ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

RIVER TERRACE COMMUNITY
WASHINGTON, DISTRICT OF COLUMBIA
JULY 21, 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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PETITIONED PUBLIC HEALTH ASSESSMENT

RIVER TERRACE COMMUNITY
WASHINGTON, DISTRICT OF COLUMBIA

Prepared by:

Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

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List of Abbreviations

AIRS	EPA's Aerometric Information Retrieval System
AQI	EPA's air quality index
ATSDR	Agency for Toxic Substances and Disease Registry
BRFSS	Behavioral Risk Factor Surveillance System
BRTS	Benning Road Transfer Station
CAA	Clean Air Act
CDC	Centers for Disease Control and Prevention
CO	carbon monoxide
CO_2	carbon dioxide
CV	comparison value
CWA	Clean Water Act
DC	District of Columbia
DC DOH	District of Columbia Department of Health
EPA	U.S. Environmental Protection Agency
EPHT	Environmental Public Health Tracking
$\mu g/m^3$	micrograms per cubic meter
MWCOG	Metropolitan Washington Council of Governments
NAAQS	EPA's National Ambient Air Quality Standards
NCI	National Cancer Institute
NE	northeast
NOx	nitrous oxides
O_3	ozone
PAH	polycyclic aromatic hydrocarbon
PEPCO	Potomac Electric Power Company
PHA	public health assessment
PJM	Pennsylvania, New Jersey, Maryland Interconnection, LLC
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppm	parts per million
PPR	Potomac Power Resources
RCRA	Resource Conservation and Recovery Act
SEER	Surveillance, Epidemiology, and End Results
SO_2	sulfur dioxide
SO_4^{-2}	sulfate
SW	southwest
SWRC	Solid Waste Reduction Center #1
TRI	EPA's Toxics Release Inventory Program
TSP	total suspended particulates
VOC	volatile organic compound

1 Summary

In August 2001, the Agency for Toxic Substance and Disease Registry (ATSDR) received a petition to conduct a public health assessment of the River Terrace community in Washington, DC. River Terrace residents expressed concern regarding the occurrence of asthma, chronic bronchitis, shortness of breath, hacking coughs, lung disease, and cancer in their community. Community members believe that these health ailments are related to exposure to air pollutants from nearby facilities.

Attributing airborne exposures to individual facilities is often an extremely difficult task, especially in urban areas such as River Terrace with many different sources of environmental contaminants. Because emissions data from facilities represent contaminant concentrations in air from a source and not at the point where people are breathing, ATSDR focused its evaluation on the levels of pollutants that were measured in the ambient (outdoor) air within and near the River Terrace community.

ATSDR evaluated air contaminant data gathered from the Environmental Protection Agency's (EPA's) Aerometric Information Retrieval System (AIRS), a computer-based repository for information about air pollution in the United States. Ambient air monitoring data are available for criteria pollutants (carbon monoxide, ozone, particulate matter, sulfate, and sulfur dioxide) from two air monitoring stations within and near River Terrace. Although the levels of some air pollutants have been elevated at River Terrace, they are similar to levels found in any urban area, including the general Washington, DC metropolitan area.

ATSDR evaluated the maximum contaminant levels detected in River Terrace air and the available data on levels known to cause adverse health effects in animals and humans and concluded that exposure to the air would not be expected to harm healthy River Terrace residents. However, the maximum levels of ozone, sulfate and particulate matter may aggravate pre-existing respiratory diseases such as asthma, emphysema, and chronic bronchitis.

Overall, the environmental data for the air exposure pathway are limited to a few contaminants, and insufficient health outcome data exist to permit an evaluation of whether increased rates of respiratory effects related to air pollution are present in this community. ATSDR has therefore categorized the River Terrace community as presenting an Indeterminate Public Health Hazard.

ATSDR recommends continued sampling of criteria pollutants in ambient air; sampling of additional pollutants, including volatile organic compounds, polycyclic aromatic hydrocarbon compounds, and metals in ambient air; collection of health outcome data on respiratory ailments; and promotion of community awareness about air pollution in River Terrace.

2 Background and Statement of Issues

In August 2001, the Agency for Toxic Substance and Disease Registry (ATSDR) received a petition to conduct a public health assessment of the River Terrace community in Washington, DC. River Terrace residents expressed concern about the occurrence of asthma, chronic bronchitis, shortness of breath, hacking coughs, lung disease, and cancer in their community. In addition, these residents believe that these health ailments are related to exposure to air pollutants primarily originating from the Potomac Electric Power Company (PEPCO) facility located on the northern edge of their community, the nearby Benning Road Transfer Station (BRTS), and a new automotive racetrack.

This report evaluates whether River Terrace residents have been, and are being, exposed to various contaminants in ambient air in their community at levels that might be associated with adverse health effects. Attributing airborne exposures to individual sources is often an extremely difficult task, especially in urban areas with many different sources of environmental contaminants. Because of the uncertainty in determining the extent to which each individual source contributes to general air pollution, ATSDR's evaluation does not provide quantitative estimates of each source's impact on levels of air pollution.

2.1 River Terrace

The River Terrace community is located in northeastern Washington, DC. Land use in the area is a mixture of industrial and residential. The Anacostia River borders the community on the west. PEPCO's Benning Road Facility borders the River Terrace community to the north. Further north is the BRTS (see Figure 1). Residential property is primarily to the south and east. Major roadways, Kenilworth Avenue and East Capitol Street, border the community on the east and south, respectively. Numerous automotive repair shops and gas stations that handle hazardous waste and/or release contaminants to the air are located along Benning Road, NE, in the vicinity of River Terrace (EPA 2003a).

2.1.1 Demographics

According to the 2000 census, approximately 2,000 people live in River Terrace (see Figure 2). Approximately 23% are age 65 and older, 7% are children 6 years or younger, and 17% are women of child-bearing age. The community is 98% African American (Bureau of the Census 2001).

2.1.2 Schools

The River Terrace Elementary School is located within the community. River Terrace Elementary serves approximately 260 students in grades pre-Kindergarten through 6, with a student population that is 99.6% African American and 0.4% Hispanic (Ersys 2002).

2.2 Potomac Electric Power Company (PEPCO)

Potomac Electric Power Company (PEPCO) operates an electric production facility at 3400 Benning Road, NE in Washington, DC—adjacent to the River Terrace Community. The PEPCO facility covers approximately 77 acres.

2.2.1 Facility Description and Operational History

The PEPCO facility has been in operation since 1906. It operates as a peak use power plant to meet the power needs of the District of Columbia and the surrounding Montgomery and Prince George's counties, Maryland. In 2000, plant ownership was transferred to Potomac Power Resources (PPR), a member of the Pennsylvania, New Jersey, Maryland (PJM) Interconnection, LLC. PJM has the authority to dispatch PEPCO Benning Road to maintain the reliability of the mid-Atlantic transmission grid. PEPCO typically operates only during particularly high demand periods (for example, during hot spells in July and August when cooling needs are the greatest and during the winter months when heating needs are the greatest) (DC DCRA 1988, PEPCO 2003).

The PEPCO facility includes a guard house, fuel oil tanks, a sulfuric acid storage tank, an ammonia tank, a pipeline oil unloading platform, regeneration waste tanks, a liquid nitrogen tank, a transformer oil above-ground storage tank, a hazardous and non-hazardous waste storage area, warehouses, pump houses, a propane fueling island, cooling towers, chillers, a transformer yard, six underground storage tanks, and offices. Security checkpoints restrict entry onto the PEPCO property, and the entire property is surrounded by a barbed-wire fence.

Originally, electricity was generated at PEPCO using coal, but in 1976, the facility switched to No. 6 fuel oil. Pursuant to the terms of a settlement agreement, in 1978, PEPCO began operating with No. 4 fuel oil (PEPCO 2003). PEPCO has four boilers to produce electricity. Boilers 1 and 2 were installed in 1975 with a design capacity of 202 million BTU per hour (DC DOH 2004). At present, two oil-fired steam generators (boiler units 15 and 16) operate to produce electricity. The generators require 27,000 barrels/day of No. 4 fuel oil (at full load) with 1% (maximum) sulfur content. In the past, fuel oil had been delivered via truck or pipeline from the M Street, SW, oil terminal. At present, fuel is brought on site by truck only (PEPCO 2003).

Each generating unit also has a cooling tower. Rainwater runoff from the facility is discharged through a storm water system with two outfalls to the Anacostia River. A third storm water outfall is located north of the facility.

2.2.2 Facility Emissions

Air emissions at the facility generally include sulfur dioxide (SO_2), nitrous oxides (NOx), carbon dioxide (CO_2), carbon monoxide (CO), volatile organic compounds (VOCs), and sulfuric acid (EPA 1997a, EPA 2003c). As an electrical power plant, PEPCO is regulated by the Environmental Protection Agency (EPA) through the Clean Air Act (CAA), the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA), and the Toxics Release Inventory Program (TRI) (EPA 2002b, EPA 2003b).

As part of its many operational permits, PEPCO is required to monitor air emissions continuously under the CAA and to report results to the District of Columbia Department of Health (DC DOH) and EPA. The CAA requires monitoring of SO_2, CO_2, and NOx at electric power plants. In addition, state operating permits and consent decrees have outlined opacity requirements for the plant (DC AQD 2000). PEPCO's visible emissions (opacity) have been in violation of its permits consistently over the years (DC DCRA 1996, EPA 2002b, EPA 2003b). For four of these events, PEPCO was designated a "High Priority Violator" (EPA 2002b, EPA 2003b).

EPA's Envirofacts reports toxic releases by PEPCO during the reporting year 2000 that include polycyclic aromatic hydrocarbon compounds (PAHs) from fugitive/non-point emissions and dioxin and dioxin-like compounds, mercury compounds, PAHs, and sulfuric acid from stack/point emissions (EPA 2002a). These contaminants are measured only as emissions and are not monitored at the local ambient air monitoring station.

2.3 Benning Road Transfer Station (BTRS)

The Benning Road Transfer Station (BRTS)—located at 3200 Benning Road, NE—currently handles 250 tons of solid waste per day from the District of Columbia's southern wards and is not open for public dumping (DC OIG 2000). When it opened in 1972, the BRTS was called "Solid Waste Reduction Center #1" (SWRC). SWRC operated north of the River Terrace community from 1972–1994. Until 1994, the SWRC disposed of approximately 1,500 tons of trash per day, by incineration. Between 1985 and 1994, SWRC's furnaces were gradually shut down as they failed to meet clean air emissions standards (DC DPW 2003).

ATSDR obtained only limited data related to past practices at SWRC. Data suggest that emissions violations began as early as 1978 and were related to particulate matter and opacity violations (PEDCo 1983). In 1983, SWRC was reported to be the largest potential particulate emitter in Washington, DC (PEDCo 1983). Potential pollutants sampled during one emissions evaluation in 1992 were particulates, inorganics (metals), nitrogen oxides, sulfur oxides, dioxins/furans, total gaseous non-methane organic hydrocarbons, oxygen, and carbon dioxide (SCOTT 1992). Additional pollutants could have been emitted by the incinerators, depending on the wastes being burned.

2.4 Other Industrial and Non-industrial Sources

In addition to PEPCO and the former SWRC incinerators, other industrial and non-industrial sources that may release air pollutants exist throughout the River Terrace area. River Terrace residents expressed concern about one of these sources, a new automotive racetrack that has been erected at the RFK Stadium, which is across the river from their community. In addition to the racetrack, other industries, automobiles, automotive shops, and gas stations all emit pollutants to the atmosphere. These sources, all of which are found in or bordering River Terrace, are undoubtedly contributing to air pollution in the area.

2.5 Meteorological Data – Wind Direction

Local meteorological conditions determine whether emissions from facilities rapidly disperse in the air or gradually accumulate to potentially unhealthy levels. Not surprisingly, wind direction plays a very important role in inhalation exposures to contaminants from point sources: when a location or community is consistently downwind of a facility, ATSDR expects people at that location to be exposed more frequently and to higher concentrations of pollutants than people located upwind from the facility.

According to wind direction measurements at the nearest meteorological station to the community—Washington National Airport/Ronald Reagan International Airport—(see Figure 4), the prevailing wind directions in the Washington, DC area are approximately equally split between blowing from a south-southwesterly direction and blowing from a northwest-northerly direction. Therefore, emissions from PEPCO (as well as from the former SWRC incinerators), located north of the community, would be expected to blow toward residents approximately 40–50% of the time.

2.6 Ambient Air Monitoring Data

Because emissions data from a facility like PEPCO represent contaminant concentrations in air from a source and not at the point where people are breathing, ATSDR focused its evaluation on the levels of pollutants that were actually measured in the ambient (outdoor) air within and near the River Terrace community.

One of ATSDR's sources of information on pollutant levels in the air is EPA's Aerometric Information Retrieval System (AIRS), a computer-based repository for information about air pollution in the United States. Ambient concentrations of pollutants in outdoor air are measured at more than 4,000 monitoring stations across the United States, owned and operated mainly by state environmental or health agencies. The state agencies forward hourly or daily measurements of pollutant concentrations to EPA's AIRS database, and qualified users may then compute summaries for monitoring stations, periods of time, and different chemicals (EPA 2003d, EPA 2003e).

ATSDR obtained a list of all AIRS monitoring locations operated in the Washington, DC area since 1960 (see Figure 5). One of these monitors (Site 41), which has operated since 1993, is located within the River Terrace community (see Figure 1). Another monitor (Site 7), which operated from 1971 until 1979, was located within one mile of the River Terrace community.

These two air monitoring stations are located within or near the River Terrace community and therefore should provide representative historic (Site 7) and current (Site 41) ambient air exposure concentrations for community members. However, no ambient air monitoring data are available for evaluating conditions before 1970 or for the years 1980–1992.

Ambient air monitoring data are available for CO, ozone (O_3), particulate matter, sulfate (SO_4^{-2}), and SO_2 (EPA 2002c, EPA 2003f). Ozone is not emitted directly into the air by facilities (such as PEPCO), but is created through a chemical reaction between nitrogen oxides and volatile organic compounds in the atmosphere. Particulate matter has been measured in different forms over the years (see Appendix F). ATSDR reviewed ambient air data for particulate matter in all forms available, which are total suspended particles (TSP), particulate matter less than 10 microns in diameter (PM_{10}), and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$).

Of the available data, SO_4^{-2} and TSP measurements were available for Site 7 only (because of the age of the air monitor), and PM_{10}, $PM_{2.5}$, SO_2, CO, and O_3 measurements were available for Site 41 only. Table 1, Appendix B, provides monitoring station descriptions by year and contaminant.

Ambient air concentrations at each station were measured every hour and averaged over different time periods to yield a value that could be compared to EPA's health-based National Ambient Air Quality Standard (NAAQS) (see Appendix E). Table 2, Appendix B, and the following text provide an overall summary of measured concentrations of each air pollutant.

2.6.1 Carbon Monoxide

ATSDR reviewed carbon monoxide (CO) measurements at Site 41 from 1993–2002. The CO maximum one-hour average was 9.1 parts per million (ppm), and the maximum eight-hour average was 7.1 ppm. During that period of time, measured levels of CO were not above the one-hour or eight-hour NAAQS (see Table 3, Appendix B).

2.6.2 Ozone

ATSDR reviewed ozone (O_3) measurements at Site 41 from 1993–2002. During that period of time, ozone levels slightly exceeded the one-hour NAAQS standard (0.12 ppm) between 0 and 2 days per year. The highest levels were detected during the summer months, with a maximum concentration of 0.155 ppm in 1997 (see Table 4, Appendix B). Ozone levels (maximum 0.128 ppm in the year 2002) exceeded the NAAQS eight-hour standard (0.08 ppm) between 2 and 20 days per year.

2.6.3 Total Suspended Particles

Total suspended particles (TSP) was measured at Site 7 in 1971 and from 1974–1979. Maximum values for both the 24-hour average (450 micrograms per cubic meter [µg/m^3]) and the annual average (101.7 µg/m^3) were detected in 1977 (see Table 7, Appendix B). The TSP 24-hour averages for several days in 1976 and 1977 were above the former TSP 24-hour NAAQS and the annual averages in 1976–1979 were above the former TSP annual NAAQS.

2.6.4 Particulate Matter less than 10 microns

Particulate matter less than 10 microns in diameter (PM_{10}) was measured at Site 41 from 1993–1996 as well as in 1998 and 2002. The PM_{10} maximum 24-hour average was 87.49 µg/m^3 and the maximum annual average was 28.82 µg/m^3. Measured levels of PM_{10} were not above the 24-hour or the annual NAAQS (see Table 6, Appendix B).

2.6.5 Particulate Matter less than 2.5 microns

Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) has been measured since 1999 at Site 41 in River Terrace. The annual average has been above the NAAQS (15 µg/m^3) for all four years during which it was measured (maximum annual average 17.03 µg/m^3) (see Table 5, Appendix B). Twenty-four hour averages also exceeded the NAAQS (65 µg/m^3) once in 1999 (72.2 µg/m^3) and twice in 2000 (94.1 µg/m^3 and 100.2 µg/m^3).

2.6.6 Sulfate

Sulfate (SO_4^{-2}) was measured at Site 7 from 1974–1979. Measurements were reported in 24-hour averages and annual averages. There are no health-based screening values for sulfate. The maximum 24-hour average was 38 µg/m^3 in 1975, and the maximum annual average was 16.11 µg/m^3 in 1978 (see Table 8, Appendix B).

2.6.7 Sulfur Dioxide

ATSDR reviewed sulfur dioxide (SO_2) measurements at Site 41 from 1993–2002. The SO_2 maximum 24-hour average was 0.031 ppm, and the maximum annual arithmetic mean was 0.010 ppm. During that period of time, measured levels of SO_2 were not reported above the health-based NAAQS values (see Table 9, Appendix B).

2.6.8 Data Limitations

Ambient air monitoring data are available for carbon monoxide, ozone, particulate matter, sulfate, and sulfur dioxide. No other contaminants have been monitored in ambient air in or near

the River Terrace community. However, some of the pollutants emitted by PEPCO, the former SWRC, and other sources could have reached nearby populations. ATSDR considers this lack of information a data gap in its public health evaluation of the River Terrace community.

Other data limitations exist. For example, in 1983, SWRC was reported to be the largest potential particulate emitter in Washington, DC, but data for particulate matter are not available for the years 1980–1992. Also, $PM_{2.5}$ data are not available before 1999. ATSDR considers this lack of information a data gap in its public health evaluation.

3 Discussion

In this section, ATSDR addresses the question of whether exposure to air contaminants at the maximum concentrations detected in and around River Terrace could result in adverse health effects. ATSDR's public health evaluation methodology is discussed in Appendix D.

River Terrace residents have been exposed to ozone and particulate matter above health-based guidance values. Residents may have been and may continue to be exposed to other pollutants, but data are not currently available to determine the extent of these possible exposures. Table 11, Appendix B, provides information on the air exposure pathway.

Low levels of some chemicals such as sulfur dioxide and carbon monoxide may exacerbate respiratory symptoms in sensitive individuals should they occur concurrent with elevated levels of other air pollutants such as ozone and particulate matter. ATSDR defines "sensitive" individuals, for the purpose of this public health assessment, as those with pre-existing respiratory conditions that lead to any kind of compromised lung function, including asthma, emphysema, influenza, and chronic bronchitis. And, other factors may affect respiratory health. For example, cold air and warm humid air are known to aggravate respiratory ailments in sensitive individuals.

The maximum level of each contaminant was compared to available health-based guidance values (Section 2.6). Chemicals detected at levels below health-based guidance values (sulfur dioxide and carbon monoxide) are not evaluated further in this report. The remaining chemicals—those exceeding health-based guidance values (ozone and particulate matter) and the one with no health-based guidance value (sulfate)—are evaluated separately in this section.

3.1 Ozone

According to recent studies, concentrations of ozone above EPA's health-based standard may trigger acute responses (for example, shortness of breath, coughing, throat irritation, and chest pains) in sensitive individuals (EPA 1997b, EPA 1997c). In general, exposure to slightly elevated levels of ozone are most likely to induce adverse effects in sensitive individuals during exercise. Exercise causes people to breathe faster and more deeply, enabling ozone to penetrate deeper into the parts of the lungs that are more vulnerable to injury (EPA 1999). Asthma is the

most common chronic disease in children, and it can be aggravated by ozone exposure (EPA 1999). Other chronic respiratory diseases may also make the lungs more vulnerable to the effects of ozone. Healthy individuals of any age are less likely to be adversely affected by slight increases in ozone.

Levels of ozone have been elevated in River Terrace, although they are similar to ozone levels in the Washington, DC metropolitan area, as a whole. Table 10 shows the number of days from 1993–2003 during which ozone levels were above the eight-hour average NAAQS of 0.08 ppm for the Washington, DC metropolitan area, as compared to the number of days exceedances occurred in River Terrace. Because ozone levels are elevated across the Washington, DC area, any adverse health effects associated with exposure to ozone would be seen throughout the metropolitan area and not limited specifically to the River Terrace community.

The Metropolitan Washington Council of Governments (MWCOG) issues advisories for populations that may be adversely affected by air pollution, depending on the measured or anticipated levels for each day. MWCOG advises sensitive populations (discussed previously) to restrict their activities or stay indoors on these "Code Orange" or "Code Red" days—when the Air Quality Index (AQI) is above 100. (For more information on the AQI, see Appendix E). River Terrace residents are encouraged to follow the warnings issued on days when air pollution levels are expected to be high. (For more information on activity restrictions associated with each level of the AQI, see EPA's AIRNow Web site, currently at: http://www.epa.gov/airnow/).

3.2 Particulate Matter

Over the past 20 years, numerous investigators have researched the public health implications of inhalation exposures to particulate matter. Prior to 1987, EPA enforced health-based standards that regulated ambient air concentrations of total suspended particulates, or TSP. By 1987, a growing amount of research had shown that the particles of greatest health concern were actually PM_{10}, which, at the time, were shown to be capable of penetrating into sensitive regions of the respiratory tract. Consequently, EPA and the states took action in 1987 to monitor and regulate ambient levels of PM_{10} (see Appendix F).

Since 1987, scores of additional epidemiologic studies have been published on the health effects of particulate matter. These studies generally suggest that adverse health effects in sensitive populations have been associated with exposure to fine particles ($PM_{2.5}$) that can penetrate into the lungs more deeply than PM_{10}. Currently, it is thought that fine particles are more likely to contribute to adverse health effects than coarse particles (EPA 2002d).

There is some scientific debate regarding what levels of particulate matter should be considered safe. On its Web site, EPA defines its Primary NAAQS as "levels of air quality which the Administrator judges are necessary, with an adequate margin of safety, to protect the public health," and its Secondary NAAQS as "levels of air quality which the Administrator judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant" (EPA 2001a). However, the results of some epidemiological studies have suggested

that there may be human health effects attributable to particulate matter at levels below the current NAAQS (EPA 1996, EPA 2003g).

Ambient air concentrations of particulate matter have varied in River Terrace over the years. The following discussion attempts to put measured concentrations of TSP, PM_{10}, and $PM_{2.5}$ into an appropriate public health context for the River Terrace community.

3.2.1 Total Suspended Particles

The TSP monitoring conducted near the River Terrace area from 1974–1979 pre-dates the current $PM_{2.5}$ and PM_{10} methodology. TSP levels measured near River Terrace occasionally were above EPA's former 24-hour average standard for TSP of 260 µg/m^3 and the former annual average TSP standard of 75 µg/m^3.

Two European studies (Heinrich et al 2000, Krämer et al 1999) looked at declines in respiratory problems in East Germany relative to West Germany after reunification, when TSP levels dropped dramatically in East Germany. The TSP decline reported in Heinrich et al. was from 65–36 µg/m^3 and in Kramer et al., from 102–42 µg/m^3. Heinrich et al. looked at children between 5 and 14 years of age; Kramer et al. looked at children about 7 years of age. From 1993 to 1995, Heinrich et al. saw a significant decrease in bronchitis, otitis media (middle ear infection), frequent colds, and febrile infections (those marked by fever) with decreasing TSP levels in East Germany. Kramer et al. reported a decline in airway irritation and all infectious airway diseases (except pneumonia) between 1989 and 1995 with decreasing TSP levels in East Germany. Though, the incidence of allergies was actually lower in East Germany, compared to West Germany, before and after reunification. It appears that air pollution (especially TSP) had exacerbated respiratory problems in East Germany prior to reunification, but that factor alone could not explain all the difference between East and West Germany.

As stated previously, it is currently thought that TSP measurements are not as good an indicator of potential long- or short-term health effects as are $PM_{2.5}$ measurements. However, it is not possible to know what levels of $PM_{2.5}$ were associated with measured past TSP levels, unless the latter had been broken down by particle size fractions. Therefore, it is difficult to conclude how likely it is that exposure to the reported past levels of particulate matter at River Terrace would have put someone at risk for adverse health effects. However, according to the epidemiologic evidence and reported past TSP levels, it is plausible that particulate matter may have aggravated pre-existing respiratory problems such as bronchitis and asthma.

3.2.2 Particulate Matter less than 10 microns

PM_{10} measured in the recent past (1993–1996, 1998, and 2002) at River Terrace has ranged from approximately 22 µg/m^3 to 29 µg/m^3—well below EPA's health-based NAAQS (50 µg/m^3). It is therefore unlikely that exposure to reported levels of PM_{10} would put residents at risk for developing adverse acute or long-term adverse health effects.

3.2.3 Particulate Matter less than 2.5 microns

$PM_{2.5}$ has been monitored in River Terrace since 1999. Because measured levels of $PM_{2.5}$ are not available before 1999, it is not possible to draw any definitive conclusions about those past exposures at River Terrace.

Acute exposures are best evaluated by using EPA's NAAQS for 24-hour average $PM_{2.5}$ levels (65 µg/m^3). According to available data, maximum 24-hour averages have been above the NAAQS three times—once in 1999 (72.2 µg/m^3) and twice in 2000 (94.1 µg/m^3 and 100.2 µg/m^3). Many epidemiologic studies have found consistent associations between exposure and adverse health effects for short-term, or acute, exposures to fine particulate matter (usually measured in days) (EPA 2002d). Acute exposures to fine particulate matter may aggravate pre-existing respiratory conditions. With regard to cardiovascular disease, several studies appear to provide evidence for an association between ambient levels of particulate matter and hospital admissions, independent of co-pollutant effects, but other studies do not (EPA 2002d). Nevertheless, on the basis of available data, it is reasonable to expect that elderly persons with pre-existing cardiopulmonary disease would be susceptible to fine particulate matter, perhaps even at levels close to the NAAQS.

A few studies have found associations between long-term, or chronic, exposures to particulate matter (usually measured in years) and adverse effects (EPA 1996, EPA 2002d). Pope et al. (2002) concluded that fine particle exposures are an important risk factor for cardiopulmonary mortality. Chronic exposures are best evaluated by use of EPA's NAAQS for annual average $PM_{2.5}$ levels (15 µg/m^3). In River Terrace, however, annual average levels measured (maximum 17.03 µg/m^3) have only very slightly exceeded this NAAQS.

On the basis of the epidemiologic evidence used by EPA to develop its $PM_{2.5}$ standard and the recorded levels of $PM_{2.5}$ in River Terrace, it is unlikely that the occasionally and mildly elevated levels of $PM_{2.5}$ would lead to acute or chronic adverse health effects in currently exposed healthy River Terrace residents. Because monitored $PM_{2.5}$ levels are slightly above reference levels, it is plausible that elderly individuals with cardiopulmonary disease could experience acute adverse effects (such as increased heart rate) on days when $PM_{2.5}$ levels are elevated. Under similar conditions, asthmatics, especially active children, might also experience acute aggravation of their condition.

3.3 Sulfate

Some chronic epidemiologic studies have shown that sulfate (SO_4^{-2}) may be associated with increased mortality in adults, increased bronchitis in children, and decreased lung function in children (Dockery et al. 1993, Pope 1995). Acute epidemiologic studies have associated sulfate exposures with increased hospitalizations and increased respiratory symptoms (EPA 1996, EPA 2002d). To date, however, no cause-and-effect relationship has been established between exposures to sulfate and the adverse effects observed in these studies.

The highest 24-hour sulfate concentration detected near River Terrace was 38 µg/m^3 in 1975. The maximum annual average measured near River Terrace was 16.11 µg/m^3 in 1978. All other annual averages were below 12 µg/m^3. Given the relatively low levels of sulfate detected, it is unlikely that chronic adverse health effects would have resulted from past sulfate exposures at River Terrace. Nevertheless, sensitive residents (such as young or elderly individuals with compromised lung function) may possibly have experienced aggravation of their conditions during some of these days. It is not possible to assess the potential impact of current sulfate exposures, because sulfate is no longer monitored in the area.

4 Community Concerns Evaluation

River Terrace residents expressed concern regarding the occurrence of asthma, chronic bronchitis, shortness of breath, hacking coughs, lung disease, and cancer in their community. ATSDR reviewed available health outcome data to determine if River Terrace residents are experiencing increased occurrences of respiratory problems or cancer related to environmental air pollution.

Government agencies routinely collect information on the health of populations within different geographic areas. Many state health departments have developed registries of illnesses and diseases. Some county and local health departments also periodically collect health information, and concerned community members and community action groups might also collect health information in areas of interest. When it is feasible to do so, health investigators use this information to evaluate whether certain health outcomes are occurring at higher than expected rates. The following text provides ATSDR's evaluation of respiratory outcomes and cancer outcomes in River Terrace. Also provided is information on potential future health outcome data collection programs.

4.1 Respiratory Outcomes

A review of air data currently available to the agency (see Section 3) indicates that the maximum levels of ozone, sulfate, and particulate matter may aggravate pre-existing respiratory diseases such as asthma, emphysema, and chronic bronchitis. To determine if increased rates exist, ATSDR reviewed reports about the health and welfare of River Terrace residents. These reports are the Behavioral Risk Factor Surveillance System for the District of Columbia Data Analysis, the Asthma in the District of Columbia Report, the African American Environmentalist Association Report, and the River Terrace Community Report. The information provided in these reports is summarized in the following text.

- *Behavioral Risk Factor Surveillance System Analysis*: The data from the behavioral risk factor surveillance system for the District of Columbia were derived from a state-based telephone survey conducted in cooperation with the Centers for Disease Control and Prevention's (CDC's) Behavioral Risk Factor Surveillance System (BRFSS). This survey was conducted to assist the DC DOH in assessing the prevalence of personal health

practices and behaviors of residents of the District. The BRFSS covers only adults age 18 and older. In the 1999 telephone survey, 9.5% of male and 13.3% of female residents of River Terrace reported that they had asthma at some point in their life. The percent of River Terrace residents who had asthma was virtually the same in White Non-Hispanics (11.7%) and Black Non-Hispanics (11.6%). The ward with the highest prevalence of asthma was Ward 8 (19.0%). River Terrace is located in Ward 7. In River Terrace, 4.9% of male residents and 8.2% of female residents reported that they had asthma at the time of the survey. The data for 2000 were very similar to the data for 1999 (Davies-Cole 2000).

- *Asthma in the District of Columbia*[1]*:* In December 2003, the DC DOH Maternal and Family Health Administration released a report that measured the burden of asthma in the District of Columbia. The three major sources of data sets used in the report were the BRFSS, inpatient hospital discharge data, and the District of Columbia mortality files. The report found that asthma is concentrated in the poorest neighborhoods and among the youngest and oldest residents. Increased hospitalizations and asthma prevalence rates are seen in the younger age groups and the oldest age group has the highest mortality rate. Ward 8 had the highest prevalence of adult asthma and highest asthma mortality rate. River Terrace, located in Ward 7, had the second highest mortality rate (4.7 per 100,000) for a 6-year reporting period (1995–2000) and the second highest adult asthma prevalence rate (9.5%) for a 3-year reporting period (1999–2001). In 2001, Wards 7 and 8 had the highest incidence of hospitalizations based on asthma inpatient admission rates. The lowest socioeconomic indicators were also found in Wards 7 and 8. Although the three data sets used in the report are not integrated at this time, the District of Columbia is using the data and this report to lay the framework for future plans to implement programs for persons who are most impacted by asthma (see Sections 4.3 and 8 for further information) (DC DOH 2003).

- *African American Environmentalist Association Report*: This report, titled "Our Unfair Share III—Race and Environment in Washington, DC," was released by the African American Environmentalist Association in 2000. It addresses many serious environmental justice issues, with chapters on Race, Cars and Lead; Race, Dumping and Land Use; Race and Facility Air Pollution; Race and Toxic Sites; Race and Water Pollution; Race and Housing; Neighborhoods; Nutrition; and Race, Spills, Leaks and RCRA. The report briefly discusses two health issues—lead in households and nutrition— but it does not evaluate any health outcome data for any site in Washington, DC, including the River Terrace community. The report concluded, however, that race is the dominant factor in determining exposure to pollution in Washington, DC (African American Environmentalist Association 2000).

- *River Terrace Community Report*[2]: This survey was conducted during the summer of 2001. It characterized itself as a grassroots community assessment that produced

[1] This report was previously referred to in Section 4.3 of the March 2004 draft ATSDR River Terrace Community Public Health Assessment, but incorrectly titled "Burden of Asthma in DC".

[2] This report was incorrectly titled "Sierra Club Report" in the March 2004 draft ATSDR River Terrace Community Public Health Assessment.

> "astounding results." This survey was community driven, initiated by a local resident and implemented by members of the River Terrace Community Organization with assistance from the Sierra Club's Environmental Justice Program. It was limited in size to 163 residents. The survey, based on self-reported information, found that the household asthma rate (27.6%), children's asthma rate (48.8%), household cancer rate (11.6%), and household bronchitis rate (25.8%) were significantly higher than the comparable rates (5.9%, 8.3%, 0.4%, and 5.3% respectively) in residents of the District of Columbia. The report did not specify whether these rates were for "ever had" or "currently have" conditions. The occurrence of cancer and bronchitis among children interviewed was 2.2% and 22.2%, respectively. The survey also stated that almost half of emergency room visits (67/144) were for conditions that are potentially linked to environmental pollution—that is, asthma, cancer, bronchitis, or other lung disease. The report concluded that there is a need for the District of Columbia Department of Health to conduct or fund a further in-depth study of the health of River Terrace residents (River Terrace Community Report 2001).

Overall, these reports, either individually or collectively, although telling, are not adequate to provide a summary of the respiratory health of River Terrace residents related to environmental air pollution. Many limitations exist: the first analysis (Davies-Cole 2000) and second report (DC DOH 2003) used BRFSS data. BRFSS data are based on a random-digit dialing sampling method, are based on patient self-reporting (not on physician reports or medical records), and cover only adults age 18 and older. The third report (African American Environmentalist Association 2000) addressed many serious environmental justice issues but did not review any health outcome data, especially health outcome data related to air pollution. The fourth study (River Terrace Community Report 2001) was based on small numbers and on self-reporting (not medically verified data). The findings of the BRFSS and River Terrace Community studies are expected to be different because they have different survey populations. Of note, even with more complete data it is often difficult to causally relate a health condition to one or more environmental pollutants. In conclusion, the available health outcome data are insufficient to determine if River Terrace residents are experiencing elevated occurrences of respiratory illness related to environmental air pollution.

4.2 Cancer Outcomes

River Terrace residents also expressed concern regarding cancer and its occurrence in their community. Cancer is not a single disease; it is actually a group of more than 200 different diseases. Because cancer is not a single disease, it does not have a single cause. Many causes or risk factors can contribute to a person's chance of getting cancer. Risk factors are different with each type of cancer, and 1 in 3 people will develop a cancer during their lifetime (ATSDR 2002).

It is difficult to determine if cancers are associated with environmental exposures. First, there is typically a long latency period before cancer development, but usually very little information regarding potential environmental exposures that occurred years ago. Further, environmental exposures often contain mixtures of chemicals, which make it difficult to associate health outcomes to a single chemical. In addition, other variables, like behavioral risk factors, must be

accounted for before making any associations of the disease outcome to a given chemical exposure (ATSDR 2002).

According to the environmental air data available to ATSDR, exposure to the maximum levels of the known contaminants would not be expected to cause cancer in River Terrace residents. However, the environmental data are limited (see Section 2.6.8). Therefore, in response to community concern regarding elevated cancer rates, ATSDR reviewed available health outcome data on cancer.

The District of Columbia Cancer Incidence & Mortality Report (1996) is a report of the cancer incidence and mortality in Washington, DC. Only the 1996 report was available for review. Because lung and bronchial cancer are most plausibly related to long-term air pollution, ATSDR reviewed the incidence and mortality of these cancers. Specifically, the age-adjusted mortality rates for lung and bronchial cancers for males and females (all races) and the age-adjusted incidence rates for lung and bronchial cancers for males and females (all races) were compared with the National Cancer Institute (NCI) Surveillance, Epidemiology, and End Results (SEER) rates for the highest 5 and the lowest 5 mortality and incidence rates. In each of these four analyses, the rates for Washington, DC fall in the median range, indicating that there is not excess incidence or mortality for lung and bronchial cancers in Washington, DC. The total number of cases and deaths of lung and bronchial cancers were provided for each of eight wards, but the observed and expected rates were not given, nor were there any lung and bronchial cancer rates provided for River Terrace. These data are insufficient to permit a determination of whether River Terrace residents are experiencing elevated occurrences of cancer.

In response to ATSDR's recommendations, DC DOH looked at cancer incidence data for River Terrace. Specifically, the DC DOH cancer registry data from 1997 to 2001 for River Terrace (census tract 9604) was analyzed for incidence rates and compared to the rates for surrounding census tract neighborhoods with respect to the top five cancers (breast, cervix, lung, prostate, and colon). The census tracts used for comparison were those directly bordering River Terrace. These neighborhoods were assumed to experience the same environmental factors as River Terrace, such as closeness to the Anacostia River, highways, gas stations, and PEPCO. The results revealed that regarding these cancers, the incidence rates for breast, cervix, lung, prostate, and colon cancers in River Terrace were not the highest compared with the surrounding communities.

In conclusion, the available health outcome data indicate the incidence and mortality rates for lung and bronchial cancers in Washington, DC are not excessive compared with national rates, and the incidence rates for River Terrace for the top five cancers are not elevated compared with surrounding neighborhoods.

4.3 Health Programs

Although the currently available health outcome data are inadequate to permit a determination of whether River Terrace residents are experiencing elevated occurrences of respiratory ailments

related to environmental air pollution, in the future several programs may be available to address these concerns.

- *National Asthma Control Program*: Despite evidence that national asthma death rates are leveling off and asthma hospitalization rates are declining, asthma's impact on health, quality of life, and the economy remains substantial (CDC 2003). Rates of severe asthma continue to affect disproportionately poor, minority, inner-city populations (CDC 2003). The CDC created the National Asthma Control Program in 1999. The goals of the program are to reduce the number of deaths, hospitalizations, emergency department visits, school or work days missed, and limitations on activity due to asthma (CDC 2003). As part of the program, CDC is funding the DC DOH to develop an asthma control plan that includes disease tracking, intervention, and occupational components. Funded since September 2001, this cooperative agreement enhances the DC DOH information systems that directly support environmental public health tracking functions (DC DOH 2003). See next bullet for additional information.

- *District of Columbia Control Asthma Now Program*: In 2001, the District of Columbia was one of 22 states awarded a grant from CDC to develop an infrastructure addressing the burden of asthma. The District of Columbia Department of Health Maternal and Family Health Administration spearhead its **DC CAN C**ontrol **A**sthma **N**ow Project. The River Terrace community has been included in the DC DOH asthma tracking program in a traditional sense; that is, monitoring the asthma outcomes throughout the District of Columbia. The asthma program is in the process of developing an electronic surveillance system, which would track various asthma outcomes such as asthma prevalence, incidence, and mortality.

  The DC DOH asthma program is also collaborating with the American Lung Association to target key personnel (e.g., parents, teachers, and school nurses) in River Terrace for enhanced health education.

  The DC Environmental Public Health Tracking program (EPHT) is in the planning phase. It does not have the resources to track asthma in the District. The EPHT program nevertheless is working closely with the DC DOH asthma program to assist with the development of its surveillance system, where appropriate.

- *River Terrace Community Health Assessment*: In July 2004, DC DOH began the River Terrace Community Health Assessment. This effort was in response to (1) River Terrace residents' concerns of possibly high rates of disease among its residents being linked to environmental causes (i.e., power plant, trash transfer station, and highway traffic) and (2) the need to gather missing data elements as identified by this ATSDR public health assessment report. The River Terrace Community Advisory Committee was developed to guide the process.

  The River Terrace Community Health Assessment is a combination of data gathering initiatives designed to capture some information on the respiratory sensitivities, medical history, and practices of River Terrace residents, as well as, information on the air quality

in the neighborhood and the River Terrace Elementary School. The data will be compiled and analyzed to determine if there are unusual rates of disease and environmental pollution when compared with local and national statistics. The initiatives are:

- A health questionnaire of 65 questions that ask River Terrace residents about their medical history, some family medical history, respiratory sensitivities, and diagnosis.
- A medical records review which will focus on the medical records of children who attend the River Terrace Elementary School. With the permission of their parents, DC DOH staff will analyze the medical records for diagnosis of respiratory related illnesses or symptoms.
- An environmental assessment of the interior of the elementary school and selected student homes. DC DOH and DC Public School System staff will develop protocol for capturing data on the air quality of the homes and school with a focus on identifying pollutants that trigger respiratory symptoms.

The River Terrace Community Advisory Committee was established to assist with the design and implementation of the community health assessment. Committee membership consists of DC DOH staff and resident volunteers with expert *ad hoc* members from the DC Department of Public Works and DC Public School System. Meeting monthly, the committee manages the overall implementation of the assessment, making adjustments as the situation warrants.

5 Child Health Considerations

Because children depend completely on adults for risk identification and management decisions, ATSDR is committed to evaluating their special interests. A summary of ATSDR's evaluation specific to children is provided in the following text (see also Section 3).

- Ozone levels are slightly elevated but are generally similar to regional metropolitan levels. Healthy children would not be expected to experience adverse health effects at the maximum detected ozone levels. However, some sensitive children (described previously as those with compromised lung function) could experience acute adverse health effects such as coughing, wheezing, and difficulty in breathing after breathing levels of ozone above EPA's NAAQS. Such effects might be prevented if sensitive children remain indoors and avoid strenuous activity, to the greatest extent possible, on days when MWCOG warns that ozone levels are likely to be high.

- Although particulate matter levels are slightly elevated, it is unlikely that healthy children will experience adverse health effects from exposure. It is plausible, however, that elevated particulate matter levels may aggravate pre-existing respiratory conditions, such as bronchitis and asthma, in River Terrace children.

- Given the relatively low levels of sulfate, it is unlikely that healthy children experienced chronic adverse health effects from past sulfate exposures. Nevertheless, young children with

compromised lung function may possibly have experienced aggravation of their conditions during some of these days.

6 Conclusions

Residents of the River Terrace community are exposed to air pollutants emitted from numerous sources. Levels of some air pollutants have been elevated above health-based guidance values at River Terrace, although they are similar to levels found in any urban area, including the general Washington, DC metropolitan area. ATSDR evaluated the maximum contaminant levels detected in River Terrace air and the available data on levels known to cause adverse health effects in animals and humans and concluded that exposure to the air would not be expected to harm healthy River Terrace residents. However, the maximum levels of ozone, sulfate, and particulate matter may aggravate pre-existing respiratory diseases such as asthma, emphysema, and chronic bronchitis.

Environmental data for the air exposure pathway are limited to a few contaminants, and insufficient health outcome data exist to permit an evaluation of whether increased rates of respiratory effects related to air pollution are present in this community. ATSDR has therefore categorized the River Terrace community as presenting an Indeterminate Public Health Hazard.

7 Recommendations

- Continue to sample criteria pollutants in ambient air in River Terrace.
- Sample additional pollutants, including volatile organic compounds, polycyclic aromatic hydrocarbon compounds, and metals in ambient air.
- Collect health outcome data on respiratory ailments in River Terrace.
- Promote community awareness about air pollution in River Terrace.

8 Public Health Action Plan

This Public Health Action Plan (PHAP) for the River Terrace community contains a description of actions taken and to be taken by ATSDR, DC DOH, EPA and others subsequent to the completion of this public health assessment. The purpose of the PHAP is to ensure that this evaluation not only identifies potential and ongoing public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. The public health actions taken and to be taken by each agency are

ATSDR Activities

Completed Actions

1. In September 2001, ATSDR acknowledged the River Terrace Community petition request and began to gather information and data about the site.
2. In November 2001, ATSDR conducted a site visit of the River Terrace community, during which representatives talked with community members and local and state officials about their concerns.
3. In July 2002, ATSDR provided residents of the River Terrace community with a community fact sheet. This fact sheet was the first in a series being developed to provide local residents with information on ATSDR and its activities related to the River Terrace site. This first fact sheet contained general information about the agency and its public health reports, as well as details on how the agency became involved with the River Terrace site.
4. In September 2003, ATSDR released this PHA in initial form to the DC DOH and the EPA. ATSDR requested these agencies review the document for any technical or factual errors or omissions in the information and data presented in the PHA.
5. In March 2004, ATSDR released this PHA for public comment. The purpose of the public comment period was to solicit questions and comments about the PHA from the local community and all interested stakeholders.
6. In April 2004, ATSDR provided the residents of the River Terrace community with its second ATSDR community fact sheet. This second fact sheet contained a summary of data evaluated in the PHA, the conclusions and recommendations of the PHA, and where to get more information.
7. In June 2004, ATSDR provided the residents of the River Terrace community with a flyer announcing that the agency would be hosting public information sessions. The flyer stated that during the information sessions, ATSDR staff members would be discussing the PHA and responding to community questions. The flyer also stated that representatives from various groups interested in the River Terrace community would be available to provide the residents with additional information. These groups included the River Terrace Community Organization, American Cancer Society, DC DOH, George Washington University Medical Center, Metropolitan Washington Council of Governments/Clean Air Partners, Mid-Atlantic Center for Children's Health and the Environment, and Sierra Club.
8. From July 12–14, 2004, ATSDR conducted a second site visit of the River Terrace community. ATSDR met with DC DOH to discuss and coordinate upcoming plans. ATSDR also held its two public information sessions for community members. During these information sessions, ATSDR staff described the evaluation of ambient (outdoor) air data and described community concerns about illnesses in the River Terrace area. ATSDR staff answered questions from community members about its evaluation of the air data. DC DOH fielded questions related to its work at this site.
9. On October 16, 2004, ATSDR participated in a community fair hosted by the River Terrace Community Organization. ATSDR talked with community members about the River Terrace PHA. Community members were also provided with packets containing information about ATSDR including the PHA process fact sheet, an

exposure fact sheet, and the second River Terrace community fact sheet. Copies of the River Terrace PHA were available.

10. In December 2004, ATSDR released its third community fact sheet. This third fact sheet was completed in coordination with DC DOH. It summarized the verbal questions expressed by the community during the July 2004 public health information sessions as well as the ATSDR and DC DOH responses to those questions. This "question and answer" fact sheet focused on environmental health concerns and other challenges facing the community.
11. In January 2005, ATSDR contacted the Metropolitan Washington Council of Governments (MWCOG) to discuss public information campaigns on air pollution in high risk areas of DC, including River Terrace. Through their voluntary action and education program (Clean Air Partners), MWCOG offers residents of metro Washington DC education on air pollution, air quality forecast and action guides, and provides numerous activities to reduce air pollution and exposure to air pollution.

Ongoing Actions

1. ATSDR and DC DOH hold conference calls to discuss and coordinate future activities.
2. ATSDR continues to foster relationships and develop partnerships between government and non-government entities to promote interaction and dissemination of health information. Although ATSDR is not the lead agency in the development of these campaigns, we can provide some support.

Planned Actions

1. ATSDR will review additional air sampling data collected by EPA in the River Terrace community and other areas in the vicinity of the PEPCO power plant. ATSDR will evaluate these data for public health significance in a health consultation when the data become available.
2. ATSDR will work in cooperation with other stakeholders to promote community awareness about air pollution. Environmental health education is available for River Terrace residents through various local groups and agencies. ATSDR is developing an Environmental Health Resource Directory which will provide program and contact information for residents desiring additional knowledge about environmental and public health issues within their community.

DC DOH Activities

Completed Actions

1. Since 1993, DC DOH has operated and continues to operate an ambient air monitor in River Terrace to measure levels of criteria air pollutants within the community.
2. In August 2001, DC DOH petitioned ATSDR to conduct a public health assessment of the River Terrace community (DC DOH 2001). DC DOH indicated that River Terrace residents are concerned that elevated rates of asthma, chronic bronchitis, shortness of breath, hacking coughs, lung disease, and cancer in their community are related to airborne chemical exposures.

3. In December 2001, DC DOH and PEPCO signed a consent decree. The decree was an amendment to a violated 1996 consent decree. The 2001 consent decree outlines a clearly defined methodology to determine PEPCO compliance with all applicable CAA air permits.
4. In 2002, the DC DOH was awarded a 1-year grant through the Trust for America's Health tracking program. CDC awarded these health tracking grants to fight chronic diseases. The CDC grants are expected to help health officials develop or enhance their ability to monitor where and when chronic diseases occur and to explore their potential links to environmental factors. The pilot programs are expected to form the building blocks for an eventual nationwide health tracking network. In 2003, however, due to funding constraints, of the 33 applicants only 10 received awards. DC DOH did not receive an award during the 2003 grant cycle.
5. In July 2004, DC DOH began the River Terrace Community Health Assessment project to capture data on the environment and health of River Terrace residents. See Section 4.3, River Terrace Community Health Assessment bullet, for additional details.
6. On July 13, 2004, DC DOH participated in ATSDR's public information sessions. (See ATSDR completed activities for further details.)
7. On October 9, 2004, the DC DOH co-sponsored a government-wide information fair held on the grounds of the River Terrace Elementary School. The Fair had two goals: to heighten awareness of District of Columbia services (e.g., health care enrollment, preventive services, child support services, fire safety, library services), and to administer the River Terrace Health Questionnaire.
8. On October 16, 2004, DC DOH participated in a community fair hosted by the River Terrace Community Organization. The fair celebrated the residents and acknowledged student achievements. DC DOH staff administered the health questionnaire to River Terrace residents.
9. In December 2004, DC DOH partnered with ATSDR to create a "question and answer" fact sheet regarding the July 2004 public information sessions. (See ATSDR completed activities for further details.)

Ongoing Actions

1. Pursuant to its obligations under the CAA, PEPCO operates continuous emissions air monitors and continuous opacity monitoring systems, and reports the results to DC DOH monthly, quarterly, and annually.
2. DC DOH staff participate in monthly meetings of the River Terrace Community Advisory Committee. The committee assists with the design and implementation of the River Terrace Community Health Assessment.

Planned Actions

1. DC DOH plans to release a report regarding the results of the River Terrace Community Health Assessment.

EPA Activities

Completed Actions

1. In October 2004, EPA's contractor conducted the first phase of an air monitoring plan focusing on the River Terrace community and other areas in the vicinity of the PEPCO power plant. Ambient air samples were collected for approximately 8 hours per day over a 3-day period when the PEPCO plant was not operating to determine background ambient conditions in the local area. The samples were analyzed for TSP, metals (arsenic, antimony, barium, cadmium, cobalt, chromium, copper, lead, manganese, nickel, and selenium), VOCs, and PAHs.
2. In June 2005, during a peak energy use period, EPA's contractor conducted the second phase of the air monitoring plan focusing on the River Terrace community and other areas in the vicinity of the PEPCO power plant. This second phase will help assess the impact of the PEPCO plant on local air quality during one period of plant operation.

Planned Actions

1. EPA will share the air monitoring results with ATSDR.

Other Activities

1. Metropolitan Washington Council of Governments issues AQI advisories on days in which air pollutants in the region are expected to reach potentially unhealthy levels.

9 Public Comment

ATSDR released this River Terrace Community public health assessment for public review and comment from March 25, 2004, through September 15, 2004. Appendix G contains both the comments received during the public comment period and ATSDR's responses to those comments.

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12 References

African American Environmentalist Association. 2000. Our unfair share III: race & environment in Washington, DC. Washington, DC. Web sit located at:
http://www.aaenvironment.com/OUS3.htm

[ATSDR] Agency for Toxic Substances and Disease Registry. 2002. ATSDR fact sheet. Cancer. Atlanta: US Department of Health and Human Services. Web site located at:
http://www.atsdr.cdc.gov/COM/cancer-fs.html

Bureau of the Census. 2001. 2000 Census of population and housing, summary tape file 1A [machine-readable data files]. Washington, DC: US Department of Commerce.

[CDC] Centers for Disease Control and Prevention. 2003. National asthma control program: improving quality of life and reducing costs—2003. Atlanta, GA: National Center for Environmental Health. Web site located at:
http://www.cdc.gov/nceh/airpollution/asthma/asthmaAAG.htm

Davies-Cole J. 2000. Handout: behavioral risk factor surveillance system for the District of Columbia (Asthma: 1999-2000). Washington, DC: District of Columbia Department of Health.

[DC AQD] District of Columbia Air Quality Division. 2000. District of Columbia Air Quality Operating Permit. PEPCO Benning Road Generating Station, Proposed Title V Operating Permit. Permit #026. Effective Date: April 14, 2000; Expiration Date: April 14, 2005.

[DC DCRA] District of Columbia Department of Consumers and Regulatory Affairs. 1988. Housing and Environmental Regulations Administration, Environmental Control Division Compliance Data System Inspection Report for Potomac Electric Power Company Benning Generating Station; Date of Inspection: August 24, 1988 and August 26, 1988.

[DC DCRA] District of Columbia Department of Consumers and Regulatory Affairs. 1996. Consent Decree between PEPCO Benning Generating Station and The District of Columbia Air Pollution Control Act of 1984 as amended. File No. ERA-96-105-ARMD

[DC DOH] District of Columbia Department of Health. 2001. August 14 letter from Theodore J. Gordon, Chief Operating Officer, DC DOH Environmental Health Administration to Dr. Jeffrey P. Koplan, Administrator, ATSDR.

[DC DOH] District of Columbia Department of Health. 2003. Asthma in the District of Columbia. Maternal and Family Health Administration, Washington DC.

[DC DOH] District of Columbia Department of Health. 2004. January 13 email from Dr. Robert Vowels, Supervisory Medical Officer, District of Columbia Department of Health to Danielle Sass regarding ATSDR's River Terrace Public Health Assessment.

[DC DPW] District of Columbia Department of Public Works. 2003. February 12 letter from Sylvestre K. Yorrick, Solid Waste Management Administration, to Danielle Sass regarding ATSDR's River Terrace Public Health Assessment.

[DC OIG] District of Columbia Office of the Inspector General. 2000. Report of Inspection: District of Columbia Department of Public Works, Solid Waste Management Administration. Report No. 00-0003KA. 2000 Dec.

Dockery DW, Pope CA, Xu X, et al. 1993. An association between air pollution and mortality in six U.S. cities. The New England Journal of Medicine 329(24):1753–59.

[EPA] Environmental Protection Agency. 1996. Air quality criteria for particulate matter. Office of Research and Development, National Center for Environmental Assessment. Washington, DC: EPA/600/P-95/001aF.

[EPA] Environmental Protection Agency. 1997a. Profile of the Fossil Fuel Electric Power Generation Industry. EPA Office of Compliance Sector Notebook Project. Washington, DC: EPA/310-R-97-007. Web site located at: http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/power2pt1.pdf.

[EPA] Environmental Protection Agency. 1997b. July 17 fact sheet: health and environmental effects of ground-level ozone. Office of Air and Radiation, Office of Air Quality Planning and Standards. Web site located at: http://www.epa.gov/ttn/oarpg/naaqsfin/o3health.html.

[EPA] Environmental Protection Agency. 1997c. Ozone: good up high, bad nearby. Office of Air and Radiation, Office of Air Quality Planning and Standards. Washington, DC: EPA/451-K-97-002. Web site located at: http://www.epa.gov/oar/oaqps/gooduphigh/.

[EPA] Environmental Protection Agency. 1999. AIRNow: ozone and your health. Office of Air and Radiation, Air Quality Planning and Standards. Washington, DC: EPA-452/F-99-003. Web site located at: http://www.epa.gov/airnow/ozone2.html#2.

[EPA] Environmental Protection Agency. 2001. National primary and secondary ambient air quality standards. Washington, DC: 62 FR 38755. Web site located at: http://www.epa.gov/air/oaqps/greenbk/40cfr50.html.

[EPA] Environmental Protection Agency. 2002a. Envirofacts Data Warehouse Multisystem Report. PEPCO Benning Generating Station, 3400 Benning Road NE Washington, DC 20019. Query executed December 26, 2002.

[EPA] Environmental Protection Agency. 2002b. Enforcement and Compliance History Online: Envirofacts Data Warehouse Multisystem Report. PEPCO Benning Generating Station, 3400 Benning Road NE Washington, DC 20019. Report generated on December 26, 2002.

[EPA] Environmental Protection Agency. 2002c. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002. Washington, DC.

[EPA] Environmental Protection Agency. 2002d. Air quality criteria for particulate matter: third external review draft. Office of Research and Development, National Center for Environmental Assessment. Washington, DC: EPA/600/P-99/002ac. Web site located at: http://www.epa.gov/ncea/pdfs/partmatt/VOL_II_AQCD_PM_3rd_Review_Draft.pdf.

[EPA] Environmental Protection Agency. 2003a. Envirofacts Data Warehouse Multisystem Report. List of EPA-Regulated Facilities in Envirofacts (zip code 20019). Query executed May 8, 2003.

[EPA] Environmental Protection Agency. 2003b. Enforcement and Compliance History Online: PEPCO Envirofacts Data Warehouse Multisystem Report. PEPCO Benning Generating Station, 3400 Benning Road NE Washington, DC 20019. Report generated on May 8, 2003.

[EPA] Environmental Protection Agency. 2003c. TRI Explorer. Releases: Facility Report, Benning Generating Station, 3400 Benning Rd. NE, Washington, DC. Office of Environmental Information. Report generated on May 8, 2003.

[EPA] Environmental Protection Agency. 2003d. About AirData. Office of Air and Radiation. Washington, DC. Web site located at: http://www.epa.gov/air/data/info.html.

[EPA] Environmental Protection Agency. 2003e. About the Air Quality System (AQS) Database. Office of Air and Radiation. Web site located at: http://www.epa.gov/air/data/aqsdb.html.

[EPA] Environmental Protection Agency. 2003f. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in July 2003. Washington, DC.

[EPA] Environmental Protection Agency. 2003g. Air quality criteria for particulate matter (fourth external review draft). Office of Research and Development, National Center For Environmental Assessment, Research Triangle Park Office. Research Triangle Park, NC, EPA/600/P-99/002aD and bD., 2003. Web site located at: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=58003.

Ersys 2002. Elementary/Middle Schools, Washington, DC. Elementary/Middle School Statistics provided by the National Center for Education Statistics 2000/2001. October 26, 2002.

Heinrich J, Hoelscher B, Wichmann HE. 2000. Decline of ambient air pollution and respiratory symptoms in children. Am J Respir Crit Care Med 161:1930–1936.

Krämer U, Behrendt H, Dolgner R, et al. 1999. Airway diseases and allergies in East and West German children during the first 5 years after reunification: time trends and the impact of sulfur dioxide and total suspended particles. Int J Epidemiol 28:865–873.

[PEDCo] PEDCo Environmental, Inc. 1983. Field inspection report: solid waste reduction center (SWRC I), District of Columbia. Completed for: Stationary Source Compliance Division, US Environmental Protection Agency. Washington, DC: 1983 Feb.

[PEPCO] Potomac Electric Power Company Holdings, Inc. 2003. February 11 letter from James S. Potts, Vice President, Safety and Environment to Danielle E. Sass, Eastern Research Group, regarding Benning Road Generating Station ATSDR Information Request.

Pope CA, Thun MJ. Namboodiri MM, Dockery DW, Evans JS, Speizer FE, Heath CW. 1995. Particulate air pollution as a predictor of mortality in a prospective study of U.S. adults. Am J Respir Crit Care Med 151:669–674.

Pope CA, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, Thurston GD. 2002. Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution. J Am Med Assoc 287:1132–1141.

River Terrace Community Report. 2001. River Terrace health survey produces astounding results. Washington, DC.

[SCOTT] Scott Environmental Technology. 1992. Emission evaluation of a solid waste incinerator. Washington Department of Public Works: Washington DC.

13 Bibliography

Abbey DE, Nishino N, McDonnell WF, et al. 1999. Long-term inhalable particles and other air pollutants related to mortality in nonsmokers. Am J Respir Crit Care Med 159:373–382.

[EPA] Environmental Protection Agency. 2000. Air trends reports: number of days with an air quality index over 100 by city, ozone only (2000). Office of Air and Radiation, Air Quality Planning and Standards. Washington, DC. Web site located at: http://www.epa.gov/airtrends/reports.html.

[EPA] Environmental Protection Agency. 2001. Latest findings on national air quality: 2000 status and trends. Office of Air and Radiation, Air Quality Planning and Standards. Washington, DC: EPA 454/K-01-002. Web site located at: http://www.epa.gov/oar/aqtrnd00/brochure/00brochure.pdf.

Greenbaum DS, Bachman JD, Krewski D, Samset JM, White R, Wyzga RE. 2001. Particulate air pollution standards and morbidity and mortality: case study. Am J Epidemiol 154(12):S78-S90.

Krewski D, Burnett RT, Goldberg MS, et al. 2000. Reanalysis of the Harvard Six Cities study and the American Cancer Society study of particulate air pollution and mortality. A special report of the Institute's Particle Epidemiology Reanalysis Project. Cambridge, MA: Health Effects Institute.

McDonnell WF, Nishino-Ishikawa N, Petersen FF, Chen LH, Abbey DE. 2000. Relationships of mortality with the fine and coarse fractions of long-term ambient PM_{10} concentrations in nonsmokers. J Exposure Anal Environ Epidemiol 10:427–436.

Pope CA. 2000. Epidemiology of fine particle air pollution and human health: biological mechanisms and who's at risk? Environ Health Perspect 108(Suppl4):713–723.

Appendix B— Tables

Table 1: Monitoring Station Descriptions by Year and Available Contaminant Data
River Terrace, Washington, DC

Year	Available Contaminant Data	Monitoring Station
1971	TSP	Site 7
1972	–	–
1973	–	–
1974	Sulfate, TSP	Site 7
1975	Sulfate, TSP	Site 7
1976	Sulfate, TSP	Site 7
1977	Sulfate, TSP	Site 7
1978	Sulfate, TSP	Site 7
1979	Sulfate, TSP	Site 7
1980	–	–
1981	–	–
1982	–	–
1983	–	–
1984	–	–
1985	–	–
1986	–	–
1987	–	–
1988	–	–
1989	–	–
1990	–	–
1991	–	–
1992	–	–
1993	PM_{10}, SO_2, CO, O_3	Site 41
1994	PM_{10}, SO_2, CO, O_3	Site 41
1995	PM_{10}, SO_2, CO, O_3	Site 41
1996	PM_{10}, SO_2, CO, O_3	Site 41
1997	SO_2, CO, O_3	Site 41
1998	PM_{10}, SO_2, CO, O_3	Site 41
1999	$PM_{2.5}$, SO_2, CO, O_3	Site 41
2000	$PM_{2.5}$, SO_2, CO, O_3	Site 41
2001	$PM_{2.5}$, SO_2, CO, O_3	Site 41
2002	PM_{10}, $PM_{2.5}$, SO_2, CO, O_3	Site 41

–	no data or information available
TSP	total suspended particulates
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
SO_2	sulfur dioxide
CO	carbon monoxide
O_3	ozone

Table 2: Maximum Ambient Air Monitoring Results for each Contaminant*

River Terrace, Washington DC

Contaminant	Years Monitored	Locations Monitored	Averaging Period	Maximum Value Detected†	Comparison Value (EPA NAAQS)
Carbon Monoxide (CO) *(Table 3)*	1993–2002	Site 41	1-hour average	9.1 ppm	35 ppm
			8-hour average	7.1 ppm	9 ppm
Ozone (O_3) *(Table 4)*	1993–2002	Site 41	1-hour average	0.155 ppm	0.12 ppm
			8-hour average	0.128 ppm	0.08 ppm
$PM_{2.5}$ *(Table 5)*	1999–2002	Site 41	24-hour average	100.2 $\mu g/m^3$	65 $\mu g/m^3$
			Annual average	17.03 $\mu g/m^3$	15 $\mu g/m^3$
PM_{10} *(Table 6)*	1993–1996, 1998, 2002	Site 41	24-hour average	70.44 $\mu g/m^3$	150 $\mu g/m^3$
			Annual average	28.82 $\mu g/m^3$	50 $\mu g/m^3$
Total Suspended Particles (TSP) *(Table 7)*	1971, 1974–1979	Site 7	1-hour average	450 $\mu g/m^3$	260 $\mu g/m^3$
			Annual average	101.47 $\mu g/m^3$	75 $\mu g/m^3$
Sulfate (SO_4^{-2}) *(Table 8)*	1974–1979	Site 7	24-hour average	38 $\mu g/m^3$	N/A
			Annual average	16.11 $\mu g/m^3$	N/A
Sulfur Dioxide (SO_2) *(Table 9)*	1993–2002	Site 41	24-hour average	0.031 ppm	0.14 ppm
			Annual average	0.010 ppm	0.03 ppm

* Source: Environmental Protection Agency [EPA]. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002 and July 2003.

† Ambient air concentrations were measured every hour and averaged over different time periods to yield a value (e.g., 24-hour average) that could be compared to EPA's health-based National Ambient Air Quality Standard.

NAAQS	National Ambient Air Quality Standard
N/A	not applicable
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppm	parts per million
$\mu g/m^3$	micrograms per cubic meter

Table 3: Ambient Air Concentrations of Carbon Monoxide (CO)*

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† (ppm)	Maximum Value† (ppm)	Date of Maximum Value	Comparison Value (EPA NAAQS [ppm])	Exceed NAAQS?
Site 41						
1993	1-hour average	0	9.1	11/4/93	35	No
	8-hour average	0.3	7.1	11/4/93	9	No
1994	1-hour average	0	9.1	12/21/94	35	No
	8-hour average	0.3	6.5	12/27/94	9	No
1995	1-hour average	0	7.1	12/15/95	35	No
	8-hour average	0.3	6.0	12/31/95	9	No
1996	1-hour average	0	7.6	1/17/96	35	No
	8-hour average	0.3	4.4	10/25/96	9	No
1997	1-hour average	0.1	7.4	12/17/97	35	No
	8-hour average	0.3	6.5	12/17/97	9	No
1998	1-hour average	0.2	6.8	12/15/98	35	No
	8-hour average	0.3	5.0	1/5/98	9	No
1999	1-hour average	0.3	8.0	1/28/99	35	No
	8-hour average	0.3	5.8	12/5/99	9	No
2000	1-hour average	0.1	6.8	2/10/00	35	No
	8-hour average	0.3	5.2	2/10/00	9	No

Table 3: Ambient Air Concentrations of Carbon Monoxide (CO)*

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† (ppm)	Maximum Value† (ppm)	Date of Maximum Value	Comparison Value (EPA NAAQS [ppm])	Exceed NAAQS?
2001	1-hour average	0.1	4.7	1/7/01	35	No
	8-hour average	0.3	4.0	1/7/01	9	No
2002	1-hour average	0.2	6.0	1/27/02	35	No
	8-hour average	0.3	4.7	1/27/02	9	No

* Source: Environmental Protection Agency [EPA]. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002 and July 2003.

† Ambient air concentrations were measured every hour and averaged over different time periods to yield a value (e.g., 8-hour average) that could be compared to EPA's health-based National Ambient Air Quality Standard.

NAAQS National Ambient Air Quality Standard
ppm parts per million

Table 4: Ambient Air Concentrations of Ozone (O_3)*

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† (ppm)	Maximum Value† (ppm)	Date of Maximum Value	Comparison Value (EPA NAAQS [ppm])	Days Above NAAQS
Site 41						
1993	1-hour average	0.001	0.137	8/25/93	0.12	1
	8-hour average	0.001	0.107	7/9/93	0.08	20
1994	1-hour average	0.002	0.137	7/13/94	0.12	1
	8-hour average	0.002	0.111	7/13/94	0.08	7
1995	1-hour average	0	0.132	7/15/95	0.12	1
	8-hour average	0	0.114	7/15/95	0.08	15
1996	1-hour average	0	0.114	8/23/96	0.12	0
	8-hour average	0	0.091	8/23/96	0.08	2
1997	1-hour average	0	0.155	7/15/97	0.12	2
	8-hour average	0.001	0.122	7/15/97	0.08	12
1998	1-hour average	0.001	0.115	7/30/98	0.12	0
	8-hour average	0.001	0.097	8/22/98	0.08	11
1999	1-hour average	0	0.126	7/31/99	0.12	1
	8-hour average	0	0.103	7/31/99	0.08	16
2000	1-hour average	0	0.120	6/10/00	0.12	0
	8-hour average	0.001	0.102	6/10/00	0.08	2

Table 4: Ambient Air Concentrations of Ozone (O_3)*

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† (ppm)	Maximum Value† (ppm)	Date of Maximum Value	Comparison Value (EPA NAAQS [ppm])	Days Above NAAQS
2001	1-hour average	0.001	0.122	6/26/01	0.12	0
	8-hour average	0.001	0.102	6/25/01	0.08	7
2002	1-hour average	0.003	0.151	7/2/02	0.12	2
	8-hour average	0.006	0.128	7/2/02	0.08	12

* Source: Environmental Protection Agency [EPA]. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002 and July 2003.

† Ambient air concentrations were measured every hour and averaged over different time periods to yield a value (e.g., 8-hour average) that could be compared to EPA's health-based National Ambient Air Quality Standard.

NAAQS National Ambient Air Quality Standard
ppm parts per million

Table 5: Ambient Air Concentrations of $PM_{2.5}$ *

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† ($\mu g/m^3$)	Maximum Value† ($\mu g/m^3$)	Date of Maximum Value	Comparison Value (EPA NAAQS [$\mu g/m^3$])	Exceed NAAQS?
Site 41						
1999	24-hour average	0	72.2‡	7/4/99	65	Yes (1 day)
	Annual average	–	16.31	–	15	Yes
2000	24-hour average	0	100.2‡	7/4/00	65	Yes (2 days)
	Annual average	–	17.03	–	15	Yes
2001	24-hour average	0.2	54.9	1/23/01	65	No
	Annual average	–	16.53	–	15	Yes
2002	24-hour average	0.5	61.7‡	7/4/02	65	No
	Annual average	–	15.80	–	15	Yes

* Source: Environmental Protection Agency [EPA]. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002 and July 2003.

† Ambient air concentrations were measured every hour and averaged over different time periods to yield a value (e.g., 24-hour average) that could be compared to EPA's health-based National Ambient Air Quality Standard.

‡ The maximum 24-hour average was measured on July 4th, likely due to celebratory fireworks in the vicinity of the air monitor.

– annual average level provided under "maximum value" column
NAAQS National Ambient Air Quality Standard
$PM_{2.5}$ Particles with diameters of 2.5 microns or less
$\mu g/m^3$ micrograms per cubic meter of air

Table 6: Ambient Air Concentrations of PM_{10} *

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† ($\mu g/m^3$)	Maximum Value† ($\mu g/m^3$)	Date of Maximum Value	Comparison Value (EPA NAAQS [$\mu g/m^3$])	Exceed NAAQS?
Site 41						
1993	24-hour average	4.72	69.75	6/18/93	150	No
	Annual average	–	28.82	–	50	No
1994	24-hour average	8.01	70.44	12/22/94	150	No
	Annual average	–	27.65	–	50	No
1995	24-hour average	3.65	67.16	2/20/95	150	No
	Annual average	–	27.76	–	50	No
1996	24-hour average	5.22	48.87	1/22/96	150	No
	Annual average	–	22.86	–	50	No
1998	24-hour average	5.74	53.12	6/22/98	150	No
	Annual average	–	22.21	–	50	No
2002	24-hour average	3.3	87.49	7/4/02	150	No
	Annual average	–	27.66	–	50	No

* Source: Environmental Protection Agency [EPA]. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002 and July 2003.

† Ambient air concentrations were measured every hour and averaged over different time periods to yield a value (e.g., 24-hour average) that could be compared to EPA's health-based National Ambient Air Quality Standard.

– annual average level provided under "maximum value" column

NAAQS National Ambient Air Quality Standard

PM10	Particles with diameters of 10 microns or less
$\mu g/m^3$	micrograms per cubic meter of air

Table 7: Ambient Air Concentrations of Total Suspended Particles (TSP)*

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† ($\mu g/m^3$)	Maximum Value† ($\mu g/m^3$)	Date of Maximum Value	Comparison Value‡ (EPA NAAQS [$\mu g/m^3$])	Exceed NAAQS?
Site 7						
1971	24-hour average	26	139	2/18/71	260	No
	Annual average	–	67.46	–	75	No
1974	24-hour average	8	152	10/1/74	260	No
	Annual average	–	60.86	–	75	No
1975	24-hour average	10	185	2/4/75	260	No
	Annual average	–	63.93	–	75	No
1976	24-hour average	8	385	1/27/76	260	Yes (4 days)
	Annual average	–	84.61	–	75	Yes
1977	24-hour average	19	450	8/22/77	260	Yes (2 days)
	Annual average	–	101.47	–	75	Yes
1978	24-hour average	19	256	10/8/78	260	No
	Annual average	–	91.33	–	75	Yes
1979	24-hour average	21	210	1/14/79	260	No
	Annual average	–	78.71	–	75	Yes

* Source: Environmental Protection Agency [EPA]. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002.

† Ambient air concentrations were measured every hour and averaged over different time periods to yield a value (e.g., 24-hour average) that could be compared to EPA's health-based National Ambient Air Quality Standard.

‡ These values are a former NAAQS; EPA regulated TSP in ambient air until 1987 when EPA began regulating PM_{10}.

– annual average level provided under “maximum value” column
NAAQS National Ambient Air Quality Standard
µg/m^3 micrograms per cubic meter of air

Table 8: Ambient Air Concentrations of Sulfate (SO_4^{-2})*

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† (µg/m^3)	Maximum Value† (µg/m^3)	Date of Maximum Value
Site 7				
1974	24-hour average	3	12.2	12/21/74
	Annual average	–	7.63	–
1975	24-hour average	0.2	38	1/17/75
	Annual average	–	11.75	–
1976	24-hour average	0.4	9.7	7/7/76
	Annual average	–	1.58	–
1977	24-hour average	0.7	19.5	9/3/77
	Annual average	–	5.31	–
1978	24-hour average	8.5	25	1/5/78
	Annual average	–	16.11	–
1979	24-hour average	6.8	20.1	3/9/79
	Annual average	–	11.3	–

* Source: Environmental Protection Agency [EPA]. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002.

† Ambient air concentrations were measured every hour and averaged over different time periods to yield a value (e.g., 24-hour average).

– annual average level provided under "maximum value" column

NAAQS National Ambient Air Quality Standard

µg/m^3 micrograms per cubic meter of air

Table 9: Ambient Air Concentrations of Sulfur Dioxide (SO_2)*

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† (ppm)	Maximum Value† (ppm)	Date of Maximum Value	Comparison Value (EPA NAAQS [ppm])	Exceed NAAQS?
Site 41						
1993	24-hour average	0.001	0.020	11/25/93	0.14	No
	Annual average	–	0.008	–	0.03	No
1994	24-hour average	0.002	0.029	12/23/94	0.14	No
	Annual average	–	0.010	–	0.03	No
1995	24-hour average	0.002	0.028	1/31/95, 2/1/95	0.14	No
	Annual average	–	0.009	–	0.03	No
1996	24-hour average	0.001	0.027	1/9/96	0.14	No
	Annual average	–	0.007	–	0.03	No
1997	24-hour average	0.002	0.023	12/17/97	0.14	No
	Annual average	–	0.007	–	0.03	No
1998	24-hour average	0.002	0.022	8/28/98	0.14	No
	Annual average	–	0.008	–	0.03	No
1999	24-hour average	0.002	0.025	12/4/99	0.14	No
	Annual average	–	0.008	–	0.03	No
2000	24-hour average	0.003	0.026	11/8/00, 11/9/00	0.14	No
	Annual average	–	0.008	–	0.03	No

Table 9: Ambient Air Concentrations of Sulfur Dioxide (SO_2)*

River Terrace, Washington, DC

Year	Averaging Period	Minimum Value† (ppm)	Maximum Value† (ppm)	Date of Maximum Value	Comparison Value (EPA NAAQS [ppm])	Exceed NAAQS?
2001	24-hour average	0.001	0.031	7/16/01	0.14	No
	Annual average	–	0.008	–	0.03	No
2002	24-hour average	0.001	0.022	6/27/02	0.14	No
	Annual average	–	0.007	–	0.03	No

* Source: Environmental Protection Agency [EPA]. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) in December 2002 and July 2003.

† Ambient air concentrations were measured every hour and averaged over different time periods to yield a value (e.g., 24-hour average) that could be compared to EPA's health-based National Ambient Air Quality Standard.

– annual average level provided under "maximum value" column
NAAQS National Ambient Air Quality Standard
ppm parts per million

Table 10: Greater Metropolitan Washington, DC and River Terrace, Washington, DC

Ozone Comparisons*

Number of Days Each Year (1993–2003) with 8-hour Average Ozone Levels Above the NAAQS

	Monitoring Station	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Washington, DC Metropolitan Area	Site 17	1	0	2	0	–	–	–	–	–	–	–
	Site 25	3	8	8	4	11	18	15	5	7	13	3
	Site 43	–	4	17	7	18	20	22	2	12	21	3
River Terrace Community	Site 41	20	7	15	2	12	11	16	2	7	12	2

* Source: Environmental Protection Agency. Air quality monitoring data downloaded from the Aerometric Information Retrieval System (AIRS) on February 12, 2004. Washington, DC.

– no data or information available
NAAQS National Ambient Air Quality Standard

Table 11: Completed Exposure Pathway

River Terrace, Washington, DC

Pathway Name	Exposure Pathway Elements					
	Source	**Media**	**Point of Exposure**	**Route of Exposure**	**Exposed Population**	**Time Frame**
Air	PEPCO and other sources	Ambient (outdoor) air	River Terrace Community	Inhalation	Community members and Visitors	Past Current Future

Appendix C—ATSDR Glossary of Environmental Health Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health.

This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

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].

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

Ambient
Surrounding (for example, ambient air).

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

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.

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.

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.

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].

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.

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

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

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.

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

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.

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

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].

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.

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.

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.

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).

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 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.

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

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

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].

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.

Substance
A chemical.

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].

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.

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).

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)

Appendix D—ATSDR Methodology

ATSDR addresses the question of whether exposure to contaminants at the maximum concentrations detected would result in adverse health effects. While the relative toxicity of a chemical is important, the human body's response to a chemical exposure is determined by several additional factors. Among these factors are the following:

- the concentration (how much) of the chemical the person was exposed to
- the amount of time the person was exposed (how long)
- the way the person was exposed (through breathing, eating, drinking, or direct contact with something containing the chemical).

Lifestyle factors (for example, occupation and personal habits) have a major impact on the likelihood, magnitude, and duration of exposure. Individual characteristics such as age, sex, nutritional status, overall health, and genetic constitution affect how a human body absorbs, distributes, metabolizes, and eliminates a contaminant. A unique combination of all these factors will determine the individual's physiologic response to a chemical contaminant and any adverse health effects the individual may suffer as a result of the chemical exposure.

ATSDR evaluates contaminants detected in environmental media at a site and determines whether an exposure to them has public health significance. ATSDR begins this evaluation by gathering reports that contain relevant environmental data for the site. These data are reviewed to determine whether contaminant levels are above health-based comparison values. Health-based comparison values are estimates of the daily human exposure to a substance that are not likely to result in adverse health effects over a specified duration of exposure. These values are developed for specific media (such as air and water) and for specific durations of exposure (such as acute and chronic).

Comparison values represent conservative levels of safety and not thresholds of toxicity. Thus, although concentrations at or below a comparison value may reasonably be considered safe, concentrations above a comparison value will not necessarily be harmful. Comparison values are intentionally designed to be much lower, usually by orders of magnitude, than the corresponding no-effect levels (or lowest-effect levels) determined in laboratory studies to ensure that even the most sensitive populations (such as children or the elderly) are protected.

To determine whether people are being exposed to contaminants or whether they were exposed in the past or will be exposed in the future, ATSDR examines the path between a contaminant and a person or group of people who could be exposed. Completed exposure pathways have five required elements. ATSDR evaluates each possible pathway at a site to determine whether all five factors exist and people are being exposed, were exposed, or may be exposed in the future. These five factors or elements must exist for a person to be exposed to a contaminant:

(1) a source of contamination
(2) transport through an environmental medium
(3) a point of exposure

(4) a route of human exposure, and
(5) an exposed population.

ATSDR classifies exposure pathways in one of the following three categories.

- *Completed Exposure Pathway*. ATSDR calls a pathway "complete" if it is certain that people are exposed (or were exposed or will be exposed) to contaminated media. Completed pathways require that the five elements exist and indicate that exposure to the contaminant has occurred, is occurring, or will occur.

- *Potential Exposure Pathway*. Potential pathways are those in which at least one of the five elements is missing, but could exist. Potential pathways indicate that exposure to a contaminant could have occurred, could be occurring, or could occur in the future.

- *Eliminated Exposure Pathway*. In an eliminated exposure pathway, at least one of the five elements is missing and will never be present. From a human health perspective, pathways can be eliminated from further consideration if ATSDR is able to show that (1) an environmental medium is not contaminated or that (2) no one is exposed to contaminated media.

Please refer to Section 3 for ATSDR's evaluation of environmental and human exposure pathway data for the River Terrace community.

Appendix E—Health-Based Comparison Values for Air Pollutants

Throughout this report, ATSDR uses EPA's former and current health-based national ambient air quality standards (NAAQS) to evaluate the public health implications of measured concentrations of various airborne pollutants. EPA has established health-based standards for six different pollutants: carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), lead (Pb), particulate matter ($PM_{2.5}$, PM_{10}), and sulfur dioxide (SO2). Two key points about these standards deserve mention.

First, ATSDR and EPA have different approaches to using the health-based standards. Specifically, EPA uses statistical analyses of air monitoring data to delineate regions of the country that are not in attainment with the health-based standards. For reference, Figure 3 in Appendix A shows what EPA has currently designated as the "nonattainment area" surrounding the River Terrace community. ATSDR, on the other hand, compares the measured levels of air pollution to EPA's health-based standards as a first step in evaluating the public health implications of the levels of air pollution. Additionally, ATSDR considers the potential for human exposure to air of poor quality and, in this report, does not consider EPA's statistical criteria for attainment. Therefore, this report's findings must not be confused with EPA's evaluation of attainment for this region.

Second, although EPA has set health-based standards for various pollutants, it has also established health-based "air quality indexes" (AQI) to provide very basic information about public health and air quality. In order to address regional air quality concerns and provide sound air quality information to the public, EPA updated its Air Quality Index (AQI) in 1999 for use by state and local communities across the country (EPA 1999).

The AQI is an index for reporting daily air quality in an easy-to-understand, color-coded format. To determine the AQI level for each day, EPA evaluates the concentrations of ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide and ranks them on a scale of 0–500, with 0 indicating little or no potential to affect public health and 500 being very hazardous. The score for each day is the highest score of any of the five pollutants (EPA 2000).

In large metropolitan areas, such as Washington, DC, state and local agencies are required to report the AQI to the public daily via newspapers, television and radio broadcasts, and Web sites (EPA 2000). For the daily AQI forecast in Washington, DC, visit the Web site http://www.mwcog.org/environment/air/forecast/ or call The Metropolitan Washington Council of Government's Air Quality Hotline at (202) 962-3299.

References:

[EPA] Environmental Protection Agency. 1999. August 4 AIRNow fact sheet: revisions to the air quality index. Office of Air and Radiation, Air Quality Planning and Standards. Washington, DC. Web site located at: http://www.epa.gov/airnow/factsht.html.

[EPA] Environmental Protection Agency. 2000. AIRNow air quality index, a guide to air quality and your health. Office of Air and Radiation. Washington, DC: EPA-454/R-00-005. Web site located at: http://www.epa.gov/airnow/aqibroch/.

Appendix F—Background Information on Particulate Matter

For nearly 20 years, the Environmental Protection Agency (EPA) has closely monitored the levels of solid particles and liquid droplets or aerosols, or "particulate matter," in the air that people breathe. Many health studies have shown that the size of airborne particles is closely related to potential health effects among exposed populations. As a result, EPA and public health agencies focus on the size of airborne particles when evaluating levels of air pollution. ATSDR also classifies the emissions and air concentrations of airborne particles by their size. Particulate matter is generally classified into three categories:

Total suspended particulates (TSP) refers to a wide range of solid particles and liquid droplets found in ambient air and typically is measured as particles having aerodynamic diameters of 25 to 40 microns or less (EPA 1996). EPA's health-based National Ambient Air Quality Standards (NAAQS) regulated ambient air concentrations of TSP until 1987; they required annual average concentrations of TSP to be less than 75 micrograms per cubic meter ($\mu g/m^3$) and 24-hour average concentrations to be less than 260 $\mu g/m^3$ (EPA 1996). Many different industrial, commercial, mobile, and natural sources emit TSP to the air.

Particulate matter smaller than 10 microns (PM_{10}) refers to the subset of TSP comprised of particles smaller than 10 microns in diameter. With research showing that PM_{10} can penetrate into sensitive regions of the respiratory tract, EPA stopped regulating airborne levels of TSP in 1987, and began regulating ambient air concentrations of PM_{10}. EPA continues to regulate levels of PM_{10} today, and requires annual average concentrations to be less than 50 $\mu g/m^3$ and 24-hour average concentrations to be less than 150 $\mu g/m^3$ (EPA 1996). Typical sources of PM_{10} include, but are not limited to, windblown dust, grinding operations, and dusts generated by motor vehicles driving on roadways.

Particulate matter smaller than 2.5 microns ($PM_{2.5}$**)**, or "fine particulates," refers to the subset of TSP comprised of particles with aerodynamic diameters of 2.5 microns or less. By definition, $PM_{2.5}$ is also a subset of PM_{10}. With recent studies linking inhalation of fine particles to adverse health effects in children and other sensitive populations, EPA proposed regulating ambient air concentrations of $PM_{2.5}$ in 1997. These health-based regulations require annual average concentrations of $PM_{2.5}$ to be less than 15 $\mu g/m^3$ and 24-hour average concentrations to be less than 65 $\mu g/m^3$ (EPA 1997). Although many different sources emit $PM_{2.5}$, the pollutant is primarily emitted by combustion sources (e.g., motor vehicles, power generation, boilers and industrial furnaces, residential heating). Fine particles are also formed in the air from other pollutants.

References:

[EPA] Environmental Protection Agency. 1996. Air quality criteria for particulate matter. Office of Research and Development, National Center for Environmental Assessment. Washington, DC: EPA/600/P-95/001aF.

[EPA] Environmental Protection Agency. 1997. Fact sheet: EPA's revised particulate matter standards. Office of Air and Radiation, Office of Air Quality Planning and Standards. Washington, DC: EPA/600/P-95/001aF.

Appendix G—Public Comments

From March 25, 2004, through July 14, 2004, ATSDR released this River Terrace Community Public Health Assessment for public review and comment. At the request of community members, the comment period was extended until September 15, 2004. Each written comment received was logged and became part of the administrative record. This appendix contains both the comments received during the public comment period and ATSDR's response to those comments.

> ***Comment 1:*** *In reviewing the Foreword, in the 3rd paragraph it states that "further sampling data is needed." What sampling is required specifically?*

Response 1: The Foreword section in ATSDR's public health assessments (PHAs) serves as a preface or introductory note about the agency. The Foreword briefly describes ATSDR's origins and the PHA process. Statements contained in the Foreword do not refer to a particular site, but to the general framework of the PHA process.

Therefore, the sentence referred to in this comment was not meant to be site-specific. In general, ATSDR scientists gather available environmental data about the site under review during the first step in the PHA process. When there is not enough environmental information available for the site under review, the report will indicate what further sampling data are needed.

In Section 6, "Conclusions" of the main PHA text, ATSDR did note that environmental data for the River Terrace site are limited. Therefore, in Section 7, "Recommendations" of the main PHA text, ATSDR recommends sampling of additional pollutants in ambient (outdoor) air including volatile organic compounds (VOCs), polycyclic aromatic hydrocarbon (PAH) compounds, and metals. Section 8, "Public Health Action Plan" of the main PHA text, contains a description of actions taken and to be taken subsequent to the completion of the PHA. See Sections 6, 7, and 8 of the main PHA text for clarification.

> ***Comment 2:*** *Also within the Foreword, the 5th paragraph effectively states that ATSDR has no data on air toxics and insufficient data on health outcomes.*

Response 2: As stated in Response 1, the Foreword is meant to serve as an introductory note about ATSDR. The statements contained in the Foreword are not site-specific.

For the River Terrace site, ATSDR did gather and review air toxics data to address community concerns about airborne exposures. Although the data are limited, ambient air monitoring data are available for criteria pollutants (carbon monoxide, ozone, particulate matter, sulfate, and sulfur dioxide) from two air monitoring stations within and near River Terrace. The U.S.

Environmental Protection Agency (EPA) collected additional air data to address some of the environmental data limitations noted in the PHA (see Section 8).

For the River Terrace site, health outcome data are contained in several reports provided to the agency. However, ATSDR notes that the data are insufficient to permit an evaluation of whether the increased rates of respiratory effects present in this community are related to environmental air pollution. The District of Columbia Department of Health (DC DOH) is currently conducting a "River Terrace Community Health Assessment" to capture data on the environment and health of River Terrace residents (see Section 4.3).

> ***Comment 3:*** *In the 2nd page of the Foreword, the report mentions that as a part of the Interactive Process: "Agencies are asked to respond…" What agencies were requested to respond? What responses have been received?*

Response 3: During the first step in the PHA process, ATSDR scientists gather available background information and environmental data about the site under review from a variety of agencies. The agencies that originally provided site information to ATSDR are then requested to review the PHA report in initial form as part of the "interactive process." Because major inaccuracies in the site information and data could invalidate ATSDR's conclusions and recommendations, the purpose of this review is to ensure that ATSDR correctly reported site information in the PHA. After incorporating relevant changes in the initial PHA, ATSDR releases the PHA to the public.

For the River Terrace site, both the EPA and the DC DOH provided site information and data to ATSDR. Therefore, ATSDR requested these agencies review the initial PHA. Minor changes were made to the PHA in response to these reviews before it was released to the public on March 25, 2004. For example, some additional statements were added to the background section to describe further the general area and nearby facilities. Also, several statements in Section 4 were re-worded to help clarify the discussion. With regard to the data presented by ATSDR in Appendix B, DC DOH stated that the column reporting "Days Above NAAQS" in Table 4 was incorrect. After closer inspection of the data, ATSDR determined the differences were created because of the way each agency rounded off chemical concentrations before comparison to the standard. ATSDR decided to modify Table 4 to be consistent with how DC DOH (and EPA) round off the data concentrations. Overall, in the case of the River Terrace Community PHA, these minor modifications did not affect ATSDR's evaluation of the data or change the agency's conclusions and recommendations.

> ***Comment 4:*** *In Section 1, paragraph 6, ATSDR recommends sampling of ....additional pollutants, including VOCs, polycyclic aromatic hydrocarbons, and metals in ambient air, collection of health outcome data…" WHO is going to do this work?*

Response 4: In response to ATSDR's recommendations, several public health actions are occurring or will be occurring.

Regarding sampling of additional air pollutants, EPA has tasked Ecology and Environment, Inc. (E & E) to conduct ambient air monitoring in the River Terrace community and other areas in the vicinity of the PEPCO power plant. The purpose of this sampling is to determine ambient air conditions and assess the impact of the PEPCO plant on local air quality during periods of operation (E & E 2004). The sampling plan calls for collection of ambient air samples and analysis for total suspended particulates (TSP), metals (arsenic, antimony, barium, cadmium, cobalt, chromium, copper, lead, manganese, nickel, and selenium), VOCs, and PAHs.

In October 2004, E & E conducted the first phase of this air monitoring plan. E & E collected ambient air samples for approximately 8 hours per day over a 3-day period when the PEPCO plant was not operating to determine background ambient conditions in the local area. In June 2005, a 2-day sampling event occurred for a period when the plant was conducting power generation operations. This second sampling event was planned during a peak energy use period. These sampling events were conducted at three locations south of PEPCO in the River Terrace community and at two locations north of PEPCO.

Regarding the ATSDR health outcome data recommendation, DC DOH began a River Terrace Community Health Assessment project in July 2004 to capture data on the environment and health of River Terrace residents. Phase One of the assessment focuses on children who attend the River Terrace Elementary School. The assessment components are a health survey, medical records reviews, and environmental monitoring. The health survey is a health questionnaire that will be completed by River Terrace residents. DC DOH clinical experts will review the medical records of children who attend the River Terrace Elementary School, with the permission of their parents, looking for patterns of respiratory sensitivities. Environmental assessments focusing on air quality will be conducted in the homes of some students and at the school.

Although no changes were incorporated into Section 1 based on this comment, ATSDR did update Sections 4 and 8 of the main PHA text to include this information.

Comment 5: *In Section 2.2.2, what is the run time for this power plant facility?*

Response 5: PEPCO typically operates only during particularly high demand periods (for example, during hot spells in summer when cooling needs are the greatest). The plant typically operates at about a 3% capacity factor, meaning that only 3% of the capacity of the plant is utilized annually (EPA 2002). The plant normally operates with two 12-hour shifts and, from a cold start, is fully operational within 18 hours of notification (EPA 2002).

The number of days PEPCO operated during 1995–2002 are shown in the following table. Days of operation were most heavily concentrated during the summer months (June, July, and August), but the facility appears to operate for at least a few days per month in the fall, spring, and winter in most years as well (ERG 2004).

Number of Days in Operation*				
Year	**Boiler 15**	**Boiler 16**	**At least one boiler**	**Both boilers**
2002	55	59	66	48
2001	26	58	62	22
2000	52	58	71	39
1999	56	57	70	43
1998	46	69	73	42
1997	11	19	19	11
1996	43	55	76	22
1995	41	100	107	34

*****Source: ERG 2004.

In more recent years (2003 and 2004), plant operations have decreased. Currently, the plant will operate only between 10 and 20 days a year (ATSDR 2004).

> ***Comment 6:*** *In Section 2.2.2, what are the actual emissions and when are the emissions reported by the facility?*

Response 6: As stated in Section 1 of the main PHA text, emissions data from facilities represent contaminant concentrations in air from a source — not at the point where people are breathing. ATSDR did not review PEPCO's emissions data. Instead, ATSDR focused its evaluation on the levels of pollutants actually measured in the ambient (outdoor) air within and near the River Terrace community.

PEPCO submits many reports with regard to facility emissions. The reports submitted to DC DOH include the Annual Emission Report (Title V permit), the Monthly Compliance Report, and the Semi Annual Deviation Report (ATSDR 2004). The Annual Emissions Statement, the Annual Compliance Certification, and the Quarterly Electronic Data Report are submitted to both DC DOH and EPA (ATSDR 2004).

> ***Comment 7:*** *In Section 2.3, note that the solid waste incinerator, operated from 1985 thru 1994, could have contributed to current health problems of long term residents despite any present day evidence of emissions.*

Response 7: ATSDR agrees that past air emissions of the former solid waste incinerators potentially could have contributed to current health ailments of long-term residents. However, data specific to the former incinerators are not available. Without knowledge of the specific chemicals and their concentrations in the air, it is not possible to estimate with any confidence

the extent to which past off-site air exposures could be associated with residents' health concerns.

> ***Comment 8:*** *In Section 2.6.8, ATSDR points out the information data gap because of the absence of ambient air quality data on many pollutants (particularly air toxics). However, ATSDR suggests no remedy for collecting this missing data.*

Response 8: The purpose of Section 2.6.8, "Data Limitations," is only to identify the information not available to ATSDR that the agency considers critical to an evaluation of the River Terrace community. Suggestions for remedying the identified data limitations are presented later in the PHA in Section 7, "Recommendations."

ATSDR does state with regard to air toxics that (1) chemical-specific air data are not available for certain years, and (2) the suite of chemicals analyzed for in air samples is limited. Data gaps identified in past sampling efforts cannot be remedied. However, ATSDR is collaborating with EPA to address current issues. EPA collected air samples and analyzed them for a variety of chemicals. ATSDR will evaluate these data for public health significance in a health consultation (see Section 8).

> ***Comment 9:*** *In Section 2.6.8, as for historical data from the incinerator, what efforts were undertaken to find records of SWRC emissions?*

Response 9: Several branches within the EPA and DC DOH were contacted to gather information about the former SWRC. For the SWRC incinerators, useful information from 1982 states that the incinerators were already in bad shape (e.g., corroding, opacity violations, and particulate violations) (ERG 2003). At that time, SWRC was listed as the "largest potential particulate emitter in Washington, DC."

Emissions data were not readily available from the sources ATSDR contacted. However, even if ATSDR was able to find records of past chemical-specific SWRC emissions, these data would be of questionable use in the PHA. As stated in Section 1 of the PHA, emissions data from facilities represent chemical concentrations in air from a source — not at the point where people are breathing. ATSDR focused its evaluation on the levels of pollutants that were actually measured in the ambient air within and near the River Terrace community where people are breathing.

> ***Comment 10:*** *In Section 4.1, the community health assessment as stated in the report was not spearheaded by the Sierra Club. It was community driven, initiated by a local resident and implemented by members of the River Terrace Community Organization.*

Response 10: ATSDR apologizes for incorrectly describing the report in the draft PHA. ATSDR modified Section 4.1 to state: "This survey was a community effort, initiated by a local resident and implemented by members of the River Terrace Community Organization with assistance from the Sierra Club's Environmental Justice Program."

Comment 11: *When you presented your findings at our public meetings in July, the community was disappointed about the recommendations that will soon become a part of the final report. The River Terrace Community waited two years for the result of the study. We believe that the study does not adequately address the health issues that the community is facing.*

Response 11: Some of the health issues facing this community, such as ready access to health care, are outside the purview ATSDR's PHA activities. ATSDR is nonetheless committed to involving a variety of government and non-government entities to help address the health issues of the River Terrace community. ATSDR sincerely hopes that the dialogue and contacts provided to the community during the July 2004 public information sessions at least begin to address the issues ATSDR is unable to undertake though our PHA process. ATSDR plans to continue working with the River Terrace community and fostering partnerships with other entities to address health issues. As requested by the community in July 2004, ATSDR expanded Section 8, Public Health Action Plan, to clarify the specific actions that have occurred, are occurring, and will occur with regard to the River Terrace site.

Comment 12: *In Section 8 of the draft PHA, under Planned Actions #1, your report states "EPA will conduct air sampling at PEPCO, in consultation with ASTDR, as part of EPA's Superfund investigations of the facility during fiscal year 2004."*

- *When was testing done in fiscal year 2004 by EPA?*
- *What were results of that testing?*
- *To whom did EPA forward the results?*

Response 12: As stated in Response 4, phase one ambient air sampling was conducted in October 2004 for approximately 8 hours per day over a 3-day period. It was done when the PEPCO plant was not operating to determine background ambient conditions in the local area. In June 2005, the phase two ambient air sampling event occurred for a period when the plant was conducting power generation operations. EPA is forwarding the results of the two phases of ambient air sampling to ATSDR. ATSDR will prepare a health consultation containing its public health evaluation of both phases of ambient air sampling data. Of note, Section 8 was expanded to include detailed descriptions of actions taken and to be taken by ATSDR, DC DOH, and EPA.

Comment 13: *In Section 8 of the draft PHA, under Planned Actions #1, your report states "EPA will conduct air sampling at PEPCO in consultation with ASTDR…"For*

this air sampling effort, can an additional monitor be placed closer to Kenilworth Ave (in order to compare it to the monitors in River Terrace)?

Response 13: ATSDR forwarded this request to EPA for consideration. During the ambient air sampling effort, one air monitor was placed closer to Kenilworth Avenue. This monitor was adjacent to the Thomas Elementary School which is located north of PEPCO.

Comment 14: *In Section 8 of the draft PHA, under Planned Actions #3, your report states "DC DOH will determine the feasibility of including the River Terrace community in future health tracking programs, such as Asthma Control Program and Trust for America's Health." This coincides with the recommendations made in Section 4.3 pertaining to the Asthma Control Program where the report states "DC DOH plans to consider the River Terrace Community for possible follow up if funding becomes available." It is now 2004. Has the River Terrace community been included in any of these health tracking programs? If so, which ones? For how long? What have been the results so far?*

Response 14: In response to this comment, ATSDR updated Section 4.3. Further, Section 8 was expanded to include detailed descriptions of actions taken and to be taken by ATSDR, DC DOH, and EPA. The following information has been added:

In 2001, the District of Columbia was one of 22 states awarded a grant from Centers for Disease Control and Prevention (CDC) to develop an infrastructure addressing the burden of asthma. The District of Columbia Department of Health Maternal and Family Health Administration spearhead its **DC CAN C**ontrol **A**sthma **N**ow Project. The River Terrace community has been included in the DC DOH asthma tracking program in a traditional sense; that is, monitoring the asthma outcomes throughout the District of Columbia. The asthma program is in the process of developing an electronic surveillance system, which would track various asthma outcomes such as asthma prevalence, incidence and mortality.

The DC DOH Asthma program is collaborating with the American Lung Association to target key personnel (e.g., parents, teachers and school nurses) in River Terrace for enhanced health education.

The DC Environmental Public Health Tracking Program (EPHT) is in the planning phase. It does not have the resources to track asthma in the District. The EPHT Program is nonetheless working closely with the Asthma Control Now Program to assist with the development of its surveillance system where appropriate.

Regarding the Trust for America's Health grant, DC DOH was awarded trust funds in 2002 for only 1 year. DC DOH did not receive an award during the 2003 grant cycle.

Comment 15: *In Section 8 of the draft PHA, under Planned Actions #4, your report states "ASTDR will work in cooperation with other stakeholders to promote community*

awareness about air pollution." What does this mean specifically? The River Terrace Community is affected by air pollution due to heavy volume of automobile traffic. The community is bordered by two major thoroughfares, Benning Road and Interstate 295. How much more "awareness" is needed? What the community needs are solutions to the problems that are affecting us from outside sources. We suggest that ATSDR recommend that the city develop public information campaigns on automobile traffic reduction in at risk health areas.

Response 15: ATSDR agrees public information campaigns on automobile traffic reduction in areas such as River Terrace would be beneficial. Environmental health education is available for River Terrace residents through various local groups and agencies. Although ATSDR would not be the lead agency in the development of such campaigns, the agency can provide some support to these local entities. ATSDR contacted the DC DOH and the Metropolitan Washington Council of Governments to discuss public information campaigns on air pollution in high risk areas of DC including River Terrace. The Clean Air Partners also offer numerous resources to citizens concerned about air quality. ATSDR is developing an 'Environmental Health Resource Directory' which will provide program and contact information for residents desiring additional knowledge about environmental and public health issues within their community.

As mentioned in Response 11, ATSDR is working in cooperation with various other government and non-government entities to address the health issues of the River Terrace community. For example, during our July 2004 public information sessions, we invited other groups interested in this community to participate and provide materials to the community. These participants included representatives from the River Terrace Community Organization, American Cancer Society, DC DOH, George Washington University Medical Center, Metropolitan Washington Council of Governments/Clean Air Partners, Mid-Atlantic Center for Children's Health and the Environment, and Sierra Club. These participants provided information on a wide variety of health topics such as asthma and cancer. In addition, the African American Environmentalist Association provided its report on environmental justice for the information sessions. ATSDR will continue to foster relationships and develop partnerships between government and non-government entities to promote interaction and dissemination of health information.

Comment 16: *In Section 8 of the draft PHA, "Ongoing Actions" and "Planned Actions" fail to address how they will remedy the data gaps (in pollutant data and health outcomes) that the report asserts in finding an "Indeterminate Public Health Hazard". This means that ATSDR will not be able to reach a conclusion in the future because the same data gaps will exist unless ATSDR or someone else undertakes the necessary air monitoring and health survey work needed to fill the "data gaps".*

Response 16: ATSDR agrees that some of the data limitations identified in the information evaluated in this PHA will continue. For example, data gaps identified in past sampling efforts cannot be remedied. ATSDR is, however, collaborating with EPA and DC DOH to address current data gaps. EPA collected air samples and analyzed them for a variety of chemicals. ATSDR will evaluate these data for public health significance in a health consultation. With

regard to health outcome data gaps, ATSDR is working with DC DOH to address community concerns regarding the rates of respiratory diseases in River Terrace. These efforts will begin to address the data gaps ATSDR identified in this PHA. Of note, Section 8 was expanded to include detailed descriptions of actions taken and to be taken by ATSDR, DC DOH, and EPA.

> ***Comment 17:*** *As of to date, representatives from the community and DC DOH have met to design a new community health assessment. We are concerned about the survey instrument, however, we look forward to reviewing those results and comparing them to the previous survey.*

Response 17: Thank-you for sharing your thoughts on the DC DOH survey.

References:

[ATSDR] Agency for Toxic Substances and Disease Registry. 2004. October 4 e-mail sent by Gayl Solomon, ATSDR, to Danielle Langmann, ATSDR, containing PEPCO's responses to a list of questions ATSDR submitted about the power plant. Philadelphia, Pennsylvania: ATSDR Region 3.

[E & E] Ecology and Environment, Inc. 2004. Air sampling and monitoring plan, PEPCO Benning Road site, River Terrace community, Washington, District of Columbia. Cross Lanes, West Virginia: TDD: SW3-02-10-0010. Contract No: 68-S3-00-01.

[EPA] Environmental Protection Agency. 2002. November 21 Inspection report of Potomac Electric Power Company (PEPCO) Benning Road Peaking Station in Washington, DC. Philadelphia, Pennsylvania: EPA Region 3.

[ERG] Eastern Research Group. 2003. July 16 e-mail sent by Danielle Sass, ERG, to Danielle Langmann, ATSDR, regarding information gathered about PEPCO and the former SWRC incinerators. Lexington, Massachusetts.

[ERG] Eastern Research Group. 2004. August 24 e-mail sent by Naida Gavrelis, ERG, to Danielle Langmann, ATSDR, regarding information gathered about PEPCO. Lexington, Massachusetts.