PUBLIC HEALTH ASSESSMENT

HUNTINGTON LANDFILL
(a/k/a HUNTINGTON TOWN LANDFILL)
HUNTINGTON, SUFFOLK COUNTY, NEW YORK

SUMMARY

The Huntington Landfill is in the Town of Huntington, Suffolk County, New York. This site is owned by the Town of Huntington and was operated as a municipal landfill from 1935 to 1989. Due to public concerns related to the landfill, an individual petitioned ATSDR to perform a public health assessment.

Adjoining the 44 acre landfill is the town owned resource recovery facility which includes an incinerator. The 12 acres where the resource recovery facility is constructed (referred to as the leasehold property) was the site of three town owned municipal incinerators. The first incinerator was constructed in 1955 and was followed four years later by a second incinerator. The third incinerator was constructed in 1966. All three incinerators ceased operation and were decommissioned in 1989.

Groundwater downgradient from the landfill is contaminated with chlorinated solvents and metals. From 1973 to 1994 the Suffolk County Department of Health Services (SCDHS) sampled about 180 private drinking water wells downgradient from the landfill. Elevated levels of some volatile organic compounds (VOCs) which may be related to the landfill were detected in about fifty of the wells. To eliminate the potential for exposure to landfill-related compounds in drinking water, the New York State Department of Health (NYS DOH) requested that all homes with private wells contaminated or threatened by the groundwater contaminant plume from the landfill be connected to public water. The Town of Huntington connected homes downgradient from the landfill to public water in three phases. Phase I took place during 1986 and 1987, and Phase II was completed in 1989. Phase III began in 1993 and was completed in 1996.

From early 1989 to 1990, the excavation of land filled garbage from the leasehold property in preparation for construction of the resource recovery facility resulted in a community odor problem. During this period the community expressed concerns about possible health effects, including cancer, caused by the proximity of the Huntington Landfill. In response to community concerns the NYS DOH conducted a cancer incidence study for the area around the site. The cancer study covered the years 1978 through 1987. Although there was a statistically significant elevation of cancer incidence for some types of cancer for the study area as a whole, examination of data for specific census tracts did not point to a geographic link between the areas of cancer incidence and the area where the landfill is located or where groundwater contamination occurs.

Because people were exposed to volatile organic compounds (primarily tetrachloroethene and trichloroethene) in private drinking water at levels above New York State Drinking Water Standards near the Huntington Landfill site, public health actions were needed to reduce or eliminate exposures. Because there is evidence from studies in animals and humans that exposure

to elevated levels of tetrachloroethene and trichloroethene can increase the risk of cancer and non-cancer adverse health effects in humans, we evaluated the potential health risk for exposure to these chemicals at the Huntington Landfill. Exposures in the past could pose a low increased risk of cancer and a low risk for non-cancer effects. Furthermore, some private water supply wells contained the inorganic contaminants nitrate and thallium at levels that could increase the risk of adverse health effects. To eliminate exposure to site-related contaminants in drinking water, the Town of Huntington has connected homes with private wells downgradient from the landfill to public water supplies. Due to the extension of public water and the construction of the landfill cap, which includes landfill gas collection/control systems, this site currently poses no apparent public health hazard.

To reduce the potential for exposure to contaminants from the landfill, at the request of the NYS DOH, the Town of Huntington has provided public water to homes with private wells that were contaminated or threatened by the groundwater plume migrating from the site. The town has also constructed a cap on the landfill which includes gas collection systems. The landfill gas collection systems effectively control soil gas migration and the release of landfill related contaminants to the air in concentrations that represent a health concern.

The NYS DOH has recommended: the installation of a groundwater monitoring well between the groundwater contaminant plume and the Gun Club Road public drinking water supply wells to provide an "early warning" mechanism should the contaminant plume migrate toward these public drinking water supply wells; continued monitoring of surface water in the Sunken Meadow Creek; and institutional controls to restrict future use of the property to reduce exposure to contamination present in the landfill. Residents who were exposed in the past to VOCs in drinking water will be considered for inclusion to the NYS DOH VOC exposure registry.

BACKGROUND

Under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the New York State Department of Health (NYS DOH) will evaluate the public health significance of the Huntington Landfill site. More specifically, ATSDR and the NYS DOH will determine whether health effects are possible and will recommend actions to reduce or prevent possible health effects.

A. Site Description and History

The Huntington Landfill (also known as the East Northport Landfill) is a 56-acre site located in a residential and light industrial area in the Town of Huntington, Suffolk County, New York. The site is owned and operated by the Town of Huntington. Sand and gravel mining operations, wooded land and residential areas surround the site (Appendix A, Figure 1). The site was originally cultivated as farmland until 1935, when sand mining operations and disposal of municipal solid waste (i.e., land-filling and open burning) began. The landfill, which comprises 44 acres of the site, operated continuously from 1935 to 1989. Three incinerators along with other auxiliary structures used for landfill and incineration activities were on the remaining 12 acres referred to as the leasehold property. The first of three incinerators was constructed in 1955,

and was followed four years later by a second incinerator. Both of those units were batch-feed type furnaces. The third incinerator was constructed in 1966 and contained a continuous-feed type furnace. None of the incinerators could separate out recyclable materials. Prior to incinerating refuse, automobile bodies and large bulky metal items were removed and stockpiled by a private party under an agreement with the town. The incinerators ceased operations and were decommissioned in the summer of 1989.

Two surface water bodies on the leasehold property were maintained at the disposal complex during the years the incinerators operated. One was a storm water recharge basin; the second basin was for wastewater Exiting ATSDR Website from the incinerator's scrubber systems, temperature control processes and ash quenching. A culvert at the eastern end of the wastewater basin discharges to the storm water basin. Discharges to the wastewater basin were eventually halted and the wastewater was treated and recirculated. Discharge was then directed to that basin only during times when the treatment system was backwashed. Direct discharge of untreated wastewater ended in 1986. As of 1986, an estimated 78 million gallons of untreated wastewater from the town's incinerators had been discharged to groundwater.

In June of 1989, the town's consultant completed an investigation of the leasehold property which included sampling of soil, surface water, incinerator ash and sediments. Following this investigation, the leasehold property, on which three incinerators were previously located, was excavated to construct a resource recovery plant, which includes a new incinerator. Areas of soil excavation from the 12-acre parcel of land included the storm water recharge basin and the incinerator wastewater discharge basin. All soil and municipal garbage excavated from the leasehold property were disposed in the landfill. The garbage excavated from the leasehold property to construct the resource recovery facility caused community odor problems from the spring of 1989 through early 1990. During this period odor complaints related to the landfill were received from areas up to five miles away from the site. The resource recovery facility was completed and began operation in 1991.

During its operation the landfill accepted predominantly municipal waste. Other waste reportedly disposed in the landfill includes up to five tons of waste cosmetics containing alcohol, acetone or nitrocellulose, up to 0.05 tons of solvent vapor degreaser sludge Exiting ATSDR Website, animal carcasses, sewage sludge, tires, wet bag asbestos, incinerator ash and demolition material from the old incinerator.

The landfill rises to a height of about 225 feet above grade, with a depth of at least 50 feet below grade. Since the landfill is unlined, leachate discharges to the groundwater. Leachate is the contaminated liquid produced when water percolates through waste. In 1973, the Suffolk County Department of Health Services (SCDHS) began collecting samples from private wells servicing homes near the landfill. Elevated levels of chlorides, nitrate and some volatile organic compounds (VOCs) were detected in some of the private wells northeast of the landfill. The SCDHS advised residents with wells contaminated above NYS DOH public drinking water guidelines not to drink or cook with their well water and to connect to public water.

In 1979, a groundwater monitoring program initiated by the town determined that groundwater

contaminants were migrating from the landfill in a northeast direction. The first regulatory action taken by the New York State Department of Environmental Conservation (NYS DEC) at the East Northport Landfill was a Consent Order issued in 1981. Issued in response to initial water quality sampling data, the Order required the town to investigate and use alternatives for solid waste reduction, to install groundwater monitoring wells, to expand methane controls and to develop a comprehensive closure plan for the landfill. In return, the State agreed to waive an enforcement hearing.

To eliminate the potential for exposure to landfill-related chemicals in drinking water, the town agreed to provide public water to homes with private wells that are or could be contaminated. Public water main extensions and public water hookups in areas affected or threatened by the groundwater contaminant plume were done in three phases (Appendix A, Figure 2). Phase I took place during 1986 and 1987, and phase II was completed in 1989. At the request of the NYS DOH, the town surveyed private wells in the area downgradient from the landfill. As a result of that survey, homes with private wells affected or threatened by the groundwater contaminant plume have been connected to public water.

In 1978, the Town of Huntington installed a venting system to monitor and control off-site migration of methane. Methane is a colorless, odorless gas produced when bacteria decomposes organic waste in an oxygen deprived environment. Methane gas burns and can explode if elevated concentrations become trapped in a confined space, such as a basement. The lower explosive limit (LEL) or the lowest level of methane in air that will ignite is 5% gas by volume, or 50,000 parts per million (ppm). NYS DEC requirements for monitoring landfill gas control systems indicate that the concentration of methane and other explosive gases generated by the facility must not exceed 25% of the LEL (12,500 ppm) inside structures on-site or off-site, and/or the LEL (50,000 ppm) in soil gas at or beyond the property boundary. The methane gas venting system was upgraded and expanded in 1979, 1981 and 1986, to include an active gas collection system and a landfill gas utilization system where collected gas was piped to a combustion engine/electric generator. In addition, soil gas monitoring wells were placed on the perimeter of the site to determine if soil gas is migrating off-site.

In January 1987, the 56-acre site was accepted to the NYS DEC Registry of Inactive Hazardous Waste Disposal Sites as representing a significant threat to the public health or environment. A remedial investigation/feasibility study (RI/FS) is conducted at all such sites. An RI determines the nature and extent of contamination related to a site. The FS uses the information provided by the RI to develop remedial actions that will eliminate the threat to public health or the environment posed by the site. In March 1991, the town signed a NYS DEC Order on Consent which provided for an RI/FS. The RI/FS was completed in 1995.

The RI confirmed the presence of a groundwater contaminant plume migrating in a northeasterly direction from the landfill. Contaminants detected in groundwater include chlorides, VOCs and low concentrations of some metals. Based on surface water samples and groundwater modeling, the plume appears to discharge into the Sunken Meadow Creek about two miles from the landfill. VOCs were also detected in samples taken from the landfill gas collection system and in on-site ambient air samples.

Concurrent with the RI/FS, the town proceeded with an interim remedial measure (IRM) related to the closure and capping of the landfill. In July of 1993, the NYS DEC approved a landfill cap design with construction starting in October 1994. Construction of the cap was completed during the summer of 1996. The cap includes surface water and active landfill gas collection systems. Currently, the town vents all collected gas to the atmosphere.

In October 1989, the ATSDR received a petition from a local citizen requesting the agency to evaluate the health concerns reported by community residents. The petitioner specifically expressed a concern that exposure to contamination from the landfill may result in serious illnesses (i.e., birth defects and cancer).

In January 1990, representatives from ATSDR met with the NYS DOH, SCDHS, NYS DEC and members of the community, including the petitioner, to conduct a site visit and to gather preliminary information about the landfill. Based on that visit and the additional information provided by concerned agencies, the ATSDR decided to prepare a public health assessment for the Huntington Landfill site.

B. Public Health Actions Implemented

In 1986, the town began providing public water to homes with private wells contaminated or threatened by the groundwater contaminant plume migrating from the landfill.

On March 16, 1992, Dr. James Melius, then Director of the NYS DOH Division of Occupational Health and Environmental Epidemiology met with the public to discuss the cancer investigation study completed in 1991 (Appendix E).

The NYS DEC held a public meeting on June 30, 1993, to discuss the result of the remedial investigation. Representatives of the NYS DOH and SCDHS were present to address health related questions.

In the summer of 1996, the town completed construction of the landfill cap. The landfill gas collection systems included in the cap have eliminated the odor problems associated with the landfill and effectively control soil gas migration.

C. Site Visit

NYS DOH staff (Mr. Joseph Crua and Ms. Carole Ju) and ATSDR personnel (Dr. Mike Allred, Mr. William Nelson and Ms. Brenda Kay Edmonds) visited the Huntington Landfill site in January 1990. Three inactive incinerators and a maintenance garage were on-site. The site was operating as a transfer station for municipal waste to be sent to the nearby Smithtown Landfill. Several workers were observed during the site visit. The site was fenced and access was controlled.

ATSDR observed no evidence of fluid seepage Exiting ATSDR Website from the landfill during the site visit. Garbage was being excavated from the leasehold property to prepare for

construction of the resource recovery facility. The excavation of the garbage produced strong, unpleasant odors which were detected while on the site. Similar odors were reported by residents living up to 5 miles away from the site. During this site visit odors were very noticeable throughout the nearby residential areas. Several public schools are within two miles of the site. The Northport Veterans Administration Hospital is about one mile northwest of the site.

On May 18, 1995, Joseph Crua and Nina Knapp with the NYS DOH and Mike Komoroski with the NYS DEC visited the site. The entire landfill was regraded to stabilize sloped areas and was in the process of being capped. A heavy soil layer with gas vent pipes was in place and the perimeter soil gas collection system was operating. Landfill-related odors were not detectable around the perimeter or at the base of the landfill. A very slight odor was intermittently detectable on top of the landfill. Two recharge basins, one on the leasehold property and one at the eastern base of the landfill, were under construction. The recharge basins will receive surface water runoff from the landfill. The site is totally fenced and access to the site is limited to a guarded gate on Town Line Road.

The NYS DEC visits this site periodically, most recently in May of 2002. They reported that the landfill cap was well maintained and in good condition. No odor was detected at the landfill. The entire site is fenced to prevent unauthorized access.

D. Demographics, Land Use, and Natural Resource Use

Demographics

From the 1990 Census data, the NYS DOH estimates that 8,117 people live within 1 mile of the landfill. The population within 1 mile of the site is 95.9 percent white, 1.5 percent black, and 2.6 percent other races. The age structure is 6.1 percent is under 6 years of age, 19.3 percent is 6-19 years of age, 67 percent is 20-64 years of age and 7.6 percent is 65 years or older. The Huntington Landfill is in census tract 1117.03 where the median household income in 1989 was $51,021 and no families live below the poverty level.

Land Use

Land use in the immediate area around the site is industrial, residential, recreational and commercial (Appendix A, Figure 3). Based on the RI, a fuel oil company and a bus depot are northwest of the former Long Island Lighting Company (LILCO), now Keyspan right-of-way. The Keyspan right-of-way extends along the entire western border of the site and is about 206 feet wide. The remaining area west of the Keyspan right-of-way is residential. North of Pulaski Road is an extensive residential area which includes part of the Towns of Smithtown and Huntington. This residential area in Huntington is characterized by single-family homes on one-acre lots. In Smithtown, the residential area north of Pulaski Road is also zoned for one-acre lots and further east for half-acre lots.

The south side of Pulaski Road in the Town of Huntington is uniformly developed with single-family dwellings, with the exception of one property located on the west of Town Line

Road, between the Long Island Railroad (LIRR) property and Pulaski Road, which is zoned as light industrial. The parcels situated south of Pulaski Road and east of Town Line Road in Smithtown are also classified as light industrial. This area is comprised of sand mining facilities, truck yards, sand and gravel operations, and commercial establishments. The area south of the landfill is residential.

The utilities near the East Northport Landfill are maintained by Keyspan and Suffolk County Water Authority. The Keyspan right-of-way property, west of the landfill, contains underground power lines and a natural gas pipeline (known as the Iroquois Pipeline) installed in the spring of 1992 and located west of the Keyspan power lines. The water supply system in the area surrounding the landfill is owned and maintained by Suffolk County Water Authority (SCWA). The system consists of a 6-inch water main on the south side of Pulaski Road and a 12-inch water main to the east of Town Line Road.

Natural Resource Use

Groundwater on Long Island is comprised primarily of the Upper Glacial, Magothy and Lloyd aquifers. The aquifer system has been designated by the U.S. Environmental Protection Agency (EPA) as a Sole Source Aquifer System pursuant to section 1424(e) of the Safe Drinking Water Act. Most water supply wells in the area are in the Upper Glacial and Magothy aquifers, establishing them as aquifers of concern. The Lloyd aquifer is overlain by the relatively impermeable Raritan clay which separates it from the Upper Glacial and Magothy aquifer. There is no immediate concern that the Lloyd aquifer is subject to contamination from overlying surface activities.

No critical wildlife habitats or historical landmark sites are within three miles of the site.

E. Health Outcome Data

The NYS DOH maintains several health outcome data bases which could be used to generate site specific data, if warranted. These data bases include the cancer registry, the congenital malformations registry, the heavy metals registry, the occupational lung disease registry, vital records (birth and death certificates) and hospital discharge information.

The NYS DOH established the Volatile Organic Compound Exposure Registry (VOC) in 1999. It will be used to evaluate health effects possibly associated with exposure to VOCs in drinking water. People who were exposed in the past to site-related VOCs in drinking water near the Huntington Landfill will be considered for inclusion in the VOC registry.

In October 1991, the NYS DOH completed a cancer incidence study for the area around the landfill. The study was conducted to address community concerns about the possibility of health effects caused by the site. The study focused on the years 1978 through 1987, which was the most recent period for which cancer reporting was complete for small area analysis. Results of the cancer incidence investigation are discussed in the Public Health Implications section of this document.

The Huntington landfill site was included in a cancer incidence study completed by the NYS DOH in July 1998. The study evaluated cancer incidence among people living near a total of 38 landfills with similar potential soil gas migration conditions. Seven types of cancer were evaluated: liver, lung, bladder, kidney, brain, non-Hodgkin's lymphoma and leukemia. For Huntington Landfill, as well as most of the other landfills in the study, people who lived within 250 feet of the landfill (the potential exposure areas) were compared with people living further away in order to see if the people living very close were more likely to have been diagnosed with one of the seven cancers during the time period 1980 to 1989. The study analyzed all the landfills as a group because not enough people lived near any one landfill to conduct landfill-specific analysis. Results of this study are discussed in the Public Health Implications section of this document.

COMMUNITY HEALTH CONCERNS

In the past, members of the community living near the Huntington Landfill have reported numerous health concerns to the NYS DOH, SCDHS, NYS DEC and ATSDR. Reported illnesses include headaches, nausea, dizziness, allergy problems, bacterial infections, eye and throat irritation, asthma, sinus and respiratory infections, cancer (e.g., lung, breast and skin) and adverse reproductive outcomes.

Specific health-related concerns are summarized as follows:

1. Some community members believe that there was an increased incidence of cancers in the community near the landfill.

2. Some community members believe that health problems may be associated with exposure to contaminants migrating from the landfill in air and groundwater. Concerns were also expressed about fly ash from the old incinerators and air contamination from the resource recovery facility.

3. During excavation of garbage from the leasehold property in 1989 and 1990, members of the community as far as five miles from the site complained about "sewage like" odors emanating from the landfill. Illnesses, including headaches, nausea, dizziness, eye and throat irritations and bacterial infections were reported by the community during this period.

4. Residents were concerned that during the 1989-1990 school year, school attendance decreased and headaches, nausea, dizziness, and respiratory infections increased in children attending schools near the landfill.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

To evaluate if a site poses an existing or potential hazard to the exposed or potentially exposed

population(s), the site conditions are characterized. Site characterization involves a review of sampling data for environmental media (e.g., soil, surface water, groundwater, air) both on- and off-site and an evaluation of the physical conditions of the contaminant sources or physical hazards near the site which may pose an additional health risk to the community or receptor population(s).

Contaminants selected for further evaluation are identified based upon consideration of the following factors:

1. Concentrations of contaminant(s) in environmental media both on- and off-site;

2. Field data quality, laboratory data quality, and sample design;

3. Comparison of on-site and off-site contaminant concentrations in environmental media with typical background levels;

4. Comparison of contaminant concentrations in environmental media both on- and off-site with public health assessment comparison values for (1) noncarcinogenic endpoints and (2) carcinogenic endpoints. These comparison values include Environmental Media Evaluation Guides (EMEGs), Cancer Risk Evaluation Guides (CREGs), drinking water standards and other relevant guidelines. Contaminant concentrations which exceed a comparison value do not necessarily pose a health threat; and

5. Community health concerns.

The selected contaminant(s) are evaluated in the Public Health Implications section (Toxicological Evaluation) of the Public Health Assessment (PHA) to determine whether exposure to these chemicals is of public health significance.

The On-Site Contamination and the Off-Site Contamination subsections include discussions of sampling data for environmental media; summary tables of sampling data are presented in Appendix B. If a chemical is selected for further evaluation in one medium (e.g., soil, sediment, surface water, groundwater, air), that contaminant will also be reported in all other media, if detected. A listed contaminant does not necessarily mean that it will cause adverse health effects from exposure.

For the purpose of evaluating environmental sampling data and site conditions in this public health assessment (PHA), "on-site" refers to the area within the property boundary as indicated in Appendix A on Figure 1 of this PHA and "off-site" refers to all areas outside of the property boundary.

A. On-site Contamination

Groundwater

Depth to groundwater in the Upper Glacial aquifer within the area of the landfill ranges from 60 to 135 feet below grade. The water table is not static but fluctuates in response to changes in groundwater storage. The fluctuations are cyclical and are associated with the seasonal differences in the rates of recharge from precipitation and of discharge by evapotranspiration. Within the study area, the water table slopes gently towards the Long Island Sound and Sunken Meadow Creek at 20 to 30 feet per mile.

Monitoring well CW-5, which was on the northwestern side of the site, was developed in 1987 and was the only on-site groundwater monitoring well. Elevated levels of arsenic (8-20 micrograms per liter [mcg/L]), lead (17-34 mcg/L), and bis(2-ethylhexyl)phthalate (200-360 mcg/L) were detected in samples taken from this well. Groundwater quality up-gradient, and down-gradient from the landfill is discussed in subsection B (Off-Site Contamination) of the "Environmental Contamination and Other Hazards" section of this document.

Landfill Leachate

During the RI, leachate samples were taken from the northern edge of the landfill. Since leachate at this site is not present at the surface, samples were obtained by digging into the fill area, and by accessing an inactive subsurface drain. These samples are not representative of the leachate at the base of the landfill, which is at least 50 feet below ground surface. Leachate samples at the base of the fill area could not be obtained. Acetone and methylene chloride were detected in leachate samples at maximum concentrations of 32 and 3 mcg/L, respectively. Since these compounds were also detected in the laboratory instrumentation blanks, their presence in the samples may be due to laboratory contamination.

Low levels of polycyclic aromatic hydrocarbons (PAHs) (3-15 mcg/L) and trace concentrations of some organochlorine insecticides (0.01-0.12 mcg/L), polychlorinated biphenyls (PCBs) 0.75 mcg/L) and pentachlorophenol (5.0 mcg/L) were also detected in one or more of the leachate samples. Elevated levels of metals including arsenic (85.7 mcg/L), barium (4,210.0 mcg/L), cadmium (33.3 mcg/L), chromium (431.0 mcg/L), lead (4,780.0 mcg/L) and mercury (6.3 mcg/L) were detected in the samples. However, the elevated levels of metals are most likely due to the high concentration of particulates in the samples. When analyzing liquid samples for metals, the sample is preserved in the field by adding acid. When a sample is acidified, contaminants in the particulate fraction of the sample can leach (dissolve) from the particulates into the liquid portion of the samples, thereby increasing the level of contamination in the liquid.

Surface Water

In 1989, several surface water samples were collected from the incinerator quench water discharge basin, and the storm water recharge basin on the leasehold property. The low levels of VOCs and metals detected in these surface water samples did not exceed public health

comparison values and/or guidelines.

During the RI, a surface water sample was collected from the recharge basin on the western side of the landfill, within the fenced perimeter of the site. Low levels of three organochlorine insecticides (delta-hexachlorocyclohexane, dieldrin, and endosulfan sulfate) were detected in this sample at concentrations ranging from 0.01-0.02 mcg/L. Lead was also detected in this sample at a concentration of 23 mcg/L. The concentrations of these compounds in surface water did not exceed public health assessment comparison values and/or guidelines.

Sediment

In 1989, several surface sediment samples were collected at a depth of zero to six inches from the incinerator quench water discharge basin and the storm water recharge basin on the leasehold property. The levels of PAHs including benz(a)anthracene (7.2 milligrams per kilogram [mg/kg]), benzo(b)fluoranthene (9.4 mg/kg), benzo(a)pyrene (6.0 mg/kg), and indeno(1,2,3-cd)pyrene (4.8 mg/kg) detected in these samples exceed public health assessment comparison values for these soil contaminants (Appendix B, Table 7).

During the RI, four surface sediment samples were collected at a depth of zero to six inches from the western recharge basin. Two of the sediment samples are a composite of six samples spread over an area of about 200 square feet. This on-site sediment was elevated for the PAHs: benzo(a)pyrene (3.6 mg/kg), benz(a)-anthracene (4.7 mg/kg) and benzo(b)fluoranthene (4.3 mg/kg) at levels that exceed public health assessment comparison values for these soil contaminants (Appendix B, Table 7). Since these samples were collected, soil was excavated from the on-site recharge basins and placed on the landfill prior to construction of the cap.

Incinerator Ash

In 1989 incinerator ash samples were collected from the bottom of the incinerator quench water discharge basin. The ash samples were analyzed for metals only. Lead was detected at a concentration of 12,570 mg/kg which exceeds the public health assessment comparison value for this metal. It is common to detect metals and PAH's in incinerator ash. Since these samples were collected, all ash and potentially contaminated underlying soil was excavated from the incinerator quench water discharge basin and disposed under the landfill cap.

Soil

In 1989, on-site soil samples were collected at the resource recovery facility from 50 test pits and 20 test borings, and 13 surface soil samples (0-6 inches below surface). Soil samples were not available on the landfill area. Lead, arsenic, chlordane, and PAH's were detected in these samples, but at levels that did not exceed background and/or public health assessment comparison values. Municipal garbage, incinerator ash, and all other areas of contamination identified in 1989 were excavated and placed under the landfill cap.

Ambient Air

On-site ambient air samples were collected in 1992 and in 1994. Although VOCs were detected in samples collected in 1992, the presence of these compounds cannot definitely be attributed to the landfill since upwind (background) samples were not collected. The results of the ambient air samples collected in 1994 are provided in Appendix B, Table 1. Based on these results, the landfill may be the source of trichloroethene, tetrachloroethene, 2-butanone and chloromethane, since these VOCs were detected in the on-site or downwind samples but were not present in the background samples. Furthermore, the highest levels of tetrachloroethene and trichloroethene (17 and 12 micrograms per cubic meter, respectively) exceeded levels typical of urban/suburban areas as well as public health comparison values (see Table 6).

As part of the RI in 1996, the Industrial Source Complex (ISC) model was used to evaluate the potential on-site and off-site exposures to site-related contaminants in air. Using the concentration of contaminant measured or estimated at the pollutant source, the ISC model considers meteorological and topographical conditions to predict an annual average concentration of contaminant potentially present at an on-site or off-site receptor location. The sources of volatile organic air contaminants at this site include the passive vents in the landfill cap and the blower station stack where actively collected landfill gas is discharged into the air. The associated health risk can then be calculated using the modeled level of exposure. The health risks associated with exposure to site-related air contaminants are discussed in the Public Health Implications section of this document.

Since collection of landfill gas samples for specific VOC analysis was conducted in 1996 for use in the ISC model, additional rounds of sampling for VOCs were conducted in 1998, 1999, and 2001. The levels of VOCs detected in these subsequent sampling events are comparable to those from 1996.

Indoor Air

Monitoring for methane is conducted on a monthly basis inside the animal shelter on the northwest corner of the site, outside of the active methane collection system. The animal shelter was constructed with a sub-slab ventilation system to prevent the migration of methane into the structure. Although methane was detected on one occasion in a soil gas probe underneath the building, methane has not been detected inside of the structure. A methane alarm system is also present inside the animal shelter. Subsequent monitoring in the soil gas probes beneath the animal shelter has not detected methane.

Soil Gas

Soil gas monitoring well clusters (Appendix A, Figure 4) along the perimeter of the landfill are monitored for methane on a monthly basis to determine if landfill gas is migrating off-site. Since the monthly monitoring program began in 1978, methane was often detected in some of the landfill gas monitoring wells. When methane was detected in perimeter monitoring wells, an investigation was conducted to determine if soil gas was migrating onto neighboring properties. Based on the results of these investigations, methane was not migrating onto residential properties. However, there are no data to determine if landfill gas was migrating onto residential

properties prior to 1978.

During the RI, landfill gas samples were collected from the perimeter soil gas monitoring wells and analyzed for VOCs. Methane can facilitate the migration of VOCs which are commonly found in gas samples from municipal landfills. The results of these samples, which are presented in Appendix B, Table 2, indicate that VOCs are present in soil gas.

Since these samples were taken, a cap was constructed on the landfill. The cap includes a gas ventilation layer and an active perimeter soil gas collection system. The 43 perimeter soil gas monitoring wells are monitored on a monthly basis. On occasion methane at levels below the LEL have been detected in 11 of the perimeter soil gas monitoring wells. Since October 1999, the highest level of methane gas detected in a perimeter soil gas monitoring well was 9,000 ppm or 0.9% gas by volume, which is below the NYS DEC regulatory limit of 50,000 ppm or 5.0% gas by volume.

B. Off-site Contamination

Groundwater (monitoring wells)

To characterize groundwater quality near the site, groundwater monitoring wells were placed hydraulically upgradient and downgradient from the landfill (see Appendix A, Figure 5). The lowest and highest concentration of contaminants detected in groundwater samples are presented in Appendix B, Table 3. The results of the RI groundwater study which included sampling of monitoring wells, private wells, and groundwater modeling would indicate that a contaminant groundwater plume is migrating from the landfill in a northeasterly direction.

The contaminant plume extends about 2 miles from the landfill, toward the Sunken Meadow Creek (Appendix A, Figure 5), is about 2,400 feet wide, and is sinking in the Upper Glacial aquifer as it moves downgradient. Near the Sunken Meadow Creek shallow groundwater flows upward and discharges to the creek.

VOCs including total 1,2-dichloroethene (0.7-31 mcg/L), trichloroethene (1.0-40 mcg/L), and tetrachloroethene (0.7-34 mcg/L) were detected in downgradient monitoring wells. The maximum concentrations of these compounds that exceed NYS DOH public drinking water standards and/or public health assessment comparison values are shown in Table 3. In addition, metals detected above NYS DOH public drinking water standards and/or public health assessment comparison values are also identified in Table 3. Since 1996 groundwater samples are collected on a semi-annual basis from 11 downgradient monitoring wells developed in the shallow, middle and deep zones of the upper glacial aquifer. The levels of contaminants detected in these groundwater samples are comparable to those collected during the RI.

Groundwater (private wells)

Since 1973, the SCDHS has sampled about 180 private wells in the area northeast of the landfill. VOCs including 1,1-dichloroethane (0.2-10 mcg/L), 1,1,1-trichloroethane (0.2-62 mcg/L),

trichloroethene (0.4-150 mcg/L), tetrachloroethene (0.2-39 mcg/L), and total 1,2-dichloroethene (1-16 mcg/L) have been detected in some of these wells (see Appendix B, Table 4). Metals detected include lead (1.0-41.2 mcg/L) and thallium (2.4-50 mcg/L). Nitrates have also been detected in some of the private wells at concentrations ranging from 300 to 24,900 mcg/L. The maximum concentrations of these contaminants exceed current NYS DOH public drinking water standards and/or public health assessment comparison values (Appendix B, Table 5). To eliminate the potential for exposure to site-related contaminants in drinking water at the request of the NYS DOH, the SCDHS and the NYS DEC, the town connected homes downgradient from the site to public water. Public water was supplied to homes in three phases. Phase I took place during 1986-87 and phase II was completed in 1989. The third phase was completed in 1996.

Groundwater (public drinking water wells)

Groundwater is the exclusive source of public drinking water in Suffolk County. The Gun Club Road public drinking water supply wellfield is the only source of public drinking water supply wells within 1.5 miles of the landfill. The Gun Club Road wellfield includes three wells, and is about 2,800 feet north/northwest of the site. Since early 1980, slightly elevated levels of nitrate (8.3-11.9 milligrams per liter [mg/L]) have been detected in Gun Club Road well #2. The NYS DOH public drinking water supply standard for nitrate is 10 mg/L. Trace concentrations of VOCs including 1,1,1-trichloroethane (0.70-5.0 mcg/L), tetrachloroethene (0.80-2.0 mcg/L), trichloroethene (1.0 mcg/L) and 1,1-dichloroethane (1.0 mcg/L) have also been detected in well #2 since 1988. All VOCs detected in well #2 do not exceed NYS DOH public drinking water standards. Moreover, due to concerns about groundwater quality, well #2 was taken out of service in 1990.

Two drinking water supply wells serving the Sunken Meadow State Park are about 2.7 miles downgradient from the landfill. These wells are classified as community drinking water supply wells and currently meet public drinking water standards. The drinking water at the beach area in Sunken Meadow State Park is supplied by the SCWA. To reduce the potential for exposure to contaminants in groundwater, in the near future all of Sunken Meadow State Park will be connected to public water supplied by the SCWA. The wells at the park will be maintained for irrigation purposes.

Surface Water

Surface water samples were collected from the Sunken Meadow Creek once in 1994 during the RI, then semi-annually starting in 1996. Since collection of surface water samples began, VOCs related to the site have been detected only at low levels of 1.0-6.9 mcg/L. Chloride and sulfates were the only inorganic parameters (landfill leachate indicators) detected at levels exceeding NYS DEC surface water standards. However, the elevated levels of chloride and sulfate are detected in surface water samples collected at a location within the tidal portion of the Sunken Meadow Creek and thus are believed to be present due to the influence of saline surface water.

Sediments

Sediment samples were collected from the Sunken Meadow Creek and analyzed for VOCs. VOCs were not detected in any of these samples.

Ambient Air

In response to community concerns about odors coming from the landfill in November 1989 the SCDHS collected ambient air samples for VOC analysis at several locations on the site border. Benzene and toluene were each detected in concentrations between 1-2 parts per billion (ppb). These concentrations are not elevated above what would be expected for an urban/suburban area (background). A third VOC, Freon 12 was also detected in one sample at a concentration of 19 ppb which is above what would be expected for an urban/suburban area.

Off-site ambient air was sampled at the landfill in 1994. Samples were collected up-wind and downwind from the landfill. Acetone and chloromethane were detected in samples collected downwind from the site (Appendix B, Table 1). However, only chloromethane may be attributable to the landfill since acetone was also detected in samples collected upwind from the site. The ambient air samples collected in 1994 may not represent worst case air quality conditions at the site since sampling was performed when barometric pressure was high. The gas released from a municipal landfill increases with decreasing barometric pressure. As discussed previously in the on-site Contamination section, the ISC dispersion model was used to evaluate potential on-site and off-site migration of site-related air contaminants.

Soil Gas

The town has been monitoring soil gas migration at the landfill on a monthly basis. On occasion methane was detected in off-site soil gas in the Keyspan right-of-way on the northwest side of the landfill.

Since 1978, landfill gas has not been detected within 150 feet of any properties bordering the landfill. Construction of the new perimeter landfill gas collection system in 1996 has effectively controlled the migration of soil gas.

Indoor Air

As part of the town's landfill gas monitoring which began in 1978, basements in as many as 12 homes bordering the landfill were sampled for methane on a monthly basis. Methane gas has never been detected in any of these homes. Monitoring for methane in homes near the landfill was suspended in 1996 when the landfill gas collection systems were completed. Monthly monitoring inside an office building associated with a sand and gravel mine east of the landfill has not detected the presence of methane.

C. Quality Assurance and Quality Control

The analytical data used by the NYS DOH in preparing this PHA are found in the RI. Laboratory data are evaluated with respect to specific quality assurance (QA) and quality control (QC)

measures. Data which do not meet certain QA/QC criteria for reasons such as excessive blank contamination or non-reproducible results are not used in the PHA or are qualified as questionable results.

D. Physical and Other Hazards

One hazard associated with the site involves methane in landfill gas. Methane can migrate through porous media as soil gas and enter confined building spaces (basements) through crawl spaces, plumbing holes, other floor holes (e.g., sumps) and foundation cracks. The potential for methane to collect in a confined space is of concern as this condition may result in a flammable/explosive atmosphere and hence be a safety problem. The construction of the landfill cap, which includes active gas collection/control systems, has significantly reduced or eliminated the possibility of methane migration.

There are no other apparent physical hazards to the general public associated with the landfill. The entire site and resource recovery facility are fenced with controlled entry and posted signs.

E. Toxic Chemical Release Inventory (TRI)

The Toxic Chemical Release Inventory (TRI) has been developed by the US EPA from chemical release information provided by those industries that are required to report contaminant emissions and releases annually. The NYS DOH reviewed air emissions data reported to the TRI by industrial facilities identified to be within a 5.0 mile radius of the Huntington Landfill site for the years 1988 through 1993. These data were reviewed to evaluate other sources of contamination that may pose an additional health risk to the exposed population at or near the site.

The NYS DOH has developed a screening model to estimate if potential contaminant concentrations resulting from air emissions at a facility may be contributing to community (receptor population) exposures to contaminants at a site. This model uses information about the facility location (distance from the exposed population) and annual air emission data to calculate annual average air concentration at a distance of 0.5 miles from the site.

Seven industrial facilities which released air emissions were identified within a 5.0 mile radius of the Huntington Landfill site. These facilities are: Polymer Plastics Corp.; Robert Busse and Co., Inc.; Pall Rai, Inc.; LNK International, Inc.; Hazeltine Corp. (Mfg. Plant); Gull Electronic Systems; and Gasser and Sons, Inc. A summary of the TRI-reported air releases by these facilities for the years 1988-1993 is presented in Table 8.

Results of the screening evaluation indicate that TRI-reported air emissions from the facilities identified would not increase contaminant levels in ambient air near the Huntington Landfill site to levels above the screening criterion of 1 mcg/m3. Based on the results of the screening evaluation, the public health significance of contaminant air emissions from TRI facilities as an additional source of community exposures at the Huntington Landfill site will not be evaluated further in this Public Health Assessment.

PATHWAYS ANALYSES

This section of the PHA identifies potential and completed exposure pathways associated with past, present and future use of the site. An exposure pathway is the process by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: (1) a contaminant source; (2) environmental media and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

The source of contamination is the source of contaminant release to the environment (any waste disposal area or point of discharge); if the original source is unknown, it is the environmental media (soil, air, biota, water) which are contaminated at the point of exposure. Environmental media and transport mechanisms "carry" contaminants from the source to points where human exposure may occur. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (i.e., ingestion, inhalation, dermal absorption). The receptor population is the person or people who are exposed or may be exposed to contaminants at a point of exposure.

Two types of exposure pathways are evaluated in the PHA; a completed exposure pathway exists when the criteria for all five elements of an exposure pathway are documented; a potential exposure pathway exists when the criterion for any one of the five elements comprising an exposure pathway is not met. A suspected exposure pathway is considered to be eliminated when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present and will never exist in the future.

A. Completed Exposure Pathways

Past Groundwater Exposure Pathways

The groundwater pathway of human exposure was completed in the past. People living downgradient from the landfill in homes serviced by private wells were exposed to site-related contaminants in drinking water. This exposure has now been eliminated by the extension of public water. Based on the RI, contaminants originating from the landfill are migrating from the site in a northeasterly direction and are generally found in the Upper Glacial (shallow) aquifer. Contaminants related to the landfill have been detected in downgradient private drinking water supply wells since the 1970s. VOCs, nitrates and some metals have been detected in private well samples in concentrations exceeding NYS DOH public drinking water supply standards.

Ambient Air

From the early 1989 to 1990 the excavation of land filled garbage from the leasehold property resulted in a community odor problem. Landfill odors were reported up to five miles from the site. During a site visit by ATSDR, NYS DOH, NYS DEC and SCDHS in January of 1990, odors from the landfill were detectable at the site and in the neighboring community. In response to community concerns, the SCDHS, in November 1989, sampled ambient air on the landfill

border for contaminants. Benzene and toluene were each detected in these samples at concentrations less than 2 ppb. These concentrations are typical of urban/suburban areas. Freon 12 was also detected in one sample at a concentration of 19 ppb, which is slightly above what may be expected for an urban/suburban area. In response to concerns expressed by the community and state and federal agencies, the town limited excavation of the waste from the leasehold property to colder months of the year and used temporary soil cover during the excavation process to reduce the odor released from the landfill.

In 1994, ambient air samples were collected at several on-site and off-site locations. Off-site samples were collected upwind from the landfill to determine air quality unaffected by the site, and downwind from the landfill to determine if the site may be the source of ambient air contamination. Based on the results of these samples (Appendix B, Table 1) exposure to low levels of VOCs in air from the landfill has occurred on-site and possibly in the community. The level of VOCs migrating from the landfill in air may have been higher in the past, especially during the excavation of the land filled waste to prepare for the construction of the resource recovery facility. Ambient air modeling conducted in 1996 did not indicate that the level of site-related contaminants off-site would represent a health concern.

Past Exposure to Incinerator Ash

Off-site exposure to airborne incinerator ash from the old on-site incinerators has occurred in the past. However, this pathway of exposure cannot be evaluated since the analytical data needed to quantify the associated health risks do not exist.

B. Potential Exposure Pathways

Sediments (On-Site)

During the investigation of the leasehold property sediment samples were collected at a depth of zero to six inches from the incinerator quench water discharge basin and the storm water recharge basin. The levels of several PAHs detected in these samples exceed public health assessment comparison values. Exposure to contaminated sediments in these areas could have occurred between 1955-1989 when the on-site incinerators were in operation. Since 1955, access to this area has been restricted by a fence. Therefore, the potential for exposure to contaminated sediments would have been limited to on-site workers. When the incinerators were decommissioned in 1989, areas of soil contamination were excavated and removed to the landfill which was then capped.

The concentration of several PAHs detected in sediments collected from the western recharge basin during the RI exceeded public health assessment comparison values. Since access to this area of the landfill is restricted by a fence, the potential for exposure to contaminated sediment in the western recharge basin is limited to on-site workers.

Past Potential Exposure to Incinerator Ash (On-Site)

During the investigation of the leasehold property, incinerator ash samples were collected and analyzed for metals only. Lead was detected at a maximum concentration of 12,570 mg/kg. PAHs are commonly associated with incinerator ash and were likely to have been present in the ash samples collected from the leasehold property. However, since these samples were not analyzed for PAHs, the potential health risk associated with possible exposure to these compounds for workers on the leasehold property cannot be evaluated. The potential for exposure to incinerator ash has been eliminated since all areas of contamination identified on the leasehold property were excavated and placed under the landfill cap.

Past Potential Exposure to Soil Gas (Off-Site)

Off-site exposure to site-related contaminants in soil gas may have occurred prior to 1978. However, there are no data to evaluate this potential pathway of exposure. Since 1978, monthly monitoring has not detected the presence of landfill gas within 150 feet of any residential properties. Soil gas has not been detected at consequential levels in any of the perimeter soil gas monitoring wells since the landfill gas collection systems began operation in 1994.

C. Eliminated Exposure Pathways

Groundwater

The investigation of this site concluded that groundwater downgradient from the landfill is contaminated with chlorinated solvents and metals. However, since homes and businesses with private wells contaminated or threatened by the groundwater contaminant plume have been connected to public water, this pathway of exposure has been eliminated.

Surface Water (On-Site and Off-Site)

Surface water samples were collected from the on-site drainage basins during the investigation of the leasehold property and the RI. The level of contamination detected in all on-site surface water samples did not exceed public health assessment comparison values.

The RI concluded that the contaminant plume migrating from the landfill discharges into the Sunken Meadow Creek (off-site). Exposure to site-related contaminants could occur if people use this off-site creek for recreational purposes such as swimming or fishing. However, the low levels of VOCs in the surface water samples taken from the creek do not exceed public health assessment comparison values. Therefore, since the levels of contaminants detected in on-site and off-site surface water samples do not exceed public health assessment comparison values, this pathway of exposure has been eliminated from further discussion in the Toxicological Evaluation section of this PHA.

Surface Soil (On-Site)

In 1989, on-site surface soil samples were collected from the leasehold property. Since the level of contamination detected in these samples does not exceed public health assessment comparison

values, this pathway of exposure has been eliminated from further discussion in the Toxicological Evaluation of this PHA.

Sediment (Off-Site)

Exposure to site-related contaminants in the sediments of Sunken Meadow Creek could occur. However, contamination was not detected in sediment samples collected during the RI. Therefore, this pathway of exposure has been eliminated from further discussion in the Toxicological Evaluation of this PHA.

Soil Gas (Future Off-Site)

The Town of Huntington instituted a landfill gas monitoring program in 1978. Monitoring for landfill gas is carried out on a monthly basis. From 1978 to 1996 the basements in as many as 12 homes were monitored on a monthly basis. Monitoring for methane in homes bordering the landfill was suspended in 1996 when construction of the landfill gas collection systems were completed. A monthly landfill gas monitoring report is submitted to the NYS DEC. These reports to date indicate that the landfill gas collection systems effectively control the off-site migration of soil gas. Based on this information, exposure to contaminated soil gas is not likely to occur.

PUBLIC HEALTH IMPLICATIONS

A. Toxicological and Epidemological Evaluation

An analysis of the toxicological implications of the human exposure pathways of concern is presented below. To evaluate the potential health risks from contaminants of concern associated with the Huntington Landfill site, the NYS DOH assessed the risks for cancer and non-cancer health effects. The health effects are related to contaminant concentration, exposure pathway, exposure frequency and duration. For additional information on how the NYS DOH determined and qualified health risks applicable to this health assessment, refer to Appendix C.

1. Past ingestion, dermal and inhalation exposure to volatile organic compounds (VOCs) nitrate and metals in private water supply wells.

For an undetermined period of time, private water supply wells were contaminated with VOCs (Appendix B, Table 4). Since 1973 the SCDHS has sampled about 180 private wells downgradient form the landfill. Contamination which may be related to the landfill was detected in about 50 of the wells sampled. Contaminant levels in drinking water prior to 1973 are unknown. Organic chemicals and metals at concentrations exceeding NYS drinking water standards and/or public health assessment comparison values have been found in private water supplies (Appendix B, Tables 4 and 5). To eliminate exposures to site-related contaminants in drinking water, the Town of Huntington connected homes with private wells downgradient from the landfill to public water in three phases. Phase I took place during 1986 and 1987, Phase II was completed in 1989 and Phase III began in 1993 and was completed in 1996. Therefore, some residents may have been exposed to these contaminants in their drinking water for 23 years

(1973-1996) or more. In addition, the Record of Decision for this site will provide for the connection to public water of any home with a private drinking water well contaminated or threatened by the groundwater contaminant plume migrating from the landfill.

Chronic exposure to chemicals in drinking water is possible by ingestion, dermal contact and inhalation from water uses such as showering, bathing and cooking. Although exposure varies depending on an individual's lifestyle, each of these exposure routes contributes to the overall daily uptake of contaminants and thus increases the potential for chronic health effects. The toxicological implications of past exposures to site-related contaminants in private water supplies is discussed below.

Organic Contaminants

Vinyl chloride is a known human carcinogen (ATSDR, 1995c). Vinyl chloride was detected in one private well at an estimated concentration of 0.30 mcg/L. Chronic exposure to drinking water contaminated with vinyl chloride at the highest level (0.3 mcg/L) reported in private water supply wells could pose a low increased cancer risk. However, since the concentration of vinyl chloride detected in this well is below the instrumental detection limit of 0.50 mcg/L and the presence of the compound was not confirmed when the well was resampled on two different occasions, the presence of vinyl chloride is questionable. Other chlorinated organic contaminants detected include: trichloroethene (up to 150 mcg/L), tetrachloroethene (up to 39 mcg/L), 1,1-dichloroethene (up to 0.5 mcg/L), carbon tetrachloride (up to 5 mcg/L), and 1,2-dichloropropane (up to 2 mcg/L). These contaminants have been found to cause cancer in laboratory animals exposed to high levels of these chemicals over their lifetimes (ATSDR, 1989; 1994a,b; 1997a,b). Chemicals that cause cancer in laboratory animals may also increase the risk of cancer in humans who are exposed to lower levels over long periods of time. Based on the results of animal studies and limited data for these contaminants in private water supply wells, chronic exposure to the highest levels of these contaminants for a period of about 23 years (from 1973-1996) could pose a low increased cancer risk. Any increased cancer risk is indeterminate for exposures prior to 1973 because no data on levels of contaminants are available.

The chlorinated organic contaminants selected for further evaluation (Appendix B, Table 4 and 5) can also cause noncarcinogenic effects, primarily to the liver, kidneys and central nervous system. Although, the risks of noncarcinogenic effects from past exposure to these contaminants in drinking water are not completely understood, the existing data suggest that they could have been low.

Metal Contaminants and Nitrates in Private Well Samples

Nitrate was detected in one private well at a concentration of 24,900 mcg/L. Nitrate is toxic when present in excessive amounts in drinking water and in some cases may cause a blood disorder in infants called methemoglobinemia. The red blood cells in infants with methemoglobinemia have a reduced ability to carry oxygen and could result in cyanosis and anoxia (blue baby). No cases of methemoglobinemia have been associated with drinking water containing nitrate at 10,000 mcg/L or less. The health risk to bottle-fed infants at higher levels of

nitrate is influenced by a number of factors including the increase in nitrate in infant formula as a result of repeated boiling of water. Some cases of infant methemoglobinemia have been reported when drinking water contained 11,000 to 20,000 mcg/L. There are many examples, however, where nitrate levels up to 20,000 mcg/L have not caused any clinical effects in infants (US EPA, 1995). Drinking water contaminated with nitrate at the highest concentrations found in private well water would pose a high risk of adverse health effects to bottle-fed infants.

Metal contaminants selected for further evaluation in private well water are iron (4,100 mcg/L), lead (41 mcg/L), sodium (60,100 mcg/L) and thallium (50 mcg/L). Although iron is an essential nutrient, ingestion of large amounts can lead to iron toxicity characterized primarily by gastrointestinal effects (Henretig and Temple, 1984). Chronic exposure to drinking water contaminated with iron at the highest concentrations found in private wells (4,100 mcg/L) would pose a minimal risk of adverse health effects. Its presence in drinking water, however, is objectionable primarily due to its affect on taste and staining of laundry and plumbing fixtures (WHO, 1984). Chronic exposure to lead is predominantly associated with neurological and hematological effects and the developing fetus and young children are particularly sensitive to lead-induced neurological effects (ATSDR, 1997). Chronic exposure to drinking water contaminated with lead at the highest concentrations found in private wells (41 mcg/L) would pose a minimal risk of adverse health effects. The main health concern about sodium ingestion is its association with high blood pressure and possibly heart disease (WHO, 1984). Chronic exposure to drinking water contaminated with sodium at the highest concentrations found in private wells (60,100 mcg/L) could pose an increased risk of adverse health effects to people on severely restricted sodium diets. Thallium can adversely affect the respiratory, cardiovascular and gastrointestinal systems, liver, kidneys and male reproductive system (ATSDR, 1992). The risk of adverse health effects from past exposures to low levels of thallium in drinking water is poorly understood. The existing data suggest, however, that chronic exposure to drinking water contaminated with thallium at the highest concentrations (50 mcg/L) found in private wells could pose a risk of adverse health effects.

2. Past inhalation exposure to volatile organic compounds in ambient air.

From early 1989 to 1990, the landfill was the source of a community odor problem. In response to community concerns the SCDHS sampled ambient air at several locations around the landfill. Although chemicals that may have been associated with odor complaints were not identified, benzene, toluene and dichlorodifluoromethane (freon 12) were detected in one or more of the samples at maximum concentrations of 2 ppb, 2 ppb and 19 ppb, respectively. The concentrations of toluene and benzene are typical of background levels for these compounds and the level of Freon 12 does not exceed the public health assessment air comparison value. Therefore, past inhalation exposure to these compounds near the Huntington Landfill site should not result in any significant increased risk of adverse health effects.

When ambient air was sampled during the RI in 1994, tetrachloroethene and trichloroethene were detected only at on-site locations at concentrations as high as 17 mcg/m3 (2.5 ppb) and 12 mcg/m3 (2.3 ppb), respectively. Based on very limited measurements made in 1994, it is estimated that neither of these contaminants should be a source of significant increased health risk. Prior to 1994, no air emissions data for tetrachloroethene and trichloroethene are available

that can be attributed to the Huntington Landfill, and therefore, the health risk from past exposure to these or other chemicals in ambient air is indeterminate.

As part of the RI, in 1996 the ISC dispersion model was used to evaluate potential exposure to airborne contaminants migrating from the landfill. Based on the ISC modeled data, the excess lifetime cancer risk associated with exposure to air contaminants was very low for employees (on-site workers) and the residents living at the maximally impacted off-site location.

3. Potential past, ingestion, dermal contact and inhalation exposure to on-site sediment and incinerator ash.

In the past, it is possible that workers at the Huntington Landfill site were exposed to contaminants in on-site sediments and incinerator ash. This exposure could have occurred for a period of up to 34 years, that is between 1955-1989 when the on-site incinerators were in operation and before areas of sediment contamination were excavated and removed. The contaminants selected for further evaluation because they exceed public health assessment comparison values (Table 7) are the PAHs: benz(a)anthracene (7.2 mg/kg), benzo(b)fluoranthene (9.4 mg/kg), benzo(a)pyrene (6 mg/kg) and indeno(1,2,3-cd)pyrene (4.8 mg/kg). Another major contaminant was lead at levels as high as 12,570 mg/kg.

These PAHs cause cancer in laboratory animals exposed to high levels over their lifetimes (ATSDR, 1995d). Common cancers associated with exposure to PAHs include skin, respiratory and gastrointestinal tract cancers. Chemicals that cause cancer in laboratory animals may also increase the risk in humans who are exposed to lower levels over long periods of time. Whether or not these chemicals cause cancer in humans is not known. Based on the results of animal studies, it is estimated that chronic past exposure of workers to these carcinogenic PAHs found in on-site sediments at the Huntington Landfill site could pose a low increased cancer risk. In addition, PAHs cause noncarcinogenic effects, primarily to the immune and blood cell-forming systems. Although the risks of noncarcinogenic effects from exposure to PAH-contaminated sediments are not completely understood, the existing data suggest that they would be minimal for worker exposures in the past.

The other contaminant selected for further evaluation is lead found at levels as high as 12,570 mg/kg in incinerator ash. The toxicological properties of lead have already been discussed. Potential past chronic exposure of workers to lead at the highest concentrations found in contaminated on-site incinerator ash would pose a low risk of adverse health effects.

Potential present and future exposures of workers to other on-site sediments contaminated with PAHs (benzo(a)pyrene, 3.6 mg/kg; benz(a)anthracene, 4.7 mg/kg; and benzo(b)fluoranthene, 4.3 mg/kg) that exceed public health assessment comparison values (Appendix B, Table 7) would also pose a low increased cancer risk and a minimal noncancer risk.

The health risks from potential past, present and future exposure to on-site sediments and incinerator ash (see above) could be reduced by wearing gloves and use of appropriate dust suppression methods.

B. ATSDR Child Health Initiative

The ATSDR Child Health Initiative emphasizes examining child health issues in all of the agency activities, including evaluated child-focused concerns through its mandated public health assessment activities. The ATSDR and the NYS DOH considers children when evaluating exposure pathways and potential health effects from environmental contaminants. We recognize that children are of special concern because of their greater potential for exposure from play and other behavior patterns. Children sometimes differ from adults in their susceptibility to the effects of hazardous chemicals, but whether there is a difference depends on the chemical. Children may be more or less susceptible than adults to health effects from a chemical and the relationship may change with developmental age.

The possibility that children or the developing fetus may have increased sensitivity to tetrachloroethene (PCE) and trichloroethene (TCE) (two of the primary contaminants at the Huntington Landfill site) was taken into account when evaluating the potential health risks associated with the groundwater contamination. Human studies suggest that exposure to mixtures of chlorinated solvents (including PCE and TCE) in drinking water during pregnancy may increase the risk of birth defects (e.g., neural tube defects, oral cleft defects, and congenital heart defects) and/or childhood leukemia (ATSDR 1997a,b). In each of these studies, however, there are uncertainties about how much contaminated water the women drank during pregnancy and about how much PCE and TCE was in the water the women drank during pregnancy. Moreover, the role of other factors in causing these effects is not fully known. The most important of the factors was the potential exposure during pregnancy to other chemicals in drinking water. These studies suggest, but do not prove, that the developing fetus may have increased sensitivity to the effects of PCE and TCE. When pregnant animals are exposed by ingestion and/or inhalation to large amounts of PCE and TCE, adverse effects on the normal development of the offspring are observed (ATSDR 1997a,b). In most, but not all of these studies, the high amounts of the chemicals also caused adverse health effects on the parent animal. A study in young mice suggests effects on the central nervous system after transient exposure to PCE by ingestion 10 to 16 days after birth (Fredriksson et al., 1993). In another study, abnormal fetal heart development was observed in the offspring of rats exposed to TCE in drinking water before and during pregnancy (Dawson et al., 1993). The estimated levels of exposure to trichloroethene and tetrachloroethene in private drinking water supplies near the Huntington Landfill were compared to the exposure levels in these animal studies where adverse health effects were observed and were found to be lower. Thus, the possibility that children may have increased sensitivity to trichloroethene and tetrachloroethene was taken into account when evaluating the potential health risks associated with the Huntington Landfill site.

C. Health Outcome Data Evaluation

In October of 1991 the NYS DOH completed a cancer incidence investigation for the areas in East Northport, Commack and Kings Park, New York. The study area was defined to include areas where citizens were concerned about the possibility of health effects caused by the proximity of the Huntington Landfill.

The study focused on the years 1978 through 1987, which was the most recent period for which cancer reporting was complete for small area analysis. In summary, the total number of newly diagnosed cancer cases was similar to expected among females. Among males, a statistically significant excess of cases was observed.

The specific sites of cancer that showed statistically significant elevations were malignant melanoma in males and females, colon cancer among males, leukemia among males, breast cancer among females and lung cancer among females.

Malignant melanoma, breast and colon cancer are known to be more common in areas of higher socioeconomic status. The median household income for the study area is higher than that of Suffolk County and considerably higher than that of New York State as a whole. Although there was a statistically significant elevation of cancer incidence for some types of cancer for the study area as a whole, examination of data for specific census tracts did not point to a geographic link between the areas of highest cancer incidence and the area where the landfill is located or where groundwater contamination occurs. A copy of the study is provided in Appendix E.

In April 1994, the NYS DOH completed a study of the occurrence of breast cancer on Long Island. The study found an association between living near chemical facilities on Long Island and the risk of breast cancer in post-menopausal women. The study found no association between residences near industry and breast cancer for pre-menopausal women. No cause and effect relationship was demonstrated. The study does not link any specific chemical site or industrial pollutant with breast cancer risk. No measurements have been taken of actual air emissions from chemical plants or individual exposure to industrial pollutants. Further investigation is necessary to verify the findings and to attempt to identify the circumstances and potential pollutants that may explain the higher incidence of breast cancer in post-menopausal women who lived near chemical sites between 1965 and 1985. The National Cancer Institute is currently funding a research study of the relationship between environmental factors and breast cancer on Long Island.

The people exposed to site-related contaminants in drinking water will be considered for addition to the NYS DOH Volatile Organic Compounds Registry. The Registry was established in 1999 as a tool for health status assessment and long-term follow-up for communities with documented exposures to VOCs. The Registry is currently evaluating exposures and health status of New York State residents at locations where drinking water or indoor air was contaminated with chemicals such as industrial solvents or petroleum products from landfills, industrial sites, spills, or other sources. Individuals and communities are selected for inclusion in the Registry if potential exposures from the contamination of private wells, public water supplies, or indoor air have been verified by sampling results. Future analysis, based on VOC Exposure Registry information, may increase understanding of potential health effects from exposures similar to those experienced by residents near the Huntington Landfill site.

The Huntington Landfill site was included in a cancer incidence study conducted by the NYS DOH. The study evaluated cancer incidence among people living near a total of 38 landfills with similar potential soil gas migration conditions. Seven types of cancer were evaluated: liver, lung,

bladder, kidney, brain, non-Hodgkin's lymphoma and leukemia. For Huntington Landfill as well as most of the other landfills in the study, people who lived within 250 feet of the landfill (the potential exposure areas) were compared with people living further away in order to see if the people living very close were more likely to have been diagnosed with one of the seven cancers during the time period 1980 to 1989. The study analyzed all the landfills as a group because not enough people lived near any one landfill to conduct landfill-specific analyses. The study found no statistically significantly elevated cancers among men living in the potential exposure areas near the 38 landfills. Among women living in the potential exposure areas, statistically significant elevations were found for bladder cancer and leukemia, but not for the other five cancer types.

The data available for this study were limited. There were no data that measured whether individuals were exposed to landfill chemicals. Only a person's address at the time of diagnosis was used for mapping his or her location. The length of time people lived at their homes before being diagnosed with cancer was unknown; a person in the study could have just recently moved to the address. This is important because there is a period of years, called latency, between the beginning of the cancer's growth and its later appearance and diagnosis. For most cancers, the period of latency is thought to be between ten and twenty years. For cancer studies, researchers would like to know where people lived and what they were exposed to at least twenty years before cancer is diagnosed. But this is rarely possible. This study looked back from cancers diagnosed in the 1980's to potential exposures that might have occurred near landfills that were active in the 1960's and 1970's. This type of study cannot prove a direct cause and effect relationship between exposure and disease. However, to investigate these findings further, ATSDR is funding an additional study. The follow-up study will update the original study to include the years 1990 to 1997 or most recent year available, and improve on the original study by using a different comparison group.

D. Community Health Concerns Evaluation

In response to community health concerns about cancer, in October of 1991 the NYS DOH completed a cancer incidence study for the area around the landfill. On March 16, 1992, NYS DOH staff met with the public to discuss the study and to address community concerns about the incidence of cancer for the area near the landfill. The results of the study are summarized in the "Health Outcome Data Evaluation" section of this document. A copy of the study is in Appendix E.

In March 1991, October 1991, June 1993, August 1993 and December 1995, NYS DOH staff held public meetings to address community concerns about exposure to contaminates migrating from the landfill in air and groundwater. At the request of the NYS DOH, SCDHS and NYS DEC, the town has provided public water to homes downgradient from the landfill. To reduce the uncontrolled release of landfill gas, the town has constructed a cap on the landfill which includes gas collection/control systems. In the past community members reported allergy problems, bacterial infections, eye and throat irritation, asthma, sinus and respiratory infections. These maladies/reactions may be due to exposure to a multitude of biological or environmental agents, and may include exposure to site-related airborne particulate matter from the old incinerators

which operated from 1955 to early 1989. However, there is no data to evaluate past exposures to fly ash from the on-site incinerators.

In response to concerns about decreased school attendance, and an increase in illness resulting from the odors emanating from the landfill, in 1990, at the request of the petitioner, NYS DOH staff contacted local physicians to determine if there was an increase in the number of patient visits. The physicians interviewed said that they had heard about the odors, but they could not verify that the landfill odors resulted in an increased number of office visits.

CONCLUSIONS

1. Because people were exposed to volatile organic compounds (primarily tetrachloroethene and trichloroethene) in private drinking water at levels above New York State Drinking Water Standards near the Huntington Landfill site, public health actions were needed to reduce or eliminate exposures. Because there is evidence from studies in animals and humans that exposure to elevated levels of tetrachloroethene and trichloroethene can increase the risk of cancer and non-cancer adverse health effects in humans, we evaluated the potential health risk for exposure to these chemicals at the Huntington Landfill. Exposures in the past could pose a low increased risk of cancer and a low risk for non-cancer effects. Furthermore, some private water supply wells contained the inorganic contaminants nitrate and thallium at levels that could increase the risk of adverse health effects. To eliminate exposure to site-related contaminants in drinking water, the Town of Huntington has connected homes with private wells downgradient from the landfill to public water supplies. Due to the extension of public construction of the landfill cap, which includes landfill has collection/control systems, this site currently poses no apparent public health hazard.

2. The landfill gas collection systems effectively control the off-site migration of landfill gas. Monthly monitoring from 1974 to 1996 in the basements of as many as 12 homes bordering the site did not detect the presence of landfill gas (methane). Monitoring for methane in homes bordering the landfill was suspended in 1996 when the construction of the landfill gas collection systems was completed.

3. The majority of the groundwater contaminant plume migrating from the landfill discharges into the Sunken Meadow Creek. Although exposure to site-related contaminants in surface water could occur, surface water monitoring of the creek indicates that the levels of contaminants do not represent a health concern.

4. Off-site exposure to airborne incinerator ash from the old on-site incinerators has occurred in the past. However, this pathway of exposure cannot be evaluated since the analytical data needed to quantify the associated health risks do not exist.

RECOMMENDATIONS

1. Continue semi-annual monitoring of the groundwater monitoring well in between the groundwater contaminant plume migrating from the landfill and the Gun Club Road public drinking water supply wells. This monitoring well acts as an early warning mechanism should contaminants from the landfill migrate closer to the Gun Club Road wellfield, and thus reduce the potential for exposure to landfill related contamination groundwater.

2. Continue operation of the landfill gas collection systems and continue monitoring the perimeter soil gas collection system on a monthly basis to determine if it remains effective in controlling the off-site migration of soil gas.

3. Maintain the methane alarm systems in the on-site animal shelter and maintenance garage, and continue weekly monitoring of these structures for explosive gases.

4. Continue semi-annual monitoring of surface water in Sunken Meadow Creek to determine if the level of surface water contamination related to the landfill increases.

5. Maintain deed restrictions on affected solids/soils areas to limit excavation and drilling in affected areas. This applies to the landfill property.

6. Maintain land use controls which prohibit well installations near the landfill and consequently limit exposures to contaminated groundwater.

7. Residents who were exposed in the past to VOCs in drinking water should be considered for inclusion to the NYS DOH VOC exposure registry.

PUBLIC HEALTH ACTION PLAN (PHAP)

The Public Health Action Plan (PHAP) for the Huntington Landfill site contains a description of actions to be taken by ATSDR and/or the NYS DOH at and near the site, following completion of this public health assessment. For those actions already taken at the site, please see the Background section of this Public Health Assessment. The purpose of the PHAP is to ensure that this health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from past, present and/or future exposures to hazardous substances at or near the site. Included, is a commitment on the part of ATSDR and/or the NYS DOH to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by ATSDR and/or the NYS DOH are as follows:

1. ATSDR and the NYS DOH will coordinate with the appropriate environmental agencies to develop plans to implement the recommendations contained in this Public Health Assessment.

2. The NYS DEC, NYS DOH and SCDHS will oversee the remediation of this site as indicated in the Recommendations section of this Public Health Assessment.

3. People exposed to VOCs in drinking water in the past will be considered for addition to the NYS DOH VOC exposure registry. Periodically, this registry will be matched with the cancer registry to evaluate possible adverse health outcomes.

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

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CERTIFICATION

This public health assessment was prepared by the New York State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methods and procedures existing at the time the public health assessment was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health assessment, and concurs with its findings.

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