date are still allowed. EPA established regulations that require school systems to inspect for damaged asbestos and to eliminate or reduce the exposure by removing the asbestos or by covering it up. EPA regulates the release of asbestos from factories and during building demolition or renovation to prevent asbestos from getting into the environment.

EPA has proposed a concentration limit of 7 million fibers per liter of drinking water for long fibers (lengths greater than or equal to 5 µm). The Occupational Safety and Health Administration has set limits of 100,000 fibers with lengths greater than or equal to 5 µm per cubic meter of workplace air for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2001. Toxicological Profile for Asbestos. Update. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Appendix G

The ATSDR Health Effects Evaluation Process

THE ATSDR HEALTH EFFECTS EVALUATION PROCESS

The ATSDR health effects evaluation process consists of two steps: a screening analysis, and at some sites, based on the results of the screening analysis and community health concerns, a more in-depth analysis to determine possible public health implications of site-specific exposure estimates.

In evaluating data, ATSDR uses comparison values (CVs) to determine which chemicals to examine more closely. CVs are the contaminant concentrations found in a specific medium (soil, water, or air) and are used to select contaminants for further evaluation. CVs incorporate assumptions of daily exposure to the chemical and a standard amount of air, water and soil that someone may inhale or ingest each day.

The two step screening analysis process provides a consistent means to identify site contaminants that need to be evaluated more closely through the use of “comparison values” (CVs). The first step of the screening analysis is the “environmental guideline comparison” which involves comparing site contaminant concentrations to medium-specific comparison values derived by ATSDR from standard exposure default values. The second step is the “health guideline comparison” and involves looking more closely at site-specific exposure conditions, estimating exposure doses, and comparing them to dose-based health-effect comparison values.

As health-based thresholds, CVs are set at a concentration below which no known or anticipated adverse human health effects are expected to occur. CVs are not thresholds of toxicity and do not predict adverse health effects. CVs serve only as guidelines to provide an initial screen of human exposure to substances. Contaminant concentrations at or below the relevant CV may reasonably be considered safe, but it does not automatically follow that any environmental concentration that exceeds a CV would be expected to produce adverse health effects. Different CVs are developed for cancer and non-cancer health effects. Non-cancer levels are based on validated toxicological studies for a chemical, with appropriate safety factors included, and the assumption that small children (22 pounds) and adults are exposed every day. Cancer levels are the media concentrations at which there could be a one additional cancer in a one million person population (one in a million excess cancer risk for an adult) eating contaminated soil or drinking contaminated water every day for 70 years. For chemicals for which both cancer and non-cancer CVs exist, the lower level is used to be protective. Exceeding a CV does not mean that health effects will occur, just that more evaluation is needed.

After completing a screening analysis, site contaminants are divided into two categories. Those not exceeding CVs usually require no further analysis, and those exceeding CVs are selected for a more in-depth analysis to evaluate the likelihood of possible harmful effects.

The North Carolina Department of Public Health (N.C. DPH) uses the following screening values for public health assessments:

1. **Environmental Media Evaluation Guide (EMEG):** EMEGs are estimated contaminant concentrations in water, soil or air to which humans may be exposed over specified time periods and are not expected to result in adverse non-cancer health effects. EMEGs are based on ATSDR “minimum risk levels” (MRLs) and conservative (highly health protective) assumptions about exposure, such as intake rate, exposure frequency and duration, and body weight.

2. **Reference Dose Media Evaluation Guides (RMEGs):** RMEGs represent concentrations of substances in water and soil to which humans may be exposed over specified time periods without experiencing non-cancer adverse health effects. The RMEG is derived from the U.S. Environmental Protection Agency's (EPA's) oral reference dose (RfD).

3. **Cancer Risk Evaluation Guide (CREG**): CREGs are estimated media-specific contaminant concentrations that would be expected to cause no more than one additional excess cancer in one million persons exposed over a 70-year lifetime. CREGs are calculated from EPA's cancer slope factors (CSFs) or inhalation unit risk (IUR) values.

4. **Maximum Contaminant Levels (MCL):** A Federal Maximum Contaminant Level (MCL) is the regulatory limit set by EPA that establishes the maximum permissible level of a contaminant in water that is deliverable to the user of a public water system. MCLs are based on health data, also taking into account economic and technical feasibility to achieve that level. (ATSDR 2005a)

5. **EPA Regional Screening Levels (RSL):** "Regional Screening Levels for Chemical Contaminants at Superfund Sites" are tables of risk-based screening levels, calculated using the latest toxicity values, default exposure assumptions and physical and chemical properties. The Regional Screening table was developed with input from EPA Regions III, VI, and IX in an effort to improve consistency and incorporate updated guidance. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm)

Contaminant concentrations exceeding the appropriate CVs are further evaluated against ATSDR health guidelines. N.C. DPH also retains for further assessment contaminants that are known or suspected to be cancer-causing agents. To determine exposure dose, N.C. DHHS uses standard assumptions about body weight, ingestion or inhalation rates, and duration of exposure. Important factors in determining the potential for adverse health effects also include the concentration of the chemical, the duration of exposure, the route of exposure, and the health status of those exposed. Site contaminant concentrations and site-specific exposure conditions are used to make conservative estimates of site-specific exposure doses for children and adults that are compared to ATSDR health guidelines (HGs), generally expressed as Minimal Risk Levels (MRLs). An exposure dose (generally expressed as milligrams of chemical per kilogram of body weight per day or "mg/kg/day") is an estimate of how much of a substance a person may come into contact based on their actions and habits. Exposure dose calculations are based on the following assumptions as outlined by the ATSDR (ATSDR 2005a):

- Children between the ages of 1 and 6 ingest an average of 1 liter of water per day
- Children weigh an average of 15 kilograms
- Infants weigh an average of 10 kilograms
- Adults ingest an average of 2 liters of water per day
- Adults weigh an average of 70 kilograms

Ingestion of contaminants present in drinking water

Exposure doses for ingestion of contaminants present in groundwater are calculated using the maximum and average detected concentrations of contaminants in milligrams per liter (mg/kg = pap). The following equation is used to estimate the exposure doses resulting from ingestion of contaminated groundwater:

$$ED_w = \frac{C \times IR \times AF \times EF}{BW}$$

Where:

ED_w = exposure dose water (mg/kg/day)
C = contaminant concentration (mg/kg)
IR = intake rate of contaminated medium (liters/day)
AF = bioavailability factor (unitless)
EF = exposure factor
BW = body weight (kilograms)

Ingestion of contaminants present in soil

Exposure doses for ingestion of contaminants present in soil are calculated using the maximum and average detected concentrations of contaminants in milligrams per kilogram (mg/kg = ppm). The following equation is used to estimate the exposure doses resulting from ingestion of contaminated soil:

$$ED_s = \frac{C \times IR \times AF \times EF}{BW}$$

Where:

ED_s = exposure dose soil (mg/kg/day)
C = contaminant concentration (mg/kg)
IR = intake rate of contaminated medium (kilograms/day)
EF = exposure factor (unitless)
BW = body weight (kilograms)

The exposure factor is an expression of how often and how long a person may contact a substance in the environment. The exposure factor is calculated with the following general equation:

$$EF = \frac{F \times ED}{AT}$$

Where:
F = frequency of exposure (days/year)
ED = exposure duration (years)
AT = averaging time (ED x 365 days/year)

Inhalation (breathing) of contaminants present in air

Inhalation is an important pathway for human exposure to contaminants that exist as atmospheric gases or are adsorbed to airborne particles or fibers. Exposure doses for breathing contaminants in air were calculated using the maximum or average detected concentrations in milligrams per cubic meter (mg/m^3) or parts per billion by volume (ppbv). The following equation is used to estimate the exposure doses resulting from inhalation of contaminated air.

$$D = (C \times IR \times EF) / BW$$

Where:

D	=	exposure dose (mg/kg/day)
C	=	contaminant concentration (mg/m^3)
IR	=	intake rate (m^3/day)
EF	=	exposure factor (unitless)
BW	=	body weight (kg)

Calculations of Contaminant Exposures During Showering

When showering in contaminated water a person may be exposed to the chemicals in the water by breathing a portion of the chemical that comes out of the water into the air (inhalation exposure), or by absorbing the chemical from the water through their skin (dermal exposure). Inhalation and dermal exposures to volatile organic compounds (VOCs) in the shower or bath may be equal to or greater than exposures from drinking the contaminated water. ATSDR uses conservative assumptions to estimate "worst case" exposures to VOCs during showering with contaminated water. The maximum concentration of VOC in the bathroom air is estimated with the following equation (Andelman 1990).

$$C_a = (C_w \times f \times F_w \times t)/V_a$$

Where:

C_a	=	bathroom air concentration (mg/m^3)
C_w	=	tap water concentration (mg/L)
f	=	fractional volatilization rate (unitless)
F_w	=	shower water flow rate (L/min)
t	=	exposure time (min)
V_a	=	bathroom volume (m^3)

Conservative calculation parameters are assumed, including a fractional volatilization of 0.9 for chlorinated VOCs, a flow rate of 8 L/min, and a small bathroom volume of 10 m^3. Conservative calculations are also made by using the maximum concentration found for each VOC in the tap water. Calculated bathroom air concentrations of VOCs can then be compared to ATSDR inhalation comparison values. Inhalation exposure dose estimates can be made using ATSDR's inhalation dose calculations.

Health guidelines represent daily human exposure to a substance that is likely to be without appreciable risk of adverse health effects during the specified exposure duration. The potential for adverse health effects exists under the representative exposure conditions if the estimated site-specific exposure doses exceed the health guidelines and they are retained for further evaluation. A MRL is an estimate of daily human exposure to a substance (in milligrams per kilogram per day [mg/kg/day] for oral exposures) that is likely to be without non-cancer health effects during a specified duration of exposure. Exposures are based on the assumption a person is exposed to the maximum concentration of the contaminant with a daily occurrence.

Generally, site-specific exposure doses that do not exceed screening values are dropped from further assessment. Exposure doses that exceed MRLs, or are known or suspected cancer-causing agents, are carried through to the health-effects evaluation. The health-effects evaluation includes an in-depth analysis examining and interpreting reliable substance-specific health effects data (toxicological, epidemiologic, medical, and health outcome data) related to dose-response relationships for the substance and pathways of interest. The magnitude of the public health issue may be estimated by comparing the estimated exposures to “no observed” (NOAELs) and “lowest observed” (LOAELs) adverse effect levels in animals and in humans, when available.

ATSDR’s toxicological profiles serve as the primary source of the health-effects data. Other sources of toxicological data include EPA’s Integrated Risk Information System (IRIS) database, International Agency for Research on Cancer (IARC) Monographs, and the National Toxicology Program (NTP). Standard toxicology textbooks and peer-reviewed scientific journals of environmental toxicology or environmental health can also be consulted.

Polynuclear Aromatic Hydrocarbons (PAHs)

ATSDR does not provide individual comparison values (CVs) for the group of structurally related multi-carbon ring compounds known as polynuclear aromatic hydrocarbons or PAHs (PAHs my also be called “polycyclic aromatic hydrocarbons”). ATSDR does provide a CREG the PAH compound benzo(a)pyrene (BaP). BaP is the most studied of the individual chemicals of the PAH group, and is thought to be the most toxic. To evaluate potential adverse health effects associated with incidental ingestion of soil PAH concentrations, the concentrations of individual detected PAH compounds are converted to an equivalent BaP concentration and summed to provide a “BaP-equivalent” concentration for all detected PAHs. BaP-equivalent exposure dose are calculated by multiplying the concentration of individual detected PAH compounds by their “toxicity equivalency factor” (TEF), a value that relates the relative toxicity of the individual PAH compounds to the toxicity of BaP. Below is a table of TEF values used by N.C. DPH to calculated BaP-equivalent concentrations. An estimated soil ingestion BaP-equivalent exposure dose is calculated using soil exposure rates. Estimated numbers of increased cancers for the combined PAH exposure is calculated by multiplying the CREG value by the BaP-equivalent exposure dose.

$$PAH_{BaP\text{-}eq} = PAH_{conc} \times TEF$$

$$\text{Combined Cancer Risk}_{PAHs} = \sum PAH_{adj} \times CSF$$

Where:

$PAH_{BaP\text{-}eq}$ = Benzo(a)pyrene equivalent TEF adjusted PAH compound concentration, mg/kg

PAH_{conc} = concentration of PAH compound, mg/kg

TEF = = Toxicity Equivalency Factor for PAH compound, unitless

Combined Cancer Risk_{PAHs}

= Summed cancer risk of all detected PAH compounds

$\sum PAH_{adj}$ = summed TEF-adjusted concentrations of all detected PAH compounds, mg/kg

CSF = Cancer Slope Factor, mg/kg-d

PAH Toxicity Equivalency Factors ("TEFs")

PAH compounds	TEF value
acenaphthene	0.001
acenaphthylene	0.001
anthracene	0.01
benzo(a)anthracene	0.1
benzo(a)pyrene	1.00
benzo(b,k)fluoranthene	na
benzo(g,h,i)perylene	0.01
benzo(b)fluoranthene	0.1
benzo(k)fluoranthene	0.01
chrysene	0.001
dibenzo(a,h)anthracene	1.00
fluoranthene	0.001
fluorene	0.001
indeno(1,2,3-cd)pyrene	0.1
2-methylnaphthalene	0.001
naphthalene	0.001
phenanthrene	0.001
pyrene	0.001

Source: *Toxicity equivalency factors for PAH and their applicability in shellfish pollution monitoring studies*. J Environ Monit, 2002, **4**, 383-388
na = not available

Cancer Health Effect Evaluations

Estimates of increased numbers of cancers are calculated for known or suspected cancer-causing contaminants using the estimated site-specific exposure dose and cancer slope factor (CSF) provided in ATSDR health guideline documents. This calculation is based on the assumption that there is no safe level of exposure to a chemical that causes cancer. However, the estimated risk is not exact and tends to overestimate the actual risk associated with exposures that may have occurred. This estimated increased cancer risk does not equal the increased number of cancer cases that will actually occur in the exposed population, but estimates a cancer risk expressed as the additional number of cases (above the background cancer level) in a population that may be affected by a carcinogen during a lifetime or other selected period of exposure. For example, an estimated cancer risk of 1×10^{-4} predicts the probability of one additional cancer over the background number of cancers in a population of 10,000. Qualitative assessment of the predicted increased numbers of cancers is also used and represents terminology suggested by ATSDR and N.C. DPH.

The estimated cancer risk calculation is:

$$\text{Estimated Cancer Risk} = \text{Dose} \times \text{CSF}$$

or

$$\text{Estimated Cancer Risk} = \text{Air Concentration} \times \text{IUR}$$

Where:

Estimated Cancer Risk	=	Expression of the cancer risk (unitless)
Dose	=	Site-specific cancer dose (mg/kg/d)
Air Concentration	=	Site-specific air concentration (µg/m^3)
CSF	=	Cancer Slope Factor ($[mg/kg/d]^{-1}$)
IUR	=	Inhalation Unit Risk ($[\mu g/m^3]^{-1}$)

The N.C. Central Cancer Registry states:

"*Although much has been learned about cancer over the past couple of decades, there is still much that is not known about the causes of cancer. What we do know is that cancer is not one disease, but a group of diseases that behave similarly. We know that different types of cancers are caused by different things. For example, cigarette smoking has been implicated in causing lung cancer, some chemical exposures are associated with leukemia, and prolonged exposure to sunlight causes some types of skin cancer. Genetic research has shown that defects in certain genes result in a much higher likelihood that a person will get cancer. What is not known is how genetic factors and exposures to cancer causing agents interact.*

Many people do not realize how common cancers are. It is estimated that <u>one</u> out of every <u>two</u> men and <u>one</u> out of every <u>three</u> women will develop a cancer of some type during his or her lifetime. As a result, it is common to find what appear to be cancer cases clustering in neighborhoods over a period of years. This will occur in any neighborhood. As people age, their chance of getting cancer increases, and so as we look at a community, it is common to see increasing numbers of cancer cases as the people in the community age.

Cancers are diseases that develop over many years. As a result, it is difficult to know when any specific cancer began to develop, and consequently, what the specific factor was which caused the cancer. Because people in our society move several times during their lives, the evaluation of clusters of cancer cases is quite challenging. One can never be certain that a specific cancer was caused by something in the community in which the person currently resides. When we investigate clusters of cancer cases, we look for several things that are clues to likely associations with exposures in the community. These are:

1. *Groups of cases of all the same type of cancer (such as brain cancer or leukemia). Because different types of cancer are caused by different things, cases of many different types of cancer do not constitute a cluster of cases.*
2. *Groups of cases among children, or ones with an unusual age distribution.*
3. *Cases diagnosed during a relatively short time interval. Cases diagnosed over a span of years do not constitute a cluster of cases unless there is consistency in the type of cancer.*
4. *Clusters of rare cancers. Because lung, breast, colon, and prostate cancers are so common, it is very difficult to find any association between them and exposures in a community."*

N.C. DPH evaluates cancer health effects in terms of possible increased cancer risk. In North Carolina, approximately 30% of women and 50% of men (about 40% combined), will be diagnosed with cancer in their life-time from a variety of causes. This is referred to as the "background cancer risk". The term "excess cancer risk" represents the risk on top of the background cancer risk. A "one-in-a-million" excess cancer risk (1/1,000,000 or 10^{-6} cancer risk) means that if 1,000,000 people are exposed to the cancer-causing substance at a certain level every day of their life-time (considered 70 years), then one cancer above the background number of cancers <u>may</u> develop in those 1 million people. In numerical terms, the background number of cancers expected in 1 million people over their life-time in 400,000. If they are all exposed to the cancer-causing substance daily throughout their life-time, then 400,001 people may get cancer, instead of the expected 400,000. The expression of the estimated cancer risk is not a prediction that cancer will occur, it represents the upper bound estimate of the probability of additional cancers, and merely suggests that there is a possibility. The actual risk may be much lower, or even no risk. For specific exposure situations N.C. DPH may use exposure periods of less than a life-time to provide a more realistic estimation of the risks that are known or predicted to have occurred for a particular area. If information on the specifics of the exposure situations at a particular site is not known, then N.C. DPH will always use health protective values to estimate the maximum level of risk that we believe to be realistic.

Estimates of Increased Number of Cancers Qualitative Assessment Categories Utilized by N.C. DPH

Estimated Number of Increased Cancers [a]	Qualitative Increased Risk Term
< 1/1,000,000	**No Apparent Increase**
< 1/100,000	**Very Low**
< 1/10,000	**Low**
< 1/1,000	**Moderate**
< 1/100	**High**
> 1/100	**Very High**

[a] As number of increased cancers above typical background numbers of cancers in the stated population size. "<1/1,000,000" = less than one additional cancer in a population of 1 million persons.

Assessment of Chemical Interactions

To evaluate the risk for noncancerous effects in a mixture, ATSDR's guidance manual (*Guidance Manual for the Assessment of Joint Toxic Action of Chemical Mixtures*, 2004) prescribes the calculation of a hazard quotient (HQ) for each chemical. The HQ is calculated using the following formula:

$$HQ = \text{estimated dose} \div \text{applicable health guideline}$$

Generally, whenever the HQ for a chemical exceeds 1, concern for the potential hazard of the chemical increases. Individual chemicals that have HQs less than 0.1 are considered unlikely to pose a health hazard from interactions and are eliminated from further evaluation. If all of the chemicals have HQs less than 0.1, harmful health effects are unlikely, and no further assessment of the mixture is necessary. If two or more chemicals have HQs greater than 0.1, then these chemicals are to be evaluated further as outlined below.

Since the HQ is greater than 1 for both adults and children the hazard index (HI) will be calculated. The HQ for each chemical then is used to determine the (HI) for the mixture of chemicals. An HI is the sum of the HQs and is calculated as follows:

$$HI = HQ1 + HQ2 + HQ3 + \ldots HQ_n$$

The HI is used as a screening tool to indicate whether further evaluation is needed. If the HI is less than 1.0, significant additive or toxic interactions are highly unlikely, so no further evaluation is necessary. If the HI is greater than 1.0, then further evaluation is necessary, as described below.

For chemical mixtures with an HI greater than 1.0, the estimated doses of the individual chemicals are compared with their NOAELs or comparable values. If the dose of one or more of the individual chemicals is within one order of magnitude of its respective NOAEL (0.1 x NOAEL), then potential exists for additive or interactive effects. Under such circumstances, an in-depth mixtures evaluation should proceed as described in ATSDR's *Guidance Manual for the Assessment of Joint Action of Chemical Mixtures*.

If the estimated doses of the individual chemicals are less than 1/10 of their respective NOAELs, then significant additive or interactive effects are unlikely, and no further evaluation is necessary.

Limitations of the Health Evaluation Process

Uncertainties are inherent in the public health assessment process. These uncertainties fall into the following categories: 1) the imprecision of the risk assessment process, 2) the incompleteness of the information collected and used in the assessment, and 3) the differences in opinion as to the implications of the information. These uncertainties are addressed in public health assessments by using worst-case assumptions when estimating or interpreting health risks. The health assessment calculations and screening values also incorporate safety margins. The assumptions, interpretations, and recommendations made throughout this public health assessment err in the direction of protecting public health.

Reference:

(Andelman 1990). *Total Exposure of Volatile Organic Compounds in Potable Water*. In: Significance and Treatment of Volatile Organic Compounds in Water Supplies, Chapter 20. Lewis Publishers, Chelsea, MI.

Appendix H

ATSDR Glossary

ATSDR Glossary

Absorption
The process of taking in. For a person or animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

Acute
Occurring over a short time [compare with chronic].

Acute exposure
Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

Additive effect
A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].

Adverse health effect
A change in body functions or cell structure that might lead to disease or health problems.

Airborne asbestos fibers
Any fibers of asbestos small enough to be made airborne. For the purposes of monitoring airborne asbestos fibers, only respirable asbestos fibers (those fibers less than 3 mm wide, more than 5 mm long and with a length to width ratio of more than 3 to 1) are counted.

Ambient
Surrounding (for example, *ambient* air).

Amphibole asbestos
Amphibole type asbestos is very straight, brittle, needle-like crystalline fibrous naturally occurring mineral. Amosite, crocidolite, tremolite, actinolite, and anthophyllite are amphibole asbestos varieties. Mostly used as insulation and construction materials. See additional information at: http://www.atsdr.cdc.gov/asbestos/more_about_asbestos/index.html

Anaerobic
Requiring the absence of oxygen [compare with aerobic].

Analyte
A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

Antagonistic effect
A biologic response to exposure to multiple substances that is less than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].

Asbestos
Asbestos is the name given to a group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur

naturally in the environment. There are two general types of asbestos, *amphibole* and *chrysotile*. Asbestos minerals have separable long, thin fibers that are strong and flexible. Asbestos has been used for a wide range of manufactured goods, mostly in building materials, friction products heat-resistant fabrics, packaging, gaskets, and coatings. See additional information at: http://www.atsdr.cdc.gov/asbestos/more_about_asbestos/index.html

Asbestosis
Asbestosis is a lung disease that occurs from breathing in asbestos fibers. Breathing in asbestos fibers can cause scar tissue (fibrosis) to form inside the lung. Scarred lung tissue does not expand and contract normally. Symptoms include: chest pain, cough, shortness of breadth, tightness in the chest, and possibly clubbing of the fingers and nail abnormalities. For more information see: http://www.nlm.nih.gov/medlineplus/ency/article/000118.htm

Biota
Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Body burden
The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

Cancer
Any one of a group of diseases that occurs when cells in the body become abnormal and grow or multiply out of control.

Cancer risk
An estimated increased risk of for getting cancer if exposed to a cancer-causing substance every day for a lifetime exposure. The true risk might be lower.

Carcinogen
A substance that causes cancer.

CAS registry number
A unique number assigned to a substance or mixture by the American Chemical Society Abstracts Service.

Central nervous system
The part of the nervous system that consists of the brain and the spinal cord.
CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

Chronic
Occurring over a long time (more than 1 year) [compare with acute].

Chronic exposure
Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure].

Chrysotile asbestos
Chrysotile asbestos, most commonly used for industrial purposes, is from the serpentine family. Chrysotile or white asbestos is the most commonly encountered form of asbestos, accounting for approximately 95% of the asbestos in place in the United States. It is a soft, fibrous silicate mineral in the serpentine group. It is distinct from other asbestiform minerals in the amphibole

group. See additional information at:
http://www.atsdr.cdc.gov/asbestos/more_about_asbestos/index.html

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

Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response (CERCLA)
Compensation, and Liability Act of 1980 (CERCLA) CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances.

Concentration
The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

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

Delayed health effect
A disease or injury that happens as a result of exposures that might have occurred in the past.

Dermal
Referring to the skin. For example, dermal absorption means passing through the skin.

Dermal contact
Contact with (touching) the skin [see route of exposure].

Detection limit
The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Disease prevention
Measures used to prevent a disease or reduce its severity.

Disease registry
A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

Dose (for chemicals that are not radioactive)
The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed

dose” is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose (for radioactive chemicals)
The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship
The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

Environmental media
Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

Environmental media and transport mechanism
Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur.

EPA
United States Environmental Protection Agency.

Epidemiology
The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

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

Exposure assessment
The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure-dose reconstruction
A method of estimating the amount of people’s past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

Exposure investigation
The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

Exposure pathway
The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Geographic information system (GIS)
A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

Groundwater
Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

Hazard
A source of potential harm from past, current, or future exposures.

Hazardous waste
Potentially harmful substances that have been released or discarded into the environment.

Health consultation
A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

Health education
Programs designed with a community to help it know about health risks and how to reduce these risks.

Health investigation
The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to estimate the possible association between the occurrence and exposure to hazardous substances.

Health promotion
The process of enabling people to increase control over, and to improve, their health.

Incidence
The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

Ingestion
The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

Inhalation
The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

Intermediate duration exposure
Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].

Lowest-observed-adverse-effect level (LOAEL)
The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Maximum Contaminant Level (MCL)
The highest level of a contaminant that EPA allows in drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. EPA sets MCLs at levels that are economically and technologically feasible. Some states set MCLs which are more strict than EPA's.

Medical monitoring
A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

Mesothelioma
A rare form of cancer that develops in the thin layer of cells lining the body's internal organs, the mesothelium. Mesothelioma is caused by exposure to asbestos and the inhalation of asbestos particles. In most cases, mesothelioma symptoms will not appear in an individual exposed to asbestos until many years after the exposure has occurred. For more information see: http://www.mesothelioma.com/

Metabolism
The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite
Any product of metabolism.

mg/kg
Milligram per kilogram.

mg/L
Milligram per liter

mg/m^3
Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

µg/dL
Micrograms per deciliter. The measure of the concentration of a substance in a known volume (a deciliter, 1 dL = 100 mL). A common unit of concentration for substances measured in blood or plasma.

Migration
Moving from one location to another.

Minimal risk level (MRL)
An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

Mutagen
A substance that causes mutations (genetic damage).

Mutation
A change (damage) to the DNA, genes, or chromosomes of living organisms.

National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)
EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

No-observed-adverse-effect level (NOAEL)
The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]

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

Point of exposure
The place where someone can come into contact with a substance present in the environment [see exposure pathway].

Population
A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

Potentially responsible party (PRP)
A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

ppb
Parts per billion.

ppm
Parts per million.

Prevalence
The number of existing disease cases in a defined population during a specific time period [contrast with incidence].

Prevention
Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public comment period
An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public availability session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public health action
A list of steps to protect public health.

Public health advisory
A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

Public health assessment (Public Health Assessment)
An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The Public Health Assessment also lists actions that need to be taken to protect public health [compare with health consultation].

Public health statement
The first chapter of an ATSDR toxicological profile. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

Public meeting
A public forum with community members for communication about a site.

RCRA [See Resource Conservation and Recovery Act (1976, 1984)]

Receptor population
People who could come into contact with hazardous substances [see exposure pathway].

Reference dose (RfD)
An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

Registry
A systematic collection of information on persons exposed to a specific substance or having specific diseases [see exposure registry and disease registry].

Remedial Investigation
The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)
This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

Respirable asbestos fibers
A fiber of asbestos small enough to penetrate into the gas exchange regions of the lungs. Respirable asbestos fibers are technically defined as fibers that are less than 3 mm wide, more than 5 mm in length and have a length to width ratio of more than 3 to 1.

RfD See reference dose

Risk
The probability that something will cause injury or harm.

Risk reduction
Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

Risk communication
The exchange of information to increase understanding of health risks.

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

Safety factor [see uncertainty factor]

SARA [see Superfund Amendments and Reauthorization Act]

Sample
A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sample size
The number of units chosen from a population or environment.

Semi-volatile organic compound (SVOC)
A group of organic compounds specified by an EPA analytical method. These compounds have boiling points higher than water and may vaporize when exposed to temperatures above room temperature. SVOCs include PAHs and phenols.

Sensitive populations
People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Solvent
A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

Source of contamination
The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

Stakeholder
A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics
A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance
A chemical.

Superfund Amendments and Reauthorization Act (SARA)
In 1986, SARA amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

Surface water
Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

Surveillance [see epidemiologic surveillance]

Survey
A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].

Teratogen
A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

Toxic agent
Chemical or physical (for example, radiation, heat, cold, microwaves) agents which, under certain circumstances of exposure, can cause harmful effects to living organisms.

Toxicological profile
An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

Toxicology
The study of the harmful effects of substances on humans or animals.

Tumor
An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor
Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].

Volatile organic compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Appendix I

PHA Summary Fact Sheet

Horton Iron & Metal Corporation NPL Site

Public Health Assessment Summary
December 2012

Background

The Horton Iron & Metal NPL site is located at 2216 U.S. Highway 421 North, Wilmington, New Hanover County. The site was added to the U.S. Environmental Protection Agency's (U.S. EPA) Superfund National Priorities List program in September 2011 – a program to clean-up abandoned hazardous waste sites that threaten to harm the environment or people.

The property is approximately 37 acres. The eastern-most 7.4 acres that are adjacent to the North East Cape Fear River have been investigated as part of the NPL listing. The contamination resulted from former fertilizer manufacturing that took place approximately from 1911-1959, and ship breaking salvage operations that occurred in two boat slips in the 1960s and 1970s.

Currently, Horton Iron & Metal Co., Inc. is a scrap iron and metal recycler that operates to the west of the contaminated area.

Current Environmental Situation

The soil, groundwater and boat slip sediment in the 7.4-acre area is contaminated with polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), pesticides, metals and asbestos.


Remnants of ship breaking salvage operations (2011)

Purpose of the Public Health Assessment

The assessment evaluated available environmental data from the 7.4-acre area to determine if the site presents a health hazard to the nearby community.

How was the Public Health Assessment conducted?

The data evaluated came from the N.C. Department of Environment and Natural Resources, and the U.S. Environmental Protection Agency and their contractors from 1990 to 2009. The data included soil, groundwater and sediments in the 7.4-acre area.

Conclusions

- We cannot conclude if asbestos in the soil can harm the health of people in the immediate area. No air monitoring has been done to see if asbestos fibers in the soil could be released into the air where people can breathe them.

- The other contaminants present at the site are not expected to cause harm.
- We do not know if former workers of the fertilizer manufacturing or ship breaking salvage operations may have been harmed by substances they were exposed to during their employment. Data was not available to determine workers' exposure levels while they were working at the site.

Recommendations

- Women that are pregnant or may become pregnant should avoid repeated exposure to the soils to prevent harm to unborn children.
- Groundwater wells on the property should not be used as a drinking water source.
- Place signs and fencing around the perimeter of the contaminated area to discourage access.
- Determine if an asbestos hazard exists and eliminate the hazard if it exists.
- Continue to monitor the data generated for this site.

Contact:

HACE Program
Telephone: (919) 707-5900
E-mail: nchace@dhhs.nc.gov
Address: N.C. Division of Public Health
OEE/MERA
1912 Mail Service Center
Raleigh, NC 27699-1912

Additional Information

The full report is available under New Hanover County at http://epi.publichealth.nc.gov/oee/hace/ncmap/CountyInfo.html#NewHanover

State of North Carolina ● Department of Health and Human Services ● Division of Public Health
www.ncdhhs.gov www.publichealth.nc.gov
N.C. DHHS is an equal opportunity employer and provider 12/12

Appendix J

Comments Received on the Initial/Public Comment Release PHA

Comments received on the *Horton Iron & Metal NPL Site Initial/Public Comment Release Public Health Assessment* released October 11, 2012. A 60-day public comment period was provided beginning on the date of the release of the document.

1. Comments were received from the New Hanover County Health Department addressing the water supplies provided for the employees of the Horton Iron & Metal facility. The New Hanover County Health Department provided the following references which address N.C. state code regarding potable water supplies.

   Potable water and its use is defined in the North Carolina State Code:
   602.1 GENERAL. Every structure equipped with plumbing fixtures and utilized for human occupancy or habitation shall be provided with a potable supply of water in amounts at pressures specified in this chapter.

   602.2 Potable water required. Only potable water shall be supplied to plumbing fixtures that provide water for drinking, bathing or culinary purposes, or for the processing of food, medical or pharmaceutical products. Unless otherwise provided in this code, potable water shall be supplied to all plumbing fixtures.

   602.3 Individual water supply. Where a potable public water supply is not available, individual sources of potable water supply shall be utilized.

N.C. DPH Response: The PHA states under *Conclusion 2 Next Steps* that the groundwater on the site should not be used as a drinking water source. Additional testing would be needed to determine whether the 2 process wells discussed in the PHA would be suitable drinking water sources. As stated in the PHA, the EPA documents indicate that municipal water is not supplied to the site. The New Hanover County Health Department may wish to further investigate the sources and quality of waters provided for the employees of Horton Iron & Metal.

2. EPA's comments provided following release of the *Initial/Public Comment Release PHA* reflect their review of HACE's follow-up to their comments provided for the draft PHA prior to release of the *Initial/Public Comment Release* document. Comments included those concerned with sub-surface soils and future development of the site for residential purposes.

N.C. DPH Response: HACE has no further response to EPA's comments. ATSDR considers only surface soils (generally defined as 0-3 inches below the ground surface) as a potential exposure source in public health assessments. HACE states that if the site is to be developed or re-purposed for purposed other than the current industrial use, additional health assessment investigations will be needed.

3. N.C. DENR's comments:
   a. Identified the site listing on the National Priorities List (NPL) was finalized in September 2011 and all of the approximately 37 acre site is designated as the NPL site.

N.C. DPH Response: The text is edited to reflect the above.

   b. DENR questions HACE's concern with the asbestos in soils in the study source area and why they would be identified as potential health hazards when there is no data that indicate that they are a hazard.

N.C. DPH Response: DPH believes that the potential hazards associated with the concentration of asbestos detected in the source area soils support our public health concerns, as well as our recommendations to document that the asbestos in soil does not present a health hazard, or to control the potential for exposure. DPH's concerns are also supported by EPA's guidance that asbestos in soil at concentrations reported for this site should be addressed.