Public Health Assessment for

STANDARD CHLORINE CHEMICAL COMPANY, INCORPORATED
KEARNY, HUDSON COUNTY, NEW JERSEY
EPA FACILITY ID: NJD002175057
APRIL 5, 2005

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

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

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

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

Agency for Toxic Substances & Disease Registry .... Julie L. Gerberding, M.D., M.P.H., Administrator
Thomas Sinks, Ph.D., M.S., Acting Director

Division of Health Assessment and Consultation…. .... William Cibulas, Jr., Ph.D., Director
Sharon Williams-Fleetwood, Ph.D., Deputy Director

Community Involvement Branch .... Germano E. Pereira, M.P.A., Chief

Exposure Investigations and Consultation Branch .... Donald Joe, M.S., Deputy Branch Chief

Federal Facilities Assessment Branch .... Sandra G. Isaacs, B.S., Chief

Superfund and Program Assessment Branch .... Richard E. Gillig, M.C.P., Chief

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PUBLIC HEALTH ASSESSMENT

STANDARD CHLORINE CHEMICAL COMPANY, INCORPORATED

KEARNY, HUDSON COUNTY, NEW JERSEY

EPA FACILITY ID: NJD002175057

Prepared by:

New Jersey Department of Health and Senior Services
Consumer and Environmental Health Services
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund law*. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations - the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When informed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-60), Atlanta, GA 30333.

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SUMMARY

The Standard Chlorine Chemical Company site is located at 1015 through 1035 Belleville Turnpike, Kearny, Hudson County, New Jersey. The site covers approximately 25 acres and is in an industrial area of Hudson County. Manufacturing operations were conducted at the site by various companies between 1916 and 1993 and included the refining of naphthalene, the manufacture of products from naphthalene, naphthalene derivatives and dichlorobenzenes, the formulation of drain cleaning products, and on a limited basis, the processing of trichlorobenzene during the 1970s. All operations ceased at the site in 1993.

The primary contaminants of concern at the Standard Chlorine site include polychlorinated biphenyls, chlorinated benzene compounds, naphthalene, chromium and 2,3,7,8-tetrachlorodibenzo-p-dioxin. On-site soil, sediment, surface water and groundwater contaminants migrate into the adjacent Hackensack River primarily by direct surface runoff and drainage ditches that run along the northern and southern property boundaries. Additionally, drums containing various site-related hazardous substances, including dioxin-contaminated asbestos, are consolidated into six sea boxes at the site. Based on October 2002 United States Environmental Protection Agency sampling results as well as results from previous sampling events that documented extensive on-site soil and groundwater contamination, the site was proposed to be added to the National Priorities List on April 30, 2003.

Although there are no completed human exposure pathways associated with the Standard Chlorine Company site at this time, the on-site contamination of soil, surface water, ground water and sediment is present at levels well above environmental comparison values. Migration of these contaminants into the Hackensack River has been documented by direct observation (e.g., a seep) and stated in the Administrative Consent Order issued by the New Jersey Department of Environmental Protection. There are two popular fishing locations on the banks of the river both 0.5 miles upstream and downstream from Standard Chlorine and hook and line fishing from boats takes place on the Hackensack River off the Standard Chlorine property. Despite the recommendations of the Fish Consumption Advisory, fishing and crabbing for consumption continues to occur. The Hackensack River is utilized by families for seasonal recreational activities such as kayaking, canoeing and the use of personal water crafts (i.e., jet skiing). The recreational uses of the Hackensack River are intermittent and therefore frequent significant exposures via ingestion of sediment/surface water pathway are unlikely. The site is potentially accessible to trespassers from the shore-bound side; however, the potential for exposure to these individuals on a routine basis is unlikely.

The New Jersey Department of Health and Senior Services, in cooperation with the Agency for Toxic Substances and Disease Registry, has concluded that the Standard Chlorine Chemical company site currently represents an ***"Indeterminate Public Health Hazard"*** for the biota (consumption of marine life) and ambient air pathways. Data associated with the biota pathway is not currently available and this pathway is the most significant pathway of exposure associated with the site, partly due to the possibility of repeated exposures. Due to lack of air monitoring data for the contaminants of concern, it is difficult to determine the potential health impact of airborne contaminants to on- and off-site worker populations, residential communities living beyond the one-mile radius of the site, site visitors and trespassers.

Frequent, significant exposures to the contaminants of concern via trespassing and recreational uses of the river pathways is unlikely. Therefore, the Public Health Hazard Category recommended for these pathways is ***"No Apparent Public Health Hazard"***.

The Kearny Department of Health, the New Jersey Department of Environmental Protection, and the United States Environmental Protection Agency have reported no community concerns regarding the site. Based on currently available data, there were no identified completed exposure pathways associated with the site and no health outcome data for the Standard Chlorine site was evaluated at this time. In the past, the New Jersey Department of Health and Senior Services designed and conducted a screening project, named the Chromium Medical Surveillance Project, to determine potential exposures to people living and/or working near chromium waste sites in Hudson and Essex counties. The Standard Chlorine site was included as part of 78 workplaces targeted for screening services. Screening results indicated little evidence of clinically observable chromium-induced health effects. However, there was evidence of low levels of exposure to chromium among some participants living and/or working in the vicinity of chromium waste sites, including adult workers at the Standard Chlorine site (New Jersey Department of Health 1994).

Without extensive remedial action, the contaminants currently present on-site would represent a potential public health concern if conditions or land use at the site change, resulting in potential future exposures. It is recommended that groundwater (on- and off-site) delineation be conducted to assess the transport of on-site contaminants into the Hackensack River. It is also recommended that air monitoring be conducted by the New Jersey Department of Environmental Protection to identify the potential impact of airborne contaminants to residential communities living beyond the one-mile radius of the site. Further, it is recommended that air monitoring be implemented during remedial activities to determine the potential health impact of airborne contaminants to on- and off-site worker populations.

Hackensack River fish tissue studies are currently underway by the New Jersey Department of Environmental Protection. When available, the results will be reviewed to evaluate the contribution of site-related contamination to the biota pathway.

PURPOSE AND HEALTH ISSUES

On April 30, 2003, the United States Environmental Protection Agency proposed to add the Standard Chlorine Chemical Company (Standard Chlorine) site, Kearny, Hudson County, New Jersey, to the National Priorities List (NPL) of Superfund sites. The New Jersey Department of Health and Senior Services (NJDHSS), in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), prepared the following public health assessment to review environmental data obtained from the site, define potential human exposure to contaminants, and to determine whether the exposures are of public health concern.

BACKGROUND

A. Site History

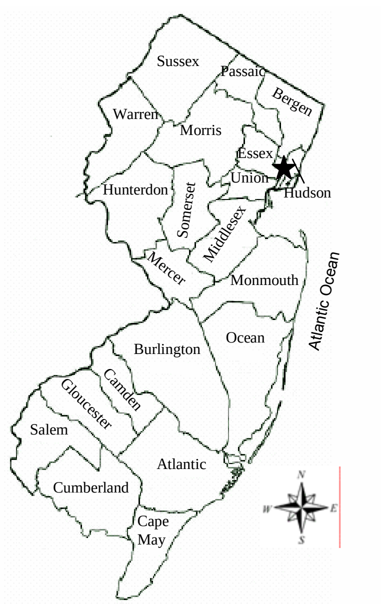

Figure 1: Location of the Standard Chlorine Chemical Company site

The Standard Chlorine site is approximately 25 acres in size and is located at 1015 through 1035 Belleville Turnpike, Kearny, Hudson County. The site location is shown in Figure 1. The site is bounded by the Hackensack River to the east, Belleville Turnpike to the west, and to the north by the former Diamond Shamrock site, which is currently owned by Tierra Solutions, Inc. (formerly Chemical Land Holdings, Inc.). The former Koppers Company, Inc. (Koppers) Seaboard site, currently owned by Beazer East, Inc. borders the Standard Chlorine site to the south. The site layout is shown in Appendix A, Figure 2. The Diamond Shamrock site was a chromate chemical manufacturing facility and past operations at the Koppers Seaboard site included coke production, and coal-tar refining. Operations on these properties adjacent to the Standard Chlorine site were discontinued during the 1970s.

Early site history indicates that the White Tar Company refined crude naphthalene (a.k.a. white tar, moth balls, tar camphor) at the site from 1916 until 1942 when the Koppers Company acquired the site and continued similar manufacturing activities, producing naphthalene products and creosote disinfectants. Koppers also stored and packaged 1,4-dichlorobenzene moth preservatives and deodorizers in solid form at the site.

Standard Chlorine operated at the site from 1963 to 1993. Operations at the site included the manufacture of moth crystals and flakes from dichlorobenzene. Standard Chlorine also separated and stored 1,2,4-trichlorobenzene at the site from 1970 until 1980. Standard Naphthalene Products, a wholly owned subsidiary of Standard Chlorine, processed liquid petroleum naphthalene at the site from 1963 until 1982. In addition, from 1963 until 1987, Chloroben Chemical Corporation, another wholly owned subsidiary of Standard Chlorine operated a batch formulation and blending operation producing various solvents and inorganic chemicals for use in cleaning drains, sewers, and septic tanks. Some Chloroben products were formulated at the site from 1,2-dichlorobenzene. The naphthalene refining operations were conducted in the eastern two-thirds of the site. The manufacture of dichlorobenzene products and the formulations of drain cleaning products occurred in the western one-third of the site. Trichlorobenzene processing occurred in the northeastern section of the property. All operations at the site ceased in 1993. Currently, the site has no manufacturing operations and limited administrative activities are conducted in an office building located on the western end of the site.

Chromium ore processing residue (COPR) generated by three chromite ore smelting facilities located in Hudson County, was deposited in over 160 sites in Hudson and Essex Counties. The chromate waste was used as fill in preparation for building foundations, construction of tank berms, roadway construction, filling of wetlands, sewerline construction and other construction and development projects (New Jersey Department of Health 1994). Two to 10 feet of COPR underlie approximately 85 percent of the Standard Chlorine site.

The site generally consists of two distinct areas. The western two-thirds of the site contain the previous plant manufacturing activities; and the eastern third contains a lagoon system in the former processing area (see Appendix A, Figure 2). Residual waste materials are currently present within the lagoon system, which has two segments designated as the east lagoon and west lagoon. The lagoon system occupies a surface area of approximately 33,000 square feet and has an average depth of six feet. The lagoon system received process wastewaters generated from various processes at the site. Historically, the lagoon effluent has overflowed by gravity into the adjacent Hackensack River (Brown and Caldwell 2001). In 1991, measures were taken to stabilize the embankment adjacent to the river and build up the berm around the lagoon system (Weston 1993).

Aerial photographs indicate that there have been discharges to the Hackensack River from this site (Brown and Caldwell, 2001; USEPA 2003). These photographs indicate piping had existed which allowed discharge into the lagoon system. The piping appears to originate from the buildings areas directly north of the lagoon system (USEPA 2003). The lagoon system is unlined and the base of the waste material is in contact with the water table. These photographs also indicate that the above-ground product storage tanks had no secondary containment and dark toned stained soil was documented in the western end of the property as well as the processing buildings north of the lagoon system.

A NJDEP inspection of the site on August 1982 reported spills of naphthalene and dichlorobenzenes on the ground surface at the site in several areas (USEPA 2003). In 1985, NJDEP collected and analyzed soil and sediment samples from 32 sites where compounds known to be associated with dioxin were produced as part of the Dioxin Site Investigation Program (NJDEP 1985). Standard Chlorine was included due to the usage of 1,2,4-trichlorobenzene and 1,2-dichlorobenzene at the site. This study revealed extensive 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) contamination in the lagoon system and in the former processing area north of the lagoon system, as evidenced by soil sampling and wipe samples of buildings, respectively (see Appendix A, Figure 2).

In October 1989, an Administrative Consent Order (ACO) was executed between Standard Chlorine and the NJDEP to conduct the necessary remedial investigations and perform remedial action(s). At NJDEP's direction in June 2000, Standard Chlorine performed an inventory of containerized waste materials stored in a building near the lagoon area. The inventory revealed the presence of dioxin-contaminated asbestos in approximately 400 drums and seven plastic bags. These and other drums containing waste materials from previous site investigations were consolidated into six sea boxes and remain on site. In December 2001, NJDEP terminated their ACO, indicating that Standard Chlorine had not completed remedial investigation activities and was non-compliant with the terms of the ACO. They requested that the USEPA evaluate the Standard Chlorine site as a candidate for listing on the NPL, based on complex environmental issues present at the site and the inability of the various responsible parties to implement effective remedial actions at the site. Based on results from sampling conducted by the USEPA in October 2002, as well as results from previous sampling events that documented extensive soil and groundwater contamination throughout the site, the USEPA determined that the site ranked for NPL listing. The USEPA proposed to add the Standard Chlorine site to the NPL on April 30, 2003.

The Standard Chlorine site lies in the Hackensack Meadowlands which has been identified by the United States Fish and Wildlife Service as a Significant Habitat Complex of the New York Bight Watershed at the request of the USEPA's New York/New Jersey Harbor Estuary Program, and may be a habitat for designated endangered and/or threatened species (USEPA 2003). There are also at least seven species of fish in the river that have management plans through the National Marine Fisheries Service thereby making the river Essential Fish Habitat. Additionally, of the 265 species of birds that migrate through the Meadowlands, 63 species nest in the Meadowlands and some use the river as a food source (USEPA 2003).

B. Site Characterization

Surface Drainage

The general direction of flow of on-site surface water is east, towards the Hackensack River. This run-off enters the Hackensack River via two outfall pipes (see Appendix A, Figure 2). Along the northern site boundary, a 48-inch diameter underground concrete stormwater pipe equipped with a tide gate receives run-off from the former Diamond Shamrock property and other commercial and industrial properties located to the west.

The eastern and western portions of the site generally slope to a central drainage swale, which receives flow from drainage ways near Buildings 2, 3 and 4 in the southwestern portion of the site (see Appendix A, Figure 2). This swale directs surface water to a drainage ditch that runs along the southern site boundary. A small drainage way along the eastern side of an abandoned railroad spur in the center of the site also drains southward into this ditch. Additionally, shallow groundwater also discharges to this southern drainage ditch. The on-site surface water in the ditch enters the Hackensack River via the south outfall, also equipped with a tide gate. A wetlands area lies south of this drainage ditch, in the former Koppers property.

The Hackensack River borders the entire eastern property boundary. It is tidally influenced and flows south to the Newark Bay. The overall direction of flow in the Hackensack River is from north to south.

Site Geology and Hydrogeology

Fill materials were placed in the coastal marshlands of the region to create property for industrial development. These fill materials generally consisted of COPR and silty sand, to depths ranging between 2 to10 feet below present grade. Underneath this fill material lies the original marsh surface, known as the Meadow Mat, consisting of silt, humus and peat. It is typically two to five feet thick. A sand layer is present beneath the Meadow Mat that is generally less than ten feet thick. A silt and clay unit is present beneath the sand layer and this layer is continuous beneath the Standard Chlorine site (Key Environmental 1997). Site characterization activities have focused on two separate groundwater-bearing units: 1) the shallow fill unit; and 2) the sand unit that underlies the Meadow Mat. The water table at the site occurs in the fill material placed above the Meadow Mat.

The groundwater flow in the fill material is primarily to the south, approximately parallel to the direction of flow in the Hackensack River. Groundwater in the fill unit in the eastern portion of the Standard Chlorine site discharges to the Hackensack River and the southern drainage ditch. Studies have indicated that the groundwater within the fill material is not tidally influenced. Groundwater in the sand unit beneath the Meadow Mat flows primarily to the south-southeast towards the drainage ditch. The underlying clay acts as an effective barrier to the downward migration of groundwater from this unit. Groundwater within the sand unit is tidally influenced to a limited extent.

C. Demography and Land Use

The Standard Chlorine site is located in an industrial area near the New Jersey Turnpike and Belleville Turnpike. Based upon the 2000 United States Census, population demographics indicate that there are no people or housing units within a one-mile radius of the site (see Appendix A, Figure 3). The site is within the New Jersey Meadowlands Commission Hackensack Meadowlands District, which has zoned the site as intermodal (see Appendix A, Figure 4). Permitted uses within this zoning are motor freight terminals, freight forwarding and intermodal facilities. The nearest residential area in Kearny is over two miles to the west.

D. Past ATSDR/NJDHSS Involvement

From January 1992 through September 1993, the New Jersey Department of Health designed and conducted a screening project to determine potential exposure to people living and/or working near chromium waste sites in Hudson and Essex counties. This project, named the Chromium Medical Surveillance Project, included the workers at the Standard Chlorine site as part of 78 workplaces targeted for screening services. The project found evidence of exposure to adult workers at the Standard Chlorine site (New Jersey Department of Health 1994).

E. Site Visits

February 18, 2004 Site Visit

On February 18, 2004 staff performed a site visit of the Standard Chlorine site. Present were Steven Miller, Julie Petix, Tariq Ahmed, Somia Aluwalia of the NJDHSS, Leah Escobar of the ATSDR, and representatives of the NJDEP, Tierra Solutions, Inc., (current owner of the former Diamond Shamrock site); Standard Chlorine, Inc., Langan Engineering and Environmental Services, Beazer East Inc. (current owner of the former Koppers Company, Inc.), and of Key Environmental Inc.

The site visit commenced at 9:30 am. The weather conditions were sunny, cold with temperature in the mid 30s with a stiff breeze. As seen in Figure 2, the site is bordered to the north by the former Diamond Shamrock site; to the east by the Hackensack River; to the south by the former Koppers site; and to the west by the Belleville Turnpike. The main driveway leading to Standard Chlorine from the Belleville Turnpike is gated and this driveway runs along the entire northern boundary of the Standard Chlorine site. This driveway is common to Standard Chlorine and the former Diamond Shamrock sites. Tierra Solutions, Inc. leases their property for trailer storage and therefore the driveway is accessed by drivers transferring trailers in the former Diamond Shamrock site. The Standard Chlorine site is fenced and gated along the western perimeter and there is an old wooden guard house that was unoccupied at the time of the site visit. "No trespass" signs were observed at northeastern part of the fence that separates the lagoon system in the Standard Chlorine site from the main driveway. All buildings on the site are abandoned with the exception of an office building located on the western end of the site. Individuals present for the site visit convened in this office building to discuss major issues associated with the contaminants of concern at the site.

The site visit proceeded from this office building to an area where six sea boxes are stored, containing dioxin-contaminated asbestos and mixed organic wastes. Numerous physical hazards were present at the site including dilapidated buildings, broken windows, debris, and an open drainage ditch. Additionally, areas along the edge of the Hackensack River were littered with rubbish and debris. The site is mostly covered with asphalt, and in some sections, gravel. The asphalt and gravel caps were placed as part of interim remedial measures by the former Diamond Shamrock Company to address exposures associated with the COPR. A series of locked gates were encountered within the Standard Chlorine site. The lagoon system, located on the eastern part of the site, was visible from the Conrail right-of-way access road (Appendix A, see Figure 2). The area surrounding the lagoon system is enclosed by a six-foot high barbed wire fence. This fence is referred to as a "dust fence barrier" since it is lined with black tarp to reduce export of particles from the lagoon system area. A trench with standing water was observed inside the fenced area. The smell of naphthalene/moth balls was noted here. The southern boundary of the Standard Chlorine site was encountered which is comprised of an open drainage ditch that ultimately empties into the Hackensack River. This southern outfall into the Hackensack River was not visible from the fenced area near the lagoons. The drainage ditch had mixed standing and frozen water. *Phragmites australis* (or common reed), a wetland plant species, was observed on either side of the ditch. The former Koppers site was on the southern side of the drainage ditch and was observed to be marshy.

The Hackensack River was at low tide during the site visit. The site visit personnel proceeded to the driveway between Tierra Solutions, Inc. and Standard Chlorine and observed the north outfall into the Hackensack River from the buried storm sewer that runs along the entire northern boundary of the Standard Chlorine site. Brown green puddles, possibly indicative of chromium contaminated water, were observed on the surface of the driveway. Upwelling of the water into the driveway occurs due to the high water table, especially under wet weather conditions. Surface water, rapidly running into a sewer drain was also observed on this driveway.

A small number of Standard Chlorine personnel occasionally work in the on-site office building. When asked about vandalism, they commented that it was a problem in the past, occurring primarily at night. This was evident from the numerous broken windows observed for on-site buildings, although Standard Chlorine personnel stated that wind damage accounted for some of this damage. According to Standard Chlorine personnel, individuals from various trucking companies periodically visit the site to inquire about the sale of the property. Local discussions about possible future uses for the site included light industrial warehousing (e.g., big box storage) and commercial (e.g., Walmart, Lowe's). Recreational uses of the Hackensack River adjacent to the site were not discussed during the site visit; this was discussed separately in a telephone conversation with the Hackensack Riverkeeper.

There was a paucity of typical signs of trespassing such as graffiti, cigarette butts and beverage cans. It was observed that not all fences were topped with barbed wire; therefore access by a determined trespasser would be plausible. During the site visit, a truck driver parking a trailer on the former Diamond Shamrock site related an incident of an individual who had used the shoreline on that property for launching his boat and was accidentally locked in when the truck driver locked the gates following his departure. Overall, the site seemed secure from the land-bound side; any potential trespassing would be limited to older children or adults. The river-bound portion of the site is not fenced and therefore access from the Hackensack River is possible. Although trash was observed along the shore-line, it was difficult to determine if this was due to trespassers or if it was wash-up from the tidally influenced Hackensack River. Pictures from this site visit are catalogued in Appendix B.

April 30, 2004 Site Visit

On April 30, 2004, staff performed a second site visit of the Standard Chlorine site in the form of an Eco-Cruise boat tour of the Hackensack River. Present were Somia Aluwalia, Christa Fontecchio, Sharon Kubiak and Steven Miller of the NJDHSS, Leah Escobar, Arthur Block of the ATSDR, representatives of the NJDEP and the NY/NJ Baykeeper, and the Hackensack Riverkeeper. The Eco-Cruise tour lasted two and half hours.

The site visit commenced at 12:10 pm at the marina located on the Hackensack River behind the Red Roof Inn, Secaucus, Hudson County. It was partly cloudy with temperatures in the 70s. The direction of the Eco-Cruise boat tour was from north to south, towards the Newark Bay. The riverkeeper began his tour by describing the layout of the Hackensack River on an illustrated map and highlighted the towns of Secaucus, Rutherford, Lyndhurst and Kearny. Wildlife refuge areas such as Saw Mill Creek, Riverbend Wetland Preserve and Lyndhurst Marshes were also pointed out on the map. The riverkeeper mentioned that although the former Honeywell (chromium manufacturing) property was located downstream from the Standard Chlorine site, chromium was detected in the Hackensack River adjacent to Standard Chlorine and near the Cayuga Dike (upstream from Standard Chlorine). He commented that he has been lobbying federal and state agencies since 1997 to remediate the site to protect valuable wetlands and marshes located on the Hackensack River. His interest in the Standard Chlorine site is with respect to endangered species, such as Northern Harrier Hawks, Black Crowned Night Herons and Yellow Crowned Night Herons, who roost on the site.

As the Eco-Cruise boat tour proceeded down the Hackensack River, housing developments in Secaucus on former wetlands were shown. Several popular fishing locations were pointed out. Of the many marinas and boat launches located along the Hackensack River, only one of these launches is a public boat launch, located 0.5 miles upstream of the Standard Chlorine site in Laurel Hill Park. According to riverkeeper, this is a popular fishing location. People were observed sitting on the pier located in the park and two individuals were observed fishing from the shoreline in the park. Child playground equipment was observed in the park and the riverkeeper commented that it was a very popular recreational area for the local residents. The Standard Chlorine site was observed next. An abandoned boat is washed up on the shoreline and trash and rubbish were also observed. The southern outfall pipe had visible outflow into the Hackensack River. Other sites, downstream of the Standard Chlorine site were viewed next. Another popular fishing area observed during the Eco-Cruise is located 0.5 miles downstream at the confluence of Penhorn Creek and the Hackensack River. A makeshift fishing pier is located in this area.

On the way back to the marina, two people were observed on a powerboat cruising up and down the Hackensack River. According to the riverkeeper, the river is used by numerous boaters, jet skiers, canoers and kayakers. Captain Sheehan stressed that it is imperative that a barrier be installed along the Standard Chlorine site shoreline to prevent site-related contamination from entering the Hackensack River.

F. Community Concerns

In order to gather information on community health concerns at the Standard Chlorine site, the NJDHSS spoke with the Health Officer, Kearny Department of Health (J. Sarnas, Health Officer, Kearny Department of Health, personal communication, 2004). The local health department has reported no community concerns regarding the site. The USEPA and NJDEP do not indicate any community concerns on record.

A Hudson County community group, the Interfaith Community Organization, has voiced concerns in press about the Standard Chlorine site (Jones 2004; Lane, 2004a; 2004b). The project director for this organization, has expressed opinions with regard to clean-up of the site and advocates the cleaning up of the Hackensack River to be included as part of site clean-up. The community group's general concern is clean-up of sites in Hudson County that have received chromate fill in the past. The Standard Chlorine site is one of these sites, and the project director is particularly interested in chromium contamination on-site, especially with respect to air-borne chromium dust and the leaching of chromium into the Hackensack River.

ENVIRONMENTAL CONTAMINATION

A compilation of environmental sample results for the Standard Chlorine site dating from July 1983 through October 2002 is provided in the following section. Media reviewed included soil, sediment, groundwater and surface water. These data were organized by the NJDHSS as on-site (Standard Chlorine) versus off-site (Hackensack River, wetland area south of Standard Chlorine property). They were further categorized into contaminant type (chromium, volatile and semi-volatile organic compounds (VOCs/SVOCs)) in the reviewed media. There was no ambient air monitoring data available for review. The environmental sample results were then compared to the environmental comparison values detailed below. Typically the most stringent comparison value is used in the screening process to identify the contaminants of concern.

The ATSDR environmental comparison values include the Environmental Media Evaluation Guide (EMEG) or Reference Media Evaluation Guide (RMEG). EMEGs are estimated contaminant concentrations that are not expected to result in adverse non-carcinogenic health effects. RMEGs represent the concentration in water or soil at which daily human exposure is unlikely to result in adverse non-cancer health effects. When EMEGs or RMEGs were not available, the USEPA Region 3 Risk-Based Concentrations (RBCs) were used. RBCs are contaminant concentrations corresponding to a fixed level of risk (i.e., a Hazard Index of 1, or lifetime excess cancer risk of one in one million, whichever results in a lower contaminant concentration) in water, air, biota, and soil.

Additionally, the New Jersey Non-Residential Direct Contact Soil Clean-up Criteria (NRDCSCC) is provided for contaminants in soil. They are based on human health impacts but also take into consideration environmental impacts. For contaminants in sediment, the New Jersey Guidance for Sediment Quality Evaluations is provided although they are based upon ecological rather than human health risk. For contaminants in surface water and groundwater, health-based New Jersey Surface Water Quality Standards (NJSWQS) and New Jersey Groundwater Quality Standards (NJGQS) are provided.

On-Site Contamination

On-site is the area as defined in the site history section of this document. It includes the lagoon system and the open drainage ditch that originates in the center of the site (see Appendix A, Figure 2).

Soil Contaminants

Chromium

Soil data collected in 1991 indicate hexavalent chromium in the upper six inches of soil. The maximum concentration of hexavalent chromium in these samples was 270 mg/kg (see Appendix A, Table 1) which is above the RMEG (200 mg/kg). None of the samples collected below the Meadow Mat (located below two to 10 feet of COPR) contained hexavalent chromium above the detection limit. Total chromium concentrations in soil were more indicative of the known presence of chromium ore processing residue above the Meadow Mat. Total chromium concentrations exceeding 10,000 mg/kg were reported in a number of soil samples in the site fill; the highest reported concentration being 34,900 mg/kg, elevated above the RMEG and the NRDCSCC (see Appendix A, Table 1). However, none of the samples collected from below the Meadow Mat indicated elevated concentrations of total chromium; the highest reported concentration was 82 mg/kg collected at a depth of 13 feet below ground surface (Brown and Caldwell 2001).

VOCs/SVOCs

Surface soil samples in the former process area north of the lagoon system were collected for analysis during the remedial investigation completed by Weston (Weston 1993). The results of these analyses indicate the presence of 1,2-dichlorobenzene, 1,4-dichlorobenzene, the trichlorobenzene isomers, and naphthalene at elevated concentrations above the NRDCSCC and environmental comparison values (see Appendix A, Table 2). Concentrations of the polyaromatic hydrocarbons (PAHs) were greater than the NRDCSCC in these surface soil samples. Soil boring samples collected for VOCs/SVOCs analysis indicate that the soil contains elevated concentrations of 1,2-dichlorobenzene, 1,4-dichlorobenzene, the trichlorobenzene isomers and naphthalene above the NRDCSCC and environmental comparison values (see Appendix A, Table 3). The PAHs were similarly elevated in the soil boring samples. Elevated levels of lead and arsenic, higher than the NRDCSCC, were detected in soil borings in the western portion of the site (Weston 1993).

Soil samples collected for 2,3,7,8-TCDD analysis in 1985 indicated that dioxin was not present above the detection limit on the western portion of the site. However, concentrations of 2,3,7,8-TCDD collected from the eastern portion of the lagoon system area were elevated, with the maximum reported concentration being 0.0696 mg/kg (see Appendix A, Table 2). Dioxin samples collected within the lagoon system in 1987 indicated that dioxin was prevalent in these soils. The maximum reported 2,3,7,8-TCDD concentration in the soil within the lagoon system was 0.268 mg/kg (see Appendix A, Table 3). Both these maximum levels values exceed the environmental comparison value for TCDD (1.9×10^{-5} mg/kg).

Arochlor-1260, a polychlorinated biphenyl (PCB) congener, was detected at 9,300 mg/kg in concrete chips taken from the vicinity of the former transformer, in the western portion of the site. This concentration significantly exceeds the NRDCSCC of 2 mg/kg. It was found in lesser concentrations (0.12 to 0.29 mg/kg) in three soil samples collected directly beneath the concrete pavement, north of the former transformer (see Appendix A, Table 2).

Sediment Contaminants

Chromium

Total chromium levels were measured at detectable levels in the majority of sediment samples, collected from January 1991 through October 2002 (see Appendix A, Table 4). Total chromium was analyzed in numerous sediment samples across the site, including the drainage ditches and the lagoon system. The highest level (16,400 mg/kg) was detected in a sediment sample taken from the drain as it originates in the center of the site. Chromium, lead, arsenic, copper, mercury and zinc were elevated above the NRDCSCC and environmental comparison values (see Appendix A, Table 4).

VOCs/SVOCs

Sediment samples in the lagoon system area revealed the highest concentration of naphthalene (25,200,000 mg/kg) and phenols and PAHs, above the NRDCSCC (see Appendix A, Table 4). Additionally samples from the drainage ditch originating on-site had the highest levels of the dichlorobenzene isomers and trichlorobenzene, exceeding the environmental comparison values. The sample with the high PCB concentration (5,160 mg/kg) was collected near Building 2, near the former transformer pad (Weston 1993). The highest detected level of 2,3,7,8-TCDD (0.0595 mg/kg) was collected from the lagoon system area. Both these contaminants were detected at levels above the NRDCSCC and the environmental comparison values.

Surface Water Contaminants

Chromium

Sampling in the small drainage way along the eastern side of an abandoned railroad spur in the center of the site had the highest level of total chromium (1,240,000 μg/L). This exceeds the NJSWQS and the Maximum Contaminants Levels (MCLs). As presented in Table 5 in Appendix A, levels of mercury, lead and arsenic were also elevated above the environmental comparison values in the surface water samples.

VOCs/SVOCs

The maximum detected concentrations of the dichlorobenzene isomers were from a sample taken in the southern drainage ditch south of Building 2 (Weston 1993). These and other VOCs/SVOCs were present in the majority of the surface water samples, but at concentrations less than the environmental comparison values and standards (see Appendix A, Table 5). A review of the available data indicated that elevated levels of 2,3,7,8-TCDD have not been reported.

Groundwater Contaminants

Chromium

Since COPR is present throughout the site, levels of total chromium as well as hexavalent chromium are elevated above the NJGQS and MCLs in a majority of the monitoring wells, in both the shallow and deep zones. The highest detected hexavalent chromium (97,000 μg/L) was reported in the northeastern portion of the site. The same monitoring well had the maximum detected total chromium (101,700 μg/L). Additionally, as presented in Table 6 in Appendix A, all metals with the exception of cyanide, were also present at levels exceeding the environmental comparison values and standards in the groundwater.

VOCs/SVOCs

Based on the site's operational history, the VOCs/SVOCs concentrations are elevated and are generally higher in the area of the lagoon system, where process wastewaters were discharged (Brown and Caldwell 2001). With the exception of anthracene, all VOCs/SVOCs concentrations are above the various standards as summarized in Table 6 in Appendix A. Dioxin was reported at concentrations below the detection limit in monitoring wells located in the eastern portion of the site (Weston 1993).

Summary of On-Site Contaminants of Concern (COC)

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

VOCs	SVOCs		Metals
Benzene	1,2-Dichlorobenzene	Fluoranthene	Antimony
Chlorobenzene	1,3-Dichlorobenzene	Indeno(1,2,3-cd)pyrene	Arsenic
Methylene Chloride	1,4-Dichlorobenzene	Phenanthrene	Chromium
1,2-Trans-Dichloroethene	1,2,3-Trichlorobenzene	Naphthalene	Copper
1,1,2-Trichloroethane	1,2,4-Trichlorobenzene	Bis(2-ethylhexyl)phthalate	Lead
Trichloroethylene	Acenapthene	2-Chlorophenol	Mercury
Tetrachloroethylene	Acenaphthylene	2,4-Dichlorophenol	Nickel
Toluene	Benzo(a)anthracene	2,4-Dimethylphenol	Zinc
Vinyl chloride	Benzo(b)fluoranthene	2-Methylphenol	
Xylenes	Benzo(a)pyrene	4-Methylphenol	
	Benzo(g,h,i)perylene	Phenol	
	Chrysene	PCB – Arochlor 1260	
	Fluorene	2,3,7,8-TCDD (Dioxin)	

Off-Site Contamination

Off-site is defined as the Hackensack River adjacent to the site and the southern drainage ditch portion in the former Koppers property (see Appendix A, Figure 2).

Sediment and Surface Water Contaminants

Data from the analysis of sediment samples collected from the Hackensack River and the southern drainage ditch in the former Koppers property is summarized in Table 7 in Appendix A. The maximum levels of VOCs detected were below the sediment screening guidelines, the NRDCSCC and the environmental comparison values.

In the 27 samples collected from the Hackensack River by Enviro-Sciences in 2000, total chromium concentrations were generally above 1,000 mg/kg (Brown and Caldwell 2001). In the same study, hexavalent chromium was detected in three of the 27 samples ranging in concentration from 3.8 to 78.1 mg/kg (Enviro-Sciences, Inc. 2000). Each one of these positive detections was located in the riverbed at the northeast corner of the site, close to the north outfall.

The concentration of the dichlorobenzene isomers and trichlorobenzene exceeded the sediment screening guidelines but were below the NRDCSCC and the environmental comparison values. The PAHs (benzo(a)anthracene, benzo(b)fluoroanthene, benzo(a)pyrene, benzo(g,h,i)perylene) exceeded all comparison values (see Appendix A, Table 7). The maximum detected concentration of naphthalene (4,570 mg/kg) was detected in the Hackensack River close to the lagoon system area (Enviro-Sciences, Inc. 2000) and this exceeded the NRDCSCC and the environmental comparison value. Maximum detected concentrations of PCBs (0.21 mg/kg) and 2,3,7,8-TCDD (0.0000964 mg/kg) were detected above environmental comparison values, at the shoreline near the northern outfall and at the southern drainage ditch in the wetlands area of the former Koppers property, respectively (Enviro-Sciences, Inc. 2000, USEPA 2003).

Selected VOCs/SVOCs are present in the surface water samples at concentrations above the environmental comparison values and the NJSWQS (see Appendix A, Table 8).

Summary of Off-Site Contaminants of Concern (COC)

The COC present in off-site sediment and surface water are as follows:

VOCs	SVOCs		Metals
Benzene Chlorobenzene	1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2,4-Trichlorobenzene Benzo(a)anthracene Benzo(b)fluoranthene Benzo(a)pyrene	Benzo(g,h,i)perylene Indeno(1,2,3-cd)pyrene Phenanthrene Naphthalene PCB – Arochlor 1260 2,3,7,8-TCDD (Dioxin)	Arsenic Chromium (Total) Copper Lead Mercury

Basic toxicological information is provided in Appendix C for some of the most prevalent COC.

DISCUSSION

The general method for determining whether a public health hazard exists to a community is to determine whether there is a completed exposure pathway from a contaminated source to a receptor population. It is then determined whether levels of exposure due to contamination are high enough to be of public health concern. An evaluation of exposure pathways is presented in the following section.

Pathways Analysis

An exposure pathway is the process by which an individual is exposed to contaminants from a source of contamination and consists of the following five elements:

1) source of contamination;
2) fate and transport in environmental media (e.g., air, groundwater, surface water, soil, sediment, biota);
3) point of exposure (i.e., location of potential or actual human contact with a contaminated medium);
4) route of exposure (e.g., inhalation, dermal contact/absorption, ingestion); and
5) receptor population.

ATSDR/NJDHSS classifies exposure pathways into three groups: (1) completed pathways, that is, those in which exposure has occurred, is occurring, or will occur; (2) potential pathways, that is, those in which exposure might have occurred, may be occurring, or may yet occur; and (3) eliminated pathways, that is, those that can be eliminated from further analysis because one of the five elements is missing and will never be present, or in which no contaminants of concern can be identified.

The following table depicts the human pathway classification for the Standard Chlorine site:

Human Exposure Pathways Associated with the Standard Chlorine Site					
Pathway Name	Point of Exposure	Route of Exposure	Exposed Population	Time	Pathway Classification
Ambient Air	Standard Chlorine site	inhalation	on- and off-site worker populations, residential communities, site visitors, trespassers	Past Present Future	Potential
Surface Soil	Standard Chlorine site	skin contact, inhalation, ingestion	visitors to site, trespassers, workers on neighboring properties	Past Present Future	Potential
Sediment	Hackensack River, on-site drainage ditch, on-site lagoons	skin contact, ingestion	trespassers, recreational users of the river	Past Present Future	Potential
River Water	Hackensack River, on-site drainage ditch	skin contact, ingestion	recreational uses of the river	Past Present Future	Potential
Groundwater	Residences, tap	skin contact, inhalation, ingestion	Residents	Past Present Future	Eliminated
Food Chain (biota)	Hackensack River	ingestion	recreational fishing, crabbing	Past Present Future	Potential

Public Health Implications

Completed Pathways

Based on available information and site visit observations, there are no known completed human exposure pathways at the Standard Chlorine site. This is because the site is currently closed to entry from the land-bound side and no tissue concentrations of site-specific contaminants (chlorinated benzenes, naphthalene) in marine life in the Hackensack River are available at present. The recreational uses of the river are intermittent and therefore frequent significant exposures via this pathway are unlikely. Similarly, the exposures to trespassers and visitors to the site would be infrequent and would not likely result in large exposures to on-site contaminants. This pathway can be defined as plausible but infrequent at best.

Potential Pathways

Ambient air pathway

There is currently no community receptor population within one-mile of the Standard Chlorine site although there are residential communities beyond the one-mile radius. Additionally, future redevelopment of the site for non-industrial purposes may significantly modify population demographics. Due to lack of air monitoring data for the COC, it is difficult to determine the potential health impact of airborne contaminants to on- and off-site worker populations, residential communities living beyond the one-mile radius of the site, site visitors and trespassers.

Surface soil pathway

As described in the site visit section of this report, there were indications of trespassers/vandals at the Standard Chlorine site (e.g., broken windowpanes on buildings, evidence of rubbish/trash washed up on the Hackensack river bank). The potential for exposure to these individuals on a routine basis is unlikely and does not justify a completed exposure pathway designation. The nearest residential area is two miles to the west and it would require a determined trespasser to access the site from the Belleville Turnpike. The northern and the western portions of the Standard Chlorine site are fenced and gated; however, the eastern portion of the site adjacent to the Hackensack River is not secure against access from the river. Although it is unlikely that the public would utilize the Standard Chlorine shoreline for recreational purposes, it was noted in the site visit that this has happened in the past (example of an individual launching boat from the shoreline) and the possibility of unauthorized access to the site via the river cannot be dismissed.

River water/sediment/seafood pathways

Recreational activities associated with the Hackensack River (i.e., fishing, boating) may be associated with an exposure pathway linked to the Standard Chlorine site. Seasonally, activities such as canoeing, kayaking, the use of small power boats and personal water crafts (i.e., jet-skiing) occur along this stretch of the Hackensack River. Laurel Hill park located on the Kearny dike, approximately half a mile upstream (see Appendix A, Figure 5) has a free public boat launch used by as many as 100 boats a day during the summer months (Captain B. Sheehan, the Hackensack Riverkeeper, personal communication, 2004). There are other independent recreational users of the Hackensack River, including charter companies and canoe/kayak clubs. As stated previously, recreational uses of the Hackensack River are intermittent and therefore frequent significant exposures via ingestion of sediment/surface water are unlikely.

Due to PCB and dioxin contamination, originating in part from the Standard Chlorine site, Fish Consumption Advisories pertaining to the consumption of some fish and blue crab have been issued for the Hackensack River. There is no commercial fishing on the Hackensack River. There are small operations that gather bait fish such as banded killifish and mummichog on a sporadic basis (Captain B. Sheehan, the Hackensack Riverkeeper, personal communication, 2004; Jim Joseph, NJDEP, personal communication, 2004). While no fisheries are designated as closed, this Advisory has been issued for the Hackensack River regarding the consumption of blue crab and striped bass due to dioxin contamination; and American eel, white perch, and white catfish due to PCB contamination in the river. The Hackensack River advisory is included as part of the Newark Bay complex advisory (NJDEP 2003; USEPA 2003).

Despite the Fish Consumption Advisories, fishing for consumption regularly takes place on the Hackensack River. There are two popular fishing locations on the banks of the river both 0.5 miles upstream and downstream from Standard Chlorine site. One location is on the Kearny dike in Laurel Hill County park and the other location is near the confluence of the Penhorn Creek and the Hackensack River (see Appendix A, Figure 5 and 6). Other popular fishing locations include Cayuga Dike (just upstream of the site), Mill Creek (five miles upstream from Laurel Hill County park), the Flats in Newark Bay, and the Ledge (near the Jersey Gardens Mall at the confluence of Newark Bay, the Kill Van Kull, and the Arthur Kill). The Hackensack River has gained in popularity for recreational fishing in recent years due to the presence of more than 60 species of fish in the river. Additionally, increased ferry traffic on the Hudson River, a neighboring river in this region, has made it harder to fish in small boats (Captain B. Sheehan, Hackensack Riverkeeper, personal communication, 2004). This has made the Hackensack River the more popular choice amongst recreational anglers.

There have been two major studies conducted by the NJDEP in 1985 and 1988, examining 2,3,7,8,-TCDD contamination in marine life in New Jersey waterways and the New York Bight, respectively (NJDEP 1985-1988). These studies are part of a statewide "Routine Monitoring Program for Toxics in Fish" developed to provide current and more comprehensive data on concentrations of toxic contaminants in fish and shellfish in order to assess human health risks and thus update/recommend fish consumption advisories gather data for advisories. The NJDEP and the NJDHSS through the interagency Toxics in Biota Committee review results from these studies to set statewide fish advisories and consumption levels. Although the dioxin levels in the Hackensack River cannot be solely attributed to Standard Chlorine, the studies indicate widespread dioxin contamination in the Newark Bay (the confluence of the Passaic and Hackensack rivers).

Two studies initiated in 2004 will characterize the bioaccumulation of dioxins, PCBs, PAHs (including naphthalene), selected pesticides, furans and chlorinated benzene compounds in fish and crab (B. Ruppel, NJDEP, personal communication, 2004; NJDEP 2004; E. Konsevick, New Jersey Meadowlands Commission, personal communication, 2004) in the Newark Bay complex, including the Hackensack River. These studies may allow an estimation of the contribution of site-related contaminants to localized biota and therefore to estimates of exposures via ingestion of edible marine life. The results of these studies in conjunction with river sediment evaluations may enable a quantitative attribution of an exposure dose from the Standard Chlorine site.

Migration Pathways from On- to Off-Site Areas

There are three areas of particular concern with regard to migration of on-site contaminants to off-site areas (the Hackensack River and the wetlands area of the former Koppers property). These are described as follows:

Lagoon System

The lagoon system was constructed on the eastern portion of the site in the mid-1940s and the eastern end is located approximately 25 feet from the Hackensack River shoreline. The lagoon system is unlined and the base of the waste material is in contact with the water table and the sides of the depression are chromium fill, the high permeability of which disperses drainage. Residual waste materials in the lagoons consist of sludge and viscous oils associated with sludge, and residual solids. The sludge is typically black and viscous and the chemical composition of the sludge has been identified from the analyses of four sludge samples collected as part of the Weston Remedial Investigation (RI) Report. The major constituent in each of the samples was naphthalene, which accounted for between 30 and almost 99 percent of the sample content (Weston 1993). Dioxin sampling events in February and March 1987 showed that contamination of 2,3,7,8-TCDD existed throughout the vertical extent of the waste material in the lagoons and across most of the horizontal extent of the lagoons (Weston 1993; Brown and Caldwell 2001).

Because the waste lagoon system is unlined and the base of the waste is below the elevation of the shallow groundwater table, the lagoon system currently represents the principal potential source of contaminant releases at the site, considering the relatively high concentration of constituents detected in the lagoon system sludges.

South Drainage Ditch

The southern drainage ditch received flow from drainage ways near Buildings 2, 3 and 4 in the southwestern portion of the site (see Appendix A, Figure 2). The southern drainage ditch also receives flow from the shallow groundwater. Shallow groundwater flows laterally in the sand unit and discharges to the southern drainage ditch and ultimately to the Hackensack River. The sediments in the drainage ditch were observed to have a yellow-brown color forming a scum on the water surface (USEPA 2003). While it is possible that surface water and sediments in the southern drainage ditch may be impacted from contaminants from the Koppers property to the south of the site, the highest concentration of contaminants were detected in the center of the Standard Chlorine property where the ditch originates on-site. The contaminants detected in the surface water and sediment samples collected in the southern drainage ditch are all site-attributable compounds.

Under New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Surface Water Permit, Standard Chlorine was permitted to discharge septic tank overflow, boiler blow down and stormwater runoff into the southern drainage ditch. Standard Chlorine was found in violation of the Spill Compensation and Control Act and the Water Pollution Control Act as stated in the Administrative Consent Order issued by the NJDEP and signed by NJDEP and Standard Chlorine on 20 October and 18 October, 1989, respectively (NJDEP 1989). The violations were issued for the past and current discharges of hazardous substances and pollutants into the waters and onto the lands of the State of New Jersey (NJDEP 1989). Additionally, during the October 2002 USEPA sampling event, a seep was observed entering the Hackensack River from the sediment nine feet to the southeast of the outfall where the southern drainage ditch confluences with the Hackensack River. The seep was black and chemical analysis of the seep documented the presence of 1,4-dichlorobenzene (USEPA 2003).

Both of these incidents document that site related hazardous substances from the site have directly entered the Hackensack River.

Soils

Soil boring samples taken at both the western and eastern portions of the site showed elevated levels of chlorobenzene, dichlorobenzene isomers, trichlorobenzene isomers and naphthalene. This may be the result of leakage or spillage from aboveground storage tanks, or migration of contaminants from the lagoons through the soils (Environmental Resources Management 1997; Weston 1993). Additionally the Standard Chlorine site has extensive Dense Non-Aqueous Phase Liquid (DNAPL) contamination (Key Environmental 1999). DNAPL is a liquid that is denser than water and does not dissolve or mix easily in water (it is immiscible). DNAPL contamination is problematic because of the high density of DNAPLs relative to water; thus, they will tend to migrate to considerable depths in an aquifer until reaching a low permeability zone that will retard further downward movement.

As part of a 1999 study by Key Environmental, samples collected in the eastern part of the site had a DNAPL composition of primarily dichlorobenzene isomers, naphthalene and trichlorobenzene isomers. Significant DNAPL migration appears to have occurred from Buildings 2, 3 and 4 areas to the southwestern part of the site (Key Environmental 1999). For samples collected in the vicinity of Buildings 2, 3 and 4, the DNAPL is believed to be comprised of primarily of the dichlorobenzene isomers. The DNAPL appears to have migrated along the top of clay unit to the northeast and the northwest and was also observed to be present south of the lagoon system.

DNAPLs present potential continuing sources of dissolved-phase chemical compounds to groundwater. The most significant migration pathway for groundwater within the fill/Meadow Mat unit is flow to the drainage ditch along the southern property boundary, and to the stormwater drainage pipe along the northern property boundary, ultimately draining into the Hackensack River. The primary migration pathway for groundwater in the sand unit is to the south with discharge to the Hackensack River.

Based on these presented migration pathways, it appears that the soils and free phase product in the vicinity of Building 2 are a continuing source of contamination to the Hackensack River.

Eliminated Pathways

The groundwater ingestion pathway has been eliminated because there are no known wells used for private or public drinking water supply located within one-mile of the site (Weston 1993). In addition, a well search conducted for another NPL site located less than two miles west of the Standard Chlorine site revealed no wells within four miles of that site (ATSDR 2002). No drinking water intakes are located in this portion of the Hackensack River. Hudson County's drinking water is supplied by four different purveyors which are the Passaic Valley Water Commission, United Water Company, United Water New Jersey, and North Jersey District Water Supply Commission. The primary sources of potable water are from watersheds outside of the county, including the Oradell Reservoir in Bergen County, New Jersey, and the Wanaque Reservoir, Passaic County, New Jersey (United Water New Jersey 2002). The Town of Kearny receives its drinking water supply from the Wanaque Reservoir in Bergen County (R. Ferraioli, Hudson County Water Department, personal communication, 2004; United Water New Jersey 2002).

Health Outcome Data

Based on currently available data, there were no identified completed exposure pathways associated with the site, therefore no health outcome data for those living in the area closest to the Standard Chlorine site was evaluated at this time. In the past (from January 1992 through September 1993), the NJDHSS designed and conducted a screening project to determine potential exposures to people living and/or working near chromium waste sites in Hudson and Essex counties. This project, named the Chromium Medical Surveillance Project (CMSP), included the workers at the Standard Chlorine site as part of 78 workplaces targeted for screening services. The NJDHSS designed this project determine if exposure to chromium was occurring and to provide medical evaluations to people who live and/or work on or near chromium waste sites. Most of the persons undergoing the follow-up medical examinations revealed no apparent clinical effects attributable to chromium exposure. However, for six persons, chromium was suspected to be a possible cause or contributing factor in their clinical conditions. The CMSP found little evidence of clinically observable chromium-induced health effects, but found evidence of low levels of exposure to chromium among some participants living and/or working in the vicinity of chromium waste sites, including adult workers at the Standard Chlorine site (New Jersey Department of Health 1994).

CHILD HEALTH CONSIDERATIONS

ATSDR recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination in their environment. Children are at greater risk than adults from certain kinds of exposures to hazardous substances because they eat and breathe more than adults (on a pound for pound basis). They also play outdoors and often bring food into contaminated areas. They are shorter than an adult, which means they breathe dust, soil, and heavy vapors closer to the ground. Children are also smaller, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most important, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

Currently there are no residents living within a mile of the Standard Chlorine site. However, the Hackensack River is used seasonally for recreational activities such as fishing, crabbing, jet-skiing and inner-tubing by families. Although this does not represent a completed exposure pathway, there is potential for incidental ingestion of contaminants in surface water, biota and river sediment. It is not expected that small children would be able to gain access to the Standard Chlorine site.

CONCLUSIONS

The Public Health Hazard Category recommended for the Standard Chlorine site is ***"Indeterminate Public Health Hazard"*** for the biota and ambient air pathways. Data associated with the biota pathway is not currently available and this pathway is the most significant pathway of exposure associated with the site, partly due to the possibility of repeated exposures. There are two popular fishing locations on the banks of the river both 0.5 miles up and downstream from Standard Chlorine and hook and line fishing from boats takes place on the Hackensack River off the Standard Chlorine property. Despite the recommendations of the Fish Consumption Advisory, fishing and crabbing for consumption continues to occur. Two studies were initiated in 2004 that will characterize the bioaccumulation of dioxins, PCBs, PAHs (including naphthalene), selected pesticides, furans and chlorinated benzene compounds in fish and crab in the Newark Bay complex, including the Hackensack River. The results of these studies may enable the NJDHSS, in cooperation with the ATSDR, to evaluate the contribution of site-related contamination to the biota pathway. There is currently no community receptor population within one-mile of the Standard Chlorine site although there are residential communities beyond the one-mile radius. Additionally, future redevelopment of the site for non-industrial purposes may significantly modify population demographics. Due to lack of air monitoring data for the COC, it is difficult to determine the potential health impact of airborne contaminants to on- and off-site worker populations, residential communities living beyond the one-mile radius of the site, site visitors and trespassers.

The Hackensack River is utilized by families for seasonal recreational activities such as kayaking, canoeing and the use of personal water crafts (i.e., jet skiing). The recreational uses of the Hackensack River are intermittent and therefore frequent significant exposures via ingestion of sediment/surface water are unlikely. The site is potentially accessible to trespassers from the shore-bound side. As stated in the pathway analysis section, the potential for exposure to these individuals on a routine basis is unlikely. Overall, the likelihood of frequent, significant exposures to the contaminants of concern via the trespassers and recreational uses of the river pathways is unlikely. Therefore, the Public Health Hazard Category recommended for these pathways is ***"No Apparent Public Health Hazard"***.

The Standard Chlorine site has complex environmental contamination such as dioxin-contaminated asbestos consolidated into sea boxes, dioxin-contaminated buildings in the former processing area north of the lagoon system, DNAPL contamination on-site which acts as a potential continuing source of dissolved-phase chemical compounds to groundwater. The on-site contamination of soil, sediment, surface water and ground water is present at levels well above environmental comparison values. The contaminants detected in the surface water and sediment samples collected in the southern drainage ditch are all site-attributable compounds. The contaminated surface and sub-surface soils on-site impact the surface water and groundwater through sediment transport in the surface and leaching of contaminants to the groundwater. The most significant migration pathway for groundwater is flow to the drainage ditch along the southern property boundary, and to the stormwater drainage pipe along the northern property boundary, ultimately draining into the Hackensack River. Another fraction of the groundwater discharges directly to the Hackensack River. Additionally, during the October 2002 USEPA sampling event, a seep was observed entering the Hackensack River from the sediment southeast of the southern outfall. Without extensive remedial action, the on-site contaminants of concern would represent a potential public health concern if conditions or land use at the site change, resulting in future exposures.

RECOMMENDATIONS

1. The Hackensack River is likely to be impacted by surface water run-off and groundwater discharge into the river and the potential impact on biota in the river is currently being evaluated by the NJDEP. It is recommended to the USEPA to reduce migration of on-site contaminants to the Hackensack River.

2. Given that groundwater present under the Standard Chlorine site discharges to the Hackensack River, hydrogeological investigations by the USEPA and/or potential responsible party(ies) to characterize the direction and extent of contaminant migration from the site to off-site areas are recommended. This distributional data will aid in the evaluation of the contribution of the Standard Chlorine site to the overall contaminant burden currently present in the Hackensack River.

3. As discussed in the Background section of this report, there are currently no individuals residing within a one-mile radius of the site although there are residential communities beyond the one-mile radius. As such, air monitoring designed to evaluate the impacts from site related contaminants should be conducted by the NJDEP (or by the appropriate environmental regulatory agency).

4. There are or will be remediation workers at the Standard Chlorine site and/or neighboring properties. Additionally, future redevelopment of the site for non-industrial purposes may significantly modify population demographics. It is recommended that air monitoring by the appropriate environmental regulatory agency be implemented during remedial activities to determine the potential health impact of airborne contaminants to both on- and off-site worker populations.

5. As site conditions change, public health implications and the potential for completed human exposure pathways will be reevaluated and the current designated Hazard Category will be reconsidered.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Standard Chlorine site contains a description of the actions to be taken by the NJDHSS and/or ATSDR at or in the vicinity of the site subsequent to the completion of this Public Health Assessment. The purpose of the PHAP is to ensure that this health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of the NJDHSS and ATSDR to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by NJDHSS and ATSDR are as follows:

Public Health Actions Taken

1. Available environmental data and other relevant information for the Standard Chlorine site have been reviewed and evaluated to determine human exposure pathways and public health issues.

2. Despite current Fish Consumption Advisories, some individuals continue to consume the fish and crabs caught/trapped from the Hackensack River. An education and outreach effort by the NJDEP, the Department of Agriculture and the NJDHSS commenced in April 2004 (as part of Routine Monitoring Program for Toxics in Fish study) to determine the basis for non-compliance, to educate anglers and community members the importance of fish advisories and the health effects associated with eating contaminated fish (NJDEP 2004b).

Public Health Actions Planned

1. Hackensack River fish tissue studies are currently underway by the NJDEP. When the final report is available, the NJDHSS, in cooperation with the ATSDR, will review the data to evaluate the contribution of site-related contamination to the biota pathway.

2. Discussions with regional angler communities are planned by the NJDEP to present available education and outreach information and, more importantly, identify locations where fishing for consumption regularly takes place despite posted fish consumption advisories. Pilot projects, in conjunction with angler surveys, are being planned to identify effective means of communicating advisories, fishing bans, and health risks associated with fish and shellfish obtained from the Newark and Raritan Bays, and the Hackensack and Passaic Rivers (K. Kirk-Pflugh, NJDEP, personal communication, 2004).

3. The ATSDR and the NJDHSS will review and evaluate any community health concerns which may arise. A public availability session is not currently planned for this site. A public availability session to gather community concerns and comments will be held in the future if a need is indicated.

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

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Preparers of Report:

Somia Aluwalia, M.S., Ph.D.
Research Scientist III

Julie R. Petix, M.P.H., C.P.M., H.O.
Health Assessment Project Manager

Steven M. Miller, Ph.D.
Environmental Scientist II

Tariq Ahmed, Ph.D., P.E.
Research Scientist II

ATSDR Regional Representatives:

Arthur Block
Senior Regional Representative

Leah T. Escobar, R.S.
Associate Regional Representative

ATSDR Technical Project Officer:

Gregory V. Ulirsch, M.S.
Technical Project Officer
Superfund Site Assessment Branch
Division of Health Assessment and Consultation

Any questions concerning this document should be directed to:

Julie R. Petix, M.P.H., C.P.M., H.O.
Health Assessment Project Manager
New Jersey Department of Health and Senior Services
Division of Epidemiology, Environmental and Occupational Health
Consumer and Environmental Health Services
3635 Quakerbridge Road
P.O. Box 369
Trenton, New Jersey 08625-0369

CERTIFICATION

The Public Health Assessment for the Standard Chlorine Chemical Company, Kearny, New Jersey, was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated.

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Gregory V. Ulirsch
Technical Project Officer, SPAB, DHAC
Agency for Toxic Substances and Disease Registry (ATSDR)

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

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Roberta Erlwein
Team Leader, CAT, SPAB, DHAC, ATSDR

APPENDIX A

Table 1
Standard Chlorine Chemical Company - On-Site Soil Contaminants
Data from Chromium Sampling Events Conducted between July 1983 - January 1991

Metals, PCBs and Dioxin	Soil Depth (feet)	Maximum Detected Concentration (mg/kg)	NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)	Environmental Comparison Value (mg/kg)
Chromium (Total)	**0 - 0.5**	**18,800**	6,100*	not available
	0.6 - 7	**34,900**		
	12 - 19	82		
Chromium (Hexavalent)	**0 - 0.5**	**270**	6,100	200 (RMEG†)
	0.6 - 7	38		

* Criterion based on the ingestion exposure pathway for hexavalent chromium
† Reference Media Evaluation Guide
Contaminants of Concern are in boldface

Table 2
Standard Chlorine Chemical Company - On-Site Soil Contaminants
Data from Sampling Events Conducted between May 1985 - October 1998
Soil Depth 0 - 2 feet

Volatile Organic Compounds	**Maximum Detected Concentration (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
Chlorobenzene	99.6	680	800 (EMEG*)
Tetrachloroethylene	2.30	6	500 (RMEG†)
Methylene Chloride	7.02	210	90 (CREG‡)
Trichloroethylene	0.866	54	7.2 (RBC§) C
1,2-trans-dichloroethene	0.0765	1,000	400 (EMEG)
Semi-Volatile Organic Compounds	**Maximum Detected Concentration (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
1,2-Dichlorobenzene	**6,470**	10,000	5,000 (RMEG)
1,3-Dichlorobenzene	1550	10,000	31,000 (RBC) N
1,4-Dichlorobenzene	**4,840**	10,000	120 (RBC) C
1,2,3-Trichlorobenzene	**0.0326**	not available	not available
1,2,4-Trichlorobenzene	**200,000**	1,200	500 (RMEG)
Anthracene	46.2	10,000	20,000 (EMEG)
Acenapthene	219	10,000	1,000 (EMEG)
Benzo(a)anthracene	1.5	4	3.9 (RBC) C
Benzo(b)fluoranthene	**65.8**	4	3.9 (RBC) C
Benzo(a)pyrene	**34.1**	0.66	0.1 (CREG)
Benzo(g,h,i)perylene	**31.4**	not available	not available
Bis (2-Ethylhexyl) phthalate	220	210	50 (CREG)
Di-n-octyl phthalate	190	10,000	800 (EMEG)
Chrysene	**41.9**	40	390 (RBC) C
Fluorene	213	10,000	800 (EMEG)
Fluoranthene	121	10,000	800 (EMEG)
Indeno(1,2,3-cd)pyrene	**35.9**	10,000	3.9 (RBC) C
Phenanthrene	**428**	not available	not available
Pyrene	70.5	10,000	2,000 (RMEG)
Naphthalene	**2,370,000**	4,200	40 (EMEG)
2,3,7,8-TCDD (Dioxin)	**0.0696**	not available	1.9×10^{-5} (RBC) C
PCB - Arochlor 1260**	**9,300**	2	1.4 (RBC) C

* Environmental Media Evaluation Guide
† Reference Media Evaluation Guide
‡ Cancer Risk Evaluation Guide for 1×10^{-6} excess cancer risk
§ Risk Based Concentration (N: Non carcinogenic effects; C: Carcinogenic effects)
** sample collected is a concrete chip
Contaminants of Concern are in boldface

Table 3
Standard Chlorine Chemical Company - On-Site Soil Contaminants
Data from Sampling Events Conducted between May 1985 - January 1999
Soil Depth > 2 feet

Volatile Organic Compounds	**Maximum Detected Concentration (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
Chlorobenzene	220	680	800 (EMEG*)
Chloromethane	0.180	1,000	not available
Tetrachloroethylene	**16**	6	500 (RMEG†)
Semi-Volatile Organic Compounds	**Maximum Detected Concentration (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
1,2-Dichlorobenzene	**9,200**	10,000	5,000 (RMEG)
1,3-Dichlorobenzene	1,700	10,000	31,000 (RBC‡) N
1,4-Dichlorobenzene	**1,630**	10,000	120 (RBC) C
1,2,3-Trichlorobenzene	**2,140**	not available	not available
1,2,4-Trichlorobenzene	**6,540**	1,200	500 (RMEG)
Anthracene	90	10,000	20,000 (EMEG)
Acenapthene	25	10,000	1,000 (EMEG)
Benzo(a)anthracene	**87**	4	3.9 (RBC) C
Benzo(b)fluoranthene	**58**	4	3.9 (RBC) C
Benzo(a)pyrene	**82**	0.66	0.1 (CREG§)
Benzo(g,h,i)perylene	**53**	not available	not available
Bis (2-Ethylhexyl) phthalate	9.92	210	50 (CREG)
Di-n-butyl phthalate	3.06	10,000	800 (EMEG)
Chrysene	**79**	40	390 (RBC) C
Fluorene	33	10,000	800 (EMEG)
Fluoranthene	200	10,000	800 (EMEG)
Indeno(1,2,3-cd)pyrene	**54**	10,000	3.9 (RBC) C
Phenanthrene	**200**	not available	not available
Pyrene	190	10,000	2,000 (RMEG)
Naphthalene	**5,750**	4,200	40 (EMEG)
2,3,7,8-TCDD (Dioxin)	**0.268**	not available	1.9×10^{-5} (RBC) C
Metals	**Maximum Detected Concentration (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
Lead	**647**	600	not available
Arsenic	**41.9**	20	0.5 (CREG)
Copper	**335**	600	60 (EMEG)

* Environmental Media Evaluation Guide

† Reference Media Evaluation Guide

‡ Risk Based Concentration (N: Non carcinogenic effects; C: Carcinogenic effects)

§ Cancer Risk Evaluation Guide for 1×10^{-6} excess cancer risk

Contaminants of Concern are in boldface

Table 4
Standard Chlorine Chemical Company - On-Site Sediment Contaminants
Data from Sampling Events Conducted between January 1991 - October 2002

Volatile Organic Compounds	**Maximum Detected Concentration (mg/kg)**	**Freshwater Sediment Screening Guidelines (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
Benzene	**23.4**	0.34	13	52 (RBC*) C
Chlorobenzene	250	not available	680	800 (EMEG[†])
Toluene	**63.1**	2.5	1,000	40 (EMEG)
Methylene Chloride	21.5	not available	210	90 (CREG[‡])
Ethylbenzene	43.3	1.40	1,000	5,000 (RMEG[§])
Semi-Volatile Organic Compounds	**Maximum Detected Concentration (mg/kg)**	**Freshwater Sediment Screening Guidelines (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
1,2-Dichlorobenzene	**5,300**	0.035	10,000	5,000 (RMEG)
1,3-Dichlorobenzene	3,900	not available	10,000	31,000 (RBC) N
1,4-Dichlorobenzene	**6,000**	0.11	10,000	120 (RBC) C
1,2,4-Trichlorobenzene	**2,900**	not available	1,200	500 (RMEG)
2,4-Dimethylphenol	**21,900**	not available	10,000	1,000 (RMEG)
Anthracene	1,700	0.22	10,000	20,000 (EMEG)
Acenapthene	**6,070**	0.02	10,000	1,000 (EMEG)
Benzo(a)anthracene	1.1	0.32	4	3.9 (RBC) C
Benzo(b)fluoranthene	**44.6**	0.24	4	3.9 (RBC) C
Benzo(a)pyrene	**37.7**	0.37	0.66	0.1 (CREG)
Benzo(g,h,i)perylene	**36.2**	0.17	not available	not available
Bis (2-Ethylhexyl) phthalate	**188**	not available	210	50 (CREG)
Chrysene	33.6	0.34	40	390 (RBC) C
Fluorene	**5,150**	0.19	10,000	800 (EMEG)
Fluoranthene	**903**	0.75	10,000	800 (EMEG)
Indeno(1,2,3-cd)pyrene	**48.3**	0.20	10,000	3.9 (RBC) C
Naphthalene	**25,200,000**	0.16	4,200	40 (EMEG)
Phenanthrene	**5,320**	0.56	not available	not available
Pyrene	663	0.49	10,000	2,000 (RMEG)
PCB - Arochlor 1260	**5,160**	0.005	2	1.9×10^{-5} (RBC) C
2,3,7,8-TCDD (Dioxin)	**0.0595**	not available	not available	1.4 (RBC) C
Metals	**Maximum Detected Concentration (mg/kg)**	**Freshwater Sediment Screening Guidelines (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
Chromium (Total)	**16,400**	26	6,100**	not available
Lead	**15,500**	31	600	not available
Arsenic	**30**	6	20	0.5 (CREG)
Copper	**401**	16	600	60 (EMEG)
Mercury	**25**	0.2	270	not available
Cyanide	99	not available	21,000	1,000 (RMEG)
Zinc	**1,850**	120	1,500	600 (EMEG)

* Risk Based Concentration (N: Non carcinogenic effects; C: Carcinogenic effects)
[†] Environmental Media Evaluation Guide
[‡] Cancer Risk Evaluation Guide for 1×10^{-6} excess cancer risk
[§] Reference Media Evaluation Guide
** Criterion based on the ingestion exposure pathway for hexavalent chromium
Contaminants of Concern are in boldface

Table 5
Standard Chlorine Chemical Company - On-Site Surface Water Contaminants
Data from Sampling Events Conducted between January 1991 - October 2002

Volatile Organic Compounds	**Maximum Detected Concentration (μg/L)**	**NJ Class SE-2 Surface Water Quality Standards (μg/L)**	**NJ Maximum Contaminant Levels (μg/L)**	**Environmental Comparison Value (μg/L)**
Benzene	**40**	71	1	0.6 (CREG*)
Chlorobenzene	**600**	21,000	not available	200 (RMEG‡)
1,2-Trans-Dichloroethene	21	not available	100	120 (RBC) N
Toluene	6	200,000	1000	200 (EMEG†)
Semi-Volatile Organic Compounds	**Maximum Detected Concentration (μg/L)**	**NJ Class SE-2 Surface Water Quality Standards (μg/L)**	**NJ Maximum Contaminant Levels (μg/L)**	**Environmental Comparison Value (μg/L)**
1,2-Dichlorobenzene	**2,740**	16,500	600	270 (RBC§) N
1,3-Dichlorobenzene	**2,920**	22,200	600	180 (RBC) N
1,4-Dichlorobenzene	**4,680**	3,159	75	0.47 (RBC) C
1,2,4-Trichlorobenzene	**82**	113	9	7.2 (RBC) N
2,4-Dimethylphenol	**1,000**	not available	not available	200 (RMEG)
Acenapthene	93	not available	not available	370 (RBC) N
2-Chlorophenol	3.9	402	not available	30 (RBC) N
Phenol	241	4,600,000	not available	3,000 (RMEG)
Fluorene	2.8	1,340	not available	240 (RBC) N
Naphthalene	**270**	not available	300	6.5 (RBC) N
Metals	**Maximum Detected Concentration (μg/L)**	**NJ Class SE-2 Surface Water Quality Standards (μg/L)**	**NJ Maximum Contaminant Levels (μg/L)**	**Environmental Comparison Value (μg/L)**
Arsenic	**10**	0.136	10	0.02 (CREG)
Chromium (Total)	**1,240,000**	3,230	100	not available
Copper	**173,000**	7.9	1,300	300 (EMEG)
Lead	**136,000**	210	15	not available
Mercury	**19,400**	0.146	2	not available
Nickel	**982,000**	3,900	no MCL monitoring req.	200 (RMEG)
Zinc	**487,000**	not available	5000	2,000 (EMEG)

* Cancer Risk Evaluation Guide for 1 x 10^{-6} excess cancer risk

† Environmental Media Evaluation Guide

‡ Reference Media Evaluation Guide

§ Risk Based Concentration (N: Non carcinogenic effects; C: Carcinogenic effects)

Contaminants of Concern are in boldface

Table 6
Standard Chlorine Chemical Company - Groundwater Contaminants
Data from Sampling Events Conducted between August 1983 - February 1999

Volatile Organic Compounds	**Maximum Detected Concentration (μg/L)**	**NJ Groundwater Quality Standards (μg/L)**	**NJ Maximum Contaminant Levels (μg/L)**	**Environmental Comparison Value (μg/L)**
Chlorobenzene	**93,000**	4	not available	200 (RMEG[*])
1,2-Trans-Dichloroethene	**244**	100	100	120 (RBC[†]) N
1,1,2-Trichloroethane	**30**	not available	3	0.19 (RBC) C
Trichloroethylene	**13,960**	1	1	0.026 (RBC) C
Tetrachloroethylene	**5,350**	1	1	0.53 (RBC) C
Methylene chloride	**415**	2	3	4.1 (RBC) C
Ethylbenzene	310	0.7	700	1,000 (RMEG)
Vinyl chloride	**669**	5	2	0.015 (RBC) C
Xylenes	**1,550**	not available	1,000	210 (RBC) N
Toluene	**1,290**	1,000	1,000	200 (EMEG[‡])
Semi-Volatile Organic Compounds	**Maximum Detected Concentration (μg/L)**	**NJ Groundwater Quality Standards (μg/L)**	**NJ Maximum Contaminant Levels (μg/L)**	**Environmental Comparison Value (μg/L)**
1,2-Dichlorobenzene	**33,000**	600	600	270 (RBC) N
1,3-Dichlorobenzene	**26,900**	600	600	180 (RBC) N
1,4-Dichlorobenzene	**33,000**	75	75	0.47 (RBC) C
1,2,4-Trichlorobenzene	**26,000**	900	9	7.2 (RBC) N
2,4-Dimethylphenol	**38,000**	100	not available	200 (RMEG)
Acenapthene	**4,300**	400	not available	370 (RBC) N
Acenaphthylene	**96**	10	not available	not available
2-Chlorophenol	**63**	40	not available	30 (RBC) N
Phenol	**360,000**	4,000	not available	3,000 (RMEG)
2-Methylphenol	**58,000**	not available	not available	1,800 (RBC) N
2,4-Dichlorophenol	**321**	20	not available	30 (EMEG)
4-Methylphenol	**200,000**	not available	not available	180 (RBC) N
Bis (2-Ethylhexyl) phthalate	**11,100**	30	6	3 (CREG[§])
Fluorene	**303**	300	not available	240 (RBC) N
Phenanthrene	**216**	10	not available	not available
Anthracene	69	2,000	not available	1,800 (RBC) N
Naphthalene	**58,200**	not available	300	6.5 (RBC) N
Metals	**Maximum Detected Concentration (μg/L)**	**NJ Groundwater Quality Standards (μg/L)**	**NJ Maximum Contaminant Levels (μg/L)**	**Environmental Comparison Value (μg/L)**
Arsenic	**130**	0.02	10	0.02 (CREG)
Antimony	**390**	2	6	4 (RMEG)
Chromium (Total)	**101,700**	100	100	not available
Chromium (Hexavalent)	**97,000**	not available	not available	30 (RMEG)
Copper	**350**	1,000	1,300	300 (EMEG)
Cyanide	197	200	200	200 (RMEG)
Lead	**44,900**	5	15	not available
Mercury	**142**	2	2	not available
Nickel	**6,740**	100	no MCL monitoring req.	200 (RMEG)
Zinc	**11,900**	5,000	5,000	2,000 (EMEG)

[*] Reference Media Evaluation Guide
[†] Risk Based Concentration (N: Non carcinogenic effects; C: Carcinogenic effects)
[‡] Environmental Media Evaluation Guide
[§] Cancer Risk Evaluation Guide for 1 x 10^{-6} excess cancer risk
Contaminants of Concern are in boldface

Table 7
Standard Chlorine Chemical Company - Off Site Sediment Contaminants
Data from Sampling Events Conducted between January 1991 - October 2002

Volatile Organic Compounds	**Maximum Detected Concentration (mg/kg)**	**Freshwater Sediment Screening Guidelines (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
Benzene	0.41	0.34	13	52 (RBC*) C
Chlorobenzene	120	not available	680	800 (EMEG†)
Toluene	0.02	2.5	1,000	40 (EMEG)
Methylene Chloride	0.0087	not available	210	90 (CREG‡)
Xylenes	0.16	>0.12	1,000	400 (EMEG)
Ethylbenzene	0.73	1.40	1,000	5,000 (RMEG§)
Semi-Volatile Organic Compounds	**Maximum Detected Concentration (mg/kg)**	**Freshwater Sediment Screening Guidelines (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
1,2-Dichlorobenzene	280	0.035	10,000	5,000 (RMEG)
1,3-Dichlorobenzene	290	not available	10,000	31,000 (RBC) N
1,4-Dichlorobenzene	**360**	0.11	10,000	120 (RBC) C
1,2,4-Trichlorobenzene	**1,200**	not available	1,200	500 (RMEG)
Anthracene	21	0.22	10,000	20,000 (EMEG)
Acenapthene	7.1	0.02	10,000	1,000 (EMEG)
Benzo(a)anthracene	**26**	0.32	4	3.9 (RBC) C
Benzo(b)fluoranthene	**19**	0.24	4	3.9 (RBC) C
Benzo(a)pyrene	**17**	0.37	0.66	0.1 (CREG)
Benzo(g,h,i)perylene	**4.90**	0.17	not available	not available
Bis (2-Ethylhexyl) phthalate	15	not available	210	50 (CREG)
Chrysene	8	0.34	40	390 (RBC) C
Fluorene	4.2	0.19	10,000	800 (EMEG)
Fluoranthene	35	0.75	10,000	800 (EMEG)
Indeno(1,2,3-cd)pyrene	**56**	0.20	10,000	3.9 (RBC) C
Naphthalene	**4,570**	0.16	4,200	40 (EMEG)
Phenanthrene	**43**	0.56	not available	not available
Pyrene	46	0.49	10,000	2,000 (RMEG)
PCB - Arochlor 1254	**0.21**	0.005	2	0.06 (EMEG)
2,3,7,8-TCDD (Dioxin)	**0.0000964**	not available	not available	1.9×10^{-5} (RBC) C
Metals	**Maximum Detected Concentration (mg/kg)**	**Freshwater Sediment Screening Guidelines (mg/kg)**	**NJ Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (mg/kg)**	**Environmental Comparison Value (mg/kg)**
Chromium (Total)	**11,700**	26	6,100**	not available
Chromium (Hexavalent)	73	not available	6,100	200 (RMEG)
Lead	**337**	31	600	not available
Arsenic	**105**	6	20	0.5 (CREG)
Copper	**295**	16	600	60 (EMEG)
Mercury	**0.650**	0.2	270	not available
Nickel	308	16	2,400	20,000 (RBC) N

* Risk Based Concentration (N: Non carcinogenic effects; C: Carcinogenic effects)
† Environmental Media Evaluation Guide
‡ Cancer Risk Evaluation Guide for 1×10^{-6} excess cancer risk
§ Reference Media Evaluation Guide
** Criterion based on the ingestion exposure pathway for hexavalent chromium
Contaminants of Concern are in boldface

Table 8
Standard Chlorine Chemical Company - Off-Site Surface Water Contaminants
Data from Sampling Events Conducted between August 1996 - October 2002

Volatile Organic Compounds	Maximum Detected Concentration (µg/L)	NJ Class SE-2 Surface Water Quality Standards (µg/L)	NJ Maximum Contaminant Levels (µg/L)	Environmental Comparison Value (µg/L)
Benzene	**23**	71	1	0.6 (CREG*)
Chlorobenzene	**760**	21,000	not available	200 (RMEG†)
Semi-Volatile Organic Compounds	**Maximum Detected Concentration (µg/L)**	**NJ Class SE-2 Surface Water Quality Standards (µg/L)**	**NJ Maximum Contaminant Levels (µg/L)**	**Environmental Comparison Value (µg/L)**
1,2-Dichlorobenzene	**6,130**	16,500	600	270 (RBC§) N
1,3-Dichlorobenzene	**430**	22,200	600	180 (RBC) N
1,4-Dichlorobenzene	**6,370**	3,159	75	0.47 (RBC) C
1,2,4-Trichlorobenzene	**200**	113	9	7.2 (RBC) N
Naphthalene	**45**	NA	300	6.5 (RBC) N
Metals	**Maximum Detected Concentration (µg/L)**	**NJ Class SE-2 Surface Water Quality Standards (µg/L)**	**NJ Maximum Contaminant Levels (µg/L)**	**Environmental Comparison Value (µg/L)**
Chromium (Total)	**3,000**	3,230	100	not available

* Cancer Risk Evaluation Guide for 1×10^{-6} excess cancer risk

† Reference Media Evaluation Guide

§ Risk Based Concentration (N: Non carcinogenic effects; C: Carcinogenic effects)

Contaminants of Concern are in boldface

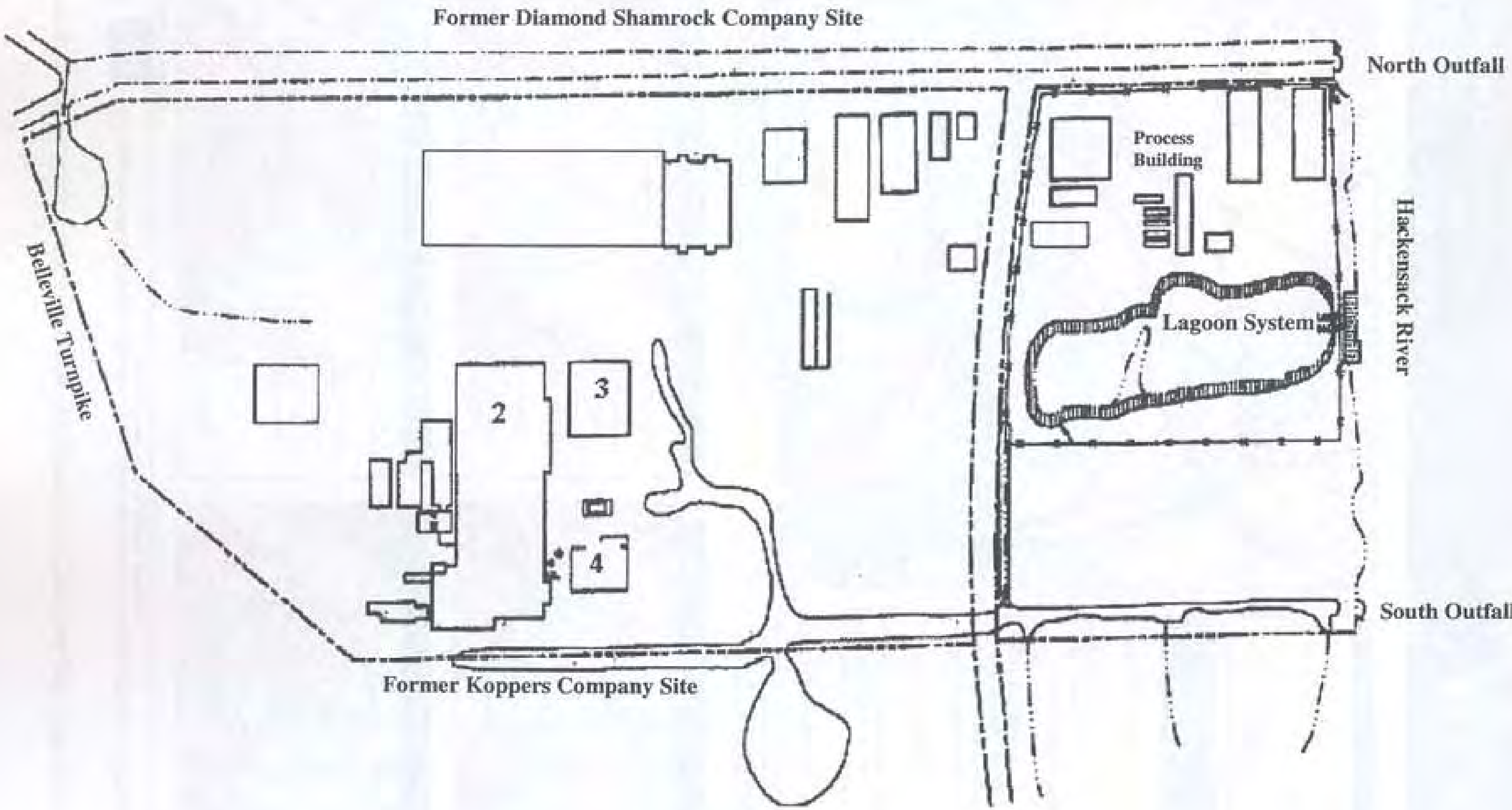
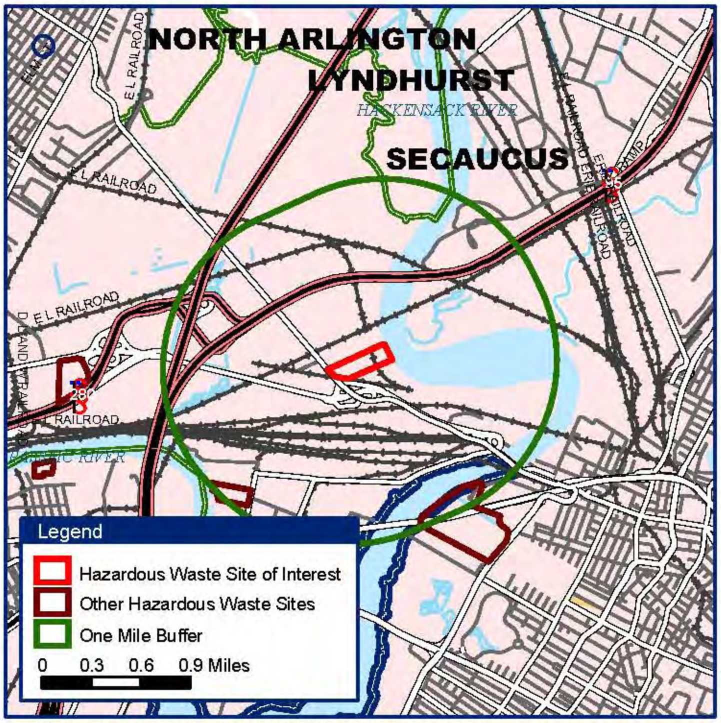


Figure 2: Site Map of the Standard Chlorine Chemical Company

Standard Chlorine
Kearny, NJ
EPA Facility ID: NJD002175057

ATSDR CDC
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY



Base Map Source: Geographic Data Technology (DYNAMAP 2000), August 2002
Site Boundary Data Source: ATSDR Public Health GIS Program, August 2002
Coordinate System (All Panels): NAD 1983 StatePlane New Jersey FIPS 2900 Feet

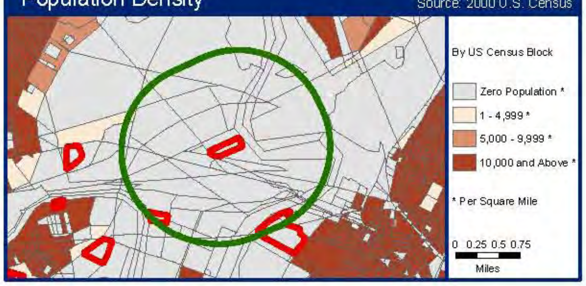
Site Location: Hudson County, NJ

Demographic Statistics
Within One Mile of Site*

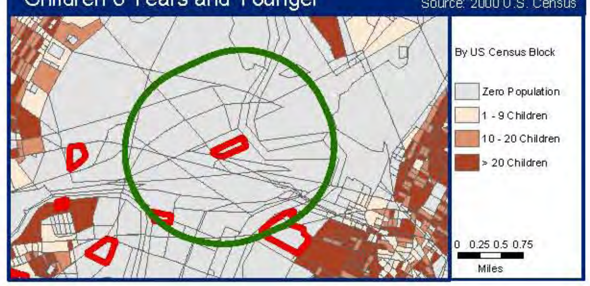
Total Population	0
White Alone	0
Black Alone	0
Am. Indian & Alaska Native Alone	0
Asian Alone	0
Native Hawaiian & Other Pacific Islander Alone	0
Some Other Race Alone	0
Two or More Races	0
Hispanic or Latino**	0
Children Aged 6 and Younger	0
Adults Agend 65 and Older	0
Females Aged 15 to 44	0
Total Housing Units	0

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

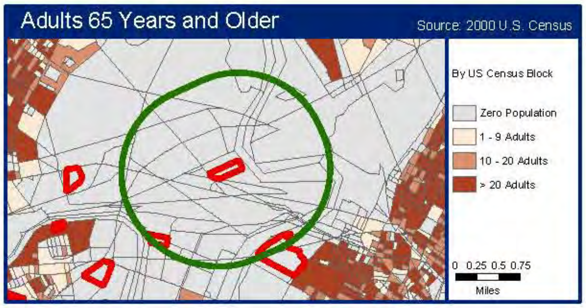
Population Density — Source: 2000 U.S. Census



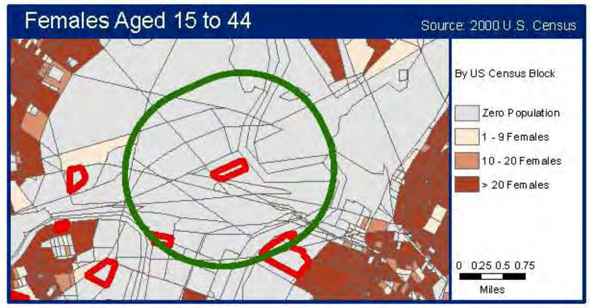
Children 6 Years and Younger — Source: 2000 U.S. Census



Adults 65 Years and Older — Source: 2000 U.S. Census



Females Aged 15 to 44 — Source: 2000 U.S. Census



GENERATED: 12-04-2003

FOR INTERNAL AND EXTERNAL RELEASE
CENTERS FOR DISEASE CONTROL AND PREVENTION | UNITED STATES DEPARTMENT OF HEALTH AND HUMAN SERVICES

Figure 3: Demographic Information of the Standard Chlorine Site based on 2000 U.S. Census

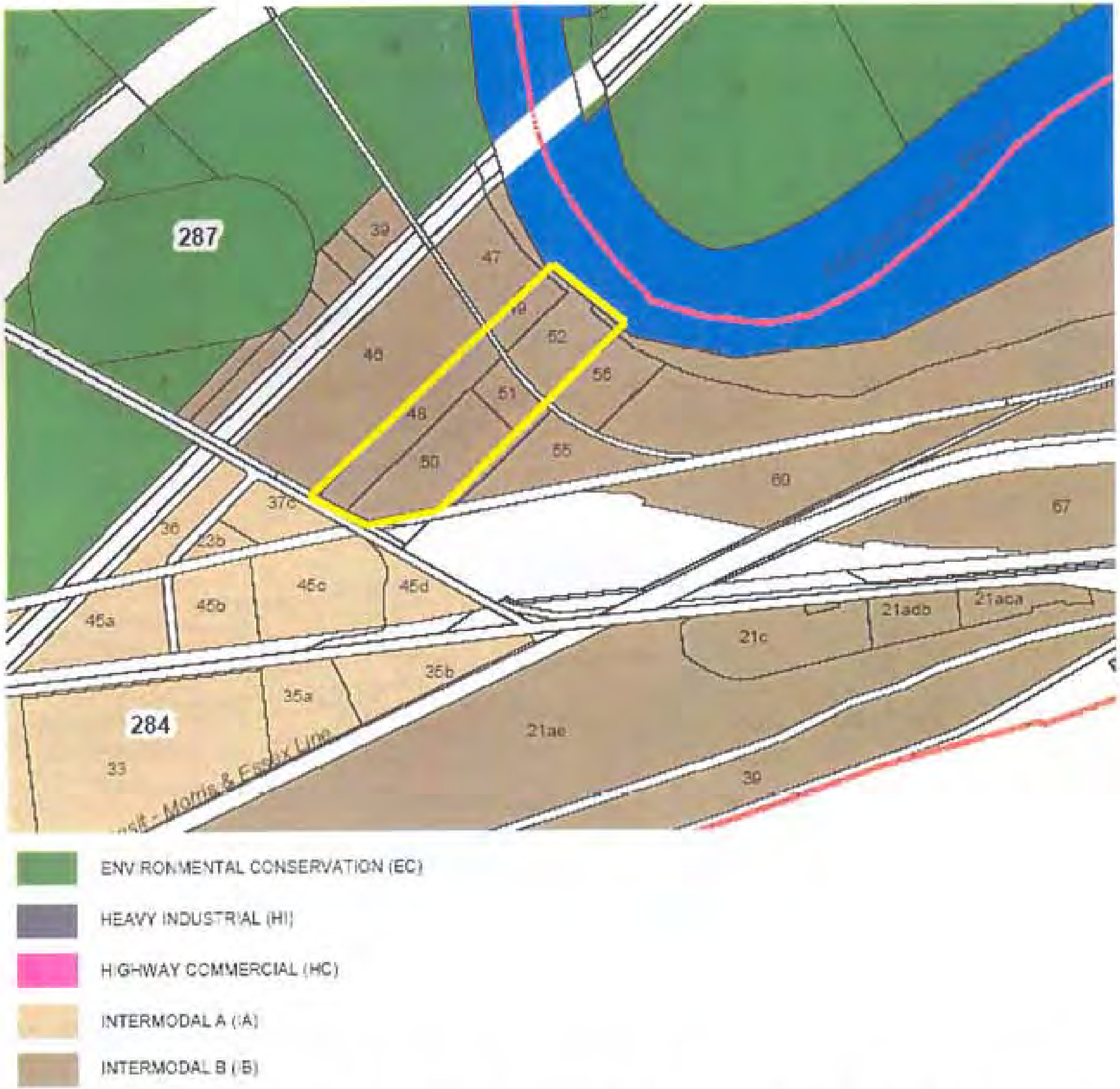


Figure 4: The New Jersey Meadowlands Commission zoning map (yellow represents site boundaries)

Available from: http://www.meadowlands.state.nj.us/maps/zone_2004_32X43.pdf

Figure 5: Map showing recreational and conservation areas near the Standard Chlorine site (star represents the site location)

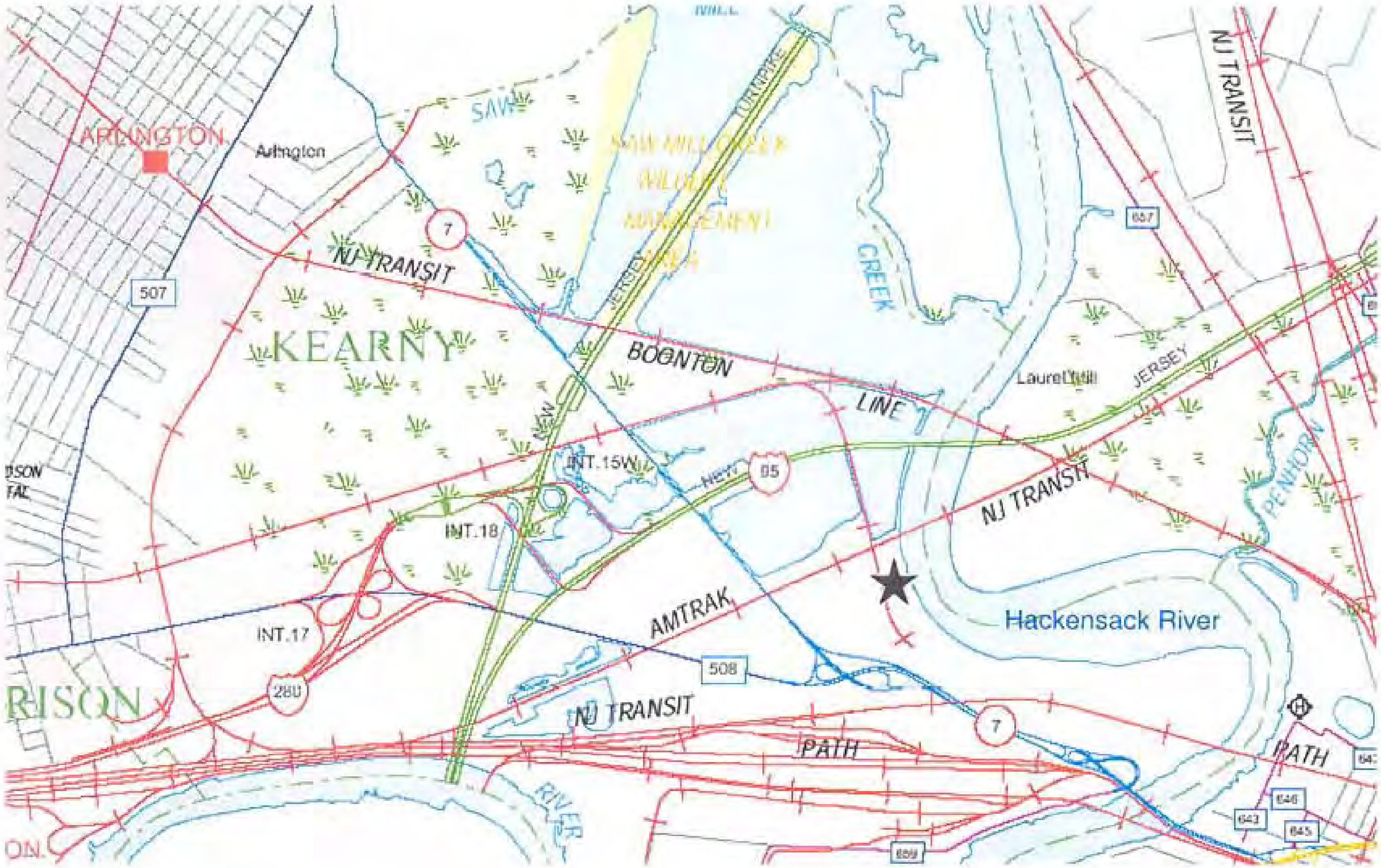


Figure 6: Map depicting the major roadways/railway transit lines near the Standard Chlorine site (star represents the site location)

APPENDIX B

Photograph 1: Broken bricks and glass on the Standard Chlorine site

Photograph 2: Example of dilapidated building on the Standard Chlorine site

Photograph 3: The former distillation building in the lagoon system area

Photograph 4: The lagoon system

Photograph 5: Trench with standing water located inside the fenced area surrounding the lagoon system

Photograph 6: The southern drainage ditch

Photograph 7: Sea boxes containing dioxin-contaminated asbestos among other process wastes

Photograph 8: The office building on the western portion of the Standard Chlorine site

Photograph 9: Entrance to the Standard Chlorine site

Photograph 10: Example of broken windows on the Standard Chlorine site

Photograph 11: The north outfall adjacent to the former Diamond Shamrock site

Photograph 12: Trailer storage on the former Diamond Shamrock property

Photograph 13: Storm drain located on the driveway shared between Standard Chlorine and the former Diamond Shamrock site

Photograph 14: Standing water as observed in the shared driveway

APPENDIX C

Toxicological Characteristics of Chemicals of Concern

The toxicological summaries provided below are based on ATSDR's ToxFAQs (http://www.atsdr.cdc.gov/toxfaq.html) and the NJDHSS Right to Know Program (http://www.state.nj.us/health/eoh/rtkweb/rtkhsfs.htm#D). Health effects are summarized in this section for some of the chemicals of concern found most frequently above CVs in the Hackensack River surface water and sediment.

The health effects described in the toxicological summaries are typically known to occur at levels of exposure much higher than those that occur from environmental contamination. The chance that a health effect will occur is dependent on the amount, frequency and duration of exposure, and the individual susceptibility of exposed persons.

Chromium

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

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

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

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

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

1,2-Dichlorobenzene

1,2-Dichlorobenzene is a colorless to pale yellow liquid with a pleasant odor. It is used as a fumigant, solvent, chemical intermediate, and insecticide.

1,2-Dichlorobenzene can affect you when breathed in and by passing through your skin. Contact can irritate and burn the skin and eyes. Skin allergy may develop. Exposure can cause headache, nausea, and irritation of the nose and throat. Higher exposure can cause you to become dizzy and lightheaded and to pass out. Long-term exposure may damage the blood cells. 1,2-Dichlorobenzene may damage the liver, kidneys and lungs, and affect the nervous system. This chemical has not been adequately evaluated to determine whether brain or other nerve damage could occur with repeated exposure. However, many solvents and other petroleum-based chemicals have been shown to cause such damage. Effects may include reduced memory and concentration, personality changes (withdrawal, irritability), fatigue, sleep disturbances, reduced coordination, and/or effects on nerves supplying internal organs (autonomic nerves) and/or nerves to the arms and legs (weakness, "pins and needles").

There is a suggested association between exposure to 1,2-Dichlorobenzene and leukemia. According to the information presently available to the New Jersey Department of Health and Senior Services, 1,2-Dichlorobenzene has been tested and has not been shown to affect reproduction.

1,3-Dichlorobenzene

1,3-Dichlorobenzene is a colorless liquid. It is used as a fumigant, an insecticide, and as a chemical intermediate. Acute (short-term) health effects may occur immediately or shortly after exposure to 1,3-Dichlorobenzene. Breathing 1,3-Dichlorobenzene can irritate the nose and throat causing coughing and wheezing. Contact can cause skin and eye irritation and burns. Exposure to 1,3-Dichlorobenzene can cause headache, drowsiness, nausea, vomiting diarrhea and abdominal cramps. 1,3-Dichlorobenzene may damage the red blood cells leading to low blood count (anemia). Chronic (long-term) health effects can occur at some time after exposure to 1,3-Dichlorobenzene and can last for months or years. There is no evidence that 1,3-Dichlorobenzene causes cancer in animals. This is based on test results presently available to the New Jersey Department of Health and Senior Services from published studies. According to the information presently available to the New Jersey Department of Health and Senior Services, 1,3-Dichlorobenzene has not been tested for its ability to affect reproduction. Other chronic effects include skin allergies. If an allergy develops, very low future exposure can cause itching and a skin rash. 1,3-Dichlorobenzene may affect the liver and kidneys.

1,4-Dichlorobenzene

1,4-Dichlorobenzene is a chemical used to control moths, molds, and mildew, and to deodorize restrooms and waste containers. It is also called para-DCB or p-DCB. Other names include Paramoth, Para crystals, and Paracide reflecting its widespread use to kill moths. At room temperature, p-DCB is a white solid with a strong, pungent odor. When exposed to air, it slowly changes from a solid to a vapor. Most p-DCB in our environment comes from its use in moth repellent products and in toilet deodorizer blocks.

In air, it breaks down to harmless products in about a month. It does not dissolve easily in water. It is not easily broken down by soil organisms. It evaporates easily from water and soil, so most is found in the air. It is taken up and retained by plants and fish.

There is no evidence that moderate use of common household products that contain p-DCB will result in harmful effects to your health. Harmful effects, however, may occur from high exposures. Very high usage of p-DCB products in the home can result in dizziness, headaches, and liver problems. Some of the patients who developed these symptoms had been using the products for months or even years after they first began to feel ill.

Workers breathing high levels of p-DCB (1,000 times more than levels in deodorized rooms) have reported painful irritation of the nose and eyes. There are cases of people who have eaten p-DCB products regularly for months to years because of its sweet taste. These people had skin blotches and lower numbers of red blood cells.

The US Department of Health and Human Services (DHHS) has determined that p-DCB may reasonably be anticipated to be a carcinogen. There is no direct evidence that p-DCB can cause cancer in humans. However, animals given very high levels in water developed liver and kidney tumors.

There is very little information on how children react to p-DCB exposure, but children would probably show the same effects as adults. No studies in people or animals show that p-DCB crosses the placenta or can be found in fetal tissues. Based on other similar chemicals, it is possible that this could occur. There is no credible evidence that p-DCB causes birth defects. One study found dichlorobenzenes in breast milk, but p-DCB has not been specifically measured.

<u>1,2,4-Trichlorobenzene</u>

1,2,4-Trichlorobenzene is a colorless liquid with a pleasant odor. It is used in heat transfer fluids, as a dielectric fluid, and in making chemicals, insecticides and fungicides. Breathing 1,2,4-Trichlorobenzene can irritate the nose, throat and eyes. Acute (short-term) health effects may occur immediately or shortly after exposure to 1,2,4-Trichlorobenzene: Contact can irritate the skin. Prolonged contact may cause skin burns. Chronic (long-term) health effects can occur at some time after exposure to 1,2,4-Trichlorobenzene and can last for months or years. Repeated exposure may damage the liver and kidneys. According to the information presently available to the New Jersey Department of Health and Senior Services, 1,2,4-Trichlorobenzene has been tested and has not been shown to cause cancer in animals. 1,2,4-Trichlorobenzene has been tested and has not been shown to affect reproduction based on information presently available to the New Jersey Department of Health and Senior Services.

Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot. These include benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, indeno(1,2,3-cd0pyrene, phenanthrene, and naphthalene

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people. Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

The US Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens. Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

2,3,7,8-TCDD (Dioxin)

2,3,7,8-TCDD belongs to a family of 75 chemically related compounds commonly known as chlorinated dioxins (CDD). It is one of the most toxic of the CDDs and is the one most studied. 2,3,7,8-TCDD is odorless and the odors of the other CDDs are not known.

2,3,7,8-TCDD may be formed during the chlorine bleaching process at pulp and paper mills. CDDs are also formed during chlorination by waste and drinking water treatment plants. They can occur as contaminants in the manufacture of certain organic chemicals. CDDs are released into the air in emissions from municipal solid waste and industrial incinerators.

When released into the air, some CDDs may be transported long distances, even around the globe. CDD concentrations may build up in the food chain, resulting in measurable levels in animals. Eating food, primarily meat, dairy products, and fish, makes up more than 90% of the intake of CDDs for the general population.

The most noted health effect in people exposed to large amounts of 2,3,7,8-TCDD is chloracne. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects noted in people exposed to high doses of 2,3,7,8-TCDD include skin rashes, discoloration, and excessive body hair. Changes in blood and urine that may indicate liver damage also are seen in people.

In certain animal species, 2,3,7,8-TCDD is especially harmful and can cause death after a single exposure. In many species of animals, 2,3,7,8-TCDD weakens the immune system and causes a decrease in the system's ability to fight bacteria and viruses. In other animal studies, exposure to 2,3,7,8-TCDD has caused reproductive damage and birth defects. The offspring of animals exposed to 2,3,7,8-TCDD during pregnancy often had severe birth defects including skeletal deformities, kidney defects, and weakened immune responses.

Several studies suggest that exposure to 2,3,7,8-TCDD increases the risk of several types of cancer in people. Animal studies have also shown an increased risk of cancer from exposure to 2,3,7,8-TCDD. The World Health Organization (WHO) has determined that 2,3,7,8-TCDD is a human carcinogen. The US Department of Health and Human Services (DHHS) has determined that 2,3,7,8-TCDD may reasonably be anticipated to cause cancer. Very few studies have looked at the effects of CDDs on children. Chloracne has been seen in children exposed to high levels of CDDs. It is not known that CDDs affect the ability of people to have children or if it causes birth defects, but given the effects observed in animal studies, this cannot be ruled out.

PCB – Arochlor 1260

Polychlorinated biphenyls (PCBs) are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the US by the trade name Arochlor. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators.

PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs. Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The US Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The USEPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

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

APPENDIX D

Summary of Public Comments and Responses
Standard Chlorine Chemical Company, Inc. Public Health Assessment

This summary presents the comments received from interested parties on the Public Comment Draft of the Standard Chlorine Chemical Company, Inc. Public Health Assessment, and the subsequent responses of the NJDHSS and the ATSDR. The public comment period occurred from September 30 through November 13, 2004. Comments are grouped by Commenter, without personal identifiers. Note that page numbers in the comments and responses refer to the Public Comment Draft of the Public Health Assessment.

We are grateful to the two interested parties who provided their review and input on the draft Public Health Assessment. Where appropriate, the report was amended to address their comments and concerns.

Commenter A

Comment 1: *"Specifically, our disagreement arises as follows: "Indeterminate Public Health Hazard" for the biota pathway ... we feel that there is sufficient evidence to consider the site a "Public Health Hazard" for the Biota Pathway."*

Response 1: Although this site is a contributor to dioxin contamination of the Hackensack River, other regional sources have contributed to the dioxin contamination of the Newark Bay Complex, which includes the Hackensack River. As such, a reliable assessment of a particular site's contribution of contamination is difficult. Additional contaminant data for the Hackensack River relating to dioxin and other chlorinated organics are expected to be available shortly from the NJDEP. This information may provide an approximate estimate of the Standard Chlorine site's contribution of dioxin contamination to biota.

Comment 2: "*"No Apparent Public Health Hazard" for all other pathways: The pathway for air exposure was ruled out based on the fact that there is no residential population within 1 mile of the site ... we ask that the potential public health hazard from the air pathway be re-evaluated.*"

Response 2: We further discussed this comment with the NJDEP and a statement recommending air monitoring to evaluate impacts from site-related contaminants has been added as a separate recommendation to the final Public Health Assessment.

At the present time no residential population exists within a one-mile radius of the site, although there are residential communities beyond the one-mile radius. However, the NJDHSS agrees that the potential exists for future exposures to occur based upon planned area redevelopment. As such, the pathway classification for ambient air has been changed from eliminated to potential; the Public Health Hazard Category recommended for this pathway is ***"Indeterminate Public Health Hazard"***.

Comment 3: "*Technical details: - Tables 2, 4, and 5 each indicate a concentration that exceeds 1,000,000 mg/kg for an individual pollutant. This is not possible.*"

Response 3: The NJDHSS acknowledges the above statement. The draft Public Health Assessment provided the analytical results as reported in the Remedial Investigation (Weston 1993).

Commenter B

Comment 1a: "*The Assessment is woefully inadequate and potentially misleading without additional data collection and information on how data was compiled and averaged …*"

Response 1a: For the purpose of the draft Public Health Assessment, the NJDHSS obtained, organized, reviewed and evaluated environmental sampling data available from the responsible state and federal environmental agencies. A detailed explanation of this effort is provided in the Environmental Contamination section located on page 9 of the draft Public Health Assessment. Additionally, there are eight data tables provided in the report (Appendix A) which provide a chronological, media-specific description of both on- and off-site contamination.

Comment 1b: "*… dispersion modeling of volatile contaminants … is necessary to determine the full extent of possible human exposure.*"

Response 1b: Currently, there are no individuals residing within a one-mile radius of the site, and air dispersion modeling was not conducted as part of the draft Public Health Assessment. On page 22 of the draft Public Health Assessment, the NJDHSS recommended that air monitoring data be collected during site remedial activities to determine the potential health impact of airborne contaminants to on- and off-site worker populations. Future air data, when available, will be evaluated in a separate Health Consultation. Additionally, a recommendation regarding air monitoring to evaluate impacts from site-related contaminants has been added to the final Public Health Assessment.

Comment 1c: "*… the south drainage ditch contains a brownish-white substance that should be characterized. An analysis of its fate and transport needs to be conducted.*"

Response 1c: Migration pathways from on- to off-site areas are discussed beginning on page 17 of the draft Public Health Assessment. This section includes an extensive description of the south drainage ditch and fate/transport to the Hackensack River.

Comment 1d: "*… the report does not contain any hydrological studies which evaluate groundwater and surface water movement associated with the site.*"

Response 1d: Please refer to Recommendation 2 located on page 22 of the draft Public Health Assessment. The NJDHSS concurs that hydrogeological studies are needed to characterize the direction and extent of contaminant migration from the site to off-site areas.

Comment 2: *"The Assessment fails to properly address the community health concerns."*

Response 2: Please refer to the "Community Concerns" section located on page 8 of the draft Public Health Assessment. According to the local health department, USEPA, and NJDEP, no community concerns were reported for the site. The NJDHSS also searched and reviewed local news articles in an effort to identify community concerns. The focus of the majority of the articles was on remedial measures and the controversy over the possible addition of the site to the National Priorities List.

Prior to the submission of the draft Public Health Assessment for public comment release, staff of the NJDHSS and ATSDR conducted a second site visit. Information obtained during this site visit, which expanded our knowledge of community health concerns and potential human exposure pathways, has been incorporated into the Site Visit section of the final Public Health Assessment.

Comment 3: *"The Assessment is incomplete in its analysis of recreational uses of the Hackensack River …Finally, although there are only two fishing locations identified by the Assessment, there are a number of other popular fishing locations …"*

Response 3: Although recreational use of the river may be year-long with large populations involved depending on the season of year, individual exposures from this pathway are not continuous and vary by personal activity. Please note that the biota pathway in the draft Public Health Assessment was identified as a significant exposure pathway associated with the site.

Comment 4: *"The Assessment's analysis of the pathway exposure for anglers is incomplete."*

Response 4: Considerable effort has been made by a number of state agencies in determining potential health risks to New Jersey anglers. Beginning on page 17 of the draft Public Health Assessment, the NJDEP Routine Monitoring Program for Toxics in Fish was discussed. This Program includes an education and outreach effort by the NJDEP, the Department of Agriculture and the NJDHSS via public hearings. Questions and answers recorded at these hearings may be viewed at www.state.nj.us/dep/dsr/response-budget. Discussions with regional angler communities are planned by the NJDEP to present available education and outreach information and, more importantly, identify locations where fishing for consumption regularly takes place despite posted fish consumption advisories.

The most recent NJDEP angler survey conducted of the Newark Bay Complex occurred in 1995 and included questions on the preparation of fish and crabs for consumption. Results indicated that most recreational anglers who reported eating fish and crabs prepared their catch according to fish consumption advisories, although some anglers reported not adhering to guidelines when preparing fish and crabs for soups and sauces. Pilot projects, in conjunction with additional angler surveys, are being planned to identify effective means of communicating advisories, fishing bans, and health risks associated with fish and shellfish obtained from the Newark and Raritan Bays, and the Hackensack and Passaic Rivers (K. Kirk-Pflugh, NJDEP, personal communication, 2004).

The above information has been incorporated into the Public Health Actions Planned section of the final Public Health Assessment.

Comment 5: "… *the Assessment must address current and future pathways for exposure* ..."

Response 5: Please refer to Recommendations 3 and 4 on page 22 of the draft Public Health Assessment.

Comment 6: "… *migration of on-site contaminants to the Hackensack River must stop immediately*."

Response 6: The NJDHSS has recommended that the USEPA reduce the migration of on-site contaminants to the Hackensack River (see Recommendation 1 on page 21 of the draft Public Health Assessment).

GLOSSARY

ATSDR Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health. This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

General Terms

Absorption
The process of taking in. For a person or an 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 function or cell structure that might lead to disease or health problems

Aerobic
Requiring oxygen [compare with anaerobic].

Ambient
Surrounding (for example, ambient air).

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.

Analytic epidemiologic study
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

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].

Background level
An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Biodegradation
Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

Biologic indicators of exposure study
A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].

Biologic monitoring
Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

Biologic uptake
The transfer of substances from the environment to plants, animals, and humans.

Biomedical testing
Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.

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.

CAP [see Community Assistance Panel.]

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

Cancer risk
A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

Carcinogen
A substance that causes cancer.

Case study
A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.

Case-control study
A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.

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 [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]

Cluster investigation
A review of an unusual number, real or perceived, of health events (for example, reports of cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.

Community Assistance Panel (CAP)
A group of people from a community and from health and environmental agencies who work with ATSDR to resolve issues and problems related to hazardous substances in the community. CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.

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, 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. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

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 an 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].

Descriptive epidemiology
The study of the amount and distribution of a disease in a specified population by person, place, and time.

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.

DOD
United States Department of Defense.

DOE
United States Department of Energy.

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. The environmental media and transport mechanism is the second part of an exposure pathway.

EPA
United States Environmental Protection Agency.

Epidemiologic surveillance [see Public health surveillance].

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.

Exposure registry
A system of ongoing followup of people who have had documented environmental exposures.

Feasibility study
A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

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.

Grand rounds
Training sessions for physicians and other health care providers about health topics.

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

Half-life ($t_{½}$)
The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.

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

Hazardous Substance Release and Health Effects Database (HazDat)
The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

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 evaluate 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.

Health statistics review
The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.

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

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].

In vitro
In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with in vivo].

In vivo
Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with in vitro].

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.

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.

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/cm^2
Milligram per square centimeter (of a surface).

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.

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].

Morbidity
State of being ill or diseased. Morbidity is the occurrence of a disease or condition that alters health and quality of life.

Mortality
Death. Usually the cause (a specific disease, a condition, or an injury) is stated.

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.

National Toxicology Program (NTP)
Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.

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

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

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

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

Physiologically based pharmacokinetic model (PBPK model)
A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.

Pica
A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

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].

Prevalence survey
The measure of the current level of disease(s) or symptoms and exposures through a questionnaire that collects self-reported information from a defined population.

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

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 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 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 (PHA)
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 PHA also lists actions that need to be taken to protect public health [compare with health consultation].

Public health hazard
A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

Public health hazard categories
Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

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 health surveillance
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

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

Radioisotope
An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.

Radionuclide
Any radioactive isotope (form) of any element.

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.

RFA
RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

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 an environment.

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.

Special 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.

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.

Substance-specific applied research
A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's toxicological profiles. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

Superfund Amendments and Reauthorization Act (SARA)
In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (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 public health 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].

Synergistic effect
A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].

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 that, 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].

Urgent public health hazard
A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

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

Other glossaries and dictionaries:
Environmental Protection Agency (http://www.epa.gov/OCEPAterms/)

National Center for Environmental Health (CDC)
(http://www.cdc.gov/nceh/dls/report/glossary.htm)

National Library of Medicine (NIH)
(http://www.nlm.nih.gov/medlineplus/mplusdictionary.html)

For more information on the work of ATSDR, please contact:

Office of Policy and External Affairs
Agency for Toxic Substances and Disease Registry
1600 Clifton Road, N.E. (MS E-60)
Atlanta, GA 30333
Telephone: (404) 498-0080