Public Health Assessment

Public Comment Release

Public Health Implications of Site Contaminants

UNIMATIC MANUFACTURING CORPORATION

ESSEX COUNTY, NEW JERSEY

EPA FACILITY ID: NJD002164796

Prepared by
New Jersey Department of Health

JANUARY 16, 2018

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

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment-Public Comment Release 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's Cooperative Agreement Partner has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate. This document represents the agency's best efforts, based on currently available information, to fulfill the statutory criteria set out in CERCLA section 104 (i)(6) within a limited time frame. To the extent possible, it presents an assessment of potential risks to human health. Actions authorized by CERCLA section 104 (i)(11), or otherwise authorized by CERCLA, may be undertaken to prevent or mitigate human exposure or risks to human health. In addition, ATSDR's Cooperative Agreement Partner will utilize this document to determine if follow-up health actions are appropriate at this time.

This document has previously been provided to EPA and the affected state in an initial release, as required by CERCLA section 104 (i) (6) (H) for their information and review. Where necessary, it has been revised in response to comments or additional relevant information provided by them to ATSDR's Cooperative Agreement Partner. This revised document has now been released for a 30-day public comment period. Subsequent to the public comment period, ATSDR's Cooperative Agreement Partner will address all public comments and revise or append the document as appropriate. The public health assessment will then be reissued. This will conclude the public health assessment process for this site, unless additional information is obtained by ATSDR's Cooperative Agreement Partner which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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New Jersey Department Health
Environmental and Occupational Health Surveillance Program
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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Summary

Introduction

On May 12, 2013, the United States Environmental Protection Agency (USEPA) proposed to add the former Unimatic Manufacturing Corporation site (Unimatic) located in Fairfield, Essex County, New Jersey, to the National Priorities List (NPL). On June 11, 2014, the USEPA listed the site as final on the NPL. The New Jersey Department of Health (NJDOH), 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, to evaluate potential human exposure to contaminants, and to determine whether the exposures are of public health concern. The top priority of ATSDR and NJDOH at this site is to ensure that the community around the site has the best information possible to safeguard its health.

In March 2013, the NJDOH prepared a Letter Health Consultation (LHC) at the request of the New Jersey Department of Environmental Protection (NJDEP) to evaluate the health risks to workers exposed to polychlorinated biphenyls (PCBs) found within and around the building. At the time of that request, the building was occupied by a manufacturer of picture frame hardware and PCBs were not used by the business. The purpose of this public health assessment is to evaluate additional exposure pathways and the public health implications of any possible exposure to PCBs. Other contaminants besides PCBs are present at this site. These contaminants were not evaluated due to the lack of usable data and that some contaminants are related to another nearby NPL site. The contaminants related to the other NPL site were evaluated in a separate document.

The primary contaminants at the Unimatic site are PCBs. PCBs are mixtures of up to 209 individual chlorinated compounds (known as congeners). Many commercial PCB mixtures are known by the trade name Aroclor. Elevated levels of PCBs have been detected in groundwater and soil at the property as well as within the site building due to past aluminum die casting operations at the site. The site is currently vacant and fenced. The USEPA has selected a cleanup remedy for on-site contamination per the September 2016 Record of Decision [USEPA 2016]. The USEPA is in the process of characterizing the extent of off-site contamination.

Conclusions	The NJDOH has reached three conclusions on the former Unimatic Manufacturing Corporation site:
Conclusion 1	*The NJDOH concludes that current and future exposures to PCBs in the building at the site will not harm workers' health because the building is not occupied; however, past exposures to PCBs for workers who occupied the Unimatic building may have harmed workers' health.*
Basis for Conclusion	The building has been vacant since 2013 preventing workers from breathing contaminated air in the building. In addition, the USEPA plans to demolish the building as part of the September 2016 Record of Decision [USEPA 2016]. During the time the building was occupied by Frameware, Inc., workers may have been exposed to PCB levels within the building which may have put these workers at an increased risk for cancer. The data supporting this conclusion was evaluated as described in the NJDOH March 2013 Letter Health Consultation (LHC) (**Appendix A**).
Conclusion 2	*The NJDOH concludes that exposures to PCB contaminated exterior surface soil on the site is not likely to harm people's health.*
Basis for Conclusion	The property is currently fenced, preventing people from contacting contaminated soil on the property. Workers at the former Unimatic facility conducted business activities inside of the building which put them at a low risk for exposure to exterior soil on the site. Therefore, a low soil contact exposure scenario was used to evaluate past worker exposures to PCBs. For child trespassers, children ranging in age from 11-16 years were used to evaluate past exposures. This is because the site is located between a residential neighborhood and a high school. Using these scenarios, the exposure doses for the ingestion of PCBs in surface soil for workers and child trespassers were below the chronic ATSDR Minimal Risk Level. This level is a health based comparison value for non-cancer health effects. Additionally, the cancer risk to workers and child trespassers from ingesting PCB contaminated surface soil was estimated to be approximately one in 1,000,000 individuals. This is considered to be a low cancer risk.
Conclusion 3	*The NJDOH cannot currently conclude whether site-related contaminants in area private wells could harm people's health.*
Basis for Conclusion	The NJDOH does not have the necessary information at this time to evaluate whether PCBs and other site-related contaminants have impacted downgradient private wells.

Next Steps	The NJDOH is working with the USEPA to gather additional information to evaluate off-site exposures, as the extent of contamination from the site is still being characterized.
For More Information	Copies of this report will be provided to community members near the site via the township libraries and will be posted on the NJDOH website. Questions about this public health assessment should be directed to the NJDOH at (609) 826- 4984.

Statement of Issues

On May 12, 2013, the United States Environmental Protection Agency (USEPA) proposed to add the former Unimatic Manufacturing Corporation site (Unimatic) located in Fairfield, Essex County, New Jersey, to the National Priorities List (NPL). On June 11, 2014, the USEPA listed the site as final on the NPL. Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986, the federal Agency for Toxic Substances and Disease Registry (ATSDR) is required to conduct public health assessment activities for sites listed or proposed to be added to the NPL. The New Jersey Department of Health (NJDOH), in cooperation with the ATSDR, prepared the following public health assessment (PHA) to review environmental data obtained from the site, evaluate potential human exposure to contaminants, and to determine whether the exposures are of public health concern.

The primary contaminants at the Unimatic site are polychlorinated biphenyls (PCBs). PCBs are mixtures of up to 209 individual chlorinated compounds (known as congeners). Many commercial PCB mixtures are known by the trade name Aroclor. Elevated levels of PCBs have been detected in groundwater, soil, and within the building on the site, due to previous aluminum die casting operations at the site.

Background

Site Description and Operational History

The Unimatic site is located at 25 Sherwood Lane in Fairfield, Essex County, New Jersey (**See Figure 1**). The property is approximately one acre in size and is located in an industrial area at the end of Sherwood Lane (**See Figure 2)**. The site contains a single story building approximately 22,000 square feet in size with a partially paved parking lot and a small landscaped area in the front (**See Figure 3**). The building was initially used as a tool shop, and later was used for aluminum die-casting. Unimatic operated at this location from 1955 through 2001.

At its peak in the 1970s, Unimatic continuously operated eight die-casting machines using lubricating oil which contained PCBs. Large volumes of lubricating oil were sprayed throughout the shop area, covering the walls and floors of the building. The PCB-laden lubricant was washed out through floor trenches to wastewater pipes, which discharged to a tributary of Deepavaal Brook.

From 1970 through 1989, Unimatic discharged between 16,000 to 86,400 gallons per day of contaminated water through the wastewater pipes [USEPA 2013]. Poor construction of the pipes allowed the wastewater to leak into the ground at the site, leading to soil and ground water contamination throughout the Unimatic property and onto surrounding properties.

After Unimatic's operations ceased in 2001, Frameware, Inc. (Frameware) began occupying the building in 2002 for the manufacture and distribution of picture frame hardware and fasteners. Frameware did not use PCBs in their operations at the site. The presence of PCBs within the building and on the property was due to the previous operations from Unimatic.

Regulatory and Remedial History

Beginning in 1982, the USEPA and the New Jersey Department of Environmental Protection (NJDEP) issued numerous violation notices to reduce the discharge of contaminated water under the National Pollutant Discharge Elimination System permit requirements. Despite this, Unimatic continued to discharge large volumes of wastewater through leaking wastewater pipes until the facility connected to municipal water in 1989.

Ongoing investigations and remediation has taken place at the Site since 2001. GZA GeoEnvironmental, Inc. (GZA), a consultant for Unimatic, investigated the site under the New Jersey Industrial Site Recovery Act (ISRA) with oversight from the NJDEP. Site work conducted by GZA included soil, groundwater, and building interior investigations as well as the excavation of approximately 5,000 tons of PCB-contaminated soil. Despite these remedial activities, widespread soil and sediment contaminated with PCBs remains in the subsurface on the site both underneath and outside the building footprint. High levels of PCBs were detected on the walls, floor, and ceiling of the building. Groundwater on the site remains contaminated with PCBs.

A remedial investigation was performed in the summer of 2015 by CDM Smith on behalf of the USEPA to further characterize contamination on the site and surrounding properties [CDM Smith 2016]. This investigation included the collection of 447 soil samples from 75 soil boring locations. These samples were collected from the site and two adjacent properties. These adjacent properties are located at 21 Sherwood Lane and a vacant lot behind the site owned by the Jersey City Municipal Utilities Authority (JCMUA). Concrete floor and wipe samples were also collected from within the Unimatic building.

In February 2016, 66 soil samples were collected from six soil boring locations on the adjacent 30 Sherwood Lane property. Samples were analyzed for PCBs, volatile organic compounds (VOCs), semi-volatile organic compounds, metals, pesticides, and dioxin/furans. Groundwater samples were also collected from on-site monitoring wells and analyzed for the same parameters as soil.

Site Geology and Hydrogeology

According to the Engineering Soil Survey of New Jersey, produced by Rutgers University in 1951, the site is located within the Piedmont Plateau subdivision of the Appalachian geographic province. Soil types in this area include silty sands and gravel [GZA 2002].

According to the U.S. Geological Survey topographical map (Pompton Plains Quadrangle, 1955, photo revised 1981), the site is located approximately 190 feet above the National Geodetic Vertical Datum. The Passaic River is located approximately 0.5-mile northeast of the site. An unnamed tributary to the Deepavaal Brook is located approximately 1,000 feet north of the Site, and an intermittent stream bed borders the site to the north [GZA 2002]. Groundwater was encountered at approximately 19 feet below ground surface (bgs) and groundwater flow in the area is to the north-northeast toward the Passaic River [GZA 2002].

Soils encountered during subsurface investigations primarily consisted of red-brown, medium to coarse sandy soils, with some silts and cobbles. Artificial fill, composed of

construction material, cobbles and medium to coarse sand, was encountered up to approximately 9 feet bgs in the northern portion of the site [GZA 2002].

Prior NJDOH/ATSDR Involvement

In March 2013, the NJDOH prepared a Letter Health Consultation (LHC) at the request of the NJDEP to evaluate the health risks to workers exposed to PCBs found within and around the building. At the time, the building was occupied by employees of Frameware.

During September and October 2012, the USEPA conducted sampling for PCBs both outside and inside the building. Various indoor media were sampled including air, surfaces (wipes), surface dust, and chips of building substrates (walls and floors). Facility workers were subject to multiple sources/pathways of PCB exposure, including inhalation of PCBs in indoor air and incidental ingestion of contaminated dust and surface soil. The primary exposure pathway to workers was through inhalation. Seven indoor air samples detected PCB (Aroclor 1242) concentrations above background levels (0.003-0.010 micrograms/cubic meter, $\mu g/m^3$, of air for urban areas) [USEPA 2013]. The indoor air concentration of PCBs in the building ranged from 1.9 to 20 $\mu g/m^3$. In addition, contact with building surfaces coated with PCB (Aroclor 1248) residuals would be a secondary source of exposure via skin absorption and incidental ingestion.

Based on the review and evaluation of available data, in 2013 the NJDOH categorized the current and future use of the Unimatic Manufacturing Corporation Site as a ***public health hazard*** **for workers** due to the presence of elevated levels of PCBs in the air within the building. Workers in the Unimatic facility had been exposed to PCBs through several exposure routes for a 10-year period, which put workers at an increased risk for cancer. The inhalation exposure pathway alone provided evidence that occupying the building was putting workers at risk.

Based on these findings, the NJDOH recommended that workers be re-located within four to six months to protect workers from any further cancer risk. The NJDOH also recommended that the building not be re-occupied until remediation takes place and PCB levels are reduced to levels that will not pose an unacceptable health risk to building occupants. The building was vacated as per the NJDOH recommendations. The March 2013 LHC is included as **Appendix A.**

Land Use and Demographics

The area surrounding the former Unimatic site is primarily commercial and industrial. According to the 2010 U.S. Census, the ATSDR estimates that there are 3,789 people living within one mile of the site. Demographic maps and statistics for the area surrounding the site can be found in **Appendix B**.

Site Visit

NJDOH and ATSDR staff performed a site visit on October 22, 2015. The purpose of the site visit was to gather information about the site and surrounding area, including potential human exposure pathways to workers, trespassers, and residents. The site is located in a commercial/light industrial area. There are no residential properties in the immediate vicinity of the site. The site building is vacant and the property is completely fenced from the front of the building to the rear. The front yard area is not fenced, but is covered with grass.

There are two adjacent commercial/light industrial properties on either side of the site. These properties are identified as 21 Sherwood Lane and 30 Sherwood Lane. Both properties are paved and/or covered with grass. There is a small intermittent stream behind the property which was dry and overgrown. A vacant grass covered lot owned by the JCMUA is adjacent to this overgrown stream area behind the site property. There are commercial properties with paved parking lots behind the site adjacent to the vacant grass lot. This area is not likely to be accessed by trespassers. Photos from the site visit can be found in **Appendix C**.

Community Concerns

According to the USEPA's Community Involvement Plan, community members expressed concern about the health risks the site may pose to humans and animals in the area [CDM Smith 2015]. Some people mentioned seeing workers in hazardous material protective suits working at the site a few years ago. The potential contamination of drinking water was also a concern. In addition to possible health effects, nearby property owners were concerned about the impact the site may have on the ability to sell, secure mortgages, and build on nearby properties.

Environmental Contamination

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

Environmental Guideline Comparison

There are a number of environmental comparison values available for screening environmental contaminants to identify contaminants of concern. These include ATSDR Environmental Media Evaluation Guides (EMEGs) and Reference Media Evaluation Guides (RMEGs). EMEGs are estimated contaminant concentrations that are not expected to result in adverse non-carcinogenic health effects. RMEGs represent the concentration in water or soil at which daily human exposure is unlikely to result in adverse non-carcinogenic effects. If the substance is a known or a probable carcinogen, ATSDR's Cancer Risk Evaluation Guides (CREGs) are also considered as comparison values. CREGs are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) persons exposed over their lifetime (78 years).

In the absence of an ATSDR environmental comparison value, other comparison values may be used to evaluate contaminant levels in environmental media. These include the USEPA Regional Screening Levels and the NJDEP Soil Cleanup Criteria. For ground water

contaminants, the NJDEP Ground Water Quality Standards (GWQS) are used as a comparison value.

Indoor Air

As discussed in the March 2013 LHC prepared by the NJDOH [NJDOH 2013], PCBs were found within the Unimatic site building. During September and October 2012, the USEPA conducted sampling for PCBs both outside and inside the site building. Various indoor media were sampled including air, surfaces (wipes), surface dust, and chips of building substrates (walls and floors). Seven indoor air samples detected PCB (Aroclor 1242) concentrations ranging from 1.9 to 20 $\mu g/m^3$. These levels exceeded typical background levels for PCBs in air and an evaluation of this data resulted in the NJDOH recommending the relocation of workers to prevent exposures to elevated PCB levels.

Surface Water/Sediment/Biota

Unimatic discharged untreated, contaminated water from 1970 until 1989, at a rate of 16,000 to 86,400 gallons per day to an unnamed tributary to Deepavaal Brook. The effluent was never analyzed for PCBs, but Unimatic has acknowledged that the discharged wastewater contained PCBs and was the source of PCBs in soil and ground water contamination on the property. The wastewater pipe discharged to a concrete culvert, which runs under parking lots and roadways for about 1,000 feet before reaching the unnamed tributary. The tributary enters Deepavaal Brook about 0.5 mile downstream, and Deepavaal Brook flows into the Passaic River approximately 1.5 miles downstream [USEPA 2013].

The Remedial Investigation report for the nearby Caldwell Trucking Superfund site describes limited data from 1985 for PCBs, pesticides, polycyclic aromatic hydrocarbons (PAHs) and VOCs in sediment for the Deepavaal Brook and surrounding unnamed tributaries [NUS 1986]. This data show PCBs were detected in sediment at one sample location in one of the unnamed tributaries to Deepavaal Brook. PCBs were not found in Deepavaal Brook [NUS 1986].

The August 1995 Revised Site Review and Update to the October 1988 PHA prepared by the NJDOH for the Caldwell Trucking site [NJDOH 1995] indicates one of the tributaries to Deepavaal Brook was remediated in accordance with a September 1989 USEPA Record of Decision. This Record of Decision addressed off-site areas impacted by the Caldwell Trucking site; however, it is not clear whether the tributary was remediated for PCBs or whether this tributary was the same one where the PCBs were found. Subsequent sampling of the Deepavaal Brook and its tributaries in March 1988 showed that no PCBs were found in any sediment or surface water samples [NUS 1989]. The primary contaminant in sediments are PAHs. These contaminants are likely due to runoff from roads and other sources as the site is located in an urban area. The USEPA plans to evaluate the extent of off-site sediment contamination in the future as part of the second phase of cleanup for the Unimatic site. There are no biota data available.

Drinking Water

Two aquifers beneath the site are used as sources for drinking water. A drinking water intake in the Passaic River is located approximately two miles downstream of the Deepavaal Brook. Groundwater in the area of the site flows to the north-northeast [GZA 2002]. Two private

residential drinking water wells are located 0.28 and 0.35 miles to the northeast (downgradient) of the site. Eleven public supply wells are located between two and four miles from the site [CDM Smith 2015]. There are no data available for PCBs or other site-related contaminants in drinking water.

Groundwater

The USEPA considered wastewater discharge from former leaking wastewater pipes and contaminated soil as the two primary sources for the groundwater contamination [USEPA 2013]. Based on subsurface investigations documenting PCBs in soil extending beneath the water table on the site, groundwater monitoring wells MW-1, MW-2, and MW-3 were installed in June 2002. Groundwater samples were collected from these monitoring wells in July 2002 and analyzed for PCBs. PCBs were detected in MW-2 at a concentration of 22 micrograms of PCBs per liter of water (µg/1), above the NJDEP GWQS of 0.5µg/l. PCBs were not detected in MW-1 and MW-3 above the Method Detection Limit.

In October 2004, groundwater monitoring wells MW-4, MW-5, and MW-6 were installed at the site. Groundwater samples were collected in November 2004 and analyzed for PCBs. PCBs were detected in monitoring wells MW-4 through MW-6 at concentrations of 448 µg/l, 2.3 µg/l and 26 µg/l, respectively.

In November 2009, monitoring wells MW-7 through MW-10 were installed along the northern property boundary. These wells were installed to evaluate groundwater conditions downgradient of the existing monitoring wells. Between December and April 2010, monitoring wells MW-4A and MW-4B were installed next to existing monitoring well MW-4 for vertical delineation of PCBs. Two monitoring wells (MW-KB-1 and MW-KB-2) were installed off-site to the north of the property.

Groundwater samples were collected from the onsite wells and analyzed for PCBs. No PCBs were detected in monitoring wells MW-1, MW-3, and MW-5. PCBs were detected in monitoring wells MW-4, MW-4A, MW-6 through MW-10 at concentrations ranging from 1.0 µg/l to 260 µg/l. In summary, water table monitoring wells MW-4, MW-6, MW-7, MW-8, MW-9, and MW-10 contained PCBs at concentrations above the NJDEP GWQS. Groundwater sampling of the off-site wells in April 2010 showed no detectable levels of PCBs. The locations of the monitoring wells are shown on **Figure 4**.

The Unimatic site is located in an area of regional VOC groundwater contamination. Of the 14 monitoring wells associated with the Unimatic site, two of these wells (MW-4 and MW-4A) were sampled once for PAHs and VOCs in December 2009. No PAHs were detected above their respective GWQS. Several VOCs were detected above GWQS in these monitoring wells. According to the February 2002 Preliminary Assessment report for the site, the use of chlorinated solvents was not identified as part of Unimatic's operations [GZA 2002]. Therefore, the focus of this health assessment will be on PCBs since the VOCs are from other sources in the area. In addition, the potential for vapor intrusion from contaminated groundwater in the area has been evaluated in a Health Consultation prepared by the NJDOH for the nearby Caldwell Trucking Company Superfund Site [NJDOH 2014].

As stated previously, groundwater samples were collected from site monitoring wells during the summer 2015 remedial investigation. This data represents a preliminary assessment of groundwater contamination. The USEPA plans to conduct a more comprehensive groundwater investigation in the near future. In addition to PCBs, additional contaminants were also detected in site monitoring wells, particularly in the area of the MW-4 well cluster.

Table 1 summarizes the concentrations of contaminants found in both site and off-site monitoring wells. As shown in the table, PCBs, dioxin, pesticides, and metals exceeded NJDEP GWQS. One semi-volatile organic compound, 1,4-dioxane, also exceeded its respective GWQS. The NJDEP GWQS were used as a comparison value for monitoring well contaminants because this value is the most applicable. There are no ATSDR comparison values available for monitoring well data.

Table 1. Contaminants Detected in Monitoring Wells

Contaminant	Number of samples	Concentration Range (µg/L)		NJDEP GWQS [a] (µg/L)	Maximum exceeds NJDEP GWQS
		Minimum	Maximum		
PCBs	32	ND	448	0.5	**Yes**
Dioxin	12	3.50E-07	1.40E-04	1.00E-05	**Yes**
Pesticides					
4'4-DDE	12	ND	0.7	0.1	**Yes**
4'4-DDT	12	ND	0.7	0.1	**Yes**
Aldrin	12	ND	0.83	0.04	**Yes**
alpha-BHC	12	ND	0.00017	0.02	No
delta-BHC	12	ND	1.6	NA	-----
gamma-BHC (Lindane)	12	ND	0.39	0.03	**Yes**
cis-Chlordane [b]	12	ND	0.64	0.5	**Yes**
trans-Chlordane [b]	12	ND	1.2	0.5	**Yes**
Dieldrin	12	ND	1.6	0.03	**Yes**
Endrin	12	ND	0.19	2	No
Endrin Aldehyde [c]	12	ND	0.08	2	No
Endrin Ketone [c]	12	ND	0.056	2	No
Semi-Volatile Organic Compounds					
1,1'-Biphenyl	12	ND	0.64	400	No
Bis (2-ethylhexyl) phthalate	12	ND	0.33	3	No
2,4-Dimethylphenol	12	ND	0.76	100	No
1,4-Dioxane	12	ND	18	0.4	**Yes**
Metals					
Aluminum	12	291	11,700	200	**Yes**
Arsenic	12	ND	3	3	No
Barium	12	16	100	6,000	No
Chromium	12	ND	38	70	No
Cobalt	12	1	8	100	No

Table 1. (Continued)

Contaminant	Number of samples	Concentration Range (µg/L)		NJDEP GWQS [a] (µg/L)	Maximum exceeds NJDEP GWQS
		Minimum	Maximum		
Metals					
Copper	12	ND	16	1,300	No
Iron	12	317	9,810	300	**Yes**
Lead	12	ND	9	5	**Yes**
Magnesium	12	6,260	47,900	NA	-----
Manganese	12	82	8,730	50	**Yes**
Nickel	12	3	24	100	No
Potassium	12	1,220	7,370	NA	-----
Selenium	12	ND	1	40	No
Sodium	12	9,550	407,000	50,000	**Yes**
Vanadium	12	ND	19	NA	-----
Zinc	12	4	43	2,000	No

a = NJDEP Ground Water Quality Standard (GWQS); b = cis and trans Chlordane were compared to the GWQS for Chlordane; c = Endrin aldehyde and Endrin ketone were compared to the GWQS for Endrin; ND = Not Detected; NA = Not Available; µg/L = micrograms of contaminant per liter of water

Soil

For this PHA, only surface soil samples were used to evaluate the potential for health effects, since sub-surface soils are not considered accessible. For surface soil, ATSDR considers the top three inches of soil the layer for incidental soil ingestion and dermal contact exposures. For the Unimatic site (25 Sherwood Lane), investigations by GZA between April 2001 and September 2010 indicated one surface soil sample collected during this time. This sample had a PCB concentration of 7.6 milligrams of PCBs per kilogram of soil (mg/kg) at a depth of 0-0.5 feet (0-6 inches) bgs. PCB contamination in subsurface soils were as high as 2,800 mg/kg. Sub-surface soil sample depths ranged from 0.5 to 37 feet bgs.

Additional contaminants besides PCBs were also found in subsurface soils in a limited number of samples collected during investigations in 2002 and 2003. These contaminants included metals, semi-volatile organic compounds (including PAHs) and VOCs. Post excavation soil samples and additional delineation samples indicated PCB contamination extends below the water table (19 feet bgs) and across the northern (JCMUA property), eastern (30 Sherwood Lane), and western property boundaries (21 Sherwood Lane) **(See Figure 2)**. A total of approximately 4,800 tons of PCB contaminated soil have been removed from the site during various stages of remediation.

In September 2012 and the summer of 2015, the USEPA collected additional soil samples from the site and surrounding properties. These investigations characterized the extent of PCB contamination remaining on the site, including areas where soil remediation had previously taken place. The 2012 soil sampling investigation only included surface soil samples analyzed for PCBs. The sample depths ranged from 0-3 inches bgs. The 2015 investigation included other contaminants besides PCBs. These additional contaminants included pesticides, dioxin/furans, semi-volatile organic compounds (including PAHs), VOCs, and metals. A supplemental soil

investigation was conducted on 30 Sherwood Lane in February 2016 and only included sampling for PCBs.

The 2015-2016 investigation included surface soil samples from a depth of 0-2 feet bgs. Data from this sample depth could not be evaluated in this PHA due to the large depth interval from the surface. This depth interval is not representative of actual surface soil exposures because it is not known if soil contaminants are evenly distributed throughout this depth. Therefore, data for the 0-2 feet bgs soil sample depth is provided only for informational purposes. Based on the available data for this health assessment, surface soil sample depths ranging from 0-6 inches (0-0.5 feet) bgs will be evaluated for potential health effects.

Soil investigations through 2016 revealed PCB concentrations on the JCMUA property ranging from 0.049 to 13.8 mg/kg for soil depths of 0-2 feet bgs. Soil sample depths at this property ranged from zero to 30 feet bgs. For 30 Sherwood Lane, sample depths ranged from 0-51 feet bgs. PCBs were found in soil at this property at concentrations ranging from non-detect to 0.085 mg/kg for samples collected at 0-2 feet bgs. For 21 Sherwood Lane, PCB concentrations in soil ranged from non-detect to 10 mg/kg for samples collected at 0-2 feet bgs. Soil sample depths ranged from 0-29 feet bgs. This property also had surface soil samples collected at 0-0.5 feet bgs in previous investigations in September 2010.

Table 2a summarizes PCB levels found in surface soil samples (0-0.5 feet bgs) on the Unimatic property (25 Sherwood Lane) and on 21 Sherwood Lane. **Table 2b** includes the additional PCB detections at depths of 0-2 feet bgs for the Unimatic Site and the three adjacent properties. This table also includes historical soil samples between 0.5 and 2 feet bgs. **Table 3** summarizes contaminants other than PCBs detected on the Unimatic property at 0-2 feet bgs. **Tables 4 and 5** summarize contaminants other than PCBs found in soil at 21 Sherwood Lane and the JCMUA property, respectively at depths of 0-2 feet bgs. The property at 30 Sherwood Lane historically was only sampled for PCBs. The data for the 0-2 feet bgs soil sample depth is for informational purposes only. It will not be used to evaluate potential health effects in this PHA.

Table 2a. PCB Concentrations in Surface Soil (0-0.5 feet bgs)

Property	Number of surface soil samples *	Concentration range for PCBs (mg/kg)	Comparison value (mg/kg)	Maximum exceeds comparison value
25 Sherwood Lane (Unimatic)	37	ND – 56[a]	0.19 (CREG)	**Yes**
21 Sherwood Lane	11	ND - 0.39[b]	0.19 (CREG)	**Yes**

CREG = ATSDR Cancer Risk Evaluation Guide; mg/kg = milligrams of contaminant per kilogram of soil; [a] Only Aroclor 1248 was detected in surface soil on this property; [b] Only Aroclor 1260 was detected in surface soil on this property; * = Surface soil sample depth = 0-0.5 feet below ground surface (bgs)

Table 2b. PCB Concentrations in Soil (0-2 feet bgs) – Unimatic and Adjacent Properties

Property	Number of soil samples *	PCB concentration range (mg/kg)	Comparison value (mg/kg)	Maximum exceeds comparison value
25 Sherwood Lane (Unimatic)	122	ND - 2800	0.19 (CREG)	**Yes**
21 Sherwood Lane	35	ND - 10	0.19 (CREG)	**Yes**
30 Sherwood Lane	6	ND - 0.085	0.19 (CREG)	No
JCMUA	8	0.049 - 13.8	0.19 (CREG)	**Yes**

ND = Not Detected; CREG = ATSDR Cancer Risk Evaluation Guide; PCBs includes Aroclors and Congeners; * = Sample depth = 0-2 feet below ground surface (bgs); JCMUA = Jersey City Municipal Utilities Authority

Table 3. Contaminants Other Than PCBs Detected in Soil (0-2 feet bgs) – Unimatic

Contaminant	Number of samples^	Concentration range (mg/kg)		Comparison value (mg/kg)	Maximum exceeds comparison value
		Minimum	Maximum		
Dioxin	3	1.40E-05	8.85E-05	0.0000029 (CREG)	**Yes**
Pesticides					
4'4-DDD	62	ND	0.046	1.6 (CREG)	No
4'4-DDE	62	ND	8.6	1.1 (CREG)	**Yes**
4'4-DDT	62	ND	7.2	1.1 (CREG)	**Yes**
Aldrin	62	ND	21	0.022 (CREG)	**Yes**
alpha-BHC	62	ND	0.00071	0.1 (NJDEP)	No
beta-BHC	62	ND	0.048	0.4 (NJDEP)	No
gamma-BHC (Lindane)	62	ND	0.4	0.4 (NJDEP)	No
cis-Chlordane *	62	ND	4.2	1.1 (CREG)	**Yes**
trans-Chlordane *	62	ND	9.3	1.1 (CREG)	**Yes**
Delta-BHC	62	ND	1.4	NA	-----
Dieldrin	62	ND	20	0.023 (CREG)	**Yes**
Endosulfan I **	62	ND	1.5	290 (Child EMEG)	No
Endosulfan II **	62	ND	0.058	290 (Child EMEG)	No
Endosulfan Sulfate	62	ND	0.00028	470 (NJDEP)	No
Endrin	62	ND	2	17 (Child EMEG)	No
Endrin Aldehyde +	62	ND	0.79	17 (Child EMEG)	No
Endrin Ketone +	62	ND	0.24	17 (Child EMEG)	No
Heptachlor	62	ND	19	0.083 (CREG)	**Yes**
Heptachlor Epoxide	62	ND	2.9	0.041 (CREG)	**Yes**
Methoxychlor	62	ND	0.0035	290 (Child RMEG)	No
Semi-volatile Organic Compounds (Includes PAHS)					
Acenaphthene	62	ND	0.29	3,400 (Child RMEG)	No
Acenaphthylene	62	ND	0.043	NA	-----
Anthracene	62	ND	0.59	17,000 (Child RMEG)	No
Benzo(a) anthracene	62	ND	0.93	0.6 (NJDEP)	**Yes**
Benzo(a) pyrene	62	ND	0.79	0.016 (CREG)	**Yes**
Benzo (b) fluoranthene	62	ND	1.3	0.6 (NJDEP)	**Yes**
Benzo (k) fluoranthene	62	ND	0.52	6 (NJDEP)	No
Benzyl butyl phthalate	62	ND	0.016	1,200 (NJDEP)	No
1,1'-Biphenyl	62	ND	0.026	47(CREG)	No
Bis (2-ethylhexl) phthalate	62	ND	240	35 (NJDEP)	**Yes**
Caprolactam	62	ND	0.42	29,000 (Child RMEG)	No
Carbazole	62	ND	0.18	24 (NJDEP)	No
Chrysene	62	ND	0.74	62 (NJDEP)	No
Di-n-octylphthalate	62	ND	0.042	23,000 (Child EMEG)	No
Dibenzofuran	62	ND	0.18	NA	-----
2,4-Dinitorophenol	62	ND	0.39	110 (Child RMEG)	No
Fluoranthene	62	ND	2	2,300 (Child RMEG)	No
Fluorene	62	ND	0.39	2,300 (Child RMEG)	No
2-Methylnaphthalene	62	ND	0.047	230 (Child RMEG)	No
Naphthalene	62	ND	0.029	1,100 (Child RMEG)	No
Phenanthrene	62	ND	2.2	NA	-----
Phenol	62	ND	0.019	17,000 (Child RMEG)	No
Pyrene	62	ND	2	1,700 (Child RMEG)	No
1,2,4,5-Tetrachlorobenzene	62	ND	0.016	NA	-----

Table 3. (Continued)

Contaminant	Number of samples^	Concentration range (mg/kg)		Comparison value (mg/kg)	Maximum exceeds comparison value
		Minimum	Maximum		
Metals					
Aluminum	62	5,540	27,200	57,000 (Child EMEG)	No
Antimony	62	ND	0.71	23 (Child RMEG)	No
Arsenic	62	ND	11.4	0.25 (CREG)	**Yes**
Barium	62	20.5	63.3	11,000 (Child EMEG)	No
Beryllium	62	ND	0.81	110 (Child EMEG)	No
Cadmium	62	ND	4.1	5.7 (Child EMEG)	No
Calcium	62	1,240	28,700	NA	-----
Chromium $^{++}$	62	8.6	690	51 (Child EMEG)	**Yes**
Cobalt	62	3.5	19	570 (Child EMEG)	No
Copper	62	2.3	1,100	570 (Child EMEG)	**Yes**
Iron	62	13,800	57,100	55,000 (RSL)	**Yes**
Lead	62	3.2	181	400 (NJDEP)	No
Magnesium	62	1,040	15,100	NA	-----
Manganese	62	94.5	24,800	2,900 (Child RMEG)	**Yes**
Mercury	62	ND	7.7	23 (NJDEP)	No
Nickel	62	6.6	1,290	1,100 (Child RMEG)	**Yes**
Potassium	62	ND	4,500	NA	-----
Selenium	62	ND	1.5	290 (Child EMEG)	No
Silver	62	ND	1.4	290 (Child RMEG)	No
Sodium	62	ND	5,460	NA	-----
Thallium	62	ND	51.5	5(NJDEP)	**Yes**
Vanadium	62	8.6	149	570 (Child EMEG)	No
Zinc	62	ND	721	17,000 (Child EMEG)	No

ND = Not Detected; NA = Not Available; CREG = ATSDR Cancer Risk Evaluation Guide; EMEG = ATSDR Environmental Media Evaluation Guide; NJDEP = NJDEP residential soil cleanup criteria; PAHs = Polycyclic aromatic hydrocarbons; RMEG = ATSDR Reference Media Evaluation Guide; RSL = USEPA Regional Screening Level; *Comparison value based on Chlordane; **Comparison value based on Endosulfan; $^{+}$ Comparison value based on Endrin; $^{++}$ ATSDR EMEG based on hexavalent Chromium; ^ = Sample depth = 0-2 feet below ground surface (bgs)

Table 4. Contaminants Other Than PCBs Detected in Soil (0-2 feet bgs) – 21 Sherwood Lane

Contaminant	Number of samples ^	Concentration range (mg/kg)		Comparison value (mg/kg)	Maximum exceeds comparison value
		Minimum	Maximum		
Pesticides					
4'4-DDD	5	ND	0.0065	1.6 (CREG)	No
4'4-DDE	5	ND	0.012	1.1 (CREG)	No
4'4-DDT	5	ND	0.00015	1.1 (CREG)	No
cis-Chlordane *	5	ND	0.00081	1.1 (CREG)	No
Dieldrin	5	ND	0.16	0.023 (CREG)	**Yes**
Endosulfan I **	5	ND	0.0026	290 (Child EMEG)	No
Endosulfan II **	5	ND	0.0084	290 (Child EMEG)	No
Endosulfan Sulfate	5	ND	0.000015	470 (NJDEP)	No
Endrin	5	ND	0.02	17 (Child EMEG)	No
Endrin Aldehyde +	5	ND	0.0046	17 (Child EMEG)	No
gamma-BHC (Lindane)	5	ND	0.0011	0.4 (NJDEP)	No
Heptachlor Epoxide	5	ND	0.06	0.041 (CREG)	**Yes**
Semi-Volatile Organic Compounds (Includes PAHs)					
Acenaphthene	5	ND	0.12	3,400 (Child RMEG)	No
Acenaphthylene	5	ND	0.096	NA	-----
Anthracene	5	ND	0.45	17,000 (Child RMEG)	No
Benzo (a) anthracene	5	ND	2.2	0.6 (NJDEP)	**Yes**
Benzo (a) pyrene	5	ND	2.4	0.016 (CREG)	**Yes**
Benzo (b) fluoranthene	5	ND	3.5	0.6 (NJDEP)	**Yes**
Benzo (k) fluoranthene	5	ND	1.2	6 (NJDEP)	No
Benzyl butyl phthalate	5	ND	0.042	1,200 (NJDEP)	No
Bis (2-ethylhexyl) phthalate	5	ND	0.68	35 (NJDEP)	No
Carbazole	5	ND	0.12	24 (NJDEP)	No
Chrysene	5	ND	2.2	62 (NJDEP)	No
Dibenzofuran	5	ND	0.05	NA	-----
Di-n-butyl phthalate	5	ND	0.013	5,700 (Child RMEG)	No
Fluoranthene	5	ND	2.3	2,300 (Child RMEG)	No
Fluorene	5	ND	0.16	2,300 (Child RMEG)	No
2-methylnaphthalene	5	ND	0.013	230 (Child RMEG)	No
Naphthalene	5	ND	0.013	1,100 (Child RMEG)	No
Phenanthrene	5	ND	1.4	NA	-----
Pyrene	5	ND	6.2	1,700 (Child RMEG)	No
Metals					
Aluminum	5	12200	19600	57,000 (Child EMEG)	No
Arsenic	5	3.1	3.5	0.25 (CREG)	**Yes**
Barium	5	34.6	64.5	11,000 (Child EMEG)	No
Beryllium	5	0.39	0.39	110 (Child EMEG)	No
Cadmium	5	0.21	0.28	5.7 (Child EMEG)	No
Calcium	5	2900	15500	NA	-----
Chromium ++	5	15.1	38.5	51 (Child EMEG)	No
Cobalt	5	4.9	11.6	570 (Child EMEG)	No
Copper	5	25.9	37.1	570 (Child EMEG)	No
Iron	5	18700	31500	55,000 (RSL)	No
Lead	5	13.8	60.3	400 (NJDEP)	No
Magnesium	5	3290	9120	NA	-----
Manganese	5	318	595	2,900 (Child RMEG)	No
Mercury	5	0.014	0.15	23 (NJDEP)	No
Nickel	5	12	18.8	1,100 (Child RMEG)	No

Table 4. (Continued)

Contaminant	Number of samples ^	Concentration range (mg/kg)		Comparison value (mg/kg)	Maximum exceeds comparison value
		Minimum	Maximum		
Metals					
Potassium	5	742	1580	NA	-----
Selenium	5	0.43	0.65	290 (Child EMEG)	No
Silver	5	0.057	0.057	290 (Child RMEG)	No
Sodium	5	577	800	NA	-----
Thallium	5	12	16.8	5 (NJDEP)	**Yes**
Vanadium	5	39.6	1580	570 (Child EMEG)	**Yes**
Zinc	5	0.51	39.9	17,000 (Child EMEG)	No

ND = Not Detected; NA = Not Available; CREG = ATSDR Cancer Risk Evaluation Guide; EMEG = ATSDR Environmental Media Evaluation Guide; NJDEP = NJDEP residential soil cleanup criteria; PAHs = Polycyclic aromatic hydrocarbons; RMEG = ATSDR Reference Media Evaluation Guide; RSL = USEPA Regional Screening Level; *Comparison value based on Chlordane; **Comparison value based on Endosulfan; $^{+}$ Comparison value based on Endrin; $^{++}$ ATSDR EMEG based on hexavalent Chromium; ^ = Sample depth = 0-2 feet below ground surface (bgs)

Table 5. Contaminants Other Than PCBs Detected in Soil (0-2 feet bgs) – JCMUA Property

Contaminant	Number of samples ^	Concentration range (mg/kg)		Comparison value (mg/kg)	Maximum exceeds comparison value
		Minimum	Maximum		
Dioxin	2	8.18E-06	9.44E-06	0.0000029 (CREG)	**Yes**
Pesticides					
4'4-DDD	8	ND	0.047	1.6 (CREG)	No
4'4-DDE	8	ND	0.58	1.1 (CREG)	No
4'4-DDT	8	ND	0.17	1.1 (CREG)	No
Aldrin	8	ND	0.0058	0.022 (CREG)	No
cis-Chlordane *	8	ND	0.011	1.1 (CREG)	No
trans-Chlordane *	8	ND	0.075	1.1 (CREG)	No
delta-BHC	8	ND	0.014	NA	-----
gamma-BHC (Lindane)	8	ND	0.031	0.4 (NJDEP)	No
Dieldrin	8	ND	0.21	0.023 (CREG)	**Yes**
Endosulfan I **	8	ND	0.019	290(Child EMEG)	No
Endosulfan II **	8	ND	0.011	290(Child EMEG)	No
Endrin	8	ND	0.024	17 (Child EMEG)	No
Endrin Aldehyde +	8	ND	0.0088	17 (Child EMEG)	No
Heptachlor	8	ND	0.017	0.083 (CREG)	No
Heptachlor Epoxide	8	ND	0.19	0.041 (CREG)	**Yes**
Methoxychlor	8	ND	0.0011	290 (Child RMEG)	No
Semi-Volatile Organic Compounds (Includes PAHs)					
Acenaphthene	8	ND	0.24	3,400 (Child RMEG)	No
Anthracene	8	ND	0.71	17,000 (Child RMEG)	No
Benzo(a)anthracene	8	ND	1.9	0.6 (NJDEP)	**Yes**
Benzo(a)pyrene	8	ND	1.5	0.016 (CREG)	**Yes**
Benzo(b)fluoranthene	8	0.017	3.1	0.6 (NJDEP)	**Yes**
Benzo(k)fluoranthene	8	ND	1.1	6 (NJDEP)	No
Benzyl butyl phthalate	8	ND	0.015	1,200 (NJDEP)	No
Bis(2-ethylhexl) phthalate	8	0.21	1.3	35 (NJDEP)	No
Caprolactam	8	ND	0.6	29,000 (Child RMEG)	No
Carbazole	8	ND	0.79	24 (NJDEP)	No
Chrysene	8	ND	2.2	62 (NJDEP)	No
Dibenzofuran	8	ND	0.17	NA	-----
Di-n-butyl phthalate	8	ND	0.013	5,700 (Child RMEG)	No
Fluoranthene	8	0.016	5.6	2,300 (Child RMEG)	No
Fluorene	8	ND	0.39	2,300 (Child RMEG)	No
2-Methylnaphthalene	8	ND	0.029	230 (Child RMEG)	No
Naphthalene	8	ND	0.013	1,100 (Child RMEG)	No
Phenanthrene	8	ND	5.2	NA	-----
Pyrene	8	0.012	9.8	1,700 (Child RMEG)	No
Metals					
Aluminum	8	11700	23100	57,000 (Child EMEG)	No
Antimony	8	ND	0.54	23 (Child RMEG)	No
Arsenic	8	1.4	5.1	0.25 (CREG)	**Yes**
Barium	8	15.6	101	11,000 (Child EMEG)	No
Beryllium	8	ND	0.93	110 (Child EMEG)	No
Cadmium	8	ND	0.74	5.7 (Child EMEG)	No
Calcium	8	1200	5790	NA	-----
Chromium ++	8	9.9	32.6	51 (Child EMEG)	No

Table 5. (Continued)

Contaminant	Number of samples ^	Concentration range (mg/kg)		Comparison value (mg/kg)	Maximum exceeds comparison value
		Minimum	Maximum		
Metals					
Cobalt	8	3.9	12.4	570 (Child EMEG)	No
Copper	8	16.1	56.6	570 (Child EMEG)	No
Iron	8	13900	45200	55000 (EPA RSL)	No
Lead	8	8.1	64.7	400 (NJDEP)	No
Magnesium	8	1530	7050	NA	-----
Manganese	8	ND	2440	2,900 (Child RMEG)	No
Mercury	8	0.0063	0.15	23 (NJDEP)	No
Nickel	8	7.9	27.5	1,100 (Child RMEG)	No
Potassium	8	ND	3130	NA	-----
Selenium	8	0.22	1.1	290 (Child EMEG)	No
Silver	8	ND	0.082	290 (Child RMEG)	No
Vanadium	8	ND	41.7	570 (Child EMEG)	No
Zinc	8	29.3	107	17,000 (Child EMEG)	No

ND = Not Detected; NA = Not Available; CREG = ATSDR Cancer Risk Evaluation Guide; EMEG = ATSDR Environmental Media Evaluation Guide; NJDEP = NJDEP residential soil cleanup criteria; PAHs = Polycyclic aromatic hydrocarbons; RMEG = ATSDR Reference Media Evaluation Guide; RSL = USEPA Regional Screening Level; *Comparison value based on Chlordane; **Comparison value based on Endosulfan; $^{+}$ Comparison value based on Endrin; $^{++}$ ATSDR EMEG based on hexavalent Chromium; ^ = Sample depth = 0-2 feet below ground surface (bgs)

Discussion

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

Assessment Methodology

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

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

Generally, the ATSDR considers three exposure categories: 1) completed exposure pathways, that is, all five elements of a pathway are present; 2) potential exposure pathways, that is, one or more of the elements may not be present, but information is insufficient to eliminate or

exclude the element; and 3) eliminated exposure pathways, that is, a receptor population does not come into contact with contaminated media. Exposure pathways are used to evaluate specific ways in which people were, are, or will be exposed to environmental contamination in the past, present, or future.

When assessing an exposure risk to a COC, the USEPA recommends use of the 95th percentile upper confidence limit (95% UCL) of the arithmetic mean to determine the exposure point concentrations (EPC) for site-related contaminants (USEPA 2013). An EPC is considered to be the concentration of a contaminant at the point of human exposure. The 95% UCL is considered a 'conservative estimate' of the average contaminant concentrations in an environmental medium to represent the EPC. To determine EPCs, site data were analyzed using ProUCL® 5.1 (USEPA 2015) developed by the US EPA to calculate the 95% UCL.

The exposed populations for the Unimatic site include adult workers and child trespassers who may have accessed the site prior to it being fenced. The exposure scenario for workers was based on an infrequent outdoor soil contact scenario. This is because workers at the former Unimatic facility (Frameware employees) conducted business activities inside of the building. Therefore, workers spend limited amounts of time outside putting them at a low risk for exposure to exterior soil on the site.

The site is located between a residential neighborhood and a high school. Therefore, a conservative age range for children likely to trespass on the property was for middle school and high school aged children ranging in age from 11-16 years. A daycare center is also located near the site, but it is not likely that these younger children would trespass on the property. The evaluated exposure pathways for site-related contaminants (PCBs) are presented in **Table 6**.

Table 6. Evaluated Exposure Pathways

Pathway	***Environmental Medium***	***Exposure Route***	***Location***	***Exposed Population***	***Pathway Classification***
Ingestion of Surface Soil	Soil	Ingestion/Dermal Contact	Site Property	Workers/ Trespassers	Past – Completed Current – Eliminated Future – Eliminated
Ingestion of Surface Soil	Soil	Ingestion/Dermal Contact	Adjacent Properties	Workers/ Trespassers	Past, Current, and Future - Eliminated
Ingestion of Sub-Surface Soil	Soil	Ingestion/Dermal Contact	Site Property/ Adjacent Properties	Workers/ Trespassers	Past, Current, and Future - Eliminated
Ingestion Surface Water/Sediment /Biota	Water/Sediment / Biota	Ingestion/Dermal Contact	Deepavaal Brook	Surrounding Community	Past, Current, and Future - Eliminated
Ingestion of Potable Water	Drinking Water	Ingestion/Dermal Contact	Public Supply Wells	Surrounding Community	Past, Current, and Future - Eliminated
Ingestion of Potable Water	Drinking Water	Ingestion/Dermal Contact	Private Wells	Surrounding Community	Past, Current, and Future - Potential
Inhalation of Indoor Air	Air	Inhalation	Site Building	Workers	Past – Completed Current - Eliminated Future - Eliminated

Completed Exposure Pathways

Ingestion of and dermal contact with contaminated surface soils on the site (past). For the past, there is a completed exposure pathway regarding ingestion of and dermal contact with contaminated site surface soil (0-0.5 feet bgs) by site workers and trespassers.

Inhalation of PCBs in indoor air (past). For the past, workers in the building may have been exposed to elevated levels of PCBs in indoor air as described in the NJDOH March 2013 LHC (**See Appendix A**).

Currently, these pathways have been eliminated since the workers have vacated the building and the site has been fenced to prevent access by trespassers.

Potential Exposure Pathways

Ingestion of potable water from private wells (past, current, future). Two aquifers beneath the Unimatic site are used as sources for drinking water. These aquifers have been impacted by PCB contamination from the site. The concentrations of PCBs in all but two monitoring wells on the site were above the NJDEP GWQS. In addition, the USEPA listed the site to the NPL based on the groundwater migration pathway. Two private residential drinking water wells are located 0.28 and 0.35 miles to the northeast (downgradient) of the site [CDM Smith 2015]. There are no data available for PCBs and other site contaminants in the downgradient private wells. However, PCBs were not detected in the two off-site monitoring wells located downgradient of the site when they were sampled in 2010. These wells were not sampled in the 2015-2016 investigation by the USEPA.

Eliminated Exposure Pathways

Inhalation of PCBs in indoor air (current, future). The currently vacant Unimatic building is going to be demolished per the September 2016 USEPA Record of Decision [USEPA 2016]. Therefore, future workers would not be exposed to PCBs in indoor air.

Exposure to subsurface soils (past, current, future). Exposures by workers and trespassers to subsurface soils are considered eliminated as ATSDR considers the top three inches of soil as the direct contact layer for incidental ingestion and dermal contact to soil. In addition, worker exposure to sub-surface soils through digging or similar activities would be unlikely based on the nature of the businesses as observed during the site visit conducted by the NJDOH and ATSDR in October 2015. Contaminated subsurface soils will be excavated in accordance with the September 2016 USEPA Record of Decision. A deed notice will be required for the Unimatic property, limiting it to non-residential use. The adjacent properties may meet the NJDEP's residential soil cleanup standards due to the small amount of contamination on these properties. However, a deed notice will be required if the residential direct contact standards cannot be met. The deed notice will include a description of any remaining contamination along with a map showing the area of restricted use[USEPA 2016].

Ingestion of PCBs in surface soil (future). If the site were to be re-occupied there would be a potential for workers or trespassers to be exposed to site contaminants in surface soil. Per the USEPA's September 2016 Record of Decision, contaminated soils exceeding the USEPA's non-

residential remediation goals will be excavated and replaced with clean soil along with a deed notice. These remediation goals are based on the NJDEP soil cleanup levels. The deed notice would limit the use of the property to non-residential use [USEPA 2016]. In addition, the NJDOH has a safe siting program in place for child care centers and schools which will prevent future exposures to children if the property use were to include these populations.

Exposure to surface soils on the adjacent properties (past, current, future). Based on the site visit conducted by the NJDOH and ATSDR in October 2015, this pathway is considered eliminated as the adjacent properties are covered with grass and/or pavement which prevent contact with contaminated soil. In addition, the area is light commercial/industrial, and there was no evidence of trespassing observed during the site visit. There is no evidence to suggest that past land use of this area was different from its current use. Per the September 2016 USEPA Record of Decision, any contaminated soils on the adjacent properties will be removed and will likely meet the NJDEP residential cleanup standards [USEPA 2016]. If these standards cannot be met, deed notices will be put in place, eliminating future exposures to contaminated soil.

Ingestion of surface water/sediment/biota (past, current, future). As discussed above, an un-named tributary is located on the site which enters Deepavaal Brook approximately 0.5 miles downstream. Deepavaal Brook flows to the Passaic River approximately 1.5 miles downstream of the site. A drinking water intake in the Passaic River is located approximately two miles downstream of Deepavaal Brook. As stated previously, PCBs were not found in the Deepavaal Brook.

There is no knowledge of fishing or recreational activities in the Deepavaal Brook according to information provided by the USEPA. There are limited data from the 1980s showing PCBs detected in sediment at one location from a tributary to the Deepavaal Brook. Subsequent samples show no PCBs in surface water or sediment in the brook or its tributaries. The tributary to the Deepavaal Brook with the PCB detection in the sediment runs through a residential area. However, the location where the PCBs were found is deep in the woods and not close to any homes. Therefore, it is unlikely that a person would come into contact with the portion of the tributary where the PCBs were found in sediment. There is no knowledge of fishing in this area.

Ingestion of potable water from public supply wells (past, current, future). Eleven public supply wells are located between two and four miles from the site [CDM Smith 2015]. According to information provided by the USEPA, the public water supply has not been routinely tested for PCBs. However, the presence of PCBs and other site contaminants in the public water supply from the site is unlikely due to the distance of these wells from the site (2-4 miles). There is also a groundwater classification exception area established by the NJDEP restricting the use of groundwater in the area to non-potable uses [USEPA 2016].

Public Health Implications of Completed Exposure Pathways

Once it has been determined that individuals have or are likely to contact site-related contaminants (i.e., a completed exposure pathway), the next step in the PHA process is the

calculation of site-specific exposure doses. This evaluation looks more closely at site-specific exposure conditions, estimates exposure doses, and compares these doses to health guideline values. These values are based on data from epidemiologic and toxicological literature and often include uncertainty factors to ensure that they are protective of human health.

Although the potential for exposure by dermal absorption of chemicals exists, the ATSDR generally considers dermal exposure to be a minor contributor to the overall exposure dose relative to contributions from ingestion and inhalation for most exposure scenarios (ATSDR 2005).

Non-Cancer Health Effects

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

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

The NOAEL is the highest tested dose of a substance that has been reported to have no harmful health effects on people or animals. LOAEL is the lowest tested dose of a substance that has been reported to cause harmful health effects in people or animals. To provide additional perspective on these health effects, the calculated exposure doses were then compared to observed effect levels (e.g., NOAEL, LOAEL). As the exposure dose increases beyond the MRL to the level of the NOAEL and/or LOAEL, the likelihood of harmful health effects increase.

Incidental Ingestion of and Dermal Contact with Soil – Site property.

Exposures are based on incidental ingestion of contaminated surface soil for two populations. The first is adult site workers with low soil contact who occupied the site until it was vacated in 2013. The exposure scenario for workers was based on a low soil contact scenario because workers at the former Unimatic facility (Frameware employees) conducted business activities inside of the building. Therefore, these workers likely spent limited amounts of time outside putting them at a low risk for exposure to exterior soil on the site.

The second exposed population is for children (11-16 years) who may have trespassed on the site prior to the site being fenced in April 2015. The site is located between a residential neighborhood and a high school. Therefore, a conservative age range for children likely to trespass on the property was for middle school and high school aged children ranging in age from 11-16 years.

Non-cancer exposure doses were calculated using the following formula:

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

where,

mg/kg/day = milligrams of contaminant per kilogram of body weight per day;
C = exposure point concentration of contaminant in surface soil (mg/kg);
IR = soil ingestion rate (kg/day);
EF = exposure factor representing the site-specific exposure scenario;
CF = conversion factor (10^{-6} kg/mg); and
BW = body weight (kg)

The following site-specific exposure assumptions (ATSDR 2016) were used to calculate past contaminant doses to site workers and trespassers.

Table 7. Site-Specific Exposure Assumptions

Exposed Population	Body Weight (kg)	Ingestion Rate (mg/day)	Exposure Assumptions	Exposure Factor
Adult Site Workers	80	100	5 days per week; 8hrs/day 50 weeks per year for 10 years	5/7days x 8/24 hours x 50/52 weeks per year = 0.228
Child Trespassers	56.8	100	8 days per month for 5 years*	8 days/30 days per month = 0.267

* Assumption based on children ages 11-16 for site trespassers

Table 8 presents the calculated exposure doses for adult site workers and child trespassers based on the EPC for PCBs.

Table 8. Calculated Exposure Doses – Non-Cancer Health Effects

Exposed Population	EPC (mg/kg)	Ingestion Rate (mg/day)	Exposure Factor	Conversion Factor (kg/mg)	Body Weight (kg)	Exposure Dose (mg/kg/day)	MRL (mg/kg/day)	Potential for non-cancer health effects
Site Workers	18.8	100	0.228	1.00E-06	80	5.36E-06	2.00E-05	No
Child Trespassers	18.8	100	0.267	1.00E-06	56.8	8.84E-06	2.00E-05	No

EPC=Exposure Point Concentration calculated using 95% UCL (USEPA 2015); MRL= ATSDR Minimum Risk Level; Example Dose Calculation: Exposure dose (non-cancer) = 18.8 mg/kg x 100 mg/day x 0.228 x 1.00E-06 kg/mg / 80 kg = 5.36 E-06 mg/kg/day

PCBs. The PCB Aroclor 1248 was the only PCB detected in the surface soil samples on the site. Because there is no MRL comparison value available specifically for Aroclor 1248, the MRL for Aroclor 1254 was used. Using the EPC of 18.8 mg/kg for Aroclor 1248 detected in surface soil on the site, the calculated exposure doses for site workers and trespassers are below the most stringent chronic oral MRL for both site workers and child trespassers. Therefore, chronic exposures to site workers and trespassers are not expected to result in adverse non-cancer health effects. A toxicological summary for PCBs is provided in **Appendix D**.

Cancer Health Effects

The site-specific lifetime excess cancer risk (LECR) indicates the cancer potential of contaminants. LECR estimates are usually expressed in terms of excess cancer cases in an exposed population in addition to the background rate of cancer. For perspective, the lifetime risk of being diagnosed with cancer in the United States is 42 per 100 individuals for males, and 38 per 100 for females (ACS 2017). Typically, health guideline comparison values developed for carcinogens are based on one excess cancer case per 1,000,000 individuals. The NJDOH considers estimated cancer risks of less than one additional cancer case among one million persons exposed as insignificant or no increased risk (expressed exponentially as 10^{-6}). According to the United States Department of Health and Human Services (USDHHS), the cancer class of contaminants detected at a site is as follows:

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

The Department of Health and Human Services' (DHHS) Report on Carcinogens has concluded that PCBs is a category 2 carcinogen and may reasonably be anticipated to be carcinogenic to humans (NTP 2014).

Cancer exposure doses were calculated using the following formula:

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

where,

mg/kg/day = milligrams of contaminant per kilogram of body weight per day;
C = exposure point concentration of contaminant in soil (mg/kg);
IR = soil ingestion rate (kg/day);
EF = exposure factor representing the site-specific exposure scenario;
CF = conversion factor (10^{-6} kg/mg);
ED = exposure duration;
AT = averaging time of 78 years; and
BW = body weight (kg).

The site-specific assumptions and recommended exposure factors used to calculate the LECR are the same as those used to assess non-cancer health effects. The LECR was calculated by multiplying the cancer exposure dose by the EPA's cancer slope factor (CSF). The CSF is defined as the slope of the dose-response curve obtained from animal and/or human cancer studies and is expressed as the inverse of the daily exposure dose, i.e., $(mg/kg/day)^{-1}$. LECRs for soil exposures were calculated using the following formula [USEPA 2009]:

$$LECR = \textit{Cancer Exposure Dose} \times CSF$$

where,

CSF = Cancer Slope Factor $(mg/kg/day)^{-1}$

As noted in **Table 7** above, an exposure duration of 10 years was used for Frameware employees since this is the time period that Frameware occupied the building. For child trespassers, an exposure duration of 5 years was used assuming that children trespassing on the site prior to it being fenced ranged in age from 11 to 16 years. The calculated LECRs for the Frameware workers and child trespassers was approximately one in 1,000,000 individuals which is considered to be a low risk for cancer (**See Table 9**).

Table 9. Cancer Exposure Doses and LECR Calculations

Exposed Population	Exposure Dose * (mg/kg/day)	Exposure Duration (years)	Averaging Time (years)	Cancer Exposure Dose (mg/kg/day)	Cancer Slope Factor $(mg/kg/day)^{-1}$	LECR
Site Workers	5.36E-06	10	78	6.87E-07	2	1E-06
Child Trespassers	8.84E-06	5	78	5.67E-07	2	1E-06

*=Exposure dose is from **Table 8**; Example Dose Calculation: Exposures Dose (cancer) = 5.36E-06 mg/kg/day x (10 years / 78 years) = 6.87E-07 mg/kg/day; LECR = 6.87E-07 mg/kg/day x 2 $(mg/kg/day)^{-1}$ = 1E-06

Child Health Considerations

ATSDR's Child Health Initiative 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. They also play outdoors and often bring food into contaminated areas. 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 importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

The NJDOH evaluated the potential risk for children trespassing on the former Unimatic site prior to it being fenced in April 2015, as children may have been exposed to PCBs in soil from the site. Based on the calculated exposure point concentration of PCBs in surface soils at the site, the exposure dose calculated for non-cancer health effects was below the chronic MRL, and therefore, adverse non-cancer health effects are not likely. Also, based on the exposure point concentration in contaminated soil on the site and a five-year exposure duration, it was determined that the site presented a low cancer risk.

Conclusions

Following the review and assessment of environmental data associated with the former Unimatic Manufacturing Corporation site, the NJDOH reached the following conclusions regarding exposures to former site workers and trespassers:

1. *The NJDOH concludes that current and future exposures to PCBs in the building at the site will not harm workers' health because the building is not occupied; however, past*

exposures to PCBs for workers who occupied the Unimatic building may have harmed workers' health. The building has been vacant since 2013 preventing workers from breathing contaminated air in the building. In addition, the USEPA plans to demolish the building as part of the September 2016 Record of Decision [USEPA 2016]. During the time the building was occupied by Frameware, Inc., workers may have been exposed to PCB levels within the building which may have put these workers at an increased risk for cancer. The data supporting this conclusion was evaluated as described in the NJDOH March 2013 Letter Health Consultation (LHC) (**Appendix A**).

2. *The NJDOH concludes that exposures to PCB contaminated exterior surface soil on the site is not likely to harm people's health.* The property is currently fenced, preventing people from contacting contaminated soil on the property. Workers at the former Unimatic facility conducted business activities inside of the building which put them at a low risk for exposure to exterior soil on the site. Therefore, a low soil contact exposure scenario was used to evaluate past worker exposures to PCBs. For child trespassers, children ranging in age from 11-16 years were used to evaluate past exposures. This is because the site is located between a residential neighborhood and a high school. Using these scenarios, the exposure doses for the ingestion of PCBs in surface soil for workers and child trespassers were below the chronic ATSDR Minimal Risk Level. This level is a health based comparison value for non-cancer health effects. Additionally, the cancer risk to workers and child trespassers from ingesting PCB contaminated surface soil was estimated to be approximately one in 1,000,000 individuals. This is considered to be a low cancer risk.

3. *The NJDOH cannot currently conclude whether site-related contaminants in area private wells could harm people's health.* The NJDOH and ATSDR do not have the necessary information at this time to evaluate whether PCBs and other site-related contaminants have impacted downgradient private wells. The NJDOH and ATSDR are working with the USEPA to gather this information, as the extent of contamination from the site is still being characterized.

Recommendations

1. NJDOH recommends the USEPA continue to characterize the extent of contamination from the site and provide this information to the NJDOH for evaluation.

2. NJDOH recommends the USEPA sample any downgradient private wells for PCBs and other site-related contaminants to determine if these wells are being impacted by contamination from the former Unimatic site.

3. NJDOH recommends that the building interior be remediated to remove PCB contamination if the former Unimatic Corporation building is to be re-occupied. The NJDOH understands that the USEPA plans to demolish the building as part of the final remedial decision for this site.

Public Health Action Plan

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

Public Health Actions Taken

1. The NJDOH reviewed information provided by the USEPA to evaluate the potential health implications of site contaminants to workers and trespassers at the former Unimatic Manufacturing Corporation site.

2. The NJDOH prepared a letter health consultation document in March 2013 at the request of the NJDEP which evaluated indoor environmental data and the potential worker exposures to PCBs in the building. The NJDOH recommended that workers vacate the building due to cancer risk.

Public Health Actions Planned

1. Copies of this health assessment will be provided to the USEPA and to the local health department. This document will also be provided to the NJDEP and made available via the city libraries and the NJDOH website. Additionally, community members who contact the NJDOH will be provided assistance in understanding the findings of this report.

2. The NJDOH will continue to review and evaluate data as it is made available.

3. Community members or workers with health concerns regarding past exposures to site contaminants can ask the NJDOH for help with outreach between their physician and trained experts specializing in occupational and environmental exposures to hazardous substances.

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Report Preparation

This Public Health Assessment for the former Unimatic Manufacturing Corporation Site was prepared by the New Jersey Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, and procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

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Any questions concerning this document should be directed to:

Environmental and Occupational Health Surveillance Program
New Jersey Department of Health
Consumer, Environmental and Occupational Health Service
P.O. Box 369
Trenton, New Jersey 08625-0369

Figures

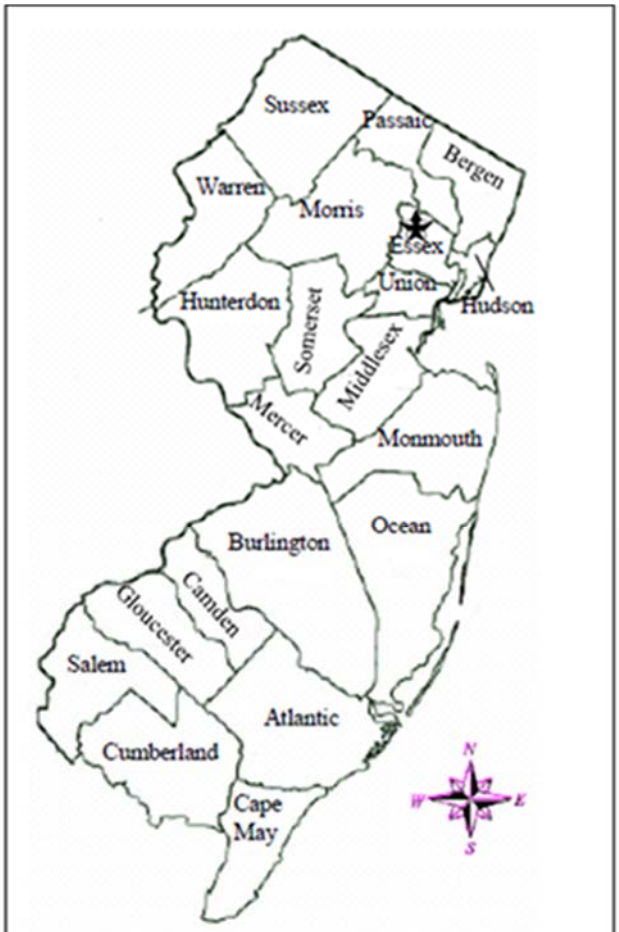


Figure 1: Location of Former Unimatic Site

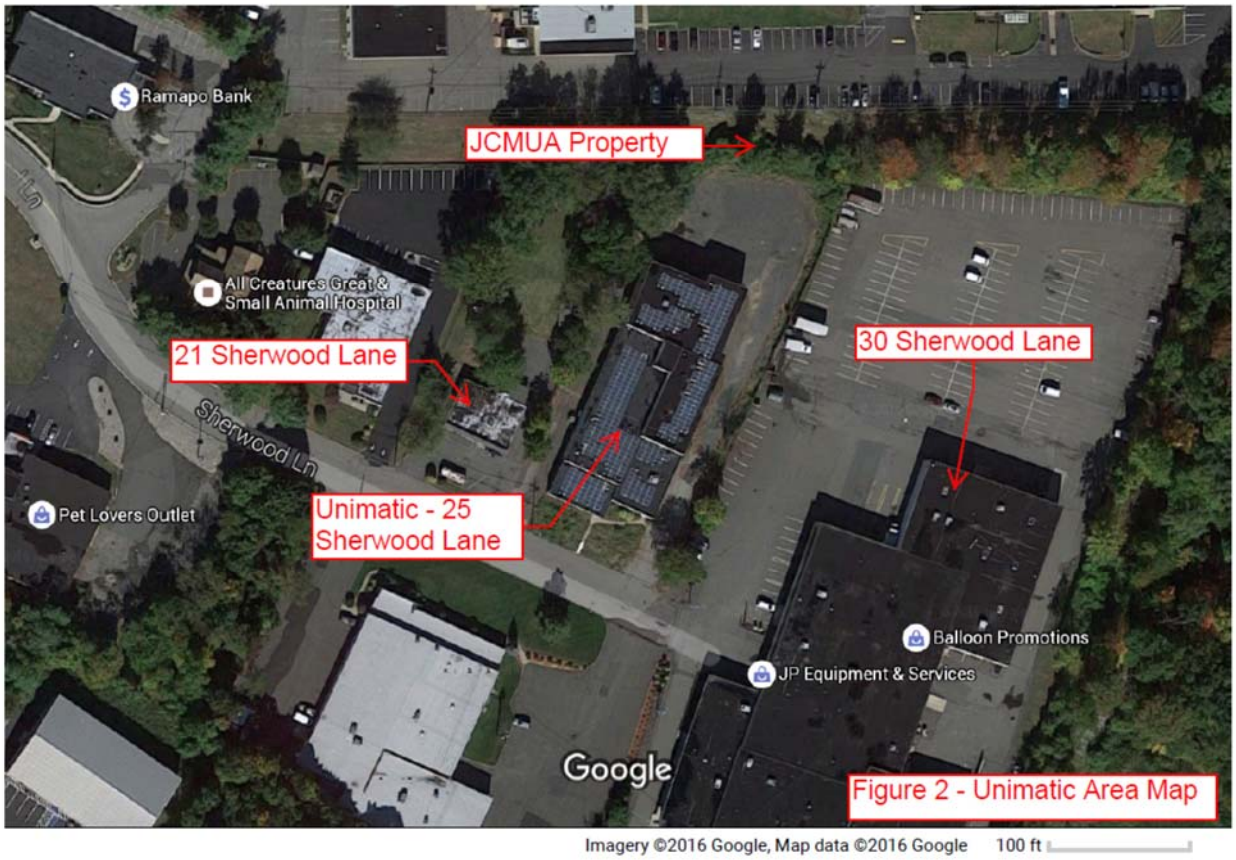


Figure 2. Unimatic area map

Figure 3. Unimatic Site (25 Sherwood Lane)

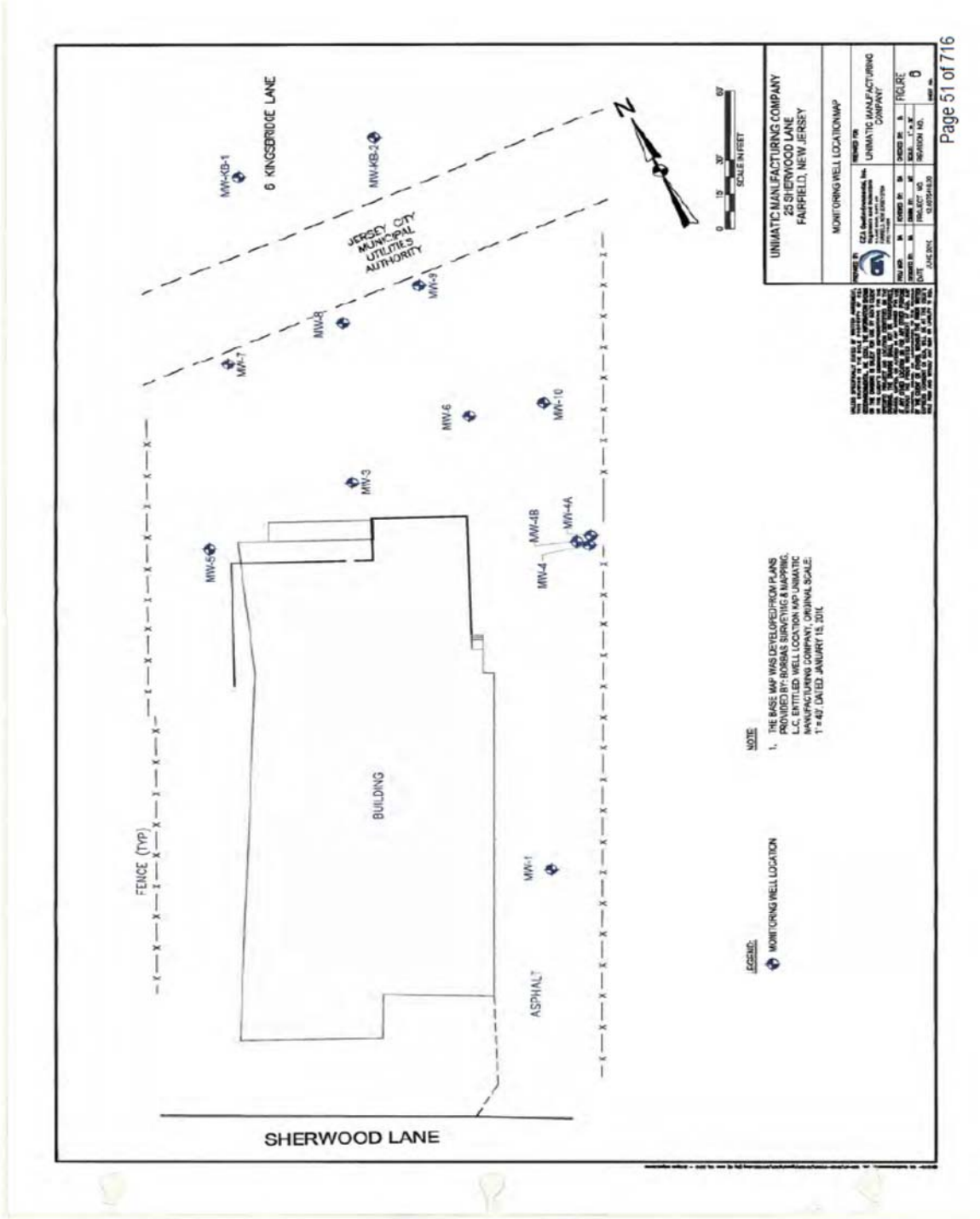


Figure 4 – Monitoring Well Location Map - Unimatic

Appendix A

New Jersey Department of Health

Letter Health Consultation – Unimatic Site

March 2013

State of New Jersey
DEPARTMENT OF HEALTH
CONSUMER, ENVIRONMENTAL AND OCCUPATIONAL HEALTH SERVICE
PO BOX 369
TRENTON, N.J. 08625-0369

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

www.nj.gov/health

MARY E. O'DOWD, M.P.H.
Commissioner

March 8, 2013

Mr. Fred Mumford
Section Chief
New Jersey Department of Environmental Protection
380 Scotch Road
PO Box 413
Ewing, NJ 08625

Dear Mr. Mumford:

This Letter Health Consultation (LHC) has been completed by the New Jersey Department of Health (NJDOH), through a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), for the Unimatic Manufacturing Corporation Site located in Fairfield, Essex County, New Jersey. This LHC was prepared at the request of the New Jersey Department of Environmental Protection (NJDEP) to evaluate the health risks to workers exposed to polychlorinated biphenyls (PCBs) which were found within and around the building.

Background

The Unimatic Manufacturing Corporation Site consists of a single story building constructed in 1955 for Unimatic and was originally used as a tool shop and later for dye casting. Since 2002 the site has been occupied by Frameware Inc. which uses the building to manufacture and distribute picture frame hardware and fasteners. The site has a history of PCB discharge to the surrounding surface and sub-surface soils. During September and October, 2012 soil sampling for PCBs was performed at the site by the US EPA. In addition, sampling for PCBs was conducted within the facility. Various indoor media were sampled including air, surfaces (wipes), surface dust and chips of building substrates (walls and floors). In addition to PCB contamination, the groundwater is also contaminated with volatile organic compounds (VOCs) in the area of the site. The DOH and ATSDR do not currently have any indoor air VOC data to evaluate any additional risk posed by VOCs through vapor intrusion.

Discussion

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. These health effects occur at levels much higher than what has been found in the Unimatic facility, however, the sampling event in October 2012 represents one point in time so it is not known if the levels were higher in the past. In addition, studies in exposed workers have shown changes in blood and urine that may indicate liver damage. Studies of workers also indicate that PCBs were associated with certain kinds of cancer

in humans, such as cancer of the liver and biliary tract (ATSDR 2001). Women exposed to high levels of PCBs when pregnant have babies with lower birth weights and effects on the nervous system and immune system. Although there may be acute and chronic non-cancer health effects associated with exposure to PCBs, the most recent data seem to indicate that the primary concern for workers at the Unimatic site is the potential for long term health effects, specifically cancer, from chronic exposure to PCBs in the building.

In animal studies, 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 anemia, acne-like skin conditions, and showed damage to the liver, stomach, and thyroid gland. Other effects of PCBs in animals include immune system and behavior changes, and reproductive affects. PCBs are not known to cause birth defects.

Although there are medical tests to measure levels of PCBs in blood, body fat, and breast milk, these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. Medical tests can show if a person has elevated PCB levels in their body above what would be considered normal, indicating past exposure to PCBs at above-normal levels, but it cannot determine when or how long a person was exposed or whether health effects will occur.

Public Health Implications of Completed Exposure Pathways

Facility workers are subject to multiple sources/pathways of PCB exposure. The primary exposure pathway to workers is the inhalation pathway. Seven indoor air samples detected PCB (Aroclor 1242) concentrations above background levels (0.003-0.010 micrograms/m^3 for urban areas) (US EPA 2013). The indoor air concentration of PCBs in the building ranged from 1.9 to 20 micrograms/m^3. In addition, contact with building surfaces coated with PCB (Aroclor 1248) residuals would be a secondary source of exposure via skin absorption and incidental ingestion. Furthermore, workers may also be exposed via skin contact and incidental ingestion of contaminated soil. Soil samples collected around the building in September 2012 indicated levels of PCBs exceeding the NJDEP non-residential cleanup standards. These elevated levels were found in areas of heavy truck traffic and near the building's rear entrance.

When assessing an exposure risk to a contaminant, the US EPA recommends the 95 percent upper confidence limit (95% UCL) of the arithmetic mean be used to determine the exposure point concentrations (EPC) for site-related contaminants (US EPA 1992). An EPC is considered to be the concentration of a contaminant at the point of human exposure. The 95% UCL is considered a 'conservative estimate' of the average contaminant concentrations in an environmental medium to represent the EPC. However, due to the small number of samples (less than 10), the US EPA recommends that the maximum concentration be used instead of the 95% UCL to evaluate risk.

Cancer Health Effects – Inhalation of PCB contaminated air

An estimated exposure dose was calculated using the following formula:

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

where C = Concentration of PCBs in air, in mg/m^3
IR = Adult Inhalation Rate
EF = Exposure Factor representing specific exposure scenario
BW = Adult Body Weight
ED = Exposure Duration representing the location-specific scenario
AT = Averaging Time (78 years x 365 days/year).

The theoretical lifetime excess cancer risk (LECR) for workers was calculated by multiplying the exposure dose by the cancer slope factor (CSF). The CSF is defined as the slope of the dose-response curve obtained from animal and/or human cancer studies and is expressed as the inverse of the daily exposure dose, i.e., $(mg/kg/day)^{-1}$.

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

C (mg/m3)	IR (m3/hr)	EF (hrs/yr)	ED (yrs)	BW (kg)	AT (days)	Dose mg/kg/day	CSF	LECR
.02	0.67	2080	10	80	28470	1.2E-04	2.0	2.4E-04

Based on the indoor air data collected in October 2012, the maximum concentration is 20 micrograms/m^3. This concentration produces a LECR of 2 in 10,000 individuals ($2x10^{-4}$) based on a typical worker scenario of 8 hour days, 5 days per week for 10 years. The ten year duration is based on information provided by the US EPA regarding the maximum amount of time workers have occupied the building. This is considered by the NJDOH to be a low increase in lifetime cancer risk in comparison to background risk. It is important to note that the cumulative cancer risk may be higher given the additional exposure pathways of dermal and incidental ingestion. Furthermore, the calculated LECR is considered to be unacceptable by the US EPA.

Conclusions and Recommendations

Based on the review of available data, the ATSDR and NJDOH categorize the current and future use of the Unimatic Manufacturing Corporation Site as a ***public health hazard*** due to the presence of elevated levels of PCBs in the air within the building. Workers in the Unimatic facility have been exposed to PCBs through several exposure routes for a 10 year period which

puts workers at an increased risk for cancer. As described in this letter, the inhalation exposure pathway alone provides evidence that occupying this building is putting workers at risk.

Based on these findings, the NJDOH recommends the following:

1. Workers should be re-located as soon as feasible in order to prevent on-going exposure. In order to protect workers from any further increased cancer risk (additional $1x10^{-5}$ risk), the NJDOH recommends that workers vacate the building within four to six months.

2. Once the building is vacant, it should not be re-occupied until remediation takes place and PCB levels are reduced to levels that will not pose an unacceptable health risk to building occupants.

3. The NJDOH is not recommending biological testing since the results would not have any clinical relevance to individual workers; however workers wishing to discuss health concerns related to PCB exposure may contact the University of Medicine and Dentistry's Environmental and Occupational Health Sciences Institute (EOHSI) at 848-445-0123. The EOHSI clinic has physicians specializing in environmental and occupational medicine.

4. Due to area groundwater contamination, a vapor intrusion investigation should be conducted at the site to determine if any additional risk exists to workers from exposure to VOCs through the vapor intrusion pathway.

The NJDOH and ATSDR are available to review any additional data and provide further guidance as appropriate. The NJDOH and ATSDR are also available to assist the NJDEP and the US EPA in communicating the health risks to the building owner and workers.

If you have any questions regarding the findings presented in this letter, please contact me at 609-826-4920 or by email at Joe.Eldridge@doh.state.nj.us.

Sincerely,

Joseph Eldridge, Director
Consumer, Environmental & Occupational
Health Service

c: Leah Graziano, ATSDR
David Rosoff, US EPA

Appendix B

ATSDR Demographic Maps

Unimatic Manufacturing Corporation

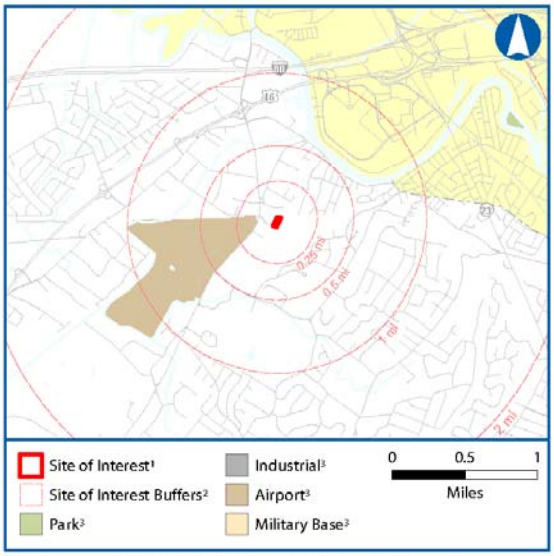
Fairfield, Essex County, NJ

GENERAL SITE PROFILE

EPA FACILITY ID NJD002164796

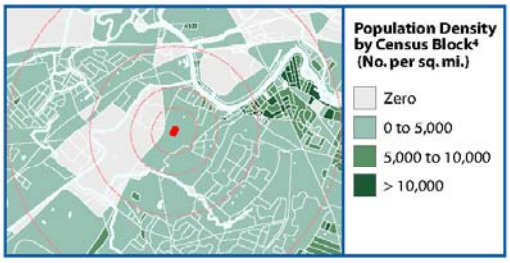
INTRODUCTORY MAP SERIES

Site Vicinity Map

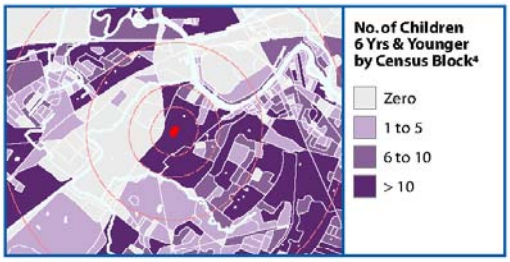


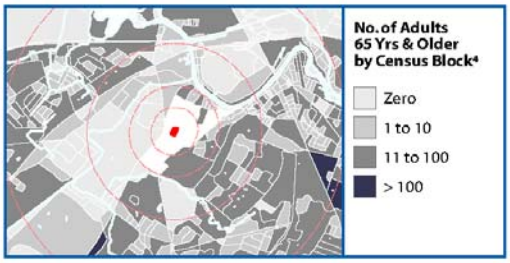
The **General Site Profile Map** depicts the hazardous waste site of interest, along with any airport, industrial, military, or park land uses. It also provides community demographic and housing statistics.

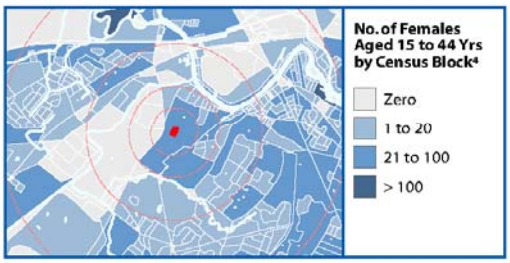
General Population Density



Sensitive Populations







Demographic Statistics[4,5]

Within 1 mile buffer of site boundary

Measure	2000	2010	Change
Total Population	3,524	3,789	+7%
White Alone	3,232	3,446	+6%
Black Alone	27	50	+85%
Am. Indian & Alaska Native Alone	6	2	-66%
Asian Alone	203	209	+2%
Native Hawaiian & Other Pacific Islander Alone	0	0	+0%
Some Other Race Alone	29	32	+10%
Two or More Races	29	52	+79%
Hispanic or Latino[6]	128	204	+59%
Children Aged 6 and Younger	290	274	-5%
Adults Aged 65 and Older	547	805	+47%
Females Aged 15 to 44	624	570	-8%
Housing Units	1,212	1,496	+23%
Housing Units Pre 1950	249	277	+11%

Data Sources: [1]ATSDR GRASP Hazardous Waste Site Boundary Database. [2]ATSDR GRASP. [3]TomTom International BV (2012). [4]US Census 2010. **Notes:** [5]Calculated using area-proportion spatial analysis method. [6]Individuals identifying origin as Hispanic or Latino may be of any race. **Projection:** Projection used for all map panels is NAD 1983 StatePlane New Jersey FIPS 2900 Feet.

PRJ 04253 WVT9 11/18/15

GRASP

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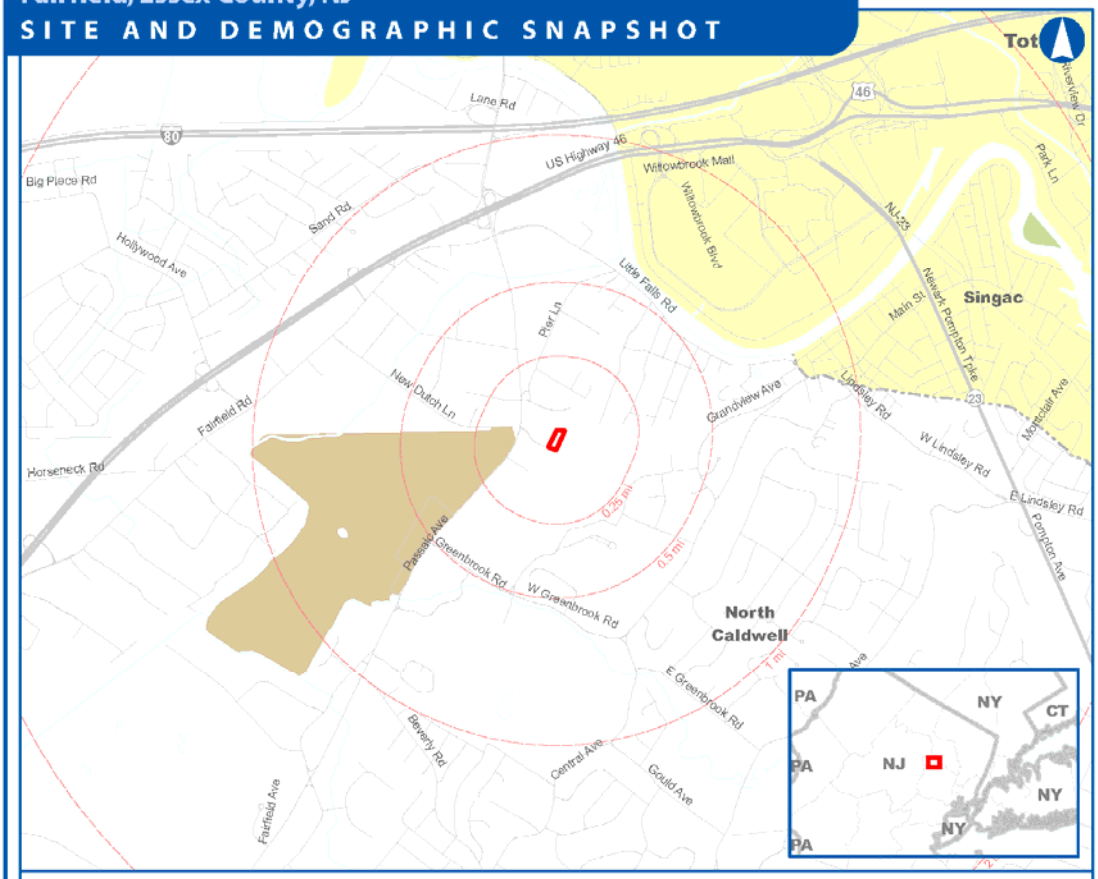
Unimatic Manufacturing Corporation

Fairfield, Essex County, NJ

SITE AND DEMOGRAPHIC SNAPSHOT

EPA FACILITY ID NJD002164796

INTRODUCTORY MAP SERIES



Demographic Statistics[4,5]

Within 1 mile buffer of site boundary

Measure	2000	2010	Change	Measure	2000	2010	Change
Total Population	3,524	3,789	+7%	Two or More Races	29	52	+79%
White Alone	3,232	3,446	+6%	Hispanic or Latino[6]	128	204	+59%
Black Alone	27	50	+85%	Children Aged 6 and Younger	290	274	-5%
Am. Indian & AK Native Alone	6	2	-66%	Adults Aged 65 and Older	547	805	+47%
Asian Alone	203	209	+2%	Females Aged 15 to 44	624	570	-8%
Native Hawaiian & Other Pacific Islander Alone	0	0	+0%	Housing Units	1,212	1,496	+23%
Some Other Race Alone	29	32	+10%	Housing Units Pre 1950	249	277	+11%

Data Sources: ¹ATSDR GRASP Hazardous Waste Site Boundary Database. ²ATSDR GRASP. ³TomTom International BV (2012). ⁴US Census 2010.
Notes: ⁵Calculated using area-proportion spatial analysis method. ⁶Individuals identifying origin as Hispanic or Latino may be of any race.
Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet.

PRJ 042S3 WVT9 11/18/15

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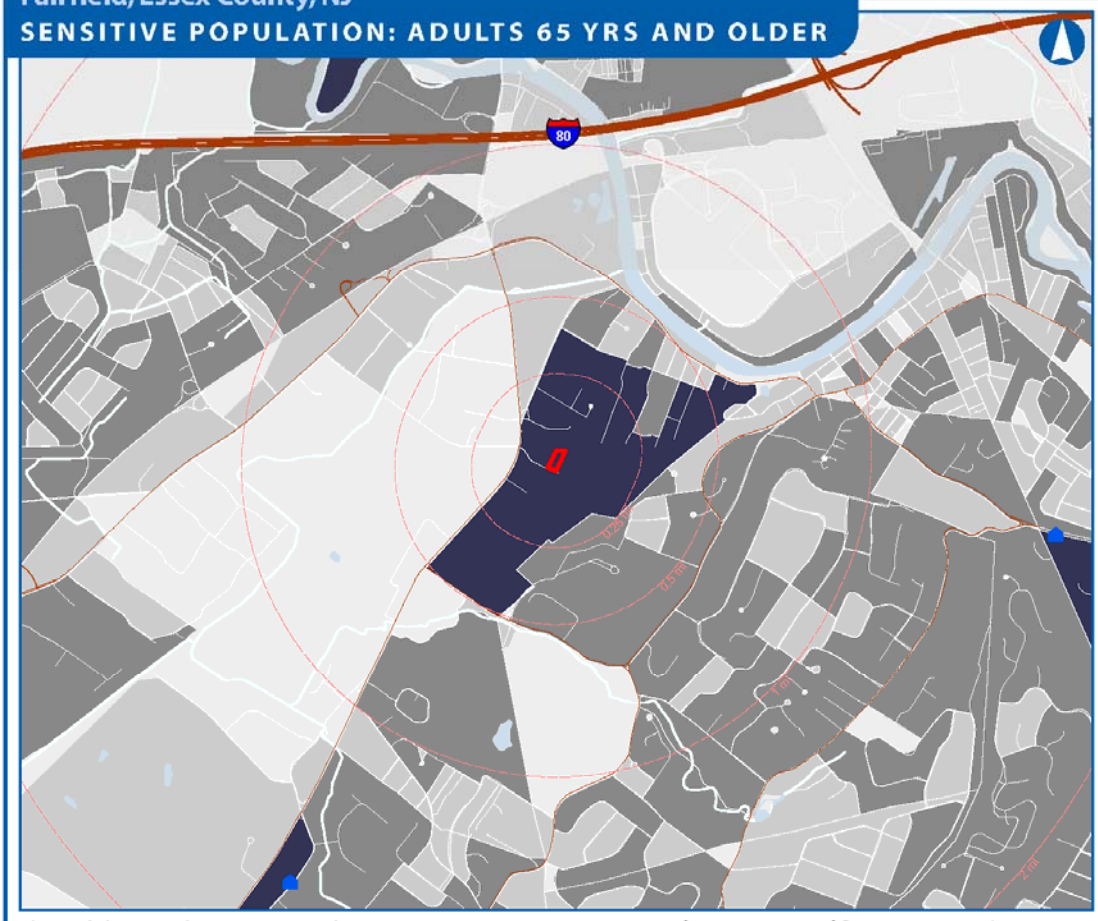
Fairfield, Essex County, NJ

SENSITIVE POPULATION: ADULTS 65 YRS AND OLDER

EPA FACILITY ID NJD002164796

INTRODUCTORY MAP SERIES



The **Adults Aged 65 Years and Older Map** depicts the site of interest and the distribution and number of adults residing in the surrounding community. The distribution of sensitive populations in and around a site is critical to understanding a community's potential for exposure to hazardous substances.

Within a **5-mile buffer** of this site are located **33,333** adults 65 years and older.

Site of Interest

- Site of Interest[1]
- Site of Interest Buffers[2]

Number of Adults 65 Yrs & Older by Census Block[3]

- Zero
- 1 to 10
- 11 to 100
- > 100

Healthcare and Elderly Facilities

- Hospitals[4]
- Nursing Homes[5]

0 0.5 1

Miles

Adults 65 Years and Older[3,6]

Within specified distance of site boundary

Distance	2000	2010	Change
0.25 mile	66	144	+118%
0.50 mile	208	360	+73%
1 mile	547	805	+47%
3 miles[7]	9,603	10,184	+6%
5 miles[7]	32,400	33,333	+2%

Data Sources: [1]ATSDR GRASP Hazardous Waste Site Boundary Database. [2]ATSDR GRASP. [3]US Census 2010. [4]Oak Ridge National Laboratory 2013. [5] Medicare.
Notes: [6]Calculated using area-proportion spatial analysis method. [7]Buffer not shown.
Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet.

GRASP PRJ ID 04753,11/18/15

GRASP

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Fairfield, Essex County, NJ

SENSITIVE POPULATION: CHILDREN 6 YRS AND YOUNGER

EPA FACILITY ID NJD002164796

INTRODUCTORY MAP SERIES

The **Children Aged 6 Years and Younger Map** depicts the site of interest and the distribution and number of children residing in the surrounding community. The distribution of sensitive populations in and around a site is critical to understanding a community's potential for exposure to hazardous substances.

Within a **5-mile buffer** of this site are located **15,922** children 6 years and younger.

Site of Interest

- Site of Interest[1]
- Site of Interest Buffers[2]

Number of Children 6 Yrs & Younger by Census Block[3]

- Zero
- 1 to 5
- 6 to 10
- > 10

Community Resources

- Hospitals[4]
- Day Care Centers[5]

0 0.5 1

Miles

Children 6 Years and Younger[3,6]

Within specified distance of site boundary

Distance	2000	2010	Change
0.25 mile	19	9	-52%
0.50 mile	89	73	-17%
1 mile	290	274	-5%
3 miles[7]	4,627	4,143	-10%
5 miles[7]	17,409	15,922	-8%

Data Sources: [1]ATSDR GRASP Hazardous Waste Site Boundary Database. [2]ATSDR GRASP. [3]US Census 2010. [4]Oak Ridge National Laboratory (2013). [5] Homeland Security Infrastructure Program 2011.
Notes: [6]Calculated using area-proportion spatial analysis method. [7]Buffer not shown.
Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet.

GRASP PRJ ID 04753, 11/18/15

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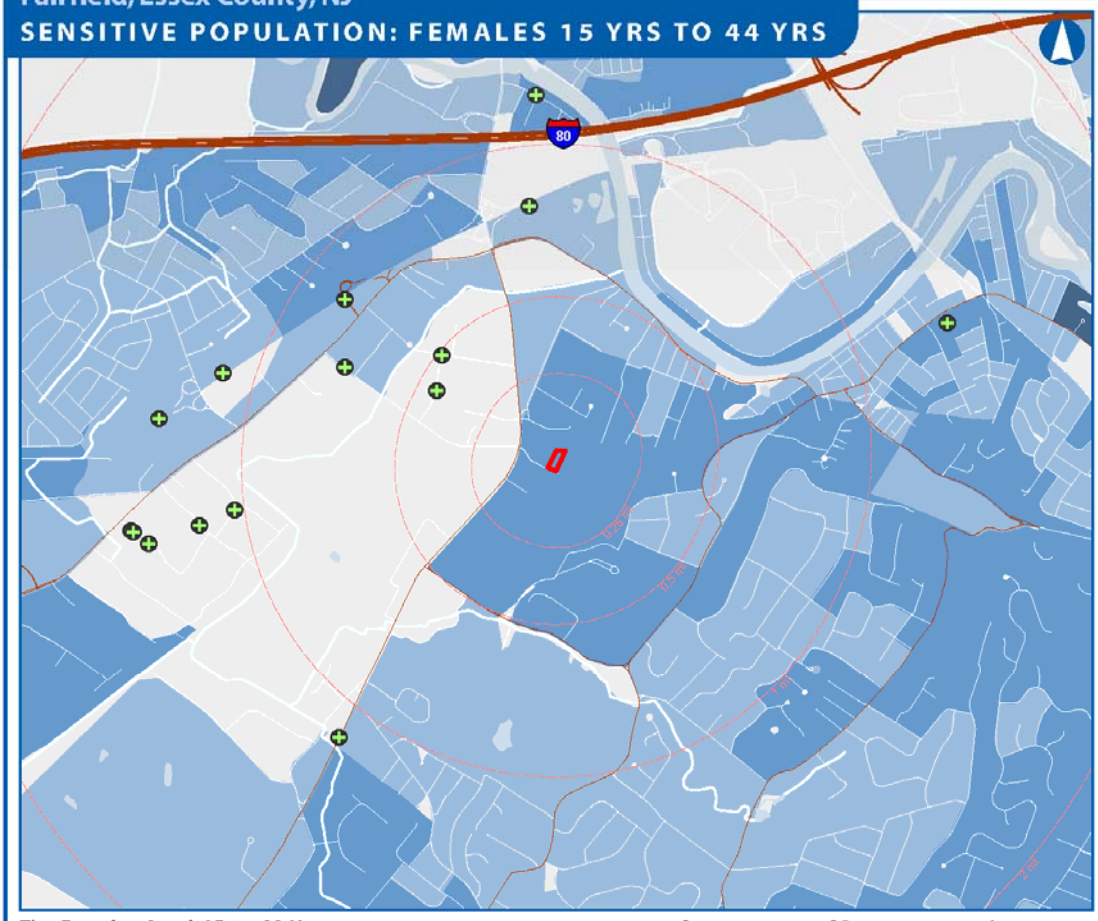
Fairfield, Essex County, NJ

SENSITIVE POPULATION: FEMALES 15 YRS TO 44 YRS

EPA FACILITY ID NJD002164796

INTRODUCTORY MAP SERIES



The **Females Aged 15 to 44 Years Map** depicts the site of interest and the distribution and number of females residing in the surrounding community. The distribution of population in and around a site is critical to understanding a community's potential for exposure to hazardous substances.

Within a **5-mile buffer** of this site are located **37,931** females aged 15 to 44 years.

Site of Interest

- Site of Interest[1]
- Site of Interest Buffers[2]

Number of Females 15 to 44 Yrs by Census Block[3]

- Zero
- 1 to 20
- 21 to 100
- > 100

Healthcare Facilities

- Hospitals[4]
- Pharmacies[5]

0 0.5 1

Miles

Females 15 to 44 Years[3,6]

Within specified distance of site boundary

Distance	2000	2010	Change
0.25 mile	42	34	-19%
0.50 mile	182	158	-13%
1 mile	624	570	-8%
3 miles[7]	11,275	9,797	-13%
5 miles[7]	39,602	37,931	-4%

Data Sources: [1]ATSDR GRASP Hazardous Waste Site Boundary Database. [2]ATSDR GRASP. [3]US Census 2010. [4]Oak Ridge National Laboratory (2013).[5] TomTom International BV (2012).
Notes: [6]Calculated using area-proportion spatial analysis method. [7]Buffer not shown.
Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet.

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Appendix C
Site Visit Photos

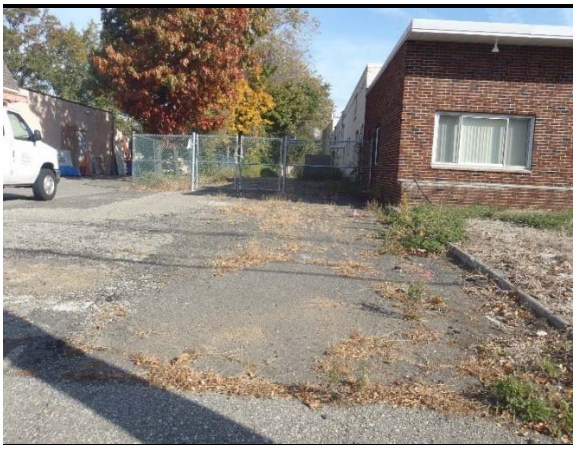
21 Sherwood Lane

30 Sherwood Lane

Front of Unimatic Site Building

Unimatic - Right Side Fence

JCMUA Lot to North of Site



Unimatic - Left Side Fence

Appendix D
Toxicological Summary - Polychlorinated biphenyls (PCBs)

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

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. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor. 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. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

PCBs enter the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs. PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators. 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. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil. 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.

People can be exposed to PCBs from old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure. Eating contaminated food are the main dietary sources of PCB exposure which include fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products. Other sources of exposure include breathing air near hazardous waste sites and drinking contaminated well water. In the workplace, exposures can occur during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

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 health effects studies of PCBs in the general population examined children of mothers who were exposed to PCBs.

Toxicological studies in 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 Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA 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. Trans-placental 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.

The chronic oral MRL for PCBs (0.00002 mg/kg/day) is based on a 55-month chronic study of female Rhesus monkeys which self-ingested capsules containing Aroclor 1254 in a glycerol/corn oil mixture. An uncertainty factor of 300 and a LOAEL of 0.005 mg/kg/day were used to calculate the MRL (ATSDR 2000). The lowest dose level tested, 0.005 mg/kg/day, is a LOAEL for decreased antibody response. Further support for the 0.005 mg/kg/day LOAEL is provided by mild clinical manifestations of toxicity at the same dose regarding eyelid and toe/finger nail changes observed in some monkeys at this dose level (ATSDR 2000).

The intermediate oral MRL for PCBs (0.00003 mg/kg/day) is based on a study of postnatal exposure effects to a PCB congener mixture, representing 80% of the congeners present in breast milk in Canadian women, on learning in monkeys. The tested dose level, 0.0075 mg/kg/day, produced a less serious LOAEL for neurobehavioral toxicity. Support for the LOAEL is provided by the occurrence of minimal immunological alterations in the same monkeys at 0.0075 mg/kg/day. An uncertainty factor of 300 and a LOAEL of 0.0075 mg/kg/day were used to calculate the intermediate MRL of 0.00003 mg/kg/day (ATSDR 2000).