LOWER MANHATTAN TEST AND CLEAN PROGRAM

Final Report

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Acronyms and Abbreviations

A	area of the site
ATSDR	Agency for Toxic Substances and Disease Registry
f/cc	fibers/cubic centimeter
COPC	contaminants of potential concern
DOF	Department of Finance
EPIC	Environmental Photographic Interpretation Center
FEMA	Federal Emergency Management Agency
HEPA	high efficiency particulate air
HPD	Housing Preservation and Development Department
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilation and air conditioning
MMVF	man made vitreous fiber
NYCDEP	New York City Department of Environmental Protection
NYCDOF	New York City Department of Finance
NSLAH	National Survey of Lead and Allergens in Housing
N	total number of events
ng/m^2	nanograms per square meter
PAH	polycyclic aromatic hydrocarbon
PCMe	phase contrast microscopy equivalent
TEM	transmission electron microscopy
TEQ	toxicity equivalent quotient
UCL	upper confidence limit
µg/ft^2	micrograms per square foot
µg/m^2	micrograms per square meter
USGS	United States Geological Survey
WTC	World Trade Center

Executive Summary

Introduction and Background

This report summarizes the results of the Lower Manhattan Test and Clean Program, a voluntary program, offered to residents and building owners concerned about potential residual contamination in buildings impacted by the collapse of the World Trade Center (WTC) towers. At the end of the World Trade Center Expert Technical Review Panel process, EPA concluded that in the absence of a unique marker for WTC dust, the agency would be unable to detect a remaining pattern of contamination due to the collapse of the WTC. The widespread routine cleaning of indoor spaces and the fact that contaminants are found in every urban environment further confound any attempt to attribute contamination to the WTC collapse. The Test and Clean Program allowed residents and building owners to have the air and dust in their units tested for four contaminants associated with dust from the collapse of the World Trade Center, thus addressing concerns about the possibility of residual contamination in sampled areas. Therefore, the Lower Manhattan Test and Clean Program was not a random sampling program designed to allow EPA to make inferences about the lower Manhattan area.

Overview of the Program

The voluntary Lower Manhattan Test and Clean Program covered the same area below Canal Street and west of Allen and Pike Streets that was targeted in EPA Region 2's 2002-2003 Indoor Air Residential Assistance Program. This program entirely encompasssed the geographic area where visible contamination with WTC dust was confirmed by EPA's Environmental Photographic Interpretation Center (EPIC). (Figure 1).

Registration for the program occurred in January, February and March 2007. Two hundred seventy-three individual residents and a total of twenty-five residential and commercial buildings registered to participate. EPA offered a cleanup if a benchmark for any of the contaminants of potential concern was exceeded in any unit or building common area. EPA conducted surveys to determine whether exceedances were attributable to sources within or adjacent to the place of business or residence. EPA implemented this program utilizing FEMA Stafford Act funding. Sample results from this program were only designed to provide information about the levels of contaminants within the apartments or building common areas sampled.

Program Results

One hundred and eighty-three (183) residential apartments and the common areas in 21 residential or commercial buildings were sampled. Some of the apartments and buildings that were registered were not sampled because the owner or manager either decided not to participate or did not make or keep sampling appointments. Most of the samples had no detectable levels of contamination, with the exception of lead in dust and total fibers in air. Eleven thousand one hundred and ninety-nine (11,199) air and dust samples were collected. Twenty-three (23) samples in 17 residential properties and 161 samples in the common areas of 16 buildings exceeded the benchmarks established for this program. Only lead in dust had a significant number of exceedances. One hundred and seventy-four (174) of the exceedances were lead in dust, and the majority of these were associated with sources within the apartment or building. Ten (10) of the exceedances were asbestos (two in air and eight in dust). Four of the asbestos in dust exceedances were associated with existing sources within buildings. The remaining six exceedances (4 in dust – 2 in the basement air of a building) were not associated with existing sources within the buildings. A summary of the results is provided in Section 3 Table 3-1.

A descriptive statistical analysis of the dust samples that contained lead was conducted. The descriptive statistical analyses describe the participating apartments and building common areas. Valid statistical inferences may not be made to any larger population of buildings because the participants are a self-selected group. When appropriate, comparisons were made with data from the National Survey of Lead and Allergens (NSLAH) conducted by the U.S. Department of Housing and Urban Development. EPA did not conduct a statistical analysis for dust samples with asbestos or the other substances because there were insufficient numbers of samples with detectable levels of asbestos (1% for both air and dust), MMVF (2% in dust) and PAH-TEQs (0% in dust).

Some of the buildings and apartments participating in the Test and Clean Program had been either cleaned and tested or only tested in both the Indoor Air Residential Assistance and the Lower Manhattan Test and Clean programs. A summary of the results from both programs is provided in Section 3. The results are provided for information only because the number of apartments and buildings involved is too small to draw definitive inferences.

Section 1 Introduction

This report documents the final phase of the EPA response to the events of September 11, 2001. The Lower Manhattan Test and Clean Program offered participants a way to get information about potential residual contaminants from the collapse of the WTC present in their homes and buildings.

Summary of Previous Sampling and Response Activities

EPA and many other agencies collected and analyzed environmental samples after the September 11, 2001 attack on the WTC. Remote monitoring data was collected and analyzed by the United States Geological Survey (USGS, 2001), the Aerospace Corporation (2002), and EPA's Environmental Photographic and Interpretation Center (US EPA, December 2005). The New York City Department of Environmental Protection (NYCDEP) conducted a building-by-building survey of the lower Manhattan buildings to determine the extent of external dust and debris contamination resulting from the collapse of the towers. The plume of dust from the collapse of the towers and subsequent fires were modeled by EPA (Gilliam, et al., 2005, Huber, et al., 2004).

It is clear from these and other data, that the plumes from the collapse of the WTC and subsequent fires impacted the New York City metro area. The most heavily impacted area was approximately bounded on the north by Chambers Street and the Brooklyn Bridge approaches (Figure 1-1). This area was entirely contained within the area that was the subject of EPA Region 2's 2002-2003 Clean and Test Indoor Air Residential Assistance Program.

Shortly after the 9/11 attack, concerns were raised about the impact of the attack on the indoor environment. The Ground Zero Task Force commissioned a survey of two residential buildings (Chatfield & Kominsky, 2001). The buildings sampled were 45 Warren Street, four blocks north of Ground Zero (undamaged); and 250 South End Avenue, one block southwest of Ground Zero (damaged). The Warren Street building was considered to have been exposed to lower concentrations of dust than that at South End Avenue. The purpose of the survey was to assess the levels of polychlorinated biphenyls (PCBs), dioxins, furans, metals, and asbestos inside the buildings. Sampling was conducted on September 18, 2001. The report concluded that concentrations of PCBs, dioxins, furans, and metals (excluding calcium) were generally low or below comparative background levels at both locations. Concentrations of asbestos found in dust samples and in the air inside the apartments were significantly elevated, and all of the indoor samples collected in the South End Avenue building exceeded ~0.05 S/cc PCMe.

From November 4 through December 11, 2001, the New York City Department of Health and Mental Hygiene (NYCDOHMH) and the Agency for Toxic Substances and Disease Registry (ATSDR) collected environmental samples in and around 30 residential buildings in lower Manhattan, and comparison samples

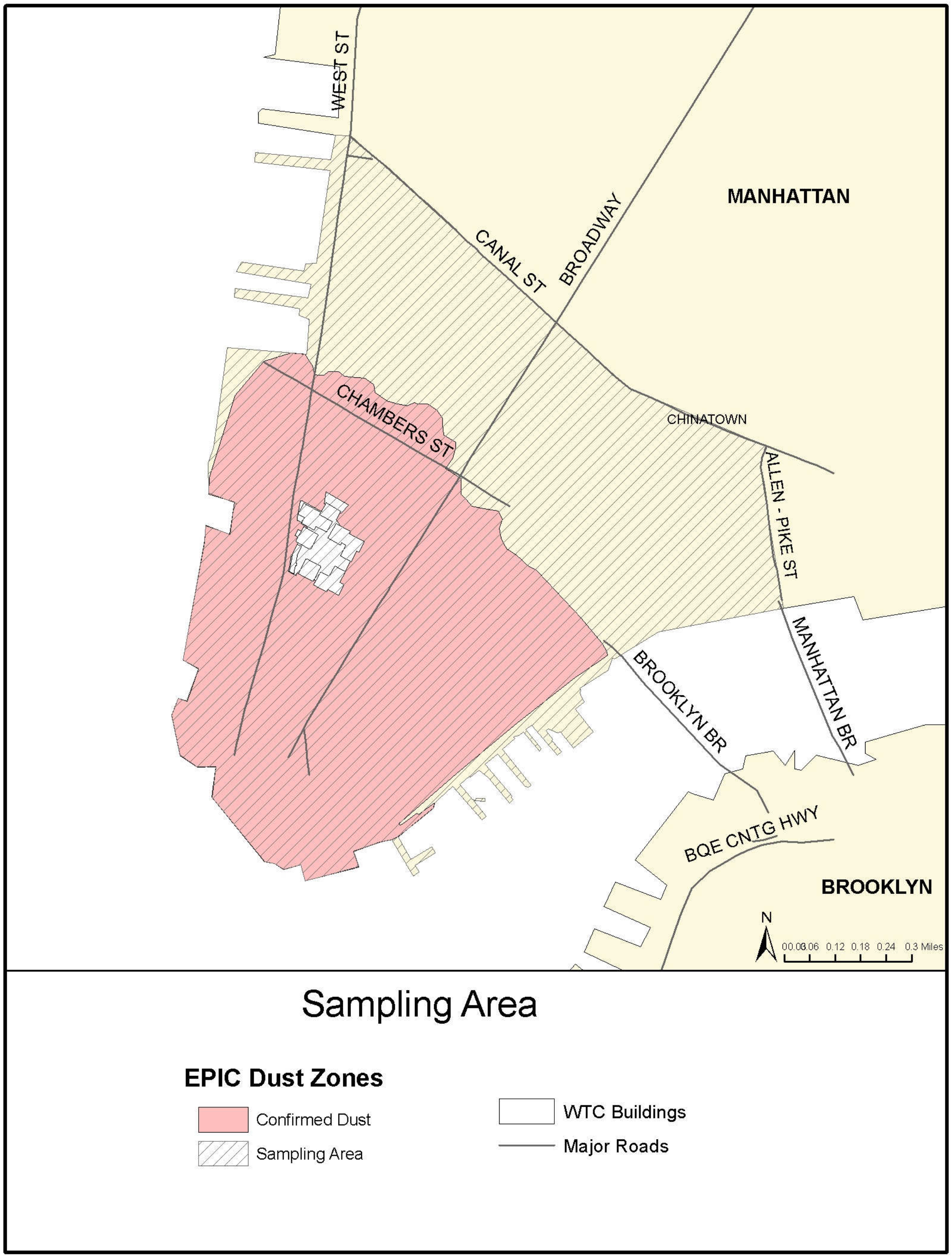

Figure 1-1 Sampling Area and EPIC Confirmed Dust Zone

in four buildings above 59th Street (NYCDOHMH/ATSDR, 2002). The samples collected were analyzed for asbestos, synthetic vitreous fibers, mineral components of concrete (crystalline silica, calcite, and portlandite), and mineral components of building wallboard (gypsum, mica, and halite). Their 2002 report concluded that higher levels of asbestos, synthetic vitreous fibers (e.g., fiberglass), mineral components of concrete, and mineral components of building wallboard were found in settled surface dust in lower Manhattan residential areas when compared with comparison residential areas above 59th Street. NYCDOHMH and ATSDR recommended:

1) Frequent cleaning with high efficiency particulate air (HEPA) vacuums and damp cloths/mops to reduce the potential for exposure;
2) Additional monitoring of residential areas in lower Manhattan;
3) An investigation to better define background levels specific to New York City for asbestos, synthetic vitreous fibers, mineral components of concrete, and mineral components of building wallboard; and,
4) Residents in lower Manhattan who were concerned about potential WTC-related dust in their residences participate in EPA Region 2's Indoor Air Residential Assistance Program.

In February 2002, a multi-agency task force headed by EPA was formed to evaluate indoor environments for the presence of contaminants that might pose long-term health risks to residents. As part of this evaluation, a task force subcommittee was established to identify contaminants of potential concern (COPC) that were likely to be associated with the WTC disaster and to establish health-based benchmarks for those contaminants during the planned (2002-2003) Indoor Residential Assistance Program in lower Manhattan. A systematic risk-based approach was used to select COPC. The goal was to identify those contaminants likely to be present within indoor environments at levels of health concern. The following chemicals were identified as COPC: dioxins, polycyclic aromatic hydrocarbons (PAH), lead, asbestos, fibrous glass, and crystalline silica.

Risk-based benchmarks for these COPC were developed to be protective of long-term habitability of residential dwellings and were submitted for peer review (US EPA, 2003a).

EPA also conducted a cleaning study to evaluate the performance of the cleaning methods recommended in the NYCDOHMH and ATSDR report to ensure that the health-based benchmarks could be achieved by using them (US EPA, 2003c). EPA concluded the following:

1) Observation of apparently WTC dust at that time was a good indicator that WTC contaminants were present, and the amount of such dust correlated with the level of contamination;

2) Concentrations of some contaminants in the WTC dust were elevated above health-based benchmarks;

3) Use of a standard cleaning method of vacuuming and wet wiping significantly reduced levels of WTC-related contamination with each cleaning event and was successful in reducing concentrations to levels below health-based benchmarks (in some cases, 2 or 3 cleanings were necessary);

4) Asbestos in air is a good indicator of whether additional cleaning is needed; and

5) Standard HVAC cleaning methods reduced the concentrations of WTC contaminants in HVAC systems.

Concurrently, EPA also conducted a "Background Study" to determine levels of selected contaminants in fourteen residential buildings (north of 77th Street in Manhattan) not directly impacted by the airborne dust plume that emanated from the WTC site (US EPA, 2003b). EPA sampled 25 residential units and nine common areas within the 14 buildings. The contaminants studied included: asbestos, lead, dioxins, polycyclic aromatic hydrocarbons (PAH), fibrous glass, crystalline silica, calcite, gypsum, and portlandite. The data collected from this study provided estimates of background concentrations for compounds that were identified as COPC related to the WTC collapse. The estimates were shown to be consistent with other background studies and historical data, where such comparison data were available.

Beginning in 2002, residents of lower Manhattan, who lived below Canal Street, were provided a choice of services. Residents could choose to have their residences professionally cleaned, followed by confirmatory testing, or they could choose to have their homes tested. Owners and managers of residential buildings and boards of cooperatives and condominiums could also have their building's common areas cleaned and/or tested and the HVAC system evaluated and cleaned, as necessary. The common areas cleaned and/or tested included areas such as the building lobby, hallways, stairways, and elevator interiors. Certain other common areas, including laundry rooms, utility rooms, compactor rooms and elevator shafts, were cleaned and/or tested as needed.

Between September 2002 and May 2003, residences were cleaned using standard cleanup methods: using HEPA-filtered vacuums and wet wiping all horizontal hard surfaces (i.e., floors, ceilings, ledges, trims, furnishings, appliances, equipment, etc.). Vertical and soft surfaces were HEPA vacuumed twice. Depending upon the size of the residence, from three to five air samples were collected and analyzed for asbestos by using transmission electron microscopy (TEM) and phase contrast microscopy (PCM). In a subset of the residences, pre and post-cleanup dust wipe samples were collected (e.g., from floors, walls, and furniture) and analyzed for dioxin, mercury, lead, and 21 other metals. A total of 4,167 apartments in 454 buildings and 793 common areas in 144 buildings were sampled for asbestos in air. A total of 28,702 valid sample results were analyzed; 22,497 from residential units, and 6,205 from common areas within residential buildings (e.g., hallways, laundry rooms).

The number of asbestos samples that exceeded the health-based benchmarks for airborne asbestos was very small, about 0.4% of the samples analyzed for asbestos. In those residences and common spaces where the benchmark was exceeded, the cleanup program was successful in achieving the health-based benchmark for asbestos after the first cleaning approximately 99% of the time. Re-cleaning was offered when benchmarks were exceeded. An analysis of the location of asbestos exceedances did not demonstrate a spatial pattern of exceedances relative to WTC proximity. Apparent groups of asbestos exceedances could be explained by the location in the sampled buildings and the variability in the number of samples that were collected from each building. When EPA compared the frequency of detection from samples collected in the cleanup program with the frequency of detection for samples collected in the background study, we found that they were similar. There was a detection rate of 2% in lower Manhattan and 5% in upper Manhattan. The minimum concentrations from both areas were identical, while the maximum detected concentration in lower Manhattan was higher than the maximum detected concentration in upper Manhattan. Although the maximum detected concentrations were not similar between the two areas, the percentage of samples that exceeded the health-based criteria was similar, with 0.5% in lower Manhattan and 0.0% (no exceedances) in upper Manhattan. The mean values appear to be indistinguishable from background values.

Wipe samples were collected from 263 apartments in 156 buildings. Approximately 14% of the pre-cleanup samples exceeded the 25 $\mu g/ft^2$ U.S. Department of Housing and Urban Development screening level for lead. There were very few exceedances of the health-based screening values measured for any of the other 22 metals. The 627 $\mu g/m^2$ screening value for antimony was exceeded in two pre-cleanup samples (0.1% of all samples); the maximum measured value was 1,180 $\mu g/m^2$. The 157 $\mu g/m^2$ screening value for mercury was exceeded in five pre-cleanup samples (0.4% of all samples). Only eight of the 1,535 (approximately 0.5%) of the combined samples (i.e., test only, and clean and test) exceeded the health-based benchmark for residential dust dioxin loading of 2 ng/m^2. The percentage of apartments that exceeded the lead health-based benchmark was greater than the percentages of apartments that had exceedances for other metals, mercury and dioxin. The frequency of detection, the maximum detected concentration, and the percentage of samples that exceeded the risk-based criteria were higher in the dust cleanup program in lower Manhattan when compared with the results from the background study in upper Manhattan. The clearest relationship found was between lead concentrations and age of building, suggesting lead based paint as a cause for high lead measurements in lower Manhattan. Proximity to the WTC and floor of the building seemed to be, at best, weakly related to measured levels of lead. The level in lower Manhattan was consistent, however, with data from HUD on mixed age housing stock in the northeast United States.

World Trade Center Expert Technical Review Panel

In March 2004, EPA convened an expert technical review panel to provide individual guidance and assistance to the Agency in its use of available exposure and health surveillance databases and registries to characterize any remaining exposures and risks, identify unmet public health needs, and individually recommend steps to further minimize the risks associated with the aftermath of the WTC attack.

The WTC Expert Technical Review Panel (WTC Panel) members met periodically in open meetings to interact with EPA and the public about plans to monitor for the presence of WTC dust in indoor environments and to individually suggest additional measures that could be undertaken by EPA and others to evaluate the dispersion of the plume and the geographic extent of environmental impact from the collapse of the WTC towers.

The WTC Panel members were charged, in part, with reviewing data from post-cleaning verification sampling to be done by EPA in the residential areas included in EPA Region 2's 2002-2003 Indoor Air Residential Assistance Program to verify that recontamination had not occurred from central heating and air conditioning systems. With the assistance of Westat, a contractor in the field of statistics, EPA developed a sampling plan to evaluate whether apartments previously cleaned in the Assistance Program had become recontaminated. The plan proposed by EPA was debated by the individual panel members, and most panel members thought that an alternate study to test for “contamination” rather than "recontamination" should be conducted.

The WTC Panel members also were charged with assessing the use of asbestos as a surrogate in determining risk for other contaminants. Using a peer review contract, EPA solicited comment from other external experts on this issue, and these experts provided a report that was shared with the WTC Panel members. These external experts generally supported the use of asbestos as a surrogate, but they encouraged the concurrent testing for lead. Some individual members of the WTC Panel, however, did not believe that asbestos was an appropriate surrogate in determining risk for other contaminants.

Other areas not specified in the WTC Panel members’ charge were also addressed by individual panel members as part of the discussions relating to assessing WTC-related contamination. These discussions led EPA to the concept that a WTC signature exists in dust. Sampling to determine the presence of the WTC signature, as well as the levels of contaminants of potential concern (COPC), would serve as the basis for determining the extent of WTC collapse contamination in indoor environments. The premise was that a signature could be developed for both the dust generated by the collapse and particulate matter generated by the fires which burned into December of 2001. Unfortunately, EPA was not able to establish with certainty a WTC signature. EPA prepared a Final Report on the World Trade Center Dust Screening Method Study, which summarized efforts to investigate the validity of the collapse plume signature concept, was prepared by EPA and submitted for peer review. A peer review of this document concluded that, "EPA has not made the case that its proposed analytical method can reliably discriminate background dust from dust contaminated with WTC residue," and that "[t]he proposed method has not demonstrated the utility of slag wool as a successful signature constituent." In consideration of these comments EPA announced in November 2005 its plan to move forward with a sampling plan that did not depend on a signature. Subsequent to the December 13, 2005 WTC Panel meeting, EPA further evaluated both the peer review and panel comments. EPA also conducted additional work to assist in answering questions that arose while considering the comments and discussed this work with panel members Paul Lioy, Morton Lippmann, and Gregory Meeker. A response to the peer review comments, summaries of the additional work performed by EPA, and an expanded statistical analysis of the study's data have since been completed. The overall variability observed in the inter-lab data and the demonstrated possibility of observing high levels of slag wool at sites not affected by the WTC collapse raise significant questions concerning the ability to use slag wool measurements generated with the current method as a tool for screening a sampled location for the presence of WTC related contamination.

Lower Manhattan Test and Clean Program

At the end of the WTC Panel process EPA concluded that in the absence of a unique marker for WTC dust, the agency would be unable to detect a remaining pattern of contamination due to the collapse of the WTC. The widespread cleaning of indoor environments, many known to have been impacted by WTC dust, and the sources of contamination in the urban environment further confound any attempt to attribute contamination to the WTC collapse. The Test and Clean Program, offered in the absence of a marker for WTC dust, covered the areas south of Canal Street and west of Allen and Pike Streets, allowed residents and building owners to have the air and dust in their units tested for four contaminants that remained of concern and are associated with dust from the collapse of the World Trade Center. Where analysis of dust and air samples found elevated levels of any of four contaminants of concern – asbestos, man-made vitreous fibers such as fiberglass, lead, and polycyclic aromatic hydrocarbons – the services of a professional cleaning service were offered. The Agency opened a registration period in January 2007, began testing of interior spaces in June 2007, completed testing in June 2008, and completed cleaning in September 2008.

Section 2 Program Description

Eligibility

Individuals who owned or rented their apartments and the owners, boards of cooperatives or condominiums and managers of residential or commercial buildings located in Manhattan south of Canal Street and west of Allen and Pike Streets were eligible to register. Buildings that were not cleaned after the collapse of the WTC, were currently uninhabited, and slated for demolition; and buildings constructed or reconstructed after May 2002 (when the cleanup effort at the WTC site was completed) were not eligible.

The registration period for the Test and Clean Program opened on January 16, 2007, and closed March 30, 2007. Registrants had to return an access agreement by April 30, 2007.

Public outreach to the community eligible for the program was extensive. Seven newspapers in Lower Manhattan circulated 584,000 copies of the advertisement for the Lower Manhattan Test and Clean program, and 8,000 flyers were distributed door-to-door for Lower Manhattan residents and buildings. The EPA attended community board meetings to answer questions about the Lower Manhattan Test and Clean program and met with residents in various large apartment buildings in the area. EPA implemented this effort utilizing FEMA funding that had been earmarked for this program. In total, 25 whole buildings and 273 residential units registered and were eligible for the program. The program began in June 2007 and was complete with the last cleaning occurring in September 2008.

All buildings and units tested had a number of characteristics recorded to allow examination of potential relationships between results and the characteristics of the units and common areas sampled. Building and unit characteristics that may be relevant are described below. A “unit” generally denotes a reasonably well defined section of a floor that will be different for each building and building type. For example, a unit within a building could be an apartment or a common area such as a corridor leading to multiple apartments or offices.

Two sets of dust samples were taken within each unit: (1) three or more samples at locations where dust-related exposures are likely to occur, such as on elevated horizontal surfaces (e.g., desk or table tops) and floors; and (2) three or more samples at locations where WTC dust may have accumulated but would not have frequently been cleaned, such as on top of cabinets. The first sets of samples are termed “accessible” samples, and the second sets are “infrequently accessed” samples. Samples from these two types of locations were taken by wipes and microvacs. These samples yielded results in load (weight or fibers per unit area) and were compared with the benchmarks described in the COPC section, Table 1.

Wipe samples were analyzed for the COPC lead and polycyclic aromatic hydrocarbons (PAH), and microvac samples were analyzed for the COPC asbestos and man-made vitreous fibers (MMVF). Wipe and microvac samples were taken in proximate locations so that for each location sampled within a unit, there were measurements of the four COPC. Indoor air samples were also collected in units and common areas at locations proximate to the locations where accessible dust samples were collected. Indoor air samples were analyzed for asbestos and for the presence of MMVF.

The analytical results from both the air samples and the dust samples were used to determine whether or not a cleaning was offered to the occupant or owner of the unit being tested. Details on the criteria used to make these decisions are described in the section entitled “Decision Criteria for Activities Following Sampling.”

Specific building and space characteristics were gathered from the occupants of residences and building representatives in order to aid in understanding the results. The information gathered is listed in Attachment 1.

Source attribution was a critical factor in determining whether to retest after cleaning. For example, if lead exceedances triggered a cleanup, a source survey was conducted. Where it was found that a potential source of the exceedance was within the building or adjacent to the building, no further cleaning or re-sampling to demonstrate clearance was offered.

Contaminants of Potential Concern (COPC)

The COPC measured in this program were asbestos, MMVF, PAH and lead. Dust samples were obtained from both accessible (e.g., floors) and infrequently accessed (e.g., behind a bookshelf) areas. EPA’s preferred approach to establishing cleanup benchmarks is risk-based. PAH and lead are both toxic via ingestion. Risk-based benchmarks for lead and PAH in settled dust (accessible areas) were developed because the primary route of exposure for these two contaminants in the indoor environment is incidental ingestion associated with direct contact with settled dust. The risk-based benchmarks for PAH and lead in settled dust for accessible areas are listed in Table 2-1.

Infrequently accessed areas were sampled to investigate the presence of contaminant reservoirs, or places where dust can accumulate and stay over long periods of time. The potential for direct exposure from infrequently accessed areas is low; thus benchmarks for these areas are not specifically risk-based. Rather, contaminant reservoirs pose the potential to contaminate accessible areas. Accordingly, the benchmarks for infrequently accessed areas were developed to minimize this potential. The infrequently accessed area benchmarks for the four COPC are also listed in Table 2-1.

Asbestos and MMVF toxicity occurs primarily from inhalation exposure. Therefore, the risk from asbestos and MMVF exposure is best determined by measuring concentrations in air. The risk-based benchmarks for asbestos and MMVF in indoor air are listed in Table 2-1. Contaminant values are considered "exceedances" if they are greater than the respective benchmark, but not if they are equal to the benchmark.

Table 2-1 Cleanup Benchmarks

Contaminant	Dust Benchmark (accessible)	Dust Benchmark (infrequently accessed)	Air Benchmark
Asbestos	5,000 s/cm^2	50,000 s/cm^2	.0009 s/cc
Man-Made Vitreous Fibers	5,000 f/cm^2	50,000 f/cm^2	.01 f/cc
Lead	40 μg/ft^2	400 μg/ft^2	NA
PAH	150 μg/m^2	1,500 μg/m^2	NA

NA = Not Applicable

Asbestos is made up of long, thin fibers and structures that are strong and heat-resistant. It has been used in thousands of products (such as building materials and heat-resistant fabrics). Inhaled asbestos is associated with three major diseases: asbestosis, lung cancer, and mesothelioma.

The risk-based clearance level for asbestos is 0.0009 structures per cubic centimeter (s/cc) in air. The level of risk associated with this benchmark is very low based on a person being exposed every day for 30 years. The asbestos benchmark for air is based on long structures(> 5 μ).

The benchmarks for asbestos in settled dust are not risk-based because there is no scientific consensus on how to determine if these fibers will ever be inhaled. The dust benchmarks are based on all structures equal to or greater than 0.5 μ; it was based on a weight of evidence approach that considered 1) measured background values, 2) an experience standard developed by experts in the asbestos identification field, and 3) benchmarks developed for other sites. The benchmark for asbestos in accessible areas is 5,000 structures per square centimeter (s/cm^2) and 50,000 s/cm^2 for infrequently accessed areas. The use of a benchmark for infrequently accessed areas is intended to minimize the potential for recontamination of accessible areas.

Man-made vitreous fibers (MMVF) are a class of insulating materials used widely in residential and industrial settings; they are made primarily from glass, rock, slag or clay. The fibrous particles have long, thin geometry, like asbestos, and can irritate the respiratory tract. MMVF's can also be a skin irritant.

Man-made vitreous fiber (MMVF) toxicity occurs primarily from inhalation exposure. The health-based clearance level for MMVF in air is 0.010 fibers per cubic centimeter (f/cc). The standards are intended to protect individuals from hazards associated with inhaling MMVF. The benchmark for MMVF in settled dust is not risk-based, and was developed with consideration given to both its toxicity and background levels relative to asbestos. The benchmark for MMVF in accessible areas is 5,000 fibers per square centimeters (f/cm^2), and 50,000 f/cm^2 for infrequently accessed areas. The use of a benchmark for infrequently accessed areas is intended to minimize the potential for recontamination of accessible areas.

Lead is a toxic metal that was used for many years in products found in and around our homes. The primary source of lead exposure is deteriorating lead-based paint. Many homes built before 1978 contain lead-based paint. Soil can pick up lead from exterior paint, or may contain lead from vehicle emissions of leaded gasoline, even though it is no longer in use. Household dust may contain lead from deteriorating lead-based paint or from soil tracked into a home. Children six years old and under are most at risk, because their nervous systems are not fully developed and they are prone to greater exposure as a result of mouthing activity.

The risk-based benchmark for lead in settled dust is based on the federal Department of Housing and Urban Development standard of 40 micrograms per square foot (µg/ft^2) for accessible floor space and 400 µg/ft^2 for infrequently accessed areas, such as window troughs. These standards are also used to clear indoor spaces after lead abatement work. Registrants were eligible for cleaning if the sampling results exceed these standards. The standards are intended to protect children from hazards associated with lead-containing dust in the indoor environment.

Polycyclic aromatic hydrocarbons (PAH) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAH are produced by many combustion sources and enter the air mostly as releases from burning coal, automobile exhaust, volcanoes and forest fires. In the indoor environment, PAH can even be produced when you cook. The approximately 28,000 building fires that occur in NYC each year are also sources of PAH. Two PAH results are derived from testing; the individual PAH concentrations and the total PAH toxicity equivalent. The total PAH toxicity equivalent consists of nine individual PAH concentrations (1-Methylnaphthalene, 2,6-Dimethylnaphthalene, 2-Methylnaphthalene, Acenaphthene,, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene) converted to a standard unit of exposure, and then added together as a measure of the cumulative effect of the PAH. The value of the total PAH toxicity equivalent is then compared with the benchmark.

The EPA health-based benchmark for PAH in accessible areas is 150 micrograms per square meter (µg/m^2). The level of risk associated with this benchmark is very low based on the assumption of daily exposure over 30 years. The benchmark for infrequently accessed areas is 1500 µg/m^2. The benchmark for infrequently accessed areas is intended to minimize the potential for recontamination of accessible areas.

Sampling Methods

Air

Sampling for asbestos and man-made vitreous fibers (MMVF) in air was performed by drawing a measured volume of air across a filter. The asbestos samples were analyzed using an electron microscope; the MMVF samples were analyzed using an optical microscope. In each case the filter was examined and the number of fibers in a measured area counted. Problems can arise when too many dust particles were captured by the filter. The filter viewing area becomes obscured (i.e. overloaded) which interferes with the ability of the technicians examining the sample under the microscope to separate or identify individual fibers. Samples where this occurred or where the sample could not be analyzed for other reasons were listed as "Not Analyzed/Invalid."

Dust

Dust samples for lead and PAH were collected by wiping a piece of soft paper over a surface, such as a floor or wall. Dust samples for MMVF and asbestos were collected by a vacuuming technique referred to as microvac.

Within individual units and building common areas, dust was collected from two types of areas, accessible and infrequently accessed. An accessible area is an area where people can be readily exposed to the dust, which include floors, tables and countertops. An infrequently accessed area is an area where people are not often exposed to the dust, which include the tops of bookshelves and under or behind refrigerators.

Analytical Methods

Air

Asbestos 40 CFR Part 763 (Asbestos Hazard Emergency Response Act [AHERA]/PCMe)
Fibers NIOSH 7400 (confirmed with Scanning Electron Microscope (SEM) if f/cc > .009)

Dust

Asbestos ASTM D 5755-03
MMVF ASTM D 5755-03 (SEM)
PAH EPA Method SW-846 8270D
Metal Lead EPA Method SW-846 6010C

Decision Criteria for Activities Following Sampling

The sampling results provided data that formed the basis for deciding whether to offer a cleaning of the unit, common area and the HVAC in the building being sampled, and whether to conduct any additional sampling within a unit or common areas of a building. Where COPC exceeded benchmarks, a cleanup was offered to the owner or occupants of those units or buildings. However, source attribution was a critical factor in determining whether to retest after cleaning and in discussions with the owner or occupant to determine whether an EPA cleanup would be useful and accepted. A source survey was conducted where exceedances were found. In those instances where peeling or flaking lead paint was noted, EPA suggested that the building management or apartment owners conduct remediations If the exceedance was due to a source within the building or adjacent to the building, no re-sampling after cleaning to demonstrate clearance was offered.

The criteria used to decide whether to clean an apartment or common area was, as noted above, the occurrence of an exceedance of any individual benchmark. In deciding what, if any, additional cleaning should be offered in buildings, EPA used a statistical measure called the 95% Upper Confidence Limit based on the mean contaminant level for accessible areas, infrequently accessed areas, or air samples in common areas. A UCL is a measure of uncertainty commonly used in scientific studies that estimates uncertainty in a given set of data caused by sampling methods, measurement and other sources of variability. The 95% UCL defines a value that will be exceeded by the true mean approximately 5% of the time in repeated sampling. The 95% UCL is commonly employed in EPA hazardous site assessments to provide a conservative upper bound estimate on the average site-wide contaminant level. The UCL was used in the decision process as follows: If the 95% UCL for the estimated building mean in common areas exceeds the benchmark value for a COPC, then this was considered to provide support for the decision to offer to clean the whole building. Separate analyses were conducted for air samples, and accessible and infrequently accessed areas, and each was compared with its own benchmarks. EPA considered the source of contamination, the HVAC configurations and the distribution of contaminant in determining what building components to clean.

Section 3 Program Results

One hundred and eighty-three (183) residential apartments and the common areas in twenty one residential or commercial buildings were sampled. Eleven thousand one hundred and ninety nine (11, 199) air and dust samples were collected, including duplicate samples collected for quality assurance purposes. Twenty three (23) samples in 17 residential properties and 161 samples in the common areas of sixteen buildings exceeded the benchmarks established for this program. A summary of the results is provided in Table 3-1.

Only lead in dust had a significant number of exceedances, and the only exceedances found that resulted in a 95% UCL above benchmarks were for lead in dust. One hundred and seventy four of the exceedances were lead in dust. One hundred fifty two of the exceedances were in common areas of buildings. The majority of the lead exceedances were associated with sources within the apartment or building.

Where there were exceedances of the benchmark, EPA contacted the resident or owner's representative; verbally informed the individual of the exceedance and offered to perform a lead survey to determine whether there were sources of the contaminant of concern within the residence or building. After conducting a source survey, EPA provided a report to each resident or owner's representative. The report contained the sampling results, source survey and information from NYCDOHMH and EPA describing how to deal with lead paint hazards, the primary source of lead contamination. EPA offered to clean all of the affected areas. In two buildings, building management decided to remediate deteriorated paint.. EPA contractors surveyed 15 apartments and 16 buildings. Lead paint was present in 13 apartments and 16 buildings.

Ten of the exceedances were asbestos (two in air and eight in dust). Nine of the exceedances were in common areas of buildings.). Four of the asbestos in dust exceedances in two of the buildings were associated with existing sources within buildings. The remaining six exceedances (4 in dust – 2 in the basement air of a building) were not associated with existing sources within the buildings. A summary of the results is provided in Section 3 Table 3-1.

Aside from lead in dust only total fibers in air were detected on a regular basis. All samples which approached the benchmark for MMVF in air were also analyzed by SEM. None of the samples analyzed by SEM had any MMVF fibers. This is consistent with the low incidence of detection of MMVF in dust. Only 58 of 3027 dust samples had detectable levels of MMVF.

EPA cleaned 16 apartments, one apartment declined cleaning. EPA cleaned some or all common areas in 14 buildings. As noted above building management decided to perform remediations in the other two buildings. In no instance was it considered necessary to clean HVAC systems.

Table 3-1 Summary of Sampling Results

Pollutant	Matrix	Area	Property Type	Samples	Non-Detects	Detects	Min	Max	Units	NA/ Overloads	Exceedances
Asbestos	Air	Accessible	Apartment	991	988	3	0.00034	0.0004	S/cc	0	0
			Whole Building	1103	992	11	0.00036	0.0043	S/cc	100	2
	Dust	Accessible	Apartment	712	707	5	2590	18,100	S/cm^2	0	1
			Whole Building	852	844	7	2470	61,800	S/cm^2	1	2
		Infrequently Accessed	Apartment	790	782	8	2590	32,400	S/cm^2	0	0
			Whole Building	685	662	23	2470	1,030,000	S/cm^2	0	5
MMVF PCM	Air	Accessible	Apartment	991	3	988	0.0007	0.018	Fibers/cc	0	0
			Whole Building	1092	17	1060	0.0006	0.0087	Fibers/cc	15	0
MMVF SEM	Air	Accessible	Apartment	22	22	0	0.0001	0.0003	Fibers/cc	0	0
			Whole Building	0					Fibers/cc		
	Dust	Accessible	Apartment	706	699	7	15.9	254.4	f/cm^2	0	0
			Whole Building	841	827	14	15.9	254.4	f/cm^2	0	0
		Infrequently Accessed	Apartment	784	778	6	15.9	190.8	f/cm^2	0	0
			Whole Building	674	643	31	15.9	508.8	f/cm^2	0	0
Lead	Dust	Accessible	Apartment	712	159	552	0	507	μg/ft^2	1	11
			Whole Building	841	100	741	0	21,100	μg/ft^2	0	77
		Infrequently Accessed	Apartment	789	41	747	0	8820	μg/ft^2	1	11
			Whole Building	674	7	667	0	102,000	μg/ft^2	0	75
PAH - TEQ	Dust	Accessible	Apartment	706	705	0	69.3	69.3	μg/m^2	1	0
(Toxicity Equivalency)			Whole Building	841	840	1	69.3	146	μg/m^2	0	0
		Infrequently Accessed	Apartment	784	780	3	69.3	201	μg/m^2	1	0
			Whole Building	674	664	9	69.3	2820	μg/m^2	1	0

Multiple analyses were performed on air and dust samples for asbestos and MMVF; therefore, the total number of results reported exceeds the total samples collected. The results above include those from 985 duplicate samples collected for quality assurance purposes.

Table 3-2 Summary of COPC Survey Results

ID	Property Square Feet	EPA Cleaned	COPC Survey Pos Neg	Analyte(s)- Matrix
Apt	1549	Yes	Positive Result	Lead-Dust
Apt	864	Yes	Positive Result	Lead-Dust
Apt	1165	Yes	Positive Result	Lead-Dust
Apt	1450	Yes	Positive Result	Lead-Dust
Apt	1387	Yes	Positive Result	Lead-Dust
Apt	2013	Yes	Positive Result	Lead-Dust
Apt	1737	Yes	Positive Result	Lead-Dust
Apt	1508	Declined cleaning	Not Applicable	Lead-Dust
Apt	1317	Yes	Positive Result	Lead-Dust
Apt	1008	Yes	Positive Result	Lead-Dust
Apt	2025	Yes	Positive Result	Lead-Dust
Apt	1072	Yes	Positive Result	Lead-Dust
Apt	1250	Yes	Positive Result	Lead-Dust
Apt	2000	Yes	Negative Result	Asbestos Dust
Apt	1880	Yes	Positive Result	Lead-Dust
Apt	934	Yes	Negative Result	Lead-Dust
Apt	564	Yes	Negative Result	Lead-Dust
Bldg	13500	Yes	Positive Result	Lead-Dust
Bldg	21000	Yes	Positive Result	Lead-Dust
Bldg	85000	Yes	Positive Result	Lead-Dust
Bldg	18000	Yes	Positive Result	Lead-Dust
Bldg	18000	Yes	Positive Result	Lead-Dust
Bldg	70000	Yes	Positive Result	Lead-Dust
Bldg	230000	Yes	Both COPC Positive Result	Asbestos-Lead-Dust
Bldg	168000	Yes	Positive Result	Lead-Dust
Bldg	200000	Declined cleaning	Positive Result	Lead-Dust
Bldg	10480	Yes	Positive Result	Lead-Dust
Bldg	12000	Yes	Positive Result	Lead-Dust
Bldg	8000	Yes	Positive Result	Lead-Dust
Bldg	120000	Yes	Positive Result	Lead-Dust
Bldg	140000	Yes	Both COPC Positive Results	Asbestos-Lead-Dust
Bldg	450000	Yes	Positive Lead Negative Asbestos	Asbestos-Lead-Dust Asbestos -Air
Bldg	125000	Declined cleaning	Positive Result	Lead-Dust

Section 4 Analyses of Lead Results

Lead was the only COPC where there were a sufficient number of detectable sample results to conduct a statistical analysis. This section presents the analyses of the prevalence of dust lead exceedances. The analysis of lead results does not include duplicate samples collected for quality assurance purposes. .

Table 4-1 presents the number of the participating properties by the following selected characteristics:

- Use of the units (residential apartments vs. whole building common areas)
- Year of construction of the units (after 1978, 1960-1977, 1940-1959, 1920-1939, and before 1920). The self reported construction year data was checked against data in the NYC DOF and HPD databases provided by EPA. When there were discrepancies, the DOF and HPD data was considered more accurate and replaced the self-reported values.
- Distance from WTC in feet (<1000, 1000-2000, 2000-3000, and 3000-4000)

A higher percentage of whole building properties (76%) had dust with lead levels exceeding benchmarks than residential properties (8%). Apartments and whole buildings built before 1920 had the highest percent of properties with at least one measurement over the dust lead exceedance (49%). None of the buildings built between 1940 and 1977 had any measurements over the exceedance and only 3% of buildings built since 1978 did. A comparison of the present data with NSLAH is included in Table 4-1. The percentages are comparable, even though the NSLAH definition of a dust lead hazard is different from an exceedance. In NSLAH, a housing unit has a dust lead hazard if any of the dust lead measurements on floors is greater than or equal to 40 $\mu g/ft^2$ or if any of the measurements on window sills is greater than or equal to 250 $\mu g/ft^2$.

In Table 4-1, the percent of exceedances decreases slightly as the distance from WTC increases, up to 3000 feet, then increases to 26%. This pattern is due to an uneven distribution of building ages in the different distance categories, especially the older age categories. Thirty-one percent (31%) of the 75 buildings within 1499 feet of the WTC were built before 1940; 26% of the 105 buildings between 1500 and 2999 feet of the WTC were built before 1940; and 68% of the 19 buildings more than 2999 feet from the WTC were built before 1940. A logistic regression of exceedances on building age and distance to WTC was conducted to confirm that this effect is due to building age. In this model, building age is a highly significant predictor of exceedance with $p< 0.0001$ and odds ratio 1.05. Each year of age increases the probability of exceedance by 5%. Distance to WTC is not a significant predictor with $p=0.53$ and odds ratio 1.0. The probability of exceedance is unrelated to the distance from WTC.

Table 4-1. Prevalence of dust lead exceedances in participating housing units by selected characteristics

Characteristics	All Properties (N)	No. of properties with dust lead exceedance	% of properties with dust lead exceedance	NSLAH: % of housing units with dust lead hazards
Total participating properties	204	31	15	
Use:				
Residential apartments	183	15	8	16
Whole building	21	16	76	NA
Construction year:				
>1978	97	3	3	2
1960-1977	38	0	0	8
1940-1959	5	0	0	18
1920-1939	27	10	37	41*
before 1920	37	18	49	
Distance from WTC (ft):				NA
<1499	75	14	19	
1500-1999	41	5	12	
2000-2999	64	7	11	
≥3000	19	5	26	
Undefined	5	0	0	
Use by Distance from WTC (ft):				
Residential apartments				
<1500	64	6	9	
1500-1999	38	3	8	
2000-2999	60	3	5	
≥3000	16	3	19	
Undefined	5	0	0	
Whole building				
<1500	11	8	73	
≥1500	10	8	80	

* Refers to "Before 1939"

Figure 4-2 presents the number of participating properties by Use, Construction Year, and Distance from WTC. The number of units in each category that exceeded are shown in red and marked above each bar.

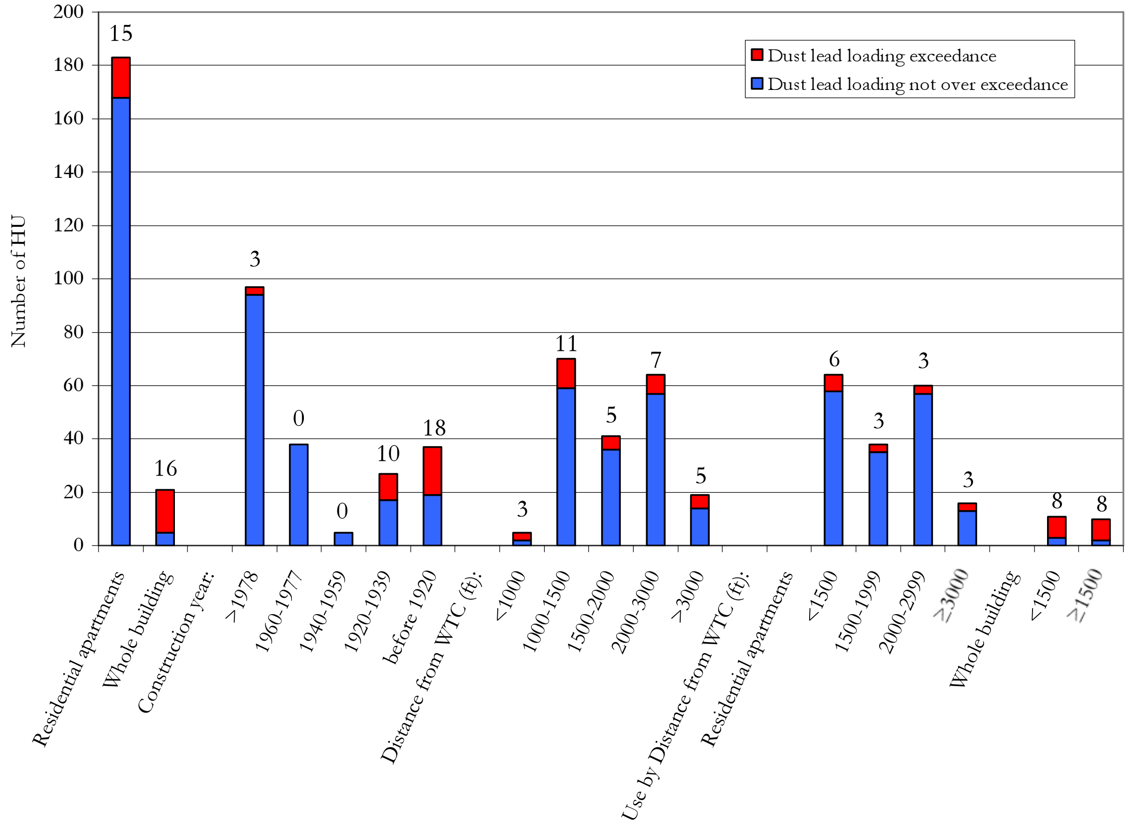

Figure 4-2. Number of participating properties by Use, Construction Year, and Distance from WTC and number of dust lead exceedances

Table 4-2 presents the prevalence of dust lead exceedances by sampling Matrix, Sub_location, and Area_surface for residential housing units. These variables are defined as following.

There are two categories of sampling matrix, accessible and infrequently accessed. An accessible area is defined as an area where people are readily exposed to the dust such as floors, tables and countertops. An infrequently accessed area is defined as an area where people are not easily exposed to the dust such as the tops of bookshelves and under or behind refrigerators.

Definitions of Sub_Location and Area_Surface are different for residential apartments and whole buildings. For residential housing units, Sub_Location categories include areas of the home such as entry, kitchen, living room, bedroom, and other rooms. Within residential housing units, the variable Area_Surface descriptions were sorted into two subcategories including floor (carpet, tile floor, doormat, hardwood floor, area rug), and surfaces other than floor (drape, top of cabinet, wall, wood, top of bookshelf, top of wall unit, shelf, top of large appliances, top of media center, etc). This separation of floors from surfaces other than floor was done because floors tend to accumulate dust both by deposition from the air and tracking from the outside and people are easily exposed to dust on this surface.

Table 4-2. Prevalence of dust lead exceedance in residential housing units by Matrix, Sub_Location, and Area_Surface

Characteristics	All participating residential units (N)	No. of units with dust lead exceedance	% of units with dust lead exceedance	NSLAH: % units with dust lead above HUD Rule (1)
Matrix:				
Accessible	183	9	5	6
Sub_Location				
Entry	90	2	2	
Kitchen	183	4	2	1
Living room	157	1	1	1
Bedroom	106	1	1	1
Other rooms	55	1	2	2
Area surface				
Floors	181	9	5	6
Surfaces other than floors	183	0	0	
Matrix:				
Infrequently accessed	183	9	5	14
Sub_Location				
Entry	13	1	8	
Kitchen	144	1	1	5
Living room	173	4	2	5
Bedroom	167	2	1	3
Other rooms	64	2	3	3
Area surface				
Floors	164	2	1	
Surfaces other than floors	179	8	5	14

(1) HUD Lead Safe Housing Rule standards are 40 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ on window sills. These locations are used here as approximations for "accessible" and "infrequently accessed" locations, respectively.

In accessible areas, different rooms had similar percentages over the exceedance (1% for living rooms and bedrooms to 2% for entries, kitchens, and other rooms), while inaccessible areas in entries were more likely to have measurements over the exceedance (8%) compared to inaccessible areas in other rooms. For accessible areas, floors were more likely to be over the exceedance level (5% compared to 0% for surfaces other than floors). For infrequently accessed areas, surfaces other than floors were more likely to be over the exceedance (5% compared to 1% for floors).

Also presented in Table 4-2 are the estimated national percentages of homes with dust lead levels above the HUD Lead Safe Housing Rule standards, 40 $\mu g/ft^2$ on floors and 250 $\mu g/ft^2$ on window sills, from NSLAH. These locations are used here as approximations for “accessible” and “infrequently accessed” locations, respectively. While the standards/exceedances and definitions of the surfaces do not match, they may be considered to be similar, allowing rough comparisons.

For whole buildings, Sub_Location includes hallways at different floor, stairwells at different floor, lobby/reception areas, and other areas. The variable Area_Surface was grouped into two categories, floors (floor, tile, carpet) and surfaces other than floor (bookshelf, wall, ceiling, top of bookshelf, behind large furniture, light fixture, metal behind liftgate, exit sign, etc.). Table 4-3 presents the prevalence of dust lead exceedances by sampling Matrix, Sub_location, and Area_Surface for whole buildings. A greater proportion of stairwells were over the exceedance level (58%) compared to hallways and lobbies (50% and 46%, respectively), while other areas had a smaller proportion over the exceedance level (40%). For accessible areas, floors were more likely to be over the exceedance level (67%) compared to surfaces other than floors (24%); however, for infrequently accessed areas, floors were less likely to be over the exceedance level (14%, compared to 71% of other surfaces).

Table 4-3 Prevalence of dust lead exceedance in whole building units by Matrix, Sub_Location, and Area_Surface

Characteristics	All participating whole buildings (N)	No. of whole buildings with dust lead exceedance	% of whole buildings with dust lead exceedance
Matrix:			
Accessible	21	14	67
Sub_Location			
Stairwells	12	7	58
Hallways	14	7	50
Lobbies	13	6	46
Other areas	10	4	40
Area surface			
Floors	21	14	67
Surfaces other than floors	21	5	24
Matrix:			
Infrequently accessed	21	15	71
Sub_Location			
Stairwells	13	6	46
Hallways	13	9	69
Lobbies	13	3	23
Other areas	10	5	50
Area surface			
Floors	14	2	14
Surfaces other than floors	21	15	71

The relationship between prevalence of housing units with lead exceedances and the number of days since last cleaning was investigated. Six cleaning frequencies were tabulated; daily, every other day, weekly, every other week, monthly, and whenever. Corresponding days since last cleaning were derived as half of the frequency in general as: 0, 1, 4, 7, 15, and unspecified, respectively. Table 4-4a displays the number of exceedances by Matrix and days since last cleaning.

Unexpectedly, when more recent that cleaning was reported in general, the unit was more likely to have dust lead loadings over the exceedances for both accessible and infrequently accessed areas. This result may be due to a similar confounding effect from building age that as was observed for the distance from WTC in Table 4-1. Dust lead samples were collected from accessible areas in 23 apartments and whole buildings reported by the owners/residents to have been cleaned daily. Nine of these 23 apartments and whole buildings had dust lead exceedances and all were built before 1940. However the relative percentages of old apartments and buildings (built before 1940) in other cleaning frequency categories are lower than this daily cleaning frequency group, which is in turn decreases the chance of having dust lead exceedances in these other categories.

Table 4-4a. Prevalence of dust lead exceedances in participating properties by matrix and days since last cleaning

Days since last cleaning	All participating properties (N)	No. of properties with dust lead exceedance	% of properties with dust lead exceedance
Accessible:	204	23	11
0	23	9	39
1	14	3	21
4	86	4	5
7	43	3	7
15	21	1	5
Unspecified	17	3	18
Infrequently accessed:	204	24	12
0	23	10	44
1	14	1	7
4	86	6	7
7	43	4	9
15	21	0	0
Unspecified	17	3	18

In addition, 120 of the participants reported that they had a professional cleaning after 9/11 and provided the date of the cleaning. This tabulation is presented as Table 4-4b.

Date of professional cleaning does not seem to be related to the proportion of residential housing units with dust lead loadings over the exceedance levels for either accessible or infrequently accessed areas.

Table 4-4b. Prevalence of dust lead exceedances in participating properties by matrix and date of professional cleaning

Date of professional cleaning	All participating properties (N)	No. of properties with dust lead exceedance	% of properties with dust lead exceedance
Accessible:	204	23	11
September-December 2001	28	3	11
January-June 2002	15	1	7
July-December 2002	8	0	0
January 2003 and later	16	2	13
Unknown	89	9	10
No professional cleaning	48	8	17
Infrequently accessed:	204	24	12
September-December 2001	28	5	18
January-June 2002	15	1	7
July-December 2002	8	1	13
January 2003 and later	16	2	13
Unknown	89	7	8
No professional cleaning	48	8	17

The correlation between dust lead loading and lead based paint inspection were investigated at the unit level. However the small sample sizes (n=31) prevented this analysis from yielding meaningful results.

Section 5 Apartments or Buildings Tested in both 2002-2003 and 2007-2008

Below is a summary of results for apartments or buildings that participated in both the 2002-2003 and 2007-2008 EPA clean up programs. The tables only compare asbestos in air and lead in dust as they were the analytes common to both efforts. Neither effort was a random sampling program; thus the results cannot be used to make inferences about the area. However, the presence of lead exceedances and lack of asbestos exceedances in the 2007-2008 program are consistent with prevalence of lead in paint and the scarcity of asbestos in dust.

Table 5-1 Lead in Apartments 2002-2003 compared to 2007-2008

Note: Results from 2002-2003 program include pre- and post-cleaning sampling.

Index	2002-2003 # of Samples	2002-2003 # of Detects	2002-2003 # of Exceeds	2002-2003 Max Exceeds	2207-2008 # of Samples	2207-2008 # of Detects	2207-2008 # of Exceeds	2207-2008 Max Exceeds
732	8	2	0		7	6	0	
1358	8	8	0		7	7	0	
1839	5	5	0		11	11	1	8820
4846	8	7	0		7	6	0	
4871	8	8	0		7	7	1	91.4
4907	6	6	0		7	7	0	
6094	7	7	0		7	6	0	
6663	7	7	0		11	8	0	
6822	7	7	0		11	10	0	
7249	6	6	0		7	7	0	

Table 5-2 Air Asbestos in Apartments 2002-2003 compared to 2007-2008

Note: Results from 2002-2003 program include aggressive and modified aggressive air sampling procedures.

Index	2002-2003 # of Samples	2002-2003 # of Detects	2002-2003 # of Overloads	2002-2003 # of Exceeds	2002-2003 Max Exceeds	2207-2008 # of Samples	2207-2008 # of Detects	2207-2008 # of Exceeds	2207-2008 Max Exceeds
62	3					5			
9	6					6			
61	3					5			
73	5		3			6			
76	5					5			
25	5					5			
52	3					5			
8	9					6			
20	5					6			
26	5					6			
1	5					6			
5	5	1				6			
14	5					5			
53	6					5			
18	5					6			
66	5					5			
59	5					5			
12	5					5			
37	5					5			
32	10	5		5	0.0129	6			
33	5					5			
23	4					6			
4	4					6			
22	6					6			
11	5					6			
24	6					5			
35	6					5			
31	5					5			
36	5					6			
54	5					5			
44	5					6			
84	5					5			
15	6					6			
28	5					6			
16	5					6			
56	6					6			
78	3					6			
6	5					5			
57	5					6			
75	4					6			

34	6					5			
80	10		2			5			
70	5					6			
67	5					5			
68	10	1		1	0.0028	5			
55	3					5			
46	5					5			
81	5					5			
45	5					5			
71	5					5			
83	5					5			
21	6					6			
17	5					5			
7	5					3			
19	5					5			
2	6					5			
60	6					5			
Total	302	7	5	6	0.0157	307	0	0	0

Table 5-3 Asbestos in Building Common Areas 2002-2003 compared to 2007-2008

Index	2002-2003 # of Samples	2002-2003 # of Detects	2002-2003 # of Overloads	2002-2003 # of Exceeds	2002-2003 Max Exceeds	2207-2008 # of Samples	2207-2008 # of Detects	2207-2008 # of Overloads	2207-2008 # of Exceeds	2207-2008 Max Exceeds
3	75					84		4		
2	94		1			131				
1	28	2				94	1			
Total	197	2	1	0	0	309	1	4	0	0

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http://www.epa.gov/wtc/panel/pdfs/WTC5_WTC_Report_FiguresOnly_Decmber_2005.pdf

COPC Report

http://www.epa.gov/wtc/copc_study.htm

Sampling Plan

http://www.epa.gov/wtc/panel/pdfs/lower-manhatten-indoor-test-and-clean-program-plan-december2006.pdf

Quality Assurance Project Plan

http://www.epa.gov/wtc/testandclean/qappfor_test_and_clean.html

Attachment 1. Descriptive data collected for residences and buildings.

ID
Entry_ID_Number
Last_Name
First_Name
Property_Street_Address
Floor
Other_space_descriptor
Apt_No
Property_or_Unit
Contact_Comment
Date_of_Inspection
Inspector_Last_Name
Inspector_First_Name
Inspection_Comment
Year_Built
Building_type
Use_of_Space
Number_Rooms_Floors
Square_Feet
Prof_Cleaned_after_collapse
Renovated_since_collapse
No_Windows
Type_of_Windows
Condition_of_Windows
No_Wall_Window_HVAC_Units
No_Wall_Window_Units_replaced
No_Wall_Window_Units_cleaned
Carpet_Present
Carpet_replaced_since_collapse
Unit_Cleaning_Frequency
Date_of_last_cleaning
Descriptive_Comment
Visible_WTC_dust_present
Friable_asbestos_present
Friable_asbestos_location
Friable_asbestos_type
Friable_asbestos_sq_ft
Friable_MMVF_present
Friable_MMVF_location
Friable_MMVF_type
Friable_MMVF_sq_ft
Chalking_peeling_paint
Chalking_peeling_paint_loc
Chalking_peeling_paint_type
Chalking_peeling_paint_sq_ft
Part_or_comb_sources_unit
Part_or_comb_unit_desc
Part_or_comb_sources_bldg
Part_or_comb_bldg_desc
Source_Attribution_Comment

Central_HVAC_system_present
No_Central_HVAC_units_building
No_Central_HVAC_ducts_unit
Purpose_of_HVAC
Central_HVAC_clean_replace
Date_HVAC_cleaning
Date_HVAC_replacement
Central_HVAC_Comment