Public Health Assessment for

STANTON CLEANERS AREA GROUNDWATER CONTAMINATION SITE
GREAT NECK, NASSAU COUNTY, NEW YORK
EPA FACILITY ID: NYD047650197
NOVEMBER 30, 2005

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

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

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

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

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PUBLIC HEALTH ASSESSMENT

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GREAT NECK, NASSAU COUNTY, NEW YORK

EPA FACILITY ID: NYD047650197

Prepared by:

New York Department of Health
Center for Environmental Health
Under a cooperative agreement with
The U.S. Department of Health and Human Services
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SUMMARY

The Stanton Cleaners Area Groundwater Contamination site is in the Villages of Great Neck Plaza, Great Neck Estates, and University Gardens in the northwestern part of Nassau County. The site includes the Water Mill Lane public water supply wellfield and the surrounding commercial area which encompasses several automotive repair/filling stations and several dry cleaning facilities, most notably Stanton Cleaners. The Stanton Cleaners dry cleaning facility in Great Neck Plaza is believed to be the major source of tetrachloroethene (PCE, also known as perchloroethylene or perc) contamination in the public supply wells.

In 1979, PCE, was detected in a water supply well operated by Citizens Water Supply which was later acquired by the Water Authority of Great Neck North (WAGNN). Concentrations of the chemical increased and, in 1983, a packed tower aeration unit was installed at the affected wellfield to treat the water prior to distribution to the community. At that time, an investigation of potential sources of PCE led to the discovery of PCE discharges and gross soil contamination behind a nearby dry cleaning facility, Stanton Cleaners. Subsequent investigations confirmed that groundwater beneath the cleaning facility was also contaminated.

The extent of PCE contamination at and near Stanton Cleaners was determined by the New York State Department of Environmental Conservation (NYS DEC) during 1997 and 1998 as part of a remedial investigation (RI) for the site. During the RI, indoor air contamination with PCE was documented within several structures near Stanton Cleaners. In 1998, the United States Environmental Protection Agency (US EPA) became involved with the site and implemented a series of measures to reduce PCE concentrations within the affected structures. These measures include a soil vapor extraction (SVE) system behind the Stanton Cleaners facility. The site was nominated by the US EPA for inclusion on the National Priorities List (NPL) in January 1999 and added to the list on May 10, 1999.

As a result of the Stanton Cleaners contamination, groundwater, soil, soil gas and air samples were tested for PCE and other volatile organic compounds (VOCs). Two completed exposure pathways have been documented for the site. Individuals were exposed to PCE in indoor air at an indoor tennis facility behind Stanton Cleaners. Consumers of public water were exposed to PCE, along with other VOCs in drinking water at levels below the drinking water standards in effect at the time. Exposure to these and other VOCs in drinking water are presently minimized through treatment with air stripping at the affected wellfield and through a program of water quality monitoring. The public health implications of these exposures are evaluated in this Public Health Assessment.

Based on the Agency for Toxic Substances and Disease Registry's (ATSDR) current guidance for assigning a health hazard category to a site (refer to Appendix D), the Stanton Cleaners site posed a public health hazard in the past because actions were needed to end PCE indoor air exposures and prevent future exposures. In February 1999, US EPA installed an SVE system behind the Stanton Cleaners site to remove subsurface soil contamination and vapors. This installation reduced indoor air exposures at the impacted facilities and helped prevent future

exposure. The indoor air exposure route for the tennis courts was eliminated when the tennis court buildings were demolished in the summer of 2004. Based on air sampling data and the results of animal and human studies, past long-term exposure to PCE in air at Plaza Tennis is estimated to pose a low increased risk of getting cancer. These estimates are based on animal studies which show that PCE at high levels can cause cancer in laboratory animals (leukemia, liver and kidney cancer). Studies of workers exposed to PCE and other chlorinated solvents suggest an increased risk of certain cancers in humans.

Exposure to PCE is also associated with noncancer health effects. Studies of humans exposed to PCE in the workplace show that long-term inhalation exposure may increase the risk of adverse reproductive effects (reduced fertility, changes in semen quality, increased incidences of menstrual disorders and increased rates of spontaneous abortion), but the data are not strong enough to conclude that these effects were due solely to PCE. Long-term exposure to high levels of PCE can also affect the central nervous system, kidney and liver of humans and laboratory animals. The Plaza Tennis PCE air concentrations adjusted to reflect the variable and noncontinuous nature of the exposures, but not all the measured air concentrations, are lower than levels associated with noncancer health effects for long-term exposure. Specifically, people who lived in apartments above dry cleaning shops scored slightly lower on tests that assessed the function of the central nervous system.

The Stanton Cleaners Area Groundwater Contamination site also posed a public health hazard in the past because actions were needed to minimize PCE drinking water exposures and prevent future exposures. These actions also addressed drinking water exposures to benzene, a contaminant not related to Stanton Cleaners. Exposures to PCE and other VOCs in drinking water are currently minimized through treatment with air stripping at the affected wellfield and through a program of water quality monitoring. Drinking water exposures may have increased in the future had these measures not been taken. The risk of someone getting cancer from drinking water exposures to site-related chemicals that were measured in the past is low. This is based on cancer observed in exposed laboratory animals and, in part, on information from studies which suggest an increased risk of certain cancers in humans exposed to PCE and other chlorinated solvents. The risk for noncancer health effects would be minimal. Exposure to these and other VOCs in drinking water are presently minimized through treatment at the affected wellfield and through a program of water quality monitoring. These measures must continue.

This document also addresses concerns citizens have expressed about past and potential exposures to VOC contaminants as well as potential exposure to the PCE treatment systems.

Although the site posed a public health hazard in the past because of contaminated indoor air and drinking water, there are no known exposures from the site presently occurring at levels of public health concern. Therefore, currently, the site does not pose a public health hazard.

Future investigation and remedial work is expected to alleviate the continuing threat of exposure by removal of contaminant sources and treatment of contaminated groundwater.

PURPOSE AND HEALTH ISSUES

The purpose of this public health assessment (PHA) is to evaluate past, current, and potential future human exposures to site-related contaminants. Moreover, this PHA fulfills the congressional mandate for a public health activity for each site proposed to the National Priorities List (NPL). This public health assessment will focus primarily on exposure to tetrachloroethene (PCE) in the public drinking water supply and in indoor air in buildings near the Stanton Cleaners facility. The public health significance of these exposures will be discussed. The actions taken to mitigate these exposures, drinking water treatment and vapor extraction, will also be discussed in this document.

BACKGROUND

Under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the New York State Department of Health (NYS DOH) evaluated the public health significance of the Stanton Cleaners site. More specifically, ATSDR and NYS DOH determined whether health effects are possible and recommended actions, listed at the end of this document, to reduce or prevent possible adverse health effects. ATSDR is a federal agency within the U.S. Department of Health and Human Services and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, to conduct public health assessments at hazardous waste sites proposed for the National Priorities List (NPL). The Stanton Cleaners site was proposed to the NPL in January 1999 and added to the list on May 5, 1999.

A. Site Description and History

Site Location and Description

The Stanton Cleaners Area Groundwater Contamination site is in the Great Neck area of the Town of North Hempstead in northwestern Nassau County. The Stanton Cleaners Property (SCP), which is the main focus of this document, is at 110 Cutter Mill Road in the Village of Great Neck Plaza (see Figure 1 in Appendix A). The SCP is approximately 1/4 acre in size and includes a one-story building in which an active dry-cleaning business operates and an adjacent one-story boiler/storage building. Most of the SCP is paved with asphalt. A narrow strip of exposed soil at the rear of the property was paved by US EPA late in 1998 in preparation for a soil vapor extraction (SVE) system. Plaza Tennis, an indoor tennis facility, located to the immediate south and east, a synagogue and school facility to the south, a condominium to the east, and an automotive fueling/service station immediately west (see Appendix A - Figure 2). The Plaza Tennis court buildings, which were to the immediate south, were demolished in the summer of 2004. Residential neighborhoods lie beyond the service station and across Cutter Mill Road to the west and north. The surrounding community is zoned commercial/residential and is serviced by public sewer and water. The Water Authority of Great Neck North

(WAGNN) supplies public water from three public water supply wells located approximately 1000 feet south of the SCP on Water Mill Lane.

Site History, Investigations, and Remedial Activities

A dry cleaner has operated at the SCP since the 1950s. The property had several different owners in subsequent years and the business may have had several names, most recently Stanton Cleaners and the New Stanton Cleaners. Between about 1958 and 1983, waste liquids from the on-site dry cleaning processes were discharged, spilled, or leaked onto the ground behind the facility. The liquids were contaminated with tetrachloroethene (PCE, also known as perchloroethylene or perc). PCE is classified as a volatile organic compound (VOC), and is a commonly used solvent in the dry cleaning industry.

During the early 1980's the Citizen's Water Supply Company, previous owner of the Water Mill Lane public supply wells, noted VOC's, including PCE, in the public water supply wells. The exact amount of contamination is unknown, but Table 9 estimates the level of contamination based on historical information. In 1983, the Water Company installed a treatment system, known as an air stripper, at Water Mill Lane to remove PCE and other VOCs from the water. This unit was reportedly the first such VOC removal system installed on a municipal water supply in Long Island. The Water Company also solicited help from the Nassau County Department of Health (NC DOH) to assist them in identifying potential sources of the PCE. As a result, NC DOH inspected the Stanton Cleaners facility in June 1983. The inspection revealed debris and empty drums in the rear yard of the site. In addition, a pipe was observed to be protruding from the rear of the building. This pipe was connected to the dry cleaning fluid-water separator and discharged onto the ground in the rear yard which slopes away from the building. This discharge was discontinued in July 1983 when the pipe was routed to the sewer. Soil samples taken near the discharge pipe showed very high concentrations of PCE, up to 8,000 milligrams per kilogram (mg/kg, also known as parts per million or ppm). In late 1983, the operator of Stanton Cleaners removed about 20 cubic yards of PCE-contaminated surface soil to an off-site disposal facility. Because further sampling revealed high levels of PCE still present in the deeper soil, NC DOH ordered the operator of Stanton Cleaners to investigate subsurface soil and groundwater at the site.

NC DOH referred the site to NYS DEC in January 1984. At that time, the facility operator installed seven groundwater monitoring wells down to the water table to determine if PCE had seeped into the aquifer. Total VOCs (primarily PCE) were found in groundwater at concentrations up to 11,700 micrograms per liter (µg/L, also referred to as parts per billion or ppb). By way of comparison, the current groundwater quality standard for PCE, which is also the same as the New York State drinking water maximum contaminant level (MCL) for PCE, is 5 µg/L (at that time, NYS DOH had a guideline value of 50 µg/L for PCE in drinking water). The highest concentrations of PCE in groundwater were found in monitoring well number 6 (MW-6), located 100 feet south of the SCP in the parking lot of a nearby synagogue. In 1985, an additional well was installed near the site and tested by the Nassau County Department of Public Works (NC DPW). These initial groundwater investigations indicated more widespread contamination of a greater magnitude than previously thought. The investigations also documented that a groundwater contaminant plume, consisting primarily of PCE, was migrating from the SCP. Soil samples collected at that time confirmed that significant soil contamination remained. Shortly thereafter, a waterproof cover was placed over the soil behind Stanton Cleaners to keep rainwater from leaching more PCE down to the water table.

In April 1985, the owner of Stanton Cleaners entered into a consent order with NYS DEC. As part of the agreement, in 1989, an air-stripping tower and groundwater extraction and treatment system, consisting of a pumped interceptor well (IW-1) adjacent to MW-6, were installed behind the Stanton Cleaners facility. Contaminated groundwater is pumped through the air stripper where VOCs are removed. The treated water is then discharged to the local public storm drain system, which empties into Little Neck Bay. This treated water has been monitored for compliance with NYS DEC discharge standards since the system went into operation. Historically, the monitoring has shown that discharges from the system exceeded permit limitations on several occasions. In addition, the system has been inoperable much of the time since its installation.

In 1993, NYS DEC added the SCP to the NYS Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site. A Class 2 site is a site that poses a significant threat to public health or the environment and action is required. The SCP was listed primarily because the existing groundwater remedy was ineffective at removing VOCs, and significant soil contamination remained behind the site. In May 1998, NYS DEC requested that the owner of the SCP repair the groundwater extraction and treatment system. By September of 1998, an upgraded system was operational and within compliance of the effluent discharge standards.

Between 1992 and 1996, NYS DEC requested that the SCP owner remediate the contamination at and around the property. After several years of unsuccessful negotiations, the owner had failed to implement a remedial investigation/feasibility study (RI/FS) for the site; thus no progress was made to remediate the property. Between April 1997 and August 1998, NYS DEC implemented an RI/FS under State Superfund to address groundwater and soil contamination and to investigate potential air contamination. The RI field activities included extensive groundwater sampling, soil sampling, and a soil vapor survey at and near the Stanton Cleaners property. Analytical results of groundwater samples collected from on- and off-site monitoring wells indicated PCE concentrations up to 17,000 µg/L downgradient of the Stanton Cleaners facility. The RI results also documented that PCE contamination from the SCP had impacted the Water Mill Lane water supply wells. PCE concentrations in raw water in some of the supply wells exceed 100 µg/L. This water is presently treated and is routinely monitored to detect if concentrations in drinking water exceed the current MCL of 5 µg/L for PCE. Actual concentrations in drinking water may have slightly exceeded the 5 µg/L level in the past, prior to treatment, although the concentrations were less than 50 µg/L, the drinking water guideline in effect between 1977 and 1989.

Soil sampling from the RI indicated PCE concentrations up to 50,000 mg/kg, in a sample about two feet below the ground surface, and concentrations up to 6,200 mg/kg, at about a 12 foot depth behind the Stanton Cleaners facility. Significant soil contamination was found down to the water table, about 65 feet below grade. The PCE concentration in one on-site groundwater sample was as high as 26,000 µg/L. Elevated concentrations of additional VOCs, including dichloromethane (DCM), *cis*-1,2-dichloroethene (C-1,2-DCE) and trichloroethene (TCE) were also detected in subsurface vapors. The results from one outdoor and one indoor air sample, at Plaza Tennis, a neighboring indoor tennis facility, suggested that subsurface PCE vapors were entering the building.

In December 1997, WAGNN informed NYS DEC that the air-stripping unit at Water mill Lane, though effectively treating VOC-contaminated water to meet drinking water standards, was in need of repair. In addition, influent (untreated) water data from one of the affected supply wells contained levels of PCE close to 200 µg/L, the design capacity of the VOC removal system. In March 1998, NYS DEC agreed to fund the construction of a new air stripper that would accommodate the increased contaminant concentrations. A new air stripper was constructed and put on-line in the summer of 1998. This air stripper was designed to be able to treat up to 2,000 gallons per minute of water containing VOCs at concentrations up to 3,400 µg/L. A summary of the wells at the Water Mill Lane wellfield and the status of each are listed in Appendix B - Table 1.

In March 1998, NYS DEC asked US EPA to conduct an emergency response action to address PCE-contaminated soil at the SCP. NYS DEC had determined that the highly contaminated soil was the major source of groundwater contamination affecting public supply wells and was also the source of high concentrations of PCE in indoor air in nearby buildings (see Air on page 12). On July 23, 1998, a US EPA Action Memorandum was signed, authorizing interim remedial measures at the site including installation of a SVE system for reducing the VOCs in soil at the site. In September 1998, US EPA completed the first step of a three-phase SVE program to mitigate indoor air releases. This step involved installing a foundation vent system along the most contaminated footing at the Plaza Tennis facility immediately behind the former discharge area of Stanton Cleaners. A large-scale SVE system was installed late in 1998 and became operational in February 1999. This system was replaced with a more powerful SVE system in May 1999 which continues to operate at the site.

In September of 1998, New York State recommended to US EPA that Stanton Cleaners be added to the NPL of hazardous waste sites. On January 25, 1999, the US EPA proposed the site for listing on the NPL as the “Stanton Cleaners Area Ground Water Contamination site”. Under this listing, US EPA planned to address the contamination related to the SCP as Operable Unit 1. Other possible sources of groundwater contamination near the site and the Water Mill Lane wellfield will be addressed under Operable Unit 2.

A Record of Decision (ROD) for Operable Unit 1 was issued by US EPA on March 3l, 1999. This ROD called for continued SVE at the SCP and installation of a groundwater extraction treatment unit to intercept contamination encroaching on the Water Mill Lane wellfield. The SVE system has been running at the SCP since February 1999. As of January 2000, data from the SVE system operation shows that approximately 11,000 pounds of PCE have been removed from soil beneath the SCP and adjacent properties. Indoor air sampling has also documented substantial reduction of PCE in all previously affected buildings. Hydrogeologic testing for the design of the proposed groundwater treatment system began in early 2000 and the system was installed later that same year.

B. Actions Implemented During the Public Health Assessment Process

A number of activities, including some noted above, have occurred with NYS DOH involvement since December 1997. At that time, NYS DEC and NYS DOH held a public meeting to announce the RI/FS program. Preliminary results from the initial stages of groundwater, soil, and soil vapor testing indicated significant PCE contamination at and around the site. Upon receiving results from an initial air sample collected in December 1997, a program of indoor air testing was implemented at Plaza Tennis, the indoor tennis facility adjoining the Stanton Cleaners property (see results in Table 2).

In February 1998, after initial testing revealed elevated concentrations of PCE in the air at Plaza Tennis, NYS DOH and NYS DEC conducted additional indoor air testing. The purpose of this testing was to evaluate potential exposures to PCE at Plaza Tennis, to determine the source of PCE in the tennis facility, and to determine if PCE vapors were affecting a nearby synagogue and proposed school building (see results in Table 3).

In March 1998, NYS DEC and NYS DOH requested that US EPA implement an emergency removal action at Stanton Cleaners to address highly contaminated soil that was adversely affecting indoor air quality in nearby buildings (see summary of soil results in Table 4).

Between March and May 1998, NYS DOH worked with ATSDR to obtain information and environmental data necessary to determine if an expedited remedy to address indoor air contamination was needed. During this time NYS DOH also conversed with the owner of Plaza Tennis and recommended that he take simple steps (e.g., do not use exhaust fans that blow out, cover cracks along the foundation footing) to help reduce PCE concentrations in Court 1.

In September 1998, the State of New York formally recommended the site to US EPA for addition to the National Priorities List. During that month, as an interim remedial measure, US EPA installed a subsurface footing vent along the most contaminated portion of the Court 1 foundation to reduce the levels of PCE vapors infiltrating into Plaza Tennis. This system was in place prior to Plaza Tennis' reopening for the 98/99 season. US EPA also initiated indoor air testing for buildings near the Stanton Cleaners site. Air results are summarized in Tables 2 and 3. Also, an existing VOC removal system at the WAGNN Water Mill Lane wellfield was upgraded to accommodate higher concentrations of VOCs in groundwater. The upgrade was funded through the State Superfund. Historic concentrations in the supply wells are summarized in Table 5.

In November, US EPA installed backflow prevention devices in the floor drains of the lower level garage at Century Apartments to prevent PCE vapors from entering the garage (refer to sample results in Table 3).

In January 1999, NYS DOH participated in an interagency meeting with local and state elected and appointed officials to discuss the status of the site investigation and remedial activities. In February, US EPA also installed a soil vapor extraction (SVE) system at the SCP to remove subsurface soil contamination and vapors. The system was upgraded with a more powerful unit in May 1999 (refer to results summarized in Table 2). Also in February, NYS DOH held a three-session meeting with patrons, instructors, and employees at Plaza Tennis to discuss the indoor air investigations and remedial measures and to answer questions about the health significance of exposures to PCE.

In March 1999, NYS DEC, NYS DOH, and US EPA jointly held a public meeting to present the proposed remedial action plan (PRAP) for the site and to respond to questions from area residents and other interested parties. By the end of the month, the three agencies completed a Responsiveness Summary that addressed numerous community concerns. This document was issued with the final Record of Decision for the site.

On five occasions in 1999, US EPA (three times) and NYS DOH (twice) retested indoor air to evaluate the effectiveness of remedial measures implemented at the site. This included a September 1999 reevaluation of PCE concentrations at Plaza Tennis prior to its reopening for the 1999/2000 season. These results are included in the air results summaries of Tables 2, 3 and 6 in Appendix B.

In May 2004, US EPA collected soil samples from the former tennis court property and from the parking lot of the synagogue school. Low levels of PCE were detected in both areas, but only one sampling point on the tennis court property had concentrations of PCE above the NYS DEC Technical and Administrative Guidance Memorandum (TAGM) of 1.4 mg/kg. The Plaza Tennis court buildings were demolished in the summer of 2004. The property is scheduled for redevelopment.

C. Site Visits and Physical Hazards

Between October 1997 and September 1999, NYS DOH staff visited the site on eight occasions to inspect the site, collect air samples, and to discuss concerns with numerous interested individuals.

No unusual physical hazards were noted during the site visits. The land surface between the rear of the cleaning facility and the wall of Court 1 (Plaza Tennis) slopes steeply. This area has been paved and secured by the US EPA as part of the on-going soil vapor removal action at the site.

In June 2004, NYS DOH staff visited the site to inspect the remedial activities and the areas previously affected by soil vapor intrusion. NYS DOH staff met with staff from US EPA and discussed the ongoing soil vapor removal action currently in place at the side.

D. Demographics, Land Use, and Natural Resource Use

NYS DOH estimated from the 1990 Census that 24,000 people live within the WAGNN public water supply area. Demographic data are shown in the table below and are compared with statewide averages. In 1990, there were 4,700 females of reproductive age (ages 15-44) in the area. There are several schools and one nursing home in the area.

Information from Nassau County (NC DOH, 1997) and WAGNN indicates that the population in the WAGNN service area has increased substantially since 1990 and is probably closer to 31,000 at the present time. Specific information on the persons exposed to contaminants associated with the Stanton Cleaners site is provided in the exposure pathways discussion below.

Demographics for New York State and WAGGN Area

	New York	**WAGNN Area**
Age Distribution		
<6	8.3%	5.7%
6-19	18.4%	17.6%
20-64	60.2%	58.7%
>64	13.1%	18.1%
Race Distribution		
White	74.4%	93.2%
Black	15.9%	2.7%
Asian	3.9%	3.1%
Other	5.8%	1.0%
Ethnicity Distribution		
Percent Hispanic	12.3%	4.8%
1989 Median Income	$32,965	$72,800
% Below Poverty Level	13.0%	3.4%

Land Use

The SCP is in a primarily commercial area. The immediate area surrounding the SCP is commercial property consisting of office space, street level shops, eateries, and automotive servicing/fuel stations. A recreational facility (Plaza Tennis) is immediately southeast of the site and a school and synagogue are immediately southwest of the site. The Century Apartments are just beyond the tennis facility east of the site. Residential neighborhoods consisting of apartment complexes and single-family homes are west, northwest, and southwest of the site beyond about 200 feet.

Natural Resource Use

The most sensitive resource presently affected by site-related contamination is Long Island's sole source aquifer. Groundwater, from the upper glacial, Magothy, and Lloyd aquifers within a four-mile radius from the site, is used as the public water supply for an estimated population of 97,000.

Air quality, both indoor and outdoor, at and near the SCP has been affected in the past and continues to be a topic of interest among community members and the regulatory agencies.

ENVIRONMENTAL CONTAMINATION

Site conditions are characterized to evaluate if a site poses an existing or potential hazard to the exposed or potentially exposed population. This site characterization involves a review of sampling data for environmental media (e.g., soil, groundwater, air), both on-site 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.

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

1. Concentrations of contaminants in environmental media both on-site and off-site;
2. Field data quality, laboratory 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-site and off-site with public health assessment comparison values for (1) noncarcinogenic endpoints and (2) carcinogenic endpoints and drinking water standards; and
5. Community health concerns.

The selected contaminants are evaluated in the Public Health Implications section of this PHA to determine whether exposure to these chemicals is of public health significance. The listing of a contaminant does not necessarily mean that it will cause adverse health effects from exposure at the concentrations detected.

This section includes a discussion of sampling data for environmental media. Summary tables of sampling data are presented in Appendix B. The data in this section were gathered during several investigations, the major one being the RI/FS completed by NYS DEC in 1998. Data from earlier investigations, particularly those done between 1983 through 1986 in conjunction with NC DOH, are also included. The primary contaminant of concern associated with Stanton Cleaners is PCE. For this reason, PCE contamination is discussed for all environmental media. Other chemicals of interest are potential PCE breakdown products including trichloroethene (TCE), *cis*-1,2-dichloroethene (1,2-DCE), and vinyl chloride. Benzene, a significant contaminant at the Water Mill Lane wellfield during the mid-1980s, does not appear as a primary contaminant in the RI analytical data for the SCP.

Subsurface Soil

Analytical data from historic sampling and from sampling during the RI indicate that subsurface soil behind the Stanton Cleaners building, beneath the Stanton Cleaners boiler room, and beneath the northwest corner of Court 1 is heavily contaminated with PCE (up to 50,000 mg/kg). Additionally, these data indicate that the entire soil column behind Stanton down to the water table (about 60 - 65 feet below ground surface) contained significantly elevated concentrations of PCE. While contaminant concentrations generally decrease with depth, PCE levels higher than the NYS DEC recommended cleanup value for PCE in soil (1.4 mg/kg) appear to be present nearly as deep as the water table. The analytical results for soil samples are summarized in Appendix B – Table 4. Current concentrations of PCE in the subsurface soil are expected to be significantly lower than the reported results due to the ongoing operation of the SVE system.

Surface Soil

Few surface soil samples have been collected at the site. This is because most of the area around the facility is paved. There is one unpaved strip of property on the slope between the SCP parking lot and Plaza Tennis. Analytical results from two soil samples collected from this strip of exposed soil were found in the record. The samples were collected in 1983 and 1985 to evaluate PCE in soil at spillage areas behind Stanton Cleaners and are therefore presumed to be near-surface (i.e., probably less than six inches deep). The first sample, collected prior to removal of visibly contaminated soil, contained PCE at a concentration of 8,000 mg/kg. Two years later, after the soil was removed and the area backfilled with clean soil, a concentration of 720 mg/kg was detected. Late in 1998, US EPA had the entire surface area between Stanton Cleaners and Plaza Tennis paved with concrete while installing the SVE system.

Groundwater

Groundwater is at a depth of approximately 60 - 65 feet beneath the SCP in soil known as upper glacial deposits. Beneath these deposits, at depths greater than about 130 feet, groundwater of the Magothy Aquifer is encountered. The groundwater flows southwest away from the SCP but then flows southerly in the direction of the Water Mill Lane supply wells. Groundwater beneath and immediately downgradient of the SCP is significantly contaminated with PCE. Analytical results show that upper glacial groundwater contains PCE concentrations up to 26,000 µg/L and it is present in 67 of 68 samples, TCE concentrations up to 750 µg/L and it is present in 23 of 45 samples, and 1,2-DCE concentrations (reported as the total of *cis*-1,2-dichloroethene and *trans*-1,2-dichloroethene or “total”) up to 1,200 µg/L and it is present in 11 of 36 samples. One of 25 samples tested for vinyl chloride had an unusually high concentration (840 µg/L, tested in 1997) of vinyl chloride; only one of the other 24 samples tested contained vinyl chloride (3 µg/L in a 1985 sample). Approximately half of the samples tested for either dichloromethane or acetone contained these contaminants but at lower levels than the PCE, TCE, and 1,2-DCE. These two chemicals are frequently associated with laboratory contamination. A few samples contained toluene; the maximum level detected was 82 µg/L. This contaminant may be related to either of two historic gasoline spills in the project area (one at the Fenley Amoco Gas Station in the 1980's and the other at a Amoco Gas Station in 1992).

Groundwater samples from the Magothy Aquifer near the SCP are generally less contaminated than those in the upper glacial aquifer. PCE was detected in four groundwater screening samples collected during well-drilling activities at concentrations ranging from 160 to 2900 µg/L. However, detections in permanent groundwater monitoring wells within the Magothy Aquifer were all less than 3 µg/L. The monitoring well data are typically considered to be of higher quality than that generated with the borehole grab-sample method. Consequently, the extent of PCE contamination in the Magothy Aquifer is not currently known with certainty, but there is a possibility that the Magothy may have been impacted with PCE contamination from the site. Groundwater sample results are summarized in Appendix B - Table 7. A map depicting the approximate extent of the contaminant plume is presented as Figure 3. As indicated on the map, the contaminant plume is migrating in the direction of the Water Mill Lane supply wells and contaminant concentrations tend to decrease with distance from the site. Analytical data from the public supply wells at Water Mill Lane, presented in Table 5, indicate that groundwater from the upper glacial deposits and the uppermost portions of the Magothy Aquifer contains PCE at concentrations approaching 270 µg/L. The Lloyd Aquifer well at the wellfield does not appear to have been significantly affected with PCE to date.

Surface Water

There were no known discharges of dry cleaning fluids directly to surface water from the cleaning operation at the site. Treated groundwater from behind Stanton Cleaners, however, has been discharged to a storm drain since about 1989. The drain empties directly into Little Neck Bay. Monitoring results from discharge samples, compiled in Appendix B - Table 8, indicate that PCE concentrations frequently exceeded the discharge limit of 5 µg/L with a maximum measured discharge of 240 µg/L. No samples of the receiving waters at Little Neck Bay are known to have been collected and tested for PCE.

Sediments

Sediment samples were collected during the RI from two storm drain catch basins near Plaza Tennis. Neither of these contained PCE above cleanup criteria concentrations.

No samples of sediments near the storm drain outfall at Little Neck Bay are known to have been collected and tested for PCE.

Air

Many indoor and outdoor air samples have been collected to determine if PCE from the soil beneath the SCP was affecting the air in nearby buildings. The air in soil pores, often called soil gas, can enter buildings through cracks and openings in foundations. If soil is heavily contaminated with PCE, vapors from the PCE can displace the natural soil gases and enter nearby buildings.

On ten different occasions between December 1997 and September 1999, NYS DEC, NYS DOH, and/or US EPA collected and analyzed a total of 147 air samples from 40 different locations in and around four buildings near the Stanton Cleaners site. Of these, 82 were collected from 22 different locations at Plaza Tennis. The results from the Plaza Tennis air samples are summarized in Appendix B - Table 2 and the results of air samples from other locations are presented in Appendix B - Table 3.

During the RI and subsequent air investigations, PCE concentrations from indoor locations were compared to State and Federal guidance values. The NYS DOH guideline value for PCE in indoor air is 100 micrograms of PCE per cubic meter of air (µg/m^3). NYS DOH also recommends that immediate action to reduce exposure should be considered when an air level is ten-times higher than the guideline, i.e., when an air level is 1,000 µg/m^3 or higher. ATSDR uses Environmental Media Evaluation Guidance (EMEG) values as screening levels to identify potential contaminants and media of concern. For PCE, ATSDR uses a chronic duration (i.e., for long-term exposure such as a lifetime) inhalation EMEG value of 270 µg/m^3. ATSDR uses an acute (i.e., for short-term exposure such as several hours at a time) inhalation EMEG value of 1,350 µg/m^3.

Analytical results from the earliest rounds of air sampling revealed that Plaza Tennis and the nearby synagogue had PCE concentrations in excess of the NYS DOH guidance value of 100 µg/m^3. The Plaza Tennis club also had PCE concentrations in excess of the ATSDR guidance value of 270 µg/m^3 (Appendix B - Tables 2 and 3). The highest PCE levels encountered were collected from Plaza Tennis, with concentrations ranging from 120 µg/m^3 to 190,000 µg/m^3. PCE was found at concentrations between 1,000 µg/m^3 and 2,800 µg/m^3 in some areas of the tennis courts where people could be exposed. These concentrations exceed NYS DOH's guideline value by more than ten times, i.e., greater than 1,000 µg/m^3. The highest levels were encountered in Court 1, which is next to the source area behind Stanton. Air samples collected adjacent to a floor joint crack contained PCE at concentrations ranging from 14,500 µg/m^3 to 30,000 µg/m^3 and a vapor sample from beneath the floor at that location contained PCE at 190,000 µg/m^3. These latter samples most likely reflect soil vapors directly infiltrating into Court 1 through openings near the foundation. While the floor joint samples are not representative of overall indoor air quality, they do reflect the magnitude of contamination directly abutting this corner of the Tennis Club.

Samples collected from the nearby synagogue, the North Shore Sephardic Synagogue, contained PCE at concentrations ranging from 2.7 µg/m^3 to 210 µg/m^3. Only one sampling location, a classroom on the lower level of the synagogue, had concentrations in excess of the NYS DOH guideline of 100 µg/m^3. Two basement-parking garages in a nearby condominium, owned by Century Apartments, were sampled for PCE during an early round of sampling. While neither sample contained PCE above the NYS DOH guideline of 100 µg/m^3, the results suggested subsurface migration of PCE into the building and the need for additional testing.

Two rounds of air sampling were conducted at the Site in September 1998 by US EPA and in October 1998 by NYS DEC/NYS DOH (see Appendix B - Tables 2, 3, and 6). These rounds were conducted to assess the extent of contamination at the condominium and to assess the effectiveness of a foundation vent system installed at the Plaza Tennis by US EPA during September 1998.

The parking garage of the adjacent condominium complex had levels of PCE from 12 µg/m^3 to 1,092 µg/m^3 in areas of the basement where people could be exposed. Samples collected from the floor drains within the parking garage contained PCE at levels up to 3,400 µg/m^3. Three samples collected from the lobby of the ground floor of the condominium ranged from 4.5 µg/m^3 to 14 µg/m^3. The lobby concentrations were below the NYS DOH air guideline of 100 µg/m^3 and are very similar to concentrations of PCE, which may normally be found in indoor air. In November 1998, US EPA installed devices in the garage floor drains to prevent contaminated vapors from migrating into the parking garage. Results from basement garage samples collected, subsequent to installation of the devices, demonstrate that PCE concentrations have decreased to levels below 100 µg/m^3. The cumulative results indicate that, prior to installation of the floor drain backflow devices, PCE vapors were migrating into the lower garage through the floor drains, resulting in elevated concentrations in both garages but not in the ground floor of the condominium. PCE concentrations in the lobby remained low during both sampling rounds, indicating that the ground and upper floors of the building were not significantly affected.

Air samples were collected from Plaza Tennis before and after US EPA's installation of a soil vapor interceptor (vent) system along the foundation of the structure. Results indicated that PCE concentrations on Court 1 dropped from approximately 1,500 µg/m^3 to about 200 µg/m^3 after the vent system became operational.

In February 1999, US EPA began operation of a SVE system in the area of contaminated soil behind Stanton Cleaners. The system was upgraded with a more powerful extraction unit in May 1999. Four rounds of samples collected since the first system became operational demonstrated a decrease in PCE concentrations at Plaza Tennis. No air samples collected from Plaza Tennis since March of 1999 have contained PCE in excess of the NYS DOH guidance value of 100 µg/m^3. The sample concentrations were in the range of typical indoor air concentrations (between not detectable to about 5 µg/m^3 for PCE). The Plaza Tennis court buildings were demolished in the summer of 2004. The property is scheduled for redevelopment.

The indoor air samples collected from the condominium, the synagogue, and from the synagogue school building next to the synagogue indicated that PCE concentrations were below NYS DOH's guideline value of 100 µg/m^3.

Results of outdoor air samples collected from behind Stanton Cleaners are presented in Appendix B Table 6. These results indicate elevated concentrations of PCE in ambient air near an exhaust vent associated with the current dry cleaning operation. Monitoring with field instrumentation at the discharge point suggested concentrations as high as 150,000 µg/m^3; concentrations in actual air samples collected for laboratory analysis from about 10 feet away from the vent were about 1,000 µg/m^3. The concentrations decrease rapidly with distance and are below the NYS DOH guidance value of 100 µg/m^3 within about 25 to 30 feet and at background concentrations by about 50 feet.

Soil Vapor

Soil vapor testing was done during the RI to find the soil most affected by PCE discharges. The results showed extensive contamination of subsurface soil with PCE, as indicated by the PCE vapors, in areas beneath the rear of Stanton Cleaners, beneath the Stanton boiler room building, and at the corner of Court 1 of Plaza Tennis. Vapor concentrations decreased with distance from the known areas of PCE-contaminated soil at the SCP.

Steam and Vacuum System

During the RI, one water/condensate sample was collected from the condensate reservoir of the steam/vacuum system, which is part of the finishing process, in the boiler room of the cleaning facility. This analysis showed only trace levels of PCE (3 µg/L). The water separator unit, often a source of PCE contaminated wastewater at dry-cleaning facilities, was found to be in compliance during recent inspections by NC DOH. These periodic compliance inspections of facility operations and discharges indicate that active soil and groundwater contaminant sources are no longer present at the site.

PATHWAY ANALYSES

This section of the PHA identifies completed exposure pathways associated with past, present and future uses 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 is comprised of five elements including: (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 adsorption). The receptors are 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 any one of the five elements comprising an exposure pathway is not met or not known to have been met. An exposure pathway is considered to be eliminated, and therefore not evaluated, when any 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.

The primary contaminant of concern associated with Stanton Cleaners is PCE. The known contaminant sources are soil and groundwater behind and beneath the cleaning facility. The environmental media/mechanisms of contaminant transport are subsurface groundwater and soil vapor. The points of exposure are homes, businesses, or other facilities supplied with contaminated groundwater and affected by the subsurface vapors. The primary exposure routes include ingestion, inhalation, and dermal contact associated with use of contaminated groundwater as a source for potable water and also inhalation associated with contaminated soil vapors. The receptor populations would be users of contaminated groundwater and residents, tenants, or patrons of structures with indoor air contamination via entry of soil vapors.

A. Completed Exposure Pathways

For the Stanton Cleaners site, there are two completed exposure pathways. The first is exposure to PCE in indoor air at Plaza Tennis, at a nearby basement garage, and possibly at a neighboring synagogue and a neighboring commercial building. The second is exposure to PCE and other VOCs via the public water supply.

Pathways Related to PCE Vapors (Historic)

Stanton Cleaners

Inhalation and dermal contact are the exposure routes associated with the vapors of the volatile dry cleaning chemical, PCE. Employees of Stanton Cleaners, as with other dry cleaning facilities, are probably exposed to PCE. Prior to 1972, these exposures were not subject to regulation in New York State, though performance standards and recommended limits had been published by two professional/technical societies. In 1972, these exposures became subject to regulations promulgated by the newly created Occupational Safety and Health Administration (OSHA). Evaluation of occupational exposures to PCE for dry cleaning employees is beyond the scope of this document.

Plaza Tennis

Individuals in buildings near the PCE-contaminated soil behind Stanton Cleaners were exposed to PCE in indoor air via vapor migration from areas of subsurface contamination into the overlying structures. This was particularly true at Plaza Tennis where many persons using that facility prior to October 1998 were exposed to PCE at concentrations exceeding both the NYS DOH guideline value of 100 $\mu g/m^3$ and the ATSDR EMEG value of 270 $\mu g/m^3$. The number of individuals potentially exposed may have been several hundred in any given year and possibly a few thousand through the total number of years the Plaza Tennis facility was in business. The NYS DOH guidance value is based on consideration of the effects of long-term exposure to PCE in air and consideration of sensitive people, including children and the elderly. It is used to guide decisions about actions to reduce human exposure to PCE. NYS DOH recommends, for example, that actions to reduce human exposure should be considered when an air level exceeds the guideline value. The ATSDR EMEG value was derived from health effects observed during much higher occupational-level exposures.

Stanton Cleaners has been in operation since the 1950s. Court 1 of Plaza Tennis was constructed in 1963 and Courts 2 and 3 were constructed some time later. Because air sampling data are not available before 1997, specific PCE levels for those years are not known and individual exposures cannot be determined. However, some estimates of historic concentrations in the air can be made from data collected before installation of the foundation vents in 1998. These samples showed PCE air levels ranged from 1,301 $\mu g/m^3$ to 2,800 $\mu g/m^3$ on Court 1, 68 $\mu g/m^3$ to 120 $\mu g/m^3$ on Court 2, 122 $\mu g/m^3$ to 320 $\mu g/m^3$ on Court 3, and between 163 and 1400 $\mu g/m^3$ in the lobby, office, and common areas. Average results for the earliest samples at these locations are 2025 $\mu g/m^3$ for Court 1, 120 $\mu g/m^3$ for Court 2, 290 $\mu g/m^3$ for Court 3, and 1300 $\mu g/m^3$ for the common area (lobby/office).

Plaza Tennis was open from October through April but closed during the remaining months. Thus, patrons and tennis instructors that were previously exposed to PCE at Plaza Tennis may have been so for seven months of each year. Most patrons have been at Plaza Tennis for less than 10 years, however, some have been playing since before 1983 when the current owner purchased the facility. Patrons typically spend one or two hours per week at the facility, though this may be as high as four for some players. Many patrons reportedly prefer Court 1 and request that court. Instructors using courts at Plaza Tennis have been there for several years. Instructors spend up to about 30 hours per week at the facility. While most of this time is on Courts 2 and 3, some is spent on Court 1. At least one full-time employee spends about 50 hours per week at the facility. The vast majority of this time is spent in the office and other common areas. The facility owner spends most weekends at the facility in the office area. During the off-season, the owner may spend weekend days on any given court doing maintenance work. Several reasonable, although conservative, exposure scenarios are presented in further detail in Tables 4 and 7 of the Public Health Implications section later in this document. The Plaza Tennis court buildings were demolished in the summer of 2004. The property is scheduled for redevelopment.

Century Apartments

Sampling conducted at Century Apartments determined that PCE was entering the lower level garage through three floor drains. The upper levels of the building were not significantly affected. Three samples collected from the lobby of the ground floor of the condominium ranged from 4.5 $\mu g/m^3$ to 14 $\mu g/m^3$. The lobby concentrations are below the NYS DOH air guideline of 100 $\mu g/m^3$ and are very similar to concentrations of PCE commonly found in indoor air.

In December 1998, US EPA installed backflow prevention devices in the three floor drains of the lower level garage at Century Apartments. Prior to this installation, nine air samples were collected from areas of the two basement garages (lower level and upper level) where people park, and possibly spend time working on or cleaning their cars. The air samples contained PCE at levels ranging from 30 $\mu g/m^3$ to 1,100 $\mu g/m^3$. Only two results (440 $\mu g/m^3$ and 1,100 $\mu g/m^3$), both from the lower level, exceeded the NYS DOH guideline value of 100 μg/m^3. Six additional samples were collected from the floor drains; these results indicated that PCE vapors were being drawn into the garage by the large exhaust fans. Since installation of the backflow prevention devices, several samples were collected from the garages. The results indicate substantial reductions of PCE levels in the garage with no results above the guideline value.

These limited sampling results indicate that PCE concentrations in the lower level of the garage before the installation of the backflow prevention devices were above the NYS DOH guideline of 100 μg/m^3. Some residents at Century Apartments may have been exposed to PCE in the basement-parking garage for short durations of time.

Levels of PCE in the garage are expected to remain low because of the storm drain backflow preventers and because much of the source area PCE has been removed by the SVE system. Additional sampling is planned as a periodic check on the effectiveness of these measures.

North Shore Sephardic Synagogue

Several air samples were collected at the synagogue and were tested for PCE. Three samples had levels (183 μg/m^3, 200 μg/m^3 and 210 μg/m^3) exceeding the NYS DOH guideline value of 100 μg/m^3. All three of the samples above the guideline were collected in the classroom on the lower floor: one was taken from the center of the room and two were taken from the corner of the room at the floor level. Of the four samples collected in the corner, two exceeded the guideline value and two did not. Of the four samples collected from the center of the room (in areas where people are most likely to be exposed), only one exceeded the guideline. No samples have exceeded the guideline value since implementation of remedial measures at Stanton Cleaners.

Some persons may have been exposed to PCE in the lower floor of the synagogue at concentrations exceeding the NYS DOH guideline value. Approximately 200 to 400 persons, including about 100 children, use the affected room for up to three hours on different occasions during the week.

Levels of PCE in the synagogue are expected to continue decreasing with time as site remediation continues. Additional sampling is planned to monitor the extent of this reduction over time.

Former Warehouse (North Shore Hebrew Academy)

A three-story structure is situated west of Stanton Cleaners and next to the North Shore Synagogue. This building, a former warehouse, was purchased by the synagogue for use as a Hebrew Academy. Renovations began around 1997. Eleven air samples were collected during various stages of renovation at the former warehouse. None of these exceeded the NYS DOH guideline value of 100 μg/m^3. The highest concentration detected, 81 μg/m^3, was measured shortly after the building was enclosed with windows. This suggests that the PCE in the building was originating via subsurface migration of PCE vapors into the building. This also suggests that previous tenants in the building may have been exposed to PCE vapors associated with

Stanton Cleaners. There are no data from that time, however, so we do not know if PCE concentrations in air in the building ever exceeded the NYS DOH guideline value.

The highest concentration of PCE was detected at about the same time that vapor extraction began behind the building. Concentrations in the building have since decreased to non-detectable levels and did so prior to the school's opening in September 1999. Follow-up monitoring, concurrent with remedial activities at Stanton Cleaners, is planned. NYS DOH and/or US EPA will review these results and provide guidance, as necessary, to ensure that health risks from indoor air contaminants (if any) at the school are minimized. Approximately 60 students now attend the school and about 12 staff are employed at the new academy.

Pathways Related to Contaminated Public Water Supply Wells (Past)

Exposure to contaminants in drinking water supplies can occur via ingestion, dermal contact and absorption during showering, bathing or other household uses, and inhalation of aerosols and vapors from water used in the household. 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.

A program for monitoring VOC contamination in public supply wells in Nassau County began in about 1976. In the 1970s and 1980s, the NYS DOH drinking water guideline for VOCs, including PCE, was 50 µg/L. When this guideline was exceeded in a public water supply well, the well was usually removed from service until an appropriate treatment system was installed. In 1989, NYS DOH adopted (in 10 NYCRR Part 5) a drinking water maximum contaminant level (MCL) of 5 µg/L for PCE and many other VOCs. Consequently, additional public water supply wells were taken out of service or had treatment systems installed.

Since implementation of VOC monitoring at the WAGNN supply wells (around 1977), VOC contaminants have been detected in four of the public supply wells at Water Mill Lane. These wells provide a portion of the water for a distribution system that serves between 30,000 and 35,000 persons. The affected wells have been treated to meet applicable drinking water standards or are no longer in service. The status of these wells is summarized in Appendix B - Table 1.

Appendix B - Table 5 presents a summary of the historic analytical data for PCE and other VOCs for each of the five wells used at Water Mill Lane since 1977. Because monitoring data are lacking prior to 1977 for these wells, specific contaminants and concentrations to which people may have been historically exposed via the public water supply cannot be determined. However, some estimates of historic concentrations in the wells can be made from the existing database.

When NYS DOH estimates exposures to VOCs from drinking water, it looks at all available data for the drinking water source. In Nassau County, quarterly monitoring of all public supply wells for VOCs began in about 1978 or 1979. The frequency of monitoring was often increased to monthly samples for wells that were contaminated with or had special treatment for VOCs.

Thus, most public water supply wells in the County have historic water quality data for VOCs from four occasions each year and in some cases from twelve sampling events. A review of these data for contaminated wells indicates that VOC contaminant levels in the wells display characteristic patterns or trends. For example, high concentrations of VOCs generally do not suddenly appear in the wells. More typically, VOC contaminants will begin to appear at relatively low concentrations and will be detected more frequently. The Watermill Lane public water supply wells that were associated with detection of VOCs historically are Wells #0022 (C2), #0700 (#21A), #4388 (#9) and #8342 (#11). The levels of contamination detected in these wells were below the NYS drinking water standard in effect at that time. Well #12796 (#2A) replaced well #0022 in 1996 and has always had VOC removal treatment. (Refer to Table 5)

Concentrations of VOC contaminants may gradually rise to a maximum and then slowly decrease (occasionally disappearing altogether). In many cases, concentrations gradually rise to a certain level and then remain near that level, with some fluctuation, for months or even years. During the course of sampling, when VOCs begin to appear in a well at low concentrations, a sample or two may have no VOCs detected. Consequently, when the earliest series of VOC samples from a well begins with one or two samples without VOC detections, but is followed by samples with VOCs, the well may not have been previously free of VOCs. In such cases, NYS DOH looks at a commonly detected concentration from the earliest years and conservatively assumes that this level was present in the well from a short time after the source of the contaminant (Stanton Cleaners) began operations.

None of the Water Mill Lane supply wells contained VOCs in the earliest samples tested, between 1977 and 1978. Contaminant trends or patterns based on the database of subsequent sample results suggests that this was probably true of most wells (see the endnotes for Appendix B – Table 5). However, consistent with the assumptions stated above, NYS DOH assumes that Well #4388 may have had relatively low levels possibly, 10 µg/L or less, of PCE contamination prior to 1977. If such PCE originated at Stanton Cleaners, a conservative estimate would be that the contaminant appeared at about 1960, a few years after Stanton Cleaners began operations. This assumes that unapproved or unregulated discharges of PCE into the ground began almost immediately when the dry cleaning operation opened (sometime in the 1950s) and allows a few years of travel time for PCE through the aquifer to the supply well. The three other wells at the wellfield, pumping during this time, were probably not contaminated. Wells #0022 and #0700 appear to have become contaminated with low levels of PCE, TCE, and/or *cis*-1,2-dichloroethene after about 1981. This was prior to VOC removal treatment, installed late in 1983, at the wellfield. Well #8342 has not been adversely affected by VOC contamination and the newest well, well #12796, has only been used with VOC removal treatment.

Under the scenario just described, water supplied from the wellfield to the distribution system may have contained about 3 µg/L of PCE (about one-quarter to one-third of the 10 µg/L, depending upon how many other wells pumped concurrently) for about 21 years. This was followed by a three year period between 1981 and 1983, when VOCs began to appear at increasing concentrations in the wells, of approximately 6 µg/L PCE, 1 µg/L TCE, and 2 µg/L of 1,2-DCE. A worksheet summarizing the method used to derive these concentrations is presented in Appendix B as Table 9. These contaminants were reduced to non-detectable concentrations at the point of distribution after VOC removal treatment was installed at Water Mill Lane in December 1983. An unknown amount of benzene passed through Well #0700 during the 1980s, beginning late in 1983. Water from that well containing about 145 µg/L of benzene may have co-mingled with water from three other wells of similar pumping capacity for about three weeks prior to initiation of VOC removal. This may have caused a short duration exposure to water with approximately 36 µg/L (one-quarter of 145 µg/L) of benzene.

During the period described above, there is no indication that contaminant levels in the water supplied to the community exceeded the NYS DOH VOC guideline of 50 µg/L in effect at the time. Historic exposures above the current maximum contaminant levels (MCLs) of 5 µg/L would have included PCE at about 6 µg/L for three years and benzene at about 36 µg/L for three weeks. Since 1983, contaminated water at the wellfield has been treated to meet the current NYS DOH MCLs (5 µg/L for each of the compounds of concern) promulgated in 1989.

B. Potential Exposure Pathways

Pathways related to PCE Vapors

Plaza Tennis (Future)

By March 1999, analytical data indicated that PCE concentrations in the Plaza Tennis facility decreased to concentrations below the NYS DOH guidance value of 100 µg/m^3. The residual amounts of PCE detected in Court 1 (up to 20 µg/m^3) decreased with time as the SVE system installed by US EPA continues to remediate contamination between Stanton Cleaners and Plaza Tennis.

Performance data from US EPA's SVE system suggest that much (probably most of the mass) of the PCE contamination in subsurface soil behind Stanton Cleaners has been removed by the system. Relatively small amounts of residual PCE vapors remain beneath the surface and probably in the soil; however, US EPA intends to continue operation of the SVE system with modifications to extract more of the PCE. If significant residual PCE remains beneath the surface when the system is shut down, vapors could affect the former Plaza Tennis property and any future redevelopment may have PCE indoor air contamination, even though the concentrations might never exceed 100 µg/m^3 again. This situation will be monitored and controls used in the future to ensure that PCE exposures at any future redevelopment remain at a minimum until and after the site is completely remediated. The Plaza Tennis court buildings were demolished in the summer of 2004. The property is scheduled for redevelopment.

Pathways Related to Contaminated Public Water Supply Wells (Present and Future)

Exposures to contaminants in drinking water supplies can occur via ingestion, dermal contact and inhalation from water uses such as showering, bathing or other household uses. 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.

Groundwater in the area of study is contaminated with VOCs, and this groundwater serves, at least in part, as the source of water for a population of about 30,000 to 35,000 people. However, as previously discussed, contaminated groundwater is treated at the Water Mill Lane wellfield to remove contaminants prior to public distribution of the water. One well at Water Mill Lane (Well #8342) is not treated for VOCs because it is free of such contamination. All of the supply wells, regardless of treatment, are required to be routinely monitored for VOC contamination. Additional monitoring is also required at wells that have VOC removal to evaluate effectiveness of the removal systems. Thus there are two controls in place, treatment and monitoring, to mitigate possible VOC exposures via public water supplies.

Exposure to VOCs through the public water supply remains a potential pathway in the event that current controls fail. If treatment systems fail, VOC contaminants could be distributed through the public water supply. If contamination reaches the supply well not currently treated for VOCs (Well #8342), VOC contaminants could also be distributed through the public water supply. Either of these possibilities would be discovered through the routine monitoring programs presently in place, thereby minimizing the duration of exposure.

NC DOH maintains a database of the historic monitoring results from public water supplies. A review of the data for the Water Mill Lane supply wells indicates that VOC contaminants are seldom detected in treated water at concentrations either below or exceeding drinking water standards. The occasional detections may be associated with system servicing and are for brief periods of time.

Pathways Related to Subsurface Soil

Exposure routes associated with contaminated soil are ingestion, dermal contact, or inhalation of contaminated particulates. Subsurface soil beneath and behind the rear portions of the SCP was heavily contaminated with PCE prior to installation of the SVE system and may still be contaminated in excess of cleanup guideline values. While there are no current exposures to these subsurface materials, past construction activities may have resulted in exposures at or adjacent to the SCP. The area of soil contamination has been paved and secured by US EPA, thereby preventing future construction into areas of known contamination. Additionally, subsurface contaminants are being remediated by the SVE system. Follow-up soil testing is planned to document the effectiveness of site remediation.

Pathways Related to Surface Soil

Surface soil at and behind the SCP was previously contaminated with high concentrations of PCE. Visual and anecdotal evidence prior to US EPA securing the area of contamination indicated that individuals occasionally passed near or through areas of soil contamination (an overgrown footpath) and walked dogs there. The levels and durations of exposure, if any, for these persons are unknown but not expected to be of public health significance. Because this

area is paved and secured, there are no current exposures. Site remediation continues; follow-up soil testing is planned to document the effectiveness of site remediation.

Pathways Related to Outdoor Air

PCE has been documented in outdoor air near the rear of the SCP. This PCE is believed to be related to present operations at the facility, rather than past unregulated disposal, and is thus not within the direct scope of this PHA. Limited data on the PCE concentrations in air behind the facility (Appendix B - Table 6) suggest that inadvertent exposures of very short duration (e.g., walking a dog or using a footpath) to concentrations above the NYS DOH guideline may have occurred.

Remedial measures specifically aimed at removing contaminated materials from the subsurface, such as the ongoing SVE, could result in exposures to PCE if vapors are released into the environment. For this reason, protective monitoring and other controls, as necessary, should be employed during remedial activities. Outdoor air monitoring since remedial measures were implemented at the SCP indicates that contributions of PCE to air, if any, from these measures would not be distinguishable from the greater amounts of PCE in the air from the active dry cleaner operations at Stanton.

Pathways Related to Surface Water, Sediments, and Biota

The nearest surface water body to Stanton Cleaners is the Little Neck Bay. Some releases of PCE into a storm drain leading to the Bay were documented (Appendix B - Table 8). The impacts of these discharges, if any, on water quality, sediments, and biota at the point of discharge to the Bay is unknown as no samples were collected from this area. Additionally, no information is available on potential exposure pathways that may be associated with the discharges. Consequently, these pathways cannot be evaluated at the present time. However, the relatively low levels of PCE in the discharge, the dilution with storm water and with the Bay, and volatilization of the PCE en route to the Bay suggest that exposures would be minimal.

Pathways Related to other Potential Source Areas

Several businesses surrounding the Stanton Cleaners Site were investigated to determine if they were a contributing source of groundwater contamination in the area. US EPA specified the SCP as Operable Unit One, and is the main focus of this PHA. Other potential sources of contamination were evaluated as Operable Unit Two. The sites involved in the evaluation of Operable Unit Two are Fenly Amoco (Amoco A), Mayflower Cleaners, former Flower Fashion Cleaners, Jonathan Auto Repair and Amoco Gas Station.

US EPA reviewed the ongoing response actions at the five nearby sites that were identified as being possible contributers to groundwater contamination in the vicinity of the Stanton Cleaners Site. The five sites were investigated and remedial actions are currently being addressed or are in

the process of being addressed by NYSDEC and/or private parties, outside of the Federal Superfund program.

Accordingly, based on its review, US EPA has concluded that, other than the continued implementation of the March 1999 remedy and the periodic review of that remedy, no further Federal response actions need to be taken as part of the Operable Unit Two remediation of the Stanton Cleaners site. US EPA may revisit this determination in the future if it obtains new information that indicates that it would be appropriate for US EPA to do so.

C. Eliminated Exposure Pathways

Because most environmental media were affected by contamination from the SCP, no exposure pathways were eliminated from the previous discussion. Some pathways, however, are not discussed in the Public Health Implications section because they are of limited importance from a public health perspective or lack sufficient data.

PUBLIC HEALTH IMPLICATIONS

A. Toxicological and Epidemiological Evaluation

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

1. <u>Past inhalation exposure to PCE in air at Plaza Tennis</u>.

People were exposed to elevated indoor air levels of PCE at Plaza Tennis. Air sampling results for areas within the building where people would most likely be exposed showed PCE in air ranging from 19 $\mu g/m^3$ to 2800 $\mu g/m^3$. Several of the sampling results exceeded public health assessment comparison values (Appendix B - Table 10), including the NYS DOH guideline of 100 $\mu g/m^3$ (NYS DOH, 1997), which considers lifetime exposure and potentially sensitive individuals, including children and the elderly. Since these health-based comparison values were exceeded, the potential health risks for exposure to PCE were further evaluated.

Chronic (Long-Term) Exposure

The health risks for chronic exposure to PCE were evaluated for people who worked or played tennis at Plaza Tennis. Depending on their activities, people were most likely exposed to different air concentrations of PCE for varying lengths of time and at different locations within the building. Furthermore, exposure to PCE was not continuous. Accordingly, to evaluate the health risks for chronic exposure, the air concentrations for those individuals who worked or played tennis at Plaza Tennis are adjusted to reflect the variable and non-continuous nature of the exposures (see table below), based on specific information provided during interviews

PCE Levels for Various Activities at Plaza Tennis*

Description	Location	Air Conc. (μg/m^3)	Hours per Week	Months per Year	Adjusted Air Conc. (μg/m^3)
Owner	Lobby/Office	1300	17	11.5	126
Full-time Employee	Lobby/Office	1300	50	6	193
Instructor	Courts	812	30	6	72.5
Patron	Courts	2025	4	6	24

μg/m^3 = micrograms per cubic meter

*The air concentration for instructors is an average for the various courts, while the air concentration for patrons is based on a stated preference for Court 1. The lobby/office air concentration is an average of three samples. Cancer risks were evaluated for 3, 6, 18, and 35 years of a 70-year lifetime for employees, instructors, owner and patrons, respectively.

Studies of workers exposed to PCE and other chemicals show an association between exposure to high levels of these chemicals and increased risks of certain forms of cancer, including esophageal, bladder, and non-Hodgkin's lymphoma (ATSDR, 1997b). These associations are unlikely to be due to chance; however, the role of other factors in causing these cancers, including exposures to other potential cancer-causing chemicals, is not fully known. Thus, these data suggest, but do not prove, that exposure to PCE causes cancer in humans. Other studies show that people living in communities with drinking water supplies contaminated by mixtures of chemicals including PCE have higher risks of certain types of cancer (e.g., non-Hodgkin's lymphoma) than do people living in communities with uncontaminated drinking water. These studies are weaker than those of workers, with occupational exposure, largely because it is uncertain whether the people who got cancer actually drank the contaminated water for long periods of time before they got cancer. The adjusted PCE air concentrations for people who worked or played tennis at Plaza Tennis (24 μg/m^3 to 193 μg/m^3) are all much lower than the PCE levels that caused cancer in laboratory animals after long-term exposure (i.e., greater than 100,000 μg/m^3). Based on the available information, we estimate that past long-term exposure to PCE in air at Plaza Tennis would pose a low increased risk of cancer. This evaluation took into consideration that respiratory rates and the resulting inhaled dose of PCE could be greater during periods of exercise. The contribution of the short-term increase in respiration rates during exercise to the long-term respiration rate and contaminant intake is small, and thus does not change our evaluation of the risk for health effects from long-term exposure. Exposure to PCE can also cause non-cancer health effects. Studies of humans exposed to PCE in the workplace show that long-term inhalation exposure may increase the risk of adverse reproductive effects (reduced fertility, changes in semen quality, increased incidences of menstrual disorders and increased rates of spontaneous abortion), but the data are not strong enough to conclude that these effects were due solely to PCE (ATSDR, 1997). Long-term exposure to high levels of PCE can also affect the central nervous system, kidney and liver of humans and laboratory animals. The adjusted Plaza Tennis PCE air concentrations (24 µg/m3 to 193 µg/m3), but not all the measured air concentrations, are lower than levels associated with non-cancer health effects for long-term exposure. Specifically, people who lived in apartments above dry cleaning shops and were exposed to levels of PCE from 1400 µg/m3 to 5000 µg/m3 scored slightly lower on tests that assessed the function of the central nervous system (Altmann, et al., 1995).

Acute (Short-Term) Exposure

Exposure to elevated levels of PCE in air can also cause acute (short-term) adverse health effects. Studies with human volunteers show that short-term inhalation exposure (4 hours) to high levels (350,000 µg/m^3) of PCE affects the nerves of the visual system and reduces scores on certain behavioral tests, evaluating the speed and accuracy of a person's response to something they see on a computer screen. Exposure to levels as high as 700,000 µg/m^3 for eight hours or less causes central nervous system symptoms such as dizziness, headache, sleepiness, lightheadedness and poor balance. These effects were mild and disappeared soon after exposure ended.

The table below summarizes the short-term PCE air concentrations measured for people who worked or played tennis at Plaza Tennis. These short-term air levels (1400 µg/m^3 to 2800 µg/m^3) are well below the levels of PCE that caused acute health effects (i.e., 350,000 µg/m^3 to 700,000 µg/m^3). Consequently, based on the available sampling information, we do not expect short-term health effects from working or playing tennis at Plaza Tennis.

Short-term PCE Levels for Various Activities at Plaza Tennis

Description	**Location**	**Air Conc. (µg/m^3)**
Owner, Instructor or Patron	Courts	2800
Full-Time Employee	Lobby/Office	1400

2. Past inhalation exposure to PCE in air at Century Apartments parking garage.

Two of nine sampling results collected from areas of the two basement garages (both from the lower level) exceeded the NYS DOH guideline value of 100 µg/m^3. The air levels of PCE in these samples were 400 μg/m^3 and 1100 μg/m^3. About two dozen individuals or families park their vehicles in the lower level of the garage and may have been exposed for several minutes per day. The levels of exposure are lower than those associated with health effects and the durations of exposure are limited. Thus, the risk of residents experiencing health effects from possible basement garage exposure to PCE is considered to be very low.

3. Past inhalation exposure to PCE in air at North Shore Sephardic Synagogue.

Three air samples collected from the synagogue had PCE levels above the NYS DOH guideline. The levels of PCE in these samples were 183 μg/m^3, 200 μg/m^3 and 210 μg/m^3. The NYS DOH guideline is not a line between air levels that cause health effects and those that do not. The guideline is lower than air levels that are associated with either noncancer or cancer effects and thereby reflects the consideration that some individuals may be more sensitive to PCE exposure than others. Thus, the possibility of health effects in children and adults is low at air levels slightly above the guideline. The guideline is also based on the assumption that people are continuously exposed to PCE in air all day, every day for as long as a lifetime. However, individuals only spend a few hours per day or even per week in the downstairs multipurpose room of the synagogue (where the three samples with PCE above the guidelines were taken). Consequently, the risk of people experiencing health effects from past exposure to PCE at the synagogue is very low.

4. Past inhalation exposure to PCE in air at Former Warehouse.

None of the air samples taken in the former warehouse exceeded the NYS DOH guideline for PCE. The highest concentration detected was 81 μg/m^3, and concentrations have decreased since the opening of the Hebrew Academy in September of 1999. The risk of people experiencing health effects from past exposure to PCE is very low.

5. Past ingestion, dermal and inhalation exposure to volatile organic contaminants in Water Mill Lane public water supply wells.

Well #4388 in the Water Mill Lane well field was contaminated with low levels of PCE which exceeded current New York State public drinking water standards and public health assessment comparison values (Appendix B - Table 11). Contaminant levels prior to 1977 are not known. If the contamination originated from operations at Stanton Cleaners, then PCE could have entered Well #4388 around 1960, and for reasons previously discussed, may have been present at a level of about 10 micrograms per liter (μg/L). Water from this wellfield supplied to the distribution system was mixed with water from other wells, resulting in an approximate PCE level of about 3 μg/L for a period of about 21 years (1960 to 1981). During the following three years until treatment systems were installed on the wells (1981 to 1983), taking into account the blending of the contaminated water with water from other wells, the PCE concentration in finished water is estimated to have been about 6 μg/L. The estimated levels in finished water for other VOCs did not exceed the current New York State public drinking water standards, with the exception of benzene, which was found in Well #0700 in late 1983. Taking into account the blending of the water from Well #0700 with water from other wells, people may have been exposed to benzene at about 36 μg/L for about three weeks.

The health effects of PCE were already discussed. Based on the results of animals studies, studies of people exposed to PCE, and the sampling data for Well #4388, we estimate that persons exposed to PCE in drinking water (6 μg/L for 3 years and 3 μg/L for 21 years) would have a very low to low increased risk of developing cancer. The risk for noncancer effects for PCE would be minimal.

Benzene, a contaminant not related to Stanton Cleaners but detected in the Water Mill Lane wells, is a known human carcinogen (ATSDR, 1997a) based on studies of people exposed to elevated levels of benzene in air in occupational settings. The levels and duration of exposure to benzene in drinking water from the Water Mill Lane wellfield are much less than the exposure levels and durations known to cause cancer in humans. Exposure to the levels of benzene detected in Well 0700 (36 μg/L) for three weeks would pose a very low increased risk of developing cancer. The risk for noncancer health effects for benzene would be minimal.

B. ATSDR Child Health Considerations

The ATSDR Child Health Considerations emphasizes examining child health issues in all of the agency activities, including evaluating child-focused concerns through its mandated public health assessment activities. ATSDR and 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 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 PCE (the primary contaminant at the site) was taken into account when evaluating the potential health risks associated with the site. Human studies suggest that exposure to mixtures of chlorinated solvents (including PCE) 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, 1997). In each of these studies, however, there are uncertainties about how much contaminated water the women drank during pregnancy and about how much PCE 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.

When pregnant animals are exposed by ingestion or inhalation to large amounts of PCE (i.e., amounts that caused adverse health effects in the adult animal), adverse effects on the normal development of the offspring are observed. In addition, 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). The estimated levels of exposure in the oral and inhalation animal studies in which adverse effects were observed are much greater than the estimated levels of exposure to PCE resulting from contamination associated with the Stanton Cleaners site. The actions taken to reduce exposure to PCE at the site will also help ensure that the potential risks are minimized.

C. Health Outcome Data Evaluation

Past exposures to chemical contaminants from the site in air and drinking water pose a low increased risk of cancer and other adverse health effects. For this reason NYS DOH has not evaluated health outcome data specifically for this site. However, NYS DOH maintains several health outcome databases, which could be used to generate site-specific data if warranted. These databases 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 data information. NYS DOH also is developing a registry of individuals in New York State who have been exposed to VOCs such as PCE and benzene.

In 1999, NYS DOH established the New York State Volatile Organic Compounds (VOC) Exposure Registry as a tool for health status assessment and long-term follow-up for individuals 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 analyses, based on VOC Exposure Registry information, may increase understanding of potential health effects from exposures similar to those experienced by residents in the WAGNN water supply area.

For communities with large public water supplies served by multiple wells, information is generally not available for accurately specifying VOC exposures for individual households. In addition, in cases where exposures ended more than ten years ago, it would be difficult now to locate the residents who lived in the area at the time of the potential exposures. For these reasons, residents supplied by public water supplies affected by contamination from the Stanton Cleaners Area Groundwater Contamination Site are not being considered for inclusion in the VOC Registry. The VOC Exposure Registry may, however, help contribute to knowledge about whether specific health outcomes may be related to exposures to the specific chemicals, particularly PCE, associated with the WAGNN water supply area.

D. Community Health Concerns Evaluation

As previously noted, NYS DOH staff participated in two public meetings and one meeting with local officials about the site and held a special meeting for the patrons of Plaza Tennis.
NYS DOH has interacted with many community members during visits to the site, via telephone

conversations, and via written correspondence. Local residents expressed a number of concerns about the Stanton Cleaners site during these communications and through letters to the editors of local newspapers. These concerns are discussed below.

Concerns About Indoor Air Quality at Plaza Tennis

Many patrons at Plaza Tennis expressed concerns about adverse health effects from past exposures to PCE in indoor air at the facility. Parents are particularly concerned about their children who attended tennis lessons there, and pregnant or nursing mothers who played tennis are concerned about potential effects to their offspring. As discussed earlier, some limited studies of women who drank water containing PCE during pregnancy suggest that PCE can cause adverse developmental effects in humans, and PCE is also known to cause adverse developmental effects in offspring of pregnant animals at levels of exposure high enough to cause health effects in the adults. The estimated exposures to PCE associated with the Stanton Cleaners site are well below PCE exposures known to cause adverse effects on the ability to bear healthy offspring in animal studies.

NYS DOH staff communicated both general information about the health effects of PCE and specific information about exposures at Plaza Tennis to the public. Much of this information was presented in a fact sheet prepared by NYS DOH. The fact sheet, appended to this document as Appendix E, is in a question and answer format; interested readers should refer to the appended fact sheet. The fact sheet was issued in February 1999 and more current information may be available. That updated information is present in this Public Health Assessment. Of particular interest are the indoor air monitoring results since installation of US EPA's interim remedial measures (referred to as "Remediation" in the fact sheet data table). In response to patrons' desire for information on the air quality at Plaza Tennis, NYS DOH prepared tabulations of the results of indoor air monitoring for PCE. These were sent to the owner of Plaza Tennis who posted the results in the lobby and they were sent to the tennis instructors. The Plaza Tennis court buildings were demolished in the summer of 2004. The property is scheduled for redevelopment.

Concerns About Students at the Neighboring School

Some members of the community expressed concern about potential PCE exposures to students at the synagogue school. As noted above, no air samples collected from the school have exceeded the NYS DOH guideline value for PCE. The detections of PCE, all of which were below the guideline, were in samples collected during renovation of the former warehouse and prior to the school's opening. Since that time, the SVE system has been in operation and levels of PCE in the building are no longer detectable. Additional monitoring is planned and appropriate guidance will be provided by the agencies to help minimize health risks, if any, from indoor air contaminants.

Concerns About Air Discharges From Remediation Systems

Some members of the community expressed concern that PCE discharged to the air from the SVE operation and from the air stripper units may have deleterious health effects. Extensive air testing has been done behind and near the SCP. The testing shows that PCE related to operations of the cleaning facility is in outdoor air and that the concentrations diminish rapidly with distance from the vents. The testing has not indicated distinguishable contributions of PCE to air from the roof discharge for the Plaza Tennis foundation vent (which exhausts soil vapor from an area next to Stanton Cleaners), or from the small air stripping unit behind the cleaning facility. The exhaust vents associated with the Plaza Tennis court buildings were dismantled when the tennis courts were demolished in the summer of 2004. The PCE vapors collected with the large SVE system are captured in carbon canisters and are not expelled to the air. With respect to the large air-stripping unit at the Water Mill Lane treatment plant, potential air discharges of PCE were evaluated by the WAGNN's engineering consultant and compared to the allowable air concentrations for PCE per NYS DEC's Air Guide 1. Based on that evaluation, the engineer determined that treatment of the air stripping off-gas would not be necessary unless PCE concentrations in the groundwater influent to the unit exceed 650 µg/L. Based upon existing information, PCE concentrations are not expected to reach this level.

Concerns About Drinking Water Quality

One common concern expressed by many individuals is the potential for exposure to VOCs in contaminated drinking water. Historic exposures to VOCs have occurred via contaminated drinking water. The magnitude of these exposures and consequent risks are not definitively known; however, NYS DOH estimates a very low to low cancer risk and a minimal risk of noncancer effects. An air stripping treatment system is currently used to remove VOC contaminants from water prior to its distribution. Monthly monitoring at the wellhead is used to verify the continued effectiveness of the treatment system.

Concerns About Other Sources of Contamination

Community members have also expressed concern about many potential sources of groundwater contamination near the Water Mill Lane wellfield. These include several dry cleaning facilities, several automotive filling and repair stations, and several light industrial facilities within one-half mile of the wellfield. Residents desire that all contaminant sources be discovered and remediated. While a major source of PCE contamination at the wellfield has been discovered (the SCP), other sources of PCE and VOCs were thought to exist. Several of these have been the subject of investigation and/or remedial activities (the Citizens Development Corporation/former dry cleaning site, Mayflower Cleaners, and at least two gasoline spills). US EPA has concluded that other than the continued implementation of the March 1999 remedy and the periodic review of that remedy, no further Federal response actions need to be taken as part of the Operable Unit Two remediation of the Stanton Cleaners site.

Concerns About Surface Water Discharges

At least one member of the community, a leader in a local water resources/wildlife advocacy group for the Little Neck Bay, expressed concern that nearby waste sites may have adversely impacted the Bay environment. Based on monitoring of treated groundwater released to the Bay from the SCP, some PCE probably entered the Bay waters. However, the relatively low levels of PCE in the discharge, the dilution with storm water and with the Bay, and volatilization of the PCE en route to and at the Bay suggest that exposures would be minimal.

Concerns About Over-pumping the Aquifer

Members of the WAGNN have expressed concern that the proposed groundwater extraction well near the wellfield and close to Little Neck Bay might jeopardize water quality at Water Mill Lane by exacerbating salt-water intrusion. US EPA is aware of this concern and has stated its intention to carefully model this groundwater dynamic during design of its extraction well to prevent intrusion problems.

The public was invited to review a draft of this public health assessment during the public comment period, which ran from July 28th, 2003 to September 24, 2003. We received eleven responses, two of which were from public agencies. A response to the comments is shown in Appendix F.

CONCLUSIONS

Based on the ATSDR's public health hazard category classification (Appendix D), the Stanton Cleaners Area Groundwater Contamination site posed a public health hazard in the past because actions were needed to end PCE indoor air exposures and prevent future exposures. These exposures may have increased in the future had these measures not been taken. The risk of someone getting cancer or noncancer adverse health effects from exposures that were measured in the past is low. Exposures to PCE have since been mitigated by the source area remedial measures implemented by US EPA.

The Stanton Cleaners Area Groundwater Contamination site also presented a public health hazard in the past because actions, such as the addition of treatment, were needed to end PCE drinking water exposures and prevent future exposures. These actions also addressed drinking water exposures to benzene, a contaminant not related to Stanton Cleaners. Drinking water exposures may have increased in the future had these measures not been taken. The risk of someone getting cancer from drinking water exposures that were measured in the past is very low to low. The risk for noncancer health effects would be minimal. Effects have been observed at similar levels in people living near dry-cleaning shops, however, these exposures were likely through indoor air rather than drinking water. Exposures to PCE may have occurred for several years prior to 1977. Exposures to PCE at concentrations slightly exceeding the current drinking water standard (but less than the guideline then in effect) probably occurred during a two or three year period in the early 1980s. Exposures to benzene at concentrations exceeding the current drinking water standard (but less than the guideline then in effect) probably occurred for one to three weeks in 1983. Since that time, no incidents of exposure in excess of drinking water standards are known to have definitively occurred. Therefore, currently, the site poses no public health hazard with respect to drinking water.

Soil contamination at the rear of the SCP may have presented limited direct exposure or ingestion threats in the past but is no longer accessible. The contamination was the source of soil vapor contamination and, consequently, indoor air contamination. Soil contamination was also a very likely source of continuing groundwater contamination. Groundwater immediately downgradient of the SCP is contaminated with PCE and the contamination encroached on a nearby public water supply wellfield. This groundwater contamination does not currently pose a public health hazard because of two controls: VOC treatment systems at the affected supply wells and routine monitoring of all wells for VOCs. These controls minimize the potential for exposure to VOCs through drinking water.

Exposure pathways other than indoor air and contaminated water supplies are not considered to be significant. Also, potential exposures that may have occurred at North Shore Sephardic Synagogue and in the parking garage of Century Apartments are not considered to be significant (very low increased cancer risk and minimal risk of non-cancer health effects). The indoor air exposure route for the tennis courts was eliminated when the tennis court buildings were demolished in the summer of 2004.

Community concerns about potential health effects from past PCE exposures have been addressed by NYS DOH through public discussions, written communications and a site-specific Fact Sheet. Other concerns have been addressed by engineering interventions to eliminate exposures along with long-term monitoring programs.

RECOMMENDATIONS

US EPA should ensure that source removal measures continue at and near the SCP. US EPA and NYS DOH should ensure that indoor air quality is periodically tested at previously affected buildings to document exposures to PCE, if any, and to evaluate the effectiveness of the ongoing removal measures. The Plaza Tennis court buildings and the exhaust vents associated with the sub-slab depressurization system were demolished in the summer of 2004. US EPA should ensure that a program of post-remediation testing is implemented as source removal measures near completion. The testing should include an evaluation of PCE concentrations in soil, soil vapor, and indoor air. In the event that a new building is built on the former Plaza Tennis site prior to source removal completion, the following must be done: the potential for soil vapor intrusion must be evaluated as well as the need for a sub-slab depressurization system. If needed, the sub-slab depressurization system must be installed during construction of the building.

NYS DOH and NC DOH should ensure that the requirements of 10 NYCRR Part 5 for community water supplies continue to be met. These requirements include treatment of source water to provide a potable supply that meets drinking water standards and regular monitoring to determine the effectiveness of VOC removal systems. The requirements also include regular monitoring of unaffected supply wells to detect possible VOC contamination.

US EPA should ensure that the remedial program selected in the March 1999 Record of Decision is fully implemented. The remedy includes interception and treatment of contaminated groundwater between the SCP and the Water Mill Lane wellfield.

NYS DOH, NC DOH and US EPA should ensure that safety standards to prevent exposures are followed during the redevelopment of the tennis court property.

PUBLIC HEALTH ACTION PLAN (PHAP)

The Public Health Action Plan (PHAP) for the Stanton Cleaners site contains a description of actions to be taken by ATSDR and/or NYS DOH following completion of this public health assessment. The purpose of the PHAP is to ensure that this public health assessment identifies public health hazards and provides a plan of action designed to mitigate and prevent adverse human health effects resulting from the 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 NYS DOH to follow up on this plan to ensure that it is implemented. The public health actions taken and planned by ATSDR and/or NYS DOH are as follows:

Public Health Actions Taken

1. Indoor air contamination related to PCE behind the SCP has been reduced or eliminated in all affected structures. This was accomplished by several soil vapor control/removal measures implemented during 1998 and 1999 by US EPA. A program of air quality monitoring was also implemented to evaluate the effectiveness of these measures.
2. Potentially affected public water supply wells have been routinely monitored by the WAGNN and NC DOH for VOC contaminants. Contaminated wells have been supplied with treatment systems to bring finished water within standards or have been taken out of service.
3. Water treated for VOCs at the Water Mill Lane wellfield is monitored on a monthly basis by WAGNN pursuant to NC DOH requirements. This monitoring serves as a check on the effectiveness of the VOC removal treatment.
4. NYS DOH worked with US EPA, ATSDR, and NYS DEC during the site investigations and implementation of remedial measures to ensure that all exposure pathways were identified and appropriately mitigated.

Public Health Actions Proposed

1. US EPA and NYS DOH will ensure that adequate indoor air monitoring is performed at all affected buildings near the SCP to determine the continued effectiveness of the remedial measures.

2. NYS DOH will continue to participate with US EPA during the implementation of the Operable Unit 1 remedy to ensure that all human exposure pathways related to the SCP contamination are appropriately assessed and mitigated and to address community concerns.

3. NYS DOH will participate in US EPA's Operable Unit 2 activities to identify other potential sources of groundwater contamination. NYS DOH will further work with US EPA relative to the development and implementation of requisite remedial measures that result from such investigations.

4. ATSDR and NYS DOH will coordinate with the appropriate agencies regarding actions to be taken in response to those recommendations provided in this public health assessment for which no plan of action has yet been developed.

5. ATSDR and NYS DOH will provide follow-up to the PHAP as needed, outlining the actions completed and those in progress. Follow-up reports will be placed in repositories that contain copies of this health assessment, and will be provided to persons who request it.

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CERTIFICATION

The Public Health Assessment for the Stanton Cleaners Area Groundwater Contamination Site 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 methodology and procedures existing at the time the public health assessment was initiated. Editorial review was completed by the cooperative agreement partner.

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

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APPENDIX A

FIGURES

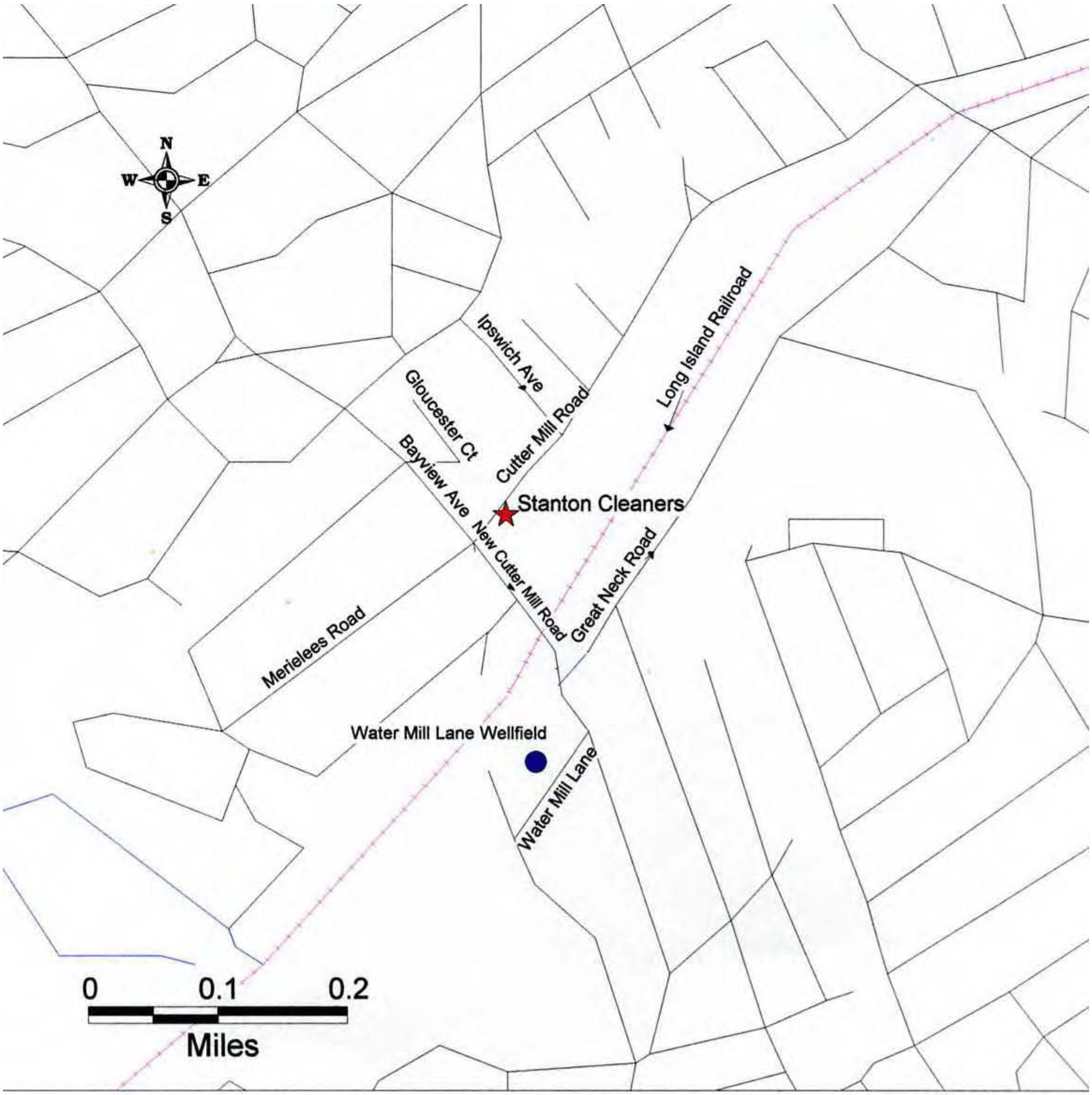
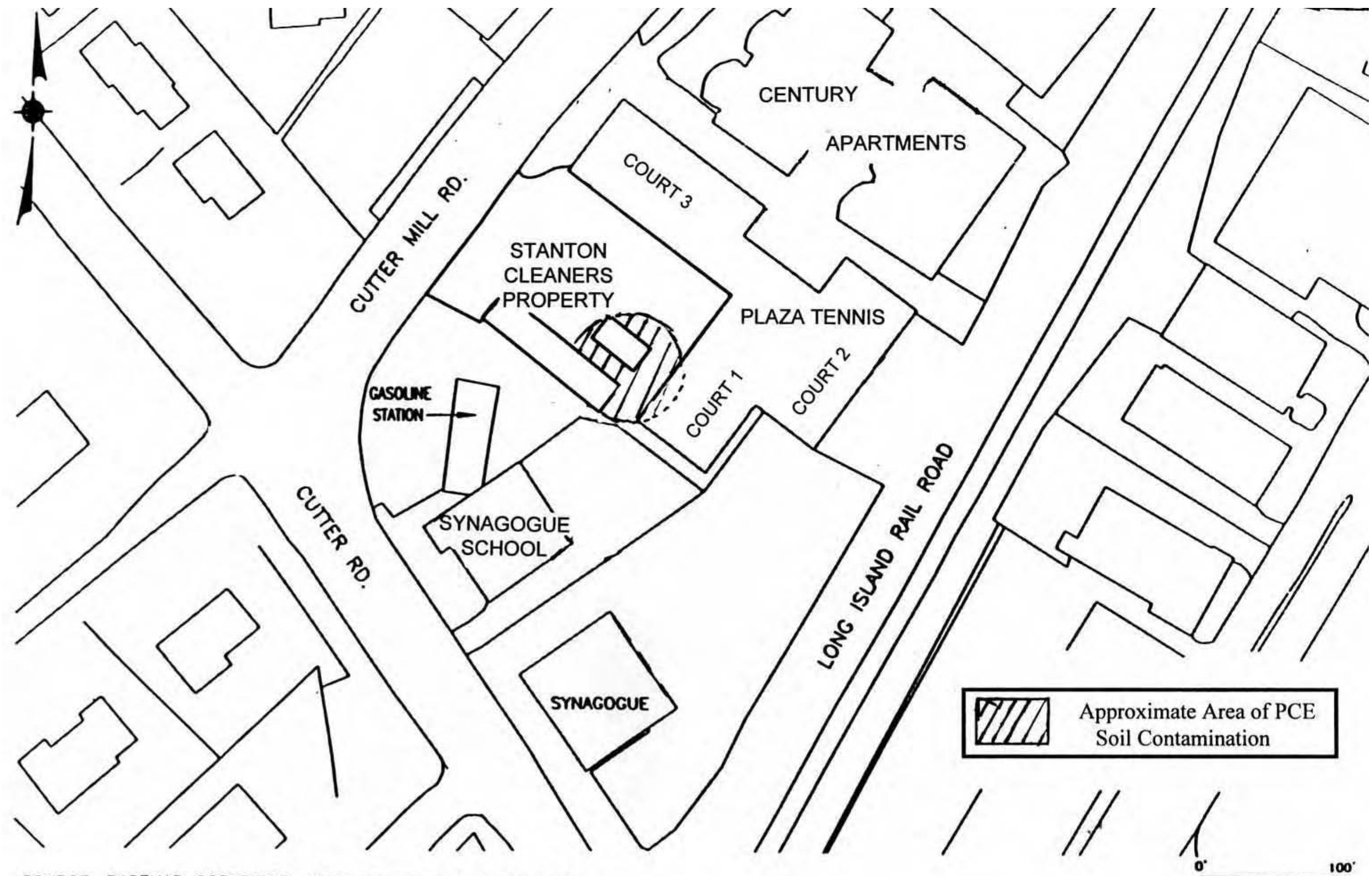


Figure 1. Site Location Map
Stanton Cleaners

Location: Great Neck
Nassau County

STATE OF NEW YORK
DEPARTMENT OF HEALTH



SOURCE: BASEMAP COPYRIGHT, 1993, COUNTY OF NASSAU N.Y.

FIGURE 2. STANTON CLEANERS AND NEIGHBORING BUILDINGS.

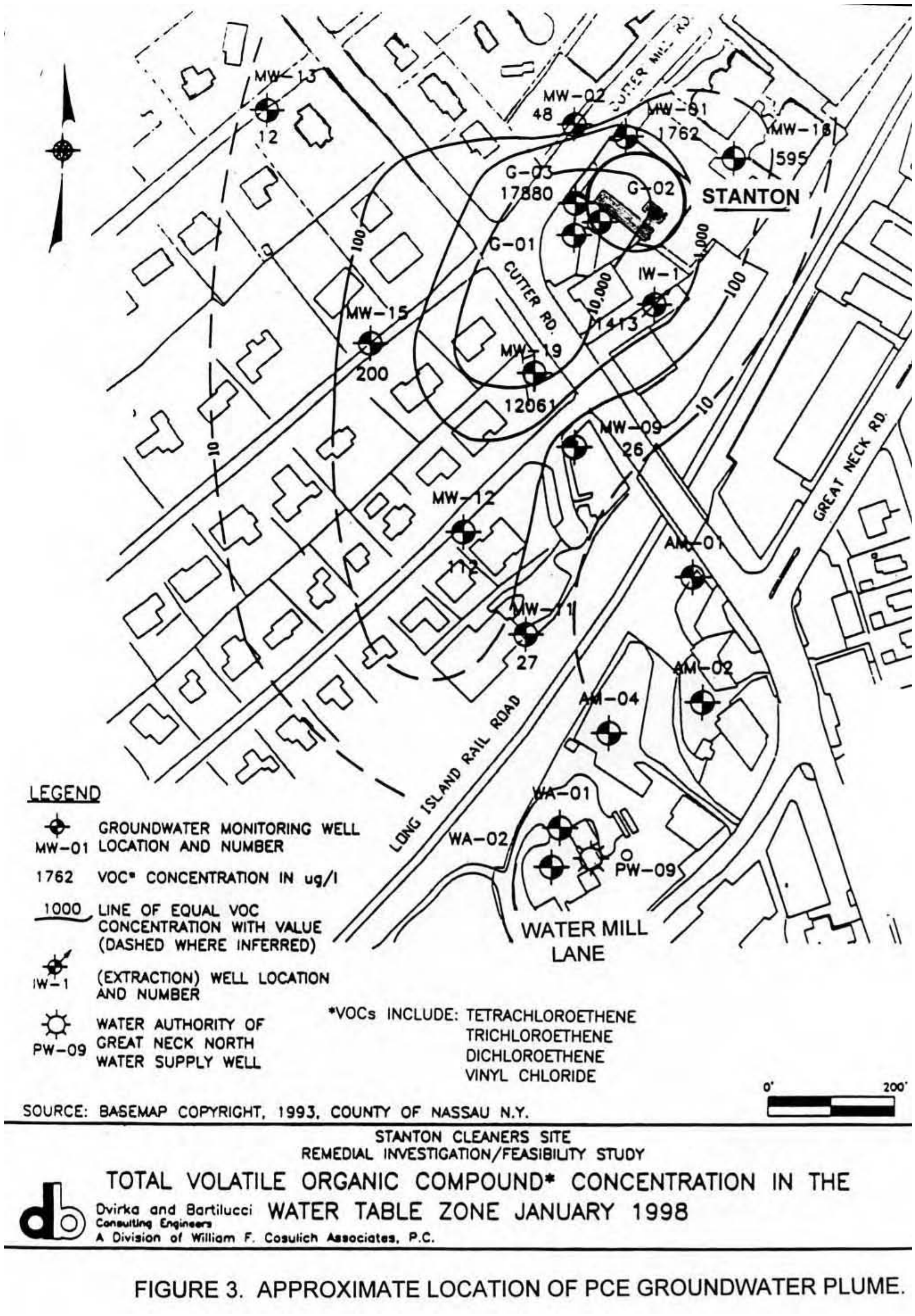


FIGURE 3. APPROXIMATE LOCATION OF PCE GROUNDWATER PLUME.

APPENDIX B

TABLES

TABLE 4

SOIL SAMPLE RESULTS

Samples collected from areas around the Stanton Cleaners Boiler Room, behind Stanton Cleaners and around Court 1 of Plaza Tennis.

All values in milligrams per kilogram (mg/kg)

Volatile Organic Compound (VOC) Analyses	Surface Soil [1]		Intermediate Depth Soil [2] 2' - 16' Depth		Deep Soil [2] > 16' Depth	
	FOD	Range	FOD	Range	FOD	Range
dichloromethane	0/1	< 0.04	20/24	< 0.001 - 230	17/24	< 0.001 - 7.0
cis-1,2-dichloroethene	1/1	0.57	18/24	< 0.001 - 91	2/24	< 0.001 - 0.008
trichloroethene (TCE)	1/1	14	13/24	< 0.001 - 38	5/24	< 0.001 - 7.0
tetrachloroethene (PCE)	2/2	720 - 8000	28/35	< 0.001 - 50000	23/27	< 0.012 - 3900

FOD = Frequency of Detection: # of Detections/# of Samples

"<" means less than the value listed; the value listed is the detection limit of a given laboratory for a given sample.

[1] Sample depths were not specified; the samples were collected to evaluate tetrachloroethene in soil at areas of liquid spillage and are, therefore, presumed to be near-surface. The value of 8,000 mg/kg for PCE was detected before a soil removal action in 1983. Soil was removed to a depth of about 3' at an area of spillage behind the Cleaners and then backfilled with clean soil. Two years later, however, a surface soil sample contained 720 mg/kg of PCE.

[2] Most of the subsurface soil samples were collected in October 1997 during the remedial investigation. Some were collected during initial investigations by the NC DOH between 1983 and 1986. The samples were collected from areas behind and around the cleaners to delineate the extent of soil contamination.

PUBLIC WATER SUPPLY WELLS NEAR STANTON CLEANERS

(All Wells Listed Are Located at the Water Mill Lane Wellfield and Serve the Water Authority of Great Neck, North (WAGNN). The Wellfield is Approximately 1,000 Feet Southwest of the Site)

WELL #	LOCAL WELL #	SCREEN INTERVAL (ft)	CAPACITY (GPM)	YEAR CONSTRUCTED	STATUS	REMARKS
N-0022	1	126-145	1050	1928	No longer in service	PTA Treatment between 1984 and 1996. Removed from service in 1996. Replaced by Well 2A (N-12796).
N-0700	2	46-91	1050	1935	No longer used, abandoned	PTA Treatment between 1984 and 1996 when use was terminated. Well was abandoned in 1996 because of screen failure.
N-4388	9	125-145	1250	1957	In use with VOC Removal	PTA Treatment since 1983; PTA system upgraded 1998
N-8424	11	373-432	1050	1966	In use with No VOC Removal	No VOCs detected in well since monitoring began in 1977
N-12796	2A	126-145	1000	1996	In use with VOC Removal	PTA Treatment since 1996; PTA system upgraded 1998

VOC = Volatile Organic Compounds (such as PCE, TCE, and TCA)

PTA = Packed Tower Aeration, a system used to remove VOCs from water.

GPM = gallons per minute

Table B1

Air Sample Results for Stanton Cleaners

AIR SAMPLE RESULTS STANTON CLEANERS

Results are reported as micrograms PCE* per cubic meter of air ($\mu g/m^3$)

Sampling Location	12/97-2/98	5/98	9/98	10/98	11/98	2/99	3/99	6/99	9/99
	No Remedial Measures			Remedial Measures Begin					
Court 1 Playing Area	1400-2800	26-183	1301	190-210	246	180	n/a	<10	24 - 25
Court 1 Behind Curtain	1300-2500	290-860	1498-1512		321-325	366-430	n/a	n/a	50
Court 1 Motor Floor Joint	14,500 - 30,000	n/a	813	n/a	n/a	n/a	n/a	n/a	n/a
Court 1 Beneath Floor	180,000	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Court 2 Playing Area	126	n/a	67.8	n/a	n/a	18	n/a	n/a	4 - 5
Court 3 Playing Area	260-320	12	129-149	30-35	n/a	n/a	29-32	<10	3
Lobby/Office Area	1200 - 1400	n/a	163	19 - 30	n/a	76 - 84	32	n/a	5 - 6

Windows Installed in School Building; SVE begins behind Stanton Cleaners

Installation of Backflow Vent at Court 1 — Backflow Preventers Installed in Garage Floor Drains — Operation of Soil Vapor Extraction System begins — Upgrade of Soil Vapor Extraction System

NOTES:

"PCE" the common dry cleaning chemical, is also known as tetrachloroethene, perchloroethylene, or TETRACHLOROETHENE.

"n/a" indicates sample not collected and, consequently, no analytical data for that location on that occasion. (After initial assessment, the number of monitoring points were reduced to a few select locations)

"<" means less than the value listed; the value listed is the lower detection limit of the laboratory.

Table B2

AIR SAMPLE RESULTS NEAR STANTON CLEANERS

PCE Concentrations for Synagogue and Garage Apartments

Results are reported as micrograms PCE per cubic meter of air ($\mu g/m^3$)

Sampling Location	2/98	5/98	9/98	10/98	11/98	2/99	3/99	6/99
	NO REMEDIAL MEASURES			REMEDIAL MEASURES BEGIN				
Synagogue								
Sanctuary/Library	n/a	28	11-12	n/a	n/a	n/a	n/a	n/a
Lower Level Classroom Center	n/a	n/a	12	n/a	n/a	n/a	n/a	n/a
Lower Level Classroom Corner	200-210	n/a	19-62	n/a	n/a	34	n/a	n/a
Lower Level Office	n/a	n/a	n/a	n/a	n/a	15	n/a	n/a
Roof by Intake Vent	n/a	2.7	n/a	n/a	n/a	n/a	n/a	n/a
Outdoor Parking Lot	n/a	3.9	n/a	n/a	n/a	n/a	n/a	n/a
Synagogue School*								
Main Floor	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lower Level	40-50	8.5-10	11.5-14.2	n/a	n/a	81	45-46	< 10
Outdoors	n/a	8.5-9.0	n/a	n/a	n/a	n/a	n/a	n/a
Garage Apartments								
Main Floor/Lobby	n/a	n/a	13.5	4.5-5.0	n/a	n/a	n/a	n/a
Upper Level Garage	n/a	[illegible]	[illegible]	[illegible]	n/a	n/a	n/a	n/a
Lower Level Garage	n/a	[illegible]	[illegible]	[illegible]	n/a	n/a	n/a	n/a
Lower Level Floor Drains	n/a	n/a	n/a	35-3400	n/a	n/a	n/a	n/a
Outdoors	n/a	n/a	n/a	10-11	n/a	n/a	n/a	n/a

Notes:

PCE, the common dry cleaning chemical, is also known as tetrachloroethene, perchloroethylene, or tetrachloroethene.

"n/a" indicates sample not collected and, consequently, no analytical data for that location on that occasion. (After initial assessment, the number of monitoring points were reduced to a few select locations)

"<" Means less than the value listed. The value listed is the lower detection limit of the laboratory; it is the value for which the laboratory will confidently state that PCE was not present at greater concentrations.

* The school building, a former warehouse, was under reconstruction and not occupied during the period presented above. This building has been included in the US EPA's ongoing indoor air monitoring program.

TABLE 5

Summary of VOC Monitoring Results for Public Water Supply Wells at Water Mill Lane, Great Neck, NY

Summary of VOC Results from Nassau County Department of Health, Bureau of Public Water Supply Protection, database of Monitoring results through July 1999. Additional information from NC DOH, 1997. All analyses for PCE, TCE, and 1,2-dichloroethene are included in the following tabulation of historic data. Benzene is also included for Well #0700 because of the significance of its magnitude. Occasionally, other VOCs appeared in the wells (such as trihalomethanes), usually at concentrations below current drinking water standards. These are not tabulated here. All values in (µg/L)

Water Mill Lane Wellfield	Samples Prior to Installation of VOC Removal System		Samples Since Installation of VOC Removal System			
			Pre-treated (from Well)		Treated (to Community)	
Well #0022 (#2)	FOD	Range *	FOD	Range	FOD	Range
tetrachloroethene (PCE)	13/56	<0.5 – 12	29/33	<0.5 – 11	2/24	<0.5 – 4.5
trichloroethene (TCE)	6/82	<0.5 – 1.0	0/33	<0.5	0/24	<0.5
cis-1,2-dichloroethene	0/73	<0.5	1/33	<0.5 – 0.7	0/24	<0.5
Well –0700 (#21A)	FOD	Range	FOD	Range	FOD	Range
tetrachloroethene (PCE)	2/11	<1.0 – 23	21/25	<0.5 – 120	0/29	<0.5
trichloroethene (TCE)	11/23	<1.0 – 6.0	42/63	<0.5 – 10.0	1/32	<0.5 – 2.0
cis-1,2-dichloroethene	8/20	<1.0 – 7.0	26/54	<0.5 – 7.0	0/29	<0.5
Benzene	3/21	<1.0 – 160	46/60	<0.5 – 160	2/32	<0.5 – 2.0
Well –4388 (#9)	FOD	Range **	FOD	Range	FOD	Range
tetrachloroethene (PCE)	15/21	<0.1 – 26	125/142	<0.5 – 190	8/127	<0.5 – 49.8
trichloroethene (TCE)	20/35	<0.1 – 3.0	38/177	<0.5 – 38.9	0/127	<0.5
cis-1,2-dichloroethene	2/13	<0.1 – 2.0	64/143	<0.5 – 2.7	1/123	<0.5 – 2.4
Well –8342 (#11)	FOD	Range ***	FOD	Range	FOD	Range
tetrachloroethene (PCE)	0/103	<0.5				
trichloroethene (TCE)	1/105	<0.5 – 1.0	N/A	N/A	N/A	N/A
cis-1,2-dichloroethene	0/102	<0.5				
Well –12796 (#2A)	FOD	Range****	FOD	Range	FOD	Range
tetrachloroethene (PCE)			31/34	<0.5 – 14	1/27	<0.5 – 1.0
trichloroethene (TCE)	N/A	N/A	0/34	<0.5	0/27	<0.5
cis-1,2-dichloroethene			0/34	<0.5	0/27	<0.5

FOD = Frequency of Detection: # Detections/ # Analyses   N/A = Not Applicable

* Well #0022 did not contain PCE or other VOCs during the earliest samples tested (1977-1981). Traces of PCE began to appear in 1982, apparently increasing to about 12 µg/L late in 1983 and then clearing up. Occasional detections of a few µg/L PCE occurred until about mid 1993. At that time, PCE began appearing with regularity in the well (concentrations of about 5 - 10 µg/L) and VOC removal treatment was added to the well. The well was removed from service in 1996. Well 0700 did not contain PCE or other VOCs during the earliest samples tested (1977-1979). Low levels of TCE began to appear in 1981. By the end of 1983, PCE, TCE, 1,2-dichloroethene, and benzene were in the well at concentrations of about 20, 5, 7, and 150 µg/L respectively. VOC removal treatment was added to the well at that time and continued until the well was removed from service in 1991.

** Well #4388 did not contain PCE or other VOCs in the earliest samples (1977 - 1978), however, most samples in subsequent years did contain PCE at a few to 26 µg/L and traces of TCE. VOC removal treatment was added late in 1983. Since that time, PCE concentrations in the well (i.e. untreated water) have gradually increased to nearly 200 µg/L.

*** Well #8342 has not contained PCE or appreciable quantities of other VOCs during the 22 years it has been tested.

**** Well #12796, which replaced Well 0022 in 1996, has always had VOC removal treatment. Untreated water samples from the well have contained about 5 to 12 µg/L PCE since installation.

TABLE 6

Air Sample Results for Stanton Cleaners

PCE Concentrations in Outdoor Air Near Stanton Cleaners Facility

All values in micrograms per liter (µg/L)

Sampling Location	12/92-2/98	5/98	9/98	10/98	6/99
Distance From Rear Wall/Vent					
Less than 10'	816	n/a	976	n/a	n/a
10' - 20'	89 - 230	n/a	216	n/a	n/a
20' - 40'	3.3 - 31	4.3	n/a	5.5 - 9.1	< 10
40' - 50'	< 5	n/a	n/a	n/a	n/a

PCE, the common dry cleaning chemical, is also known as tetrachloroethene, perchloroethylene, or tetrachloroethene.
"n/a" indicates sample not collected.
"<" Means less than the value listed; the value listed is the lower detection limit of the laboratory.

TABLE 7

GROUNDWATER SAMPLE RESULTS FOR STANTON CLEANERS
Summary of results from numerous monitoring well and Hydropunch samples as reported in the 1998 RI/FS Report and other historical documents. Most results are from off-site samples; maximum results are generally immediately downgradient from the site.
All values for range are in micrograms per liter (μg/L).

Analyte	Upper Glacial Aquifer (~60 - 130 feet in Study Area)		Magothy Aquifer (typically > ~ 130 feet)	
	FOD	Range	FOD	Range
tetrachloroethene (PCE)	67/68	<1 - 26000	9/10	1 - 2900
trichloroethene (TCE)	23/45	<1 - 750	0/4	<10
1,2-dichloroethene, total	11/36	<2 - 1200	1/4	<10 - 1
1,1-dichloroethene	0/18	<10 - <1000	3/4	<10 - 6
vinyl chloride	2/25	<1 - 840	0/4	<10
toluene	4/18	<10 - 82	1/4	<10 - 1
dichloromethane	9/18	<10 - 41	0/4	<10
acetone	3/18	<10 - 560	3/4	<10 - 6

FOD = Frequency of Detection: # Detections/# Analyses

" < " means less than the value listed; the value listed is the detection limit of a given laboratory for a given sample.

TABLE 8

PCE Concentrations in Discharges to Storm Drain from Groundwater Treatment Unit at Stanton Cleaners. Storm Drain Discharges Directly to Little Neck Bay.

Date	Maximum Concentration
March 1989	N/A
April 1989	N/A
May 1989	N/A
June 1989	10
July 1989	10
Aug 1989	5
Sept 1989	4
Oct 1989	4
Nov 1989	1
Dec 1989	20
Jan 1990	1
Feb 1990	4
March 1990	7
April 1990	2
May 1990-	19
June 1990	14
July 1990	11
Aug 1990	38
Sept 1990	3
Oct 1990	9
Nov 1990	5
Dec 1990	48
March 1991	27
April 1991	26
May 1991	10
June 1991	120
July 1991	19
August 1991	32
Sept 1991	2
Oct 1991	34
Nov 1991	2
Dec 1991	3
March 1992	7
April 1992	36
May 1992	7
June 1992	24
July 1992	22
August 1992	76
Sept 1992	18
Oct 1992	63
Nov 1992	9
Dec 1992	6
Jan 1993	1
Feb 1993	110
March 1993	7
April 1993	5
May 1993	88
June 1993	37
July 1993	11
Aug 1993	5
Sept 1993	21
Oct 1993	N/A
Nov 1993	6
Dec 1993	4
Jan 1994	1
Feb 1994	5
March 1994	11
April 1994	N/A
May 1994	N/A
June 1994	N/A
July 1994	1
Aug 1994	1
Sept 1994	200
Oct 1994	1
Nov 1994	33
Dec 1994	5
Jan 1995	5
Feb 1995	46
March 1995	N/A
April 1995	N/A
May 1995	240
June 1995	1.6
July 1995	N/A
Aug 1995	N/A
Sept 1995	N/A
Oct 1995	ND
Nov 1995	N/A
Dec 1995	1.4
Jan 1996	1.6
Feb 1996	N/A
March 1996	ND
April 1996	2.5
May 1996	ND
June 1996	ND
July 1996	N/A
Aug 1996	N/A
Sept 1996	2.1
Oct 1996	2.6

N/A: Data not available

Note:All levels are in micrograms per liter (μg/L).

TABLE 9

Estimates of Historic VOC Concentrations in Public Water near Stanton Cleaners Site (based upon a review of water monitoring results and well use information)

Period	Contaminant Estimates/Assumptions in Wells		Multiplier to Account for Mixing of Wells	Contaminant Contribution to Final Concentration
1960-1980	1 Well at 10 µg/L PCE		0.25	2.5
	3 Wells at ND (assume not present)		0.75	0
# years = 21			PCE @ 2.5 + 0	≈ 3 µg/L
1981-1983	1 Well at	20 µg/L PCE	0.25	5
		6 µg/L DCE	0.25	1.5
		3 µg/L TCE	0.25	0.75
	1 Well at	2 µg/L PCE	0.25	0.5
	2 Wells at	ND	0.5	0
# years = 3			PCE @ 5 + 0.5 + 0	≈ 6 µg/L
			TCE @ 0.75 + 0	≈ 1 µg/L
			DCE @ 1.5 + 0	≈ 2 µg/L
Late 1983 (up to about 3 weeks)	1 Well at	145 µg/L benzene	0.25	36.2
	3 Wells at	ND	0.75	0
≈ 3 weeks			benzene @ 36 + 0	≈ 36 µg/L

Note: The "Multiplier for Mixing of Wells" assumes approximately equal pumping from each well.

Table 10

Public Health Assessment Inhalation Comparison Values For Tetrachloroethene

[All values in micrograms per cubic meter (μg/m^3)]

Comparison Values*			
Cancer	**Basis****	**Noncancer**	**Basis****
2	EPA PV	100	NYS DOH

* Comparison values determined for a 70 kilogram (kg) adult who continuously inhales 20 cubic meters (m^3) of air per day, an amount typically inhaled during a 24 hour period, over a lifetime.

** EPA PV = Provisional value from US EPA Superfund Technical Support Center; National Center for Environmental Assessment

NYS DOH = New York State Department of Health. 1997. Tetrachloroethene Ambient Air Criteria Document. Albany, NY: Bureau of Toxic Substance Assessment.

Table 11
Water Quality Standards/Guidelines and/or Public Health Assessment Comparison Values Exceeded by Contaminants Found in Private Drinking Water Wells at Stanton Cleaners Area Groundwater Contamination Site
[All values in micrograms per liter (µg/L)]

Contaminant	Water Quality Standards/Guidelines			Comparison Values*			
	New York State		U.S. EPA				
	Ground-Water	Drinking Water	Drinking Water	Cancer	Basis**	Noncancer	Basis**
Benzene***	0.7	5	5	1.2	EPA CPF	21	EPA PV
tetrachloroethene	5	5	5	0.7	EPA PV	70	EPA RfD

* Comparison values determined for a 70 kg adult who drinks 2 liters of water per day.
** EPA CPF = US EPA Cancer Potency Factor
EPA PV = Provisional value from US EPA Superfund Technical Support Center; National Center for Environmental Assessment
EPA RfD = US EPA Reference Dose
*** Benzene is not a contaminant associated with the Stanton Cleaners site but has been detected in the Water Mill Lane public supply wells.

APPENDIX C

NYS DOH PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS FOR CONTAMINANTS OF CONCERN

NYS DOH PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS FOR CONTAMINANTS OF CONCERN

To evaluate the potential health risks from contaminants of concern associated with the Stanton Cleaners Area Groundwater Contamination site, the New York State Department of Health assessed the risks for cancer and noncancer health effects.

Increased cancer risks were estimated by using site-specific information on exposure levels for the contaminant of concern and interpreting them using cancer potency estimates derived for that contaminant by the US EPA or, in some cases, by the NYS DOH. The following qualitative ranking of cancer risk estimates, developed by the NYS DOH, was then used to rank the risk from very low to very high. For example, if the qualitative descriptor was "low", then the excess lifetime cancer risk from that exposure is in the range of greater than one per million to less than one per ten thousand. Other qualitative descriptors are listed below:

Excess Lifetime Cancer Risk

Risk Ratio	Qualitative Descriptor
equal to or less than one per million	very low
greater than one per million to less than one per ten thousand	low
one per ten thousand to less than one per thousand	moderate
one per thousand to less than one per ten	high
equal to or greater than one per ten	very high

An estimated increased excess lifetime cancer risk is not a specific estimate of expected cancers. Rather, it is a plausible upper bound estimate of the probability that a person may develop cancer sometime in his or her lifetime following exposure to that contaminant.

There is insufficient knowledge of cancer mechanisms to decide if there exists a level of exposure to a cancer-causing agent below which there is no risk of getting cancer, namely, a threshold level. Therefore, every exposure, no matter how low, to a cancer-causing compound is assumed to be associated with some increased risk. As the dose of a carcinogen decreases, the risk of developing cancer decreases, but each exposure is accompanied by some increased risk.

There is general consensus among the scientific and regulatory communities on what level of estimated excess cancer risk is acceptable. An increased lifetime cancer risk of one in one million or less is generally not considered a significant public health concern.

For noncarcinogenic health risks, the contaminant intake was estimated using exposure assumptions for the site conditions. This dose was then compared to a risk reference dose (estimated daily intake of a chemical that is likely to be without an appreciable risk of health effects) developed by the US EPA, ATSDR and/or NYS DOH. The resulting ratio was then compared to the following qualitative scale of health risk:

Qualitative Descriptions for
Noncarcinogenic Health Risks

Ratio of Estimated Contaminant Intake to Risk Reference Dose	Qualitative Descriptor
equal to or less than the risk reference dose	minimal
greater than one to five times the risk reference dose	low
greater than five to ten times the risk reference dose	moderate
greater than ten times the risk reference dose	high

Noncarcinogenic effects unlike carcinogenic effects are believed to have a threshold, that is, a dose below which adverse effects will not occur. As a result, the current practice is to identify, usually from animal toxicology experiments, a no-observed-effect-level (NOEL). This is the experimental exposure level in animals at which no adverse toxic effect is observed. The NOEL is then divided by an uncertainty factor to yield the risk reference dose. The uncertainty factor is a number which reflects the degree of uncertainty that exists when experimental animal data are extrapolated to the general human population. The magnitude of the uncertainty factor takes into consideration various factors such as sensitive subpopulations (for example, children or the elderly), extrapolation from animals to humans, and the incompleteness of available data. Thus, the risk reference dose is not expected to cause health effects because it is selected to be much lower than dosages that do not cause adverse health effects in laboratory animals.

The measure used to describe the potential for noncancer health effects to occur in an individual is expressed as a ratio of estimated contaminant intake to the risk reference dose. A ratio equal to or less than one is generally not considered a significant public health concern. If exposure to the contaminant exceeds the risk reference dose, there may be concern for potential noncancer health effects because the margin of protection is less than that afforded by the reference dose. As a rule, the greater the ratio of the estimated contaminant intake to the risk reference dose, the greater the level of concern. This level of concern depends upon an evaluation of a number of factors such as the actual potential for exposure, background exposure, and the strength of the toxicologic data.

APPENDIX D

PUBLIC HEALTH HAZARD CATEGORIES

INTERIM PUBLIC HEALTH HAZARD CATEGORIES

CATEGORY / DEFINITION	DATA SUFFICIENCY	CRITERIA
A. Urgent Public Health Hazard This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.	This determination represents a professional judgement based on critical data, which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards.
B. Public Health Hazard This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.	This determination represents a professional judgement based on critical data, which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.
C. Indeterminate Public Health Hazard This category is used for sites in which "*critical*" data are *insufficient* with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.	This determination represents a professional judgement that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.	The health assessor must determine, using professional judgement, the "criticality" of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.
D. No Apparent Public Health Hazard This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.	This determination represents a professional judgement based on critical data, which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.
E: No Public Health Hazard This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.	Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future	

**Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans.*

APPENDIX E

NEW YORK STATE DEPARTMENT OF HEALTH
FACT SHEET: PLAZA TENNIS INDOOR AIR INVESTIGATION
NYSDOH Indoor Air Investigations at Stanton Cleaners, Great Neck
February 1999

Background

In 1983, low levels of a dry cleaning chemical, tetrachloroethene (also known as perchloroethylene, PCE, or PERC), were found in a public water supply well at the Water Mill Lane plant in Great Neck, New York. At the request of the Water Authority of Great Neck North, the Nassau County Department of Health attempted to determine the source(s) of the PERC. During their investigation, the County Department of Health inspected Stanton Cleaners, a dry cleaning shop located 1,000 feet northwest and uphill of Water Mill Lane. They discovered a pipe at the back of the shop that was spilling water and dry cleaning fluid onto the ground. The County ordered the owner to stop dumping the fluids and to clean up any chemicals that had been spilled or that had seeped into the ground. The dumping stopped and samples of soil from behind the shop were tested for chemicals. The results of the soil tests indicated very high levels of PERC. Several test wells were drilled down to the water table, about 60 feet deep, to see if the PERC had seeped down to the aquifer. The groundwater samples from these test wells showed high levels of PERC.

Several steps were taken over the past 15 years to address some of the contaminant problems at the site.

In 1983, approximately 20 cubic yards of PERC contaminated soil was removed from behind the Stanton Cleaners property.

In 1984 a treatment system, known as an air stripper, was installed at the Water Mill Lane Plant to remove PERC from the water.

In 1987, a waterproof cover was placed over the soil behind Stanton Cleaners to keep rainwater from seeping more of the PERC down to the aquifer.

In 1989, a system was installed behind Stanton Cleaners to remove PERC from the groundwater.

Between 1992 and 1996, the New York State Department of Environmental Conservation (NYSDEC) listed Stanton Cleaners as a hazardous waste site and attempted to get the owner to remediate the site.

In 1997, NYSDEC conducted extensive soil and groundwater tests at and around the Stanton Cleaners property.

In 1998, the Water Authority installed a new air stripper for the Water Mill Lane plant with funding from NYSDEC.

In July 1998, the groundwater treatment system behind the Cleaners was upgraded to be more effective.

In 1998, NYSDEC, the New York State Department of Health (NYSDOH), and the United States Environmental Protection Agency (USEPA) conducted extensive tests of air behind Stanton Cleaners and in nearby buildings, including Plaza Tennis.

In 1998, the USEPA joined the NYSDEC and NYSDOH to assist in site clean up activities.

In September 1998, the USEPA installed a foundation vent at Plaza Tennis to reduce the levels of PERC vapors getting inside Court 1 from the contaminated soil behind Stanton Cleaners.

In December 1998, the USEPA installed backflow prevention devices in the floor drains of the lower level garage at Century Apartments to prevent PERC vapors from entering the garage.

In February 1999, the USEPA also installed a soil vapor extraction (SVE) system to address the remaining soil contamination.

Indoor and Outdoor Air Sampling

Many indoor and outdoor air samples have been collected to determine if PERC from the soil beneath the Stanton Cleaners property was affecting the air in nearby buildings. The air in soil pores, often called soil gas, can enter buildings through cracks and openings in foundations. If soil is heavily contaminated with PERC, vapors from the PERC can displace the natural soil gases and enter nearby buildings.

On six different occasions between December 1997 and November 1998, NYSDOH/NYSDEC and the USEPA collected and analyzed a total of 109 air samples from 39 different locations in and around four buildings near the Stanton Cleaners site. This includes the indoor tennis building, Plaza Tennis, to the southeast and northeast.

Some of the indoor air samples from Plaza Tennis contained PERC at levels above the New York State Department of Health (NYSDOH) guideline of 100 micrograms of PERC per cubic meter of air ($\mu g/m^3$). The NYSDOH recommends that the average air level of PERC not exceed 100 $\mu g/m^3$ considering continuous lifetime exposure and sensitive people, including children and the elderly. PERC levels were reduced significantly after actions were taken.

A total of five rounds of sampling have been conducted since December 1997. Not all locations were included during each round of sampling. For the first two rounds of sampling, PERC concentrations exceeded the NYSDOH guidance value of 100 $\mu g/m^3$ at Plaza Tennis. The PERC levels were between 1,400 and 2,800 $\mu g/m^3$ in areas of the tennis courts where people play tennis. These levels indicate that immediate actions should be taken to reduce exposure. Some very high levels of PERC were detected behind plastic curtains that are against the outer walls and adjacent to a floor crack by the foundation of the tennis building. These PERC levels, ranging from 20,000 to 190,000 $\mu g/m^3$, measure levels in soil gas beneath the floor, but people were not being exposed to these levels.

The third, fourth, and fifth rounds of sampling were conducted at the site in September, October, and November of 1998. These rounds were collected to assess the effectiveness of a foundation vent system installed at the tennis club by USEPA during September.

The third round samples collected in September 1998 from Plaza Tennis indicated high levels of PERC at Court 1. At this point the USEPA installed a foundation vent system to reduce the levels of PERC. Samples were taken again in October 1998 to determine the effectiveness of this system. These samples indicate that PERC concentrations on Court 1 dropped from approximately 1,500 μg/m^3 to about 200 μg/m^3 after the vent system became operational. Over time, these concentrations are expected to decrease even further with the recent installation of a soil vapor extraction system. This system was put in place by the USEPA in early February 1999.

An additional round of air sampling has been conducted by the USEPA to test the effectiveness of the soil vapor extraction system but the final results are not yet available.

Stanton Cleaners Site
Summary of Air Sampling Results
Results are reported as micrograms PERC per cubic meter (μg/m^3)
(n/a indicates sample not collected)

	Before Remediation			After Remediation	
Sampling Location	December 1997 February 1998	May 1998	September 1998	October 1998	November 1998
Tennis Court					
Court 1 Playing Area	1400 - 2800	n/a	1301	190 - 210	246
Court 2 Playing Area	120	n/a	67.8	n/a	n/a
Court 3 Playing Area	260 - 320	n/a	122 - 149	n/a	n/a
Court 1 Behind Curtain	1300 - 2500	290 - 860	1498 - 1512	220	321 - 325
Court 1 Corner Floor Joint	14,500 - 30,000	n/a	n/a	n/a	n/a
Court 1 Beneath Floor	190,000	n/a	n/a	n/a	n/a
Lobby/Office Area	1200 - 1400	n/a	163	19 - 30	n/a

Questions and Answers

1. What is (PERC) tetrachloroethene?

Tetrachloroethene is a manufactured chemical that is widely used in the dry-cleaning of fabrics, including clothes. It is also used for degreasing metal parts and in manufacturing other chemicals. Tetrachloroethene is found in consumer products, including some paint and spot removers, water repellents, brake and wood cleaners, glues, and suede protectors. Other names for tetrachloroethene include PERC, tetrachloroethylene, perchloroethylene, and PCE. PERC is a commonly used name and will be used in the rest of this question and answer sheet.

PERC is a nonflammable, colorless liquid at room temperature. It readily evaporates into air and has an ether-like odor. Because most people stop noticing the odor of PERC in air after a short time, odor is not a reliable warning signal of PERC exposure. Because PERC is so widely used, it is commonly found in outdoor and indoor air. Outdoor air levels of PERC across the U.S. range from 1.9 $\mu g/m^3$ to 4.0 $\mu g/m^3$.

2. How does PERC enter and leave my body?

When people are exposed to PERC, it can enter the body in food they eat, the water they drink, wash and cook with, and in the air they breath. When PERC vapors escape from dry cleaning shops or soil and enter the air of nearby buildings, breathing air is the major route of exposure for residents. When people breathe air containing PERC, the PERC is taken into the body through the lungs and passed into the blood, which carries it to all parts of the body. A large fraction of this PERC is breathed out, unchanged, through the lungs into the air. Some of this PERC is stored in the body (for example, in fat, liver, and brain) and some is broken down in the liver to other compounds and eliminated in urine. PERC can also be found in breastmilk. Once exposure stops, most of the PERC and its breakdown products leave the body in several days. However, it may take several weeks for all of the PERC and its breakdown products to leave the body.

3. What kinds of health effects can be caused by exposure to PERC in air?

The relative strength (potency) of PERC to cause health effects is relatively low, but breathing air with high levels of PERC can damage many parts of the body. Figure 1 shows the relationship between breathing air containing PERC and known health effects in humans and animals, including those at very high levels of exposure. The diagram on the right side of the figure shows the effects of long-term exposures in humans and animals whereas the diagram on the left side shows the same information for short-term exposures. Generally, more severe effects are seen at higher levels.

In humans and animals, the major non-cancer effects of short-term and long-term exposure are on the central nervous system, kidney, and liver. Short-term exposures also damage the reproductive system of animals. Long-term exposure may cause reproductive effects in humans. Studies in animals show that lifelong exposure to very high levels of PERC can cause liver cancer in mice and leukemias and kidney tumors in rats. Human studies show an increased risk of cancer (esophageal and cervical cancer, and non-Hodgkin's lymphoma) among workers exposed to PERC for many years, but the data are not strong enough to clearly show that the cancers were caused by PERC and not by something else. More detailed information on the human health effects of PERC can be found on the back of Figure 1.

4. Should I be concerned about exposures to PERC in the air of Plaza Tennis?

The likelihood of health effects because of exposure to PERC depends on the level and length of exposure. In general, the more a person is exposed to the more likely that health effects will occur. Differences in exposures should be kept in mind when considering exposures to PERC in the air of Plaza Tennis.

An important factor to consider is individual sensitivity. Not all people exposed to the same amount of PERC will show the effects shown in Figure 1. People differ in age, sex, diet, family traits, lifestyle, and state of health. These differences can affect how people will respond to a given exposure. One person may feel fine during and after an exposure while another person may become sick. This is known as sensitivity. Differences in sensitivity also should be kept in mind when examining the following information on the human exposures to PERC in the air of Plaza Tennis.

At the current levels of PERC in Plaza Tennis, we would not expect to observe health effects from playing tennis or working there. Long-term chronic exposure at levels detected before remedial measures were undertaken, however, could pose adverse health effects to people routinely inside the building. These issues are discussed in greater detail in the following sections, "Present and Future Exposures" and "Past Exposures."

A. Present and Future Exposures

PERC levels found during the November sampling ranged from about 20 μg/m^3 to 325 μg/m^3. Levels of PERC in the building are expected to decrease with time because a vapor extraction system installed by the USEPA began operating behind Stanton Cleaners in February, 1999. Additional sampling is planned to monitor the expected reductions in PERC levels.

At these current PERC levels in the playing area of the tennis courts, we would not expect to observe health effects from playing and working at Plaza Tennis. As Figure 1 shows, the lowest levels associated with short-term or long-term health effects are 1,400 to 5,000 μg/m^3 (the indoor air levels for people who lived in apartments near dry cleaning shops). These people (on average) were not only exposed to higher air concentrations but probably were exposed more frequently (every day) for longer periods each day (perhaps up to 24-hours) for more years (they lived in their apartment for about 11 years, on average) than patrons and workers at Plaza Tennis. These differences in the PERC levels in air and the frequency and length of exposure suggest that the doses from the current and future levels of PERC in the air at Plaza Tennis will be lower than those associated with effects in the apartment residents.

B. Past Exposures

Stanton Cleaners has been in operation since the 1950s and Court 1 was constructed during the 1960s. Because we do not have air samples prior to 1997, we do not have data on specific PERC levels for those years and cannot accurately determine people's exposures. However, some estimates of historic concentrations in the air can be made from data collected before installation of the foundation vents in 1998. These samples showed PERC air levels ranged from 1,000 to 3,000 μg/m^3 in areas (primarily Court 1) where people could be exposed.

Previous air levels of PERC at Plaza Tennis are similar to air levels associated with mild central nervous system effects in people who lived in apartments near dry cleaning shops. As discussed earlier, however, it is likely that the exposures of the residents in the studies were greater than those of patrons or workers at Plaza Tennis. The risk of experiencing these health effects for patrons and workers at Plaza Tennis is lower than for the residents of apartments near dry-cleaning shops.

These air levels are also lower than air levels (50,000 to 80,000 μg/m^3) associated with central nervous system, liver, and kidney effects in dry-cleaning workers. Moreover, the dry-cleaning workers were exposed for about 8 hours per day, five days per week, for about 10 years. The exposure of these workers was likely much greater than those of patrons or workers at Plaza Tennis. The risk of patrons and workers at Plaza Tennis experiencing these health effects is very low.

5. When should I or my children see a physician?

If you or your children have symptoms that you think are caused by PERC exposure, you and your children should see a physician. You should tell the physician about the symptoms and about when, how, and for how long you think you and/or your children were exposed to PERC. We can talk with your physician if more information is necessary. Have them call 1-518-458-6402 or 1-800-458-1158 (extension 6402).

6. Should I be concerned my children or I are exposed to air levels slightly above 100 μg/m^3, the NYSDOH guideline for PERC in air?

The NYSDOH recommends that the average air level of PERC not exceed 100 μg/m^3 considering continuous lifetime exposure and sensitive people, including children and the elderly. Although some levels reported for the November sampling are slightly above the guideline, the guideline is not a line between air levels that cause health effects and those that do not. The guideline is much lower than the air levels that caused either non-cancer or cancer effects. Thus, the possibility of health effects in children and adults is low even at air levels slightly above the guideline. The guideline is based on the assumption that people are continuously exposed to PERC in air all day, every day for as long as a lifetime. This is not likely for most people playing at Plaza Tennis who are more likely to be exposed for a few hours once or twice per week for part of their lifetime.

7. Some air samples taken near Court 1 were substantially higher than the DOH guideline. Should I be concerned?

The highest PERC results were from air samples collected to discover how PERC was entering the building, not in samples used to evaluate exposures to patrons and workers. These samples came from an air gap in a floor crack between the baseboard and the foundation. These high results (14,000 to 190,000 μg/m^3) indicate that the PERC in Plaza Tennis was coming from subsurface vapors. They are not representative of typical exposure for people playing or working at Plaza Tennis.

8. Why were the patrons of Plaza Tennis not notified?

In January 1998 one air sample from behind the plastic curtain at the perimeter of Court 1 contained 2,500 μg/m^3. This sample was not from an area where people play tennis. We later sampled in the middle of the court to determine what levels of PERC people might be exposed to. The State received the preliminary results from the Court 1 air samples in mid-March 1998. The data were not validated with releasable results until mid-April. The owner of Plaza Tennis was formally notified of the results by letter dated April 29, 1998. The letter instructed him to notify players of the elevated concentrations. Plaza Tennis closed for the summer on May 1. By the time Plaza Tennis reopened on October 1, USEPA had installed the footing vent and PERC concentrations had been reduced nearly ten-fold.

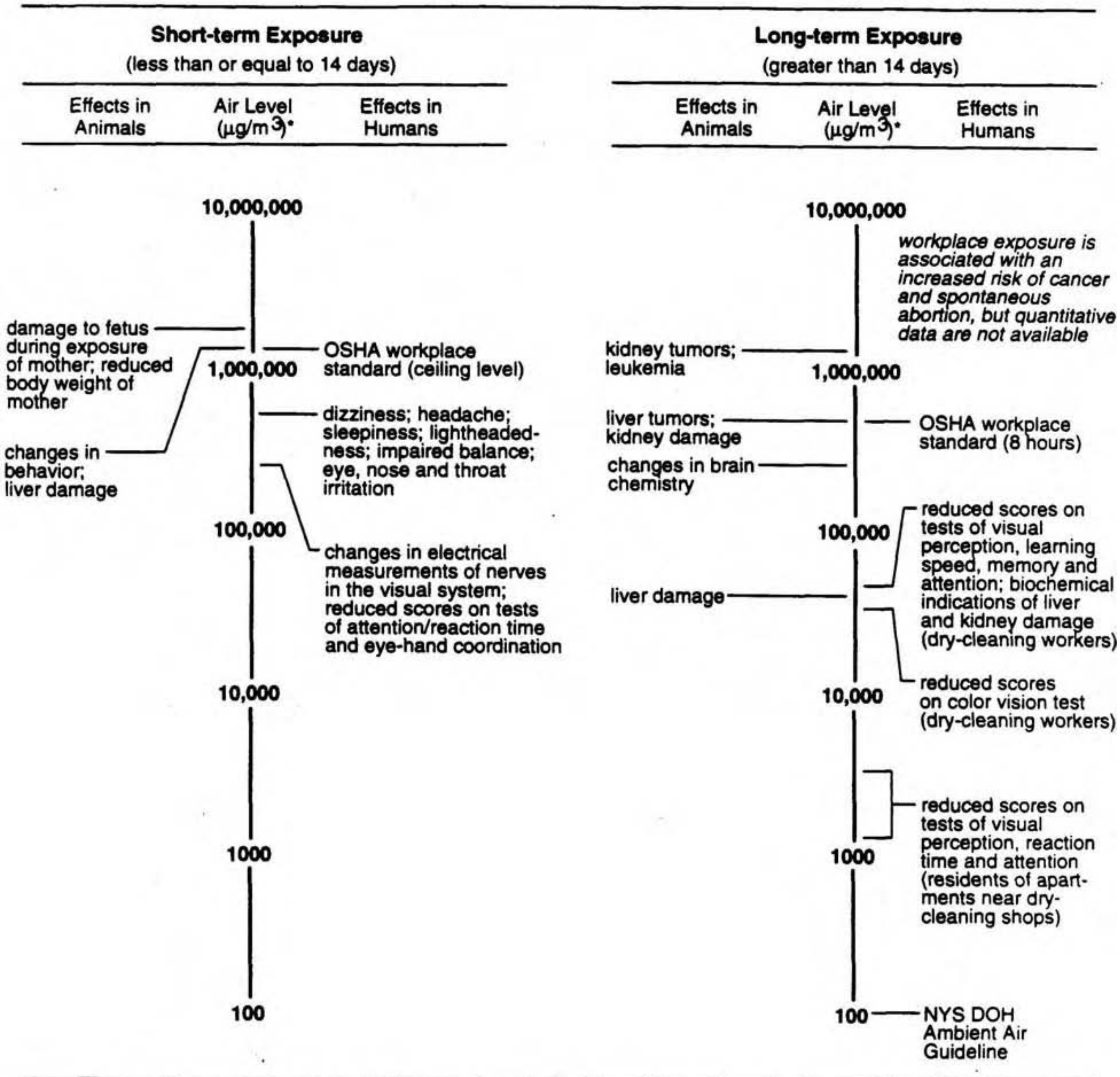
During the six weeks between the NYSDOH's receipt of the March preliminary results and the April letter, we conferred extensively with the environmental agencies (NYSDEC and USEPA) about appropriate remedial measures. We conferred with the U.S. Agency for Toxic Substances and Disease Registry, which concurred that there was no immediate health threat. We also talked with the owner and instructed him to take simple steps to reduce PERC concentrations on Court 1.

For Additional Information

Health Related: For health-related concerns, call or write William Gilday, Bureau of Environmental Exposure Investigation, New York State Department of Health, 2 University Place, Albany, NY 12203, (518) 458-6306 or Mark Van Deusen, Outreach Program, New York State Department of Health at (518) 458-6402 or use the toll free number 1-800-458-1158.

Environmental Investigations: For questions about the New York State Department of Environmental Conservation's investigations and activities, contact Tom Gibbons at 518-457-7924. Questions about the United States Environmental Protection Agency's involvement should be directed to Louis DeGuardia at 732-906-6927.

Figure 1. Health Effects from Breathing Tetrachloroethene (Perc). The diagram shows the effects observed in humans and animals exposed to specific measured levels of tetrachloroethene in air. The diagram contains information on the effects observed after short-term (left-side of figure) and long-term (right side of figure) exposure. Federal workplace standards (set by the Occupational Safety and Health Administration or OSHA) are also shown on the diagram.



*Effects are listed at the lowest level (micrograms per cubic meter of air ($\mu g/m^3$)) at which they were first observed. They may also be seen at higher levels.

Guideline = 100 $\mu g/m^3$ (micrograms/m^3) = 0.015 ppm (parts per million) = 15 ppb (parts per billion)

August, 1998

ADDITIONAL INFORMATION ON THE HUMAN EFFECTS OF PERC

Short-Term Exposures

Studies with volunteers show that short-term exposures of 8-hours or less to 700,000 micrograms per cubic meter (μg/m^3) cause central nervous system symptoms such as dizziness, headache, sleepiness, lightheadedness, and poor balance (Figure 1). Exposures to 350,000 μg/m^3 for 4 hours affected the nerves of the visual system and reduced scores on certain behavioral tests (which, for example, measure the speed and accuracy of a person's response to something they see on a computer screen). These effects were mild and disappeared soon after exposure ended.

Long-term Exposures

Studies of dry cleaning workers indicate that long-term exposure (9 - 20 years, for example) to workplace air levels averaging about 50,000 μg/m^3 to 80,000 μg/m^3 reduces scores on behavioral tests and causes biochemical changes in blood and urine (Figure 1). The biochemical changes indicate liver and kidney damage. The effects were mild and hard to detect. How long the effects would last if exposure ended isn't known.

There is only one study of long-term exposure to air levels lower than in the workplace. The study reported reduced scores on behavioral tests in healthy adults living (for 10.6 years, on average) in apartments near dry cleaning shops (Figure 1). The effects were small; the average test scores of the residents were slightly lower than that of unexposed people. The average air level in all apartments was 5,000 μg/m^3 and the median was 1,400 μg/m^3 (that is, half the measured air levels were above 1,400 μg/m^3 and half were below it).

Some studies show a slightly increased risk of cancer and reproductive effects among workers exposed to PERC, including dry cleaning workers. The cancers associated with exposure included cancers of the esophagus and cervix and non-Hodgkin's lymphoma. The reproductive effects associated with exposure included increased risks of spontaneous abortion, menstrual and sperm disorders, and reduced fertility. The data suggest, but do not prove, that the effects were caused by PERC and not by some other factor or factors. These studies provided some (cancer studies) or no data (studies on reproduction) on workplace air levels; however, reported workplace air levels (for example, 50,000 μg/m^3 to 80,000 μg/m^3) are often considerably higher than those found in outdoor air or indoor air of homes, apartments, or buildings.

APPENDIX F
RESPONSE TO COMMENTS

Stanton Cleaners PHA Response to Comments

This summary was prepared to address comments and questions on the public comment draft of the Stanton Cleaners Area Groundwater Contamination Site Public Health Assessment. The public was invited to review the draft during the public comment period, which ran from July 28th, 2003 to September 24, 2003. We received eleven responses, two of which were from public agencies. Some statements were reworded for clarity. If you have any questions about this summary, you can contact the New York State Department of Health's (NYSDOH) project manager for the site at the toll-free number 1-800-458-1158, extension 27870.

Comment #1: Based on Figure 3, the extent of PCE contamination at and near Stanton Cleaners has not been delineated. There is no basis for the 10 ppb contour and there are no data northeast or southwest. Figure 4 does not depict the approximate extent of the contaminant plume, and neither does Figure 3. There are no data to justify the 10 ppb contour, or justification for the 100 ppb contour to the northeast or the southwest.

Response #1: Groundwater contour maps such as Figure 3 are approximations of the distribution of groundwater contamination. As shown in the figure, the 10 ppb contour line is dashed, indicating that it is inferred. We agree that data are limited in the northeast and southwest, nevertheless, it is clear that the contaminant plume follows the direction of groundwater flow.

Comment #2: How does water quality monitoring minimize exposures to VOCs in drinking water? Preventative and remedial measures may minimize exposures, but how does monitoring prevent and/or minimize an exposure to VOCs?

Response #2: The affected wells are treated to remove VOCs. Frequent monitoring allows the water operator to anticipate and adjust treatment operations before problems arise, thereby minimizing potential exposures.

Comment #3: In previous paragraphs the text indicates that there are no known exposures from the site. "The site does not pose a public health hazard" and exposures are "minimized through treatment... and water quality", yet in the final statement of the summary the text indicates that "future investigations and remedial work is expected to alleviate the continuing threat of exposure", please explain the contradiction.

Response #3: Currently no one is exposed to site-related contamination. If remedial actions are not taken, contamination in soil gas and groundwater can increase and potentially cause future exposure problems.

Comment #4: Monitoring wells were installed down to the water table, yet PCE has been detected in the deeper aquifer. The elevated concentration of the PCE would suggest that a dense non-aqueous phase liquid (DNAPL) was present, yet there is no mention of whether the presence of a DNAPL was investigated. PCE in the soil detected in concentrations of 50,000 ppm are indicative of free phased product. Why was free product not investigated?

Response #4: DNAPL was analyzed for, but was not found.

Comment #5: How many times were the MCLs in the drinking water exceeded, what were the constituents, what were the concentrations detected, and when did the excursions occur?

Response #5: Table 8 contains a summary of data from the Water Mill Lane public water supply wells. If the commentor needs additional detail, please contact us directly at 1-800-458-1158. For more recent data, readers may go to Water Authority of Great Neck North's website: www.waterauthorityofgreatnecknorth.com.

Comment #6: These demographics are out dated (14 years old). In order for a study like this to be accurate and representative, the data needs to be current. Please either explain or update.

Response #6: The 1990 Census information was used rather than the 2000 Census information because the 1990 Census information more closely represents the population living in the area at the time of the exposure than does the 2000 Census information.

Comment #7: There are residential dwellings across the road to the west and southwest, why were these not included in the land use section?

Response #7: The word "southwest" was added to the text of the "Land Use" section, so that the land use paragraph now reads. "Residential neighborhoods consisting of apartment complexes and single family homes are west, northwest and southwest of the site beyond about 200 feet".

Comment #8: For a study that involves health and risk contaminants, selection for further evaluation should be based on MCLs and/or Risk Based Concentrations (RBCs), not background levels. Background levels may also be impacted by other factors; it is risk that is a priority.

Response #8: Background levels are used because background numbers are often more conservative than either MCLs or RBCs. Background (naturally occurring) levels may be elevated for a particular contaminant. Therefore, cleanup numbers can't get below the elevated background numbers.

Comment #9: Why was the vertical extent of contamination not delineated? Vertical and horizontal extent is a requirement for all RCRA, CERCLA investigations.

Response #9: The vertical extent of the groundwater contamination has been evaluated and is discussed briefly in the Environmental Contamination Section, Groundwater subsection. For additional information you may wish to review the investigation documents in the document repository (Nassau County Clerk) or contact the US EPA Project Manager, Mr. Damian Duda at 1(212) 637-4265.

Comment #10: Why have no samples been collected of the receiving waters at Little Neck Bay and analyzed for PCE, especially when PCE has been detected in the storm drain discharges (above MCLs) on at least 39 occasions (according to Table 4)?

Response #10: Little Neck Bay is not used for drinking water purposes and PCE is not readily absorbed into fish or crustaceans, so the potential for exposures to PCE is limited. Also, the levels of

PCE in the discharge, the dilution with storm water and with the Bay, and volatilization of the PCE en route to the Bay suggest that exposures would be minimal.

Comment #11: Why was contact with soil by construction workers (based on soil concentrations), and contact with surface water (based on the storm water discharges) not also considered? These exposure pathways must also be considered bases on the concentrations and media affected.

Response #11: Exposure to construction workers is discussed in the section "Pathways Related to Groundwater Soil". However, we have no information about potential exposures to evaluate them further. Based on the expected limited exposures related to the storm drain, and the relatively low concentrations of PCE detected, we did not evaluate this pathway further.

Comment #12: The text indicates that "performance data from the US EPA's SVE System suggest that much (probably most of the mass) of the PCE contamination in subsurface soil behind Stanton Cleaners has been removed by the system". On what is this statement based?

Response #12: No final report has been issued for the performance data from the Stanton Cleaners SVE System since remediation is still ongoing. To date, as much as 16,000 lbs. of contamination has been removed from the source area. A total amount of the contamination removal can be determined after remediation activities are complete.

Comment #13: Exposure of PCE to children at the synagogue school is a health concern. While air samples have not exceeded NYS DOH guideline values for PCE, the health risk to this sensitive population is not known, especially long-term and cumulative effects of the levels of PCE present. Exposure levels specifically for children have not been considered, why not?

Response #13: Three air samples collected from the synagogue had PCE levels above the NYS DOH guideline. The levels of PCE in these samples were 183 $\mu g/m^3$, 200 $\mu g/m^3$, and 210 $\mu g/m^3$. The NYS DOH guideline is not a line between air levels that cause health effects and those that do not. The guideline is lower than air levels that are associated with either non-cancer or cancer effects and thereby reflects the consideration that some individuals may be more sensitive to PCE exposure than others. Thus, the possibility of health effects in children and adults is low at air levels slightly above the guideline. The guideline is also based on the assumption that people are continuously exposed to PCE in air all day, everyday, for as long as a lifetime. However, individuals only spend a few hours per day or even per week in the downstairs multipurpose room of the synagogue where the three samples with PCE above the guidelines were taken. Consequently, the risk of people experiencing health effects from past exposure to PCE at the synagogue is very low.

Comment #14: The school opened in September 1999, five years ago, yet the text indicates that follow-up monitoring, concurrent with remedial activities "is planned"....why would it take five years to "plan" something? What has been implemented?

Response #14: During the renovation of the warehouse, several indoor air samples were collected. PCE was not detected at levels above 100 ug/m^3, the NYS DOH guideline value. Prior to the school opening in 1999, soil vapor extraction activities at the Stanton Cleaners source area further decreased the PCE detected in the building to background levels. For additional information about sampling at the school, you may wish to contact the US EPA Environmental Remedial Response project manager, Mr. Damian Duda at 1 (212) 637-4265.

Comment #15: If exposure to VOCs through the public water supply remains a potential pathway in the event that a current control fails, why not install sentinel wells and conduct regular monitoring so preemptive precautions can be implemented?

Response #15: The public water supply wells are monitored on a regular basis to ensure water quality and to detect any changes in the quality of public water. This monitoring is protective of public health along with remedial measures that are taken when needed.

Comment #16: Nothing in this paragraph relates to future scenarios. Please address the potential pathway related to subsurface soil in the future, for example, construction of a new building, repairs to foundation or utilities, etc. US EPA risk guidelines clearly state that future scenarios must be considered also.

Response #16: In the event that redevelopment of the site or surrounding areas occur, this Public Health Assessment recommends that source removal measures be implemented, if necessary, and that the remedial program activities continue as specified in the March 1999 Record of Decision.

Comment #17: Just because an area is paved does not mean that exposure to vapors through cracks, fissures and pores in the pavement is not possible, as evidenced by the exposures at the tennis courts. Why was this potential not considered? US EPA risk assessment guidelines clearly state that consideration to these, and future scenarios be considered.

Response #17: The tennis courts were located downgradient from the source area and received large amounts of the contaminated discharge from the site thus causing the elevated PCE contamination in the soil beneath the tennis court floors. Once source-related remedial activities were implemented, excavation of the soil source area and implementation of the SVE treatment system, elevated levels of PCE soil vapor contamination in indoor air was substantially reduced. Indoor air sampling at the tennis courts following these remedial activities detected reduced PCE indoor air contamination.

Comment #18: Why is the PCE “believed” to be related to present operations at the facility, rather than past unregulated disposal? And why would the outdoor air near the rear of the site not be included in the scope of this PHA? And why, whether past or current emissions, would PCE in the outdoor air not be a concern to the Department of Health, regardless of when it originated or where the source is believed to be? Regardless of whether PCE in the air is distinguishable from the greater amounts of PCE in the air from the active dry cleaner operations or not, PCE in the air should be evaluated as to whether or not it presents a potential risk. If PCE is above risk based criteria, then there is a need to remediate, regardless of when the exposure pathway was generated (from historical unregulated means or present operations).

Response #18: Dry cleaning facilities are permitted to vent PCE to the outside air during routine operation. Active dry cleaning facilities are regulated by the NYS DEC. Further, concentrations decrease rapidly with distance and are below the NYS DOH guidance value of 100 ug/m^3 within about 25 to 30 feet and at background concentrations by about 50 feet.

Comment #19: What are the other referenced locations that may be a contributor to the source of contamination, and when are they going to be investigated?

Response #19: The Fenly Amoco Gas Station (Amoco A), Mayflower Cleaners, former Flower Fashion Cleaners and Jonathan's Auto Repair, Amoco Gas Station (Amoco B) are potential contributors to groundwater contamination. All these sites are currently being remediated.

Comment #20: An exposure pathway cannot be eliminated due to "lack of sufficient" data. Why were some pathways considered "limited importance from a public health perspective", and thus eliminated?

Response #20: Exposures cannot be assessed if there are no data on which to base the assessment. Since unregulated disposal is no longer occurring, future scenarios do not need to be discussed.

Comment #21: The excuse that dilution is the solution to pollution is not a valid remedy. The risk to the environment via these pathways requires investigation, not just estimates.

Response #21: Our evaluation indicates that the levels of contaminants in the environmental media are low and the associated potential exposures are also unlikely to be at a level of public health concern.

Comment #22: Rather than an ambiguous statement that source removal should continue and indoor air quality should be tested, why isn't there a strict schedule of monitoring and reporting already implemented?

Response #22: For more information about the current schedule of monitoring and reporting, please contact the US EPA project manager.

Comment #23: Why have there been no additional samples collected at Court 1 Corner floor joint and beneath floor since 2/98?

Response #23: The health and environmental agencies agreed that it would not be sampled. The playing areas and offices were more representative of exposure areas than under the floor.

Comment #24: Why have there been so few sampling and monitoring events at the synagogue (only two locations during a single event since 9/98)? How can risk be evaluated with such limited data? Why were the lower level floor drains in the Century Apartments not resampled since the 3400 ug/m^3 hit in 10/98? Why have the main floor lobby, upper level garage, lower level floor drains, and outdoors of the century apartments not been monitored to confirm the effectiveness of the backflow preventers?

Response #24: Since the backflow preventers were put in place, no PCE above air guidelines was detected in the previously affected areas. For additional info on this sampling you may wish to contact the US EPA Project Manager, Mr. Damian Duda at 1(212) 637-4265.

Comment 25: What measures were used to account for the increased respiration of the athletes while playing tennis?

Response # 25: We did not directly evaluate the effect of increased respiration while playing tennis. Heavy physical activity is estimated to increase the hourly respiration rate by four to five-fold, which could increase the short-term inhalation contaminant dose. The actual increase in the short-term inhalation contaminant dose of PCE is difficult to estimate because on exercise, the exhaled dose of the contaminant would also increase. However, assuming a four to five-fold increase in the short term contaminant dose, and assuming that none of this dose is exhaled, the exposure would be about 32 to 65 times lower than short term PCE exposures that are known to cause health effects on the nervous system in humans. We therefore do not expect that the increase in respiration due to exercise at Plaza Tennis would result in short-term adverse health effects from PCE exposure. For chronic exposures, the contribution of the short-term increase in respiration rates to the long-term respiration rate is small. Therefore the increased respiration due to exercise would not change our evaluation of the risks for chronic cancer and noncancer health effects from exposure to PCE at Plaza Tennis facility.

Comment #26: What are the units of measurement for the concentrations on the table? Apparently the VOC treatment is not working at Well #4388 as evidenced by the detection of PCE at 49.8 (one order of magnitude over the MCL assuming units are in ppb on the table) since the installation of the VOC removal system. Why has the system not been upgraded to prevent this exposure to the public drinking supply? What is the analytical method of testing the water samples and by what lab?

Response #26: The one time detection of 49.3 has not been repeated. Current data for the water supply can be found in their annual report. The units are micrograms per liter, sometimes called parts per billion (ppb). This information has been added to the table. For more information on analytical methods and what laboratory is used for water analysis, the person who commented may wish to contact the Water Authority of Great Neck North. Contact information is on their website: www.waterauthorityofgreatnecknorth.com.

Comment #27: Does NCHD continue to take duplicate samples of water distributed to the public on a regular basis?

Response #27: The Nassau County Department of Health works closely with all the water districts in Nassau County to ensure that water distributed to consumers meets the NYS DOH drinking water standards prior to its distribution.

Comment #28: It is upsetting that WAGNN water consumers ingested 36 ppb of PCE for three weeks in 1983. Is it possible that benzene, along with PCE, was in drinking water before 1977? We must calculate exposures to look for the VOCs; NYS DOH allowed exposure to 100 ppbs total VOCs/L This could be dangerous to a developing fetus.

Response #28: We have no information on the concentrations of volatile organic compounds that WAGNN consumers may have been exposed to prior to 1980. Since we have no information on past exposures, we cannot estimate these risks. The interim public drinking water guidelines of 1977 established limits on the concentration of any one organic chemical to no more than 50 µg/L and the total concentration of organic contaminants to no more than 100 µg/L. These guidelines were intended to provide a means to limit exposure of the general public to organic contaminants, particularly those whose toxicology had not been studied. Although we have no information on past exposures prior to 1980, exposure at the level of the guidelines would constitute a low risk for adverse health effects (including those to the developing fetus) for most chemicals.

Comment #29: What is the criteria that you are comparing the exposure concentrations to that lead you to "estimate" a very low to low increased risk of developing cancer and the "risk for noncancer effects for PCE would be "minimal"? Is this just because you believe these numbers sound "low", or is this based on data?

Comment #30: The statement "Past exposures to chemical contaminants from the site in air and drinking water pose a low increased risk of cancer and other adverse health effects" is qualitative at best. There has been no quantitative evaluation of the risk and not all the exposure pathways have been qualitatively evaluated.

Response #29 and #30: The comments are incorrect in suggesting that the risks were not based on actual data or were not quantitatively evaluated. In addition, all completed exposure pathways for which there were adequate and representative exposure information were quantitatively evaluated. Please refer to the Pathways Analysis section of the document for a complete discussion of the exposure pathways, and the basis for including or excluding them from evaluation.

The methods used to quantitatively estimate the cancer and noncancer health risks for exposure to PCE related to the Stanton Cleaners site were included in Appendix C of the public health assessment. As explained in the Appendix, the qualitative descriptors correspond to specific ranges of quantitative risk estimates, based on site-specific sampling data used to represent exposures to PCE resulting from the Stanton Cleaners area groundwater contamination site. For cancer risks, the descriptor "very low" means that the exposures pose an estimated lifetime increased cancer risk of less than one in one million. The descriptor "low" means that the estimated lifetime increased cancer risk is between one in one million and one in ten thousand. For noncancer risks, the descriptor of "minimal" means that the estimated exposure is below a reference dose or reference concentration (i.e., exposure levels derived by health agencies that are considered to be without appreciable risk of noncancer health effects during a lifetime).

Comment #31: Estimates of cancer risk have not been quantified. Low cancer risk is unacceptable to the community. There are measures that can be implemented to eliminate the risk to the community.....why have these measures not been implemented?

Response #31: The cancer risk estimates were in fact quantified. The numerical estimates of increased cancer risk depended on the exposure assumptions used to evaluate risk for various activities at Plaza Tennis and for drinking water containing PCE. For Plaza Tennis, the numerical estimates of increased cancer risk ranged from about 6 in one million to about 16 in one million, while for PCE exposures in drinking water, the numerical estimate of cancer risk ranged from about 7 in ten million to about 3 in one million. The qualitative descriptors assigned to the numerical estimates of risk (i.e., very low, low, moderate, or high) are discussed in Appendix C of the document. Measures taken to protect the community from contaminant exposure in the public water supply are currently in place through regular monitoring of the distributed water and the placement of treatment systems on wells containing contamination.

Comment #32: The public must be assured exactly who will do the post-remediation sampling of soil, soil vapor, indoor air, buildings surrounding Stanton, pre and post-groundwater treatment. How often will the sampling be and where will the results be store and made available to the public?

Response #32: US EPA is responsible for the post-remediation activities for the site. For specific information on these activities you may wish to contact the US EPA Environmental Remedial Response project manager, Mr. Damian Duda at 1(212) 637-4265.

Comment #33: Will NYS DOH work with Army Corps of Engineers if they take over running the remediation unit for Stanton for the next 30 years?

Response #33: NYS DOH will work with all appropriate agencies to protect the residents from exposure to site-related contamination.

Comment #34: Is there funding for all of the Public Health Actions proposed?

Response #34: All of the Public Health Actions that were proposed will be accomplished through financial cooperation from all local, state and federal agencies.

Comment #35: There is an Appendix E on the Plaza Tennis Indoor Air, but I could not find any report or appendix on the school/synagogue.

Response #35: The Plaza Tennis facility had significant indoor air contamination due to the Stanton Cleaners site. The level of PCE detected within the tennis court areas was above the action level where immediate steps must be taken to reduce indoor air contaminants. Although PCE contamination was detected in the synagogue, the level of contamination was much lower than that of the tennis facility and the duration of time individuals spent in the affected areas was considered minimal, not enough to contribute to any significant health concern. The former warehouse (future academy) associated with the synagogue never had PCE contamination detected above background levels since it was converted to the academy.

Comment #36: There is concern that previous tenants of the former warehouse may have been exposed to PCE vapors. There are no data from that time and these persons are no longer there, but their exposure levels are a concern. VOC database registry is needed to collect this health assessment data. It's not enough to just include in the VOC registry persons exposed to VOCs from past drinking water as a result of this site. All persons exposed to VOCs at all affected buildings must be included to determine long-term health effects.

Response #36: 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. No historic indoor air data exists for the former warehouse so it is unknown what concentration of PCE workers were exposed to or the length of time these exposures may have occurred. Without this information, exposures cannot be determined or if individuals developed health effects from the PCE site-related exposure or from other sources.

Comment #37: The assessment should be amended to include more details about the VOC registry, such as; what is the criteria for inclusion in the registry; what is the process for enrolling a person in the registry; what information/data is collected; how is the information used; who has access to the information in the registry; how is the privacy of individuals on the registry protected; what kind of follow-up is conducted, how frequently and by whom.

Response #37: The VOC Registry helps NYS DOH staff study the relationship between someone being exposed to VOCs and potential health problems that might be associated with the exposure. 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. Enrollment in the Registry is voluntary. Residents complete a questionnaire which asks about possible exposures, past and present health status for each household member and other factors related to health, such as smoking history. Questions about current and past medical issues such as cancer or other diseases are included. The types of health problems reported by a community are compared with state and national data to see if the community is experiencing unusual rates of disease. All information provided by Registry participants is strictly confidential, only NYS DOH staff have access to this personal information and no specific individual information is provided in reports. After household members have agreed to enroll in the Registry and have returned the completed questionnaire, NYS DOH staff will contact Registry members approximately every two to three years and ask for updated health information for each household member.

Comments #38: Exposure to contamination from the Stanton site has occurred at locations other than the actual hazardous waste site itself. The assessment should be amended to clarify the responsibilities of all entities involved in a change of use at an impacted location.

Response #38: Before a change of use would be approved for the Stanton Cleaners site, site-related contamination should be remediated. Currently, there is no known plan to change the use of Stanton Cleaners property.

APPENDIX G
ATSDR GLOSSARY OF TERMS

ATSDR Glossary of Terms

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

General Terms

Absorption
The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.
Acute
Occurring over a short time [compare with chronic].
Acute exposure
Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].
Additive effect
A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].
Adverse health effect
A change in body function or cell structure that might lead to disease or health problems
Aerobic
Requiring oxygen [compare with anaerobic].
Ambient
Surrounding (for example, ambient air).
Anaerobic
Requiring the absence of oxygen [compare with aerobic].
Analyte
A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.
Analytic epidemiologic study
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.
Antagonistic effect
A biologic response to exposure to multiple substances that is less than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].
Background level
An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.
Biodegradation
Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).
Biologic indicators of exposure study
A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].
Biologic monitoring
Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.
Biologic uptake
The transfer of substances from the environment to plants, animals, and humans.
Biomedical testing
Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.

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

Body burden

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

CAP [see Community Assistance Panel.]

Cancer

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

Cancer risk

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

Carcinogen

A substance that causes cancer.

Case study

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

Case-control study

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

CAS registry number

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

Central nervous system

The part of the nervous system that consists of the brain and the spinal cord.

CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

Chronic

Occurring over a long time [compare with acute].

Chronic exposure

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

Cluster investigation

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

Community Assistance Panel (CAP)

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

Comparison value (CV)

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

Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

Concentration

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

Contaminant

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

Delayed health effect

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

Dermal

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

Dermal contact
Contact with (touching) the skin [see route of exposure].
Descriptive epidemiology
The study of the amount and distribution of a disease in a specified population by person, place, and time.
Detection limit
The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.
Disease prevention
Measures used to prevent a disease or reduce its severity.
Disease registry
A system of ongoing registration of all cases of a particular disease or health condition in a defined population.
DOD
United States Department of Defense.
DOE
United States Department of Energy.
Dose (for chemicals that are not radioactive)
The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.
Dose (for radioactive chemicals)
The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.
Dose-response relationship
The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).
Environmental media
Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.
Environmental media and transport mechanism
Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.
EPA United States Environmental Protection Agency.
Epidemiologic surveillance
[see Public health surveillance].
Epidemiology
The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.
Exposure
Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].
Exposure assessment
The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.
Exposure-dose reconstruction
A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.
Exposure investigation
The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.
Exposure pathway
The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.
Exposure registry
A system of ongoing followup of people who have had documented environmental exposures.

Feasibility study
A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.
Geographic information system (GIS)
A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.
Grand rounds
Training sessions for physicians and other health care providers about health topics.
Groundwater
Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].
Half-life ($t^{1/2}$)
The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.
Hazard
A source of potential harm from past, current, or future exposures.
Hazardous Substance Release and Health Effects Database (HazDat)
The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.
Hazardous waste
Potentially harmful substances that have been released or discarded into the environment.
Health consultation
A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].
Health education
Programs designed with a community to help it know about health risks and how to reduce these risks.
Health investigation
The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to evaluate the possible association between the occurrence and exposure to hazardous substances.
Health promotion
The process of enabling people to increase control over, and to improve, their health.
Health statistics review
The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.
Indeterminate public health hazard
The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.
Incidence
The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].
Ingestion
The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].
Inhalation
The act of breathing. A hazardous substance can enter the body this way [see route of exposure].
Intermediate duration exposure
Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].
In vitro
In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with in vivo].

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

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

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

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

Metabolite
Any product of metabolism.

mg/kg
Milligram per kilogram.

mg/cm2
Milligram per square centimeter (of a surface).

mg/m3
Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration
Moving from one location to another.

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

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

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

Mutagen
A substance that causes mutations (genetic damage).

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

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

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

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

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

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

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

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

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

Plume
A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.
Point of exposure
The place where someone can come into contact with a substance present in the environment [see exposure pathway].
Population A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).
Potentially responsible party (PRP)
A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.
ppb
Parts per billion.
ppm
Parts per million.
Prevalence
The number of existing disease cases in a defined population during a specific time period [contrast with incidence].
Prevalence survey
The measure of the current level of disease(s) or symptoms and exposures through a questionnaire that collects self-reported information from a defined population.
Prevention
Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.
Public availability session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.
Public comment period
An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.
Public health action
A list of steps to protect public health.
Public health advisory
A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.
Public health assessment (PHA)
An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].
Public health hazard
A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.
Public health hazard categories
Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.
Public health statement
The first chapter of an ATSDR toxicological profile. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.
Public health surveillance
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.
Public meeting
A public forum with community members for communication about a site.
Radioisotope
An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.

Radionuclide
Any radioactive isotope (form) of any element.
RCRA [see Resource Conservation and Recovery Act (1976, 1984)]
Receptor population
People who could come into contact with hazardous substances [see exposure pathway].
Reference dose (RfD)
An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.
Registry
A systematic collection of information on persons exposed to a specific substance or having specific diseases [see exposure registry and disease registry].
Remedial investigation
The CERCLA process of determining the type and extent of hazardous material contamination at a site.
Resource Conservation and Recovery Act (1976, 1984) (RCRA)
This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.
RFA
RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.
RfD [see reference dose]
Risk
The probability that something will cause injury or harm.
Risk reduction
Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.
Risk communication
The exchange of information to increase understanding of health risks.
Route of exposure
The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].
Safety factor [see uncertainty factor]
SARA [see Superfund Amendments and Reauthorization Act]
Sample
A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.
Sample size
The number of units chosen from a population or an environment.
Solvent
A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).
Source of contamination
The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.
Special populations
People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.
Stakeholder
A person, group, or community who has an interest in activities at a hazardous waste site.
Statistics
A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.
Substance
A chemical.
Substance-specific applied research
A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's toxicological profiles. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.
Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

Superfund Amendments and Reauthorization Act (SARA)
In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.
Surface water Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].
Surveillance [see public health surveillance]
Survey
A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].
Synergistic effect
A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].
Teratogen
A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.
Toxic agent
Chemical or physical (for example, radiation, heat, cold, microwaves) agents that, under certain circumstances of exposure, can cause harmful effects to living organisms.
Toxicological profile
An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.
Toxicology
The study of the harmful effects of substances on humans or animals.
Tumor
An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).
Uncertainty factor
Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].
Urgent public health hazard
A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.
Volatile organic compounds (VOCs)
Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

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

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

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

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