Interim Final WTC Residential Confirmation Cleaning Study

Volume 1

110 Liberty St.
New York, NY

U.S Environmental Protection Agency, Region 2
New York City Response and Recovery Operations
290 Broadway
New York, NY 10007-1866
May 2003

Acknowledgments

The United States Environmental Protection Agency (EPA) is grateful for the generous contribution of Mr. David M. Baldwin of Liberty Street Associates, LLC for his generosity in providing 110 Liberty Street as the study building.

This project was designed by EPA with the support of the Indoor Air Work Group of EPA's Interagency Indoor Air Task Force. The efforts of the task force were essential to successful implementation of the study. The work group organizations directly involved in the development of the project included: the Federal Emergency Management Agency; the New York City Department of Environmental Protection; the New York City Department of Health and Mental Hygiene; The City of New York Mayor's Office of Environmental Coordination; the New York City Office of Emergency Management; the New York State Department of Health and Mental Hygiene; the Agency for Toxic Substances and Disease Registry; the Occupational Safety and Health Administration; EPA's Office of Solid Waste and Emergency Response, and EPA Region 2.

Note:
This interim final report is a working document that will be subject to further agency and third-party review. EPA intends to excerpt, and possibly expand, portions of this report for inclusion in manuscripts that will be submitted to scientific journals for review and consideration for publishing.

Table of Contents

Executive Summary

The United States Environmental Protection Agency (EPA) responded to the September 11, 2001 attack on the World Trade Center (WTC) in conjunction with the President's declaration of a national disaster. The Federal Emergency Management Agency (FEMA), the federal government office coordinating disaster response, issued mission assignments to EPA related to:

- cleaning dust and debris from the streets of lower Manhattan
- assessing the ambient environment through analysis of air and dust samples
- providing washing stations for decontamination of personnel and equipment involved in dust and debris removal operations, and
- disposing of hazardous materials found at the WTC response and recovery site.

Residents of lower Manhattan expressed concerns about the safety and reliability of cleaning methods utilized to remove dust and debris from residential unit interiors and building exteriors. Traditional FEMA support programs were available; however, residents requested additional assurance. To address concerns about the extent of indoor impact of dust and debris, as well as concerns regarding fire-related particle deposition, EPA Administrator Christine Todd Whitman formed an Interagency Indoor Air Task Force. The task force included representatives from the following agencies: EPA, FEMA, the New York City Department of Health and Mental Hygiene (NYCDOHMH), the New York City Department of Environmental Protection (NYCDEP), the New York City Office of Emergency Management, the New York City Mayor's Office of Environmental Coordination, the New York State Health Department, the New York State Department of Environmental Conservation, the Occupational Safety and Health Administration (OSHA), and the Agency for Toxic Substances and Disease Registry (ATSDR). The multidisciplinary, interagency group focused on issues of concern to residents and developed coordinated strategies to address the concerns.

In May 2002, EPA, FEMA and New York City (NYC) announced a voluntary cleanup program for residential units in lower Manhattan. This program would run parallel to and simultaneously with several other efforts, in order to reassure residents regarding the potential risks from exposure to residual WTC dust and debris, and to provide residents with the opportunity to have WTC residual material removed from their units as expeditiously as possible. Funded by FEMA through interagency agreements with EPA and NYC, these efforts include:

- identification of Contaminants of Potential Concern (COPC)
- a background study of the COPC in upper Manhattan (Background Study)
- inspection and cleaning of building exteriors in lower Manhattan
- Indoor Air Residential Assistance-WTC Dust Cleanup Program (WTC Dust Cleanup Program)
- cleaning of unoccupied, uncleaned residential buildings, and
- study of cleaning techniques in an unoccupied building adjacent to the WTC site that was directly impacted by the WTC collapse (WTC Residential Confirmation Cleaning Study).

This report presents the results of the WTC Residential Confirmation Cleaning Study (study) conducted by EPA.

Background
Following the attack on the World Trade Center, residential living spaces in the immediate vicinity of ground zero were impacted by dust and debris. Samples of dust and debris collected by EPA from the streets of lower Manhattan contained asbestos at levels greater than one percent of sample mass in approximately 35 percent of the 160 samples taken between September 11, 2001 and October 10, 2001. A study of residential unit interiors proximal to the WTC site was funded by FEMA, and implemented by ATSDR and NYCDOHMH with EPA support. This study concluded that although air sampling indicated that asbestos in air benchmarks had not been exceeded, residual material in the dust was attributable to the WTC attack and collapse. Preliminary results of this study were provided early in 2002. Final results were issued in September 2002.[1]

Shortly after the disaster, NYCDOHMH, EPA and others provided the residents of lower Manhattan with recommendations on cleaning methods through the media, fact sheets and community meetings. These recommendations were based on previously established cleaning procedures that were proven to be effective in removing layered particulate matter and debris with minimal dust generation.

Objectives
In an effort to provide additional information to the public on cleaning methods that may be effective in reducing contaminants from dust generated by the WTC collapse and recovery efforts, EPA, in concert with FEMA and NYC, commenced a study of a building on Liberty Street, just south of the WTC site, that had been heavily impacted by the collapse of the twin towers. The purpose of the study was to confirm the adequacy of various cleaning and vacuuming methods used by residents and professional cleaning companies, in the aftermath of the attack, to clean dust and debris from residential living areas.

Project Implementation
EPA and its contractors commenced the WTC Residential Confirmation Cleaning Study on June 14, 2002. The study addressed cleaning of a complex mixture of contaminants, including construction debris and fire-related compounds. EPA was unaware of a precedent for an indoor environmental cleanup with such a diverse set of parameters; however, time pressures did not allow for conducting extensive research on potential cleaning techniques in a controlled setting. The real-time need to determine the effectiveness of the cleaning methods being used by residents, and being employed in the WTC Dust Cleanup Program, drove the decision to field test the effectiveness of the standard dust removal methods in a heavily impacted, unoccupied building.

Eleven cleaning methods were selected for testing and assigned to residential units within the building according to the levels of observed dust. An attempt was made to test each method in units with both significant and minimal levels of dust.

Multiple endpoints were used in the study to ensure that the complexity of the dust was comprehensively considered. Analytical results were compared to health-based benchmarks for pre-selected COPC to determine if the cleaning was successful in achieving these values. The

[1]New York City Department of Health and Mental Hygiene/Agency for Toxic Substances and Disease Registry (NYCDOHMH). (2002). *Final Report of the Public Health Investigation to Assess Potential Exposures to Airborne and Settled Dust in Residential Areas of Lower Manhattan.*

COPC included: asbestos, lead, dioxin, polycyclic aromatic hydrocarbons (PAH), fibrous glass and crystalline silica (alpha-quartz, cristobalite, tridymite.)

The study used a combination of data sets to determine the extent of contamination, the effectiveness of cleaning methods, and the differences of sampling and analytical methods.

A summary of the significant conclusions of the study are provided below. These include observations about the extent of WTC-related contamination within the building and the effectiveness of the cleaning methods tested in the study.

Conclusions Regarding Contamination of the Building:

- The study found that the observation of WTC dust is an indicator that WTC contaminants may be present and that the amount of WTC dust correlates with the level of contamination.

- The study found that concentrations of some contaminants in the WTC dust were elevated above health-based benchmarks.

Conclusions Regarding Cleaning Effectiveness:

- The study demonstrated that the 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.

- The study found that one to three cleanings were necessary to reduce contamination levels to below health-based benchmarks, and the number of cleanings required generally correlated with the levels of contamination initially identified in the units.

- The study found that standard Heating, Ventilation and Air Conditioning (HVAC) cleaning methods reduced the concentrations of WTC contaminants in HVAC systems.

- The study found that conducting asbestos air sampling was a conservative method for determining if additional cleaning was needed.

The study successfully demonstrated that standard cleaning practices are effective in removing the complex mixture of WTC dust, thereby reducing individual exposure to WTC-related contaminants. Therefore, EPA's recommendation continues to be that individuals concerned about the presence of WTC dust use HEPA vacuums and wet wiping to remove the dust from their dwellings. Depending on the amount of dust deposited, repeated cleanings may be necessary.

1. Introduction

In an effort to provide information to the public on cleaning methods that would be effective in removing dust and contaminants generated by the WTC collapse and recovery efforts, EPA, in concert with FEMA and NYC, began a study of a building that had been impacted. The building was located on Liberty Street, just south of the WTC site. On June 14, 2002, EPA and its contractors commenced the WTC Residential Confirmation Cleaning Study to confirm the adequacy of various cleaning and vacuuming methods that may have been used by the residents of lower Manhattan and professional cleaning companies to clean dust and debris from residential living areas.

1.1 Background/Objectives

Shortly after the collapse of the WTC, NYCDOHMH, EPA and others provided the residents of lower Manhattan with recommendations on cleaning methods through the media, fact sheets and community meetings. These recommendations were based on previously established cleaning procedures that were proven to be effective in removing layered particulate matter and debris, with minimal dust generation. The WTC Residential Confirmation Cleaning Study was conducted to provide the residents with additional information. The effectiveness of the cleaning methods tested in the study was evaluated through the collection and analysis of pre-cleanup and post-cleanup samples, and comparison of the resulting analytical data to health-based screening levels for the COPC. Table 1.0 presents the primary clearance criteria used to determine cleaning effectiveness.

The study's COPC included: asbestos in air by phase contrast microscopy equivalent (PCMe) [2], lead in air and settled dust, dioxin in air and settled dust, PAH in air and settled dust, fibrous glass and man made vitreous fibers (MMVF) in air, and alpha-quartz in air. More detail on the selection of these compounds is included in Section 1.2.

In addition to evaluating data for the COPC in their respective media identified above, data was also evaluated for COPC that were analyzed using alternate analytical methods [e.g., asbestos in air using PCM and transmission electron microscopy (TEM) Asbestos Hazard Emergency Response Act (AHERA), COPC in other media (e.g., asbestos, MMVF, and alpha-quartz in settled dust), compounds that were included as part of the crystalline silica analytical analysis (e.g., cristobalite, tridymite, calcite, and gypsum in air and wipe samples]. The results from these additional analyses were primarily used to evaluate the cleaning methods as there were no health-based benchmarks for comparison. The exception would be the asbestos in air PCM and TEM AHERA results, which in addition to being used to evaluate the cleaning methods, were also compared to their respective regulatory criteria.[3] These regulatory criteria are referred to as

[2]The asbestos air samples were collected according to NIOSH 7400 (PCM). The sample filters were analyzed using a modified AHERA method. Although the total TEM (AHERA) fiber count was recorded, a separate PCM-equivalent (PCMe) count was recorded by modifying the AHERA method to count only fibers greater than 5 μm (micrometer). It is this modified-AHERA PCMe fiber count that was the basis of the asbestos test results and clearance criterion.

[3]The regulatory clearance criterion for TEM AHERA was 70 S/cm^2, converted to 0.022 S/cc, based on a volume of 1200 cc. The regulatory criterion for PCM AHERA was 0.01 f/cc based on a volume of 1200 cc.

secondary numeric criteria. Cleaning continued in the residential units and commercial spaces until primary clearance criteria were achieved. Some areas required three cleaning events.

This report provides information on the type of cleaning and sampling methods that were used, the results of the analytical analyses performed, and the conclusions that were made based on the information collected.

1.2 Identification of Contaminants of Potential Concern (COPC)

Under the auspices of the Interagency Indoor Air Task Force working group, a committee was formed to identify contaminants of potential concern (COPC) and associated health-based clearance criteria for the lower Manhattan clean-up program. Among other purposes, this initiative was intended to inform the selection of contaminants to monitor in the WTC Residential Confirmation Cleaning Study and Background Study and to provide a measure of cleaning effectiveness by establishing health-based clean-up goals for indoor air and settled dust. A draft of the COPC/Benchmarks Report prepared by EPA was peer reviewed on October 21-22, 2002. The final report is currently being completed. As such, the COPC identified for inclusion in the study reflect those contaminants cited in the peer review draft of the COPC/Benchmarks Report.[4]

The development of the COPC report began with an assessment of the indoor environment by reviewing historical information on hazardous substances that have been associated with building fires and collapses. Many compounds, including combustion byproducts such as dioxins and PAH were identified, along with building materials such as asbestos and fibrous glass. Ambient air, indoor air, and indoor/outdoor bulk dust monitoring data were also reviewed. Data sources included EPA's ambient air and bulk dust/debris monitoring program (www.epa.gov/wtc), OSHA's air/dust monitoring data, and the NYCDOHMH/ATSDR indoor air pilot program. A concerted effort was also made to identify and review additional sources of WTC-related data from other governmental agencies (e.g., U.S. Geological Survey, NYC Department of Education) academic institutions, environmental organizations, and the private sector.

A semi-quantitative screening process was performed on the collected sampling data referenced above. Based on frequency of detection, concentration, and inherent toxicity, contaminants that exceeded health-based screening levels for ambient air were identified. Dioxin and PAH were added to the COPC list by this process. In addition, building constituents with carcinogenic effects (asbestos) or irritant effects (fibrous glass, alpha-quartz) that were consistently and significantly found in bulk debris and indoor dust samples were identified as COPC.[5] Finally, lead was included based on a comparison of sampling data with existing regulatory standards. Collectively, the resulting group of contaminants (asbestos, lead, dioxin, PAH, fibrous glass and alpha-quartz) are called "contaminants of potential concern" or COPC in this report.

[4]U.S. Environmental Protection Agency. (September, 2002). *World Trade Center Indoor Air Assessment: Selecting Contaminants of Concern and Setting Health-Based Benchmarks*. A draft report. Peer review has been completed; final publication pending. Customarily referred to as the COPC/Benchmarks Report.

[5]NYCDOHMH, 2002.

1.3 Development of Clearance Criteria for Lead

At the time the study was initiated, COPC benchmarks were established for all contaminants except lead. Initially, the clearance criterion used for lead was 0.1 $\mu g/m^3$, which was based on an estimated national background concentration. Risk-based clearance criteria for lead in indoor air provide a means to evaluate the effectiveness of the WTC residential cleaning program. Information on background concentrations of lead in indoor air also informs attainment of cleanup objectives. Background information has been obtained from historical information on ambient air lead concentrations in urban environments, and will be further refined with data from a site-specific background study being conducted as part of the WTC Dust Cleanup Program.

Table 1.0
Primary Clearance Criteria Used to Determine Reoccupancy[6]

Compound	***Air***	***Settled Dust***
Asbestos	0.0009 S/cc	N/A
Polycyclic Aromatic Hydrocarbons (PAH)	0.2 $\mu g/m^3$	300 $\mu g/m^2$
Dioxin/Furan	0.001 ng/m^3	4 ng/m^2
Lead	1 $\mu g/m^3$	25 $\mu g/ft^2$ (micro vacuum comparison value 25 $\mu g/ft^2$)
Fibrous Glass (Man-made Vitreous Fibers)	10 S/L	N/A
Alpha-quartz (0.001 mg/m^3 - 0.004 mg/m^3 based on analytical methods)	0.004 mg/m^3	N/A

EPA's risk assessment methodology for lead has been advanced through use of a biokinetic model[7] that incorporates a biomarker of exposure/effect (blood lead) and multimedia exposure modeling. Through use of this model EPA identifies a goal of reducing environmental lead exposure so that 95 percent of childhood blood lead levels are below 10 µg/dl. This goal is accomplished when the airborne lead concentration is set at 1 $\mu g/m^3$, and input values for all other sources of environmental lead exposure (e.g., water, soil, dust, diet) are set at background concentrations.

[6] U.S. Environmental Protection Agency. (September, 2002). *World Trade Center Indoor Air Assessment: Selecting Contaminants of Concern and Setting Health-Based Benchmarks*. Values have been excerpted from this draft report.

[7] U.S. Environmental Protection Agency. (February, 1994). *Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children.* (OSWER EPA/540/R/93/081).

1.4 The Project Team

The study was designed, implemented and managed by EPA staff with the assistance of EPA's contractors: WRS Infrastructure and Environment, Inc. (WRS) and Weston Solutions, Inc. (Weston).

EPA's project team consisted of three individuals from the Region 2 Removal Action Branch detailed to the region's New York City Response and Recovery Operations (NYCRRO). The individuals included a Section Chief and two On-Scene Coordinators (OSCs) who were responsible for overall management and oversight of the contractors assigned to the project. All communication regarding site work activities, work scheduling, difficulties encountered, deviations from the work plan or sampling plan, and project progress were addressed by the OSCs on a daily basis.

The WRS project team consisted of fourteen individuals: the response manager, the site health and safety officer, the project coordinator/field accountant, the foreman, and seven laborers who were supported by the program manager, the alternate program/contracts manager, and the corporate health and safety manager. WRS provided equipment and services associated with the cleaning operations.

The Weston project team consisted of eight individuals: the project manager, two sample technicians, two technical writers, one technical artist and two data validators who were supported by the program manager and assistant program manager. Weston provided deliverables and services associated with the sampling operations.

1.5 Cleaning Methods

The Residential Confirmation Cleaning Study called for the testing of eleven cleaning methods. These ranged from basic vacuuming with standard household equipment, to wet vacuuming of carpets, to the use of commercial quality vacuums equipped with High Efficiency Particulate Air (HEPA) filters, to wet wiping with water only or soap and water, to cleaning of HVAC systems.

The study focused primarily on cleaning methods used to clean residential living areas. However, two commercial units were included in the study. Cleaning of the commercial units was necessary to avoid the redistribution of dust from uncleaned areas to clean areas, because the commercial units were located on the same floor of the building as the apartments. These units also provided an opportunity to gain experience relative to the cleaning of heating, ventilation, and air conditioning units that may have been impacted by the WTC collapse. Cleaning of the commercial units was a condition of the access agreement agreed to with the building owner.

At the time of the WTC attack, these two commercial units had been used as a Chiropractor's Office and a retail Mattress Store. To complete the remainder of the building, three additional commercial units, including two restaurants (Lemongrass Grill and The Food Exchange) and a Barber Shop were cleaned.

EPA applied up to two cleaning methods in each of thirteen residential units, and up to five cleaning methods in each of two commercial units. The eleven cleaning methods tested are presented below:

1. Residential quality upright vacuums and shop vacuums.
2. Residential quality upright vacuums and shop vacuums with the addition of an Air Filtration Device (AFD).
3. HEPA-filtered upright and shop vacuums.
4. HEPA-filtered upright and shop vacuums with the addition of an AFD.
5. Industrial quality HEPA-filtered vacuums.
6. Industrial quality HEPA-filtered vacuums with the addition of an AFD. **(This cleaning method was used in both residential and commercial units.)**
7. Wet wiping of all horizontal and/or vertical surfaces with soap and water.
8. Carpet cleaning.
9. Standard cleaning procedures used by professional duct cleaning companies for the cleaning of air conditioning (A/C) systems, ducts and related equipment.
10. Use of water only for wet wipe of horizontal and/or vertical surfaces.
11. Scope A cleaning procedures developed by EPA and New York City for the cleaning of units in lower Manhattan.

Determination of which cleaning method would be studied in each rental unit was based on the apparent level of impact that unit had endured as a result of the WTC collapse. EPA developed a set of four tests to evaluate cleaning methods in the rental units. The tests were assigned based upon readily observable impact by WTC dust, and prescribed six of the eleven cleaning methods to be used to respond to each level of impact. Up to five different cleaning tests were tested in each residential and commercial unit. Factors related to level of impact included directional exposure to ground zero and location of the unit in the building.

At project commencement, a visual assessment of the level of impact each rental unit had sustained was performed. This assessment was utilized to assign each rental unit to an applicable cleaning test. The assignment process was modified to ensure that each of the cleaning methods was applied (tested) in units that had experienced both low and high levels of observable impact.

The effectiveness of the cleaning methods was evaluated through the collection and analysis of pre-cleanup and post-cleanup samples, and through comparison of the resulting analytical data to the COPC, to determine if the cleaning method achieved health-based screening levels. The COPC evaluated in this study were: asbestos in air by PCMe, lead in air and settled dust, dioxin in air and settled dust, PAH in air and settled dust, fibrous glass (MMVF) in air, and alpha-quartz in air.

Data was also evaluated from other compounds that do not have health-based benchmarks established in EPA's COPC/Benchmark Report. These included asbestos in air by PCM and TEM AHERA, asbestos in settled dust, calcite in air and settled dust, gypsum in air and settled dust, cristobalite in air and settled dust, tridymite in air and settled dust, fibrous glass (MMVF) in settled dust by wipe sampling, alpha-quartz in settled dust by wipe sampling and total settled dust. After the initial cleaning of each unit, the OSC reviewed the established cleanup criteria, reviewed the analytical results, and provided direction as to which units required additional cleaning. In the event that it was determined that a unit did not achieve the primary clearance criteria, it was cleaned a second time using the same method as the original test. The unit was then tested again for the COPC that did not meet the health-based benchmark during the first test. If the unit failed to achieve the cleanup criteria again, it was cleaned with the strongest equipment (commercial quality vacuum with HEPA filter and an AFD). Midway through the project, the clearance criterion for lead was revised to use a health-based benchmark rather than a background level benchmark. This eliminated the need for re-cleaning some units, because the revised criterion indicated lead levels were lower than the newly established benchmark. For the most part, the health-based benchmarks were achieved after the first or second cleaning was completed. However, two units required three cleanings.

Air samples were collected to monitor for employee exposure during cleaning operations. Results are presented in Attachment A, *Personal Monitoring Data.*

1.6 The Work Plan

Specific procedures that were followed to perform the study, and a summary of all changes that were made to the work plan during the course of the study, are presented in Attachment B, *The Work Plan and Changes to the Work Plan*.

1.7 Project Documentation

At project commencement, digital photographs of all building interiors and building contents were taken. An inventory of personal belongings was developed. Photo documentation of the condition of each unit was compiled prior to each activity in the unit. Contents, conditions and specific areas of interest were digitally recorded. Photo documentation continued during initial sampling tasks. A record of equipment, materials, procedures and areas sampled was also maintained. Crews working in each unit were photographed. Procedures, equipment, and conditions were recorded during cleaning operations. All photographs were digitally recorded and are available upon request from EPA.

2. Cleaning Activities

2.1 Building Logistics

The study was conducted in a building supporting both residential and commercial use at the southern edge of ground zero. Located at 110 Liberty Street, New York, NY, the building is situated between Liberty and Cedar Streets. Accessible from both Liberty and Cedar Streets, it has a co-address of 113-117 Cedar Street. The location of the building in relation to ground zero is presented in Attachment C, *Site Map*. The building contains thirteen residential apartments and five commercial units, as well as common areas. It is five stories high. Prior to the WTC attack, all of the residential units were occupied, and the commercial units accommodated operating businesses. The configuration of the building interior is presented in Attachment D, *Floor Plans*.

The Residential Apartments
The thirteen residential apartments range in size from 655 square feet to 1,335 square feet. The dwellings have an open floor plan design. Each provides a kitchen, a bathroom, and bedrooms, as well as a utility closet containing a water heater and a furnace.

The Commercial Units
The five commercial units range in size from 716 square feet to 2,451 square feet. Two of these, both located on the second floor, were cleaned as part of the study:

- Chiropractor's Office
- Mattress Store

The remaining three commercial units were not part of the study, but were cleaned at the conclusion of the study, to complete the remainder of the building and to satisfy a condition of access for EPA to conduct the study:

- Lemongrass Grill
- The Food Exchange
- Barber Shop

The Lemongrass Grill has dining room facilities located on the first floor. Its preparation facilities are located in the basement. The Food Exchange is located on the first floor. Its preparation facilities are also in the basement. The Barber Shop is entirely situated in the basement.

The Common Areas
Common areas include an elevator, stairwells and hallways. There is a trash compactor room and a utility room on floors two through five. A common laundry room is located on the second floor. The basement contains an elevator shaft and motor room, a trash compactor room, a fire equipment room, the Barber Shop and preparation and storage areas for The Food Exchange and Lemongrass Grill.

Air Conditioning Systems
All of the residential and commercial units included in the study were heated by hot water

baseboard systems. In most cases, window-mounted air conditioners were in place to cool the residential units. Types of air conditioning systems present in the building are identified in Table 2.0.

Table 2.0
Air Conditioning Systems by Unit

Unit	*System*
Residential Apartments 5A, 5C, 5D	Ductless A/C unit, with remote condenser/compressor unit
Residential Apartments 2A, 2B, 3B, 3C, 3D, 4A, 4B, 4C, 4D	Window/wall mounted units
Baldwin Realty Company (3A)	Ductless A/C with remote condenser/compressor unit
Chiropractor's Office	Air handling unit with remote condenser/compressor unit (Atrium)
Mattress Store	Air handling unit with remote condenser/compressor unit (Atrium)
Lemongrass Grill	HVAC self contained system, makeup air system with hood, 2 ductless air systems with remote compressor/condenser units (Atrium)
The Food Exchange	Two air handling units with remote cooling tower (Atrium)
Barber Shop	Ductless A/C unit with remote condenser/compressor unit

Building Condition
Both Cedar Street and Liberty Street were closed to traffic after the WTC attack. Tenants were not permitted to enter the building. EPA, other governmental officials, and the building owner had been the only individuals authorized to enter the building since September 11, 2001. Presently, the residential spaces of the building are being re-occupied. The NYC Building Department inspected the building for structural integrity prior to EPA mobilization to the site.

The building interior had been professionally cleaned by the building owner, Liberty Street Associates, LLC, shortly after the collapse of the WTC. Those cleaning activities focused on the removal of gross dust and debris. Floors, walls and ceilings were cleaned using HEPA vacuums, AFDs and wet wiping using soap and water. Personal items, such as furniture, clothing, electronics and kitchenware were not cleaned. The cleaning began on October 29, 2001 and was completed on November 11, 2001. The cleaning performed during this period was limited to the residential units, the common areas, the basement, the roof, and the Baldwin Realty Company office. None of the other commercial spaces had been cleaned.

Although the cleaning discussed above took place prior to implementation of the study, there had been significant redeposition of dust that had become airborne during the removal of the WTC-related debris. At project assignment, the Chiropractor's Office and the Mattress Store were covered with inches of dust. The New York City Fire Department vacuumed dust from these units just prior to commencement of the study, as part of the recovery operation. Prior to cleaning, each unit was inspected and photographed to document its condition and contents. Bulk dust samples were collected.

At the onset of the project, the condition of the units varied. Some units evidenced significant impact, while other units evidenced minimal impact by dust and debris related to the WTC incident. The units facing Liberty Street contained a larger quantity of dust than those facing Cedar Street. All of the residential and commercial units contained dust generated and redeposited by the work effort at ground zero. The amount of dust appeared to be dependent on the location of the unit with respect to its orientation to ground zero, and the degree of damage it had sustained during and after the collapse.

During the initial cleaning, the doors and broken windows facing Liberty Street had been secured with plywood. However, they were not secured in a manner that would sufficiently seal them to prevent the entry of dust being generated during debris removal operations. Likewise, skylights located on the top floors of the building had been damaged and offered a pathway for dust to migrate into the building. These conditions existed during most of the WTC recovery effort.

Building Contents

All of the residential rental units contained personal possessions. Some units were fully furnished, containing numerous personal possessions. Others contained few furnishings and/or personal possessions. The commercial units contained property customarily found in those types of business establishments. For example, the Mattress Store contained a display of twenty-five box springs and mattresses. The restaurants contained dining room tables, chairs, food preparation equipment, and food.

Prior to commencement of cleaning operations, each tenant was contacted for the purpose of scheduling an appointment to determine the tenant's wishes relative to disposition of their belongings. At the appointment, residents were suited with hooded, powered air-purifying respirators (PAPR), which pull ambient air through a filter. The residents were advised of the applicable aspects of the Health and Safety Plan, including dust and respiratory hazards. (The Health and Safety Plan is discussed in Section 2.2 below.) The residents then accompanied EPA into the apartments to review contents and to discuss the planned disposition of personal property.

Residents were advised that retention of porous items was not recommended due to the difficulties associated with cleaning and testing. Residents were given the option of having their possessions: cleaned on the spot so the resident could immediately take possession, cleaned later and left in the apartment, or disposed of by EPA.

2.2 Personal Air Sampling, Personal Protective Equipment and Safety Risks

Personal air sampling was conducted for the workers that were participating in cleaning activities. Air sampling conformed to the site specific Air Surveillance Plan which is included in Section 8.0 of the Site Health and Safety Plan. The Site Health and Safety Officer conducted daily air sampling of employee exposure to three contaminants: asbestos, alpha-quartz and lead. On only one occasion during the study was the permissible level for alpha-quartz exceeded. Comprehensive information relative to health and safety is provided in Attachment E, *Health and Safety Plan, Changes and Issues*.

Personal Protective Equipment
The study was conducted using the following levels of protection:

- Level D+: This level of protection requires employees to wear safety glasses, disposable coveralls (Tyvek®), disposable head coverings, disposable undergarments, disposable gloves, disposable boot covers, steel-toed boots, and hearing protection (if applicable).

- Level C: This level of protection requires employees to supplement the above with an air purifying respirator (half face or full face PAPR) equipped with P100 cartridges.

Safety Risks
At project onset, all units and common areas were inspected to assess building condition and to identify safety risks such as: gas, oil, and water leaks; perishable foods; rodent/insect infestations; damaged floors, walls, stairways, and elevators. All safety risks identified were eliminated prior to commencement of cleaning activities. The safety risks identified included electrical concerns, necessary building repairs, building access concerns, and rodent infestation. Additional details relative to safety risks are provided in Attachment E, *Health and Safety Plan, Changes and Issues.*

2.3 Equipment

EPA selected equipment similar or identical to the equipment observed in use by residents of lower Manhattan after the attack on the WTC, and tested use of this equipment in performing the cleaning of residential apartments at the project site. A commercially produced vacuum manufactured by Nilfisk™ Advance Vacuum Systems was selected to provide industrial strength vacuuming technology, because many management companies who cleaned residential and commercial spaces in lower Manhattan purchased Nilfisk™ equipment. Furthermore, confidence in the strength of the equipment had been evidenced in that it had been used by companies to clean federal buildings of anthrax prior to the study.

In the aftermath of the WTC attack, vacuums were made available to the general public by the American Red Cross, and a vacuum reimbursement program was established by New York State in conjunction with FEMA. The vacuums made available to the public included vacuums with HEPA-filtration made by Eureka®, Hoover® and Mastercraft®. Shop vacuums produced under the Ridgid® brand and Craftsman® brand were also observed in use by residents of lower Manhattan in the wake of the attack. High efficiency particulate air (HEPA) filters are capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter. The study tested cleaning using vacuums with and without HEPA filtration.

An Air Filtration Device (AFD) is a local exhaust system with HEPA filtration that is capable of creating and maintaining a negative pressure differential between the outside and the inside of the work area. The AFD functions as a stand-alone piece of equipment in a room. During the study, the AFD was used as an air-polishing device, to capture dust particles that became airborne as a result of disturbances caused by the cleaning activities. The study tested cleaning with and without use of AFDs.

Shop vacuums are easy to maneuver and are designed to pick up dust, shavings and debris. Upright vacuums are designed for use on horizontal surfaces such as floors. For purposes of the study:

- The Eureka® and Hoover® upright vacuums were purchased both as devices with HEPA filtration and as devices with standard bag filtration.
- The Ridgid® and Craftsman® shop vacuums were interchangeable. (Both can be changed from a standard cartridge filter to a HEPA-rated cartridge.)

Wet vacuums are designed to clean horizontal porous surfaces with soap and water (shampoo). The wet vacuum used in the study was an upright model, providing a suction head lift of 103 inches of water. Suction head is the measure of the suction capacity of a wet vacuum pump. In this case the wet vacuum pump is capable of lifting water 103 inches.

Table 3.0 identifies equipment manufacturer and model used in the study. However, there was no intent of the study to compare manufacturers or the relationships between any particular devices. The objective of the cleanup was to confirm the effectiveness of cleaning of individual spaces using different equipment.

Table 3.0
Equipment Manufacturer and Model

Make	***Model***
Nilfisk™	CFM127
Hoover® (HEPA)	U6459-900
Hoover®	U5046-930
Craftsman®	113.170250
Eureka® (HEPA)	S4170
Eureka®	7618
Ridgid®	WD17351
Carpet Express®	C4 (wet vac)
ACSI® (AFD)	400/600
ForceAir 2,000® EC (AFD)	1000/2000

Field Observations of Equipment Used

Upright vacuums are designed for use on horizontal surfaces such as floors. These use rotating devices to collect dust, and do not provide direct suction force. Brush attachments were used on the horizontal surfaces that could be reached. The hose attachments were limited according to their length and hose type. Plastic hose was not as resilient as rubber or cloth-covered hose. Attachments such as the crevice tools were used with ease because of their small profile. These were made of plastic; therefore, they were not a concern around potential electrical sources. The vacuums were noisy in the areas being cleaned due to the unfurnished state of the units, and accordingly, the enhanced acoustics.

Shop vacuums are designed to provide easy unload of bulk debris. This type of vacuum typically provides a suction head lift of 48-51 inches of water. The shop vacuums were easy to maneuver even when pulled by the hose. They were also noisy in the unfurnished rooms. The hoses and attachments were larger in diameter than those of the upright vacuums. Crevice tools were larger than some spots to be cleaned. Cartridges loaded quickly with the fine dust being suctioned. Use of tube extensions and extra hose lengths facilitated the cleaning of vertical walls and ceilings. The cartridge filters required vacuuming to be cleaned of caked dust. Once this was completed, the suction increased dramatically.

Commercial quality vacuums are designed for heavy use. This type of vacuum typically provides a suction head lift of 82-93 inches of water. Certain accessories were specially designed for specific applications and required some understanding of their operational adjustments. The added instrumentation facilitated monitoring the operation of the equipment. Fine dust clogged the primary filter cloth easily when used in extreme conditions; however, the HEPA filter when checked visually appeared free of dust. Only the cloth filter required vacuuming. The Nilfisk™ vacuum has a duel motor drive, providing an intense suction allowing for better lift of trapped material than that obtained by off-the-shelf equipment. Each Nilfisk™ vacuum arrived with a 20 amp rated plug that did not conform to the receptacles in the building. The appropriate plug ends were procured and installed. At 92.6 pounds, the vacuum can be handled by one person who maneuvers it in a manner similar to the maneuver of a shopping cart. However, two people are required to ascend stairs with the vacuum.

Wet vacuums are designed to clean horizontal porous surfaces with soap and water (shampoo). The wet vacuums used in the study were an upright model, providing a suction head lift of 103 inches of water. This vacuum was easy for one person to use. The vacuum required hot water to work properly. The hot water had to be hand carried to the site in five-gallon buckets because hot water was not available. The vacuum could spray water or soap individually or both soap and water at the same time. It uniformly sprayed soap and water on the carpet. The soap and water was allowed to penetrate the carpet, and was then suctioned off of the carpet. This spraying capability facilitated the removal of dirt, dust, and debris from the surface.

Use of Swiffer® brand cloths was discontinued quickly because of the small coverage area provided. The cloth quickly loaded with dust and dried out. It then streaked the surfaces being cleaned. Both wet and dry types of Swiffer® cloths were used with the same result. Windex® brand cleaner and water was used as a replacement for the Swiffer® cloth.

Use of water without soap on horizontal surfaces resulted in smearing and re-deposit of the dirt.

Water and ammonia-based cleaner (Windex®) did not smear. No difference in the cleanliness of the carpets based on use of water or soap and water was observed visually.

2.4 Cleaning Methods

Eleven tests were developed to evaluate eleven different cleaning methods that may have been used to clean residential and commercial spaces. To evaluate the equipment under comparable and varying conditions, tests were performed using similar equipment to clean areas that had both significant and minimal dust. Every attempt was made to evaluate each test on two spaces. An outline of the tests and prescribed cleaning methods follows:

Test 1 (A, B)

A. Cleaning was conducted using residential quality upright vacuums and shop vacuums that are available from Hoover®, Eureka®, Ridgid® and Craftsman®, as well as wet wiping.

B. Cleaning was conducted with the vacuums used in Test A, with the addition of an AFD, as well as wet wiping.

Test 2 (A, B)

A. Cleaning was conducted in up to two units using HEPA-filtered upright vacuums and HEPA-filtered shop vacuums available from Hoover®, Eureka®, Ridgid®, and Craftsman®, as well as wet wiping.

B. Cleaning was conducted with the vacuums used in Test A, with the addition of an AFD, as well as wet wiping.

Test 3 (A, B)

A. Cleaning was conducted in up to two units using commercial quality HEPA-filtered vacuums manufactured by Nilfisk™ Advance Vacuum Systems, as well as wet wiping.

B. Cleaning was conducted in up to two units with the vacuums used in Test A, with the addition of an AFD, as well as wet wiping.

Test 4 (A, B ,C, D, E)

A. Cleaning was conducted in commercial units and common areas using commercial quality HEPA-filtered vacuums manufactured by Nilfisk™ Advance Vacuum Systems[8]. An AFD was used. Debris that could not be vacuumed was manually removed and disposed.

B. (Wet Wiping.) Additional cleaning of wall surface areas was conducted to remove any residues that may not have been removed by vacuuming. Wiping of the walls with a damp soapy cloth was performed to remove residual dust that may have adhered to the walls from the force of the collapse. Wet wiping of walls was performed in the Chiropractor's Office, the Mattress Store, Unit 3C, and Unit 3B.

C. (Wet Vacuum.) Wall-to-wall carpeting was present in the Chiropractor's Office, and the Mattress Store. The Chiropractor's Office was wet-vacuumed using hot water; the Mattress Store was wet-vacuumed using hot water and carpet shampoo.

D. (HVAC Cleaning.) HVAC systems are located in the Chiropractor's Office, the Mattress

[8] Test method 4A is the same as test method 3B. Both test methods use the same cleaning equipment. Test method 4A was used in commercial units; test method 3B was used in residential units.

Store, Lemongrass Grill, and The Food Exchange. These systems were cleaned by professional duct cleaning companies using standard cleaning procedures.

E. (Wet Wiping.) Wet wiping was accomplished using water only on horizontal and vertical surfaces. This cleaning procedure was applied in the Chiropractor's Office (bathroom tile floor and desktop), the Mattress Store (vinyl tile floor and window ledge), and the Barber Shop (vertical and horizontal surfaces).

Modified Scope A – Lower Manhattan Cleaning Procedure
Added as an amendment to the original work plan, this cleaning method mirrored the procedure that EPA and NYC are implementing as part of the Indoor Air Residential Assistance-WTC Dust Cleanup Program, with the exception of the cleaning of personal belongings. This procedure is presented in Attachment F, *Scope A - Lower Manhattan Cleaning Procedure.*

2.5 Mobilization

Site activities began on June 17, 2002. Activities included mobilizing equipment and supplies, establishing a temporary office, identifying emergency support services and contacting vendors to arrange for specialized services and delivery of bulk items. Consolidated Edison was contacted and installed a shunt from the main trunk line to the building to provide electricity. Mobilization was completed by June 21, 2002. On June 24, 2002, WRS laborers arrived at the study building to begin work. Work continued through the third week of October 2002.

Prior to commencement of the study, bulk samples were collected from three units in the building. Samples were collected from units that contained excessive amounts of dust, in an attempt to characterize the asbestos concentration in dust from worst case locations in the building. Samples were collected from the Chiropractor's Office, the Mattress Store and residential Unit 5C. Analysis of the samples indicated that less than one percent asbestos was present. Therefore, NYC asbestos licensing and certification regulations did not apply to the project. The federal OSHA asbestos standard (29 CFR 1926.1101) did apply to the project. At EPA direction, WRS assigned a team of asbestos-trained personnel to the project. Two licensed supervisors and two licensed workers were part of the operations team. All field operations personnel had completed all applicable training.

2.6 Cleaning of Residential Units

The cleaning of each of the thirteen residential units was accomplished using the vacuum equipment type prescribed by the designated test, as presented in Attachment H, *Synopsis of Cleaning Methods by Building Area and Fact Sheets*. Management of waste was accomplished as the cleaning activities occurred. The sequence of procedures followed in each residential unit was the same.

Security. The first cleaning activity in each unit related to the securing of potential access points from air infiltration, such as wall and window mounted air conditioning units. It was necessary to clean the access points as they were secured, to ensure that use of the access points after cleaning activities would not result in re-contamination. In order to limit unauthorized access to the building and to protect equipment and supplies during daytime work hours, previously damaged windows were secured and the entrance door to the building was continuously monitored. At the end of the work day, the entrance door on the Cedar Street side of the building was locked.

Where glass windows had been blown out, the temporary wood panels that had been installed for site security purposes were removed and reinstalled to afford complete closure. Intact windows were opened, and the jambs, sashes, and sills were cleaned thoroughly. The windows were then closed. In windows where an air conditioning unit was present, the air conditioning unit was removed from the window. The temporary protection on the exterior of the window was removed. The window cabinet that had housed the air conditioning unit was vacuumed, then covered with plastic to prevent air filtration. The air conditioning unit was vacuumed to remove loose dust, wrapped in plastic, and disposed. Wall mounted air conditioning units were removed from the wall, and sealed in plastic. The wall cabinet that had housed the air conditioning unit was vacuumed, then covered with plastic to prevent air infiltration. The air conditioning unit was vacuumed to remove loose dust, wrapped in plastic, and disposed. Disposal of the air conditioning units and installation of new self-contained ductless systems was performed by the building owner following completion of the study.

Waste Management. At the onset of the project, due to limited space outside the building, it was necessary to line the hallways with plastic and to temporarily locate the items to be disposed, including personal possessions, until a roll-off container could be procured. As cleaning progressed, waste was accumulated and staged in the common areas by the elevator until a sufficient quantity was gathered to fill a roll-off container. The waste was wrapped in plastic to avoid cross-contamination of the hallways leading to the roll-off container. The removed materials were hand-carried through the hallways and down the stairwell to the roll-off container located outdoors, because the elevator was not functioning.

Vacuuming. Vacuuming commenced at the entrance doorway of the unit. Working from the ceiling to the floor, toward the furthest area of the unit, all surfaces were vacuumed of loose dust and debris. Walls, ceilings, doors, pipes, ledges, closets, cabinets, shelving, trim, fixtures, and electrical outlets were vacuumed as they were encountered. Upon reaching the furthest point in the unit, the direction of cleaning was reversed and the same cleaning procedures were followed while returning to the point of origin at the entrance doorway. This procedure accomplished the cleaning of each unit twice using the designated cleaning method.

Wet Wiping. Wet wiping was performed on all horizontal surfaces to remove dust. The WRS cleaning crew applied wet wiping to all horizontal surfaces, including the floor, as they progressed from the furthest point of the interior of the unit back to the door. Wet wiping was the last activity performed in the unit.

Cleaning Air Conditioning Units. As noted in Section 2.1 above, two types of air conditioning systems were used in the residential living spaces: window/wall mounted air conditioners, and ceiling-mounted ductless air conditioners with remote condenser/compressor units. Bathroom fans also presented airflow routes that needed to be cleaned. Ceiling-mounted air conditioners were cleaned using HEPA-filtered equipment. The grills were removed to provide access to the interior. The condenser and compressor units on the roof were visually inspected and found to be clean. Removal of the ceiling cover to access the bathroom fan assemblies was necessary. The fan and motor were vacuumed; the fan housing was wet wiped. The interior of the exhaust duct was vacuumed to the first foot. The unit was reassembled and covered with poly sheeting.

Baseboard heating components, including the hydronic finned radiation systems, were cleaned. The protective covers were removed to expose the heating elements. The fins were then vacuumed and brushed simultaneously to remove dust. The space located under the heating element was vacuumed. The protective covers were reattached.

Cleaning of Refrigerators, Dishwashers and Stoves (including exhaust fans). Prior to cleaning refrigerators, the appliance was unplugged and checked for food contents. If present, food was removed, bagged and disposed. The coils, underbody, compressor compartment, and back of each refrigerator was cleaned. Dust from the cooling coils was cleaned by elevating the appliance and simultaneously using vacuums and specialized brushes. Upon completing these activities the floor area where the refrigerator had been located was cleaned. Prior to cleaning, each stove unit was disconnected from its electric receptacle and gas line. Old exhaust fan lights and filters were removed and replaced. The first foot of the exhaust duct was vacuumed. The stove hood was vacuumed. Prior to cleaning dishwashers, the toe plate was removed and dust was vacuumed from under the appliance. After cleaning, all appliances were staged on plastic for subsequent removal by the owner, who had decided to replace them.

Pre-Cleaning and Post-Cleaning Sampling. Pre-cleaning and post-cleaning sampling was performed to measure levels of COPC. Sampling data was reviewed and a decision regarding the need for additional cleaning was made. Wipe samples were collected from solid surfaces, both vertical and horizontal. A micro vacuum technique was used on sofas, mattresses, and porous materials. All sampling was conducted in accordance with the Quality Assurance Project Plan (QAPP) contained within Attachment G, *Sampling and Analysis Plan*.

2.7 Cleaning of Commercial Units, Common Areas and Basement

The cleaning of each commercial unit was accomplished using the vacuum equipment type prescribed by the designated test, as presented in Attachment H, *Synopsis of Cleaning by Building Area and Fact Sheets.* Management of waste was accomplished as the cleaning activities occurred. The sequence of procedures for vacuuming, wet wiping, waste management, and pre-cleaning and post-cleaning sampling mirrored the procedures used in the residential units. Cleaning of the HVAC systems and carpets presented the only significant differences from the procedures used to clean the residential units. A discussion of the procedures used to clean the HVAC systems and carpets in the commercial units and the procedures used to clean the common areas and the basement follows.

HVAC Systems

The Chiropractor's Office is located in the north end of the building at the Liberty Street address. It contains four patient rooms and an administrative section with a waiting room and a half bath facility. The air conditioning system in the unit is suspended from the third floor deck above a suspended acoustical tiled ceiling, located in the south end of the office space. It utilizes a common closed return to convey air to the blower cabinet. The supply trunk runs northward, supplying air to the balance of the rental space through supply diffuser grills. The system's condenser/compressor unit is located on the building's atrium roof area at the second floor elevation.

The Mattress Store is located in the north end of the building at the Liberty Street address. Space design is open throughout the unit, with a half bath, utility closet, and coat closet located in the south end of the room. The A/C system air handler is suspended under the third floor deck, above the suspended acoustical tiled ceiling. The system has two closed return air grills, a blower cabinet, and a supply trunk with a four way directional supply grill. The system's condenser/compressor unit is located in the building's atrium roof area at the second floor elevation.

The procedures used to clean the Chiropractor’s Office and Mattress Store were identical. They mirrored the procedures used by HVAC cleaning companies when responding to ordinary HVAC cleaning requisitions. The following cleaning activities were conducted, in the following order:

1. A clean plastic barrier was installed on the floor surface, three feet to either side of the suspended HVAC system, from the return intake to the furthest supply grill.
2. Access points were selected at the return and supply sides of the duct system. A HEPA-filtered vacuum collection system was installed at the end of the supply run to collect internal dust.
3. A rotating brush system was used to dislodge dust in the direction of the vacuum collection system.
4. Degreasing agents were used on the HVAC internal coil units and cleaned. Supply grills were cleaned in a similar fashion.
5. A biocide agent was applied to the duct's internal components and allowed to dry.
6. An encapsulant was applied to the internal surfaces in order to ensure that residual dust was sealed in.
7. The work area was cleaned of all equipment and plastic protection.
8. The system was visually inspected at the air handling unit access panels for view of internal components. The duct work was visually inspected for dust in the return and in the supply lines.

Carpet Cleaning (study)
Two methods were utilized to clean the carpets in the Chiropractor's Office and the Mattress Store: 1) Nilfisk™ vacuum with HEPA filtration, and 2) wet vacuuming. Carpets were wet-vacuumed in the Chiropractor's Office and in the Mattress Store, using standard carpet shampooing equipment available to the public at rental stores. The carpets were cleaned twice, sampled, and disposed as porous material. Initially, the carpets were cleaned running in the direction of the room from front to back (Liberty Street to Cedar Street). The carpets were then cleaned again, in a direction crossing the room from side to side.

Warm water only was used in the Chiropractor's Office. Soap (carpet shampoo) and warm water were used in the Mattress Store. Seven-in-One™ brand professional carpet shampoo, manufactured by Kent Investment Corporation, was diluted at two ounces per gallon of water. This dilution achieved 1,400-2,000 square feet of cleaning coverage.

Common Areas (study)
The common areas were the first areas of the building cleaned, in order to provide a dust-free area for Level D entry through the common spaces, and to provide a safe location for equipment storage. All foyers, stairways, and halls were vacuumed using commercial quality HEPA vacuums. All horizontal and vertical surfaces in the common areas were wet wiped where

possible. The common areas were re-cleaned as necessary due to traffic.

Stairwells were cleaned commencing at the Cedar Street doorway vestibule starting in the stairwell at the ground entrance and proceeding to the rooftop access door. The stairwells were then re-cleaned, following the same route back. The ceilings, walls, handrails, balusters, treads, risers, fire protection equipment, lighting, and trim were cleaned.

The hallways of each floor were accessed through fire doors at the stairwell platform for each floor. Access to each floor remained closed until each stair well had been cleaned from bottom to top, and from top to bottom. The hallways were cleaned in the same manner as the stairwells, except that not all of the hallway walls were wet wiped. The second floor hallway floor was covered with vinyl tile. It was wet wiped. However, the third and fourth floor walls were made of plywood. Wallpaper originally applied to the wall surfaces had been removed, leaving a rough paste finish that was not conducive to wet wiping.

Each hallway contained a utility room with a wall-enclosed trash chute that led to the basement of the building. Some items were discovered in the utility closets. Boxes that were unopened were vacuumed and left in place. Other items were packaged for disposal. The utility areas did not seem to be impacted by WTC dust.

An elevator accessing each floor was located on the Cedar Street side of the building. It was not operational for the first two months of the project. Eventual repair of the elevator by others allowed access to the inner compartment. The elevator cab and the exterior top of the cab were vacuumed.

Basement (study)

The basement of the building is comprised of separate rooms: a trash compactor room, a motor room associated with the elevator shaft, a common access area from the street, and a fire protection equipment room. The brick walls of the basement were encrusted with mud, indicating a high water level at some time in the building's history. These rooms were cleaned using commercial HEPA equipment. Loose debris related to stone and mortar deterioration was vacuumed from the walls and ledges of the base of the elevator shaft. Small rocks, paper, debris, and rodent carcasses were removed.

2.8 Cleaning of Non-Study Commercial Units

As discussed in Section 2.1, three commercial units were cleaned at the conclusion of the study, although they were not part of the study: Lemongrass Grill, the Food Exchange and the Barber Shop. These units were cleaned using cleaning methods as presented in Attachment H, *Synopsis of Cleaning Methods by Building Area and Facts Sheets*.

The sequence of procedures for vacuuming, wet wiping, waste management, and pre-cleaning and post-cleaning sampling mirrored the procedures used in the residential units. Management of waste was accomplished as the cleaning activities occurred. Disposal of debris was handled in the same manner as in the residential units. Cleaning of the HVAC systems presented the only significant difference from the cleaning procedures used in the residential units. A discussion of the procedures used to clean the HVAC systems follows.

Lemongrass Grill occupies 2,351 square feet of space. It utilizes a self-contained re-circulating HVAC system, with no outdoor supply air, that is suspended above the floor in the south end of the restaurant. Return air enters the unit through a grill located in the front side of the unit. The air-handling unit is accessible through access doors on either side of the unit. The unit is enclosed with one-half-inch sheet rock. A supply trunk runs northward through the restaurant with three supply branches. A second source of duct is located adjacent to an exhaust hood for the cooking equipment. This system is separate from the HVAC and supplies makeup air to the hood area. Ambient air is drawn in from a grill above street level to a blower inside the building that leads to a supply trunk. Four supply grills are adjacent to the food exhaust hood.

The Food Exchange is a restaurant that occupies 2,324 square feet of space, running from Cedar Street at the South end through to Liberty Street on the north end. Two side-by-side air handlers that share the supply air duct system are supported above a decorative tinned acoustical ceiling. The supply duct system splits mid-building and runs approximately fifty feet in two opposite directions. A water cooling tower is located outside the building on the building atrium. The air handlers use a common air return with no makeup air being drawn from outside the building. Access to the duct work on the north side of the building must be through the access grill openings, because the ceiling is enclosed in sheet rock. Access to the duct work on the south side is through a suspended ceiling. The ceiling tiles in the area of the duct work and the insulation wrapping the duct work were removed prior to cleaning the ducts. The space from the suspended ceiling to the upper deck, including the grid work, was vacuumed. An isolation wall was fabricated to bar the north side from the south side.

The services of an HVAC consultant were secured to develop site-specific cleaning procedures for the Lemongrass Grill and the Food Exchange, and to stipulate necessary controls, protective measures, and standards for the cleaning and sampling confirmation process. These procedures are provided in Attachment I, *HVAC Cleaning Procedures*.

The Barber Shop is situated below grade. The unit contains a ductless A/C system with a remote condenser/compressor unit. The condenser/compressor unit is located above the entrance door that accesses Liberty Street. The air handling system and the condenser/compressor unit was cleaned in an effort to remove accumulated residual dust and debris so that the units could be handled for disposal by the building owner.

2.9 Cleaning of Building Exterior/Roof

Cleaning of the building exterior and the rooftop was accomplished and monitored by the NYCDEP. NYCDEP hired an asbestos abatement contractor to accomplish this task. Cleaning of the building exterior was initiated at approximately the same time that cleaning of the interior of the building began. NYCDEP subcontractors were required to vacuum and wash the building exterior twice over a two-day period before acceptable results were achieved.

The building has two roof elevations: An atrium roof at the second floor level, and a roof at the fifth floor level. Four residential compressor/condenser units are situated on the fifth floor roof. These service ductless air conditioning units in the residential apartments. Prior to the study, these units were cleaned by outside contractors. Three commercial compressor/condenser units are situated on the atrium roof of the building. These units service the Chiropractor's Office, the

Mattress Store and the Lemongrass Grill. These three units were cleaned as part of the study. The Food Exchange air conditioning system utilizes a water-cooling tower located on the atrium roof that was also cleaned.

2.10 Summary of Cleaning Activity

Table 4.0 presents an overview of the tests used to clean residential and common areas of the building as well as a description of that area. A full description of the cleaning activities in each area can be found in Attachment H, *Synopsis of Cleaning Methods by Building Area and Fact Sheets.*

Table 4.0
Summary of Cleaning Activity

Unit/Area	*Equipment Used*	*Cleaning Method*	*Wet Wipe*		*First Cleaning*	*Second Cleaning*	*Third Cleaning*
2A	Ridgid® shop vacuum and Hoover® upright, AFD	Test 1B	Horizontal Surfaces	soap/water	**Asbestos/ overload**	Cleared for COPC	
2B	Industrial HEPA vacuum	Test 3A	Horizontal Surfaces	soap/water	Cleared for COPC		
2nd Floor Common Area	Industrial HEPA vacuum, AFD	Test 4A	Horizontal & Vertical Surfaces	soap/water	Cleared for COPC		
3A	Craftsman® shop vacuum and Eureka® upright, w/HEPA and AFD	Test 2B	Horizontal Surfaces	soap/water	Cleared for COPC		
3B	Industrial HEPA vacuum, AFD	Scope A	Horizontal & Vertical Surfaces	soap/water	**Asbestos/ overload and lead (wipe) exceedence**	Cleared for COPC	
3C	Craftsman® shop vacuum and Eureka® upright Industrial HEPA vacuum, AFD	Test 1A Test 3B	(1A)(1A) (3B) Horizontal & Vertical Surfaces	soap/water	**Asbestos/ overload** and lead (micro vacuum) exceedence	**Asbestos/ overload and MMVF (air) exceedance**	Cleared for COPC
3D	Ridgid® shop vacuum and Hoover® upright	Test 1A	Horizontal Surfaces	soap/water	**Asbestos/ overload**	Cleared for COPC	
3rd Floor Common Area	Industrial HEPA vacuum, AFD	Test 4A	Horizontal & Vertical Surfaces	soap/water	Cleared for COPC		
4A	Craftsman® shop vacuum and Eureka® upright, HEPA	Test 2A	Horizontal Surfaces	soap/water	**Asbestos/ overload and alpha-quartz (air) exceedence**	Cleared for COPC	
4B	Ridgid® shop vacuum and Hoover® upright, HEPA and AFD	Test 2B	Horizontal Surfaces	soap/water	Cleared for COPC		
4C	Craftsman® shop vacuum and Eureka® upright	Test 1A	Horizontal Surfaces	soap/water	Cleared for COPC		

Table 4.0 **Summary of Cleaning Activity**							
Unit/Area	***Equipment Used***	***Cleaning Method***	***Wet Wipe***		***First Cleaning***	***Second Cleaning***	***Third Cleaning***
4D	Ridgid® shop vacuum and Eureka® upright, HEPA	Test 2A	Horizontal Surfaces	soap/water	**Lead (wipe) exceedance**	Cleared for COPC	
4th Floor Common Area	Industrial HEPA vacuum, AFD	Test 4A	Horizontal & Vertical Surfaces	soap/water	Cleared for COPC		
5A	Industrial HEPA vacuum, AFD	Test 3B	Horizontal Surfaces	soap/water	**Lead (wipe) exceedance**	Cleared for COPC	
5C	Industrial HEPA vacuum	Test 3A	(3A)(3A)(3B)	soap/water	**Asbestos/ overload and MMVF (air) exceedance**	**Asbestos/ overload and MMVF (air) exceedance**	Cleared for COPC (asbestos: modified-aggressive sampling)[9]
	Industrial HEPA vacuum, AFD	Test 3B	Horizontal Surfaces				
5D	Industrial HEPA vacuum , AFD	Test 3B	Horizontal Surfaces	soap/water	Cleared for COPC		
5th Floor Common Area	Industrial HEPA vacuum, AFD	Test 4A	Horizontal & Vertical Surfaces	soap/water	**Asbestos/ overload**	Cleared for COPC	
Cedar St. Stairwell	Industrial HEPA vacuum, AFD	Test 4A,4B	Horizontal & Vertical Surfaces	soap/water	Cleared for COPC		
Elevator Shaft Basement Area	Industrial HEPA vacuum, AFD	Test 4A	No Wet Wipe		Cleared for COPC		
Liberty St. Stairwell	Industrial HEPA vacuum, AFD	Test 4A,4B	Horizontal & Vertical Surfaces	soap/water	**Alpha-quartz (air) exceedance**	Cleared for COPC[10]	

2.11 Difficulties Encountered and Resolutions

A discussion of the difficulties encountered during the cleaning portion of the study, along with a discussion of how they were resolved is presented below.

Site Conditions

Rummaging. Site debris, abandoned possessions, and construction related waste materials were wrapped in plastic sheeting, and carried to a staged roll-off container. When filled to capacity, the

[9] Asbestos air clearance criterion was met using modified aggressive air sampling protocol; however, the clearance criterion was not met using aggressive air sampling.

[10] Silica analytical methods were note received until after project completion. However, a single elevated sample result in a low occupancy area of the building was not considered to be a health hazard. Therefore, no further cleaning was conducted.

containers were transported off site for disposal, and replaced with empty containers. It was discovered that people were rummaging through the contents of the roll-off containers after personnel left the site for the day. To deter this activity, it was necessary to monitor the debris box at night. The staff of the cleaning contractor was utilized to provide security. Shift hours were adjusted to add two-hour increments of coverage by crew members until midnight. This eliminated the rummaging.

Elevator. The elevator was out of service from project commencement until late August. Therefore, it was necessary to manually carry individual items down the stairways of many floors for disposal in the roll-off container. Many unanticipated labor hours were dedicated to hand carrying the disposable items.

Hot Water. The building was without gas service; therefore, hot water was unavailable. Hot water was only used for the shampooing of carpets. Hot water was obtained from a local delicatessen and manually transported in five-gallon buckets as needed. Cold water was used to clean the remainder of the facility.

Electric Service. EPA contacted Consolidated Edison directly to install a shunt from the main trunk line to the building to provide electricity by the mobilization date.

Office Space. The location and the condition of the building did not allow for office space. Nor was there sufficient space proximal to the site to set up an office trailer. Therefore, office space to accommodate copying and administration was established in a hotel several blocks away. Because the building was without telephone service, in order to enable continuous communication, personnel carried cell phones at all times.

Spoiled Food. At project commencement, information obtained by others indicated that all foodstuffs in the building were removed shortly after September 11, 2001. However, a walk-in box in the Lemongrass Grill contained perishable food that had been overlooked. Large quantities of fish and shrimp were discovered that had been spoiling for nine months. The odor was noxious. Additionally a previously undiscovered chest freezer was filled with spoiled food including fish, shrimp, beef and miscellaneous food items that required removal. Approximately 200 pounds of spoiled food was collected, double bagged and disposed of utilizing a NYC Sanitation Truck. Water from melted ice and rotting food debris at the bottom of the freezer was removed and the area was sanitized. Similarly, the refrigerators in the apartments were to have been emptied of all solid contents by others shortly after the World Trade Center attack. However, residual foods remained. These spoils were also removed and disposed. The building owner subsequently disposed of all kitchen appliances, including the refrigerators.

Rodents. Dead rats and mice were prevalent in the basement areas, in the elevator shaft, and in some rental units. Rodent droppings were evident on floor surfaces throughout these areas. The remains of rodents were collected, bagged and deposited in the roll-off containers. Live rats were encountered in the Lemongrass Grill and the Food Exchange. The assistance of the building owner was sought to hire an exterminator.

Coordination

Tenant Response. Residents did not consistently appear at the scheduled time for appointments to address disposition of personal belongings. This caused slight delays to cleaning efforts. It was necessary to adjust the cleaning schedules to minimize the delays.

Parking. Although an arrangement had been made with the Office of Emergency Management (OEM) for EPA and its subcontractors to park vehicles on Cedar Street, the NYC Police Department ticketed vehicles without regard to established verbal agreements. Time expended to respond to tickets was significant. Communications with the OEM were helpful at times.

Building Contractor Coordination. The Baldwin Realty Company, the resident management company of the building owner, had not performed any repairs on the building since September 11, 2001, because the entire area had been off limits to the public. Shortly after the study began, the management company's repair and maintenance contractors commenced activities including: replacement of windows, doors, sashes, and suspended ceilings; repair of the elevator; and removal of refrigerators and stoves. EPA and its contractors were required to closely coordinate activities with these contractors to avoid interference with the study, and to ensure that areas were cleaned and sampled before the contractors commenced their work. At onset of the project, meetings were scheduled to discuss activities and to provide a schedule of cleaning activities. The intent was to clean and clear areas prior to the performance of any maintenance activities. Prior to commencing cleaning, signs were erected and caution tape was placed around the areas undergoing cleaning, to avoid interference by other contractors. Unfortunately, work conducted by window repair and floor contractors created dirt and debris that necessitated re-cleaning of some units. This situation occurred between sampling events only once, in Unit 5C, between the collection of air samples for asbestos.

Health and Safety Concerns

PPE. The only health and safety concern related to PPE was fogging goggles. Fogging goggles caused personnel some degree of visual difficulty. The problem was solved by applying an anti-fogging agent to the lens of the goggles. The requirement for goggles was downgraded to a requirement for safety glasses when it was determined that the amount of dust produced was not irritating to an employee's eyes.

Personal Air Sampling. A very small percentage of the personal air samples for asbestos were overloaded with dust and could not be analyzed by the laboratory.

Baseboard Heating Cleaning. Intensive labor was required in order to remove visible dust from the baseboard heating systems.

Heat Stress. Heat exhaustion, heat cramps, and heat stroke were a major concern due to the extreme heat experienced during cleanup activities. The heat stress hazard was mitigated by mandating frequent breaks to replenish fluids and lower core body temperatures.

Heavy Lifting. All units contained heavy objects that were moved, disposed of, or lifted to enable cleaning underneath. The Site Health and Safety Officer frequently instructed WRS employees relative to proper lifting techniques. All personnel were directed to obtain assistance when lifting objects over fifty pounds. The non-functioning elevator resulted in a quantity of heavy lifting that significantly exceeded what had been anticipated at project commencement.

3. Sampling Activities

3.1 Baseline Sampling

Prior to initiating cleanup activities, bulk composite samples were collected in each of the three units which had sufficient dust present to collect a bulk sample. These Units included 5C, and the two commercial units on the second floor (Mattress Store, Chiropractor's Office). The bulk samples were analyzed for alpha-quartz, MMVF, lead, PAH, dioxins/furans, and asbestos. Due to insufficient volume, the sample collected from Unit 5C was not analyzed for PAH or dioxins/furans.

EPA's evaluation of the analytical data from the bulk composite sampling event was utilized in identifying COPC concentrations present in the settled dust, and assisted EPA in determining the applicability of regulatory standards and in identifying potential health and safety concerns. Analytical results of the bulk sampling are not included in this report.

In addition to the collection of bulk composite samples, baseline air samples were also collected. These samples were collected from the breathing level (5-6 ft.) and from the main living area of the units which, based upon visual observations, were both the least and the most impacted by the WTC disaster. Samples collected from the least impacted apartments (Units 3A and 3B) represented a best case test and were analyzed for asbestos and MMVF. Samples collected from the most impacted areas (Mattress Store, Chiropractor's Office) represented a worst case test and were analyzed for dioxin/furans, PAH, asbestos and MMVF.

EPA's evaluation of the baseline air sampling event determined that the airborne concentrations of PAH and dioxin/furans were not a health concern; therefore, the collection of additional air samples of these parameters was not necessary. This decision was based on the analysis of baseline bulk and air PAH and dioxin/furan samples which were collected from the most severely impacted units. As the air samples did not contain PAH or dioxin/furans at concentrations above the stringent primary clearance criterion as established in the COPC/Benchmarks Report[11], EPA determined that airborne PAH or dioxin/furans would also not be present in the other less impacted units. EPA's decision to eliminate PAH and dioxin/furan analyses for air samples was later confirmed through the collection of reference samples in Unit 4C. These samples were analyzed for PAH and the analytical result was found to be below the clearance criterion of 0.2 $\mu g/m^3$.

3.2 Pre-Cleaning Sampling

Prior to cleaning activities, wipe samples were collected from each of the thirteen residential units and the two commercial units included in the study (Chiropractor's Office, Mattress Store). The wipe samples were collected from a 10 cm x 10 cm area using dedicated, disposable templates which were left in-place. One sample was collected from the surface of each of the following four non-porous locations within each unit: ceiling, wall, bare floor, and horizontal surface (e.g., counters, tables, dressers, window sills). All samples were analyzed for asbestos, MMVF, lead, PAH, dioxins/furans, and alpha-quartz. Exceptions to this were the ceiling samples which were

[11] U.S. Environmental Protection Agency. (September, 2002). *World Trade Center Indoor Air Assessment: Selecting Contaminants of Concern and Setting Health-Based Benchmarks*.

analyzed for asbestos only, and horizontal surfaces which were also analyzed for total dust. Generally, pre-cleaning air sampling was not conducted because of concerns that given the presence of significant levels of dust, using the aggressive technique might make overloading the filters more likely.

Pre-cleaning sampling also included the collection of micro vacuum samples from up to six porous surface areas (e.g., carpets, furniture fabric) in twelve of the thirteen residential units, and both commercial units included in the study (Mattress Store, Chiropractor's Office). The samples were collected from a 10 cm x 10 cm area using dedicated, disposable templates which were left in place. Each unit contained a different number of porous surface sample areas, except Unit 4B which did not have any porous surfaces from which to collect a sample. The micro vacuum samples were analyzed for lead and for asbestos (TEM).

3.3 Sampling During Cleaning

All sampling conducted during cleaning activities was undertaken for the purpose of documenting potential worker exposure to asbestos, lead and alpha-quartz. Samples were collected from the breathing zone (5-6 ft.) in the center of the room being cleaned. The pumps were run the entire length of the work day (no less than 8 hours) and were not stopped during breaks. As reflected in Attachment A, *Personal Monitoring Data*, on only one occasion during the study was the permissible exposure level exceeded for alpha-quartz.

3.4 Post-Cleanup Sampling

Post-cleaning sampling conducted was designed to determine if the cleaning methods attained the health-based benchmarks established in EPA's COPC/Benchmarks Report[12]. Following cleanup activities in the thirteen residential and two commercial units, post-cleanup wipe and micro vacuum samples were collected in the same manner as the pre-cleanup samples.

The post-cleanup samples were collected from locations adjacent to the pre-cleanup sampling locations whenever possible. In situations where the pre-cleanup sampling location was now inaccessible, a new sample was collected as close to the initial location as possible. Post-cleanup air samples were collected in each of the thirteen residential units and in each of the two commercial units included in the study. The analyses for these samples included MMVF, alpha-quartz, lead, and asbestos. The building's four hallways, two stairwells, basement and elevator shaft were also included in this sampling event; however, the elevator shaft did not include alpha-quartz analysis.

All of the aforementioned post-cleanup area air samples were collected following a minimum settling period of sixteen (16) hours and included the implementation of aggressive and/or modified-aggressive air sampling techniques. Aggressive sampling employs the use of a leaf blower followed by circulating fans, whereas the modified-aggressive sampling employs the circulating fans without the initial use of a leaf blower. Aggressive sampling was utilized because

[12] U.S. Environmental Protection Agency. (September, 2002). *World Trade Center Indoor Air Assessment: Selecting Contaminants of Concern and Setting Health-Based Benchmarks*.

of its past use in accordance with the Asbestos Hazard Emergency Response Act (AHERA), for determining the effectiveness of asbestos abatement in schools. Modified-aggressive air sampling was also used because it is more representative of long-term trends of typical household activity such as those expected within the study building.

While there is a greater potential for overloading under aggressive sampling conditions, this test is representative of a worst case scenario. Modified-aggressive air sampling, however, has less of a potential for overloading and is typical of household activity patterns. (Difficulties associated with sample overloading are discussed in detail in Section 3.8 below.)

Other post-cleanup sampling efforts were implemented to evaluate the efficiency of the cleaning of the HVAC systems within the two commercial units included in the study (Chiropractor's Office, Mattress Store). Post-cleanup air samples were collected in close proximity to the HVAC return ducts and analyzed for asbestos, MMVF, alpha-quartz and lead.

3.5 Sampling Supplies and Equipment

Table 5.0 specifies the supplies and equipment required and utilized to collect samples, as described in the QAPP.[13]

Table 6.0 specifies the micro vacuum equipment and the National Air Duct Cleaners Association (NADCA)-recommended method for sample collection that was used.

Table 7.0 specifies the air sampling equipment that was used.

[13] The QAPP is presented within Attachment G.

Table 5.0 **Wipe Sampling Equipment**			
Analyte	***Sample Media***	***Wetting Solution***	***Sample Jar***
Asbestos	6inch x 6 inch, Super Polx 1200 Class 10 Cleanroom Wipes	10 ml of a 50/50 mixture of 2-propanol and DI water	4 oz. glass
MMVF	6 inch x 6 inch, Super Polx 1200 Class 10 Cleanroom Wipes	10 ml of a 50/50 mixture of 2-propanol and DI water	4 oz. glass
Alpha-quartz, Calcite, Gypsum, Total Dust	"Ghost Wipes" (SKC Inc., No. 225-2414)	Distilled water	4 oz. glass
Lead	"Ghost Wipes" (SKC Inc., No. 225-2414)	Distilled water	4 oz. glass
PAH's	3 inch x 3 inch, Cotton Gauze	2 ml of acetone	Amber glass or glass jars wrapped in aluminum foil
Dioxins/Furans	3 inch x 3 inch, Cotton Gauze	2 ml of acetone	Amber glass or glass jars wrapped in aluminum foil

Table 6.0 **Micro Vacuum Equipment and NADCA-Recommended Method for Sample Collection**[14]			
Analyte	***Sample Media***	***Flow Rate***	***Sample Pump***
Asbestos	0.45 µm (25 mm) MCE filter micro vacuum cassette	2 L/min.	Diaphram pump
Lead	0.8 µm (37 mm) MCE filter micro vacuum cassette	2.5 L/min.	Diaphram pump
NIOSH 0500	0.8 µm (37 mm) MCE filter matched weight cassette	15 L/min.	Gilian® Air Con-2

[14] Pump flow rates were measured at the start of each day. A primary dry cell calibrator (BIOS DC-Lite) was used to establish the flow rates of the diaphram pump. A Gilibrator-2 high flow wet cell calibrator was used to establish the flow rates of the Gilian® AirCon-2 high volume air samplers. Flow rates were recorded.

Table 7.0 **Air Sampling Equipment**[15]					
Analyte	***Sample Media***	***Flow Rate***	***Sample Period***	***Sample Pump***	***Notes***
Asbestos (TEM and PCM)	0.45 µm and 0.8µm (25 mm) MCEF cassette	10 L/min.	480 min.	Gilian® Air Con-2	None
MMVF	0.45 µm and 0.8µm (25 mm) MCEF cassette	10 L/min.	480 min.	Gilian® Air Con-2	None
Alpha-quartz, Calcite, Gypsum	5 µm (37 mm) PVC cassette	2.5 L/min.	480 min.	SKC Model 224-PCXR8	Aluminum cyclone needed
Lead	0.8 µm (37 mm) MCEF cassette	10 L/min.	480 min.	Gilian® Air Con-2	None
PAH's	2 µm (37 mm) PTFE filter followed by 150 mg, 8 x 110, XAD-2 sorbent tube	2 L/min.	480 min.	Gilian® Air Con-2	None
Dioxins/Furans	32 mm quartz filter followed by polyurethane foam (PUF)	15 L/min.	56 hour	Gilian® Air Con-2	One

3.6 Sample Analysis and Management

Laboratories Utilized and Analyses Performed
Inorganic analyses, which included MMVF, alpha-quartz, calcite, gypsum, lead, total dust, pH and total particulates not otherwise specified (NIOSH 0500) were performed by EMSL Laboratories (EMSL), at the corporate headquarters located at 107 Haddon Avenue, Westmont, NJ. The analyses for asbestos using PCM, PLM, and TEM were performed by EMSL Laboratories, 307 West 38th St., New York, NY. Organic analyses were provided by Paradigm Analytical, 2627 North Chase Parkway SE, Wilmington, NC. These analyses included PAH and Dioxins/Furans.

[15] Pump flow rates were measured before and after sample collection. Pumps were calibrated before each use and the flow rate was confirmed following the sample period. A primary dry cell calibrator (BIOS DC-Lite) was used to establish the flow rates of the SKC personal sampling pumps. A Gilibrator-2 High Flow Wet Cell Calibrator was used to establish the flow rates of the AirCon-2 high volume air samplers. Calibrating for alpha-quartz, calcite, gypsum and dioxins/furans also required separate flow chambers. Flow rates were recorded on Air Sampling Data Sheets.

Sample Handling and Shipment
Samples transported to EMSL were typically picked up by an EMSL courier the day after sample collection. A small percentage of the EMSL samples, and all of the samples transported to Paradigm Analytical, were shipped via Federal Express. Several samples were damaged during shipment and are so documented in Attachment J, *Reporting of Analytical Results*.

At the conclusion of each sampling event, chain of custody (COC) records were generated electronically using Scribe7 v2.2 software. A copy of the COC records were printed, signed, and shipped with the samples to the lab. The only COC records not generated in this fashion were those for the April 30, 2002 bulk sampling event and the personal monitoring samples collected by WRS.

3.7 Analytical Data

Validation
The validation of all organic and inorganic analytical data was performed in accordance with the QAPP. Validation of inorganic data was performed by Weston. Validation of organic data was performed by EPA Region 2 personnel.

Reporting
All analytical results were tabulated subsequent to validation and are provided in Attachment J, *Reporting of Analytical Results*.

3.8 Difficulties Encountered and Resolutions

Sample Overloading
Initially, many of the asbestos analyses were reported by the laboratory as overloaded. After consulting with the laboratory, it was determined that a reported value of overloaded did not mean that the sample cassette was overloaded with asbestos. Rather, the filter contained particulate matter that could obstruct the field of view of the laboratory analyst.

The only resolution to the problem of sample overloading was the repeated cleaning of the units. It was only after the presence of settled dust was minimized through cleaning that the aggressive and modified-aggressive sampling techniques were able to be used to collect air samples that did not have overloaded filters.

Data Reporting
Given that nearly 3,000 samples were collected and submitted for analysis during the course of the study, EPA's inability to receive laboratory data in a timely manner was a major and ongoing problem. The greatest impact was felt in the scheduling of time and resources for the re-cleaning of the units. The delay in receiving data resulted in the inability to determine if re-cleaning was necessary, which in turn complicated the scheduling of day-to-day work and resource requirements. In many cases, the last minute redirection of the cleaning and sampling contractor's resources was required in an effort to maintain productivity. Furthermore, many of the data packages were incomplete upon receipt, delaying EPA's ability to validate the data in a timely manner, and resulting in delays in issuing final building clearance and the completion of this report.

Another issue which impacted EPA's data reporting was the rejection of data during the validation process. Several wipe samples and one air sample that were analyzed for dioxin/furans were initially reported as rejected. Fortunately, the rejected dioxin/furans data could still be utilized to obtain a Toxicity Equivalent value by calculating an Estimated Maximum Possible Concentration (EMPC) for the dioxin/furans that were rejected. In addition to the dioxin/furans, several lead samples (air, wipe and micro vacuum) were rejected for lab blank, field blank or method blank contamination. The only other sample that was rejected was an inorganic wipe sample that was rejected due to a laboratory blank being out of the control range.

The wipe sampling analytical results for alpha-quartz, calcite, gypsum, cristobalite, tridymite, and total dust were uncertain, thereby rendering the data unusable.

3.9 Modifications to the Study

Modified Aggressive Air Sampling

Both modified-aggressive and aggressive air sampling were used in determining if asbestos air clearance criteria could be achieved in four units. The use of modified-aggressive air sampling was included after repeated problems with overloaded filters were encountered and the further evaluation of aggressive sampling determined that conditions created by aggressive air sampling were not typical of household living patterns.

Wet Wipe using Windex®/Wipe with Water Only

The work plan initially called for use of soap and water to accomplish wet wiping. Windex® brand was used because it is a commonly used cleaner believed to be readily available in most people's homes. Furthermore, it is non-damaging to most surfaces, from wood to fiberglass. Typically, this soap does not "over-suds". It provides an effective detergent-based protection of surfaces when combined with cold water. This was important, because hot water was not immediately available at the project site. During the project, it was determined that a wet wipe procedure using water only would also be evaluated. Water only was used on the desktop and in the bathroom of the Chiropractor's Office, and in the entire Barber Shop. Water only was also used on the vinyl tiles under the carpeted area in the Mattress Showroom.

Horizontal Wet Wipe Only/Horizontal and Vertical Wet Wipe

The majority of the tests of cleaning methods were accomplished using horizontal wet wipe only, to assist in determination of whether vacuuming without wet wiping would result in acceptable cleaning. However, application of both horizontal and vertical wet wipe was tested in Units 3B and 3C. Application of both horizontal and vertical wet wiping in Unit 3B was consistent with the procedures called for relative to testing of Scope A - Lower Manhattan Cleaning Procedures. Unit 3C was selected for an additional test using both horizontal and vertical wet wiping, because that apartment was heavily impacted by WTC dust. The cleaning test called for the use of non-HEPA-filtered vacuums and no AFD.

Use of Swiffer® Brand Cloths

The use of Swiffer® brand cloths for application of wet wipe was also evaluated. Swiffer® cloths were utilized during the cleaning of the first residential unit 5D.

Modified Scope A - Lower Manhattan
Shortly after the study was initiated, the procedures for the WTC Dust Cleanup Program were developed. Once those procedures were finalized, it was decided to include a modified Scope A cleaning procedure developed by the WTC Dust Cleanup Program as one of the cleaning methods in the study.

3.10 Supplemental Sampling Activities

Sampling of "Non-Study" Units
As noted previously, three commercial units located within the study building, but not part of the initial study, were also cleaned by EPA. Pre-cleanup samples collected from two of the three non-study commercial units (Food Exchange, Lemongrass Grill) were limited to the collection of wipe samples from within the HVAC system ducts. Analysis of these samples included lead, MMVF, alpha-quartz and asbestos. Pre-cleanup samples collected from the remaining non-study commercial unit (Barber Shop) included a bulk sample of insulation material which was collected to confirm its asbestos content. Pre-cleanup wipe samples were also collected for analysis of lead, dioxin and PAH.

Post-cleanup area air samples were collected from the three non-study commercial units (Barber Shop, Lemongrass Grill, and The Food Exchange). The analyses for these samples included MMVF, asbestos, alpha-quartz, and lead. Additional air samples were collected in the Lemongrass Grill and The Food Exchange in close proximity to the HVAC return ducts, in order to evaluate the effectiveness of the HVAC cleaning method.[16]

Post-cleanup wipe samples were collected from the inside surfaces of the HVAC ducts within two of the three non-study units (Lemongrass Grill, The Food Exchange) and analyzed for asbestos, MMVF, alpha-quartz and lead. Additionally, samples were collected from the inside surfaces of the ducts within the non-study units utilizing a modified micro vacuum technique; these were collected in accordance with the National Air Duct Cleaners Association (NADCA) ACR 2002 procedures referenced in Attachment I, and analyzed for Total Particulates Not Otherwise Regulated (PNOR) following NIOSH 0500 methodology.

3.11 Mercury Vapor Using Lumex® Analyzer

On June 19, 2002, with the assistance of Dr. Clyde Johnson, Assistant Professor of Environmental Sciences at Medgar Evers College (City University of New York), EPA measured mercury vapor levels in the thirteen residential units, three commercial units, and all common areas in the study building. All sampling was conducted under pre-cleaned conditions utilizing a Lumex® RA-915+ Mercury Vapor Analyzer. Measurements were performed at the breathing zone of infants and adults (6 inches and 5 feet above the floor), using continuous, real-time monitoring and data logging of mercury levels. Further explanation of mercury sampling activities and results are included in Attachment K, *Summary of Mercury Vapor Results Using the Lumex® Vapor Analyzer*.

[16]See Attachment I, *HVAC Cleaning Procedures*.

4. Analytical Results

Introduction

This section reviews analytical results by building area and comparative results. The discussion of analytical results by building area mirrors to a large degree Attachment H, *Synopsis of Cleaning Methods by Building Area and Fact Sheets*, adding information relative to analytical results as they relate to the residential or commercial unit under review. Briefly summarizing the logistics of each unit, the cleaning methods employed, the number of times the unit was cleaned, and providing a narrative description of the analytical results for that unit, the narratives follow the tables in Attachment J, *Key for Analytical Tables and Reporting of Analytical Results*. Attachment J provides the analytical results for each sample that was collected and analyzed. Results reported in units of f/cc are associated with PCM analyses and results that are reported in units of 5>5u/cc are associated with PCMe analyses. A key at the beginning of Attachment J identifies the units associated with each result.

Analytical results are presented in alphabetical order, with details relative to samples that were collected before and after any cleaning event. If a compound is not present for a unit or if a sample type is not present for a compound, then it is not listed in the text. It is of note that in the case of asbestos wipe and micro vacuum samples, a certain number of structures needed to be detected to be reported as being detected above the detection limit. This number was in the range of 6-8 structures. Therefore, asbestos may be indicated as being present even though the sample result is reported as below the detection limit. Samples were analyzed for 23 PAH compounds.

The PAH results are reported as toxicity equivalency factors (TEF) values. These values are the sum of seven of the most toxic carcinogenic PAH[17], modified to reflect benzo[a]pyrene equivalents. The PAH analyses could potentially identify an additional 16 PAH compounds (23 total). These additional compounds are less toxic and in general are not carcinogenic, thus they are not included in the TEF calculations. Fifteen (15) samples that were analyzed for PAH detected at least one of these additional 16 less toxic compounds. These samples, along with the non-TEF modified concentrations detected, are reported in Table 8.0. The values in this table cannot be directly compared to the primary clearance value of 300 ug/m^2 because the primary clearance value represents a TEF value; however, the value listed for each PAH sample in Attachment J reflects the value that can be compared to the primary clearance value.

The dioxin results were modified using a toxicity equivalency method (TEQ), that takes into account the toxicity difference between the different congener groups, and the results are reported in 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) equivalents. The TEQ value reported in the table represents the estimated maximum potential concentration (EMPC). The TEQ EMPC value used data that indicated the presence of a congener above zero but did not meet all of the QA/QC reporting level criteria. This value represents the highest potential concentration of dioxin that may be present.

---

[17] These seven compounds were used to calculate the toxicity equivalence factor (TEF): benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene.

Table 8.0 PAH Analytical Results						
Unit Number	***Sample Identification***	***Category***	***Matrix***	***Analyte***	***Final Results***	***Final Results Units***
2A	9094-W-2A-003	PAH	Wipe	Fluoranthene	320	µg/m^2
2A	9094-W-2A-003	PAH	Wipe	Phenanthrene	250	µg/m^2
2A	9094-W-2A-003	PAH	Wipe	Pyrene	300	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Anthracene	320	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Benzo[a]anthracene	760	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Benzo[e]pyrene	450	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Benzo[a]pyrene	680	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Benzo[b]fluoranthene	980	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Benzo[g,h,i]perylene	520	µg/m^2 *
3C	9094-W-3C-003	PAH	Wipe	Benzo[k]fluoranthene	330	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Chrysene	830	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Fluoranthene	1700	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Indeno(1,2,3-c,d)pyrene	560	µg/m^2 *
3C	9094-W-3C-003	PAH	Wipe	Phenanthrene	1300	µg/m^2
3C	9094-W-3C-003	PAH	Wipe	Pyrene	1600	µg/m^2
3D	9094-W-3D-003	PAH	Wipe	Fluoranthene	280	µg/m^2
3D	9094-W-3D-003	PAH	Wipe	Pyrene	280	µg/m^2
4C	9094-A-4C-016	PAH	Air	Biphenyl	0.12	µg/m^3 *
4C	9094-A-4C-016	PAH	Air	2,6-Dimethylnaphthalene	0.12	µg/m^3 *
4C	9094-A-4C-016	PAH	Air	Fluorene	0.06	µg/m^3 *
4C	9094-A-4C-016	PAH	Air	1-Methylnaphthalene	0.18	µg/m^3
4C	9094-A-4C-016	PAH	Air	2-Methylnaphthalene	0.34	µg/m^3
4C	9094-A-4C-016	PAH	Air	Naphthalene	0.46	µg/m^3
4C	9094-A-4C-016	PAH	Air	Phenanthrene	0.12	µg/m^3 *
4C	9094-A-4C-017	PAH	Air	Dibenzofuran	0.06	µg/m^3 *
4C	9094-A-4C-017	PAH	Air	2,6-Dimethylnaphthalene	0.13	µg/m^3 *
4C	9094-A-4C-017	PAH	Air	Fluorene	0.03	µg/m^3 *
4C	9094-A-4C-017	PAH	Air	1-Methylnaphthalene	0.19	µg/m^3
4C	9094-A-4C-017	PAH	Air	2-Methylnaphthalene	0.35	µg/m^3
4C	9094-A-4C-017	PAH	Air	Naphthalene	0.48	µg/m^3
4C	9094-A-4C-017	PAH	Air	Phenanthrene	0.13	µg/m^3 *
4C	9094-W-4C-003	PAH	Wipe	Fluoranthene	270	µg/m^2
4D	9094-W-4D-003	PAH	Wipe	Benzo[a]anthracene	270	µg/m^2
4D	9094-W-4D-003	PAH	Wipe	Benzo[b]fluoranthene	320	µg/m^2
4D	9094-W-4D-003	PAH	Wipe	Chrysene	300	µg/m^2
4D	9094-W-4D-003	PAH	Wipe	Fluoranthene	580	µg/m^2
4D	9094-W-4D-003	PAH	Wipe	Phenanthrene	410	µg/m^2
4D	9094-W-4D-003	PAH	Wipe	Pyrene	530	µg/m^2
5C	9094-W-5C-003	PAH	Wipe	Benzo[b]fluoranthene	260	µg/m^2
5C	9094-W-5C-003	PAH	Wipe	Fluoranthene	430	µg/m^2
5C	9094-W-5C-003	PAH	Wipe	Phenanthrene	300	µg/m^2
5C	9094-W-5C-003	PAH	Wipe	Pyrene	370	µg/m^2
Barber Shop	9094-W-BS-013	PAH	Wipe	Biphenyl	380	µg/m^2

Table 8.0 **PAH Analytical Results**						
Unit Number	***Sample Identification***	***Category***	***Matrix***	***Analyte***	***Final Results***	***Final Results Units***
Chiropractor's Office	9094-A-CHR-012	VOCs	Air	Acenaphthene	0.18	µg/m^3
Chiropractor's Office	9094-A-CHR-012	VOCs	Air	2,6-Dimethylnaphthalene	0.21	µg/m^3
Chiropractor's Office	9094-A-CHR-012	VOCs	Air	1-Methylnaphthalene	0.28	µg/m^3
Chiropractor's Office	9094-A-CHR-012	VOCs	Air	2-Methylnaphthalene	0.58	µg/m^3
Chiropractor's Office	9094-A-CHR-012	VOCs	Air	Naphthalene	0.83	µg/m^3
Chiropractor's Office	9094-A-CHR-012	VOCs	Air	Phenanthrene	0.21	µg/m^3
Chiropractor's Office	9094-A-CHR-013	VOCs	Air	Acenaphthene	0.19	µg/m^3
Chiropractor's Office	9094-A-CHR-013	VOCs	Air	2,6-Dimethylnaphthalene	0.22	µg/m^3
Chiropractor's Office	9094-A-CHR-013	VOCs	Air	1-Methylnaphthalene	0.28	µg/m^3
Chiropractor's Office	9094-A-CHR-013	VOCs	Air	2-Methylnaphthalene	0.57	µg/m^3
Chiropractor's Office	9094-A-CHR-013	VOCs	Air	Naphthalene	0.82	µg/m^3
Chiropractor's Office	9094-A-CHR-013	VOCs	Air	Phenanthrene	0.22	µg/m^3
Chiropractor's Office	9094-W-CHR-002	PAH	Wipe	Fluoranthene	190	µg/m^2*
Chiropractor's Office	9094-W-CHR-002	PAH	Wipe	Phenanthrene	160	µg/m^2*
Chiropractor's Office	9094-W-CHR-002	PAH	Wipe	Pyrene	180	µg/m^2*
Chiropractor's Office	9094-W-CHR-003	PAH	Wipe	Fluoranthene	230	µg/m^2*
Chiropractor's Office	9094-W-CHR-003	PAH	Wipe	Phenanthrene	180	µg/m^2*
Chiropractor's Office	9094-W-CHR-003	PAH	Wipe	Pyrene	230	µg/m^2*
Mattress Store	9094-W-MAT-003	PAH	Wipe	Fluoranthene	570	µg/m^2
Mattress Store	9094-W-MAT-003	PAH	Wipe	Phenanthrene	330	µg/m^2
Mattress Store	9094-W-MAT-003	PAH	Wipe	Pyrene	520	µg/m^2
Mattress Store	9094-W-MAT-004	PAH	Wipe	Fluoranthene	120	µg/m^2*
Mattress Store	9094-W-MAT-004	PAH	Wipe	Phenanthrene	90	µg/m^2

* Estimated Concentration (J)

Table 8.0 contains the PAH analytical results that were identified as being above the detection limit. These values cannot be directly compared to the health-based benchmark, which is based on the TEF calculations. The TEF values are listed in the tables in Attachment J.

At times during the project, the laboratory chose to perform analyses on samples that were neither requested by EPA nor specified on the Chain of Custody. This was most evident in the case of wipe samples that were collected for total dust. The QAPP required the collection of one pre-cleaning and one post-cleaning sample for total dust from each unit. These samples (wipes) also served as the samples used for the analysis of crystalline silica (alpha-quartz, cristobalite, tridymite, calcite and gypsum). The crystalline silica sample was also collected pre-cleaning and post-cleaning; however, it was collected from three locations in the unit. Upon submitting the samples to the laboratory, specific direction was provided to the lab regarding which samples were to be analyzed for total dust. The laboratory however, chose to prepare all three samples for the total dust analysis rather than prepare the samples specified on the chain of custody.

A mercury vapor investigation was conducted as part of the study. The mercury vapor investigation was conducted using a Lumex® analyzer[18] that revealed a mean mercury vapor concentration of 53.6 ng/m^3 (range 3 - 210 ng/m^3), demonstrating that air samples within the building tested below EPA's Reference Concentration of 300 ng/m^3. A statistical evaluation of the results of the mercury vapor investigation is presented in Attachment K, *Summary of Mercury Vapor Results using the Lumex® Vapor Analyzer*.

(Note: The following section does not include data and discussion of wipe sampling results for alpha-quartz, calcite, gypsum, cristobalite, tridymite and total dust. The analytical results for these parameters were uncertain thereby rendering these data unusable.)

Discussion of Analytical Results by Building Area

Unit 2A – This unit is located on the second floor. It is a 1,335 sq. ft. loft with one bedroom facing Cedar Street. The unit has hardwood floors. The unit presented minimal dust accumulation in the dwelling with the exception of the baseboard-heating units. The windows were not blown in. All personal items were disposed except for a couch and chairs.

Cleaning Method – The unit was cleaned using Test 1B: use of a Ridgid® shop vacuum and Hoover® upright vacuum for vacuuming the floors and other surfaces. Neither vacuum was equipped with a HEPA filter. An AFD was used during the cleaning process. In addition, all horizontal surfaces were wet wiped. This cleaning method was used for each cleaning event.

Cleaning Results – The unit met the primary clearance criteria listed in Table 1.0 for each compound after being cleaned twice.

Asbestos

Before Cleaning Samples – Pre-cleaning micro vacuum and wipe samples were collected for asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. Three of the four micro vacuum samples detected chrysotile. All five wipe samples detected chrysotile, although two of the samples were below the detection limit.

[18] The instrument has a detection limit of 2 ng/m^3.

Post 1st Cleaning Samples – Three air, three micro vacuum, and five wipe samples were collected. The three air samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA and PCMe analysis could not be conducted due to overloading of particulate material.

The results for the three micro vacuum samples indicate that asbestos was present at levels generally lower than those observed before cleaning. One of the samples was identified as non-detect, although asbestos was detected below the detection limit.

The results for the five wipe samples that were collected indicate that asbestos was present in two of the five samples at lower concentrations than the pre-cleaning samples. One of the two samples in which asbestos was detected was below the detection limit.

Post 2nd Cleaning Samples – Six asbestos air samples were collected after the second cleaning. The samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc and were at lower concentrations than after the first cleaning. The TEM AHERA results were all below the secondary numeric criterion of 0.022 S/cc; two of the six samples were below the detection limit. The PCMe results were at or below the primary clearance criterion of 0.0009 S/cc; three of the six samples were below the detection limit.

<u>Dioxin</u>
Before Cleaning Samples – Four pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The concentrations of dioxin detected were lower than those of the pre-cleaning samples. The TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

<u>Gypsum</u>
Before Cleaning Samples – Pre-cleaning samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected in any sample. Because gypsum was below the detection limit in all of the samples collected, no additional samples were collected for analysis of gypsum.

<u>Lead</u>
Before Cleaning Samples – Four micro vacuum samples and four wipe samples were collected. Lead was detected in three of the four micro vacuum samples at concentrations below the comparison value of 25 $\mu g/ft^2$ one sample was below the detection limit. Three of the four wipe samples had detectable concentrations of lead above the primary clearance criterion of 25 $\mu g/ft^2$, while the fourth sample was below the detection limit.

Post 1st Cleaning Samples – Two air samples, three micro vacuum samples and four wipe samples were collected after the first cleaning. The two air samples, all three micro vacuum samples, and three of the four wipe samples were below the detection limit. The fourth wipe sample was above detection limit but below the primary clearance criterion. The results from the first cleaning indicate that the cleaning technique was effective in removing the elevated concentrations of lead observed prior to the first cleaning. Because the primary clearance criterion for lead was met after the first cleaning, no additional samples were collected for analysis of lead.

<u>Alpha-Quartz</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. This indicates that the cleaning method used was able to reduce the pre-cleaning concentration of alpha-quartz. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of alpha-quartz.

<u>Calcite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of calcite.

<u>Cristobalite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limits after the first cleaning, no additional samples were collected for analysis of cristobalite.

<u>Tridymite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limits after the first cleaning, no additional samples were collected for analysis of tridymite.

<u>MMVF</u>
Before Cleaning Samples – Four pre-cleaning wipe samples were collected. One of the four samples was below the detection limit; MMVF was detected in the other three samples.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. The results for the air samples indicate that MMVF was present; however, the samples were below the primary clearance criterion of 10 S/L. The results of the five wipe samples indicate that MMVF was still present after the first cleaning; however, the concentrations detected were lower than the pre-cleaning samples. There is not a clearance criterion for MMVF in settled dust. Since the air samples were below the primary clearance criterion and the MMVF in settled dust was reduced after the first cleaning, no additional samples were collected for analysis of MMVF.

PAH
Before Cleaning Samples – Four pre-cleaning wipe samples were collected. Three of the four samples were below the detection limit; the TEF for these samples was below the primary clearance criterion. PAH compounds were detected in the fourth sample; however, the calculated TEF was below the primary clearance criterion of 300 $\mu g/m^2$.

Post 1st Cleaning Samples – Four wipe samples were collected after the first cleaning. All of the samples were below the detection limit and the TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$. Because all of the samples were below the detection limit and the primary clearance criterion after the first cleaning, no additional samples were collected for analysis of PAH.

Unit 2B – This unit is located on the second floor. It is a 946 sq. ft. loft with two separate bedrooms facing Cedar Street. The unit has hardwood floors and no carpeting. The unit presented minimal dust accumulation, except around baseboard-heating elements. All windows were intact. All personal items except a couch were disposed of prior to cleanup.

Cleaning Method – The unit was cleaned using Test 3A: an industrial HEPA-filtered vacuum. An AFD was not used. All horizontal surfaces were wet wiped.

Cleaning Results – The unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

Asbestos
Before Cleaning Samples – Three micro vacuum and four wipe samples were collected for analysis of asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. Chrysotile was detected in all three micro vacuum samples. Three of the four wipe samples detected chrysotile. One of the three samples also contained Anthophyllite. However, the result for this sample, as well as for the fourth wipe sample, was below the detection limit.

Post 1st Cleaning – Test 1B – Three air, four micro vacuum, and five wipe samples were collected. Three air samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc. All three TEM AHERA results were below the secondary numeric criterion of 0.022 S/cc. Likewise, all three PCMe results were below the primary clearance criterion of 0.0009 S/cc. The results for four micro vacuum samples indicate that asbestos was present at levels similar to, and in some cases higher than, those observed before cleaning. The results for the five wipe samples indicate that asbestos was present in three of the five samples. Two of the three samples in which asbestos was detected were below the detection limit.

Dioxin

Before Cleaning Samples – Three pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected in either sample.

Lead

Before Cleaning Samples – Three micro vacuum samples and three wipe samples were collected. Lead was detected in one of the three micro vacuum samples at a concentration below the comparison value of 25 µg/ft^2. Two of the three wipe samples had detectable concentrations of lead; one sample was above the primary clearance criterion of 25 µg/ft^2. The third sample was below the detection limit.

Post 1st Cleaning Samples – Two air samples, four micro vacuum samples and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion. The four micro vacuum samples and one of the four wipe samples, were below the detection limit. Three of the four wipe samples were above the detection limit, but below the primary clearance criterion of 25 µg/ft^2. The results from the first cleaning indicate that the cleaning technique was effective in removing the elevated concentrations of lead that were observed prior to the first cleaning.

Post 2nd Cleaning Sampling – Because the cleaning was conducted prior to the establishment of a risk-based cleanup level for lead in air, this unit was re-cleaned in an effort to meet the established primary clearance criterion. Sampling results following the second cleaning indicate levels below the primary clearance criterion.

Alpha-Quartz

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Calcite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of calcite.

Cristobalite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Tridymite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples and four wipe samples were collected after the first cleaning. All of the samples were below the detection limit.

MMVF
Before Cleaning Samples – Three pre-cleaning wipe samples collected. MMVF was detected in all three.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. The results for the three air samples indicate that MMVF was present; however, all samples were below the primary clearance criterion of 10 S/L. The results of the five wipe samples indicate that MMVF remained present in four of the five samples after the first cleaning, but the concentrations detected were lower than the pre-cleaning samples. There is not a clearance criterion for MMVF in settled dust. Because the air samples were substantially below the primary clearance criterion and the MMVF in settled dust was reduced after the first cleaning, no additional samples were collected for analysis of MMVF.

PAH
Before Cleaning Samples – Three pre-cleaning wipe samples were collected. All three samples were below the detection limit. The TEF for each sample was below the primary clearance criterion.

Post 1st Cleaning Samples – Four wipe samples were collected after the first cleaning. All of the samples were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 μg/m^2. Since all of the samples were below the detection limit and the primary clearance criterion after the first cleaning, no additional samples were collected for analysis of PAH.

Second Floor Hallway – The second floor hallway has vinyl tiles on the floor, and walls made of sheet rock covered with wallpaper glue. The ceiling is also made of sheet rock, and is painted.

Cleaning Method – This area was cleaned using Test 4A and Test 4B. Test 4A used an industrial

HEPA filtered vacuum and an AFD. Test 4B was a soap and water wet wipe of the ceiling and floor only.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

Asbestos
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – Two post-cleaning air samples were collected. The two air samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc. Similarly, the TEM AHERA results were all below the secondary numeric criterion of 0.022 S/cc. The PCMe results were all below the primary clearance criterion of 0.0009 S/cc with one of the two samples being below the detection limit.

Dioxin
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – There were no post-cleaning samples collected

Gypsum
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected in any sample.

Lead
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. The two air samples were below the detection limit.

Alpha-Quartz
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Calcite
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

Cristobalite
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

Tridymite
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

MMVF
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. The results indicate that MMVF was present in one of the samples; however, the concentration was below the primary clearance criterion of 10 S/L. Because the air samples were below the primary clearance criterion, no additional samples were collected for analysis of MMVF.

PAH
Before Cleaning Samples – There were no pre-cleaning samples collected.

Post 1st Cleaning Samples – There were no post-cleaning samples collected.

Unit 3A – This 1,368 sq. ft. loft faces Cedar Street and is utilized as office space for the Baldwin Realty Company. Carpet is present on half of the floor space; the remainder is hardwood floors. The area is furnished with 10-12 wooden desks, files and office equipment. The unit presented minimal dust accumulation in the dwelling. No windows were blown in.

Cleaning Method – This unit was cleaned using Test 2B: a Craftsman® shop vacuum and a Eureka® upright vacuum with HEPA filter. An AFD was used during the cleaning process. All horizontal surfaces were wet wiped.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

Asbestos
Before Cleaning Samples – Four air, four micro vacuum and four wipe samples were collected for asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. All four of the micro vacuum samples detected chrysotile. One of the four wipe samples detected chrysotile. The PCM results for both air samples were below the secondary numeric criterion, and the two PCMe air results were below the primary clearance criterion of 0.0009 S/cc.

Post 1st Cleaning Samples – Three air, four micro vacuum and five wipe samples were collected for asbestos. Three asbestos air samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results indicate that one sample was below the secondary numeric criterion and the other two could not be analyzed due to particulate overloading of the filter. The TEM AHERA results were below the secondary numeric criterion for two samples. The third sample could not be analyzed due to particulate overloading of the filter. Of the three air samples analyzed using PCMe, one sample could not be analyzed due to overloading of particulate material. The other two samples were below the primary clearance criterion of 0.0009 S/cc.

The results of the four micro vacuum samples indicate that asbestos was present at levels generally lower than those observed before cleaning. One of the samples was identified as non-detect.

The results of the five wipe samples indicate that asbestos was present in all but one sample; however, two of the samples were identified as non-detect. One of the non-detect samples had an elevated detection limit due to the presence of non-asbestos particulate matter.

<u>Dioxin</u>
Before Cleaning Samples – Three pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that the concentrations of dioxin were similar to the pre-cleaning samples. The TEQ concentration for each sample was below the criterion of 4 ng/m^2.

<u>Gypsum</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected above the detection limit for either sample.

<u>Lead</u>
Before Cleaning Samples – Four micro vacuum samples and three wipe samples were collected. Lead was not detected in any of the micro vacuum samples. One of the wipe samples was below the detection limit and one wipe sample was below the primary clearance criterion of 25 $\mu g/ft^2$. The third wipe sample exceeded the primary clearance criterion at 38.9 $\mu g/ft^2$.

Post 1st Cleaning Samples – Two air samples, four micro vacuum samples, and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion but were qualified as rejected, due to field blank contamination. The results of the micro vacuum and wipe samples show that, while two of the micro vacuum and two of the wipe samples exceeded the detection limits, all samples met the primary clearance criterion and the comparison values for lead after the first cleaning.

Alpha-Quartz

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All samples were below the detection limit.

Calcite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Cristobalite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Tridymite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All were below the detection limit.

MMVF

Before Cleaning Samples – Two pre-cleaning air samples and three pre-cleaning wipe samples were collected. The two air samples had MMVF detected, but were below the primary clearance criterion. The three wipe samples had MMVF detected in concentrations from 57.23 S/cm^2 to 801.24 S/cm^2.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. All of the air sample results indicate that MMVF was present at levels below the primary clearance criterion of 10 S/L. All of the wipe sample results were below the detection limit of 22.89 S/cm^2. This indicates that the cleaning method was able to reduce the pre-cleaning concentration of MMVF.

PAH

Before Cleaning Samples – Three pre-cleaning wipe samples were collected. All three were below the detection limit. The TEF for each sample was below the primary clearance criterion.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected. All four were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$.

<u>Unit</u> <u>3B</u> – This unit is located on the third floor. It is a 968 sq. ft. loft with three bedrooms facing Cedar Street. The unit has hardwood floors. No windows were blown in and the unit presented minimal dust accumulation, with the exception of the baseboard heating units, which contained visible dust. All of the tenant's personal items remained in the unit and were cleaned.

Cleaning Method – This unit was cleaned using the Scope A cleaning procedures: industrial HEPA-filtered vacuum of all surfaces. An AFD was used. All surfaces were wet wiped. This cleaning method was used for each cleaning event in this unit.

Cleaning Results – This unit met the primary clearance criteria listed in Table 1.0 for each compound after being cleaned twice.

<u>Asbestos</u>
Before Cleaning Samples – Two air, three micro vacuum and four wipe samples were collected for asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. The two air samples that were collected were analyzed using PCM and PCMe. One PCM result was below the secondary numeric criterion of 0.01 f/cc. The other PCM result was above the secondary numeric criterion. The PCMe results indicate that both samples were below the detection limit and below the primary clearance criterion of 0.0009 S/cc. Two of the three micro vacuum samples detected chrysotile. The third sample was below the detection limit. Three of the four wipe samples were below the detection limit. The fourth one detected chrysotile at a concentration slightly above the detection limit.

Post 1st Cleaning – Three air, three micro vacuum and five wipe samples were collected to evaluate if additional cleaning events were necessary. The three air samples that were collected indicated that all three PCM results were below the secondary numeric criterion of 0.01 f/cc and that the TEM AHERA and PCMe analyses could not be conducted due to overloading of particulate material. Due to inconclusive PCMe results, a second cleaning was conducted.

The results for the three micro vacuum samples indicate that asbestos was present at levels similar to those observed before cleaning.

The results for the five wipe samples that were collected indicate that asbestos was present in all five of the samples at slightly higher concentrations than the pre-cleaning samples. One of the five samples in which asbestos was detected was below the detection limit.

Post 2nd Cleaning – Three asbestos air samples were collected after the second cleaning. The samples were analyzed for PCM, TEM AHERA, and PCMe. Two of the three PCM results were below the detection limit; all three were below the secondary numeric criterion of 0.01 f/cc. All three TEM AHERA results were below the detection limit and below the secondary numeric criterion of 0.022 S/cc. All three PCMe results were below the detection limit and below the primary clearance criterion of 0.0009 S/cc. All of the air asbestos results after the second cleaning were at lower concentrations than the pre-cleaning samples and the samples collected after the first cleaning. This indicates that the cleaning techniques used were efficient at removing asbestos to levels that were below detection limits and below the primary clearance and secondary numeric criteria.

Dioxin

Before Cleaning Samples – Four pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that there was dioxin present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that the concentrations of dioxin detected were similar to the pre-cleaning samples and that the TEQ concentrations for each sample were well below the primary clearance criterion of 4 ng/m^2. Because the dioxin samples were below the primary clearance criterion for all of the samples collected, no additional samples were collected for analysis of dioxin.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected in any sample. Because gypsum was below the detection limits for all of the samples collected, no additional samples were collected for analysis of gypsum.

Lead

Before Cleaning Samples – Three micro vacuum samples and four wipe samples were collected. The results indicate that all three micro vacuum samples were below the detection limit and at concentrations below the comparison value of 25 $\mu g/ft^2$. Two of the four wipe samples had detectable concentrations of lead; however, they were below the primary clearance criterion of 25 $\mu g/ft^2$. The third sample was below the detection limit. The fourth sample was lost at the laboratory and was not analyzed.

Post 1st Cleaning Samples – Two air samples, three micro vacuum samples and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. All three micro vacuum samples and one of the four wipe samples were below the detection limit. Two wipe samples were below the primary clearance criterion and the fourth wipe sample was above the primary clearance criterion. Due to the one lead sample being above the primary clearance criterion, as well as the asbestos samples that exceeded the primary clearance criterion, this unit was cleaned a second time.

Post 2nd Cleaning Samples – Two lead wipe samples were collected after the second cleaning in the area where the post-first cleaning lead exceedance occurred. One of the samples was received broken at the laboratory and was not analyzed. The other sample was below the detection limit and below the primary clearance criterion. The results from the second cleaning indicate that the cleaning technique was effective in removing the elevated concentration of lead that was observed after the first cleaning.

Alpha-Quartz

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. The two air samples were below the detection limit. Because the samples were below the detection limits after the first cleaning, no additional samples were collected for analysis of alpha-quartz.

Calcite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of calcite.

Cristobalite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of cristobalite.

Tridymite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of tridymite.

MMVF

Before Cleaning Samples – Two pre-cleaning air samples and three pre-cleaning wipe samples were collected. One of the two air samples was above the primary clearance criterion of 10 S/L and the other air sample was above the detection limit. The results for all three of the wipe samples indicate that MMVF was above the detection limit. This indicates that MMVF was present in the unit prior to cleaning.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. The results for the three air samples indicate that MMVF was present; however, all three were below the primary clearance criterion of 10 S/L. The results of the five wipe samples indicate that three of the five samples were below the detection limit and the remaining two samples were at the detection limit. Although MMVF was still present after the first cleaning, the concentrations detected were much lower than the pre-cleaning samples. There is not a clearance criterion for MMVF in settled dust. Because the air samples were below the primary clearance criterion and the MMVF in settled dust was reduced after the first cleaning, no additional samples were collected for analysis of MMVF.

PAH

Before Cleaning Samples – Four pre-cleaning wipe samples were collected. All four samples were below the detection limit. The TEF for each sample was below the primary clearance criterion.

Post 1st Cleaning Samples – Four wipe samples were collected after the first cleaning. All of the samples were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$. Because all of the samples were below the detection limit and the primary clearance criterion after the first cleaning, no additional samples were collected for analysis of PAH.

Unit 3C – This unit is located on the third floor. It is a 655 sq. ft. loft with two bedrooms facing the WTC site. The unit has hardwood floors with no carpet. The unit presented significant accumulation of dust in the dwelling. The windows were blown in. The majority of personal items were disposed of prior to cleaning.

Cleaning Method – This unit was cleaned using Test 1A: a Craftsman® shop vacuum and a Eureka® upright vacuum with no HEPA filter. An AFD was not used. This method was used for the first two cleaning events. For the third cleaning event the method was changed to Test 3B: an industrial HEPA filtered vacuum and an AFD. All horizontal and vertical surfaces were wet wiped in conjunction with each method.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned three times.

Asbestos

Before Cleaning Samples – Four micro vacuum and four wipe samples were collected for asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. All four of the micro vacuum samples detected chrysotile. Three of the four wipe samples detected chrysotile; one also detected amosite. The fourth wipe sample was below the detection limit.

Post 1st Cleaning Samples – Three air, four micro vacuum, and five wipe samples were collected for asbestos. The PCM and PCMe analyses could not be conducted due to overloading of particulate matter on the filters.

The results of the four micro vacuum samples indicate that asbestos was present at levels higher than those observed before cleaning.

Two of the five wipe samples were below the detection limit, although one of these samples did detect chrysotile. Results of the remaining three samples were above the detection limit and similar to or lower than the pre-cleaning samples.

Post 2nd Cleaning – Four air samples were collected for asbestos. The samples could not be analyzed due to overloading of particulate matter on the filters. Therefore, a third cleaning was conducted using a more aggressive cleaning method: a commercial HEPA vacuum and an AFD.

Post 3rd Cleaning – Six air samples were collected for asbestos after the third cleaning. The samples were analyzed for PCM, TEM AHERA, and PCMe. The results of the PCM analysis indicate that three of the six samples were below the detection limit. The remaining three samples were above the detection limit but below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that all six samples were below the detection limit. The PCMe results also indicate that all six samples were below the detection limit. This suggests that the cleaning techniques used for the third cleaning were effective at reducing the particulate matter to levels that permitted valid air samples to be collected and analyzed, with the results indicating that all six samples were below the primary clearance criterion of 0.0009 S/cc.

<u>Dioxin</u>
Before Cleaning Samples – Three pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present and that the TEQ concentration for one of the three samples was above the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentrations were below the primary clearance criterion of 4 ng/m^2. This indicates that the cleaning techniques used were effective at reducing the pre-cleaning concentrations of dioxin.

<u>Gypsum</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected above the detection limit in the air samples.

<u>Lead</u>
Before Cleaning Samples – Four micro vacuum samples and three wipe samples were collected. Lead was detected in all four micro vacuum samples at concentrations above the comparison value. Two of the three wipe samples detected concentrations above the primary clearance criterion of 25 $\mu g/ft^2$. The micro vacuum samples exceeded the comparison value in a range of 39.4 $\mu g/ft^2$ to 135 $\mu g/ft^2$, and the two wipe samples exceeded the primary clearance criterion at 48.7 $\mu g/ft^2$ and 750 $\mu g/ft^2$. This indicates that lead was present prior to cleaning.

Post 1st Cleaning Samples – Two air samples, four micro vacuum samples, and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion. The results of the micro vacuum and wipe samples show that all but one micro vacuum sample (26.9 $\mu g/ft^2$) met the comparison value or primary clearance criterion for lead.

Post 2nd Cleaning Samples – Two air samples were collected after the second cleaning. Both samples detected concentrations below the primary clearance criterion.

Alpha-Quartz
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All samples were below the detection limit.

Calcite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of calcite.

Cristobalite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Since all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of cristobalite.

Tridymite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Since all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of tridymite.

MMVF
Before Cleaning Samples – Three pre-cleaning wipe samples were collected. The three wipe samples detected MMVF in concentrations from 343.39 S/L to 744.01 S/L. This indicates that MMVF was present prior to cleaning.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. All of the air sample results indicate that MMVF was present at levels below the primary clearance criterion of 10 S/L. All of the wipe sample results were above the detection limit and at concentrations similar or lower than the pre-cleaning samples.

Post 2nd Cleaning – Five air samples were collected after the second cleaning. Four of the five samples were below the primary clearance criterion of 10 S/L. However, one sample exceeded the primary clearance criterion at 91.796 S/L. This value was further evaluated and determined to be invalid due to an equipment malfunction which resulted in the collection of a volume of air significantly lower than the other four samples. It should be noted that the other four post-2nd cleaning air samples, and the three post-1st cleaning air samples were below the applicable health-based benchmark.

PAH

Before Cleaning Samples – Three pre-cleaning wipe samples were collected. Two of the three samples were below the detection limit. The calculated TEF for these two samples was below the primary clearance criterion. Twelve PAH compounds were detected in the third sample. The calculated TEF for this sample exceeded the TEF of 300 $\mu g/m^2$ with a value of 1,046.6 $\mu g/m^2$.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected. All four samples were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$. This indicates that the cleaning techniques used were effective in reducing the PAH pre-cleaning concentrations.

Unit 3D – This unit is located on the third floor. It is a 968 sq. ft. loft with three bedrooms, facing the WTC site. The unit has hardwood floors with no carpet. This unit presented a significant accumulation of dust in the dwelling. Its windows were blown in. The majority of personal items, with the exception of three pieces of hardwood furniture, were disposed of prior to cleaning.

Cleaning Method – This unit was cleaned using Test 1A: a Ridgid® shop vacuum and a Hoover® upright without a HEPA filter. AFDs were not used during cleaning. All horizontal surfaces were wet wiped. This cleaning method was used for each cleaning event.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned twice.

Asbestos

Before Cleaning Samples – Three micro vacuum and five wipe samples were collected for asbestos. These samples indicate that asbestos was present in the unit before cleaning. All three of the micro vacuum samples detected chrysotile, and four of the five wipe samples detected chrysotile. The remaining sample was below the detection limit.

Post 1st Cleaning Samples – Three micro vacuum, five wipe samples and three air samples were collected for asbestos.

All three of the air samples, which were analyzed using PCM, TEM AHERA, and PCMe, could not be analyzed due to overloading of particulate material. Due to this situation, a second cleaning was conducted.

The results of the three micro vacuum samples indicate that asbestos was present at levels lower than those observed before cleaning. One of the samples was below the detection limit.

The results of the five wipe samples indicate that asbestos was present in all of the samples, but generally at lower concentrations than those observed before cleaning.

Post 2nd Cleaning Samples – Four post-cleaning air samples were collected for asbestos. These samples were analyzed using PCM, TEM AHERA, and PCMe. The results of the PCM analysis were below the secondary numeric criterion of 0.01 f/cc. One sample was below the detection limit. The TEM AHERA results were all below the detection limit. The PCMe results were also all below the primary clearance criterion of 0.0009 S/cc. This indicates that the cleaning techniques were effective at reducing the particulate matter, which allowed valid air samples to be collected and analyzed.

Dioxin

Before Cleaning Samples – Four pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2 and were detected at lower concentrations than in the pre-cleaning samples. This indicates that the cleaning techniques were effective in reducing dioxin concentrations.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected above the detection limit of 0.008 mg/m^3 in the air samples.

Lead

Before Cleaning Samples – Three micro vacuum samples and four wipe samples were collected. One of the three micro vacuum samples was above the comparison value. The other two results were below the detection limit. The results indicate lead was present in two of the four wipe samples at concentrations above the primary clearance criterion of 25 $\mu g/ft^2$. The micro vacuum samples exceeded the comparison value at 50.7 $\mu g/ft^2$ and the two wipe samples exceeded the primary clearance criterion at 112 $\mu g/ft^2$ and 201 $\mu g/ft^2$.

Post 1st Cleaning Samples – Two air samples, three micro vacuum samples, and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion but were qualified as rejected due to field blank contamination. The results of the micro vacuum and wipe samples show that while one of the micro vacuum (qualified as rejected) and two of the wipes samples exceeded the detection limit, all samples met the comparison value and the primary clearance criterion for lead after the first cleaning. Therefore, additional samples were not collected for analysis of lead.

Alpha-Quartz

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All samples were below the detection limit.

Calcite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of calcite.

Cristobalite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of cristobalite.

Tridymite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of tridymite.

MMVF

Before Cleaning Samples – Four pre-cleaning wipe samples were collected. The four wipe samples had MMVF detected in concentrations from 228.93 S/cm^2 to 1259.09 S/cm^2. This indicates that MMVF was present prior to cleaning.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. All of the air sample results indicate that MMVF was present but at levels below the primary clearance criterion of 10 S/L. All of the wipe sample results were at or below the detection limit of 22.89 S/cm^2. This indicates that the cleaning method was able to reduce the pre-cleaning concentration of MMVF.

PAH

Before Cleaning Samples – Four pre-cleaning wipe samples were collected. Three of the four samples were below the detection limit and below the primary clearance criterion. The fourth sample had two PAH compounds detected; the calculated TEF was below the primary clearance criterion.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected. All four samples were below the detection limit, and each sample was below the primary clearance criterion of 300 μg/m^2.

<u>Third</u> <u>Floor</u> <u>Hallway</u> – The third floor hallway is an area with plywood floors, and walls made of sheet rock covered with wallpaper glue. The ceiling is also made of sheet rock, and is painted.

Cleaning Method – This area was cleaned using Test 4A and Test 4B. Test 4A used industrial HEPA-filtered vacuums and an AFD, while Test 4B consisted of a soap and water wet wipe of the ceiling only.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

<u>Asbestos</u>
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two post-cleaning air samples were collected. The two air samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM result were all below the secondary numeric criterion of 0.01 f/cc. Similarly, the TEM AHERA results were all below the secondary numeric criterion of 0.022 S/cc. The PCMe results were all below the primary clearance criterion of 0.0009 S/cc with both samples being below the detection limit.

<u>Dioxin</u>
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were no samples collected after cleaning.

<u>Gypsum</u>
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were two air samples collected after the first cleaning. Gypsum was not detected in any sample.

<u>Lead</u>
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There was one air sample collected after the first cleaning. The air sample was below the detection limit. Since the primary clearance criterion was met for lead after the first cleaning, no additional lead samples were collected.

<u>Alpha-Quartz</u>
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were two air samples collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of alpha-quartz.

Calcite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

Cristobalite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were two air samples collected after the first cleaning. Both were below the detection limit.

Tridymite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

MMVF
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. The results indicate that MMVF was present in both samples; however, the concentrations were below the primary clearance criterion of 10 S/L. Because the air samples were below the primary clearance criterion, no additional samples were collected for MMVF.

PAH
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were no samples collected after cleaning.

Unit 4A – This unit is located on the fourth floor. It is a 1,368 sq. ft. open loft facing Cedar Street. No windows were blown in and there was minimal dust accumulation in the dwelling with the exception of the baseboard heating units, which contained visible dust. The unit has hardwood floors. All of the tenant's personal items were removed prior to the cleanup.

Cleaning Method – This unit was cleaned using Test 2A: a Craftsman® shop vacuum and Eureka® upright vacuum with a HEPA filter for vacuuming the floors and other surfaces. There were no AFDs used during the cleaning process. In addition, all horizontal surfaces were wet wiped. This cleaning method was used for each cleaning event.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned twice.

Asbestos
Before Cleaning Samples – Three micro vacuum and four wipe samples were collected

for asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. All three micro vacuum samples detected chrysotile above the detection limit. Three of the four wipe samples were below the detection limit; however, chrysotile was detected in two of these samples. The fourth wipe sample was above the detection limit.

Post 1st Cleaning – Three air samples, three micro vacuum samples, and five wipe samples were collected. The three air samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM, TEM AHERA and PCMe analyses could not be conducted due to overloading of particulate material. Due to inconclusive asbestos air results, a second cleaning was conducted.

The results for the three micro vacuum samples indicate that asbestos was present at levels similar to or higher than those observed before cleaning. One of the samples was identified as non-detect, although asbestos was present below the detection limit.

The results for the five wipe samples that were collected indicate that asbestos was present in all five samples, although two samples were below the detection limit. The concentrations observed were similar to or higher than the pre-cleaning samples.

Post 2nd Cleaning – Three asbestos air samples were collected after the second cleaning. The samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results could not be obtained due to the filter being overloaded with particulate material. The TEM AHERA results for each sample were below the detection limit and below the secondary numeric criterion of 0.022 S/cc. The PCMe results were all below the primary clearance criterion of 0.0009 S/cc, with all three of the samples below the detection limit. This indicates that the cleaning techniques used were able to reduce the particulate matter in the unit after the second cleaning, which permitted samples to be analyzed. The results of the analysis indicated that asbestos concentrations were below the primary clearance criterion of 0.0009 S/cc.

Dioxin

Before Cleaning Samples – Three pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected in any sample.

Post 2nd Cleaning Samples – Two air samples were collected after the second cleaning.

Gypsum was not detected in any sample.

Lead

Before Cleaning Samples – Three micro vacuum samples and three wipe samples were collected. The results indicate that all three of the micro vacuum samples were below the comparison value of 25 μg/ft^2 and below the detection limit. The three wipe samples contained detectable concentrations of lead; however, all of the concentrations were below the primary clearance criterion of 25 μg/ft^2.

Post 1st Cleaning Samples – Two air samples, three micro vacuum samples and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion of 1.0 μg/m^3. Two of the three micro vacuum samples were below the detection limit. The third micro vacuum sample was slightly above the detection limit, but below the comparison value. Three of the four wipe samples were below the detection limit. The fourth sample was above the detection limit but below the primary clearance criterion. Since the primary clearance criterion was met for lead after the first cleaning, no additional samples were collected for analysis of lead.

Alpha-Quartz

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. One of the two air samples detected alpha-quartz at a concentration above the detection limit, at 0.008 mg/m^3. The detection also was above the primary clearance criterion of 0.004 mg/m^3. The other air sample was below the detection limit. Since one air sample exceeded the primary clearance criterion, additional air samples for alpha-quartz were collected.

Post 2nd Cleaning Samples – Two air samples were collected after the second cleaning. The results showed that both samples were below the detection limit. This indicates that the second cleaning was able to reduce the alpha-quartz concentration in air to below the detection limit.

Calcite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Post 2nd Cleaning Samples – Two air samples were collected after the second cleaning. The results indicate that both samples were below the detection limit.

Cristobalite

Before Cleaning Samples –Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Post 2nd Cleaning Samples – Two air samples were collected after the second cleaning. The results indicate that both samples were below the detection limit.

Tridymite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Post 2nd Cleaning Samples – Two air samples were collected after the second cleaning. The results indicate that both samples were below the detection limit.

MMVF

Before Cleaning Samples – Three pre-cleaning wipe samples were collected. All three sample results indicate that MMVF was present above the detection limit.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. The results for the three air samples indicate that MMVF was present; however, both samples were below the primary clearance criterion of 10 S/L. The results of the five wipe samples indicate that four of the samples were below the detection limit and one sample was at the detection limit. The MMVF concentrations after the first cleaning were lower than those in the pre-cleaning samples. There is not a clearance criterion for MMVF in settled dust. Since the air samples were below the primary clearance criterion and the MMVF in settled dust was greatly reduced after the first cleaning, no additional samples were collected for analysis of MMVF.

PAH

Before Cleaning Samples – Three pre-cleaning wipe samples were collected. All three samples were below the detection limit and the TEF for each sample was below the primary clearance criterion.

Post 1st Cleaning Samples – Four wipe samples were collected after the first cleaning. All of the samples were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$. Since all of the samples were below the detection limit and the primary clearance criterion after the first cleaning, no additional samples were collected for analysis of PAH.

Unit 4B – This unit is located on the fourth floor. It is a 968 sq. ft. loft with four bedrooms facing Cedar Street. No windows were blown in and there was minimal dust accumulation in the dwelling with the exception of the baseboard heating units, which contained visible dust. The unit has hardwood floors and all of the tenant's personal items were cleaned and sealed in bags prior to the cleanup.

Cleaning Method – This unit was cleaned using Test 2B. a Ridgid® shop vacuum and Hoover® upright vacuum with a HEPA filter for vacuuming the floors and other surfaces. An AFD was used during the cleaning process. In addition, all horizontal surfaces were wet wiped. This cleaning method was used for each cleaning event.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

<u>Asbestos</u>

Before Cleaning Samples – Pre-cleaning wipe samples were collected for asbestos. The results for these samples indicate that asbestos was present in the unit prior to cleaning. Two of the five wipe samples were below the detection limit, although one of these samples had chrysotile detected. The remaining three samples had chrysotile detected above the detection limit.

Post 1st Cleaning – Three air and five wipe samples were collected. The three air samples were analyzed using PCM and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc. The PCMe results for each sample were below the primary clearance criterion of 0.0009 S/cc and were reported as below the detection limit.

The results for the five wipe samples that were collected indicate that asbestos was present in two of the five samples; however one of these samples was below the detection limit. The remaining three samples were below the detection limit.

<u>Dioxin</u>

Before Cleaning Samples – Four pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that there was dioxin present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

<u>Gypsum</u>

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected in any sample.

<u>Lead</u>

Before Cleaning Samples – Four pre-cleaning wipe samples were collected. The results indicate that lead was detected in three of the four wipe samples with two samples exceeding the primary clearance criterion of 25 μg/ft^2. One sample was slightly over the primary clearance criterion with a result of 30 μg/ft^2, while the second was twice the primary clearance criterion with a result of 50 μg/ft^2.

Post 1st Cleaning Samples – Two air samples and four wipe samples were collected after the first cleaning. The two air samples were above the detection limit but below the primary clearance criterion of 1.0 μg/m^3. Three of the four wipe samples were below the detection limit. The fourth wipe sample was above the detection limit but below the primary clearance criterion. Since the primary clearance criterion was met for lead after the first cleaning, no additional cleaning was necessary.

Post 2nd Cleaning Sampling – Because the cleaning was conducted prior to the establishment of a risk based cleanup level for lead in air, this unit was re-cleaned in an effort to meet the initially established clearance criterion . Sampling results following the second cleaning indicated levels below the primary clearance criterion.

Alpha-Quartz
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Calcite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Cristobalite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Tridymite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

MMVF
Before Cleaning Samples – Four pre-cleaning wipe samples collected. All four samples had MMVF detected above the detection limit.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. The results for the three air samples indicate that MMVF was present; however, both samples were below the primary clearance criterion of 10 S/L. The results of the five wipe samples indicate that MMVF was still present after the first cleaning; however, the concentrations detected were generally lower than the pre-cleaning samples. There is not a clearance criterion for MMVF in settled dust.

PAH
Before Cleaning Samples – Four pre-cleaning wipe samples were collected. All four samples were below the detection limit and the TEF for each sample was below the primary clearance criterion.

Post 1st Cleaning Samples – Four wipe samples were collected after the first cleaning. All of the samples were below the detection limit and the TEF for each sample was below the primary clearance criterion of 300 μg/m^2. Because all of the samples were below the detection limit and the primary clearance criterion after the first cleaning, no additional samples were collected for analysis of PAH.

Unit **4C** – This unit is located on the fourth floor. It is a 655 sq. ft. open loft that faces the WTC site. The windows were blown in and there was significant dust accumulation in the dwelling. The unit has hardwood floors and no carpet. All personal possessions to be retained by the tenant were vacuumed and bagged.

Cleaning Method – This unit was cleaned using Test 1A: a Craftsman® shop vacuum and a Eureka® upright vacuum for vacuuming the floors and other surfaces. No HEPA or AFD was used during the cleaning process. In addition, all horizontal surfaces were wet wiped.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

Supplemental Sampling Activities – The air samples collected for PAH analysis were taken for reference purposes only. These samples are discussed in the PAH section below.

Asbestos

Before Cleaning Samples – Pre-cleaning micro vacuum and wipe samples were collected for asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. All four of the micro vacuum samples detected chrysotile, and one of the four micro vacuum samples detected amosite. Three of the four wipe samples detected chrysotile; however, one of these samples was below the detection limit. The fourth wipe sample did not detect chrysotile and was below the detection limit.

Post 1st Cleaning Samples – Three air samples, three micro vacuum samples, and five wipe samples were collected for asbestos. The samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM analysis could not be conducted due to overloading of particulate material. The TEM AHERA results were above the detection limit but were below the secondary numeric criterion of 0.022 S/cc. Two of the three air samples analyzed using PCMe were below the primary clearance criterion of 0.0009 S/cc. The third air sample detected chrysotile and was present at the primary clearance criterion of 0.0009 S/cc. Since the primary primary clearance criterion was met, no additional cleaning was required.

The results of the three micro vacuum samples indicate that asbestos was present at levels lower than those observed before cleaning.

The results of the five wipe samples indicate that asbestos was present above the detection level in one of the five samples. The concentrations were lower than in the pre-cleaning concentrations.

Dioxin

Before Cleaning Samples – Three pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that there was dioxin present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that the TEQ concentration for each sample was below the criterion of 4 ng/m^2 and were detected at lower concentrations than in the pre-cleaning samples.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected above the detection limit in these samples.

Lead

Before Cleaning Samples – Four micro vacuum samples and three wipe samples were collected. The results indicate that all four micro vacuum samples exceeded the comparison value. Two of the three wipe samples exceeded the primary clearance criterion of 25 µg/ft^2. The third wipe sample was below the detection limit. The micro vacuum samples ranged in concentration from 69.8 µg/ft^2 to 83.7 µg/ft^2, and the wipe samples ranged from non-detect to 181 µg/ft^2.

Post 1st Cleaning Samples – Two air samples, three micro vacuum samples, and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion of 1.0 µg/m^3. The results of the micro vacuum and wipe samples show that all samples met the comparison value or primary clearance criterion for lead after the first cleaning; however, three of the four wipe samples were qualified as rejected due to field blank contamination, and one wipe sample was not analyzed because it was not received at the laboratory.

Post 2nd Cleaning Samples – While the study was underway, there was a revision from a background clearance criterion for lead in air of 0.1 µg/m^3 to a health-based clearance criterion for lead in air of 1.0 µg/m^3. The initial results were compared to the background clearance criterion which resulted in a decision to re-clean the dwelling and resample for lead in air. This also occurred in four other units and although these units were cleaned a second time and samples were collected after the second cleaning, the revised lead-in-air criterion actually negated the need for the second cleaning and sampling events. One air sample was collected and analyzed for lead. The result for this sample indicates that the concentration was below the primary clearance criterion of 1.0 µg/m^3.

Alpha-Quartz

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Calcite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Cristobalite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Tridymite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

MMVF
Before Cleaning Samples – Three pre-cleaning wipe samples were collected. The three wipe samples contained MMVF detected at concentrations from 57.23 S/cm^2 to 1030.17 S/cm^2. This indicates that MMVF was present prior to cleaning.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. All of the air sample results indicate that MMVF was present, but at concentrations below the primary clearance criterion of 10 S/L. The wipe sample results were detected in concentrations ranging from 57.23 S/cm^2 to 343.39 S/cm^2 which were similar to or lower than the pre-cleaning samples.

PAH
Before Cleaning Samples – Three pre-cleaning wipe samples were collected. Two of the three samples were below the detection limit; the TEF for each sample was below the primary clearance criterion. PAH compound was detected in the third sample; however the calculated TEF was below the primary clearance criterion of 300 μg/m^2.

Post 1st Cleaning Samples – Two post-cleaning air samples and four post-cleaning wipe samples were collected. Both air samples had seven PAH compounds detected; however, the calculated TEFs for these samples were below the primary clearance criterion of 0.2 μg/m^3. All wipe samples were below the detection limit and the TEF for each sample was below the primary clearance criterion of 300 μg/m^2.

Unit 4D – This unit is on the fourth floor. It is a 968 sq. ft. open loft facing the WTC site. The unit had windows blown in and presented a significant accumulation of dust. The dwelling has hardwood floors with no carpet. All personal possessions to be retained by the tenant were vacuumed and bagged.

Cleaning Method – This unit was cleaned using Test 2A: a Ridgid® shop vacuum and a Eureka® upright vacuum with a HEPA filter. No AFDs were used. All horizontal surfaces were wet-wiped. This cleaning method was used for each cleaning event.

Cleaning Results – This unit met the clearance listed in Table 1.0 for each compound after being cleaned twice.

Asbestos

Before Cleaning Samples – Six micro vacuum and five wipe samples were collected for asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. All six of the micro vacuum samples detected chrysotile above the detection limit. Two of the five wipe samples were below the detection limit, although one detected chrysotile. The remaining three samples were above the detection limit.

Post 1st Cleaning Samples – Three air, six micro vacuum samples and five wipe samples were collected for asbestos. The samples were analyzed using PCM, TEM AHERA, and PCMe. The results for the PCM analysis indicate that two of the three samples were below the secondary numeric criterion of 0.01 f/cc. The third slightly exceeded this value with a concentration of 0.02 f/cc. The TEM AHERA results indicate that all three samples were below the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that two of the three air samples were below the primary clearance criterion of 0.0009 S/cc. The third sample detected chrysotile and was at the primary clearance criterion of 0.0009 S/cc.

The results of the six micro vacuum samples indicate that asbestos was present at levels lower than those observed before cleaning.

The results of the five wipe samples indicate that asbestos was present in all of the samples at concentrations similar to or lower than those observed before cleaning.

Dioxin

Before Cleaning Samples – Four pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that there was dioxin present at concentrations lower than those observed in the pre-cleaning samples. In addition, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2. This indicates that the cleaning techniques were effective at reducing dioxin concentrations.

Gypsum

Before Cleaning Samples - Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples - Two air samples were collected after the first cleaning. Gypsum was not detected above the detection limit of 0.016 mg/m^3 for these samples.

Lead

Before Cleaning Samples – Six micro vacuum samples and four wipe samples were collected. The results indicate that lead was detected in all six of the micro vacuum samples at concentrations above the comparison value of 25 $\mu g/ft^2$, ranging from 26.2 $\mu g/ft^2$ to 83.5 $\mu g/ft^2$. One of the four wipe samples exceeded the primary clearance criterion of 25 $\mu g/ft^2$ with a concentration of 169 $\mu g/ft^2$.

Post 1st Cleaning Samples – Two air samples, six micro vacuum samples, and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion but were qualified as rejected due to lab blank contamination. The results of the micro vacuum and wipe samples show that all but one wipe sample (66 $\mu g/ft^2$) met the comparison value or primary clearance criterion for lead.

Post 2nd Cleaning Samples – One air sample and one wipe sample were collected after the second cleaning. Both sample results were below their respective clearance criterion.

Alpha-Quartz

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All samples were below the detection limit.

Calcite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Since all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of calcite.

Cristobalite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of cristobalite.

Tridymite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit. Because all of the samples were below the detection limit after the first cleaning, no additional samples were collected for analysis of tridymite.

MMVF

Before Cleaning Samples – Four wipe samples were collected. MMVF was detected in the wipe samples in concentrations from 286.16 S/cm^2 to 2174.79 S/cm^2.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. All of the air sample results indicate that MMVF was present, but at levels below the primary clearance criterion of 10 S/L. All of the wipe sample results were in the range of 57.23 S/cm^2 to 572.31 S/cm^2, which is lower than the pre-cleaning range. This indicates that the cleaning techniques were effective at reducing MMVF concentrations.

PAH

Before Cleaning Samples – Four wipe samples were collected. Three of the four samples were below the detection limit with TEF values below the primary clearance criterion. The fourth sample had six PAH compounds detected; the calculated TEF slightly exceeded the primary clearance criterion of 300 $\mu g/m^2$ with a value of 325.8 $\mu g/m^2$.

Post 1st Cleaning Samples – Four wipe samples were collected. All four samples were below the detection limit, and the TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^3$.

Fourth Floor Hallway – The fourth floor hallway is an area with plywood floors and walls made of sheet rock covered with wallpaper glue. The ceiling is also made of sheet rock, and is painted.

Cleaning Method – This area was cleaned using Test 4A and Test 4B. Test 4A used an industrial HEPA-filtered vacuum and an AFD, while Test 4B consisted of a soap and water wet wipe of only the ceiling.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

Asbestos

Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One sample was collected after cleaning. The air sample was analyzed using PCM, TEM AHERA, and PCMe. The PCM result was below the secondary numeric criterion of 0.01 f/cc. Similarly, the TEM AHERA result was below the secondary numeric criterion of 0.022 S/cc. The PCMe result was below the primary clearance criterion of 0.0009 S/cc with the sample being below the detection limit.

Dioxin

Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were no post- cleaning samples collected.

Gypsum
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. Gypsum was not detected.

Lead
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The air sample was below the primary clearance criterion of 1.0 $\mu g/m^3$.

Alpha-Quartz
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The sample was below the detection limit.

Calcite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The sample was below the detection limit.

Cristobalite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The sample was below the detection limit.

Tridymite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The sample was below the detection limit.

MMVF
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The results indicate that MMVF was present in the sample; however, the concentration was below the primary clearance criterion of 10 S/L.

PAH
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – There were no samples collected.

Unit **5A** – This unit is on the fifth floor. It is a 1,404 sq. ft. loft facing Cedar Street with one bedroom. The unit has hardwood floors and no carpet. One window had been blown in. The dwelling presented minimal accumulation of dust, except for baseboard-heating units. Numerous items were cleaned, then bagged.

Cleaning Method – This unit was cleaned using Test 3B: an Industrial HEPA-filtered vacuum. An AFD was used during cleaning. In addition, all horizontal surfaces were wet wiped.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned twice.

Asbestos

Before Cleaning Samples – Seven micro vacuum and four wipe samples were collected for analysis of asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. Chrysotile was detected in six of the seven micro vacuum samples and all four of the wipe samples; however, chrysotile was present below the detection limit in two of the four wipe samples.

Post 1st Cleaning – Three air samples, seven micro vacuum samples, and five wipe samples were collected. The three air samples were analyzed using PCM and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc. All three PCMe analyses were at or below the primary criterion of 0.0009 S/cc.

The results for the seven micro vacuum samples indicate that asbestos results varied and were present at levels higher and lower than before cleaning.

The results for the five wipe samples showed that asbestos was present in one sample; however, all samples were below the detection limit. The results indicate that the cleaning techniques used were effective in reducing the asbestos concentrations observed prior to cleaning.

Dioxin

Before Cleaning Samples – Three wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four wipe samples were collected and analyzed for dioxin. The results indicate that the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected in any sample.

Lead

Before Cleaning Samples – Seven micro vacuum samples and three wipe samples were collected. Lead was detected in one of the seven micro vacuum samples at concentrations below the comparison value of 25 $\mu g/ft^2$. All three wipe samples had detectable concentrations of lead, two of which were above the primary clearance criterion of 25 $\mu g/ft^2$.

Post 1st Cleaning Samples – Two air samples, seven micro vacuum samples and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. All seven micro vacuum samples were below the comparison value. Two of the four wipe samples exceeded the primary clearance criterion, therefore, additional cleaning was necessary.

Post 2nd Cleaning Sampling – Three wipe samples were collected following the second cleaning. The results of all three samples were below the primary clearance criterion. In two of the samples, lead was not detected. The sampling results following the second cleaning indicate that the primary clearance criterion was met.

Alpha-Quartz

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Calcite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Cristobalite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

Tridymite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. All of the samples were below the detection limit.

MMVF

Before Cleaning Samples – Three pre-cleaning wipe samples were collected. MMVF was detected in all three of the samples.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. The results of the three air samples indicate that MMVF was present; however, all samples were below the primary clearance criterion of 10 S/L. The results of the five wipe samples indicate that MMVF continued to be present in all of five of the samples after the first cleaning; however, the concentrations detected were lower than in the pre-cleaning samples. This indicates that the cleaning techniques were effective at reducing the pre-cleaning concentrations of MMVF.

<u>PAH</u>
Before Cleaning Samples – Three pre-cleaning wipe samples were collected. All three samples were below the detection limit. The TEF for each sample was below the primary clearance criterion.

Post 1st Cleaning Samples – Four wipe samples were collected after the first cleaning. All were below the detection limit and the TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$. Since all of the samples were below the detection limit and the primary clearance criterion after the first cleaning, no additional samples were collected for analysis of PAH.

<u>Unit</u> <u>5C</u> – This unit is located on the fifth floor. It is a 968 sq. ft. loft with three separate bedrooms facing the WTC. The unit has hardwood floors. Windows were blown in. There was significant accumulation of dust in the dwelling. All of the tenant's personal items were removed prior to cleaning.

Cleaning Method – This unit was cleaned twice using Test 3A: an industrial HEPA-filtered vacuum for vacuuming the floors and other surfaces. An AFD was not used during the cleaning process. All horizontal surfaces were wet wiped. This cleaning method was used for the first two cleaning events. The third cleaning event used Test 3B, which is similar to Test 3A described above; however, AFDs were used during the third cleaning.

Cleaning Results – With the exception of asbestos, this unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned three times.

<u>Asbestos</u>
Before Cleaning Samples – Three micro vacuum and four wipe samples were collected for analysis of asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. All three micro vacuum samples, as well as all four wipe samples, detected chrysotile above the detection limit.

Post 1st Cleaning – Three air samples, three micro vacuum samples, and five wipe samples were collected. The three air samples were analyzed using PCM and PCMe. The PCM results indicate that two of the samples were below the secondary numeric criterion of 0.01 f/cc. The third slightly exceeded the primary clearance criterion with a result of 0.015 f/cc. The PCMe analysis could not be conducted due to overloading of particulate material. Due to inconclusive PCMe results, a second cleaning was conducted.

The results for two of the three micro vacuum samples indicate that asbestos was present at levels similar to those observed before cleaning. The third micro vacuum sample was reported as being below the detection limit.

The results for the five wipe samples indicate that two of the five samples were below the detection limit, although one of these samples had chrysotile detected. The remaining three samples had chrysotile detected at concentrations above the detection limit. Unlike the micro vacuum samples, the results of the wipe samples collected after the first cleaning were lower than the pre-cleaning concentrations. This indicates that the cleaning techniques used were able to reduce the concentrations of asbestos in settled dust.

Post 2nd Cleaning – Five asbestos air samples were collected after the second cleaning. The samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM, TEM AHERA, and PCMe results could not be obtained due to the filters being overloaded with particulate material. Due to inconclusive PCMe results, a third cleaning was conducted.

Post 3rd Cleaning – Four asbestos air samples were collected after the third cleaning. The samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results indicate that one sample was below the detection limit and the other three were at the detection limit. All PCM results were below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results had chrysotile detected above the detection limit; however, all four results were below the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that two of the samples which were collected under a modified-aggressive sampling methodology, were below or at the detection limit. The remaining two samples, collected under an aggressive sampling methodology, were slightly above the primary clearance criterion of 0.0009 S/cc with results of 0.0015 S/cc and 0.0016 S/cc. The results obtained from the samples collected with the modified-aggressive sampling were used as evidence of meeting the primary clearance criterion.

Dioxin

Before Cleaning Samples – Three pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2. Since dioxin was below the detection limit for all of the samples collected, there were no additional dioxin samples collected.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Gypsum was not detected in any sample.

Lead

Before Cleaning Samples – Three micro vacuum samples and three wipe samples were collected. Lead was detected in all three micro vacuum samples at concentrations above (approximately four to six times) the comparison value of 25 μg/ft^2. Two of the three wipe samples had detectable concentrations of lead above the primary clearance criterion of 25 μg/ft^2, while the third was below the primary clearance criterion.

Post 1st Cleaning Samples – Two air samples, three micro vacuum samples and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion of 1.0 μg/m^3. However, at the time the results were received, the primary clearance criterion that was being used for comparison was the background clearance criterion of 0.1 μg/m^3, not the health-based clearance criterion of 1.0 μg/m^3 which was developed during the execution of this project. Therefore, additional air samples were collected after the second cleaning.

All three micro vacuum samples were below the detection limit. This indicates that the cleaning techniques used were able to reduce the elevated pre-cleaning lead concentrations that were observed in the settled dust in the areas where the samples were collected.

The results of three of the four wipe samples were below the primary clearance criterion (one sample was broken and not analyzed). The results from the first cleaning indicate that the cleaning technique was effective in removing the elevated concentrations of lead that were observed prior to the first cleaning. Since the primary clearance criterion was met for lead after the first cleaning, no additional samples were collected for the analysis of lead, with the exception of the air samples discussed above.

Post 2nd Cleaning – Two air samples were collected after the second cleaning. The results of both indicate that the samples were below the primary clearance criterion of 1.0 μg/m^3. Since the primary clearance criterion was met for lead after the first cleaning, no additional samples were collected.

<u>Alpha-Quartz</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

<u>Calcite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both samples were below the detection limit.

<u>Cristobalite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both samples were below the detection limit.

Tridymite

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. One was below the detection limit and one was slightly above the detection limit.

MMVF

Before Cleaning Samples – Three pre-cleaning wipe samples were collected. All three samples were above the detection limit.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. The results indicate that MMVF was present in all three, with two samples being above the primary clearance criterion of 10 S/L. The third was below the primary clearance criterion. The results of the five wipe samples indicate that MMVF was still present after the first cleaning at concentrations similar to or higher than the pre-cleaning samples. There is not a clearance criterion for MMVF in settled dust; however, since two of the air samples were above the primary clearance criterion, additional air samples were collected for analysis of MMVF.

Post 2nd Cleaning – Five air samples were collected after the third cleaning. The results indicate that the two of the five samples were above the primary clearance criterion. Due to this situation, additional air samples were collected after the third cleaning.

Post 3rd Cleaning – Two air samples were collected after the second cleaning. The results indicate that both samples were below the primary clearance criterion and below the detection limit.

PAH

Before Cleaning Samples – Three pre-cleaning wipe samples were collected. Two of the three samples were below the detection limit; the TEF for these samples was below the primary clearance criterion. The third sample had four PAH compounds detected; the calculated TEF was 303.5 $\mu g/m^2$**,** which is slightly above the primary clearance criterion of 300 $\mu g/m^2$.

Post 1st Cleaning Samples – Four wipe samples were collected after the first cleaning. All were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$. Since all of the samples were below the detection limit and the primary clearance criterion after the first cleaning, no additional samples were collected for analysis of PAH.

Unit 5D – This unit is on the fifth floor. It is a 1,024 sq. ft. open loft facing the World Trade Center site. This unit had windows that were blown in, which resulted in significant dust accumulation. The dwelling has hardwood floors with no carpet. All personal items were removed prior to cleaning.

Cleaning Method – This unit was cleaned using Test 3B: an industrial HEPA-filtered vacuum and an AFD. All horizontal surfaces were wet wiped.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned one time.

Asbestos

Before Cleaning Samples – Two micro vacuum and five wipe samples were collected for analysis of asbestos. These samples indicate that asbestos was present in the unit prior to cleaning. The two micro vacuum samples detected chrysotile above the detection limit. Three of the five wipe samples were below the detection limit, although four of the five wipe samples detected either chrysotile or amosite.

Post 1st Cleaning Samples – Three air, two micro vacuum and five wipe samples were collected for asbestos. The samples were analyzed for PCM and PCMe. The PCM results indicate all three air samples were below the secondary numeric criterion of 0.01 f/cc. The PCMe results indicate that all three of the samples were below the primary clearance criterion of 0.0009 S/cc.

The results of the two micro vacuum samples indicate that asbestos was present at levels somewhat similar to those observed before cleaning.

The results of the five wipe samples indicate that asbestos was below the concentrations observed in the pre-cleaning samples and was below the detection limit for all samples.

Dioxin

Before Cleaning Samples – Four wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was not present and that the TEQ concentration for all samples was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four post-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that there was dioxin present; however, the TEQ concentration was below the primary clearance criterion of 4 ng/m^2 and similar to pre-cleanup concentrations.

Gypsum

Before Cleaning Samples - Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples - Two air samples were collected after the first cleaning. Gypsum was not detected above the detection limit of 0.016 mg/m^3 in the air samples.

Lead

Before Cleaning Samples - Two micro vacuum samples and four wipe samples were collected. Lead was detected in both micro vacuum samples and two of the four wipe samples at concentrations above the comparison value or primary clearance criterion of 25 µg/ft^2. The micro vacuum samples exceeded the comparison value, ranging from 27.1 µg/ft^2 to 49.1 µg/ft^2, and the two wipe samples exceeded the primary clearance criterion, ranging from 25.3 µg/ft^2 and 32.1 µg/ft^2.

Post 1st Cleaning Samples (*Test 3B)* – Two air samples, two micro vacuum samples, and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. The results of the micro vacuum and wipe samples show that all samples met the comparison value or primary clearance criterion for lead.

<u>Alpha-Quartz</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

<u>Calcite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

<u>Cristobalite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

<u>Tridymite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

<u>MMVF</u>
Before Cleaning Samples – Four wipe samples were collected. The four wipe samples evidenced MMVF above the detection limit, which indicates that MMVF was present prior to cleaning.

Post 1st Cleaning Samples – Three air samples and five wipe samples were collected after the first cleaning. All of the air sample results indicate that MMVF was present, but at levels below the primary clearance criterion of 10 S/L. All of the wipe sample results were in the range of 114.46 S/cm^2 to 228.93 S/cm^2. This indicates that the cleaning method was able to reduce the pre-cleaning concentration of MMVF.

<u>PAH</u>
Before Cleaning Samples – Four wipe samples were collected. All four samples were below the detection limit, and the TEF of 300 $\mu g/m^2$.

Post 1st Cleaning Samples – Four wipe samples were collected. All four samples were below the detection limit; the TEF value was below the primary clearance criterion of

300 μg/m^2.

Fifth **Floor** **Hallway** – The fifth floor hallway is an area with plywood floors and walls made of sheet rock covered with wallpaper glue. The ceiling is also made of sheet rock, and is painted.

Cleaning Method – This area was cleaned twice using Test 4A and Test 4B. Test 4A used an industrial HEPA-filtered vacuum and an AFD, while Test 4B consisted of a soap and water wet wipe of only the ceiling.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned twice.

Asbestos
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected. The air samples were analyzed using PCM. The PCM results were below the secondary numeric criterion of 0.01 f/cc. The samples could not be analyzed for PCMe, due to overloading of particulate matter on the filters.

Post 2nd Cleaning Samples – Two air samples were collected. The air samples were analyzed using TEM AHERA, and PCMe. The samples could not be analyzed for PCM, due to overloading of particulate matter on the filters. The TEM AHERA results were below the secondary numeric criterion of 0.022 S/cc, with the samples being below the detection limit. Similarly, the PCMe results were below the primary clearance criterion of 0.0009 S/cc with the samples likewise below the detection limit.

Dioxin
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were no post-first cleaning samples collected.

Post 2nd Cleaning Samples – There were no post-second cleaning samples collected.

Gypsum
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. Gypsum was not detected. Since gypsum was below the detection for the sample collected, no additional gypsum samples were collected.

Lead
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The air sample was below the primary clearance criterion of 1.0 μg/m^3. Since the primary clearance criterion was met for lead after the first cleaning, no additional lead samples were collected.

Alpha-Quartz
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The sample was below the detection limit. Because the sample was below the detection limit after the first cleaning, no additional samples were collected for analysis of alpha-quartz.

Calcite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The sample was below the detection limit. Because the sample was below the detection limit after the first cleaning, no additional samples were collected for analysis of calcite.

Cristobalite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning; the sample was below the detection limit. Because the sample was below the detection limit after the first cleaning, no additional samples were collected for analysis of cristobalite.

Tridymite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – One air sample was collected after the first cleaning. The sample was below the detection limit. Since the sample was below the detection limit after the first cleaning, no additional samples were collected for tridymite.

MMVF
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. The results indicate that MMVF was present in both samples; however, the concentrations were below the primary clearance criterion of 10 S/L. Because the air samples were below the primary clearance criterion, no additional samples were collected for MMVF.

PAH
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were no post-first cleaning samples collected.

Post 2nd Cleaning Samples – There were no post-second cleaning samples collected.

Barber Shop – The Barber Shop is located below grade to Liberty Street. This 1,268 sq. ft. open space faces the WTC site. The front door of the business was blown inward. Significant amounts of dust and debris were deposited down into the staircase into the rental space. Floor areas are covered with ceramic tiles. The ceiling is a suspended system composed of fibrous tiles. A void space is above the suspended ceiling, The void space accommodates flexible A/C ducts, electrical conduit and lights. All structural support members above the ceiling are encapsulated with a non-asbestos insulating material. Equipment including chairs, wash sinks, counters and hair care displays were located in the shop. The head space above the entrance door houses a condenser/compressor unit that was heavily impacted with WTC-related dust and debris. Ceiling tiles, flexible duct, chairs, display shelving, and hair care merchandise were disposed of prior to cleaning. Ancillary rooms that extend under Liberty Street are adjacent to the shop space. These rooms have earthen floors and are believed to be associated with utility companies. They were not cleaned.

Cleaning Method – This unit was cleaned using Test 4A and Test 4E. Test 4A consisted of use of an industrial HEPA vacuum to vacuum floors and other surfaces. An AFD was used during the cleaning process. Test 4E consisted of use of water to wet wipe all horizontal and vertical surfaces.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

Supplemental Sampling Activities – One bulk sample of insulation material was collected to determine its asbestos content, in order to address applicable health and safety concerns. Asbestos was not detected in the sample.

Asbestos

Before Cleaning Samples – Other than the bulk sample mentioned in the previous section, no other pre-cleanup samples were collected.

Post 1st Cleaning Samples – Three air samples were collected for asbestos. The samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM results indicate that all three samples were below the detection limit and below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that all three samples were below the detection limit and below the secondary numeric criterion of 0.022 S/cc. The PCMe results also indicate that all three samples were below the detection limit and were below the primary clearance criterion of 0.0009 S/cc.

Dioxin

Before Cleaning Samples – Four pre-cleaning wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples – Four wipe samples were collected and analyzed for dioxin. The results indicate that the concentrations of dioxin detected were slightly lower than the pre-cleaning samples. The TEQ concentration for each sample was below the criterion of 4 ng/m^2.

Lead

Before Cleaning Samples – Four pre-cleaning wipe samples were collected. Three of the four samples were above the detection limit. The fourth sample was below the detection limit. Two were above the primary clearance criterion of 25 $\mu g/ft^2$. Two of the samples were qualified as rejected due to field blank contamination.

Post 1st Cleaning Samples – Two air samples and four wipe samples were collected after the first cleaning. All of the air and wipe samples were below the detection limit and met the primary air and wipe clearance criteria for lead after the first cleaning.

MMVF

Before Cleaning Samples – No pre-cleaning samples were collected for MMVF.

Post 1st Cleaning Samples – Three air samples were collected after the first cleaning. MMVF was detected in two of three samples, but at levels below the primary clearance criterion of 10 S/L.

PAH

Before Cleaning Samples – Four wipe samples were collected. All of the samples were below the detection limit. The TEF for each sample was below the primary clearance criterion. One PAH compound was detected in the fourth sample; however, the TEF was below the primary clearance criterion of 300 $\mu g/m^2$.

Post 1st Cleaning Samples – Four wipe samples were collected. All four samples were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$.

Cedar Street Staircase – This area consisted of wood steps/landings, sheet rock walls and ceiling. Flooring was covered with vinyl tiles; walls and ceilings were covered with gloss paint.

Cleaning Method – This area was cleaned using Test 4A and Test 4B. Test 4A utilized a commercial HEPA-filtered vacuum and an AFD. Test 4B consisted of soap and water wet wipe of all horizontal and vertical surfaces.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

Asbestos

Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected. The air samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM results were below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that chrysotile was present, but both samples were below the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that one sample was below the detection limit and the other had chrysotile present, but at a concentration below the primary clearance criterion of 0.0009 S/cc.

Gypsum
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected. Gypsum was not detected in either sample.

Lead
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Lead was not detected in either sample. The results were below the primary clearance criterion of 1.0 $\mu g/m^3$. Because the primary clearance criterion was met for lead after the first cleaning, no additional lead samples were collected.

Alpha-Quartz
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both samples were below the detection limit.

Calcite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

Cristobalite
Before Cleaning Samples – There were no air samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

Tridymite
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both were below the detection limit.

MMVF
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. The results indicate that MMVF was only present in one sample. Both samples were below the primary clearance criterion of 10 S/L.

<u>Chiropractor's</u> <u>Office</u> – This is a 716 sq. ft. office space with four examination rooms facing the World Trade Center site. All front windows were blown in. Significant amounts of dust were present on all horizontal and vertical surfaces. Floor areas were covered with wall-to-wall carpeting. The suspended ceiling was covered with fibrous tiles. There was a two-foot high void space above the ceiling. The space above the suspended ceiling contained the HVAC system and wood floor joist system for the third floor apartments. This area contained WTC-related and non-WTC- related dust. The space was extremely difficult to clean due to the presence of electrical wires, recessed lighting fixtures, sprinkler systems, and the dry, friable nature of the wood support system. Ceiling tiles, flexible ventilation ducts and office equipment were disposed of prior to cleaning.

Cleaning Method – This unit was the subject of separate tests to evaluate five different cleaning techniques as described below:

Test 4A: Industrial HEPA-filtered vacuums and AFD.
Test 4B: Wet wipe all walls.
Test 4C: Hot water wet vacuum
Test 4D: A/C Duct Cleaning
Test 4E: Water only wet-wipe of the bathroom floor and desktop.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after the Test 4E cleaning event except for the lead wipe collected from the bathroom floor.

Supplemental Sampling Activities – Prior to initiating pre-cleaning sampling activities as described below, EPA collected a bulk composite sample from the Chiropractor's Office. The analytical data obtained from the bulk composite was utilized in identifying COPC concentrations present in settled dust, determining the applicability of regulatory standards, and identifying potential health and safety concerns. The Chiropractor's Office was selected, based upon visual observation, as being representative of a "worst case scenario" in the study building.

<u>Asbestos</u>
Before Cleaning Samples – Two air samples, four micro vacuum samples, and five wipe samples were collected for asbestos. The air samples were analyzed for PCM and PCMe. The PCM results indicate that one sample was above the secondary numeric criterion of 0.01 f/cc and one was below this value. The PCMe results were both below the detection limit and below the primary clearance criterion of 0.0009 S/cc. All four of the micro vacuum samples contained chrysotile above the detection limit. All five wipe samples were also above the detection limit, with chrysotile being detected in all five samples and amosite in two of the five samples.

Post 1st Cleaning Samples (*Test 4A)* – Three air, four micro vacuum, and five wipe samples were collected for asbestos. The air samples were analyzed for PCM and PCMe; however, none of the analyses could be completed due to overloading of particulate material.

The results of the four micro vacuum samples indicate that asbestos was present at levels lower than those observed before cleaning.

Asbestos was present in all five wipe samples at lower concentrations than those observed before cleaning. One of the five samples was identified as being below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Three air samples and five wipe samples were collected for asbestos. The air samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results indicate that one sample could not be analyzed due to particulate overloading; two were above the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that two samples could not be analyzed due to particulate overloading; one sample was above the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that two of the samples could not be analyzed due to particulate overloading; one was above the primary clearance criterion of 0.0009 S/cc.

The results of the five wipe samples indicate that asbestos was present in all five samples at lower concentrations than those observed before cleaning.

Post 1st Cleaning Samples (Test 4C) – Five air samples and four micro vacuum samples were collected for asbestos. The air samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM analysis could not be conducted due to overloading of the filter with particulate matter. The TEM AHERA results indicate that three of the five samples could not be analyzed due to overloading of the filters with particulate material. The remaining two samples were below the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that three of the five air samples analyzed could not be analyzed due to overloading of particulate matter. The remaining two PCMe results indicate that one sample was below the primary clearance criterion and one sample exceeded the primary clearance criterion of 0.0009 S/cc at 0.0033 S/cc.

The results of the four micro vacuum samples indicate that asbestos was present in all five samples at lower concentrations than those observed before cleaning, but at similar concentrations to those after Test 4A cleaning.

Post 1st Cleaning Samples (Test 4D) – Three air samples were collected for asbestos. The samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results indicate that all three samples were below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that all three samples were below the detection limit and below the secondary numeric criterion of 0.022 S/cc. The PCMe results were all below the detection limit and were below the primary clearance criterion of 0.0009 S/cc.

Dioxin

Before Cleaning Samples – One air sample and four wipe samples were collected and analyzed for dioxin. The results indicate that there was dioxin present; however, the TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples (*Test 4A)* – Four wipe samples were collected and analyzed for dioxin. The TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples (Test 4B) – Four wipe samples were collected and analyzed for dioxin. The concentrations of dioxin were similar to the pre-cleaning samples. The TEQ concentration for each sample was below the criterion of 4 $ng/m^{2.}$

Post 1st Cleaning Samples (*Test 4E*) – Three wipe samples were collected and analyzed for dioxin. The concentrations of dioxin were slightly lower than the pre-cleaning samples. The TEQ concentration for each sample was below the criterion of 4 ng/m^2.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected. Gypsum was not detected in the air samples above the detection limit range of 0.008 mg/m^3 to 0.017 mg/m^3.

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Gypsum was detected in air at concentrations of 0.011 mg/m^3 and 0.014 mg/m^3.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Gypsum was detected in air above the detection limit with the results of 0.009 mg/m^3 to 0.012 mg/m^3.

Lead

Before Cleaning Samples – Four micro vacuum samples and four wipe samples were collected. Lead was detected in all of the micro vacuum samples and wipe samples. Three of the four micro vacuum results exceeded the comparison value of 25 $\mu g/ft^2$, ranging from 28.2 $\mu g/ft^2$ to181 $\mu g/ft^2$. Wipe sample concentrations exceeded the primary clearance criterion of 25 $\mu g/ft^2$ in all of the samples, ranging in concentrations from 74.7 $\mu g/ft^2$ to 433 $\mu g/ft^2$.

Post 1st Cleaning Samples (*Test 4A)* – Two air samples, four micro vacuum samples, and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. The results of the micro vacuum and wipe samples show that, while all of the micro vacuum and two of the wipes samples were below the comparison value or primary clearance criterion. The remaining two wipe samples exceeded the primary clearance criterion with concentrations of 64.5 $\mu g/ft^2$ and 146 $\mu g/ft^2$.

Post 1st Cleaning Samples (Test 4B) – Two air samples and four wipe samples were collected. The two air samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. Two of the four wipe samples exceeded the primary clearance criterion at concentrations of 147 $\mu g/ft^2$ and 556 $\mu g/ft^2$.

Post 1st Cleaning Samples (Test 4C) – Two air samples and four micro vacuum samples were collected. The two air samples both exceeded the primary clearance criterion at 1.89 $\mu g/m^3$ and 2.56 $\mu g/m^3$. All four micro vacuum samples were below the comparison value of 25 $\mu g/ft^2$.

Post Cleaning Samples (Test 4D) – Two air samples were collected. Both were below the detection limit of 0.052 $\mu g/m^3$ and the primary clearance criterion of 1.0 $\mu g/m^3$.

Post 1st Cleaning Samples (Test 4E) – Three wipe samples were collected. Two of the three samples were below their respective primary clearance criterion. The third sample exceeded the primary clearance criterion of 25 $\mu g/ft^2$ at a concentration of 954 $\mu g/ft^2$.

Alpha-Quartz
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected after the first cleaning. Samples were below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Samples were below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Both were below the detection limit.

Calcite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected after the first cleaning. Samples were below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Samples were below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Both were below the detection limit.

Cristobalite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected after the first cleaning. Both samples were below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Both samples were below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Both were below the detection limit.

Tridymite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected after the first cleaning. Both samples were below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Both samples were below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Both were below the detection limit.

MMVF

Before Cleaning Samples – Two air samples and four wipe samples were collected. MMVF was present in both air samples, but below the primary clearance criterion of 10 S/L. The four wipe samples had detectable concentrations of MMVF.

Post 1st Cleaning Samples (Test 4A) – Three air samples and five wipe samples were collected after the first cleaning. All of the air sample results indicate that MMVF was present at levels below the primary clearance criterion of 10 S/L. All of the wipe sample results indicate that MMVF was present at concentrations below pre-cleaning samples.

Post 1st Cleaning Samples (Test 4B) – Three air samples and five wipe samples were collected after the first cleaning. Two of the three air samples exceeded the primary clearance criterion of 10 S/L at 17.579 S/L and 60.606 S/L. All of the wipe samples were below the concentrations detected during pre-cleaning sampling and were similar to the concentrations after Test 4A.

Post 1st Cleaning Samples (Test 4C) – Five air samples were collected after the first cleaning. All of the air samples indicate that MMVF was present at levels below the primary clearance criterion of 10 S/L.

Post 1st Cleaning Samples (Test 4D) – Three air samples were collected after cleaning. All of the air samples indicate that MMVF was present at levels below the primary clearance criterion of 10 S/L.

PAH

Before Cleaning Samples – Two air samples and four wipe samples were collected. The two air samples both detected six PAH compounds; however, the calculated TEFs were below the primary clearance criterion of 0.2 $\mu g/m^3$. Two of the four wipe samples also detected three PAH compounds; however, the calculated TEFs were below the primary clearance criterion of 300 $\mu g/m^2$. The remaining two samples were below the detection limit. The TEF for each sample was below the primary clearance criterion.

Post 1st Cleaning Samples (Test 4A) – Four wipe samples were collected. All four samples were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$.

Post 1st Cleaning Samples (Test 4B) – Four wipe samples were collected. All four samples were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 $\mu g/m^2$.

Post 1st Cleaning Samples (Test 4E) – Three post-cleaning wipe samples were collected. All three samples were below the detection limit. The TEF for each sample was below the primary clearance criterion of 300 μg/m^2.

<u>Elevator</u> <u>Shaft/Compactor</u> <u>Room</u> – This area consisted of an elevator shaft with a soil floor and an adjacent compactor room with a concrete floor. Construction was of cinder block walls and exposed floor joists.

Cleaning Method – This area was cleaned using Test 4A. Test 4A consisted of use of an industrial HEPA-filtered vacuum and an AFD. No wet wiping was performed.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

<u>Asbestos</u>
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Three air samples were collected. The three air samples were analyzed using PCM, TEM AHERA, and PCMe. The three PCM results were all below the secondary numeric criterion of 0.01 f/cc. Two of the three results were below the detection limit. Similarly, the TEM AHERA results were all below the secondary numeric criterion of 0.022 S/cc. All three of the samples were also below the detection limit. The PCMe results were all below the primary clearance criterion of 0.0009 S/cc, with all three of the samples below the detection limit.

<u>Lead</u>
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. The two air samples were below the detection limit.

<u>MMVF</u>
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – Three air samples were collected after the first cleaning. MMVF was present in each of the three samples; however, the concentrations were below the primary clearance criterion of 10 S/L.

<u>The</u> <u>Food</u> <u>Exchange</u> – This unit is a 5,000 sq. ft. restaurant occupying three floors. The first floor is at street level with entrances from both Liberty and Cedar Streets. This floor was used for food service and customer dining. The lower level (basement) was used for food preparation and storage. The third level (sub-basement) was used for storage of restaurant equipment. Ceramic tile covers the floor area in both the dining room and the basement. The floor of the sub-basement is packed soil. All exterior windows had been blown inward depositing significant amounts of dust on all surface areas of the first floor. Minimal dust was present in the basement. The first floor ceiling by the Liberty Street entrance is made of gypsum board. The ceiling on the Cedar Street entrance consists of suspended acoustical tile covered with decorative tin facing. Above the suspended ceiling is a two-foot void space that houses the HVAC system for the establishment. The basement ceiling is a suspended fibrous tile ceiling. The void space above both suspended ceilings and the gypsum ceiling contained both WTC-related and non-WTC- related dust. Asbestos pipe insulation was present in the void space of the basement. Grills, refrigerators, tables and chairs were present on the first floor. The basement contains walk-in refrigerators, preparation tables, stoves, dishwashing areas and dry goods storage. Prior to cleaning, all open and bulk stored food, fibrous ceiling tiles in the basement, and wrap insulation that had surrounded the HVAC systems were disposed.

Cleaning Method – This unit was cleaned using Test 4A and Test 4D. Test 4A consisted of use of an industrial HEPA-filtered vacuum and an AFD. All horizontal surfaces were wet wiped. Test 4D consisted of cleaning of the HVAC system by a subcontractor utilizing standard industry cleaning techniques.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned once.

Asbestos

Before Cleaning Samples – One wipe sample and one bulk sample were collected from the HVAC system. The wipe sample concentration was below the detection limit, however the detection limit was much higher than the other wipe sample detection limit (approximately 300,000 vs. 3,000). The bulk sample was analyzed by PLM and asbestos was not detected.

Post 1st Cleaning Samples (Test 4A) – Eight air samples were collected for asbestos. The air samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results indicate that six of the samples were below the detection limit and all eight samples were below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that seven of the samples were below the detection limit and all eight samples were below the numeric criterion of 0.022 S/cc. The PCMe results indicate that all eight of the air samples were below the detection limit and below the primary clearance criterion of 0.0009 S/cc.

Post 1st Cleaning, HVAC System – Three air and two wipe samples were collected. The air samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results indicate that all of the samples were below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that two of the samples were below the detection limit and the third was at the detection limit with all three being below the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that two of the samples were below the detection limit and the third was at the detection limit with all three being below the primary clearance criterion of 0.0009 S/cc.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples, HVAC System – One air sample was collected after the first cleaning. Gypsum was not detected above the detection limit of 0.008 mg/m^3 in the air sample.

Lead (HVAC)
Before Cleaning Samples – One wipe sample was collected from the HVAC system. Lead was detected above the primary clearance criterion of 25 µg/ft^2 at 1310 µg/ft^2.

Post 1st Cleaning Samples, *HVAC System* – Two air samples and two wipe samples were collected after the first cleaning. The two air samples were below the detection level and primary clearance criterion of 1.0 µg/m^3. Lead concentrations exceeded the primary clearance criterion at 136 µg/ft^2 and 183 µg/ft^2. The post-cleaning lead exceedances were attributed to the composition of the HVAC construction material.

Post 1st Cleaning Samples (Test 4A) – Five air samples were collected. All were below the detection level.

Alpha-Quartz (HVAC)
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples, HVAC System – One air sample was collected after the first cleaning. The air sample was below the detection limit.

Calcite (HVAC)
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples, HVAC System – One air sample was collected. The air sample was below the detection limit.

Cristobalite (HVAC)
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples, HVAC System – One air sample was collected after the first cleaning. The air sample was below the detection limit.

Tridymite (HVAC)
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples, HVAC System – One air sample was collected. The air sample was below the detection limit.

MMVF (HVAC)
Before Cleaning Samples – One sample was collected. The wipe sample had an MMVF concentration of 11732.44 S/cm^2.

Post 1st Cleaning Samples, *HVAC System* – Three air samples and two wipe samples were collected. All of the air and wipe sample results indicate that MMVF concentrations were below the detection limit and that the air samples were below the primary clearance criterion of 10 S/L. This indicates that the cleaning method was able to reduce the pre-cleaning concentration of MMVF in the HVAC system.

Post 1st Cleaning Samples (Test 4A) – Eight air samples were collected. All sample concentrations were below the primary clearance criterion of 10 S/L. Six of the eight samples were below the detection limit.

Total Dust
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples, HVAC System – The results for the micro vacuum sample indicated that dust was present below the clearance criteria of 0.5 mg/cm^2. This value is lower than the clearance criteria set by NADCA.

Lemongrass Grill – This unit is 3,500 square feet in area with two floors. All exterior windows facing the WTC were blown inward depositing significant amounts of dust on all surfaces of the first floor. Minimal dust was present in the basement. The first floor is at street level with entrances from both Liberty and Cedar Streets. The lower level (basement) was used for food preparation and storage. Gypsum ceilings and hardwood floors are present throughout the dining area. Wood floor joists and sub-floor from the first floor constitute the basement ceiling. The dining area is decorated with Thai accents consisting of bamboo and thatch.

Grills, ovens, refrigerators, tables, chairs and a bar are on the first floor. The basement contains a walk-in refrigerator, freezers, preparation table, dishwasher, and dry goods storage. The floor of the basement is concrete. The establishment's HVAC system is suspended from the ceiling of the first floor.

Prior to cleaning, all tables, chairs, containerized food and accent decorations were disposed. Restaurant equipment including woks, utensils, pots, pans, and flatware were vacuumed and washed.

Cleaning Method – This unit was cleaned using Test 4A and Test 4D. Test 4A consisted of use of an industrial HEPA-filtered vacuum and an AFD. Test 4D consisted of professional cleaning of the HVAC system using standard industry techniques. All horizontal surfaces were wet wiped. This cleaning method was used for each cleaning event. The HVAC system was also cleaned and tested.

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after being cleaned twice. The HVAC met the clearance criteria after being cleaned once.

Asbestos
HVAC Cleaning Results – One wipe sample and one bulk sample were collected from the HVAC system. The wipe sample concentration was below the detection limit, however the detection limit was much higher than the other wipe sample detection limit (approximately 12,000 vs. 3,000). The bulk sample was analyzed by PLM and found to be less than one percent asbestos.

Post 1st Cleaning – Five air samples were collected from the first floor and one air sample was collected from the basement. The samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM, TEM AHERA and PCMe analyses of the five samples collected from the first floor could not be conducted due to overloading of particulate material. The sample collected from the basement met the primary clearance criterion and secondary numeric criterion.

Post 2nd Cleaning – Seven air samples were collected after the second cleaning. The samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc. Five of the samples were below the detection limit. The TEM AHERA results were all below the secondary numeric criterion of 0.022 S/cc, with six of the seven samples below the detection limit. The PCMe results were all below the primary clearance criterion of 0.0009 S/cc, with six of the seven samples below the detection limit. The seventh sample was at the detection limit of 0.0005 S/cc. This indicates that the cleaning techniques were effective at removing particulate matter after the first cleaning, which allowed valid asbestos air samples to be collected. The results indicate that the unit met the primary clearance and secondary numeric criteria.

HVAC System – Four air samples and two wipe samples were collected after the HVAC system was cleaned. The air samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that two samples were below the detection limit and that two samples were equal to the detection limit of 0.0005 S/cc. The PCMe results indicate that all four samples were below the detection limit of 0.0005 S/cc.

The results for the two asbestos wipe samples indicate that both samples were below the detection limit. The detection limit (12,100 S/cm^2) was higher than the detection limit (approximately 3,000 S/cm^2) for most other wipe samples on this project.

Dioxin

Before Cleaning Samples – There were no samples collected and analyzed for dioxin.

Post 1st Cleaning Samples – There were no samples collected and analyzed for dioxin.

HVAC System – There were no samples collected and analyzed for dioxin.

Gypsum

Before Cleaning Samples – Pre-cleaning air samples were not collected. .

Post 1st Cleaning Samples – There were no samples collected after the first cleaning for gypsum.

HVAC System – One air sample was collected for gypsum. This sample was below the detection limit.

Lead (HVAC)
Before Cleaning Samples – One wipe sample was collected. Lead was detected at a concentration above the primary clearance criterion of 25 $\mu g/ft^2$ with a value of 10700 $\mu g/ft^2$.

Post 1st Cleaning Samples – Four air samples were collected. All four samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. One of these samples was collected from the basement.

HVAC System – Three air samples and two wipe samples were collected after the HVAC system was cleaned. The air sample results indicate that all three air samples were below the detection limit. The two wipe sample results indicated that lead was still present at 25.9 $\mu g/ft^2$ and 166 $\mu g/ft^2$. Both of these results were above the primary clearance criterion. Post cleaning lead exceedances were attributed to the composition of the HVAC construction material.

Alpha-Quartz (HVAC)
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – There were no samples collected after the first cleaning.

HVAC System – One air sample was collected. The air sample was below the detection limit.

Calcite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – There were no samples collected after the first cleaning.

HVAC System – One air sample was collected after the HVAC system was cleaned. This sample was below the detection limit.

Cristobalite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – There were no samples collected after the first cleaning.

HVAC System – One air sample was collected after the HVAC system was cleaned. This sample was below the detection limit.

Tridymite
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples – There were no samples collected after the first cleaning.

HVAC System – One air sample was collected after the HVAC system was cleaned. This sample was below the detection limit.

MMVF
Before Cleaning Samples – One wipe sample was collected. The sample was below the detection limit.

Post 1st Cleaning Samples – Five air samples were collected after the first cleaning. MMVF was below the detection limit.

HVAC System – Four air and two wipe samples were collected after the HVAC system was cleaned. The results for all air and wipe samples indicate that MMVF was below the detection limit and that the air samples were below the primary clearance criteria of 10 S/L.

Post 2nd Cleaning Samples – One air sample was collected after the second cleaning. The result was below the detection limit.

PAH
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were no samples collected after the first cleaning.

Total Dust
Before Cleaning Samples – There were no samples collected before cleaning.

Post 1st Cleaning Samples – There were no samples collected after the first cleaning.

HVAC System – One micro vacuum sample was collected. The results for the micro vacuum sample indicate that dust was present below the clearance criterion of 0.50 mg/cm^2. This value is lower than the clearance criterion set by NADCA.

Liberty Street Staircase – The stairwell consisted of cast concrete steps/landings, sheet rock walls and ceiling. All surfaces were covered with gloss paint.

Cleaning Method – This area was cleaned using Test 4A and Test 4B. Test 4A consisted of use of an industrial HEPA-filtered vacuum and an AFD. Test 4B consisted of soap and water wet wipe of all horizontal and vertical surfaces.

Cleaning Results – This area did not meet the primary clearance criterion for alpha-quartz listed in Table 1.0. Due to a delay in receiving analytical results, this exceedance was not identified until after the close of the study. However, the only elevated sampling result for airborne alpha-quartz was obtained from the Liberty Street staircase. This result is inconsistent with the other 53 samples taken throughout apartments and common spaces in the building. Those results were all reported to be below the detection limit. Consequently, the presence of a single elevated sample result in a low occupancy area of the building is not indicative of a health hazard.

Asbestos
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected for asbestos. These samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results were all below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that one was below the detection limit and one was at the detection limit. Both samples were below the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that one was below the detection limit and one was at the detection limit. Both samples were below the primary clearance criterion of 0.0009 S/cc.

<u>Gypsum</u>
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected. Gypsum was not detected.

<u>Lead</u>
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected for lead. Lead was not detected in either sample.

<u>Alpha-Quartz</u>
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. One sample exceeded the primary clearance criterion of .004 mg/m^3. Alpha-quartz was not detected in the remaining sample.

<u>Calcite</u>
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both samples were below the detection limit.

<u>Cristobalite</u>
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both samples were below the detection limit.

<u>Tridymite</u>
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected after the first cleaning. Both samples were below the detection limit.

<u>MMVF</u>
Before Cleaning Samples – There were no samples collected.

Post 1st Cleaning Samples – Two air samples were collected. The results for both samples were below the primary clearance criterion of 10 S/L.

<u>Mattress</u> <u>Store</u> – This is a 968 sq. ft. open space facing the World Trade Center site. All front windows were blown in. Significant amounts of dust were present on all horizontal surfaces. Floor areas were covered with wall-to-wall carpeting. Approximately 25 display mattresses and box springs were present. Ceiling tiles, mattresses, office equipment and flexible ventilation ducts were removed and disposed of prior to cleaning. The space above the suspended ceiling exhibited the same characteristics as in the Chiropractor's Office.

Cleaning Method – This unit was the subject of separate tests to evaluate five different cleaning techniques as described below:

Test 4A:	Industrial HEPA-filtered vacuums and AFD
Test 4B:	Wet wipe all walls
Test 4C:	Hot water carpet shampoo
Test 4D:	A/C duct cleaning
Test 4E:	Cleaning of vinyl floor tile and wet wipe of window ledge using water only

Cleaning Results – This unit met the clearance criteria listed in Table 1.0 for each compound after the Test 4E cleaning event except for one lead wipe which was collected from a window ledge.

Supplemental Sampling Activities – Prior to initiating pre-cleaning sampling activities as described below, EPA collected a bulk composite sample from the Mattress Store. The analytical data obtained from the bulk composite was utilized in identifying COPC concentrations present in settled dust, determining the applicability of regulatory standards, and identifying potential health and safety concerns. The Mattress Store was selected, based upon visual observation, as being representative of a "worst case scenario" in the study building.

<u>Asbestos</u>

Before Cleaning Samples – Four air, seven micro vacuum, and three wipe samples were collected for asbestos. The air samples were analyzed for PCM and PCMe. The PCM results indicate that two of the samples were above and two of the samples were below the secondary numeric criterion of 0.01 f/cc. The PCMe results indicate that two of the samples could not be analyzed due to overloading of particulate material. The remaining two samples were below the detection limit and below the primary clearance criterion of 0.0009 S/cc. All seven of the micro vacuum samples and all three of the wipe samples detected chrysotile.

Post 1st Cleaning Samples (Test 4A) – Three air samples, seven micro vacuum samples and four wipe samples were collected for asbestos. The air samples were analyzed for PCM, TEM AHERA, and PCMe. The PCM results indicate that all three samples were below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that two of the samples could not be analyzed due to overloading of particulate material. The remaining sample was below the secondary numeric criterion of 0.0022 S/cc. The PCMe results indicate that two of the samples could not be analyzed due to overloading of particulate material. The remaining sample was below the primary clearance criterion of 0.0009 S/cc. The results of the seven micro vacuum samples indicate that asbestos was present at concentrations lower than those observed before cleaning. The results of the wipe samples indicate that asbestos was present in all four samples at higher concentrations than those observed before cleaning.

Post 1st Cleaning Samples (Test 4B) – Three air samples and four wipe samples were collected for asbestos. The three air samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM results indicate that two samples could not be analyzed due to overloading of particulate material and one sample was above the secondary numeric criterion of 0.01 f/cc. The TEM AHERA and PCMe analyses could not be analyzed due to overloading of particulate matter.

Asbestos was present in three of the four wipe samples at higher concentrations than those observed before cleaning, but similar to the Test 4A samples. One sample was recorded as below the detection limit; however, the detection limit was greater than normal due to the presence of particulate material.

Post 1st Cleaning Samples (Test 4C) – Five air and seven micro vacuum samples were collected. Five air samples were analyzed using PCM, TEM AHERA, and PCMe. The PCM results indicate that all five samples were below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that all five samples were below the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that all five samples were above the primary clearance criterion of 0.0009 S/cc. The results of the seven micro vacuum samples indicate that asbestos was present in concentrations above the detection level in four of the seven samples. However, post-cleanup sample concentrations were lower than those observed before cleaning and after Test 4A cleaning.

Post 1st Cleaning Samples (Test 4D) – Three air samples were collected and analyzed using PCM, TEM AHERA, and PCMe. The PCM results indicate that all three samples were below the detection limit and below the secondary numeric criterion of 0.01 f/cc. The TEM AHERA results indicate that all three samples were below the detection limit and below the secondary numeric criterion of 0.022 S/cc. The PCMe results indicate that all three samples were below the detection limit and below the primary clearance criterion of 0.0009 S/cc.

<u>Dioxin</u>

Before Cleaning Samples – Two air samples and three wipe samples were collected and analyzed for dioxin. The results indicate that dioxin was present; however, the TEQ concentration for each sample was below the primary clearance criterion of 0.001 ng/m^3 for air and 4 ng/m^2 for settled dust.

Post 1st Cleaning Samples (Test 4A) – Four wipe samples were collected and analyzed for dioxin. The concentrations of dioxin were similar to the pre-cleaning samples. The TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples (Test 4B) – Four post-cleaning wipe samples were collected and analyzed for dioxin. The concentrations of dioxin were slightly higher than the pre-cleaning samples. The TEQ concentration for each sample was below the primary clearance criterion of 4 ng/m^2.

Post 1st Cleaning Samples (Test 4E) – Two post-cleaning wipe samples and two pre-water wipe samples were collected and analyzed for dioxin. The results indicate that the concentrations of dioxin were similar to the pre-cleaning samples. TEQ concentrations were below the primary clearance criterion of 4 ng/m^2.

<u>Gypsum</u>

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected. Gypsum was not detected in the air samples above the detection limit.

Post 1st Cleaning Samples, (Test 4B) – Two air samples were collected. Gypsum was not detected in the air samples above the detection limit.

Post 1st Cleaning Samples, (Test 4C) – Two air samples were collected. Gypsum was not detected in the air samples above the detection limit.

<u>Lead</u>

Before Cleaning Samples – Seven micro vacuum samples and three wipe samples were collected. All seven micro vacuum samples were below the comparison value of 25 $\mu g/ft^2$. Two of the three wipe samples were above the primary clearance criterion of 25 $\mu g/ft^2$. The third was below the detection limit. Concentrations of lead in the two wipe samples, which exceeded the primary clearance criterion of 25 $\mu g/ft^2$, were 38.9 $\mu g/ft^2$ and 77 $\mu g/ft^2$.

Post 1st Cleaning Samples (Test 4A) – Two air samples, seven micro vacuum samples, and four wipe samples were collected after the first cleaning. The two air samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. Five of the seven micro vacuum samples were below the detection limit. All seven samples were below the comparison value. Two of the four wipe samples exceeded the primary clearance criterion with concentrations of 42.2 $\mu g/ft^2$ and 43.9 $\mu g/ft^2$. Of the remaining two samples, one was below the primary clearance criterion and both were below the detection limit and below the primary clearance criterion.

Post 1st Cleaning Samples (Test 4B) – Two air samples and four wipe samples were collected. The two air samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. Two of the four wipe samples exceeded the primary clearance criterion with concentrations of 91.5 $\mu g/ft^2$ and 79.3 $\mu g/ft^2$. Of the remaining two, one was below the primary clearance criterion and the other was below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples and seven micro vacuum samples were collected. The two air samples were below the primary clearance criterion of 1.0 $\mu g/m^3$. All seven micro vacuum samples were below the comparison value of 25 $\mu g/ft^2$.

Six were below the detection limit.

Post 1st Cleaning Samples (Test 4D) – Two air samples were collected, both with results below the 0.051 µg/m^3 detection limit as well as the primary clearance criterion of 1.0 µg/m^3.

Post Cleaning Samples (Test 4E) – Three wipe samples were collected. The glass jars containing two of the samples were broken at the laboratory; however, the laboratory was able to analyze these samples. The samples were below the primary clearance criterion of 25 µg/ft^2. The third sample exceeded the primary clearance criterion at a concentration of 38.2 µg/ft^2. Re-cleaning and testing at this location was not performed since this sample was collected on a window sill which was later painted by the property owner.

<u>Alpha-Quartz</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – There were two air samples collected after the first cleaning. Both air samples were below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Both samples were below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Both were below the detection limit.

<u>Calcite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected. Both air samples were below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Both samples were below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Both were below the detection limit.

<u>Cristobalite</u>
Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected after the first cleaning. Both air samples were below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Both samples were below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Both were below the detection limit.

<u>Tridymite</u>

Before Cleaning Samples – Pre-cleaning air samples were not collected.

Post 1st Cleaning Samples (Test 4A) – Two air samples were collected. Both air samples were below the detection limit. .

Post 1st Cleaning Samples (Test 4B) – Two air samples were collected. Both samples were below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Two air samples were collected. Both were below the detection limit.

<u>MMVF</u>

Before Cleaning Samples – Four air samples and three wipe samples were collected. All four air samples were above the detection limit. MMVF was detected above the primary clearance criterion of 10 S/L in two of the four air samples. The three wipe samples had detectable concentrations of MMVF.

Post 1st Cleaning Samples (Test 4A) – Three air samples and four wipe samples were collected. MMVF was present in all, but at concentrations below the primary clearance criterion of 10 S/L. All of the wipe sample results were below the concentrations detected during pre-cleaning sampling, with one below the detection limit.

Post 1st Cleaning Samples (Test 4B) – Three air samples and four wipe samples were collected after the first cleaning. All three of the air samples were below the primary clearance criterion of 10 S/L. All of the wipe samples were below the concentrations detected during pre-cleaning sampling, with one below the detection limit.

Post 1st Cleaning Samples (Test 4C) – Five air samples were collected after the first cleaning. MMVF was present in all, but at concentrations below the primary clearance criterion of 10 S/L.

Post 1st Cleaning Samples (Test 4D) – Three air samples were collected after cleaning. All were below the detection limit and below the primary clearance criterion of 10 S/L.

<u>PAH</u>

Before Cleaning Samples – One air sample and three wipe samples were collected. The air sample was below the detection limit. The TEF was below the primary clearance criterion of 0.2 $\mu g/m^3$. Two of the three wipe samples had PAH compounds detected. One sample detected three PAH compounds and the other detected two PAH compounds. The calculated TEFs for these two samples, as well as the third sample, were below the primary clearance criterion of 300 $\mu g/m^2$.

Post 1st Cleaning Samples (Test 4A) – Four post-cleaning wipe samples were collected. All four were below the detection limit; the TEF for each sample was below the primary clearance criterion of 300 μg/m^2.

Post 1st Cleaning Samples (Test 4B) – Four post-cleaning wipe samples were collected. All four samples were below the detection limit; the TEF for each sample was below the primary clearance criterion of 300 μg/m^2.

Post 1st Cleaning Samples (Test 4E) – Two wipe samples were collected. Both were below the detection limit; the TEF for each was below the primary clearance criterion of 300 μg/m^2.

5. Discussion

This project was an essential element of EPA's efforts in responding to concerns raised by residents of lower Manhattan regarding the presence of WTC dust in their homes. EPA endeavored to confirm that the cleaning methods that individuals were using, and that representatives of health and environmental agencies had recommended, were effective in removing the dust generated by the unprecedented disaster.

Concurrent with this study, EPA conducted the Indoor Air Residential Assistance-WTC Dust Cleanup Program, cleaning residential spaces for residents of lower Manhattan who expressed interest. It was imperative to complete this study as quickly as possible to determine if the routine cleaning procedures being employed in the WTC Dust Cleanup Program required modification.

The study addressed cleaning of a complex mixture of contaminants, including construction debris and fire-related compounds. As noted in the Executive Summary, EPA was unaware of a precedent for an indoor environmental cleanup with such a diverse set of parameters. However, time pressure did not allow for conducting extensive research on potential cleaning techniques in a controlled setting. The urgent and real-time need to determine the effectiveness of the cleaning methods being used by residents and being employed in the WTC Dust Cleanup Program drove the decision to field test the effectiveness of the standard dust removal methods in a heavily-impacted unoccupied building.

Multiple endpoints were used in the study to ensure that the complexity of the dust was comprehensively considered. Sampling for a variety of compounds was conducted before and after cleaning. Clearance was determined by the removal of contaminants to the health-based benchmarks established in the COPC/Benchmark Report.

The study used a combination of data sets to determine the extent of contamination, the effectiveness of the cleaning methods, and the differences across various sampling and analytical methods.

5.1 Data Sets

Many different samples from multiple media for specific compounds were collected over the course of the study which resulted in a variety of data sets being generated. Different data sets were used to evaluate the objectives listed above. Multiple data sets were used for determining the extent of contamination before any cleaning events occurred and for evaluating the effectiveness of various cleaning methods.

The most informative data sets included results from asbestos wipe sampling, lead wipe and micro vacuum sampling and MMVF wipe sampling events conducted before and after first cleaning of the residential units. The majority of results for other compounds for which wipe samples were collected before and after first cleaning (e.g., dioxin, PAH) were below the detection limits for both sampling events. Therefore, these data sets did not provide a useful basis for determining the extent of contamination prior to cleaning or for evaluating the effectiveness of the cleaning methods. Pre-cleaning air sampling was not conducted because of concerns that the presence of significant levels of dust accumulation might make overloading of filters more likely using the aggressive technique.

The results from the two commercial units included as part of the study could not be used to evaluate existing contamination or overall cleaning efficiency, in as much as the cleaning and sampling process that was used in the commercial units differed from the cleaning and sampling process that was used in the residential units. The non-study commercial units were sampled only for post-cleaning clearance confirmation.

It should be noted that samples were collected for alpha-quartz, calcite, gypsum, tridymite, crystobalite and total dust. However, data for these parameters are not included in this document due to uncertainties in the analytical results. Another data set, asbestos micro vacuum samples, was also not included for evaluating the extent of contamination or cleaning efficiency because the results were extremely variable and did not present consistent trends, as did other data. A work group of the Interagency Indoor Air Task Force debated the inclusion of asbestos micro vacuuming in this study as a result of concerns that the results would not be relevant because, as stated in the ASTM - Standard Test Method for Micro Vacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations: "…the collection efficiency of this technique is unknown and will vary among substrates."[19] This uncertainty, combined with the high degree of uncertainty in predicting airborne asbestos levels based on the amount in settled dust[20] and the variable nature of the asbestos micro vacuum results, limited the use of this data set. Despite these concerns and the quantitative limitations of the method, micro vacuuming was used in an effort to assess the presence of asbestos.

The data sets that did not provide adequate information for determining the extent of existing contamination and the efficiency of cleaning methods, were useful, in combination with the other data sets, to address variances in the use of different sampling and analytical methods, and the use of different equipment.

5.2 Extent of Contamination

This study was designed to establish the effectiveness of a variety of cleaning methods in removing dust and associated materials related to the WTC collapse. In order to evaluate different cleaning methods, the degree of contamination prior to cleaning needed to be assessed. This was accomplished by visually observing the amount of dust in an apartment and by collecting samples prior to cleaning events.

Qualitative visual observations of the quantities of WTC dust that had been deposited into each

---

[19]American Society for Testing and Materials. (1995). *Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations*. (ASTM Publication No. D576-95.) West Conshohocken, PA.

[20]The uncertainty of predicting airborne asbestos levels based on settled dust was recently reiterated by a panel of experts that peer reviewed an EPA report that proposed a health-based benchmark for asbestos in settled dust based on utilizing a K factor approach. Specifically, the peer review panel (www.tera.org) stated:

> "The panel did not endorse the asbestos settled dust benchmark because the only relevant exposure pathway for asbestos is inhalation and the K-factor methodology is, at this time, inadequate for predicting inhalation exposure from asbestos surface loading measurements."

apartment were recorded in the initial phase of the study, prior to cleaning. Six apartments were identified as having accumulated a significant amount of dust. The remaining seven apartments were identified as having a minimal amount of dust accumulation. All of the apartments characterized as containing a significant amount of dust presented windows that had been blown in during the collapse of the WTC. The visual observations were used in an attempt to distribute the cleaning methods evenly, based on the amount of dust present.

Once the analytical results were available, it was possible to quantitatively determine differences that existed in the amount of contamination that was present in the apartments prior to cleaning. As indicated above, the pre-cleaning results for asbestos wipe sampling, lead wipe and micro vacuum sampling, and MMVF wipe sampling results from the residential units provided the most complete data set for determining the existing contamination in apartments prior to cleaning. These four data sets were used to establish differences in contamination between apartments prior to cleaning.

The results for each data set identified above were averaged by unit, then ranked from the highest concentration t the lowest concentration, which resulted in each unit having four rankings (one for each data set). These rankings are presented in Table 9.0.

The range of the highest concentration to the lowest concentration for each compound or sample type spanned an order of magnitude. One apartment, 4B, did not contain any porous surfaces that could be sampled, therefore there were no micro vacuum samples collected. This prohibited this unit from being included in the ranking.

Once the units were assigned a ranking for each data set, the rankings for each unit were summed to create a variable called "sum of ranks". This information is presented in Table 10.0. The sum of ranks has a theoretical range of 4-48, while the observed range in this evaluation was 13-45. This indicates that there was generally an even distribution within the theoretical range, with the exception of the lower end of the range, as there were no units which ranked less than 13. Therefore, the visual observations of dust generally corresponded with levels of contamination found in the dust. The results of the ranking evaluation indicates that there was a difference in the degree of an average contamination for these compounds between units prior to the cleaning events.

1.
The study found that there was a pre-cleaning difference in the levels of contamination among the units in the building.

Table 9.0
Ranking of Residential Units for Four Contaminants based on Level of Contamination Before Cleaning [21]

Ranking by Asbestos Wipe Results

Unit	Rank	Asbestos Wipe	Lead Wipe	Lead Microvac	MMVF Wipe
5A	**1**	**65,290**	732	2	799
3D	**2**	**60,623**	81	20	601
5C	**3**	**35,021**	129	177	687
3C	**4**	**34,030**	268	72	477
2B	**5**	**28,092**	40	3	4,731
2A	**6**	**16,607**	34	6	787
4C	**7**	**14,242**	88	75	477
5D	**8**	**9,651**	17	38	441
4D	**9**	**8,861**	52	61	830
3A	**10**	**2,962**	19	5	515
3B	**11**	**2,566**	9	5	1,259
4A	**12**	**2,368**	12	5	401
4B		**7,911**	25	n/a	501

Ranking by MMVF Wipe Results

Unit	Rank	Asbestos Wipe	Lead Wipe	Lead Microvac	MMVF Wipe
2B	**1**	28,092	40	3	**4,731**
3B	**2**	2,566	9	5	**1,259**
4D	**3**	8,861	52	61	**830**
5A	**4**	65,290	732	2	**799**
2A	**5**	16,607	34	6	**787**
5C	**6**	35,021	129	177	**687**
3D	**7**	60,623	81	20	**601**
3A	**8**	2,962	19	5	**515**
3C	**9**	34,030	268	72	**477**
4C	**10**	14,242	88	75	**477**
5D	**11**	9,651	17	38	**441**
4A	**12**	2,368	12	5	**401**
4B		7,911	25	n/a	**501**

Ranking by Lead Wipe Result

Unit	Rank	Asbestos Wipe	Lead Wipe	Lead Microvac	MMVF Wipe
5A	**1**	65,290	**732**	2	799
3C	**2**	34,030	**268**	72	477
5C	**3**	35,021	**129**	177	687
4C	**4**	14,242	**88**	75	477
3D	**5**	60,623	**81**	20	601
4D	**6**	8,861	**52**	61	830
2B	**7**	28,092	**40**	3	4,731
2A	**8**	16,607	**34**	6	787
3A	**9**	2,962	**19**	5	515
5D	**10**	9,651	**17**	38	441
4A	**11**	2,368	**12**	5	401
3B	**12**	2,566	**9**	5	1,259
4B		7,911	**25**	n/a	501

Ranking by Lead Microvac Result

Unit	Rank	Asbestos Wipe	Lead Wipe	Lead Microvac	MMVF Wipe
5C	**1**	35,021	129	**177**	687
4C	**2**	14,242	88	**75**	477
3C	**3**	34,030	268	**72**	477
4D	**4**	8,861	52	**61**	830
5D	**5**	9,651	17	**38**	441
3D	**6**	60,623	81	**20**	601
2A	**7**	16,607	34	**6**	787
3A	**8**	2,962	19	**5**	515
3B	**9**	2,566	9	**5**	1,259
4A	**10**	2,368	12	**5**	401
2B	**11**	28,092	40	**3**	4,731
5A	**12**	65,290	732	**2**	799
4B		7,911	25	**N/A**	501

[21] The results for each compound and/or sample type were averaged by unit and then ranked from the highest concentration to the lowest concentration. The values presented in the tables represent the average concentration detected per unit. The average concentration calculation included samples that were identified as below the detection limit. These samples were assigned a value equal to the detection limit. The sample size for each unit was generally either four or five samples. Unit 4B was not included in the rankings because no micro vacuum samples were collected for lead before cleaning.

Table 10.0 **Ranking of Residential Units by** **Pre-Cleaning Average Concentrations of Contaminants[22]**									
Unit Number	*Observable Dust*	*Cleaning Test*	*Times Cleaned*	*Presence of Belongings[23]*	*Asbestos Wipe*	*Lead Wipe*	*Lead Microvac*	*MMVF Wipe*	*Sum of Ranks*
					Rank	**Rank**	**Rank**	**Rank**	
5C	significant	3A,3A,3B	3	No, 1 couch	3	3	1	6	**13**
5A	minimal	3B,3B	2	No, 1 couch	1	1	12	4	**18**
3C	significant	1A,1A,3B	3	No, 1 couch	4	2	3	9	**18**
3D	significant	1A,1A	2	no, 1 couch & chair	2	5	6	7	**20**
4D	significant	2A,2A	2	no, 1 chair & ottoman	9	6	4	3	**22**
4C	significant	1A	1	no, 1 couch	7	4	2	10	**23**
2B	minimal	3A	1	no, 1 couch	5	7	11	1	**24**
2A	minimal	1B,1B	2	no, 1 couch & chair	6	8	7	5	**26**
5D	significant	3B	1	no, 1 couch	8	10	5	11	**34**
3B	minimal	Scope A	2	Yes	11	12	9	2	**34**
3A	minimal	2B	1	yes, carpet	10	9	8	8	**35**
4A	minimal	2A,2A	2	no, 1 couch	12	11	10	12	45

Cleaning Equipment:
1A Basic w/o AFD
2A Intermediate w/HEPA w/o AFD
3A Advanced w/o AFD
1B Basic w/AFD
2B Intermediate w/HEPA w/AFD
3B Advanced w/AFD

The visual classification of dust in the apartments was also compared to the ranking for each apartment. There was general agreement between the visual observations and the analytical results in that five of the six units that were classified as having significant dust accumulation ranked in the top six places. This indicates that visual observations of dust is an indicator that contaminants associated with WTC-related dust may be present.

---

[22]Each contaminant per sampling type was ranked based upon the average concentration per unit with the highest average concentration receiving a rank of 1 and the remaining values continued in ascending order up to 12. The ranking for each combination was then summed for each unit to determine which unit had the highest overall concentration of contaminants. The sum of the rankings for each compound per unit indicates that 5C contained the highest concentrations of contaminants prior to cleaning. Note that the lower the sum of ranks, the higher the concentration of total contaminants.

Unit 4B is not included in the list of rankings because there were no lead micro vacuum samples collected in this unit. As a point of reference, the sum of the ranks for 4B for the asbestos, lead, and MMVF wipe samples totals 27. This indicates that this unit would have placed in the bottom-tier of the rankings.

[23]In units where personal belongings were retained, the items were cleaned and bagged, simulating a situation where no belongings were present.

2.
The study found that the observation of WTC dust is an indicator that WTC contaminants may be present and that the amount of WTC dust correlates with the level of contamination.

5.3 Location of Units

Based upon the visual observations of dust and the ranking of individual apartments for pre-cleaning analytical results, it was noted that the apartments facing the WTC site corresponded with a higher average level of contamination within the unit for lead, asbestos and MMVF. Specifically, the units facing Liberty Street (units with C and D designations) which were in the direct path of the WTC collapse generally showed the greatest degree of contamination. This indicates that buildings, or portions of buildings, that had significant amounts of dust deposited from the WTC site may have had a greater amount of contamination than buildings that did not have significant amounts of dust deposited.

3.
The study found that the portions of the building with higher levels of deposited WTC dust had higher levels of contamination.

5.4 Comparison to Health-Based Benchmarks

The pre-cleaning analytical results for all of the data sets listed above were also evaluated to determine if the concentration of contaminants in the dust were elevated above health-based benchmarks. For this evaluation, the health-based benchmarks presented in Table 1.0 were used for comparison to the pre-cleaning and post-cleaning sampling results. Based on pre-cleaning data, there were ten residential units and five commercial units that exceeded a health-based benchmark for either lead, dioxin, PAH, or some combination of the three compounds. Based on post-cleaning data, an additional three residential units and one common area exceeded a health-based benchmark for either asbestos, lead, MMVF, or alpha-quartz, or a combination of these compounds.

Cumulatively, nineteen sites inside the building or 76 percent exceeded a health-based benchmark for one or more contaminants associated with the WTC collapse. This indicates that some contaminant concentrations exceeded health-based benchmarks.

4.
The study found that concentrations of some contaminants in the WTC dust were elevated above health-based benchmarks.

5.5 Cleaning Effectiveness

Cleaning effectiveness was determined using two endpoints. One endpoint was the reduction in contaminant concentration between the pre-cleaning and post-cleaning event concentrations in each unit. The other endpoint was the ability to meet health-based benchmarks. The evaluation of both endpoints proved that cleaning indoor environments using standard cleaning techniques (vacuuming and wet wiping techniques) succeeded in reducing contaminant concentrations below health-based benchmarks. This is evidenced by the fact that all residential units, commercial units, and common areas had marked reductions in contaminant concentrations between cleaning events. In addition, all of the residential units, commercial units, and common areas exhibited concentrations that were below health-based benchmarks at the conclusion of the study.

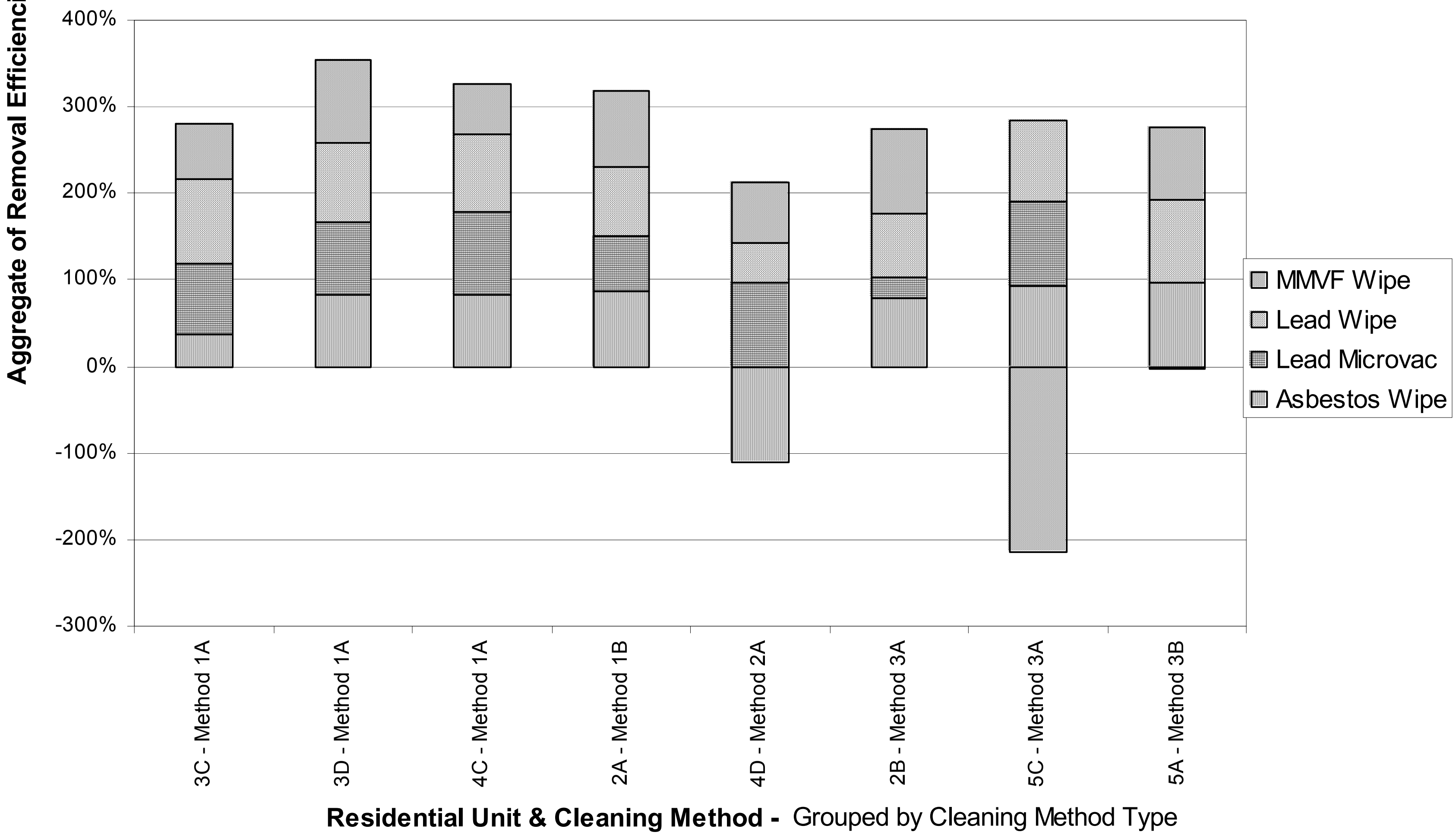
The comparison of pre-cleaning and post-first cleaning concentrations for asbestos wipe and air samples, lead wipe and micro vacuum samples, MMVF wipe samples, and asbestos air samples from post-second and third cleaning events is presented in Table 11.l. This table shows the average concentration of the pre-cleaning samples in comparison with post-cleaning events, with the difference presented in the last column on the right. Exceedances of COPC by cleaning event are presented in Table 11.2. *Note: Due to the quantity of information presented, Table 11.1 and Table 11.2 are presented at the conclusion of this discussion.*

The aggregate removal efficiencies for the nine apartments that were identified as being the most heavily contaminated, based on pre-cleaning results, are presented in Figure 1.0. This figure shows that with the exception of two apartments, there was a net decrease for each contaminant regardless of sampling media or test methods. Asbestos wipe samples for one apartment and MMVF wipe samples for another apartment were the two exceptions. The reason for this is unknown.

As indicated in Section 2.4, a total of eleven cleaning methods were tested in the study. These eleven methods were distributed among 25 spaces, although one of the methods, 4A, was used in all of the common spaces and commercial spaces. Because the different test methods that were evaluated were similar in nature, and the number of apartments that were available for testing the methods was limited, all of the test methods were identified as being able to reduce contaminant concentrations and no specific test method was identified as being more effective. Therefore, the central theme of these methods, specifically vacuuming and using wet wiping techniques, was demonstrated to be effective for reducing contaminant concentrations.

5.
The study demonstrated that 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.

Figure 1.0 Contaminant Removal Efficiency After the First Cleaning Attempt of Units Identified Through Pre-Cleaning Measurements as Most Contaminated (2A, 2B, 3C, 3D, 4C, 4D, 5A, and 5C).



5.6 Multiple Cleaning Events

The results indicate that meeting health-based benchmarks is achievable using the methods identified above, although they also indicate that multiple cleaning events (from one to three times) may be needed to achieve these benchmarks. The incremental increase in the number of residential units that met the health-based benchmarks is presented in Table 12.0. The data shows that dioxin and PAH met the health-based benchmarks after the first cleaning for each unit and that the majority of the units (92 percent) met the health-based benchmarks for MMVF and alpha-quartz after the first cleaning. The number of cleaning events required to meet all of the health-based benchmarks for each unit are presented in Table 4.0. This table illustrates that multiple cleaning events may be needed to meet the health-based benchmarks for each compound.

Table 12.0
Number of Units Meeting Health-Based Benchmarks by Cleaning Event

Compound	*Pre-Cleaning*	*First Cleaning*	*Second Cleaning*	*Third Cleaning*
Asbestos	N/A[24]	5/13 (38%)	6/8 (75%)	2/2 (100%)
Lead	3/13 (23%)	9/13 (69%)	4/4 (100%)	
MMVF	N/A	12/13/ (92%)	0/2 (0%)	2/2 (100%)
Alpha-quartz	N/A	12/13 (92%)	1/1 (100%)	
Dioxin	12/13 (92%)	13/13 (100%)		
PAH	10/13 (77%)	13/13 (100%		

An analysis was also conducted to examine if the degree of pre-cleaning contamination affected the number of cleaning events required to meet the health-based benchmarks. Table 13.0 below presents the results of this analysis. The sum of ranks for each apartment from Table 9.0 were grouped and the average number of cleaning events for each grouping was calculated. Since there were no definitive natural breaks in the sum of ranks, three separate groupings were chosen. One was based on a numeric grouping, in which the sum of ranks were assigned to four groups (10-19, 20-29, 30-39, and 40 and above).

The results suggest that there is a decreasing trend in the number of cleaning events required. The second grouping used the mid-point to create two groups (0-23 and 24-48). This grouping also indicates a decreasing trend in the average number of cleaning events required. The third grouping divided the data into an equal number of units. Although this grouping suggests a decreasing trend for most of the groupings, the decreased trend did not continue for the last set of

[24] N/A signifies that samples were not collected before cleaning.

data. Overall, it appears that there may be a decreasing trend in the average number of cleaning events required to meet the clearance criteria based upon the degree of pre-cleaning contamination.

Table 13.0

Residential Units that are More Heavily Contaminated (Lower Sum of Ranks) Required More Cleaning Events to Achieve the Clearance Criteria[25]

Unit Number	*Observable Dust*	*Cleaning Test*	*Times Cleaned*	*Sum of Ranks*	*Numeric Grouping*	*Mid-point Grouping*	*Equal Number Grouping*
5C	significant	3A,3A,3B	3	13			
5A	minimal	3B,3B	2	18	2.7		2.7
3C	significant	1A,1A,3B	3	18		2.2	
3D	significant	1A,1A	2	20			
4D	significant	2A,2A	2	22			1.7
4C	significant	1A	1	23	1.6		
2B	minimal	3A	1	24			
2A	minimal	1B,1B	2	26			1.3
5D	significant	3B	1	34	1.3	1.5	
3B	minimal	Scope A	2	34			
3A	minimal	2B	1	35			1.7
4A	minimal	2A,2A	2	45	N/A		

It should be noted that there were two units in which the test was changed for the third cleaning event. Unit 3C was cleaned twice using Test 1A. Test 3B was used for the third cleaning to achieve the health-based benchmarks. Unit 5C was cleaned twice using Test 3A. Test 3B was used for the third cleaning to achieve the health-based benchmarks. It is unclear if the change in the method, the additional cleaning event, or a combination of the two, was responsible for meeting the health-based benchmark.

6.
The study found that two to three cleanings were necessary to reduce contamination levels to below health-based benchmarks, and that the number of cleanings generally correlated with the levels of contamination initially found in the units.

[25] Using the rankings presented in Table 10.0, a semi-quantitative evaluation was made to determine if there was a difference in the number of cleaning events needed to meet the clearance criteria based on the measured concentrations of pre-cleaning contamination. The average number of cleaning events required to meet the clearance criteria was calculated using several different groupings of the sum of ranks. The first set of calculations used numeric breakpoints of 10-19, 20-29, 30-39, and >40. This grouping indicates a decreasing trend in the average number of cleaning events required. The second set of groupings used the mid-point 23.5. This grouping also indicates a decreasing trend in the average number of cleaning events required. The third grouping divided the data into an equal number of units. Although this grouping suggests a decreasing trend for most of the groupings, the decreased trend did not continue for the last set of data. Overall, it appears that there may be a decreasing trend in the average number of cleaning events required to meet the clearance criteria based upon the degree of pre-cleaning contamination.

5.7 Sampling Methods

Several types of sampling methods (air, micro vacuum, and wipe samples) were used in this study to determine the contaminant concentrations before and after cleaning events. An assessment was made to determine if one of these sampling methods could be used as a surrogate, which would allow only one type of sample for one compound to be used to assess if an indoor space required additional cleaning. As the amount of contamination present after a cleaning event was the most important factor for determining if a surrogate test could be used, only the post-cleaning data was used for this particular assessment.

The post-cleaning data that was collected indicated that it was necessary to conduct eleven additional cleaning events (9 second cleaning events and 2 third cleaning events) due to either a health-based benchmark being exceeded or samples that could not be analyzed. As presented in Table 14.0, air samples collected for asbestos and analyzed using PCMe accounted for the majority (82 percent) of the additional cleaning events. These additional cleaning events were conducted because the filters were overloaded with particulate matter and could not be analyzed. In comparison:

lead would have resulted in a total of four additional cleaning events (36 percent), although three were based on wipe samples and one was based on a micro vacuum sample;
MMVF air samples resulted in three additional cleaning events (27 percent);
silica resulted in one additional cleaning even t(nine percent); and
PAH and dioxin wipe samples results in zero additional cleaning events.

This indicates that the testing methodology associated with PCMe asbestos air sampling is very sensitive to particulate matter and that an indoor environment needs to be relatively clean of particulate matter to achieve valid PCMe results. Based on the compounds and testing methods chosen, the data suggests that using asbestos air samples as an indicator for additional cleaning is the most sensitive of the testing methods, as it results in the largest percentage of additional cleaning events. In addition, it is conservative in nature because the asbestos air sampling with PCMe analysis may indicate that additional cleaning events need to be conducted even if no contamination is present above health-based benchmarks, simply because of excess particulate matter. For example, there were five instances where the sampling results for the other compounds indicated that the unit met the health-based benchmarks, which would indicate that no additional cleaning was necessary; however, because the asbestos air samples could not be analyzed due to the filters being overloaded with particulate material, the unit was cleaned again.

Table 14.0 **Number of Additional Cleaning Events Required based on Sampling Method**[26]			
Compound	***Sampling Method(s)***	***Number of Additional Cleaning Events***	***Percentage***
Total	Air, Micro vacuum and Wipe	11	**100%**
Asbestos	Air via PCMe	9	**82%**
Lead	Wipe	3	**27%**
Lead	Micro vacuum	1	**9%**
MMVF	Air	3	**27%**
Silica	Air	1	**9%**
PAH	Wipe	0	**0%**
Dioxin	Wipe	0	**0%**

Table 14.0 indicates the number of additional cleaning events that were required based on the results from the post-cleaning event samples for the residential units by compound and sampling method. The data indicates that using asbestos air sampling with PCMe analysis accounted for the most number of additional cleaning events. Overall, the data suggest that the use of asbestos air sampling as a surrogate testing method is generally a conservative methodology to use to determine if further cleaning is warranted.

7.
The study found that conducting asbestos in air sampling after cleaning could be used as a surrogate method for determining if future cleaning was needed.

[26]The percentages listed in the right-hand column sum to greater than 100% because several of the units had more than one compound above a health-based benchmark after a cleaning event.

5.8 Air Disturbance

The asbestos air samples were collected using two types of air disturbance prior to sampling. Either an aggressive technique, using a leaf blower and oscillating fans to disturb the air, or a modified-aggressive technique, using only oscillating fans to disturb the air was used. In several instances both methods were used in the same apartment to evaluate if there was a difference in the analytical results. Both the aggressive and modified-aggressive techniques are expected to create air disturbance over an eight-hour sampling period that represents either a worst-case or high-end (respectively) air movement in an indoor environment, which would provide a conservative estimate of the airborne asbestos concentration.

Table 15.0
Comparison of Airborne Asbestos Samples Collected Using Modified-Aggressive and Aggressive Air Disturbance Methods[27]

	Modified-Aggressive Air Disturbance			***Aggressive Air Disturbance***		
Unit	**Sample ID**	**Result**	**Units**	**Sample ID**	**Result**	**Units**
2A	9094-A-2A-25	0.0004	S>5μ/cc	9094-A-2A-28	< 0.0005	S>5μ/cc
	9094-A-2A-26	0.0004	S> 5μ/cc	9094-A-2A-29	< 0.0005	S> 5μ/cc
	9094-A-2A-27	0.0004	S> 5μ/cc	9094-A-2A-30	< 0.0005	S> 5μ/cc
3B	9094-A-3B-39	< 0.0005	S> 5μ/cc			
	9094-A-3B-40	< 0.0005	S> 5μ/cc			
	9094-A-3B-41	< 0.0005	S> 5μ/cc			
3C	9094-A-3C-32	< 0.0005	S> 5μ/cc	9094A-3C-35	< 0.0005	S> 5μ/cc
	9094-A-3C-33	< 0.0005	S> 5μ/cc	9094-A-3C-36	< 0.0005	S> 5μ/cc
	9094-A-3C-34	< 0.0005	S> 5μ/cc	9094-A-3C-37	< 0.0005	S> 5μ/cc
3D	9094-A-3D-23	< 0.0005	S> 5μ/cc	90-94-A-3D-33	< 0.0005	S> 5μ/cc
	9094-A-3D-24	< 0.0005	S> 5μ/cc	9094-A-3D-34	< 0.0005	S> 5μ/cc
5C	9094-A-5C-31	0.0004	S> 5μ/cc	9094-A-5C-33	0.0016	S> 5μ/cc
	9094-A-5C-32	< 0.004	S> 5μ/cc	9094-A-5C-34	0.0015	S> 5μ/cc
Number Below Detection Limit		**9/13**			**8/10**	
Percent Below Detection Limit		**69.2%**			**80.0%**	
Average		**0.00045**			**0.00071**	

In apartments where both methods were used, the modified-aggressive technique was used first and air samples were collected. Several days later, the aggressive technique was used and additional air samples were collected with no cleaning events occurring between sampling events.

[27]Samples below the detection limit were assigned a value equal to the detection limit. Comparison of asbestos air samples that were collected using modified-aggressive and aggressive air disturbance. The samples collected using modified-aggressive air disturbance (i.e., box fans) were collected several days prior to the samples collected using aggressive air disturbance (i.e., leaf blower and box fans). The comparison does not show any trends, as the percentage of samples below the detection limit was higher for the aggressive air disturbance while the average asbestos concentration was nominally lower for the modified-aggressive air disturbance.

As shown in Table 15.0, the comparison of these results suggest that no conclusive difference could be observed.

Overall, the samples collected using the aggressive technique had a slightly higher percentage of samples below the detection limit (80 percent vs. 69 percent) than the samples collected with the modified-aggressive technique, while the samples collected using the modified-aggressive technique had a lower average concentration (0.00045 S/cc) than the samples collected using the aggressive technique (0.00071 S/cc).

8.
The study did not find a measurable difference in the use of modified or aggressive air disturbance technique.

5.9 Filter Overloading

As mentioned above, there were many instances where the filters from the asbestos air samples were overloaded with particulate material and could not be analyzed, which resulted in invalid asbestos air results and required additional cleaning events. During the study, the use of an air filtration device was added to the cleaning method for the third cleaning in an attempt to reduce the airborne particulate matter as both previous air sampling events resulted in overloaded filters. This occurred twice. In both cases, there was no overloading of the filters and valid asbestos air results were received. This prompted an evaluation to determine if there was a noticeable reduction in overloading filters with particulate matter when an AFD was used during the cleaning event. The data for all of the units in the building were used to see if there was a difference in the percentage of units with at least one overloaded filter when an AFD was used.

Table 16.0 presents a comparison of the percentage of units, including residential, common spaces, and commercial spaces, with asbestos air samples that could not be analyzed due to the filter being overloaded with particulate matter, and indicates whether or not an AFD was used. The data suggest that using an AFD during cleaning may offer a slight advantage for reducing the potential for overloading a filter with particulate matter.

9.
The study found that the use of an Air Filtration Device during cleaning offered a slight advantage to reducing the potential for filter overloading.

Table 16.0 **The Use of an Air Filtration Device Reduces the Occurrence of Overloaded Air Sample Filters**			
AFD Used	*Number of Units with or without AFDs for the First cleaning*	*Number of Units with One or More Overloads*	*Percentage of Units with Overloads*
Yes	18	7	38.9%
No	7	4	57.1%
AFD Used	*Number of Units with or without AFDs for the Second Cleaning*	*Number of Units with at Least One Overload*	*Percentage of Units with Overloads*
Yes	5	0	0.05
No	5	2	40.0%
AFD Used	*Number of Units with or without AFDs for the Third Cleaning*	*Number of units w/at Least One Overload*	*Percentage of Units with Overloads*
Yes	2	0	0.0%
No	0	0	N/A

5.10 HVAC System

The HVAC system was cleaned in two of the commercial units. The system was cleaned by professionals using equipment and techniques common to the industry that included HEPA-filtered vacuums, air whips, air washing and soap and water washes. Wipe samples were collected prior to cleaning and after cleaning for comparison. The results indicate that overall there was a reduction of an order of magnitude for the compounds which were detected. In The Food Exchange, lead was reduced from 1,310 $\mu g/m^3$ to 159 $\mu g/m^3$ (average), MMVF was reduced from 11,732 S/cm^2 to<57.3 S/cm^2. In the Lemongrass Grill, there was a reduction in lead concentrations from 10,700 $\mu g/m^3$ to 95.95 $\mu g/m^3$ (average). This indicates that standard HVAC cleaning methods and equipment reduced the concentrations of WTC-related contaminants by an order of magnitude.

10.
The study found that standard HVAC cleaning methods reduced the concentrations of WTC-related contaminants.

5.11 Observations

5.11.1 Review of Personal Monitoring Data

In addition to evaluating the efficiency of various cleaning methods, the study assessed the potential for exposure to workers during the actual cleaning procedures. This was accomplished through the collection of personal monitoring data (approximately 500 samples) while cleaning was taking place. These samples, which measured airborne levels of asbestos, lead and silica, provide insight, although limited by the scope of the pilot program, into the potential exposures incurred by residents during cleaning activities.

All air samples (103) that were analyzed by phase contrast microscopy (PCM) were below the Occupational Health and Safety Administration's (OSHA) Permissible Exposure Limit (PEL) for asbestos of 0.1 f/cc. The PEL represents a time-weighted average over a 40 hour work week, and is intended to protect workers from adverse health effects. Although PCM analysis is the required analytical procedure for compliance with OSHA PEL for asbestos, EPA conducted an additional analysis of samples using transmission electron microscopy (TEM) for all samples that were greater than 1/10 the OSHA PEL (64 samples). This follow up analysis by the more powerful transmission electron microscope determined that very little of the fibrous material identified by PCM was actually asbestos. PCM cannot distinguish asbestos from other non-asbestos fibers (e.g., fibrous glass), whereas TEM has that ability.

Personal air monitoring results (44 samples) for lead were all below the OSHA PEL of 50 $\mu g/m^3$. The PEL represents a time-weighted average over a 40 hour work week, and is intended to protect workers from adverse health effects. No individual sample exceeded 1 $\mu g/m^3$.

Personal air monitoring results (97 samples) for crystalline silica (quartz) were, with one exception, below the OSHA PEL of 100 $\mu g/m^3$. The PEL represents a time-weighted average over a 40 hour work week, and is intended to protect workers from adverse health effects. The quartz concentration in the sample that exceeded the PEL was 108 $\mu g/m^3$. Only 19 of the 96 samples were above the approximate detection limit of 5 $\mu g/m^3$.

Asbestos, lead and crystalline silica (quartz) are substances that have been identified as WTC contaminants of potential concern in the indoor environment. The personal monitoring data obtained during the study, within the range of contamination found in the building's apartments, that the use of personal protective equipment (e.g., respirator, gloves) during cleaning activities (vacuuming, wet wiping) was not necessary.

5.11.2 Final Observations

EPA's position remains that individuals concerned about the presence of WTC-related dust should use HEPA vacuums and wet wiping to remove the dust from their dwelling spaces. Depending on the amount of dust deposited, repeated cleanings may be necessary.

5.12 Complexities

The interpretation of results from this study is complicated by several factors. This was a non-controlled, field study. The WTC dust material is not homogeneous; in EPA's ambient WTC settled dust bulk sampling only 35 percent of the samples contained greater than one percent asbestos. The number of completely or partially uncleaned buildings available and willing to participate in the study was very limited. Thus, in the selected building, units varied in the amount of baseline contamination, and results of baseline testing were not available prior to the assignment and initiation of the first set of cleaning protocols. Therefore, some cleaning methods (Scope A, 1B and 2B) were only tested on units with lower levels of contamination. Therefore, it is difficult to draw conclusions about the ability of these methods to remove heavy contamination. It was not possible to make every comparison between methods and the level of contamination. In addition, a large number of cleaning methods were tested, given the number of units available for pilot cleaning. This limited the number of times each method could be tested, and makes the overall results more susceptible to fluctuations due to extreme data points that may represent rare, unusual conditions. Variation in the types of sampling conducted pre- and post-cleaning events make it difficult to compare certain indices of contamination to different cleaning methods.

6. Summary

This complex study was able to identify a cleaning method that is able to reduce levels of the multiple contaminants that are associated with WTC-related dust and able to reduce those contaminants below health-based benchmarks. The specific cleaning method includes vacuuming porous and hard surfaces and wet wiping hard surfaces. The results also indicate that the cleaning method may need to be repeated several times, especially in heavily impacted apartments, to bring concentrations below health-based benchmarks. In addition, the results from this study indicate that using asbestos air sampling to determine if additional cleaning is necessary is an approach that should generally determine if an area has been cleaned effectively. The data also indicates that buildings that had significant amounts of WTC-related dust are likely to have had more contamination than those buildings that did not have significant amounts of dust deposited.

In conclusion, this study shows that while there were impacts to the indoor environment in this building from the collapse of the WTC, these types of impacts can be mitigated if the cleaning method identified is followed, perhaps several times, and should result in an indoor environment that is similar to those found prior to the collapse.

Table 11.1

Comparison of Cleaning Results by Cleaning Event

Table 11.1
PCME Asbestos Air Samples - Pre 2nd Cleaning, Post 2nd Cleaning, and Post 3rd Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
2A-2nd	9094-A-2A-010	Pre 2nd cleaning		overload	S>5u/cc	2A	9094-A-2A-028	Test 1B - Post 2nd cleaning	<	0.000500	S>5u/cc	
2A-2nd	9094-A-2A-011	Pre 2nd cleaning		overload	S>5u/cc	2A	9094-A-2A-029	Test 1B - Post 2nd cleaning	<	0.000500	S>5u/cc	
2A-2nd	9094-A-2A-012	Pre 2nd cleaning		overload	S>5u/cc	2A	9094-A-2A-030	Test 1B - Post 2nd cleaning	<	0.000500	S>5u/cc	
						2A		Test 1B - Post 2nd cleaning				
						2A		Test 1B - Post 2nd cleaning				
		Average						**Average**		**0.000500**		
3B-2nd	9094-A-3B-011	Pre 2nd cleaning		overload	S>5u/cc	3B	9094-A-3B-039	Scope A - Post 2nd cleaning	<	0.000500	S>5u/cc	
3B-2nd	9094-A-3B-012	Pre 2nd cleaning		overload	S>5u/cc	3B	9094-A-3B-040	Scope A - Post 2nd cleaning	<	0.000500	S>5u/cc	
3B-2nd	9094-A-3B-013	Pre 2nd cleaning		overload	S>5u/cc	3B	9094-A-3B-041	Scope A - Post 2nd cleaning	<	0.000500	S>5u/cc	
3B-2nd	9094-A-3B-026	Pre 2nd cleaning	<	0.000900	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-027	Pre 2nd cleaning		0.001100	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-028	Pre 2nd cleaning	<	0.000500	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-029	Pre 2nd cleaning		0.000500	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-030	Pre 2nd cleaning	<	0.000500	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-031	Pre 2nd cleaning		0.001500	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-032	Pre 2nd cleaning		0.001100	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-033	Pre 2nd cleaning		0.000900	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-034	Pre 2nd cleaning	<	0.000500	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-035	Pre 2nd cleaning		0.001000	S>5u/cc	3B		Scope A - Post 2nd cleaning				
3B-2nd	9094-A-3B-036	Pre 2nd cleaning	<	0.000900	S>5u/cc	3B		Scope A - Post 2nd cleaning				
						3B		Scope A - Post 2nd cleaning				
		Average		**0.000855**				**Average**		**0.000500**		
				.								
3C-2nd	9094-A-3C-009	Pre 2nd cleaning		overload	S>5u/cc	3C	9094-A-3C-025	Test 1A - Post 2nd cleaning		overload	S>5u/cc	
3C-2nd	9094-A-3C-010	Pre 2nd cleaning		overload	S>5u/cc	3C	9094-A-3C-026	Test 1A - Post 2nd cleaning		overload	S>5u/cc	
3C-2nd	9094-A-3C-011	Pre 2nd cleaning		overload	S>5u/cc	3C	9094-A-3C-027	Test 1A - Post 2nd cleaning		overload	S>5u/cc	
						3C	9094-A-3C-028	Test 1A - Post 2nd cleaning		overload	S>5u/cc	
						3C	9094-A-3C-029	Test 1A - Post 2nd cleaning		overload	S>5u/cc	
		Average						**Average**				
3C-3rd	9094-A-3C-025	Post 2nd cleaning - Test 1A		overload	S>5u/cc	3C	9094-A-3C-032	Test 3B - Post 3rd cleaning	<	0.0005	S>5u/cc	
3C-3rd	9094-A-3C-026	Post 2nd cleaning - Test 1A		overload	S>5u/cc	3C	9094-A-3C-033	Test 3B - Post 3rd cleaning	<	0.0005	S>5u/cc	
3C-3rd	9094-A-3C-027	Post 2nd cleaning - Test 1A		overload	S>5u/cc	3C	9094-A-3C-034	Test 3B - Post 3rd cleaning	<	0.0005	S>5u/cc	
3C-3rd	9094-A-3C-028	Post 2nd cleaning - Test 1A		overload	S>5u/cc	3C	9094-A-3C-035	Test 3B - Post 3rd cleaning	<	0.0005	S>5u/cc	
3C-3rd	9094-A-3C-029	Post 2nd cleaning - Test 1A		overload	S>5u/cc	3C	9094-A-3C-036	Test 3B - Post 3rd cleaning	<	0.0005	S>5u/cc	
						3C	9094-A-3C-037	Test 3B - Post 3rd cleaning	<	0.0005	S>5u/cc	
		Average						**Average**		**0.000500**		
3D-2nd	9094-A-3D-008	Pre 2nd cleaning		overload	S>5u/cc	3D	9094-A-3D-023	Test 1A - Post 2nd cleaning	<	0.0005	S>5u/cc	
3D-2nd	9094-A-3D-009	Pre 2nd cleaning		overload	S>5u/cc	3D	9094-A-3D-024	Test 1A - Post 2nd cleaning	<	0.0004	S>5u/cc	
3D-2nd	9094-A-3D-010	Pre 2nd cleaning		overload	S>5u/cc	3D	9094-A-3D-025	Test 1A - Post 2nd cleaning	<	0.0005	S>5u/cc	
						3D	9094-A-3D-026	Test 1A - Post 2nd cleaning	<	0.0005	S>5u/cc	
		Average						**Average**		**0.000475**		
4A-2nd	9094-A-4A-008	Pre 2nd cleaning		overload	S>5u/cc	4A	9094-A-4A-023	Test 2A - Post 2nd cleaning	<	0.0009	S>5u/cc	
4A-2nd	9094-A-4A-009	Pre 2nd cleaning		overload	S>5u/cc	4A	9094-A-4A-024	Test 2A - Post 2nd cleaning	<	0.0008	S>5u/cc	
4A-2nd	9094-A-4A-010	Pre 2nd cleaning		overload	S>5u/cc	4A	9094-A-4A-025	Test 2A - Post 2nd cleaning	<	0.0009	S>5u/cc	
		Average						**Average**		**0.000867**		
5C-2nd	9094-A-5C-009	Pre 2nd cleaning		overload	S>5u/cc	5C	9094-A-5C-024	Test 3A - Post 2nd cleaning		overload	S>5u/cc	

Table 11.1

PCME Asbestos Air Samples - Pre 2nd Cleaning, Post 2nd Cleaning, and Post 3rd Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
5C-2nd	9094-A-5C-010	Pre 2nd cleaning		overload	S>5u/cc	5C	9094-A-5C-025	Test 3A - Post 2nd cleaning		overload	S>5u/cc	
5C-2nd	9094-A-5C-011	Pre 2nd cleaning		overload	S>5u/cc	5C	9094-A-5C-026	Test 3A - Post 2nd cleaning		overload	S>5u/cc	
						5C	9094-A-5C-027	Test 3A - Post 2nd cleaning		overload	S>5u/cc	
						5C	9094-A-5C-028	Test 3A - Post 2nd cleaning		overload	S>5u/cc	
		Average						**Average**				
5C-3rd	9094-A-5C-024	Post 2nd cleaning - Test 3A		overload	S>5u/cc	5C	9094-A-5C-031	Test 3B - Post 3rd cleaning		0.0004	S>5u/cc	
5C-3rd	9094-A-5C-025	Post 2nd cleaning - Test 3A		overload	S>5u/cc	5C	9094-A-5C-032	Test 3B - Post 3rd cleaning	<	0.0004	S>5u/cc	
5C-3rd	9094-A-5C-026	Post 2nd cleaning - Test 3A		overload	S>5u/cc	5C	9094-A-5C-033	Test 3B - Post 3rd cleaning		0.0016	S>5u/cc	
5C-3rd	9094-A-5C-027	Post 2nd cleaning - Test 3A		overload	S>5u/cc	5C	9094-A-5C-034	Test 3B - Post 3rd cleaning		0.0015	S>5u/cc	
5C-3rd	9094-A-5C-028	Post 2nd cleaning - Test 3A		overload	S>5u/cc	5C						
		Average						**Average**		**0.000975**		

Table 11.1
Lead Wipe Samples - Before Cleaning and Post 1st Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
2A	9094-W-2A-002	Before cleaning	<	4.65	ug/ft2	2A	9094-W-2A-018	Post 1st cleaning - Test 1B	<	4.65	ug/ft2	
2A	9094-W-2A-003	Before cleaning		49.40	ug/ft2	2A	9094-W-2A-019	Post 1st cleaning - Test 1B		11.30	ug/ft2	
2A	9094-W-2A-004	Before cleaning		35.40	ug/ft2	2A	9094-W-2A-020	Post 1st cleaning - Test 1B	<	4.65	ug/ft2	
2A	9094-W-2A-005	Before cleaning		44.60	ug/ft2	2A	9094-W-2A-021	Post 1st cleaning - Test 1B	<	4.65	ug/ft2	
		Average		**33.51**				**Average**		**6.31**		**27**
2B	9094-W-2B-002	Before cleaning	<	4.65	ug/ft2	2B	9094-W-2B-016	Post 1st cleaning - Test 3A	<	4.65	ug/ft2	
2B	9094-W-2B-003	Before cleaning		97.00	ug/ft2	2B	9094-W-2B-017	Post 1st cleaning - Test 3A		9.90	ug/ft2	
2B	9094-W-2B-004	Before cleaning		17.50	ug/ft2	2B	9094-W-2B-018	Post 1st cleaning - Test 3A		18.70	ug/ft2	
						2B	9094-W-2B-019	Post 1st cleaning - Test 3A		7.41	ug/ft2	
		Average		**39.72**				**Average**		**10.17**		**30**
3A	9094-W-3A-002	Before cleaning	<	4.65	ug/ft2	3A	9094-W-3A-018	Post 1st cleaning - Test 2B	<	4.65	ug/ft2	
3A	9094-W-3A-003	Before cleaning		38.90	ug/ft2	3A	9094-W-3A-019	Post 1st cleaning - Test 2B		10.50	ug/ft2	
3A	9094-W-3A-004	Before cleaning		12.00	ug/ft2	3A	9094-W-3A-020	Post 1st cleaning - Test 2B		9.29	ug/ft2	
						3A	9094-W-3A-021	Post 1st cleaning - Test 2B	<	4.65	ug/ft2	
		Average		**18.52**				**Average**		**7.27**		**11**
3B	9094-W-3B-002	Before cleaning	<	4.65	ug/ft2	3B	9094-W-3B-019	Post 1st cleaning - Scope A	<	4.65	ug/ft2	
3B	9094-W-3B-003	Before cleaning		11.50	ug/ft2	3B	9094-W-3B-020	Post 1st cleaning - Scope A		51.60	ug/ft2	
3B	9094-W-3B-004	Before cleaning		9.65	ug/ft2	3B	9094-W-3B-021	Post 1st cleaning - Scope A		10.90	ug/ft2	
3B	9094-W-3B-005	Before cleaning		LOST	ug/ft2	3B	9094-W-3B-022	Post 1st cleaning - Scope A		7.27	ug/ft2	
		Average		**8.60**				**Average**		**18.61**		**-10**
				.								
3C	9094-W-3C-002	Before cleaning	<	4.65	ug/ft2	3C	9094-W-3C-017	Post 1st cleaning - Test 1A		5.02	ug/ft2	
3C	9094-W-3C-003	Before cleaning		750.00	ug/ft2	3C	9094-W-3C-018	Post 1st cleaning - Test 1A		8.03	ug/ft2	
3C	9094-W-3C-004	Before cleaning		48.70	ug/ft2	3C	9094-W-3C-019	Post 1st cleaning - Test 1A		6.01	ug/ft2	
						3C	9094-W-3C-020	Post 1st cleaning - Test 1A	<	4.65	ug/ft2	
		Average		**267.78**				**Average**		**5.93**		**262**
3D	9094-W-3D-002	Before cleaning	<	4.65	ug/ft2	3D	9094-W-3D-016	Post 1st cleaning - Test 1A		8.22	ug/ft2	
3D	9094-W-3D-003	Before cleaning		201.00	ug/ft2	3D	9094-W-3D-017	Post 1st cleaning - Test 1A		9.80	ug/ft2	
3D	9094-W-3D-004	Before cleaning		112.00	ug/ft2	3D	9094-W-3D-018	Post 1st cleaning - Test 1A	<	4.65	ug/ft2	
3D	9094-W-3D-005	Before cleaning	<	4.65	ug/ft2	3D	9094-W-3D-019	Post 1st cleaning - Test 1A	<	4.65	ug/ft2	
		Average		**80.58**				**Average**		**6.83**		**74**
4A	9094-W-4A-002	Before cleaning		5.66	ug/ft2	4A	9094-W-4A-016	Post 1st cleaning - Test 2A	<	4.65	ug/ft2	
4A	9094-W-4A-003	Before cleaning		21.50	ug/ft2	4A	9094-W-4A-017	Post 1st cleaning - Test 2A		10.70	ug/ft2	
4A	9094-W-4A-004	Before cleaning		9.41	ug/ft2	4A	9094-W-4A-018	Post 1st cleaning - Test 2A	<	4.65	ug/ft2	
						4A	9094-W-4A-019	Post 1st cleaning - Test 2A	<	4.65	ug/ft2	
		Average		**12.19**				**Average**		**6.16**		**6**
4B	9094-W-4B-002	Before cleaning	<	4.65	ug/ft2	4B	9094-W-4B-014	Post 1st cleaning - Test 2B	<	4.65	ug/ft2	

Table 11.1
Lead Wipe Samples - Before Cleaning and Post 1st Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
4B	9094-W-4B-003	Before cleaning		50.00	ug/ft2	4B	9094-W-4B-015	Post 1st cleaning - Test 2B		6.68	ug/ft2	
4B	9094-W-4B-004	Before cleaning		14.00	ug/ft2	4B	9094-W-4B-016	Post 1st cleaning - Test 2B	<	4.65	ug/ft2	
4B	9094-W-4B-005	Before cleaning		30.00	ug/ft2	4B	9094-W-4B-017	Post 1st cleaning - Test 2B	<	4.65	ug/ft2	
						4B						
		Average		**24.66**				**Average**		**5.16**		**20**
4C	9094-W-4C-002	Before cleaning	<	4.65	ug/ft2	4C	9094-W-4C-019	Post 1st cleaning - Test 1A		LOST	ug/ft2	
4C	9094-W-4C-003	Before cleaning		181.00	ug/ft2	4C	9094-W-4C-020	Post 1st cleaning - Test 1A		14.90	ug/ft2	(Validation = R).
4C	9094-W-4C-004	Before cleaning		77.50	ug/ft2	4C	9094-W-4C-021	Post 1st cleaning - Test 1A		8.28	ug/ft2	(Validation = R).
						4C	9094-W-4C-022	Post 1st cleaning - Test 1A		7.81	ug/ft2	(Validation = R).
		Average		**87.72**				**Average**		**10.33**		**77**
4D	9094-W-4D-002	Before cleaning	<	4.65	ug/ft2	4D	9094-W-4D-020	Post 1st cleaning - Test 2A		20.40	ug/ft2	(Validation = R).
4D	9094-W-4D-003	Before cleaning		169.00	ug/ft2	4D	9094-W-4D-021	Post 1st cleaning - Test 2A		66.00	ug/ft2	(Validation = R).
4D	9094-W-4D-004	Before cleaning		17.40	ug/ft2	4D	9094-W-4D-022	Post 1st cleaning - Test 2A		10.60	ug/ft2	(Validation = R).
4D	9094-W-4D-005	Before cleaning		17.10	ug/ft2	4D	9094-W-4D-023	Post 1st cleaning - Test 2A		15.60	ug/ft2	(Validation = R).
		Average		**52.04**				**Average**		**28.15**		**24**
5A	9094-W-5A-002	Before cleaning		4.79	ug/ft2	5A	9094-W-5A-020	Post 1st cleaning - Test 3B	<	4.65	ug/ft2	
5A	9094-W-5A-003	Before cleaning		191.00	ug/ft2	5A	9094-W-5A-021	Post 1st cleaning - Test 3B		43.50	ug/ft2	
5A	9094-W-5A-004	Before cleaning		2000.00	ug/ft2	5A	9094-W-5A-022	Post 1st cleaning - Test 3B		10.50	ug/ft2	
						5A	9094-W-5A-023	Post 1st cleaning - Test 3B		39.70	ug/ft2	
		Average		**731.93**				**Average**		**24.59**		**707**
5C	9094-W-5C-002	Before cleaning		6.95	ug/ft2	5C	9094-W-5C-017	Post 1st cleaning - Test 3A		Broken	ug/m2	
5C	9094-W-5C-003	Before cleaning		336.00	ug/ft2	5C	9094-W-5C-018	Post 1st cleaning - Test 3A		10.30	ug/ft2	
5C	9094-W-5C-004	Before cleaning		43.60	ug/ft2	5C	9094-W-5C-019	Post 1st cleaning - Test 3A		7.69	ug/ft2	
						5C	9094-W-5C-020	Post 1st cleaning - Test 3A		6.86	ug/ft2	
		Average		**128.85**				**Average**		**8.28**		**121**
5D	9094-W-5D-002	Before cleaning		7.35	ug/ft2	5D	9094-W-5D-016	Post 1st cleaning - Test 3B	<	4.65	ug/ft2	
5D	9094-W-5D-003	Before cleaning		4.68	ug/ft2	5D	9094-W-5D-017	Post 1st cleaning - Test 3B		12.80	ug/ft2	
5D	9094-W-5D-004	Before cleaning		25.30	ug/ft2	5D	9094-W-5D-018	Post 1st cleaning - Test 3B	<	4.65	ug/ft2	
5D	9094-W-5D-005	Before cleaning		32.10	ug/ft2	5D	9094-W-5D-019	Post 1st cleaning - Test 3B	<	4.65	ug/ft2	
		Average		**17.36**				**Average**		**6.69**		**11**

Table 11.1

Lead Micro Vacuum Samples - Before Cleaning and Post 1st Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
2A	9094-M-2A-006	Before cleaning		4.03	ug/ft2	2A	9094-M-2A-022	Post 1st cleaning - Test 1B	<	2.32	ug/ft2	
2A	9094-M-2A-007	Before cleaning		14.40	ug/ft2	2A	9094-M-2A-023	Post 1st cleaning - Test 1B	<	2.32	ug/ft2	
2A	9094-M-2A-008	Before cleaning		3.89	ug/ft2	2A	9094-M-2A-024	Post 1st cleaning - Test 1B	<	2.32	ug/ft2	
2A	9094-M-2A-009	Before cleaning	<	2.32	ug/ft2							
		Average		**6.16**				**Average**		**2.32**		**4**
2B	9094-M-2B-005	Before cleaning	<	2.32	ug/ft2	2B	9094-M-2B-020	Post 1st cleaning - Test 3A	<	2.32	ug/ft2	
2B	9094-M-2B-006	Before cleaning		4.54	ug/ft2	2B	9094-M-2B-021	Post 1st cleaning - Test 3A	<	2.32	ug/ft2	
2B	9094-M-2B-007	Before cleaning	<	2.32	ug/ft2	2B	9094-M-2B-022	Post 1st cleaning - Test 3A	<	2.32	ug/ft2	
						2B	9094-M-2B-023	Post 1st cleaning - Test 3A	<	2.32	ug/ft2	
		Average		**3.06**				**Average**		**2.32**		**1**
3A	9094-M-3A-006	Before cleaning	<	4.65	ug/ft2	3A	9094-M-3A-022	Post 1st cleaning - Test 2B		4.85	ug/ft2	
3A	9094-M-3A-007	Before cleaning	<	4.65	ug/ft2	3A	9094-M-3A-023	Post 1st cleaning - Test 2B	<	2.32	ug/ft2	
3A	9094-M-3A-008	Before cleaning	<	4.65	ug/ft2	3A	9094-M-3A-024	Post 1st cleaning - Test 2B		4.39	ug/ft2	
3A	9094-M-3A-009	Before cleaning	<	4.65	ug/ft2	3A	9094-M-3A-025	Post 1st cleaning - Test 2B	<	2.32	ug/ft2	
		Average		**4.65**				**Average**		**3.47**		**1**
3B	9094-M-3B-006	Before cleaning	<	4.65	ug/ft2	3B	9094-M-3B-023	Post 1st cleaning - Scope A	<	2.32	ug/ft2	
3B	9094-M-3B-007	Before cleaning	<	4.65	ug/ft2	3B	9094-M-3B-024	Post 1st cleaning - Scope A	<	2.32	ug/ft2	
3B	9094-M-3B-008	Before cleaning	<	4.65	ug/ft2	3B	9094-M-3B-025	Post 1st cleaning - Scope A	<	2.32	ug/ft2	
		Average		**4.65**				**Average**		**2.32**		**2**
				.								
3C	9094-M-3C-005	Before cleaning		68.40	ug/ft2	3C	9094-M-3C-021	Post 1st cleaning - Test 1A		6.32	ug/ft2	
3C	9094-M-3C-006	Before cleaning		135.00	ug/ft2	3C	9094-M-3C-022	Post 1st cleaning - Test 1A		9.66	ug/ft2	
3C	9094-M-3C-007	Before cleaning		43.30	ug/ft2	3C	9094-M-3C-023	Post 1st cleaning - Test 1A		26.90	ug/ft2	
3C	9094-M-3C-008	Before cleaning		39.40	ug/ft2	3C	9094-M-3C-024	Post 1st cleaning - Test 1A		6.47	ug/ft2	
						3C		Post 1st cleaning - Test 1A				
		Average		**71.53**				**Average**		**12.34**		**59**
3D	9094-M-3D-005	Before cleaning		50.70	ug/ft2	3D	9094-M-3D-020	Post 1st cleaning - Test 1A	<	2.32	ug/ft2	
3D	9094-M-3D-006	Before cleaning	<	4.65	ug/ft2	3D	9094-M-3D-021	Post 1st cleaning - Test 1A		5.71	ug/ft2	(Validation = R).
3D	9094-M-3D-007	Before cleaning	<	4.65	ug/ft2	3D	9094-M-3D-022	Post 1st cleaning - Test 1A	<	2.32	ug/ft2	
		Average		**20.00**				**Average**		**3.45**		**17**
4A	9094-M-4A-005	Before cleaning	<	4.65	ug/ft2	4A	9094-M-4A-020	Post 1st cleaning - Test 2A	<	2.32	ug/ft2	
4A	9094-M-4A-006	Before cleaning	<	4.65	ug/ft2	4A	9094-M-4A-021	Post 1st cleaning - Test 2A	<	2.32	ug/ft2	
4A	9094-M-4A-007	Before cleaning	<	4.65	ug/ft2	4A	9094-M-4A-022	Post 1st cleaning - Test 2A		2.58	ug/ft2	
		Average		**4.65**				**Average**		**2.41**		**2**
4B		Before cleaning				4B		Post 1st cleaning - Test 2B				

Table 11.1
Lead Micro Vacuum Samples - Before Cleaning and Post 1st Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
4B		Before cleaning				4B		Post 1st cleaning - Test 2B				
4B		Before cleaning				4B		Post 1st cleaning - Test 2B				
4B		Before cleaning				4B		Post 1st cleaning - Test 2B				
4B		Before cleaning				4B		Post 1st cleaning - Test 2B				
		Average		**none**				**Average**		**none**		
4C	9094-M-4C-005	Before cleaning		76.10	ug/ft2	4C	9094-M-4C-023	Post 1st cleaning - Test 1A	<	2.32	ug/ft2	
4C	9094-M-4C-006	Before cleaning		83.70	ug/ft2	4C	9094-M-4C-024	Post 1st cleaning - Test 1A	<	2.32	ug/ft2	
4C	9094-M-4C-007	Before cleaning		69.80	ug/ft2	4C	9094-M-4C-025	Post 1st cleaning - Test 1A	<	2.32	ug/ft2	
4C	9094-M-4C-008	Before cleaning		70.80	ug/ft2							
		Average		**75.10**				**Average**		**2.32**		**73**
4D	9094-M-4D-006	Before cleaning		83.50	ug/ft2	4D	9094-M-4D-024	Post 1st cleaning - Test 2A		2.40	ug/ft2	
4D	9094-M-4D-007	Before cleaning		66.00	ug/ft2	4D	9094-M-4D-025	Post 1st cleaning - Test 2A	<	2.32	ug/ft2	
4D	9094-M-4D-008	Before cleaning		26.20	ug/ft2	4D	9094-M-4D-026	Post 1st cleaning - Test 2A	<	2.32	ug/ft2	
4D	9094-M-4D-009	Before cleaning		39.90	ug/ft2	4D	9094-M-4D-027	Post 1st cleaning - Test 2A	<	2.32	ug/ft2	
4D	9094-M-4D-010	Before cleaning		78.20	ug/ft2	4D	9094-M-4D-028	Post 1st cleaning - Test 2A	<	2.32	ug/ft2	
4D	9094-M-4D-011	Before cleaning		72.10	ug/ft2	4D	9094-M-4D-029	Post 1st cleaning - Test 2A	<	2.32	ug/ft2	
		Average		**60.98**				**Average**		**2.33**		**59**
5A	9094-M-5A-005	Before cleaning	<	2.23	ug/ft2	5A	9094-M-5A-024	Post 1st cleaning - Test 3B		2.60	ug/ft2	G.F. AA
5A	9094-M-5A-006	Before cleaning	<	2.23	ug/ft2	5A	9094-M-5A-025	Post 1st cleaning - Test 3B		4.15	ug/ft2	G.F. AA
5A	9094-M-5A-007	Before cleaning	<	2.23	ug/ft2	5A	9094-M-5A-026	Post 1st cleaning - Test 3B		2.60	ug/ft2	G.F. AA
5A	9094-M-5A-008	Before cleaning	<	2.23	ug/ft2	5A	9094-M-5A-027	Post 1st cleaning - Test 3B		0.78	ug/ft2	G.F. AA
5A	9094-M-5A-009	Before cleaning	<	2.23	ug/ft2	5A	9094-M-5A-028	Post 1st cleaning - Test 3B		0.98	ug/ft2	G.F. AA
5A	9094-M-5A-010	Before cleaning		3.46	ug/ft2	5A	9094-M-5A-029	Post 1st cleaning - Test 3B		1.02	ug/ft2	G.F. AA
	9094-M-5A-011		<	2.23	ug/ft2	5A	9094-M-5A-030	Post 1st cleaning - Test 3B		5.27	ug/ft2	G.F. AA
		Average		**2.44**				**Average**		**2.49**		**0**
5C	9094-M-5C-005	Before cleaning		104.00	ug/ft2	5C	9094-M-5C-021	Post 1st cleaning - Test 3A	<	2.32	ug/ft2	
5C	9094-M-5C-006	Before cleaning		293.00	ug/ft2	5C	9094-M-5C-022	Post 1st cleaning - Test 3A	<	2.32	ug/ft2	
5C	9094-M-5C-007	Before cleaning		133.00	ug/ft2	5C	9094-M-5C-023	Post 1st cleaning - Test 3A	<	2.32	ug/ft2	
		Average		**176.67**				**Average**		**2.32**		**174**
5D	9094-M-5D-006	Before cleaning		27.10	ug/ft2	5D	9094-M-5D-020	Post 1st cleaning - Test 3B	<	2.32	ug/ft2	
5D	9094-M-5D-007	Before cleaning		49.10	ug/ft2	5D	9094-M-5D-021	Post 1st cleaning - Test 3B	<	2.32	ug/ft2	
		Average		**38.10**				**Average**		**2.32**		**36**

Table 11.1
Asbestos Wipe Samples - Before Cleaning and Post 1st Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
2A	9094-W-2A-001	Before cleaning	<	2,366	S/cm2	2A	9094-W-2A-017	Post 1st cleaning - Test 1B	<	1,183	S/cm2	
2A	9094-W-2A-002	Before cleaning	<	2,366	S/cm2	2A	9094-W-2A-018	Post 1st cleaning - Test 1B	<	1,183	S/cm2	
2A	9094-W-2A-003	Before cleaning		56,192	S/cm2	2A	9094-W-2A-019	Post 1st cleaning - Test 1B		4,397	S/cm2	
2A	9094-W-2A-004	Before cleaning		18,945	S/cm2	2A	9094-W-2A-020	Post 1st cleaning - Test 1B	<	2,366	S/cm2	
2A	9094-W-2A-005	Before cleaning		3,166	S/cm2	2A	9094-W-2A-021	Post 1st cleaning - Test 1B	<	1,183	S/cm2	
		Average		**16,607**				**Average**		**2,063**		**14,544**
2B	9094-W-2B-001	Before cleaning	<	2,366	S/cm2	2B	9094-W-2B-015	Post 1st cleaning - Test 3A	<	5,916	S/cm2	
2B	9094-W-2B-002	Before cleaning	<	2,366	S/cm2	2B	9094-W-2B-016	Post 1st cleaning - Test 3A	<	5,916	S/cm2	
2B	9094-W-2B-003	Before cleaning		102,096	S/cm2	2B	9094-W-2B-017	Post 1st cleaning - Test 3A	<	5,916	S/cm2	
2B	9094-W-2B-004	Before cleaning		5,540	S/cm2	2B	9094-W-2B-018	Post 1st cleaning - Test 3A	<	5,916	S/cm2	
						2B	9094-W-2B-019	Post 1st cleaning - Test 3A		5,936	S/cm2	
		Average		**28,092**				**Average**		**5,920**		**22,172**
3A	9094-W-3A-001	Before cleaning	<	2,366	S/cm2	3A	9094-W-3A-017	Post 1st cleaning - Test 2B		15,037	S/cm2	
3A	9094-W-3A-002	Before cleaning	<	2,366	S/cm2	3A	9094-W-3A-018	Post 1st cleaning - Test 2B	<	11,832	S/cm2	
3A	9094-W-3A-003	Before cleaning	<	2,366	S/cm2	3A	9094-W-3A-019	Post 1st cleaning - Test 2B		3,957	S/cm2	
3A	9094-W-3A-004	Before cleaning		4,749	S/cm2	3A	9094-W-3A-020	Post 1st cleaning - Test 2B		3,166	S/cm2	
						3A	9094-W-3A-021	Post 1st cleaning - Test 2B	<	2,366	S/cm2	
		Average		**2,962**				**Average**		**7,272**		**-4,310**
3B	9094-W-3B-001	Before cleaning	<	2,366	S/cm2	3B	9094-W-3B-018	Post 1st cleaning - Scope A		742	S/cm2	
3B	9094-W-3B-002	Before cleaning	<	2,366	S/cm2	3B	9094-W-3B-019	Post 1st cleaning - Scope A	<	740	S/cm2	
3B	9094-W-3B-003	Before cleaning		3,166	S/cm2	3B	9094-W-3B-020	Post 1st cleaning - Scope A		4,699	S/cm2	
3B	9094-W-3B-004	Before cleaning	<	2,366	S/cm2	3B	9094-W-3B-021	Post 1st cleaning - Scope A		3,957	S/cm2	
						3B	9094-W-3B-022	Post 1st cleaning - Scope A		2,473	S/cm2	
		Average		**2,566**				**Average**		**2,522**		**44**
				.								
3C	9094-W-3C-001	Before cleaning	<	2,366	S/cm2	3C	9094-W-3C-016	Post 1st cleaning - Test 1A	<	2,366	S/cm2	
3C	9094-W-3C-002	Before cleaning		2,374	S/cm2	3C	9094-W-3C-017	Post 1st cleaning - Test 1A		12,663	S/cm2	
3C	9094-W-3C-003	Before cleaning		55,401	S/cm2	3C	9094-W-3C-018	Post 1st cleaning - Test 1A		77,561	S/cm2	
3C	9094-W-3C-004	Before cleaning		75,979	S/cm2	3C	9094-W-3C-019	Post 1st cleaning - Test 1A	<	2,366	S/cm2	
						3C	9094-W-3C-020	Post 1st cleaning - Test 1A		13,454	S/cm2	
		Average		**34,030**				**Average**		**21,682**		**12,348**
3D	9094-W-3D-001	Before cleaning		4,749	S/cm2	3D	9094-W-3D-015	Post 1st cleaning - Test 1A		14,246	S/cm2	
3D	9094-W-3D-002	Before cleaning	<	2,366	S/cm2	3D	9094-W-3D-016	Post 1st cleaning - Test 1A		3,957	S/cm2	
3D	9094-W-3D-003	Before cleaning		172,534	S/cm2	3D	9094-W-3D-017	Post 1st cleaning - Test 1A		10,289	S/cm2	
3D	9094-W-3D-004	Before cleaning		118,716	S/cm2	3D	9094-W-3D-018	Post 1st cleaning - Test 1A		10,289	S/cm2	
3D	9094-W-3D-005	Before cleaning		4,749	S/cm2	3D	9094-W-3D-019	Post 1st cleaning - Test 1A		10,289	S/cm2	
		Average		**60,623**				**Average**		**9,814**		**50,809**
4A	9094-W-4A-001	Before cleaning	<	2,366	S/cm2	4A	9094-W-4A-015	Post 1st cleaning - Test 2A		1,979	S/cm2	
4A	9094-W-4A-002	Before cleaning	<	2,366	S/cm2	4A	9094-W-4A-016	Post 1st cleaning - Test 2A		1,583	S/cm2	
4A	9094-W-4A-003	Before cleaning		2,374	S/cm2	4A	9094-W-4A-017	Post 1st cleaning - Test 2A	<	1,183	S/cm2	
4A	9094-W-4A-004	Before cleaning	<	2,366	S/cm2	4A	9094-W-4A-018	Post 1st cleaning - Test 2A		6,331	S/cm2	
						4A	9094-W-4A-019	Post 1st cleaning - Test 2A	<	1,183	S/cm2	
		Average		**2,368**				**Average**		**2,452**		**-83**

Table 11.1
Asbestos Wipe Samples - Before Cleaning and Post 1st Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
4B	9094-W-4B-001	Before cleaning	<	2,366	S/cm2	4B	9094-W-4B-013	Post 1st cleaning - Test 2B	<	2,366	S/cm2	
4B	9094-W-4B-002	Before cleaning	<	2,366	S/cm2	4B	9094-W-4B-014	Post 1st cleaning - Test 2B	<	2,366	S/cm2	
4B	9094-W-4B-003	Before cleaning		18,203	S/cm2	4B	9094-W-4B-015	Post 1st cleaning - Test 2B		4,749	S/cm2	
4B	9094-W-4B-004	Before cleaning		13,454	S/cm2	4B	9094-W-4B-016	Post 1st cleaning - Test 2B	<	2,366	S/cm2	
4B	9094-W-4B-005	Before cleaning		3,166	S/cm2	4B	9094-W-4B-017	Post 1st cleaning - Test 2B	<	2,366	S/cm2	
		Average		**7,911**				**Average**		**2,843**		**5,068**
4C	9094-W-4C-001	Before cleaning	<	2,366	S/cm2	4C	9094-W-4C-018	Post 1st cleaning - Test 1A	<	2,366	S/cm2	
4C	9094-W-4C-002	Before cleaning	<	2,366	S/cm2	4C	9094-W-4C-019	Post 1st cleaning - Test 1A	<	2,366	S/cm2	
4C	9094-W-4C-003	Before cleaning		49,069	S/cm2	4C	9094-W-4C-020	Post 1st cleaning - Test 1A		3,166	S/cm2	
4C	9094-W-4C-004	Before cleaning		3,166	S/cm2	4C	9094-W-4C-021	Post 1st cleaning - Test 1A	<	2,366	S/cm2	
						4C	9094-W-4C-022	Post 1st cleaning - Test 1A	<	2,366	S/cm2	
		Average		**14,242**				**Average**		**2,526**		**11,716**
4D	9094-W-4D-001	Before cleaning	<	2,366	S/cm2	4D	9094-W-4D-019	Post 1st cleaning - Test 2A		2,374	S/cm2	
4D	9094-W-4D-002	Before cleaning	<	2,366	S/cm2	4D	9094-W-4D-020	Post 1st cleaning - Test 2A	<	2,366	S/cm2	
4D	9094-W-4D-003	Before cleaning		34,032	S/cm2	4D	9094-W-4D-021	Post 1st cleaning - Test 2A		26,118	S/cm2	
4D	9094-W-4D-004	Before cleaning		2,374	S/cm2	4D	9094-W-4D-022	Post 1st cleaning - Test 2A		43,529	S/cm2	
4D	9094-W-4D-005	Before cleaning		3,166	S/cm2	4D	9094-W-4D-023	Post 1st cleaning - Test 2A		18,995	S/cm2	
		Average		**8,861**				**Average**		**18,676**		**-9,815**
5A	9094-W-5A-001	Before cleaning	<	2,366	S/cm2	5A	9094-W-5A-019	Post 1st cleaning - Test 3B	<	2,366	S/cm2	
5A	9094-W-5A-002	Before cleaning	<	2,366	S/cm2	5A	9094-W-5A-020	Post 1st cleaning - Test 3B	<	2,366	S/cm2	
5A	9094-W-5A-003	Before cleaning		233,475	S/cm2	5A	9094-W-5A-021	Post 1st cleaning - Test 3B	<	2,366	S/cm2	
5A	9094-W-5A-004	Before cleaning		22,952	S/cm2	5A	9094-W-5A-022	Post 1st cleaning - Test 3B	<	2,366	S/cm2	
						5A	9094-W-5A-023	Post 1st cleaning - Test 3B	<	2,366	S/cm2	
		Average		**65,290**				**Average**		**2,366**		**62,923**
5C	9094-W-5C-001	Before cleaning		9,497	S/cm2	5C	9094-W-5C-016	Post 1st cleaning - Test 3A		2,374	S/cm2	
5C	9094-W-5C-002	Before cleaning		3,166	S/cm2	5C	9094-W-5C-017	Post 1st cleaning - Test 3A	<	2,366	S/cm2	
5C	9094-W-5C-003	Before cleaning		97,347	S/cm2	5C	9094-W-5C-018	Post 1st cleaning - Test 3A	<	2,366	S/cm2	
5C	9094-W-5C-004	Before cleaning		30,075	S/cm2	5C	9094-W-5C-019	Post 1st cleaning - Test 3A		3,166	S/cm2	
						5C	9094-W-5C-020	Post 1st cleaning - Test 3A		3,166	S/cm2	
		Average		**35,021**				**Average**		**2,688**		**32,333**
5D	9094-W-5D-001	Before cleaning	<	2,366	S/cm2	5D	9094-W-5D-015	Post 1st cleaning - Test 3B	<	5,916	S/cm2	
5D	9094-W-5D-002	Before cleaning	<	2,366	S/cm2	5D	9094-W-5D-016	Post 1st cleaning - Test 3B	<	5,916	S/cm2	
5D	9094-W-5D-003	Before cleaning	<	2,366	S/cm2	5D	9094-W-5D-017	Post 1st cleaning - Test 3B	<	5,916	S/cm2	
5D	9094-W-5D-004	Before cleaning		4,749	S/cm2	5D	9094-W-5D-018	Post 1st cleaning - Test 3B	<	5,916	S/cm2	
5D	9094-W-5D-005	Before cleaning		36,406	S/cm2	5D	9094-W-5D-019	Post 1st cleaning - Test 3B	<	5,916	S/cm2	
		Average		**9,651**				**Average**		**5,916**		**3,735**

Table 11.1
MMVF Wipe Samples - Before Cleaning and Post 1st Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
2A	9094-W-2A-002	Before cleaning	<	57.23	mmvf_S/c	2A	9094-W-2A-017	Post 1st cleaning - Test 1B		57.23	mmvf_S/c	
2A	9094-W-2A-003	Before cleaning		629.55	mmvf_S/c	2A	9094-W-2A-018	Post 1st cleaning - Test 1B		114.46	mmvf_S/c	
2A	9094-W-2A-004	Before cleaning		2117.56	mmvf_S/c	2A	9094-W-2A-019	Post 1st cleaning - Test 1B		171.69	mmvf_S/c	
2A	9094-W-2A-005	Before cleaning		343.39	mmvf_S/c	2A	9094-W-2A-020	Post 1st cleaning - Test 1B		57.23	mmvf_S/c	
						2A	9094-W-2A-021	Post 1st cleaning - Test 1B		114.46	mmvf_S/c	
		Average		**786.93**				**Average**		**103.01**		**684**
2B	9094-W-2B-002	Before cleaning		629.55	mmvf_S/c	2B	9094-W-2B-015	Post 1st cleaning - Test 3A	<	57.23	mmvf_S/c	
2B	9094-W-2B-003	Before cleaning		13163.22	mmvf_S/c	2B	9094-W-2B-016	Post 1st cleaning - Test 3A		114.46	mmvf_S/c	
2B	9094-W-2B-004	Before cleaning		400.62	mmvf_S/c	2B	9094-W-2B-017	Post 1st cleaning - Test 3A		228.93	mmvf_S/c	
						2B	9094-W-2B-018	Post 1st cleaning - Test 3A		171.69	mmvf_S/c	
						2B	9094-W-2B-019	Post 1st cleaning - Test 3A		171.69	mmvf_S/c	
		Average		**4731.13**				**Average**		**148.80**		**4,582**
3A	9094-W-3A-002	Before cleaning		57.23	mmvf_S/c	3A	9094-W-3A-017	Post 1st cleaning - Test 2B	<	22.89	mmvf_S/c	
3A	9094-W-3A-003	Before cleaning		801.24	mmvf_S/c	3A	9094-W-3A-018	Post 1st cleaning - Test 2B	<	22.89	mmvf_S/c	
3A	9094-W-3A-004	Before cleaning		686.78	mmvf_S/c	3A	9094-W-3A-019	Post 1st cleaning - Test 2B	<	22.89	mmvf_S/c	
						3A	9094-W-3A-020	Post 1st cleaning - Test 2B	<	22.89	mmvf_S/c	
						3A	9094-W-3A-021	Post 1st cleaning - Test 2B	<	22.89	mmvf_S/c	
		Average		**515.08**				**Average**		**22.89**		**492**
3B	9094-W-3B-002	Before cleaning		744.01	mmvf_S/c	3B	9094-W-3B-018	Post 1st cleaning - Scope A		57.23	mmvf_S/c	
3B	9094-W-3B-003	Before cleaning		2289.26	mmvf_S/c	3B	9094-W-3B-019	Post 1st cleaning - Scope A	<	57.23	mmvf_S/c	
3B	9094-W-3B-004	Before cleaning		744.01	mmvf_S/c	3B	9094-W-3B-020	Post 1st cleaning - Scope A	<	57.23	mmvf_S/c	
						3B	9094-W-3B-021	Post 1st cleaning - Scope A		57.23	mmvf_S/c	
						3B	9094-W-3B-022	Post 1st cleaning - Scope A	<	57.23	mmvf_S/c	
		Average		**1259.09**				**Average**		**57.23**		**1,202**
				.								
3C	9094-W-3C-002	Before cleaning		343.39	mmvf_S/c	3C	9094-W-3C-016	Post 1st cleaning - Test 1A		57.23	mmvf_S/c	
3C	9094-W-3C-003	Before cleaning		744.01	mmvf_S/c	3C	9094-W-3C-017	Post 1st cleaning - Test 1A		171.69	mmvf_S/c	
3C	9094-W-3C-004	Before cleaning		343.39	mmvf_S/c	3C	9094-W-3C-018	Post 1st cleaning - Test 1A		400.62	mmvf_S/c	
						3C	9094-W-3C-019	Post 1st cleaning - Test 1A		114.46	mmvf_S/c	
						3C	9094-W-3C-020	Post 1st cleaning - Test 1A		114.46	mmvf_S/c	
		Average		**476.93**				**Average**		**171.69**		**305**
3D	9094-W-3D-002	Before cleaning		228.93	mmvf_S/c	3D	9094-W-3D-015	Post 1st cleaning - Test 1A	<	22.89	mmvf_S/c	
3D	9094-W-3D-003	Before cleaning		572.31	mmvf_S/c	3D	9094-W-3D-016	Post 1st cleaning - Test 1A		22.89	mmvf_S/c	
3D	9094-W-3D-004	Before cleaning		1259.09	mmvf_S/c	3D	9094-W-3D-017	Post 1st cleaning - Test 1A	<	22.89	mmvf_S/c	
3D	9094-W-3D-005	Before cleaning		343.39	mmvf_S/c	3D	9094-W-3D-018	Post 1st cleaning - Test 1A	<	22.89	mmvf_S/c	
						3D	9094-W-3D-019	Post 1st cleaning - Test 1A	<	22.89	mmvf_S/c	
		Average		**600.93**				**Average**		**22.89**		**578**
4A	9094-W-4A-002	Before cleaning		400.62	mmvf_S/c	4A	9094-W-4A-015	Post 1st cleaning - Test 2A	<	22.89	mmvf_S/c	
4A	9094-W-4A-003	Before cleaning		629.55	mmvf_S/c	4A	9094-W-4A-016	Post 1st cleaning - Test 2A	<	22.89	mmvf_S/c	
4A	9094-W-4A-004	Before cleaning		171.69	mmvf_S/c	4A	9094-W-4A-017	Post 1st cleaning - Test 2A		22.89	mmvf_S/c	
4A						4A	9094-W-4A-018	Post 1st cleaning - Test 2A	<	22.89	mmvf_S/c	
						4A	9094-W-4A-019	Post 1st cleaning - Test 2A	<	22.89	mmvf_S/c	
		Average		**400.62**				**Average**		**22.89**		**378**

Table 11.1
MMVF Wipe Samples - Before Cleaning and Post 1st Cleaning Results

Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Unit Number	Sample_Id	Cleaning Type	Sign	Result	Units	Difference
4B	9094-W-4B-002	Before cleaning		286.16	mmvf_S/c	4B	9094-W-4B-013	Post 1st cleaning - Test 2B		286.16	mmvf_S/c	
4B	9094-W-4B-003	Before cleaning		629.55	mmvf_S/c	4B	9094-W-4B-014	Post 1st cleaning - Test 2B		228.93	mmvf_S/c	
4B	9094-W-4B-004	Before cleaning		400.62	mmvf_S/c	4B	9094-W-4B-015	Post 1st cleaning - Test 2B		400.62	mmvf_S/c	
4B	9094-W-4B-005	Before cleaning		686.78	mmvf_S/c	4B	9094-W-4B-016	Post 1st cleaning - Test 2B		171.69	mmvf_S/c	
						4B	9094-W-4B-017	Post 1st cleaning - Test 2B		57.23	mmvf_S/c	
		Average		**500.78**				**Average**		**228.93**		**272**
4C	9094-W-4C-002	Before cleaning		57.23	mmvf_S/c	4C	9094-W-4C-018	Post 1st cleaning - Test 1A		57.23	mmvf_S/c	
4C	9094-W-4C-003	Before cleaning		1030.17	mmvf_S/c	4C	9094-W-4C-019	Post 1st cleaning - Test 1A		228.93	mmvf_S/c	
4C	9094-W-4C-004	Before cleaning		343.39	mmvf_S/c	4C	9094-W-4C-020	Post 1st cleaning - Test 1A		343.39	mmvf_S/c	
						4C	9094-W-4C-021	Post 1st cleaning - Test 1A		114.46	mmvf_S/c	
						4C	9094-W-4C-022	Post 1st cleaning - Test 1A		228.93	mmvf_S/c	
		Average		**476.93**				**Average**		**194.59**		**282**
4D	9094-W-4D-002	Before cleaning		400.62	mmvf_S/c	4D	9094-W-4D-019	Post 1st cleaning - Test 2A		57.23	mmvf_S/c	
4D	9094-W-4D-003	Before cleaning		2174.79	mmvf_S/c	4D	9094-W-4D-020	Post 1st cleaning - Test 2A		171.69	mmvf_S/c	
4D	9094-W-4D-004	Before cleaning		286.16	mmvf_S/c	4D	9094-W-4D-021	Post 1st cleaning - Test 2A		572.31	mmvf_S/c	
4D	9094-W-4D-005	Before cleaning		457.85	mmvf_S/c	4D	9094-W-4D-022	Post 1st cleaning - Test 2A		228.93	mmvf_S/c	
						4D	9094-W-4D-023	Post 1st cleaning - Test 2A		228.93	mmvf_S/c	
		Average		**829.86**				**Average**		**251.82**		**578**
5A	9094-W-5A-002	Before cleaning		297.60	mmvf_S/c	5A	9094-W-5A-019	Post 1st cleaning - Test 3B		286.16	mmvf_S/c	
5A	9094-W-5A-003	Before cleaning		1308.15	mmvf_S/c	5A	9094-W-5A-020	Post 1st cleaning - Test 3B		57.23	mmvf_S/c	
5A	9094-W-5A-004	Before cleaning		792.45	mmvf_S/c	5A	9094-W-5A-021	Post 1st cleaning - Test 3B		114.46	mmvf_S/c	
						5A	9094-W-5A-022	Post 1st cleaning - Test 3B		57.23	mmvf_S/c	
						5A	9094-W-5A-023	Post 1st cleaning - Test 3B		114.46	mmvf_S/c	
		Average		**799.40**				**Average**		**125.91**		**673**
5C	9094-W-5C-002	Before cleaning		457.85	mmvf_S/c	5C	9094-W-5C-016	Post 1st cleaning - Test 3A		1774.17	mmvf_S/c	
5C	9094-W-5C-003	Before cleaning		457.85	mmvf_S/c	5C	9094-W-5C-017	Post 1st cleaning - Test 3A		744.01	mmvf_S/c	
5C	9094-W-5C-004	Before cleaning		1144.63	mmvf_S/c	5C	9094-W-5C-018	Post 1st cleaning - Test 3A		4211.37	mmvf_S/c	
						5C	9094-W-5C-019	Post 1st cleaning - Test 3A		2758.14	mmvf_S/c	
						5C	9094-W-5C-020	Post 1st cleaning - Test 3A		1316.32	mmvf_S/c	
		Average		**686.78**				**Average**		**2160.80**		**-1,474**
5D	9094-W-5D-002	Before cleaning		251.82	mmvf_S/c	5D	9094-W-5D-015	Post 1st cleaning - Test 3B		171.69	mmvf_S/c	
5D	9094-W-5D-003	Before cleaning		206.03	mmvf_S/c	5D	9094-W-5D-016	Post 1st cleaning - Test 3B		228.93	mmvf_S/c	
5D	9094-W-5D-004	Before cleaning		712.21	mmvf_S/c	5D	9094-W-5D-017	Post 1st cleaning - Test 3B		171.69	mmvf_S/c	
5D	9094-W-5D-005	Before cleaning		595.21	mmvf_S/c	5D	9094-W-5D-018	Post 1st cleaning - Test 3B		114.46	mmvf_S/c	
						5D	9094-W-5D-019	Post 1st cleaning - Test 3B		228.93	mmvf_S/c	
		Average		**441.32**				**Average**		**183.14**		**258**

Table 11.2

Exceedances of COPC by Cleaning Event

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Second Floor Hallway: Test 4A

	Cleanup Criteria			Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m	4 ng/m2				
PAH	0.2 ug/m3	300 ug/m2				
Asbestos	0.0009 f/cc	n/a				
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2			
MMVF	0.01 f/cc	n/a				
Silica	4 ug/m3	n/a				

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 5C: Test 3A, 3B

	Cleanup Criteria			Pre-Cleaning			Post-First Cleaning			Post-Second Cleaning			Post-Third Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2													
PAH	0.2 ug/m3	300 ug/m2			303.5										
Asbestos	0.0009 f/cc	n/a					OL			OL			0.0016		
							OL			OL			0.0015		
							OL			OL					
										OL					
										OL					
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		336	104		SB							
					43.6	293									
						133									
MMVF	0.01 f/cc	n/a					13.399			16.598					
							19.25			12.621					
Silica	4 ug/m3	n/a													

OL = Overloading of particulates
MV = Microvac
SB = Sample broken

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 5A: Test 3B

	Cleanup Criteria			Pre-Cleaning			Post-First Cleaning			Post - Second Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2										
Asbestos	0.0009 f/cc	n/a										
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		191			43.5				
					2000			39.7				
MMVF	0.01 f/cc	n/a										
Silica	4 ug/m3	n/a					LT 0.007					

OL = Overloading of particulates
MV = Microvac
LT = Concentration is less than the specified level of detection

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 4D: Test 2A

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning			Post - Second Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2			325.8							
Asbestos	0.0009 f/cc	n/a										
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		169	83.5	0.146 R	20.4 R				
						66	0.137 R	66 R				
						26.2		10.6 R				
						39.9		15.6 R				
						78.2						
						72.1						
MMVF	0.01 f/cc	n/a										
Silica	4 ug/m3	n/a										

MV = Microvac
R = Result rejected

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 4C: Test 1A

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning			Post - Second Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2										
Asbestos	0.0009 f/cc	n/a										
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		181	76.1		NOT ANALYZED				
					77.5	83.7		14.9 R				
						69.8		8.28 R				
						70.8		7.81 R				
MMVF	0.01 f/cc	n/a										
Silica	4 ug/m3	n/a										

MV = Microvac
R = Result rejected

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 4B: Test 2B

	Cleanup Criteria			**Pre-Cleaning**			**Post - First Cleaning**			**Post - Second Cleaning**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2										
Asbestos	0.0009 f/cc	n/a										
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		50							
					30							
MMVF	0.01 f/cc	n/a										
Silica	4 ug/m3	n/a										

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 4A: Test 2A

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning			Post - Second Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2										
Asbestos	0.0009 f/cc	n/a					OL					
							OL					
							OL					
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2									
MMVF	0.01 f/cc	n/a										
Silica	4 ug/m3	n/a					0.008					

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 3D: Test 1A

	Cleanup Criteria			**Pre-Cleaning**			**Post-First Cleaning**			**Post-Second Cleaning**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2										
Asbestos	0.0009 f/cc	n/a					OL					
							OL					
							OL					
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		201	50.7	0.074 R		5.71 R			
					112		0.126 R					
MMVF	0.01 f/cc	n/a										
Silica	4 ug/m3	n/a										

OL = Overloading of particulates
MV = Microvac
R = Result rejected

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 3C: Test 1A, 3B

	Cleanup Criteria			Pre-Cleaning			Post-First Cleaning			Post-Second Cleaning			Post-Third Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2			6.2										
PAH	0.2 ug/m3	300 ug/m2			1046.6										
Asbestos	0.0009 f/cc	n/a					OL			OL					
							OL			OL					
							OL			OL					
										OL					
										OL					
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		750	68.4			26.9						
					48.7	135									
						43.3									
						39.4									
MMVF	0.01 f/cc	n/a								91.796					
Silica	4 ug/m3	n/a													

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 3B: Scope A

	Cleanup Criteria			Pre-Cleaning			Post-First Cleaning			Post-Second Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2										
Asbestos	0.0009 f/cc	n/a					OL					
							OL					
							OL					
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		SAMPLE LOST			51.6			SB	
MMVF	0.01 f/cc	n/a		14.78								
Silica	4 ug/m3	n/a										

OL = Overloading of particulates
MV = Microvac
SB = Sample broken

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 3, Unit 3A: Test 2B

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2							
Asbestos	0.0009 f/cc	n/a					OL		
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		38.9		0.116 R		
							0.131 R		
MMVF	0.01 f/cc	n/a							
Silica	4 ug/m3	n/a							

OL = Overloading of particulates
MV = Microvac
R = Result rejected

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 2B: Test 3A

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning			Post - Second Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2										
Asbestos	0.0009 f/cc	n/a										
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		97							
MMVF	0.01 f/cc	n/a										
Silica	4 ug/m3	n/a										

UD = Uneven distribution of material
OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 2A: Test 1B

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning			Post - Second Cleaning			Post - Third Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2													
PAH	0.2 ug/m3	300 ug/m2													
Asbestos	0.0009 f/cc	n/a					OL								
							OL								
							OL								
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		49.4										
					44.6										
					35.4										
MMVF	0.01 f/cc	n/a													
Silica	4 ug/m3	n/a													

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Mattress Store: Test A (Industrial HEPA filtered vacuums, AFD)

	Cleanup Criteria			**Pre-Cleaning**			**Post - First Cleaning**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2		LT 2.7					
Asbestos	0.0009 f/cc	n/a		OL			OL		
				OL			OL		
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		38.9			43.9	
					77			42.2	
MMVF	0.01 f/cc	n/a		11.716					
				92.184					
Silica	4 ug/m3	n/a							

OL = Overloading of particulates
MV = Microvac
LT = Concentration is less than the specified level of detection

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event
Mattress Store: Test B (Wet wipe all walls)

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2		2.7					
Asbestos	0.0009 f/cc	n/a		OL			OL		
				OL			OL		
							OL		
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		38.9			91.5	
					77			79.3	
MMVF	0.01 f/cc	n/a		11.716					
				92.184					
Silica	4 ug/m3	n/a							

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Mattress Store: Test C (Hot water carpet shampoo)

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2		2.7					
Asbestos	0.0009 f/cc	n/a		OL			0.0025		
				OL			0.0016		
							0.0025		
							0.0016		
							0.0016		
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		38.9				
					77				
MMVF	0.01 f/cc	n/a		11.716					
				92.184					
Silica	4 ug/m3	n/a							

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Mattress Store: Test D (A/C duct cleaning)

			Pre-Cleaning			Post - First Cleaning		
COPC	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	4 ng/m2							
PAH	300 ug/m2		2.7					
Asbestos	n/a		OL					
			OL					
Lead	25 ug/ft2	25 ug/ft2		38.9				
				77				
MMVF	n/a		11.716					
			92.184					
Silica	n/a							

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Mattress Store: Test E

(Cleaning of vinyl floor tile and window ledge wet wipe using water only)

	Cleanup Criteria			Pre-Cleaning			Pre-Water	Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Wipe**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2								
PAH	0.2 ug/m3	300 ug/m2		2.7						
Asbestos	0.0009 f/cc	n/a		OL						
				OL						
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		38.9				38.2	
					77					
MMVF	0.01 f/cc	n/a		11.716						
				92.184						
Silica	4 ug/m3	n/a								

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Liberty Street Staircase: Test 4A, 4B

	Cleanup Criteria			Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2				
PAH	0.2 ug/m3	300 ug/m2				
Asbestos	0.0009 f/cc	n/a				
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2			
MMVF	0.01 f/cc	n/a				
Silica	4 ug/m3	n/a		22		

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Lemongrass Grill: Test 4A

	Cleanup Criteria			Pre-Cleaning			Post-First Cleaning			Post-Second Cleaning			Post-Encap.		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2													
PAH	0.2 ug/m3	300 ug/m2													
Asbestos	0.0009 f/cc	n/a					OL								
							OL								
							OL								
							OL								
							OL								
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		10700 J			25.9 R							
								166							
MMVF	0.01 f/cc	n/a													
Silica	4 ug/m3	n/a													

OL = Overloading of particulates
MV = Microvac
R = Result rejected
J = Estimated concentration

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Lemongrass Grill Basement

	Cleanup Criteria			Post-First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2				
PAH	0.2 ug/m3	300 ug/m2				
Asbestos	0.0009 f/cc	n/a				
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2			
MMVF	0.01 f/cc	n/a				
Silica	4 ug/m3	n/a				

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

The Food Exchange: Test 4A

	Cleanup Criteria			**Pre-Cleaning**			**Post - First Cleaning**			**Post-Encap.**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2										
PAH	0.2 ug/m3	300 ug/m2										
Asbestos	0.0009 f/cc	n/a										
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		1310			136				
								183				
MMVF	0.01 f/cc	n/a										
Silica	4 ug/m3	n/a										

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

The Food Exchange Basement

	Cleanup Criteria			Post-First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/	4 ng/m2				
PAH	0.2 ug/m:	300 ug/m2				
Asbestos	0.0009 f/c	n/a				
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2			
MMVF	0.01 f/cc	n/a				
Silica	4 ug/m3	n/a				

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Elevator Shaft/Compactor Room: Test 4A

	Cleanup Criteria			**Post - First Cleaning**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2				
PAH	0.2 ug/m3	300 ug/m2				
Asbestos	0.0009 f/cc	n/a				
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2			
MMVF	0.01 f/cc	n/a				
Silica	4 ug/m3	n/a				

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Chiropractor's Office: Test A (Industrial HEPA filtered vacuums, AFD)

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2							
Asbestos	0.0009 f/cc	n/a					UD		
							OL		
							OL		
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		433	28.2		146	
					346	181 J		64.5	
					116	69.3 J			
					74.7				
MMVF	0.01 f/cc	n/a							
Silica	4 ug/m3	n/a					LT 8		

UD = Uneven distribution of material
OL = Overloading of particulates
MV = Microvac
J = Estimated concentration
LT = Concentration is less than the specified level of detection

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Chiropractor's Office: Test B (Wet Wipe all walls)

	Cleanup Criteria			**Pre-Cleaning**			**Post - First Cleaning**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2							
Asbestos	0.0009 f/cc	n/a					OL		
							0.039		
							OL		
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		433	28.2		147	
					346	181		556	
					116	69.3			
					74.7				
MMVF	0.01 f/cc	n/a					17.579		
							60.606		
Silica	4 ug/m3	n/a							

OL = Overloading of particulates
M.V. = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Chiropractor's Office: Test C (Hot water wet vacuum)

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2							
Asbestos	0.0009 f/cc	n/a					OL		
							0.0033		
							OL		
							OL		
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		433	28.2	1.89		
					346	181	2.56		
					116	69.3			
					74.7				
MMVF	0.01 f/cc	n/a							
Silica	4 ug/m3	n/a							

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Chiropractor's Office: Test D (A/C duct cleaning)

	Cleanup Criteria			Pre-Cleaning			Post - First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2							
Asbestos	0.0009 f/cc	n/a							
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		433	28.2			
					346	181			
					116	69.3			
					74.7				
MMVF	0.01 f/cc	n/a							
Silica	4 ug/m3	n/a							

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Chiropractor's Office: Test E

(Cleaning of bathroom floor and desk top wet wipe using water only)

	Cleanup Criteria			**Pre-Cleaning**			**Pre-Water**	**Post - First Cleaning**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Wipe**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2								
PAH	0.2 ug/m3	300 ug/m2								
Asbestos	0.0009 f/cc	n/a								
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		433	28.2	147 ug/ft2 (Tile)		954 (Tile)	
					346	181	556 ug/ft2 (Desk)			
					116	69.3				
					74.7					
MMVF	0.01 f/cc	n/a								
Silica	4 ug/m3	n/a								

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Cedar Street Staircase: Test 4A, 4B

	Cleanup Criteria			**Post - First Cleaning**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2				
PAH	0.2 ug/m3	300 ug/m2				
Asbestos	0.0009 f/cc	n/a				
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2			
MMVF	0.01 f/cc	n/a				
Silica	4 ug/m3	n/a				

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Barber Shop: Test 4A, 4E

	Cleanup Criteria			Pre-Water Wipe		Post-Water Wipe	
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**Air**	**Wipe**
Dioxin	0.001 ng/m3	4 ng/m2					
PAH	0.2 ug/m3	300 ug/m2					
Asbestos	0.0009 f/cc	n/a					
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		12.1 R		
					25.9 R		
					42.9		
MMVF	0.01 f/cc	n/a					
Silica	4 ug/m3	n/a					

MV = Microvac
R = Result rejected

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Fifth Floor Hallway: Test 4A

	Cleanup Criteria			**Post-First Cleaning**			**Post-Second Cleaning**		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2							
Asbestos	0.0009 f/cc	n/a		OL					
				OL					
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2						
MMVF	0.01 f/cc	n/a							
Silica	4 ug/m3	n/a							

OL = Overloading of particulates
MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Fourth Floor Hallway: Test 4A

	Cleanup Criteria			Post-Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2				
PAH	0.2 ug/m3	300 ug/m2				
Asbestos	0.0009 f/cc	n/a				
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2			
MMVF	0.01 f/cc	n/a				
Silica	4 ug/m3	n/a				

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Third Floor Hallway: Test 4A

	Cleanup Criteria			Post - FirstCleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m3	4 ng/m2				
PAH	0.2 ug/m3	300 ug/m2				
Asbestos	0.0009 f/cc	n/a				
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2			
MMVF	0.01 f/cc	n/a				
Silica	4 ug/m3	n/a				

MV = Microvac

Table 11.2

Contaminants of Potential Concern (COPC) Exceedance By Event

Unit 5D: Test 3B

	Cleanup Criteria			Pre-Cleaning			Post-First Cleaning		
COPC	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**	**Air**	**Wipe**	**MV**
Dioxin	0.001 ng/m	4 ng/m2							
PAH	0.2 ug/m3	300 ug/m2							
Asbestos	0.0009 f/cc	n/a							
Lead	1 ug/m3	25 ug/ft2	25 ug/ft2		25.3	27.1			
					32.1	49.1			
MMVF	0.01 f/cc	n/a							
Silica	4 ug/m3	n/a							

MV = Microvac

Attachment A

Personal Monitoring Data

Asbestos Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study

(Analytical Method NIOSH 7400 (PCM); NIOSH 7402 (TEM). Flow Rate 2.0 L/min, Minimum Sample Volume 400 L)

Sample Number	Location	ASBESTOS (f/cc)		Sample Number	Location	ASBESTOS (f/cc)	
PEL 0.1f/cc (PCM)		PCM	TEM	PEL 0.1f/cc (PCM)		PCM	TEM
APS-9094-A-062502-CA	Common-JN	0.024	<.003	APS-9094-A-070802-BA	5A	0.013	<.002
APS-9094-A-062502-JB	5C	0.022	<.003	APS-9094-A-070802-FB	BLANK	<	N/A
APS-9094-A-062502-FB	BLANK	<	N/A	APS-9094-A-070802-LB	LOT BLANK	<	N/A
APS-9094-A-062502-LB	LOT BLANK	<	N/A	APS-9094-A-070902-JB	4B	0.003	<.003
APS-9094-A-062602-BA	Common-BA	0.012	<.003	APS-9094-A-070902-JN	5A	0.002	<.002
APS-9094-A-062602-SC	Common	0.013	<.003	APS-9094-A-070902-FB	BLANK	<	N/A
APS-9094-A-062602-FB	BLANK	<	N/A	APS-9094-A-070902-LB	LOT BLANK	<	N/A
APS-9094-A-062602-LB	LOT BLANK	<	N/A	APS-9094-A-071002-GR	4B	0.022	0.007
APS-9094-A-062702-GR	5D	0.008	****	APS-9094-A-071002-SC	5A	0.031	<.003
APS-9094-A-062702-NF	5C	0.015	<.002	APS-9094-A-071002-FB	BLANK	<	N/A
APS-9094-A-062702-FB	BLANK	<	N/A	APS-9094-A-071002-LB	LOT BLANK	<	N/A
APS-9094-A-062702-LB	LOT BLANK	<	N/A	APS-9094-A-071102-JB	3C	0.022	<.002
APS-9094-A-062802-JB	5D/2B	0.012	<.002	APS-9094-A-071102-BA	3D	0.079	<.008
APS-9094-A-062802-JN	5C	0.016	<.002	APS-9094-A-071102-FB	BLANK	<	****
APS-9094-A-062802-FB	BLANK	<	N/A	APS-9094-A-071102-LB	LOT BLANK	<	****
APS-9094-A-062802-LB	LOT BLANK	<	N/A	APS-9094-A-071202-GR	3C	0.006	****
APS-9092-A-062902-SC	5C	overloaded		APS-9094-A-071202-JN	3D/MATRESS	0.006	****
APS-9094-A-062902-GR	2B	0.006	***	APS-9094-A-071202-FB	BLANK	<	****
APS-9094-A-062902-FB	BLANK	<	***	APS-9094-A-071202-LB	LOT BLANK	<	****
APS-9094-A-062902-LB	LOT BLANK	<	***	APS-9094-A-071302-RH	4A/MATRESS	0.038	<.011
ABS-9094-A-063002-JB	2B/4C	0.007	***	APS-9094-A-071302-SC	4D/4A/CHIRO	0.057	<.012
ABS-9094-A-063002-WA	4D	0.005	***	APS-9094-A-071302-FB	BLANK	<	N/A
APS-9094-A-063002-FB	BLANK	<	***	APS-9094-A-071302-LB	LOT BLANK	<	N/A
APS-9094-A-063002-LB	LOT BLANK	<	***	APS-9094-A-071502-GR	3A	0.018	<.002
APS-9094-A-070102-JN	4D	0.051	<.003	APS-9094-A-071502-BA	2A	0.021	<.002
APS-9094-A-070102-GR	4C	0.027	<.003	APS-9094-A-071502-FB	BLANK	N/A	N/A
APS-9094-A-070102-LB	LOT BLANK	N/A	N/A	APS-9094-A-071502-LB	LOT BLANK	N/A	N/A
APS-9094-A-070202-JB	4C	0.018	<.002	APS-9094-A-071602-JB	3A	0.011	<.002
APS-9094-A-070202-SC	4D/5A	0.016	<.002	APS-9094-A-071602-JN	2A	0.014	<.002
APS-9094-A-070202-FB	BLANK	<	N/A	APS-9094-A-071602-FB	BLANK	N/A	N/A
APS-9094-A-070202-LB	LOT BLANK	<	N/A	APS-9094-A-071602-LB	LOT BLANK	N/A	N/A
APS-9094-A-070302-JN	4C	0.01	<.004	APS-9094-A-071702-GR	3A	0.004	****
APS-9094-A-070302-FB	BLANK	<	N/A	APS-9094-A-071702-SC	MATRESS	0.023	<.003
APS-9094-A-070302-LB	LOT BLANK	<	N/A	APS-9094-A-071702-FB	BLANK	<	N/A
APS-9094-A-070802-GR	4C/4B	0.013	<.002				

***** The PCM was below the NYC reoccupancy standard (.01 f/cc) so TEM was not run.**

< - Below the dectection limit. This method assumes the limit of dectection is 7 f/mm2

N/A - Not Applicable

Asbestos Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study

(Analytical Method NIOSH 7400 (PCM); NIOSH 7402 (TEM). Flow Rate 2.0 L/min, Minimum Sample Volume 400 L)

Sample Number	Location	ASBESTOS (f/cc)		Sample Number	Location	ASBESTOS (f/cc)	
PEL 0.1f/cc (PCM)		PCM	TEM	PEL 0.1f/cc (PCM)		PCM	TEM
APS-9094-A-071702-LB	LOT BLANK	<	N/A	APS-9094-A-072602-LB	LOT BLANK	<	****
APS-9094-A-071802-JB	3A/4A	0.009	***	APS-9094-A-072702-JN	3C	0.039	<.005
APS-9094-A-071802-JN	MATRESS	0.037	<.003	APS-9094-A-072702-FB	BLANK	<	N/A
APS-9094-A-071802-FB	BLANK	N/A	***	APS-9094-A-072902-JB	THAI	0.039	<.004
APS-9094-A-071802-LB	LOT BLANK	N/A	***	APS-9094-A-072902-SC	3C	0.039	overloaded
APS-9094-A-071902-NF	CHIRO	OVERLOADED	0.053	APS-9094-A-072902-FB	BLANK	<	N/A
APS-9094-A-071902-BA	MATRESS	0.013	<.002	APS-9094-A-072902-LB	LOT BLANK	<	N/A
APS-9094-A-071902-FB	BLANK	<	N/A	APS-9094-A-073002-BA	THAI	0.005	****
APS-9094-A-071902-LB	LOT BLANK	<	N/A	APS-9094-A-073002-SC	CHIRO/CA	0.006	****
APS-9094-A-072002-SC	MATRESS	0.017	<.002	APS-9094-A-073002-FB	BLANK	<	****
APS-9094-A-072002-RH	CHIRO	OVERLOADED	>.004	APS-9094-A-073002-LB	LOT BLANK	<	****
APS-9094-A-072002-GR	4A	0.011	<.007	APS-9094-A-073102-JN	MATRESS	0.009	****
APS-9094-A-072002-FB	BLANK	<	***	APS-9094-A-073102-GR	THAI	0.022	****
APS-9094-A-072002-LB	LOT BLANK	<	***	APS-9094-A-073102-FB	BLANK	<	N/A
APS-9094-A-072202-NF	CHIRO	0.019	<.002	APS-9094-A-073102-LB	LOT BLANK	<	N/A
APS-9094-A-072202-JN	MATRESS	0.012	<.002	APS-9094-A-080102-SC	CHIRO	0.009	****
APS-9094-A-072202-JB	4A	0.009	***	APS-9094-A-080102-BA	THAI	0.007	****
APS-9094-A-072202-FB	BLANK	<	N/A	APS-9094-A-080102-FB	BLANK	<	****
APS-9094-A-072202-LB	LOT BLANK	<	N/A	APS-9094-A-080102-LB	LOT BLANK	<	****
APS-9094-A-072302-SC	3D	0.016	<.002	APS-9094-A-080202-GR	THAI	<.002	****
APS-9094-A-072302-NF	CA/THAI/3B	0.021	<.002	APS-9094-A-080202-JN	MATRESS/CA	<.002	****
APS-9094-A-072302-FB	BLANK	<	N/A	APS-9094-A-080202-FB	BLANK	<	****
APS-9094-A-072302-LB	LOT BLANK	<	N/A	APS-9094-A-080202-LB	LOT BLANK	<	****
APS-9094-A-072402-NF	CHIRO	0.048	<.008	APS-9094-A-080302-SC	MATRESS	0.004	****
APS-9094-A-072402-JN	4C/CA	0.049	<.006	APS-9094-A-080302-BA	CA	0.006	****
APS-9094-A-072402-FB	BLANK	<	N/A	APS-9094-A-080302-FB	BLANK	<	****
APS-9094-A-072402-LB	LOT BLANK	<	N/A	APS-9094-A-080302-LB	LOT BLANK	<	****
APS-9094-A-072502-SC	CA/5C	0.034	<.002	APS-9094-A-080502-GR	THAI	0.004	****
APS-9094-A-072502-BA	3B	0.021	<.004	APS-9094-A-080502-JN	THAI	0.005	****
APS-9094-A-072502-FB	BLANK	<	N/A	APS-9094-A-080502-FB	BLANK	<	****
APS-9094-A-072502-LB	LOT BLANK	<	N/A	APS-9094-A-080502-LB	LOT BLANK	<	****
APS-9094-A-072602-GR	3B	0.004	***	APS-9094-A-080602-JN	THAI	0.002	****
APS-9094-A-072602-JB	55 Liberty	0.004	***	APS-9094-A-080602-FB	BLANK	<	****
APS-9094-A-072602-JN	5C/THAI	0.007	***	APS-9094-A-080702-BA	THAI	0.002	****
APS-9094-A-072602-FB	BLANK	<	***	APS-9094-A-080702-FB	BLANK	<	****

***** The PCM was below the NYC reoccupancy standard (.01 f/cc) so TEM was not run.**

< - Below the dectection limit. This method assumes the limit of dectection is 7 f/mm2

N/A - Not Applicable

Asbestos Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study
(Analytical Method NIOSH 7400 (PCM); NIOSH 7402 (TEM). Flow Rate 2.0 L/min, Minimum Sample Volume 400 L)

Sample Number	Location	ASBESTOS (f/cc)		Sample Number	Location	ASBESTOS (f/cc)	
PEL 0.1f/cc (PCM)		**PCM**	**TEM**	**PEL 0.1f/cc (PCM)**		**PCM**	**TEM**
APS-9094-A-080802-SC	THAI	0.007	***	APS-9094-A-090402-SC	FOOD X	0.004	N/A
APS-9094-A-080802-FB	BLANK	<	***	APS-9094-A-090402-FB	BLANK	<	N/A
APS-9094-A-080902-JN	THAI	0.006	***	APS-9094-A-090502-JN	FOOD X	<.003	N/A
APS-9094-A-080902-FB	BLANK	<	***	APS-9094-A-090502-FB	BLANK	<	N/A
APS-9094-A-081202-JN	4B	0.016	<.003	APS-9094-A-090602-SC	5TH CA	0.019	<.005
APS-9094-A-081202-FB	BLANK	<	N/A	APS-9094-A-090602-FB	BLANK	<	N/A
APS-9094-A-081302-SC	5TH CA	0.007	***	APS-9094-A-090902-JN	3D	0.011	<.003
APS-9094-A-081302-FB	BLANK	<	***	APS-9094-A-090902-SC	4A	0.018	N/A
APS-9094-A-081502-SC	FOOD X	0.022	<.003	APS-9094-A-090902-FB	BLANK	<	N/A
APS-9094-A-081502-FB	BLANK	<	N/A	APS-9094-A-091002-JN	2A	0.005	N/A
APS-9094-A-081602-SC	FOOD X	0.008	***	APS-9094-A-091002-SC	5C	0.007	N/A
APS-9094-A-081602-FB	BLANK	<	***	APS-9094-A-091002-FB	BLANK	<	N/A
APS-9094-A-081902-JN	FOOD X	0.038	<.003	APS-9094-A-091202-SC	MATTRESS/CHIRO	0.011	<.002
APS-9094-A-081902-FB	BLANK	<	***	APS-9094-A-091202-JN	3C	0.005	<.002
APS-9094-A-082002-SC	FOOD X	0.02		APS-9094-A-091302-JN	BARBER	0.131	<.008
APS-9094-A-082002-FB	BLANK	<	***	APS-9094-A-091602-JN	BARBER	overloaded	0.007
APS-9094-A-082102-JN	FOOD X	0.009	***	APS-9094-A-091602-SC	FOOD X	0.008	N/A
APS-9094-A-082102-FB	BLANK	<	***	APS-9094-A-091602-FB	BLANK	<	N/A
APS-9094-A-082202-SC	FOOD X	0.014	<.002	APS-9094-A-091702-JN	BARBER	overloaded	0.003
APS-9094-A-082202-FB	BLANK	<	N/A	APS-9094-A-091702-SC	FOOD X	0.015	<.003
APS-9094-A-082302-JN	FOOD X	<.005	***	APS-9094-A-091702-FB	BLANK	<	N/A
APS-9094-A-082302-FB	BLANK	<	N/A	APS-9094-A-091802-SC	THAI	0.017	0.002
APS-9094-A-082602-SC	FOOD X	0.022	<.003	APS-9094-A-091802-JN	BARBER	0.033	<.002
APS-9094-A-082602-FB	BLANK	<	N/A	APS-9094-A-091802-FB	BLANK	<	N/A
APS-9094-A-082802-SC	FOOD X	0.02	<.002	APS-9094-A-091902-SC	FOOD X	0.006	<.002
APS-9094-A-082802-FB	BLANK	<	N/A	APS-9094-A-091902-JN	5C/BARBER	0.025	<.002
APS-9094-A-082902-JN	FOOD X	0.007	***	APS-9094-A-091902-FB	BLANK	<	N/A
APS-9094-A-082902-FB	BLANK	<	N/A	APS-9094-A-092402-SC	N-STRS/3RD FL	0.019	<.002
APS-9094-A-083002-SC	FOOD X	0.028	<.006	APS-9094-A-092402-JN	BARBER	0.011	<.002
APS-9094-A-083002-FB	BLANK	<	N/A	APS-9094-A-092402-FB	BLANK	<	N/A
APS-9094-A-090302-JN	FOOD X	0.028	<0.003	APS-9094-A-092502-SC	S-STRS/2ND FL	0.007	N/A
APS-9094-A-090302-FB	BLANK	<	N/A	APS-9094-A-092502-FB	BLANK	<	N/A

***** The PCM was below the NYC reoccupancy standard (.01 f/cc) so TEM was not run.**

< - Below the dectection limit. This method assumes the limit of dectection is 7 f/mm2

N/A - Not Applicable

Lead Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study

(Analytical Method NIOSH 7300, Flow Rate 2.0 L/min PEL 50 ug/m^3)

Sample Number	Location	LEAD (ug/m^3)		Sample Number	Location	LEAD (ug/m^3)
LPS-9094-A-062502-CA	Common-JN	<.269		LPS-9094-A-070802-FB	BLANK	<.250
LPS-9094-A-062502-JB	5C	0.909		LPS-9094-A-070802-LB	LOT BLANK	0.268
LPS-9094-A-062502-FB	BLANK	<.25		LPS-9094-A-070902-JB	4B	<.169
LPS-9094-A-062502-LB	LOT BLANK	<.25		LPS-9094-A-070902-JN	5A	0.433
LPS-9094-A-062602-BA	Common-BA	<.233		LPS-9094-A-070902-FB	BLANK	<.250
LPS-9094-A-062602-SC	Common	<.347		LPS-9094-A-070902-LB	LOT BLANK	<.250
LPS-9094-A-062602-FB	BLANK	<.25		LPS-9094-A-071002-GR	4B	1.68
LPS-9094-A-062602-LB	LOT BLANK	<.25		LPS-9094-A-071002-SC	5A	0.272
LPS-9094-A-062702-GR	5D	<.238		LPS-9094-A-071002-FB	BLANK	0.328
LPS-9094-A-062702-NF	5C	<.0213		LPS-9094-A-071002-LB	LOT BLANK	0.267
LPS-9094-A-062702-FB	BLANK	<.25		LPS-9094-A-071102-BA	3D	0.234
LPS-9094-A-062702-LB	LOT BLANK	<.25		LPS-9094-A-071102-JB	3C	0.245
LPS-9094-A-062802-JB	5D/2B	<.202		LPS-9094-A-071102-FB	BLANK	<.250
LPS-9094-A-062802-JN	5C	<.202		LPS-9094-A-071102-LB	LOT BLANK	<.250
LPS-9094-A-062802-FB	BLANK	<.25		LPS-9094-A-071202-GR	3C	<.242
LPS-9094-A-062802-LB	LOT BLANK	<.25		LPS-9094-A-071202-JN	3D/MATRESS	<.258
LPS-9094-A-062902-SC	5C	<.211		LPS-9094-A-071202-FB	BLANK	<.25
LPS-9094-A-062902-GR	2B	<.273		LPS-9094-A-071202-LB	LOT BLANK	<.25
LPS-9094-A-062902-FB	BLANK	<.250		LPS-9094-A-071302-SC	Chiro/4D/4A	<.0395
LPS-9094-A-062902-LB	LOT BLANK	<.250		LPS-9094-A-071302-RH	4A/MATRESS	<.0418
LPS-9094-A-063002-FB	BLANK	<.250		LPS-9094-A-071302-FB	BLANK	<.25
LPS-9094-A-063002-LB	LOT BLANK	<.250		LPS-9094-A-071302-LB	LOT BLANK	<.25
LBS-9094-A-063002-JB	2B/4C	<.210		LPS-9094-A-071502-GR	3A	<.209
LBS-9094-A-063002-WA	4D	0.387		LPS-9094-A-071502-BA	2A	<.0214
LPS-9094-A-070102-GR	4C	<.255		LPS-9094-A-071502-FB	BLANK	<.25
LPS-9094-A-070102-FB	BLANK	<.25		LPS-9094-A-071502-LB	LOT BLANK	<.25
LPS-9094-A-070102-LB	LOT BLANK	<.25		LPS-9094-A-071602-JB	3A	<.225
LPS-9094-A-070202-JB	4C	<.207		LPS-9094-A-071602-JN	2A	<.227
LPS-9094-A-070202-SC	4D/5A	<.205		LPS-9094-A-071602-FB	BLANK	<.25
LPS-9094-A-070202-FB	BLANK	<.250		LPS-9094-A-071602-LB	LOT BLANK	<.25
LPS-9094-A-070202-LB	LOT BLANK	<.250		LPS-9094-A-071702-SC	MATRESS	0.277
LPS-9094-A-070302-JN	4C	<.269		LPS-9094-A-071702-GR	3A	<.216
LPS-9094-A-070302-FB	BLANK	<.250		LPS-9094-A-071702-FB	BLANK	<.250
LPS-9094-A-070302-LB	LOT BLANK	<.250		LPS-9094-A-071702-LB	LOT BLANK	<.250
LPS-9094-A-070802-GR	4C/4B	0.244		LPS-9094-A-071802-JN	MATRESS	0.277
LPS-9094-A-070802-BA	5A	0.36		LPS-9094-A-071802-JB	3A/4A	<.208

Lead Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study

(Analytical Method NIOSH 7300, Flow Rate 2.0 L/min PEL 50 ug/m^3)

Sample Number	Location	LEAD (ug/m^3)		Sample Number	Location	LEAD (ug/m^3)
LPS-9094-A-071802-FB	BLANK	<.250		LPS-9094-A-072202-FB	BLANK	<.250
LPS-9094-A-071802-LB	LOT BLANK	<.250		LPS-9094-A-072202-LB	LOT BLANK	<.250
LPS-9094-A-071902-BA	MATRESS	<.206		LPS-9094-A-072302-SC	3D	<.272
LPS-9094-A-071902-NF	CHIRO	0.312		LPS-9094-A-072302-NF	CA/THAI/3B	0.272
LPS-9094-A-071902-FB	BLANK	<.250		LPS-9094-A-072302-FB	BLANK	<.250
LPS-9094-A-071902-LB	LOT BLANK	<.250		LPS-9094-A-072302-LB	LOT BLANK	<.250
LPS-9094-A-072002-RH	CHIRO	0.765		LPS-9094-A-072402-NF	CHIRO	0.328
LPS-9094-A-072002-FB	BLANK	<.250		LPS-9094-A-072402-JN	4C/CA	<.218
LPS-9094-A-072002-LB	LOT BLANK	<.250		LPS-9094-A-072402-FB	BLANK	<.250
LPS-9094-A-072202-NF	CHIRO	<.224		LPS-9094-A-072402-LB	LOT BLANK	<.250

Silica Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study
(Analytical Method NIOSH 7500, Flow Rate 2.5 L/min, Required Volume 400 to 1,000 L)

SILICA													
Sample Number	**Location**	**Quartz**		**Cristobalite ****		**Tridymite**		**Gypsum**		**Calcite**		**Portlandite**	
		(mg)	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**
PEL* mg/m^3			**0.1**		**0.05**		**0.05**		**5**		**5**		**5**
SPS-9094-A-062502-CA	Common-JN	0.027	0.029	0.317	0.337	0.09	0.096	0.31	0.033	0.058	0.062	0.034	0.036
SPS-9094-A-062502-JB	5C	0.099	0.108	0.359	0.393	<.02	<.022	<.02	<.022	<.02	<.022	<.02	<.022
SPS-9094-A-062502-FB	BLANK	<.005	N/A	<.020	N/A	<..020	N/A	N/A	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062502-LB	LOT BLANK	0.013	N/A	0.395	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062602-BA	Common-BA	0.011	0.016	0.047	0.067	<.02	<.029	<.02	<.014	<.02	0.014	<.02	<.014
SPS-9094-A-062602-SC	Common	<.01	<.009	0.035	0.031	<.02	<.018	<.02	<.009	<.02	<.009	<.02	<.014
SPS-9094-A-062602-FB	BLANK	<.01	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062602-LB	LOT BLANK	0.007	N/A	0.109	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062702-GR	5D	<.005	<.043	<.20	<.017	<.02	<.017	<.02	<.017	<.02	<.017	<.02	<.017
SPS-9094-A-062702-NF	5C	0.011	0.009	0.209	0.179	0.104	0.089	0.023	0.02	0.021	0.018	0.02	0.017
SPS-9094-A-062702-FB	BLANK	<.005	N/A	0.021	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062702-LB	LOT BLANK	<.005	N/A	0.021	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062802-JB	5D/2B	<.005	<.004	<.02	<.016	<.02	<.016	<.02	<.016	<.02	<.016	<.02	<.016
SPS-9094-A-062802-JN	5C	0.005	0.004	0.095	0.078	0.029	0.024	<.02	<.016	<.02	<.016	<.02	<.016
SPS-9094-A-062802-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062802-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062902-SC	5C	<.005	<.003	<.02	<.01329	<.02	<.01329	<.02	<.013	<.02	<.013	<.02	<.013
SPS-9094-A-062902-GR	2B	0.016	0.012	<.02	<.01490	<.02	<.01490	0.045	0.034	<.02	<.015	<.02	<.015
SPS-9094-A-062902-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-062902-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-063002-JB	2B/4C	0.012	0.008	<.02	<.01412	<.02	<.01412	<.02	<.014	<.02	<..014	<.02	<.014
SPS-9094-A-063002-WA	4D	<.005	<.003	<.02	<.01338	<.02	<.01338	<.02	<.013	<.02	<.013	<.02	<.013
SPS-9094-A-063002-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-063002-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070102-JN	4D	<.005	<.004	0.034	0.028	0.032	0.027	<.02	<.017	<.02	<.017	<.02	<.017
SPS-9094-A-070102-GR	4C	<.005	<.004	<.02	<.017	<.02	<.017	<.02	<.017	<.02	<.017	<.02	<.017
SPS-9094-A-070102-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070102-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070202-JB	4C	<.006	0.004	0.025	0.016	<.02	<.013	<.02	<.013	<.02	<.013	<.02	<.013
SPS-9094-A-070202-SC	4D/5A	<.005	<.003	0.029	0.018	<.02	<.013	<.02	<.013	<.02	<.013	<.02	<.013
SPS-9094-A-070202-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070202-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070302-JN	4C	<.005	<.007	<.02	<.027	<.02	<.027	<.02	<.027	<.02	<.027	<.02	<.027

AS - The lowest reportable value is equivalent to the Analytical Sensitivity which is calculated from the lowest reproducible concentration of silica detectable by the instrument.
N/A - Not Applicable

Silica Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study
(Analytical Method NIOSH 7500, Flow Rate 2.5 L/min, Required Volume 400 to 1,000 L)

SILICA														
Sample Number	**Location**	**Quartz**		**Cristobalite ****		**Tridymite**		**Gypsum**		**Calcite**		**Portlandite**	
		(mg)	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**
PEL* mg/m^3			**0.1**		**0.05**		**0.05**		**5**		**5**		**5**
SPS-9094-A-070302-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070302-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070802-GR	4C/4B	<.005	<.003	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-070802-BA	5A	<.005	<.003	<.02	<.013	<.02	<.013	<.02	<.013	<.02	<.013	<.02	<.013
SPS-9094-A-070802-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070802-LB	LOT BLANK	0.011	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070902-JN	5A	0.032	0.022	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-070902-JB	4B	<.005	<.003	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-070902-FB	BLANK	0.1	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-070902-LB	LOT BLANK	0.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071002-GR	4B	<.020	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071002-SC	5A	<.050	<.032	<.02	<.013	<.02	<.013	<.02	<.014	<.02	<.013	<.02	<.013
SPS-9094-A-071002-FB	BLANK	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071002-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071102-BA	3D	0.013	0.009	<.02	<.014	<.02	<.014	0.018	0.012	<.02	<.014	<.02	<.014
SPS-9094-A-071102-JB	3C	0.007	0.005	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071102-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071102-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071202-GR	3C	<.005	<.004	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071202-JN	3D/MATRESS	<.005	<.003	<.02	<.013	<.02	<.013	0.013	0.009	<.013	<.013	<.02	<.013
SPS-9094-A-071202-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071202-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071302-RH	4A/MATRESS	<.005	<.006	<.02	<.022	<.02	<.022	0.012	0.013	<.02	<.022	<.02	<.022
SPS-9094-A-071302-SC	4D/4A	<.005	<.005	<.02	<.022	<.02	<.022	<.02	<.022	<.02	<.022	<.02	<.022
SPS-9094-A-071302-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071302-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071502-GR	3A	<.005	<.003	<.02	<.013	<.02	<.013	<.02	<.013	<.02	<.013	<.02	<.013
SPS-9094-A-071502-BA	2A	0.009	0.006	<.02	<.014	<.02	<.014	0.012	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071502-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071502-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071602-JB	3A	<.005	<.004	<.02	<.014	<.02	<.014	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071602-JN	2A	<.005	<.004	<.02	<.014	<.02	<.014	<.02	N/A	<.02	N/A	<.02	N/A

AS - The lowest reportable value is equivalent to the Analytical Sensitivity which is calculated from the lowest reproducible concentration of silica detectable by the instrument.
N/A - Not Applicable

Silica Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study

(Analytical Method NIOSH 7500, Flow Rate 2.5 L/min, Required Volume 400 to 1,000 L)

SILICA													
Sample Number	Location	Quartz		Cristobalite **		Tridymite		Gypsum		Calcite		Portlandite	
		(mg)	(mg/m3)	(mg)	(mg/m3)	(mg)	(mg/m3)	(mg)	(mg/m3)	(mg)	(mg/m3)	(mg)	(mg/m3)
PEL* mg/m^3			0.1		0.05		0.05		5		5		5
SPS-9094-A-071602-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071602-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071702-GR	3A	<.005	<.003	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071702-SC	MATRESS	<.005	<.004	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071702-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071702-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071802-JB	3A/4A	0.03	0.02	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014	<.02	<.014
SPS-9094-A-071802-JN	MATRESS	0.005	0.004	<.02	<.016	<.02	<.016	<.02	<.014	<.02	<.016	<.02	<.015
SPS-9094-A-071802-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071802-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071902-NF	CHIRO	<.005	<.004	<.02	<.017	<.02	<.017	0.024	0.02	<.02	<.017	<.02	<.017
SPS-9094-A-071902-BA	MATRESS	<.005	<.003	<.02	<.013	<.02	<.013	<.02	<.013	<.02	<.013	<.02	<.013
SPS-9094-A-071902-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-071902-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072002-SC	MATRESS	<.005	<.003	<.02	<.013	<.02	<.013	0.018	0.012	<.02	<.013	<.02	<.013
SPS-9094-A-072002-RH	CHIRO	<.005	<.003	<.02	<.014	<.02	<.014	0.023	0.016	<.02	<.014	<.02	<.014
SPS-9094-A-072002-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072002-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072202-NF	CHIRO	<.005	<.004	<.02	<.014	<.02	<.014	0.014	0.01	<.02	<.014	<.02	<.014
SPS-9094-A-072202-JN	MATRESS	<.005	<.004	<.02	<.014	<.02	<.014	0.01	0.007	<.02	<.014	<.02	<.014
SPS-9094-A-072202-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072202-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072302-SC	3D	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-072302-NF	CA/THAI/3B	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-072302-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072302-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072402-NF	CHIRO	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-072402-JN	4C/CA	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-072402-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072402-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072502-SC	CA/5C	<.005	<.003	<.02	<.003	<.02	<.013	0.011	0.007	<.02	<.013	<.02	<.013
SPS-9094-A-072502-BA	3B	<.005	<.003	<.02	<.003	<.02	<.014	<.01	0.007	<.02	<.014	<.02	<.014
SPS-9094-A-072502-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	<as	<.02	N/A

AS - The lowest reportable value is equivalent to the Analytical Sensitivity which is calculated from the lowest reproducible concentration of silica detectable by the instrument.
N/A - Not Applicable

Silica Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study

(Analytical Method NIOSH 7500, Flow Rate 2.5 L/min, Required Volume 400 to 1,000 L)

SILICA													
Sample Number	**Location**	**Quartz**		**Cristobalite ****		**Tridymite**		**Gypsum**		**Calcite**		**Portlandite**	
		(mg)	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**
PEL* mg/m^3			**0.1**		**0.05**		**0.05**		**5**		**5**		**5**
SPS-9094-A-072502-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	<as	<.02	N/A
SPS-9094-A-072602-JN	5C/THAI	<.005	<.003	<.02	<.013	<.02	<.013	<.01	<.007	<.02	<.013	<.02	<.013
SPS-9094-A-072602-GR	3B	<.005	<.003	<.02	<.013	<.02	<.013	<.01	<.007	<.02	<.013	<.02	<.013
SPS-9094-A-072602-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072602-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072702-JN	3C	<.005	<.008	<.02	<.032	<.02	<.032	<.01	<.016	<.02	<.032	<.02	<.032
SPS-9094-A-072702-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072902-JB	THAI	<.005	<.003	<.020	<.013	<.02	<.013	<0.10	<.007	<.02	<.013	<.02	<.013
SPS-9094-A-072902-SC	3C	<.005	<.003	<.020	<.014	<.02	<.014	0.013	0.009	<.02	<.013	<.02	<.013
SPS-9094-A-072902-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.010	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-072902-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.010	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-073002-BA	THAI	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-073002-SC	CHIRO/CA	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-073002-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-073002-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-073102-JN	MATRESS	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-073102-GR	THAI	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-073102-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-073102-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080102-SC	CHIRO	0.011	0.008	<.02	<.014	<.02	<.014	<.01	<.007	0.027	0.019	<.02	<.014
SPS-9094-A-080102-BA	THAI	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-080102-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080102-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080202-GR	THAI	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<0.07	<.02	<.014	<.02	<.014
SPS-9094-A-080202-JN	MATRESS/CA	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<0.07	<.02	<.014	<.02	<.014
SPS-9094-A-080202-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080202-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080302-SC	MATRESS	<.005	<.006	<.02	<.023	<.02	<.023	<.01	<.011	<.02	<.023	<.02	<.023
SPS-9094-A-080302-BA	CA	<.005	<.006	<.02	<.023	<.02	<.023	<.01	<.011	<.02	<.023	<.02	<.023
SPS-9094-A-080302-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080302-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080502-GR	THAI	0.011	0.008	<.02	<.015	<.02	<.015	<.01	<.007	<.02	<.015	<.02	<.015
SPS-9094-A-080502-JN	THAI	<.005	<.0004	<.02	<.015	<.02	<.015	<.01	<.007	<.02	<.015	<.02	<.015

AS - The lowest reportable value is equivalent to the Analytical Sensitivity which is calculated from the lowest reproducible concentration of silica detectable by the instrument.
N/A - Not Applicable

Silica Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study
(Analytical Method NIOSH 7500, Flow Rate 2.5 L/min, Required Volume 400 to 1,000 L)

SILICA														
Sample Number	**Location**	**Quartz**		**Cristobalite ****		**Tridymite**		**Gypsum**		**Calcite**		**Portlandite**	
		(mg)	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**
PEL* mg/m^3			**0.1**		**0.05**		**0.05**		**5**		**5**		**5**
SPS-9094-A-080502-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080502-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080602-JN	THAI	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-080602-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080702-BA	THAI	<.005	<.002	<.02	<.008	<.02	<.008	<.01	<.004	<.02	<.008	<.02	<.008
SPS-9094-A-080702-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080802-BA	THAI	<.005	<.002	<.02	<.008	<.02	<.008	<.01	<.004	<.02	<.008	<.02	<.008
SPS-9094-A-080802-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-080902-JN	THAI	<.005	<.007	<.02	<.027	<.02	<.027	<.01	<.027	<.02	<.014	<.02	<.027
SPS-9094-A-080902-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-081202-JN	4B	<.005	<.005	<.02	<.02	<.02	<.02	<.01	<.01	<.02	<.02	<.02	0.01
SPS-9094-A-081202-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-081302-SC	5th CA	<.005	<.015	<.02	<.015	<.02	<.015	<.02	<.015	<.02	<.015	<.02	<.015
SPS-9094-A-081302-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-081502-SC	FOOD X	<.005	<.004	<.02	<.017	<.02	<.017	<.01	<.009	<.02	<.017	<.02	<.017
SPS-9094-A-081502-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-081602-SC	FOOD X	<.005	<.004	<.02	<.018	<.02	<.018	<.01	<.009	<.02	<.018	<.02	<AS
SPS-9094-A-081602-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-081902-JN	FOOD X	<.005	<AS	<.02	<AS	<.02	<AS	<.01	<.009	<.02	<.018	<.02	<.018
SPS-9094-A-081902-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-082002-SC	FOOD X	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.017	<.02	<.014
SPS-9094-A-082002-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-082102-JN	FOOD X	<.005	<.004	<.02	<.014	<.02	<.014	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-082102-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-082202-SC	FOOD X	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-082202-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-082302-JN	FOOD X	<.005	<.007	<.02	<.027	<.02	<.027	<.01	<.013	<.02	<.027	<.02	<.027
SPS-9094-A-082302-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-082602-SC	FOOD X	<.005	<.004	<.02	<.017	<.02	<.017	<.01	0.009	<.02	<.017	<.02	<.017
SPS-9094-A-082602-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-082802-SC	FOOD X	<.005	<.003	<.02	<.013	<.02	<.013	<.01	<.007	<.02	<.013	<.02	<.013
SPS-9094-A-082802-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-082902-JN	FOOD X	<.005	<.003	<.02	<.014	<.02	<.014	<.02	<.007	<.02	<.014	<.02	<.014

AS - The lowest reportable value is equivalent to the Analytical Sensitivity which is calculated from the lowest reproducible concentration of silica detectable by the instrument.
N/A - Not Applicable

Silica Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study
(Analytical Method NIOSH 7500, Flow Rate 2.5 L/min, Required Volume 400 to 1,000 L)

SILICA														
Sample Number	**Location**	**Quartz**		**Cristobalite ****		**Tridymite**		**Gypsum**		**Calcite**		**Portlandite**	
		(mg)	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**	**(mg)**	**(mg/m3)**
PEL* mg/m^3			**0.1**		**0.05**		**0.05**		**5**		**5**		**5**
SPS-9094-A-082902-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-083002-SC	FOOD X	<.005	<.009	<.02	<.035	<.02	<.035	<.01	<.018	<.02	<.035	<.02	<.035
SPS-9094-A-083002-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-090302-JN	FOOD X	0.006	0.005	<.02	<.017	<.02	<.015	<.01	<.008	<.02	<.017	<.02	<.017
SPS-9094-A-090302-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-090402-SC	FOOD X	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-090402-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-090502-JN	FOOD X	<.005	<.003	<.02	<.013	<.02	<.013	0.01	0.007	<.02	<.013	<.02	<.013
SPS-9094-A-090502-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-090602-SC	5TH CA	<.005	<.008	<.02	<.032	<.02	<.032	<.01	<.016	<.02	<.032	<.02	<.032
SPS-9094-A-090602-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.2	N/A
SPS-9094-A-090902-SC	4A	0.007	0.008	<.02	<.023	<.02	<.023	0.035	0.039	0.071	0.08	<.02	<.023
SPS-9094-A-090902-FB	BLANK	0.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-091302-JN	BARBER	<.005	<.012	<.02	<.047	<.02	<.047	0.01	0.023	<.02	<.047	<.02	<.047
SPS-9094-A-091302-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-091602-JN	BARBER	0.005	0.004	<.02	<.017	<.02	<.017	0.024	0.02	<.02	<.017	<.02	<.017
SPS-9094-A-091602-SC	FOOD X	<.005	<.004	<.02	<.017	<.02	<.017	<.01	<.009	<.02	<.017	<.02	<.017
SPS-9094-A-091602-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	0.024	0.02	<.02	N/A	<.02	N/A
SPS-9094-A-091602-LB	LOT BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	<.009	<.02	N/A	<.02	N/A
SPS-9094-A-091702-JN	BARBER	0.008	0.006	<.02	<.015	<.02	<.015	<.01	<.007	<.02	<.015	<.02	<.015
SPS-9094-A-091702-SC	FOOD X	0.005	0.004	<.02	<.015	<.02	<.015	<.01	<.007	<.02	<.015	<.02	<.015
SPS-9094-A-091702-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	N/A	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-091802-JN	BARBER	<.005	<.004	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-091802-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-091902-SC	FOOD X	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<.007	<.02	<.014	<.02	<.014
SPS-9094-A-091902-FB	BLANK	<.005	N/A	<.02	N/A	<.02	N/A	<.01	N/A	<.02	N/A	<.02	N/A
SPS-9094-A-092402-SC	N-STRS/3RD FL	<.005	<.003	<.02	<.014	<.02	<.014	<.01	<AS	<.02	<.014	<.02	<.014
SPS-9094-A-092402-JN	BARBER	0.005	0.003	<.020	<.013	<.02	<.013	<.01	<AS	<.02	<.013	<.02	<.013
SPS-9094-A-092402-FB	BLANK	<.005	N/A	<.020	N/A	<.02	N/A	<.010	N/A	<.02	N/A	<.02	N/A

AS - The lowest reportable value is equivalent to the Analytical Sensitivity which is calculated from the lowest reproducible concentration of silica detectable by the instrument.
N/A - Not Applicable

Silica Personal Air Sampling Results for the WTC Residential Confirmation Cleaning Study

(Analytical Method NIOSH 7500, Flow Rate 2.5 L/min, Required Volume 400 to 1,000 L)

***PEL for Quartz, Cristobalite and Tridymite**

The Permissible Exposure Limit for quartz (0.1 mg/m3) was arrived by using 100 in the denominator of the formula specified for quartz at 29CFR 1910.1000 Table Z-3. The cristobalite and tridymite PELs (0.05 mg/m3) were arrived at by halving the quartz value as specified at 29CFR 1910.1000 Table Z-3

****Suspiciously High Values of Cristobalite in EPA WTC Samples**

In this project, EMSL has been using the tertiary peak (non-overlapping with other five phases) for Cristobalite for estimating this phase if it is to be present. Some of the samples do show a strong diffraction peak in the angular region 30.2-32.4 degree 2-theta. However, there are reasons to suggest that these peaks may be due to some other phase, not Cristobalite.Three spectra from the project # 040208995 are enclosed. Each shows a strong peak and the true position for cristobalite superimposed. Clearly, the peaks in these samples are very mu displaced to the left with respect to the true position. For comparison purposes, a similar spectra taken on a 50 ug cristobalite standard is alsc EMSL Laboratories is using a disclaimer, that Cristobalite has not been confirmed in these samples and that estimates are only tentative.

***** The PCM was below the NYC reoccupancy standard (.01 f/cc). Therefore, TEM was not run.**

AS - The lowest reportable value is equivalent to the Analytical Sensitivity which is calculated from the lowest reproducible concentration of silica detectable by the instrument.
N/A - Not Applicable

Attachment B

The Work Plan and Changes to the Work Plan

Residential Confirmation Cleaning Study

Work Plan

Prepared for and by:

The United States Environmental Protection Agency
2890 Woodbridge Avenue
Edison, New Jersey 08837

May 30, 2002

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) has been tasked to evaluate the effectiveness of various cleaning procedures that may have been utilized in cleaning residential living spaces located in the immediate vicinity of ground zero that are contaminated with dust and debris from the World Trade Center (WTC) attack. The study will involve implementing various vacuuming and cleaning techniques in separate apartments to determine their effectiveness. Comprehensive sampling for Contaminants of Potential Concern (COPC) will be conducted throughout the study to determine which method of cleaning is most effective at dust control. The building located at 110 Liberty Street has been selected for the study. The location of the building in relation to ground zero is shown on Figure 1.0.

1.1 BACKGROUND INFORMATION

The building at 110 Liberty Street is five stories with twelve (12) residential and six commercial spaces and has been unoccupied since September 11, 2001. It is owned by Liberty Street Associates LLC (David M. Baldwin Realty Company, Inc). The building is situated between Liberty and Cedar Steets and has a co-address of 113-117 Cedar Street. The collapse of the WTC severly impacted all spaces in the building with deposition of dust and debris. Windows of residential and commercial spaces facing the WTC were blown out as were the sky lights located in the ceilings of the three, fifth floor dwellings. The building was professionally cleaned shortly after the collapse of the WTC. The cleanup was limited to all residential spaces, the basement and the roof. None of the commercial spaces, except for unit 3A were cleaned. Two of the commercial spaces (Unit 1 and Unit 2) are presently covered with inches of dust. All of the residential rental spaces contain dust of various degrees due to redeposition of dust generated from the work effort at ground zero.

The rental spaces range in size from 1,000 to 1,300 square feet. The residential spaces are of open design and include a kitchen, bathroom and sleeping area. Commercial spaces identified as Unit 1, Unit 2 and Dwelling 3A were used as a chiropractors office, a retail mattress showroom and offices of Baldwin Realty, respectively. Each space is heated by an individual hot water base board system. Window or roof mounted air conditioners are present in the residential space, central systems are present in the commercial space (Unit 1 and Unit 2). Rental spaces are accessible from Liberty or Cedar Streets through common hallways, floors are accessible via an elevator and stairs. The building is presently without electricity and service is not expected to be restored until mid June. Each floor has a trash compactor room and a utility room. A laundry room is located on the second floor. The basement contains the building trash compactor, elevator shaft, electric meter rooms, preparation and storage areas for the Chinese restaurant, and a hair salon.

The study will be conducted on twelve (12) residential and three commercial spaces. The two restaurants and hair salon are not part of the study but will be cleaned by EPA at the completion of the study.

2. PROPOSED PLANS AND PROJECT OBJECTIVES

EPA will evaluate eight cleaning techniques during the study. Fifteen (15) separate units will be identified and evaluated based on the following criteria: exposure to ground zero, type of interior decorating and the location of the unit in the building. Cleaning techniques will be specific to each unit and will consist of basic vacuuming with standard household equipment to use of advanced commercial quality equipment. Wet wiping of horizontal surfaces will be performed in each unit. The use of wet vacuums for cleaning carpets will also be investigated. Comprehensive sampling for COPC will be conducted prior to, during and after the cleanup. Laboratory data will be evaluated by EPA to determine the efficiency and effectiveness of each cleanup technique as well as possible exposures to individuals performing the task.

The Cleanup Plan details the tasks and procedures to be used during the cleaning of specific units. Tasks will be identified and protocols will be detailed for building assessments, setup of support/decontamination zones, vacuuming/washing and disposal.

The Sampling and Analysis Plan (SAP) presents the detailed procedures and methods for sampling and analysis of bulk, surface and airborne dusts. Sampling will be performed during all phases of the cleanup. A Quality Assurance Project Plan (QAPP) is included in the Sampling and Analysis Plan to ensure that the sampling and analysis are conducted in conformance with EPA Quality Assurance/Quality Control (QA/QC) objectives.

The Health and Safety Plan (HASP) provides the minimum safety requirements that will be implemented during the activities conducted under the Cleanup and Sampling Plans. The Health and Safety Plan satisfies the requirements of 29 CFR 1910.120.

3. CLEANUP PLAN

This Cleanup Plan describes the procedures and protocols to be implemented for the following tasks:

i) support areas, security
ii) building and apartment access and assessment;
iii) photo documentation, and inventories of existing conditions;
iv) cleaning of common areas, building exteriors, elevator shafts and heating systems;
v) decontamination areas;
vi) procedures for interior cleaning;
vii) procedures for containment and disposal of cleanup wastes.

The sampling program to be implemented is summarized in Section 4. Specific details of sampling activities/protocols/methods performed during the Cleanup are presented in the Sampling and Analysis Plan and associated QAPP. All activities performed under the Cleanup Plan will be performed in accordance with the health and safety protocols presented in the Health and Safety Plan.

1. Support Facilities:

This project will require office space large enough to support numerous activities including public relations, public availability, technical support, communications, data collection and presentation, contractor support and EPA management. Portable trailers cannot be used in the area due to space constraints, therefore office space in the immediate vicinity of the cleanup will be rented for the duration of the study. Security needs will be determined for support areas and the study building.

2. Building Access and Assessment:

Prior to entering the building, EPA will obtain a signed access agreement with the building owner(s) and prior tenant(s). These documents will be prepared by EPA attorneys and signed copies will be kept on file. Once access is obtained the entire building and each apartment will be inspected for safety concerns including: gas/oil/water leaks, perishable foods, rodent/insect infestations, individual or common heating/cooling systems, damaged floors/walls/roofs, common areas, stair ways and elevators. All safety concerns will be noted/evaluated and repaired (if necessary) prior to beginning the cleanup.

3. Photo Documentation and Inventories:

Photo documentation of all building interiors will be conducted and catalogued in an index. The building owner and tenant will be requested to accompany EPA during this event. Inventories of personnel belongings will be developed and owners will be permitted to remove valuables. This documentation is for the benefit of all parties involved. Measurements of the apartment and details of the interior decorating (furniture/carpets etc.) will be obtained to develop a floor plan of the living space. The floor plan will be utilized to locate and document sample locations while the cleanup is progressing. Bulk samples of dust will be obtained (if possible) for laboratory analysis and subsequent evaluation.

4. Cleaning of Common Areas:

EPA will clean building exterior areas (if necessary) prior to beginning interior work. The work will be performed by a subcontractor utilizing vacuum trucks equipped with HEPA filtration. All foyers, stair ways, hall ways, elevators/shafts, and common heating systems will be vacuumed using commercial quality HEPA-filtered vacuums. Cleaning of common areas will begin at the building entrance and proceed to the upper level then return down to the entrance. Plastic curtains will be installed at the interface of clean and non - clean areas to prevent re - deposition of dust due to drafting. If HVAC systems are present, subcontractors specializing in cleaning these units may be utilized. All ventilation ducts will be covered with plastic to minimize recontamination with dust. Wet washing of walls, and ceilings will be performed if dust cannot be removed by vacuuming. The goal of this activity is to provide a dust free area to allow level "D" entry through the common spaces and for construction of equipment storage and decontamination areas. Decontamination areas be will temporary structures built of wood and plastic sheeting to be utilized to don and doff protective equipment when entering or exiting the work areas.

5. Interior Cleaning:

EPA will evaluate eight cleaning techniques on fifteen (15) rental spaces. Each cleaning technique will be tested on two rental units. The eight cleanup techniques will vary through use of different vacuuming systems. Sampling of dust before, during, and after the cleanup will be performed to evaluate the effectiveness of each cleanup technique and worker exposure.

General cleaning procedures which will be employed for all units are as follows: Bulk accumulations of dust and debris (if present) will be manually removed using shovels and commercial quality HEPA-filtered vacuums. All horizontal and vertical surfaces will be vacuumed beginning with the ceilings and working down along the walls to the floor. Windows, electrical outlets, sills, heating/cooling units will be vacuumed as they are encountered. Filters will be replaced on cooling units. After cleaning, A/C units will be sealed with plastic sheeting. Central HVAC intake/discharge registers will be covered with plastic. Horizontal and vertical solid surfaces including floors, appliances, table tops, cabinets (interior/exterior) as well as flat ware, and accent items will be washed with soap and water (if appropriate). Books, files, magazine, porous accent items will be vacuumed and stored in boxes then covered with plastic bags. Items such as clothes, shoes, drapes/curtains, will be HEPA vacuumed (if necessary) and stored in plastic bags for washing/dry-cleaning by the tenant. Carpets and furniture will be dry vacuumed until visibly clean. The tenant will be invited to monitor the cleanup if desired. EPA will furnish protective equipment to tenant(s) during the cleanup. No items will be discarded unless authorized by the tenant. If necessary, work schedules will be modified to accommodate the tenant.

Detailed cleaning procedures and sequencing of work are included as Attachment A.

Four scenarios have been developed to evaluate eight cleanup techniques. Each scenario contains two parts for testing two different cleaning procedures. Each scenario is discussed below:

Scenario 1:
(Selection Criteria): Accumulation of dust on horizontal surfaces should be limited to a dusting. This scenario may represent a typical apartment which was impacted but not totally encompassed in dust.

Test A (Equipment Selection) Cleaning will be conducted in two units using basic residential quality upright vacuums and shop vacuums which are available from Hoover®, Eureka®, Rigid® and Craftsman®.

Test B (Equipment Selection) Cleaning will be conducted in two units with basic vacuums as used in Test A but with the addition of an air filtration device (AFD). The AFD produces a negative pressure differential which will serve to capture dust particles through HEPA filtration that become airborne as a result of the cleaning activities.

Scenario 2:
(Selection Criteria) Same or similar to Scenario 1.

Test A (Equipment Selection) Cleaning will be conducted in two units using HEPA-filtered upright vacuums and HEPA-filtered shop vacuums which are available from Hoover®, Eureka®, Rigid® and Craftsman® companies. The upright vacuums from Hoover® and Eureka® were provided to residents of lower Manhattan, by FEMA and the American Red Cross for cleaning of their occupied space.

Test B (Equipment Selection) Cleaning will be conducted in two units using the same vacuums in Test A but with the addition of an AFD.

Scenario 3:
(Selection Criteria): Same or similar to Scenario 1.

Test A (Equipment Selection) Cleaning will be conducted in two units using commercial quality HEPA-filtered vacuums. These vacuums will be purchased from Nilfisk-Advance™ Vacuum Systems. Vacuums of this type were used by management companies for cleaning residential/commercial spaces in lower Manhattan after the WTC attack.

Test B (Equipment Selection) Cleaning will be conducted in two units using the same vacuums in Test A but with the addition of a AFD.

Scenario 4:
(Selection Criteria) Units have a direct exposure to ground zero. Windows were blown out as a result of the WTC collapse. Accumulation of dust on horizontal surfaces measures in inches. This scenario represents a severely impacted space with heavy accumulations of dust and debris. The two commercial spaces (Units 1 and Unit 2) in the building fit this criteria. Both spaces have wall to wall carpeting and acoustical ceiling tiles.

Test A (Equipment Selection) Cleaning will be conducted in both units using Nilfisk™ HEPA-filtered vacuums. Debris that cannot be vacuumed will be manually removed and disposed of. Due to the excessive amount of dust, a minimum of two AFDs will be used to control airborne dust. Cleaning will continue until all visible dust has been removed.

Test B (Wet Wiping) Additional cleaning of wall surface areas will be conducted to remove any dust residues that may not have been removed by vacuuming. Wiping of the walls with a damp soapy cloth will be performed to remove residual dust that may have adhered to the walls from the force of the collapse.

Test C (Carpet Shampooing) Wall to wall carpeting in both units will be shampooed or steam cleaned using commercial duty equipment.

Scenarios 1, 2 and 3 will be each be tested on four units. Scenario 4 will be tested on the two commercial spaces. Additional evaluation of wet wiping methods will be conducted on the 15th (Dwelling) that has not been proposed for evaluation under the previously proposed scenarios.

Samples will be collected prior to, during and after cleanup in accordance with the SAP to determine the effectiveness of the cleaning. If sample results do not attain cleanup objectives for a specific scenario, the unit will be re-cleaned using the same equipment and re-sampled. If after a second cleaning the results are unsatisfactory the unit will be cleaned using a method proven successful.

6. Disposal of Waste Generated in Cleanup:

Dust/debris, used protective equipment, clogged vacuum filters, expendables and items discarded by the tenant will be double bagged in 6ml plastic bags and deposited in a roll off container placed out side the building. The roll off container will be transported off site when full and replaced with another roll-off container. Water used for hand washing and equipment washing will be disposed into the sanitary sewer.

4. PROJECT SAMPLING

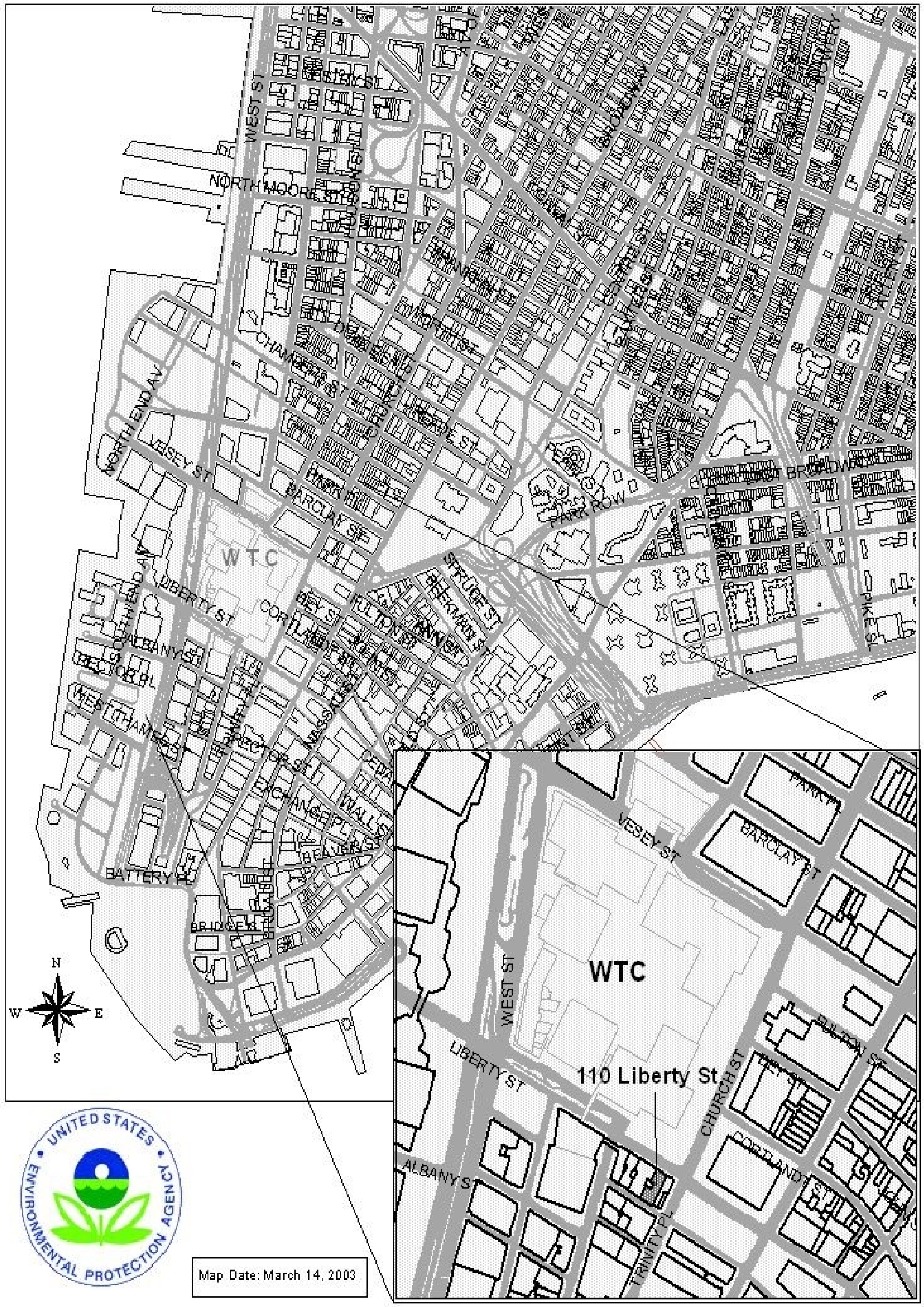
EPA will perform comprehensive sampling before, during and after the cleanup to evaluate the effectiveness of the work and possible worker exposure. Samples of dust collected by wipe, micro vac, and personnel pump sampling techniques will be obtained from porous and nonporous surfaces as well as from workers. Prior to the start of work, bulk samples will be collected (if possible) from each unit. If bulk samples cannot be collected, samples will be obtained using wipe or micro - vac techniques. Samples will be collected from the locations, and analyzed for the parameters shown on the tables included as Attachment B. Specific sampling protocols, methods as well as sample management, data validation and reporting are detailed in the SAP.

5. REPORT PREPARATION

Upon completion of the study a summary report will be prepared discussing the work performed under each scenario. The report will present a synopsis of the work, detailing conditions of the units prior to, during and after the cleanup, duration of the cleanup, problems encountered during cleanup and sampling, sample locations, laboratory data summary tables, and QA/QC documentation. This information will be presented to EPA for evaluation and recommendation.

Figure 1.0

Base Map of Lower Manhattan



Attachment A

Residential Confirmation Cleaning Study
Sequence of Activities and Detailed Cleaning Procedures

1. Obtain Access from Owner(s) & Tenants(s):
i. Meet with owner/tenants to explain the pilot and goals.
ii. Arrange for owner/tenants to enter rental space to identify items to be discarded or removed (clothes, rugs, furniture) This entry will be after hallways are cleaned and tenants are provided proper PPE.

2. Photo Documentation of Rental Space:
i. EPA will video and photograph all rental and common spaces before the cleanup begins. (drawers, cabinets, and closets will be opened and areas of damage will be noted)
ii Inventories of all belongings will be logged and entered into an EPA database.
iii Heating and air conditioning systems will be identified and photographed..
iv The interior space will be detailed on a scaled floor plan. Furniture, carpets, beds will be identified, sample locations will be marked.

3. Exterior Cleaning:
NYC is responsible for cleaning roof tops and building exteriors that are covered with dust. Dust will be removed by vacuum and wetted then brushed into bags.

4. Cleaning of Common Spaces:
EPA will initiate the cleanup by vacuuming all common spaces. This includes hallways, utility rooms, laundry rooms, compactor rooms, elevators and elevator shafts. Work will begin from the entrance to the top floors. Windows and screens will be cleaned first. Vacuuming will begin at the ceiling and continue down the walls to the floor. Work will continue to the next floor via stair ways. Utility rooms, compactor rooms and laundry rooms, will be vacuumed as encountered starting from the ceiling working down to the floor. Appliances will be moved to permit complete cleaning. Dryer vents and filters will be replaced or cleaned. When the top hallway is completed vacuuming will continue floor by floor to the building entrance following the same procedures as during the initial cleaning. Isolation barriers will be installed at the stairwell of each floor to minimized recontamination caused by drafting. This barrier will also isolate the common spaces for clearance sampling. Following receipt of acceptable clearance sample results, the floor of the common spaces (hallway) will be covered with construction paper (red rosin), and will be used as storage areas for equipment and supplies, and as passage areas for (level D) workers and visitors.

5. Cleaning of Interior (Residential) Spaces:
EPA will begin cleaning interior spaces beginning at the entrance door of the rental space. Workers will vacuum the foyer areas and construct an isolation barrier to separate this area from the rest of the rental space. The contained foyer area will be considered a clean space for donning PPE. Exteriors of windows/screens will be cleaned first. Interior areas will be cleaned as encountered. Items identified by the tenant(s) for disposal will be consolidated and bagged. Personnel belongings (shoes, clothes, linens etc.) will be vacuumed then bagged for washing/cleaning by the tenant. Vacuuming will begin at the ceiling and continue down the

walls to the floor, working toward the far end of the rental space. Window sills, electrical outlets, mouldings, baseboard heating elements and horizontal surfaces will be vacuumed as encountered. Carpets will be vacuumed 2 times using an agitator bar after removal of gross dust.. Fabric covered furniture will be vacuumed 2 times using a stiff brush attachment after removal of gross dust. Fabric window dressings will be vacuumed 2 times. Window air conditioners will be vacuumed externally then dismantled to be vacuumed internally. Central HVAC intake/discharge registers (if present) will be removed/cleaned to permit interior duct cleaning then replaced and covered with plastic. Appliances such as refrigerators and stoves will be moved to vacuum dust from floor footprint area. Spoiled food (if present in the refrigerator) will be removed at this time. Refrigerator cooling tubes will brushed and vacuumed. Closet and dresser interiors will be vacuumed. Upon reaching the far end of the rental space vacuuming will continue by reversing the process detailed above. Vacuuming will continue to the entrance area. At this time horizontal surfaces will be wet wiped, solid floors will be moped, flatware and solid objects, will be washed. Flatware, solid objects (electrical equipment, exercise equipment, etc.) will be packaged in boxes and/or covered with plastic. Work will continue to the isolation barrier where all cleaning equipment will be vacuumed and/or washed for use on the next rental space..

6. Cleaning of Interior (Commercial) Spaces:
Two commercial spaces are present in the building, both are grossly contaminated with inches of dust and debris. Both spaces are carpeted and have central air conditioning systems with the exchanger located above tiled ceilings. Entrance to the spaces is via a hallway from Cedar Street and a stairwell from Liberty Street. The heavy accumulation of dust in these spaces requires special considerations. The units will be isolated from both entrance ways by plastic barriers. Vacuum motors and canisters will operate from outside the isolation area. Vacuuming will be accomplished by snaking hoses into the contaminated areas. This procedure will minimize entraining dust into the air. Due to the accumulation of dust, negative air machines will be utilized to manage air born dust. The front windows are presently covered with plywood. Plywood will be removed and window openings will be vacuumed to remove dust and residual debris. Upon completion, plywood and plastic will be installed until the building owner installs permanent windows. Following complete removal of accumulated dust, vacuums will be brought into the space and cleaning will proceed as detailed in the procedures for residential space.

7. Specialized Cleaning Procedures
a. Window Mounted Air Conditioners.
Vacuum exterior surfaces, remove from wall mount and relocate to isolated cleaning area. Cover A/C mount with plastic. Discard filters and open unit to expose interior mechanism. Vacuum cooling fins and interior surfaces. Replace filter, install in mount and cover interior vents with plastic.

b. Roof Mounted A/C
Units cannot be removed; therefore, cleaning will be performed with the unit in place. Remove and replace filters, vacuum interior, inspect exterior exchanger, replace all cleaned parts and cover interior vents with plastic.

c. Refrigerators

Inspect refrigerator, remove and dispose of spoiled food. Move appliance to isolated cleaning area, elevate and clean dust from cooling coils using vacuums and specialized brushes. Clean floor area where appliance was located.

d. Stoves

Move appliance from location, clean floor area. Vacuum storage drawer (if present) and open top of stove to vacuum. Remove exhaust fan light and filters, replace with new. Vacuum first foot of exhaust duct if present.

e. Dishwashers

Remove toe plate and vacuum dust from under appliance.

f. Bathroom Fans

Remove protective cover and wet wipe, remove fan/motor and vacuum. Vacuum first foot of exhaust duct.

g. Hydronic Finned Radiation

Remove protective covers to expose heat elements. Finns are to be vacuumed and brushed to remove dust.

h. Electronic Equipment

Equipment is to be moved to the isolated cleaning area where dust will be removed by blowing air into the cooling slats while vacuuming.

i. Non-perishable canned and bottled goods

These items are to be wet wiped and stored in boxes covered with plastic for the tenant.

j Carpets

Carpets will be vacuumed twice or until visibly clean. Carpets in the commercial space will be shampooed after vacuuming.

Attachment B

Changes to the Work Plan

Changes to the Work Plan

1. WET WIPING

1.1 Wet Wipe Using Windex® / Wet Wipe Using Water Only

The work plan initially called for use of soap and water to accomplish wet wiping. Windex® brand was used because it is a commonly used cleaner believed to be readily available in most people's homes. Further, it is non-damaging to most surfaces, from wood to fiberglass. Typically, this soap does not "over-suds." It provides an effective detergent-based protection of surfaces when combined with cold water. This was important, because hot water was not immediately available at the project site. During the project, EPA opted to also evaluate application of wet wipe using water only. Water only was used on the desktop in the Chiropractor's Office, in the bathroom of the Chiropractor's Office, and in the entire Barber Shop. Water only was also used on the vinyl tiles under the carpeted area in the Mattress Store.

1.2 Horizontal Wet Wipe Only / Horizontal and Vertical Wet Wipe

The majority of tests of cleaning methods were accomplished using horizontal wet wipe only, to assist in determination of whether vacuuming without wet wiping would result in acceptable cleaning. However, application of both horizontal and vertical wet wipe was tested in Units 3B and 3C.

Application of both horizontal and vertical wet wiping in Unit 3B was consistent with the procedures called for relative to testing of Scope A, Lower Manhattan Cleaning Procedures. (Attachment F).

Unit 3C was selected for additional tests of the use of both horizontal and vertical wet wiping. The unit was selected for the following reasons:

- The apartment was heavily impacted by WTC dust
- The apartment was fully furnished and contained many personal belongings, and
- he test of vacuuming method called for use of equipment without HEPA filter or AFD. Additionally, the resident had expressed the intention to return.

1.3 Use of Swiffer® Brand Cloths

EPA opted to evaluate use of Swiffer® brand cloths for application of wet wipe. Swiffer® brand cloths were utilized during the cleaning of residential unit 5D.

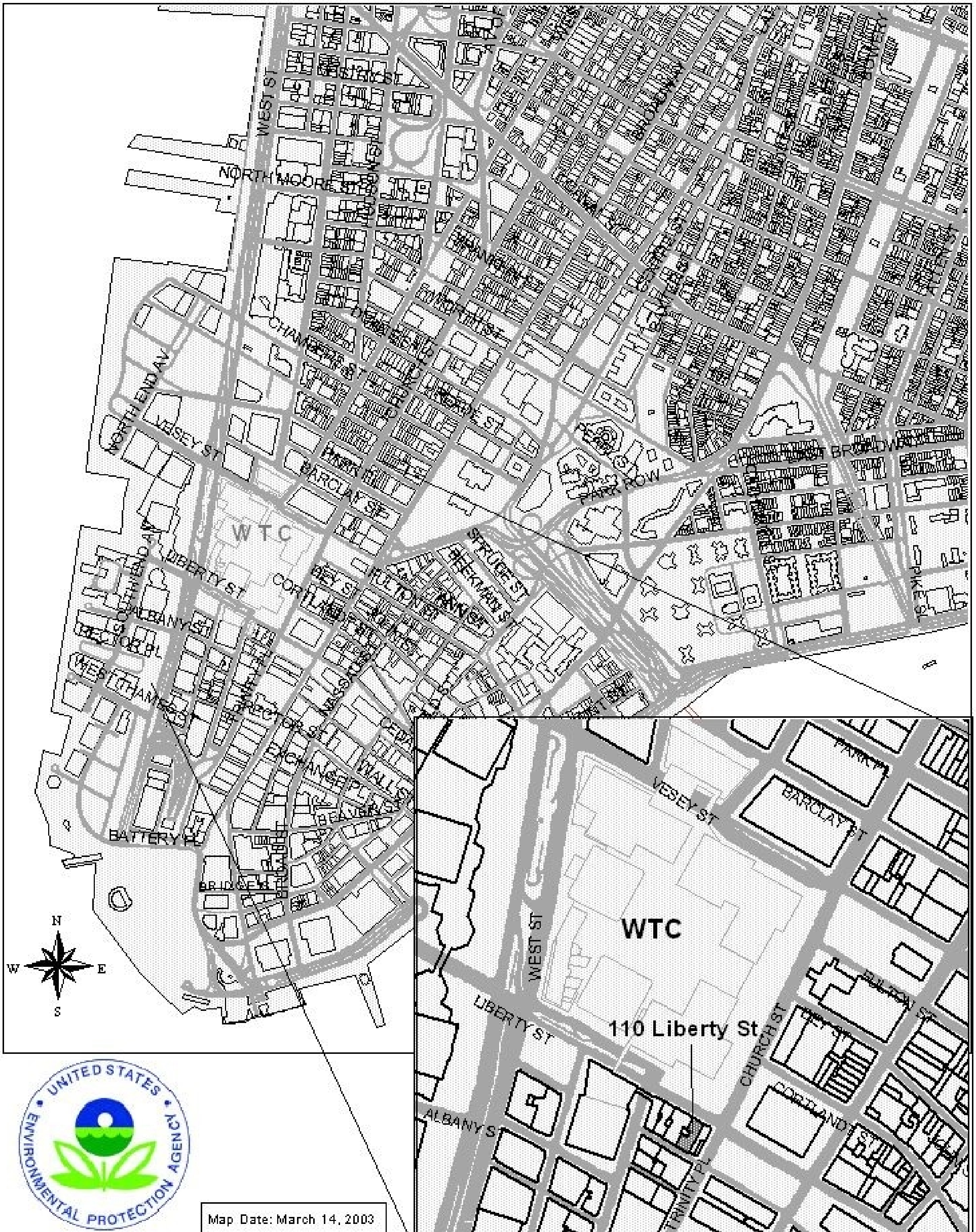
2. SCOPE A- LOWER MANHATTAN CLEANING PROCEDURES

See Attachment F.

Attachment C

Site Map

Base Map of Lower Manhattan

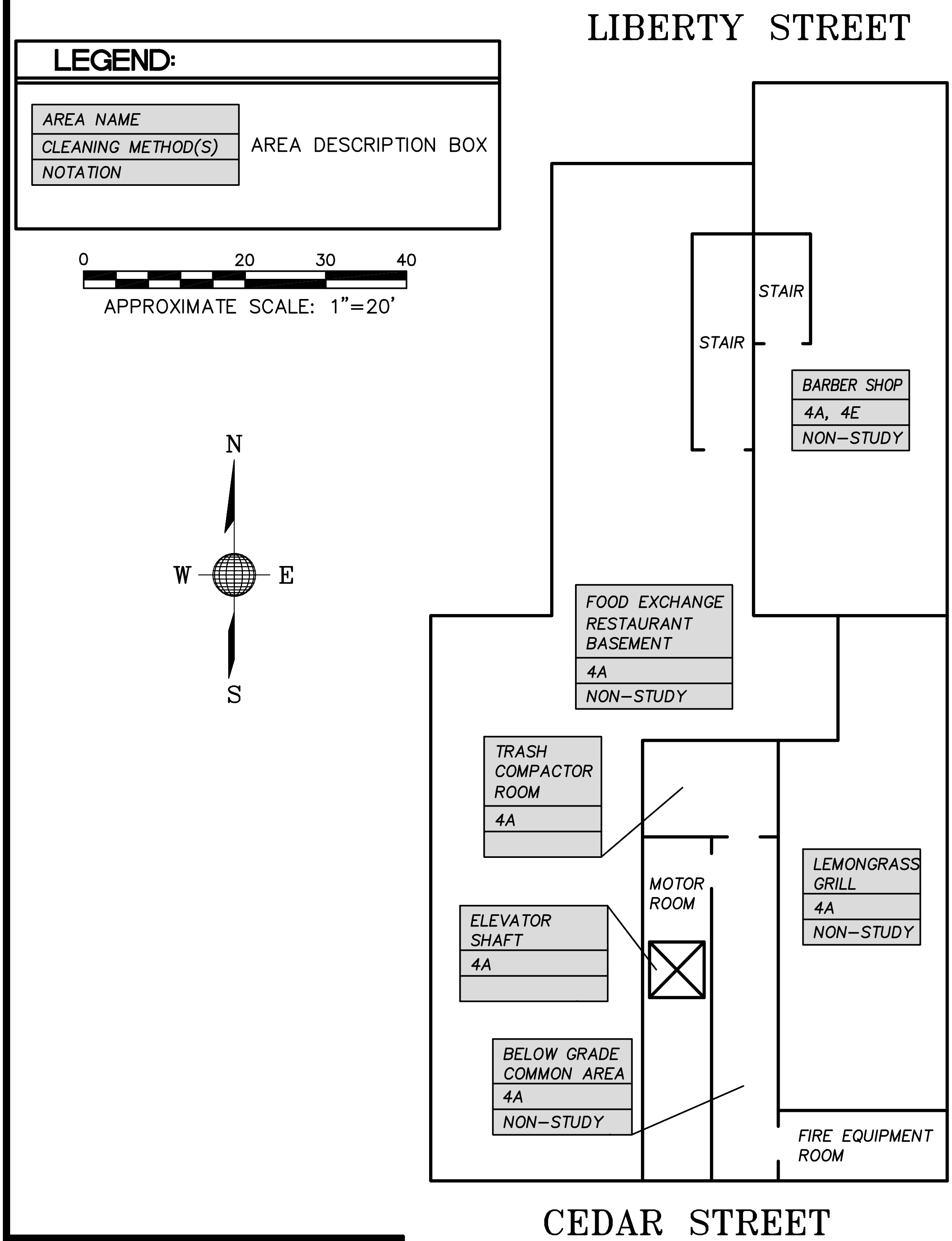


Map Date: March 14, 2003

Attachment D

Floor Plans

BASEMENT



DRAWING STATUS	DRAFT		FINAL	X

PROJECT NO. :501060	RESPONSE MANAGER: SCOTT WILHELM	PROGRAM MANAGER: BRADLEY J. CUNNINGHAM	PROGRAM/CONTRACTS MANAGER: KIM D. BENNETT

SCALE: 1" = 20'		CADD ID: 501060_0	PLOT DATE: 2/10/03	CHK BY: K.D.B.	CHK DATE: 2/10/03
REVISION NO.: 0	REV DATE: NA	DRN BY: AML	DRN DATE: 12/9/02	APPVD BY: K.D.B.	APPVD DATE: 2/10/03

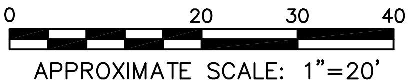
WRS Infrastructure & Environment, Inc.
925 CANAL STREET, SUITE 7301, BRISTOL, PENNSYLVANIA 19007
PH: (267) 540-0048 FAX: (267) 540-0049

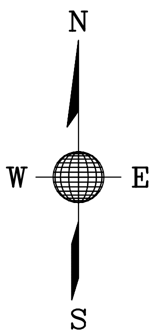
WTC RESIDENTIAL
CONFIRMATION CLEANING STUDY
110 LIBERTY STREET, NEW YORK, NEW YORK
US DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONTRACT NO. 68-S2-99-07
DELIVERY ORDER NO. 060

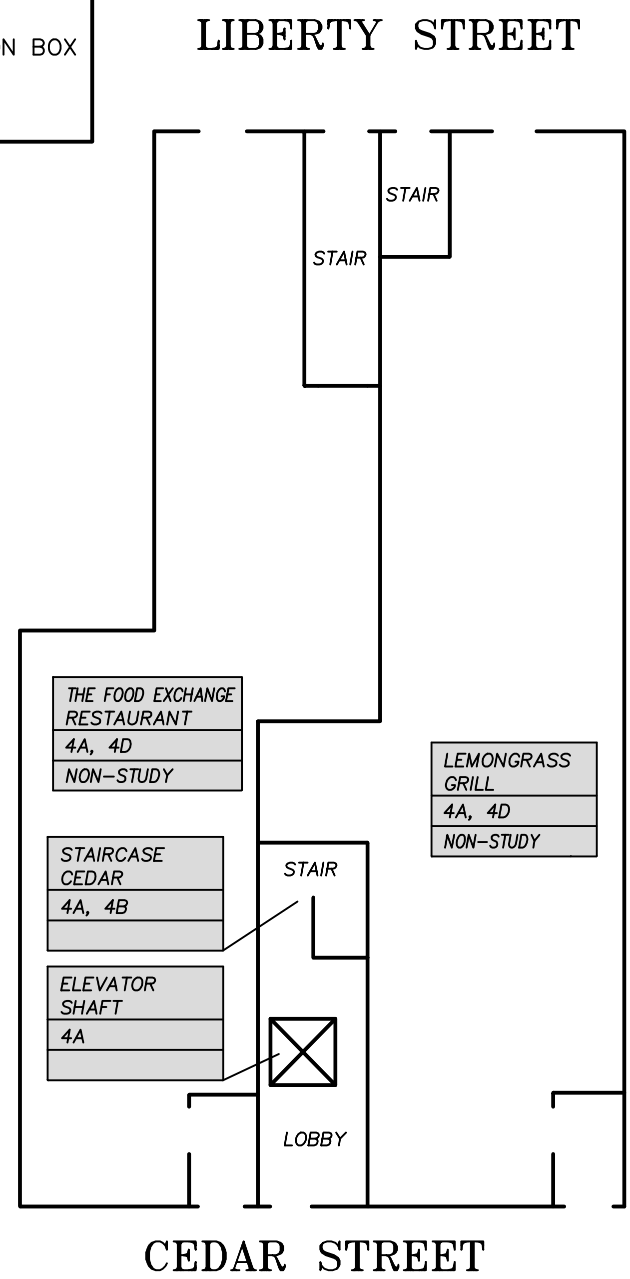
FIRST FLOOR

LEGEND:

AREA NAME	AREA DESCRIPTION BOX
CLEANING METHOD(S)	
NOTATION	







DRAWING STATUS	DRAFT		FINAL	X

PROJECT NO. :501060 RESPONSE MANAGER: SCOTT WILHELM	PROGRAM MANAGER: BRADLEY J. CUNNINGHAM	PROGRAM/CONTRACTS MANAGER: KIM D. BENNETT	
SCALE: 1" = 20'	CADD ID: 501060_1	PLOT DATE: 2/10/03	CHK BY: K.D.B.	CHK DATE: 2/10/03
REVISION NO.: 0	REV DATE: NA	DRN BY: AML	DRN DATE: 12/9/02	APPVD BY: K.D.B.	APPVD DATE: 2/10/03

WRS Infrastructure & Environment, Inc.
925 CANAL STREET, SUITE 7301, BRISTOL, PENNSYLVANIA 19007
PH: (267) 540-0048 FAX: (267) 540-0049

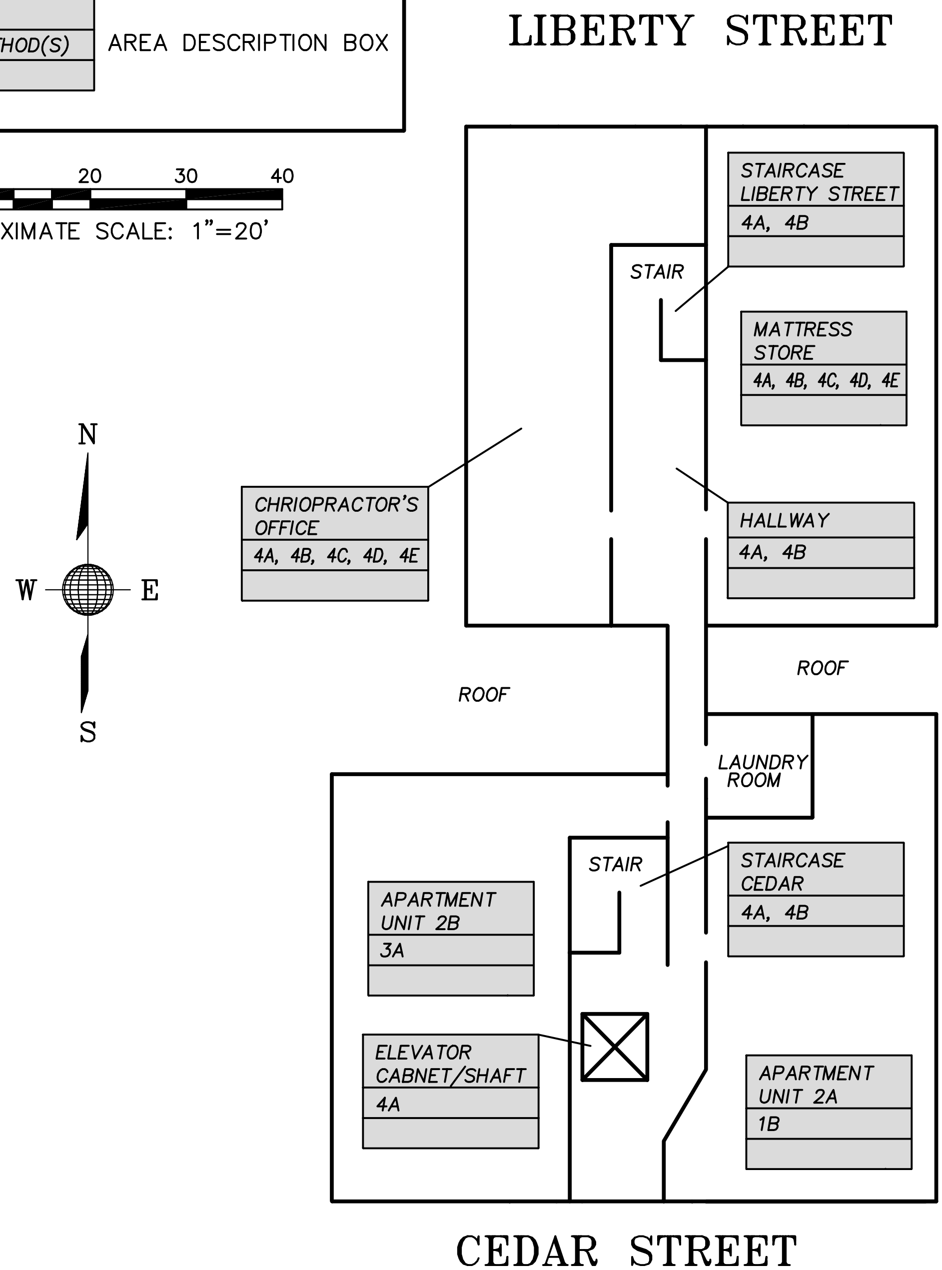
WTC RESIDENTIAL
CONFIRMATION CLEANING STUDY
110 LIBERTY STREET, NEW YORK, NEW YORK
US DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONTRACT NO. 68-S2-99-07
DELIVERY ORDER NO. 060

SECOND FLOOR

LEGEND:

AREA NAME	AREA DESCRIPTION BOX
CLEANING METHOD(S)	
NOTATION	

0 20 30 40
APPROXIMATE SCALE: 1"=20'



DRAWING STATUS	DRAFT		FINAL	X

PROJECT NO. :501060	RESPONSE MANAGER: SCOTT WILHELM	PROGRAM MANAGER: BRADLEY J. CUNNINGHAM	PROGRAM/CONTRACTS MANAGER: KIM D. BENNETT	
SCALE: 1" = 20'	CADD ID: 501060_2	PLOT DATE: 2/10/03	CHK BY: K.D.B.	CHK DATE: 2/10/03
REVISION NO.: 0 / REV DATE: NA	DRN BY: AML	DRN DATE: 12/9/02	APPVD BY: XX	APPVD DATE: 2/10/03

WRS Infrastructure & Environment, Inc.
925 CANAL STREET, SUITE 7301, BRISTOL, PENNSYLVANIA 19007
PH:(267) 540-0048 FAX:(267) 540-0049

WTC RESIDENTIAL
CONFIRMATION CLEANING STUDY
110 LIBERTY STREET, NEW YORK, NEW YORK
US DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONTRACT NO. 68-S2-99-07
DELIVERY ORDER NO. 060

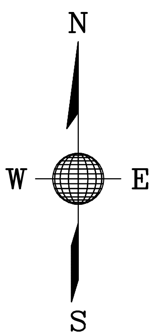
THIRD FLOOR

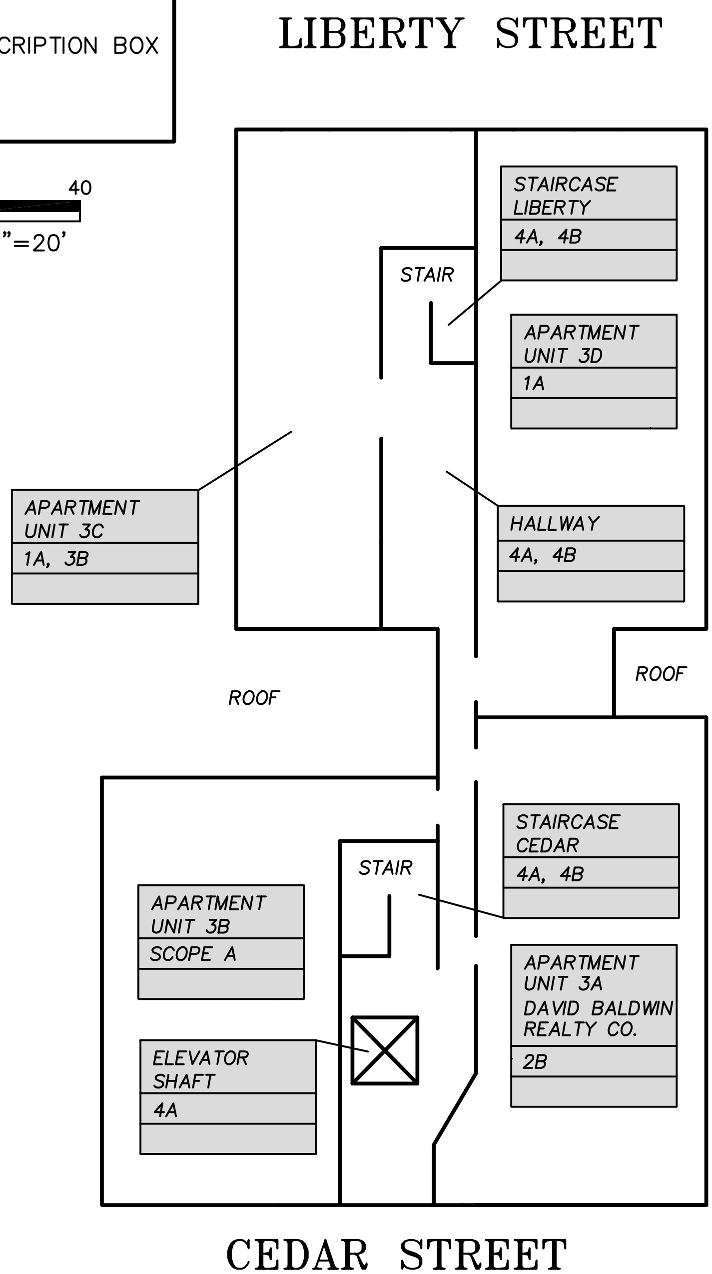
LEGEND:

AREA NAME	AREA DESCRIPTION BOX
CLEANING METHOD(S)	
NOTATION	

0 20 30 40

APPROXIMATE SCALE: 1"=20'





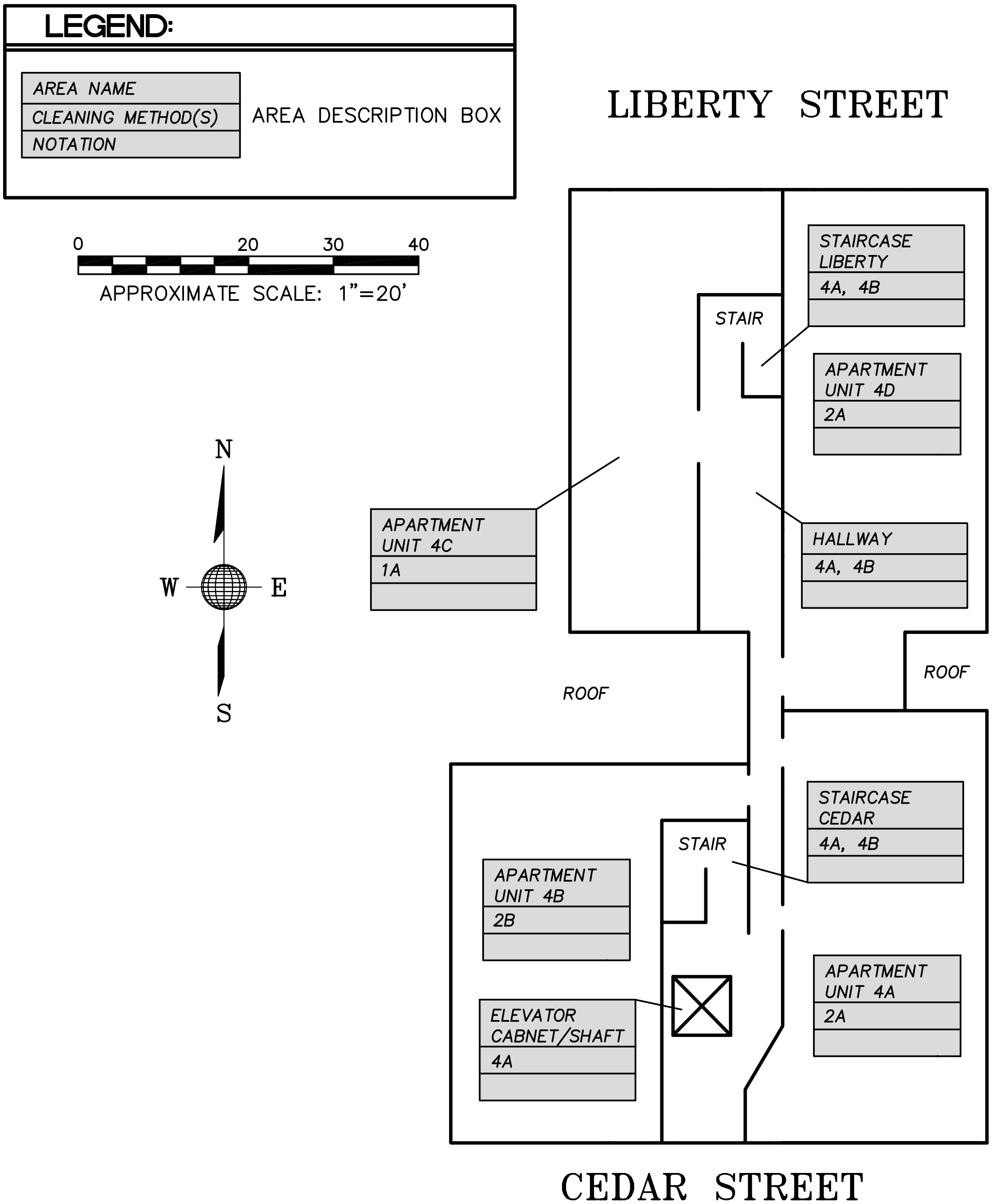
DRAWING STATUS	DRAFT		FINAL	X

PROJECT NO. : 501060	RESPONSE MANAGER: SCOTT WILHELM	PROGRAM MANAGER: BRADLEY J. CUNNINGHAM	PROGRAM/CONTRACTS MANAGER: KIM D. BENNETT	
SCALE: 1" = 20'	CADD ID: 501060_3	PLOT DATE: 2/10/03	CHK BY: K.D.B.	CHK DATE: 2/10/03
REVISION NO.: 0 / REV DATE: NA	DRN BY: AML	DRN DATE: 12/9/02	APPVD BY: K.D.B.	APPVD DATE: 2/10/03

WRS Infrastructure & Environment, Inc.
925 CANAL STREET, SUITE 7301, BRISTOL, PENNSYLVANIA 19007
PH: (267) 540-0048 FAX: (267) 540-0049

WTC RESIDENTIAL
CONFIRMATION CLEANING STUDY
110 LIBERTY STREET, NEW YORK, NEW YORK
US DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONTRACT NO. 68-S2-99-07
DELIVERY ORDER NO. 060

FOURTH FLOOR



DRAWING STATUS	DRAFT		FINAL	X

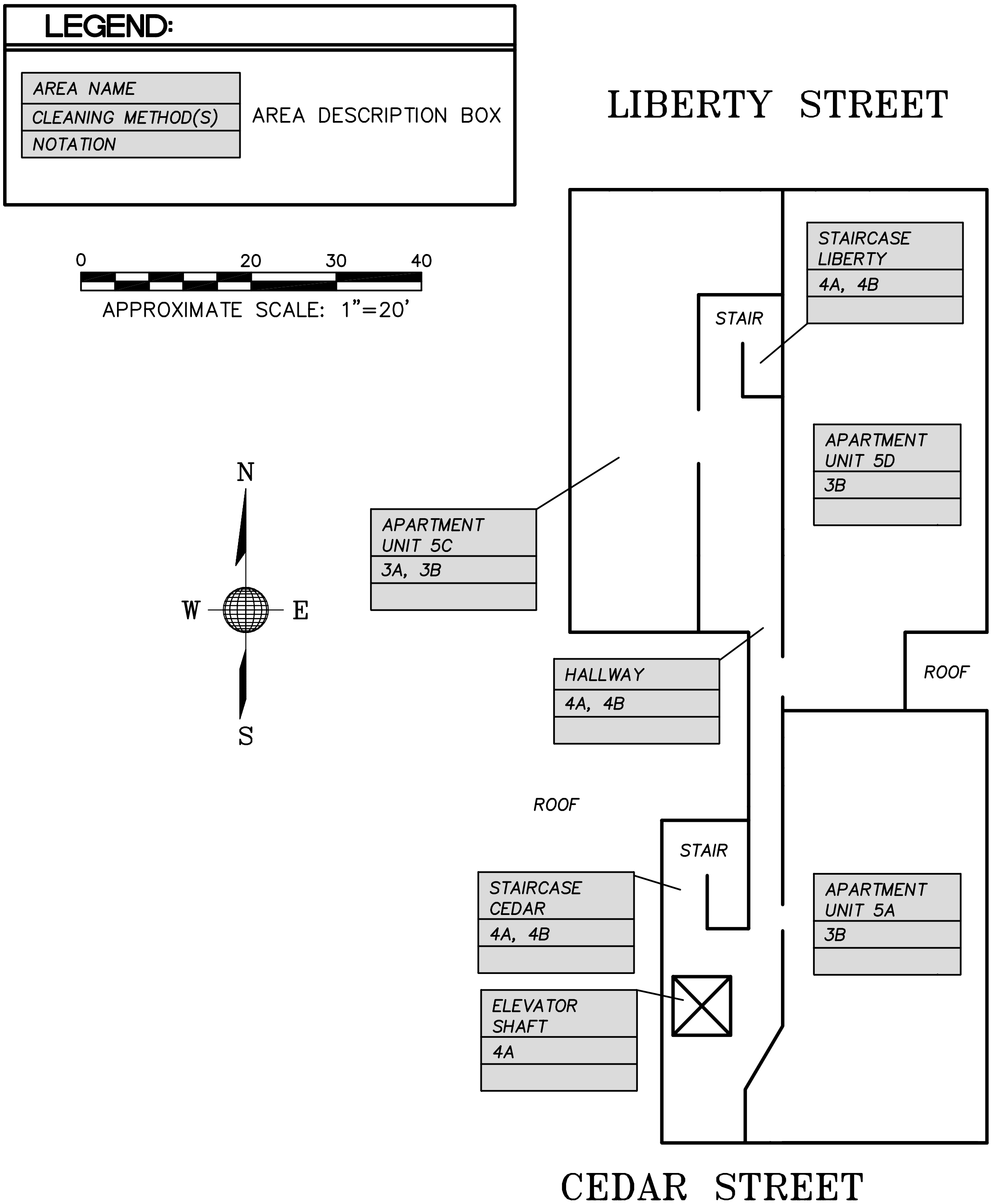
PROJECT NO. : 501060 RESPONSE MANAGER: SCOTT WILHELM | PROGRAM MANAGER: BRADLEY J. CUNNINGHAM | PROGRAM/CONTRACTS MANAGER: KIM D. BENNETT

SCALE: 1" = 20'	CADD ID: 501060_4	PLOT DATE: 2/10/03	CHK BY: K.D.B.	CHK DATE: 2/10/03
REVISION NO.: 0 / REV DATE: NA	DRN BY: AML	DRN DATE: 12/9/02	APPVD BY: K.D.B.	APPVD DATE: 2/10/03

WRS Infrastructure & Environment, Inc.
925 CANAL STREET, SUITE 7301, BRISTOL, PENNSYLVANIA 19007
PH: (267) 540-0048 FAX: (267) 540-0049

WTC RESIDENTIAL
CONFIRMATION CLEANING STUDY
110 LIBERTY STREET, NEW YORK, NEW YORK
US DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONTRACT NO. 68-S2-99-07
DELIVERY ORDER NO. 060

FIFTH FLOOR



DRAWING STATUS	DRAFT		FINAL	X

PROJECT NO. :501060 | RESPONSE MANAGER: SCOTT WILHELM | PROGRAM MANAGER: BRADLEY J. CUNNINGHAM | PROGRAM/CONTRACTS MANAGER: KIM D. BENNETT

SCALE: 1" = 20'		CADD ID: 501060_5	PLOT DATE: 2/10/03	CHK BY: K.D.B.	CHK DATE: 2/10/03
REVISION NO.: 0	REV DATE: NA	DRN BY: AML	DRN DATE: 12/9/02	APPVD BY: K.D.B.	APPVD DATE: 2/10/03

WRS Infrastructure & Environment, Inc.
925 CANAL STREET, SUITE 7301, BRISTOL, PENNSYLVANIA 19007
PH: (267) 540-0048 FAX: (267) 540-0049

WTC RESIDENTIAL
CONFIRMATION CLEANING STUDY
110 LIBERTY STREET, NEW YORK, NEW YORK
US DEPARTMENT OF ENVIRONMENTAL PROTECTION
CONTRACT NO. 68-S2-99-07
DELIVERY ORDER NO. 060

Attachment E

Health and Safety Plan, Changes and Issues

Changes to the Health and Safety Plan

1. Changes to the Health and Safety Plan

As a result of changing conditions and new information gained in the field through analytical activities, changes were made to the Health and Safety Plan. The changes related to lead sampling, levels of protection, and use of personal protective equipment. A memorandum concerning detection of cristobalite interference in laboratory results was also incorporated. (See Attachment E).

1.1 Lead Sampling

Air sampling to characterize for exposure of personnel to lead was discontinued on July 24, 2002, because lead in air concentrations consistently presented below the OSHA Action Limit of 30 ug/m3. (29CFR 1926.62).

1.2 Level of Protection

Levels of personal protective equipment (PPE) were changed to reflect exposure measurements. An addendum to the Health and Safety Plan was prepared to address this on September 17, 2002. The table below presents the PPE assignments by task, pursuant to original and the amended Health and Safety Plan.

1.3 Personal Protective Equipment (PPE) By Task

Location	***Task***	***Original PPE***	***Revised PPE***
Exclusion Zone	1. Surveying and prep of previously cleaned areas	Level C- ½ face	Level C- ½ face
	2. Surveying and prep of areas not previously cleaned	Level C PAPR	Level C PAPR
	3. Vacuuming with non-HEPA-filtered equipment	Level C PAPR	Level C PAPR
	4. Vacuuming with HEPA-filtered equipment in previously cleaned areas	Level C- ½ face	Level C- ½ face
	5. Wet wiping following non-HEPA vacuuming	Level C- ½ face	Level C- ½ face
	6. Wet wiping following HEPA vacuuming	Level D+	Level D+
	7. Cleaning equipment using air and vacuum	Level C PAPR	Level C PAPR
	8. Removing/ changing vacuum bags and filters	Level C PAPR	Level C PAPR
	9. Re-cleaning units w/HEPA vacuuming and supporting personal air sampling results	New Task	Level D+
	10. Re-cleaning units w/ non-HEPA vacuuming	New Task	Level C- ½ face
	11. Re-cleaning units w/HEPA vacuuming without supporting personal air sampling results	New Task	Level C- ½ face

1.4 Use of Goggles

Goggles were assigned for Levels D and D+ because of concerns that irritation of employee's eyes might result from airborne fiberglass. Once it was determined that eye irritation was not occurring, safety glasses were substituted.

Health and Safety Issues

1. Health and Safety Issues

1.1 Electrical Concerns

All areas of the building were inspected to ensure that no electrical concerns posed a threat to the safety of employees. In the Food Exchange, live, loose hanging electrical wires were found. Electricity at the panel box was shut off and the wires in question were taped.

1.2 Building Repairs

A damaged hand rail in the Liberty Street stairwell was reinstalled to ensure the safety of personnel. All other repairs made prior to commencement of the work related to building access.

1.3 Building Access

The only access concern related to broken windows in the Chiropractor's Office. In order to prevent unauthorized access, which could potentially pose risks to both public health and to equipment used in the study, plywood panels were installed over the broken windows.

1.4 Rodent Infestation

In the process of inspecting to identify safety concerns, evidence of rodent infestation was discovered (droppings). The building owner was advised of the problem and contacted an exterminator.

1.5 Personal Monitoring

Every morning, the Site Health and Safety Officer calibrated the personal pumps. The initial flow, pump start time, pump serial number, date, location of pump, and sample number were recorded. Personal pumps are typically worn by employees to collect air samples that are representative of what the employees are experiencing while working. Given the space constraints of the work areas and the number of parameters to be measured, the majority of exposure measurements were made using area samples.

Pumps for the three parameters were mounted on five-foot tripod stands, in lieu of being worn by the employees. The Site Health and Safety officer collected media blanks at a rate of 10% of samples. At the end of the day, the stand was disassembled and the final flow rate and finish time were recorded. The total volume was calculated and the samples were packaged and forwarded to EPA's contracted laboratory. The laboratory is accredited for analysis of lead and silica by the American Industrial Hygiene Association and by the NVLAP for asbestos. The air samples were analyzed by the laboratory for asbestos, using one or both of the following procedures: PCM /TEM.

Sampling for airborne lead ceased on July 24, 2002, after consistent results of non-detectable concentrations. Sampling for asbestos and silica continued throughout the project to the extent commensurate with the task and crew size.

1.6 Work Zones

Upon commencement of the study, the building condition was assessed for the purpose of establishing work zones. Determination of work zones was made with consideration of boundaries that would maximize work productivity while facilitating pre and post sampling efforts. The demarcation of zones was accomplished to ensure the health and welfare of personnel and third parties. The Site Health and Safety Officer supervised the demarcation of zones. Space at the site was extremely limited, forcing continuous re-designation of the support zone, contamination reduction zone and the personnel decontamination area throughout the project. At any given time, the exclusion zone consisted of the area or areas then being cleaned; the contamination reduction zone and the personnel decontamination zone changed accordingly. Typically, because the walls of the apartment units offered inherent boundaries, the room or area configuration served as the delineation.

The Support Zone

As noted previously, space constraints at the site presented difficulty, resulting in ongoing re-designation of work zones. The purpose of the support zone is to provide an area for support and communications to operations personnel. Initially, the support zone was designated as an area outside of the building, adjacent to the entrance vestibule on Cedar Street, while office functions were accomplished from a hotel several blocks away. The site Health and Safety Officer conducted daily safety meetings in the outdoor area to establish project procedures and controls, and to communicate changes. After being cleaned, the entrance vestibule was designated as part of the support zone. A third support zone was located on the second floor after it had been cleaned. This support zone occupied the north end of the enclosed hallway area between the Chiropractor's Office and the Mattress Store, and extended into apartment 2B, where an on-site office was established. (This unit was cleaned and sampled prior to use.) The outdoor area, the vestibule and the second floor area were all utilized as support zones until completion of the project.

The Exclusion Zone and The Contamination Reduction Zone

The exclusion zone was identified as the areas of the building then requiring cleaning. These areas were designated with a unit number or a common area reference. All personnel, tools, and small equipment passed into and out of the exclusion zone through the contamination reduction zone. The purpose of the contamination reduction zone is to provide a defined area for reduction of any contamination potentially sustained in the exclusion zone. The contamination reduction zone was relocated appropriately as the exclusion zone focal area changed.

The contamination reduction zone was initially established in the stairway landing area, near the elevator, adjacent to the vestibule on the first floor. Personnel suited with personal protective equipment in the vestibule. They unsuited in the area at the bottom of stairs, before re-entering the vestibule. As the job progressed, the contamination reduction zone was located adjacent to the areas being cleaned.

The Personnel Decontamination Area

The personnel decontamination area was located directly inside the contamination reduction zone. In this area, personnel disrobed of personal protective wear that was subsequently bagged and disposed. The personnel decontamination area was supplemented with other safety precautions such as: a portable eye wash station, a first aid kit and fire extinguishers placed at various locations through out the building.

WRS INFRASTRUCTURE & ENVIRONMENT, INC.

<u>SITE-SPECIFIC HEALTH AND SAFETY PLAN</u>

USEPA REGION II
Emergency Response and Rapid Response Service

WTC Pilot Cleaning Evaluation
110 Liberty Street
New York, NY

Submitted to:

USEPA REGION II

Prepared by:

WRS INFRASTRUCTURE & ENVIRONMENT, INC.
925 Canal Street, Suite 3701
Bristol, PA 19007

WRS Project Number: 501060

Document No. 501060-001

WRS INFRASTRUCTURE & ENVIRONMENT, INC.

SITE-SPECIFIC HEALTH AND SAFETY PLAN

USEPA REGION II
Emergency Response and Rapid Response Service

WTC Pilot Cleaning Evaluation
New York, NY

Submitted to:

USEPA REGION II

Prepared by:

WRS INFRASTRUCTURE & ENVIRONMENT, INC.
925 Canal Street, Suite 3701
Bristol, PA 19007

WRS Project Number:

Prepared by: ______________________________ Date: __________
Doug Nelson CIH, CHMM
WRS Corporate Health and Safety Manager

Reviewed by: ______________________________ Date: __________
Scott Wilhelm
WRS Response Manager

Reviewed by: ______________________________ Date: __________
Dan Harkay
EPA On Scene Coordinator

APPENDICES

APPENDIX A HEALTH AND SAFETY FORMS

APPENDIX B HEAT STRESS

APPENDIX C WRS LOCKOUT/ TAGOUT SOP

APPENDIX D WRS FALL PROTECTION SOP

1.0 INTRODUCTION

1.1 Purpose, Scope and Applicability of the Site Specific Health and Safety Plan

Purpose of this site specific Health and Safety Plan (HASP) is to identify anticipated hazards and the control measures to be implemented at the **WTC Pilot Cleaning Evaluation** in New York City, hereafter known as the Site. The procedures presented in this HASP are based on the best available information at the time of the plan's preparation, and are intended only for the activities described in this plan.

The Plan applies to all WRS Infrastructure & Environment, Inc. (WRS) employees, and subcontractor employees. All personnel prior to entering the exclusion zone or contamination reduction zone (decontamination zone) must review and sign this plan. All personnel on site shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the project tasks/operations. This HASP summarizes those hazards in **Section 4.0** and defines hazard control measures planned for the site.

All visitors entering the contamination reduction zone and exclusion zone at the site will be required to read and verify compliance with the provisions of this HASP. In addition, visitors will be expected to comply with relevant OSHA requirements. Visitors will be expected to provide their own personal protective equipment unless the USEPA specifies otherwise. In the event that a visitor does not adhere to the provisions of this HASP, he/she will be requested to leave the work area.

The requirements and protocols cited in this plan were developed in consideration of current safety standards as defined by EPA/OSHA/NIOSH, health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources were consulted in developing this plan:

- OSHA General Industry and Construction Standards.
- EPA Standard Operating Safety Guides.
- NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines.
- NIOSH Pocket Guide to Chemical Hazards.
- EPA Draft Work Plan
- EPA Provided Sample Analytical Data

1.2 Revisions to the Plan

Revisions to this plan may be made in response to changes or unexpected conditions not described in this Plan. All revisions to this plan shall be documented on a *Field Procedures Change Authorization form* (Appendix A), approved by the WRS H&S Manager.

2.0 KEY PERSONNEL AND RESPONSIBILITIES

2.1 Key Personnel

The following personnel have principal responsibility for the implementation , maintenance and oversight of health and safety measures during site activities.

Job Function	Name	Phone	Alternate Phone
WRS Response Mgr.	Scott Wilhelm	610-220-8481	
WRS Program Mgr.	Brad Cunningham PE	267-540-0048	215-796-0337
WRS H&S Mgr.	Doug Nelson CIH, CHMM	770-469-6522	678-296-1267

2.2 Responsibilities

2.2.1 Response Manager

The **Response Manager** is responsible for health and safety "performance" in the field. The Site Response Manager can temporarily halt work at any time if, in his/her opinion, it is necessary to protect the health and well being of site workers or the general public. Specific responsibilities of the Response Manager include:

- Directing site activities in accordance with the HASP.
- Being aware of and complying with all applicable federal, state, and local occupational health and safety regulatory requirements.
- Ensuring that resources called for in the HASP and Work Plan/Operations Plan are on site and operational.
- Verifying that all permits, supporting documentation and clearances for a given task (e.g., utility surveys, health and safety plan, confined space entry permits) are in place.
- Informing the appropriate site management and safety personnel of the activities to be performed each day.
- Providing technical advice during routine operations and emergencies.
- Handling field emergency response situations that may arise.
- Correcting unsafe acts and conditions.
- Participating in pre-job and daily safety meetings.

2.2.2 Site Safety and Health Officer (SSHO)

The **Site Safety and Health Officer (SSHO)** has responsibility for ensuring that provisions of each HASP are implemented in the field by all WRS employees and subcontractor employees. The SSHO must be trained to implement the requirements in the site specific HASP, including the correct use of monitoring instruments, health and safety criteria for the site, documentation of monitoring results, and actions to take if site conditions change.

The designated SSHO shall continuously evaluate the adequacy of prescribed health and safety procedures and levels of protection against the actual conditions encountered in the field. If an obvious discrepancy exists between the realized hazard(s) and the level of personal protective equipment (either too much or too little), the SSHO shall immediately bring the situation to the attention of the WRS Health and Safety Manager (HSM). With the concurrence of the HSM and the Response Manager, the SSHO shall take appropriate corrective action. The SSHO has final on-site authority for all matters specifically related to worker health and safety, and emergency situations that require immediate action, including the authority to temporarily cease operations. Additional responsibilities of the SSHO include:

- Monitoring site activities for unsafe acts and conditions and initiating their correction.
- Monitoring project and site activities for conformance to the site specific HASP.
- Overseeing confined space entries and ensuring that all confined space entries are done in accordance with the requirements found in the WRSIE standard operating procedures (SOP's) for confined space entry.
- Performing on-site air monitoring and personal sampling as specified in the site specific HASP.
- Calibration of instruments.
- Maintenance of health and safety equipment and supplies.
- Ensuring that all work-related injuries and illnesses are properly treated and investigated.
- Conducting safety briefings and daily safety meetings.
- Maintaining documentation in support of the HASP.
- Participating in a pre-job safety briefing with project personnel to discuss anticipated hazards and their control measures.

2.2.3 WRS Health and Safety Manager (HSM)

The **WRS Health and Safety Manager (HSM)** shall be responsible for implementing an effective hazardous waste operations health and safety program. The HSM shall have the requisite authority to implement the procedures set forth in the WRS Health and Safety Manual for Hazardous Waste Site Activities, including the authority to temporarily halt work on a project if necessary, to protect employees' safety or health. The HSM may delegate certain duties to the SSHO or to other WRS personnel, but shall be ultimately responsible for the following:

- Overseeing the employee medical surveillance program and interacting with examining physicians as required
- Investigating site histories, performing site characterizations, and assessing site/task specific hazards.
- Developing or assessing task specific monitoring procedures, action levels, levels of personal protective equipment (PPE), and health and safety requirements for the site and the HASP.
- Performing periodic site inspections/audits.
- Following to resolution all deficiencies noted during site inspections. and,
- Resolve "level of care" conflicts that may arise during conduct of the project.

2.2.4 Foreman, Operators, and Technicians

All site personnel share responsibilities for health and safety. Specific duties include:

- Conducting work in accordance with the HASP.
- Participating in daily safety meetings/planning.
- Prompt reporting of all incidents and potential health and safety-related problems.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Description

The Site is located at 110 Liberty Street. It is five stories with 12 residential and six commercial spaces. It has been unoccupied since 9/11/01. The building was severely impacted in the WTC collapse. Dust and debris were deposited in the building, windows were blown out, as well as skylights. Residential spaces, the basement and the roof of the building were professionally cleaned shortly after the collapse. Two of the commercial spaces have "inches" of dust and all residential spaces have experienced varying degrees of dust re-deposition.

Rental spaces range in size from 1,000 to 1,300 square feet. They are open in design and consist of a kitchen, bathroom and sleeping area. Each space is heated by an individual hot water baseboard system. Window or roof mounted air conditioners are present in the residential space, central air systems are present in commercial spaces Unit 1 and 2. Rental spaces are accessible through from Liberty and Cedar Streets through common hallways. Floors are accessible via an elevator and stairs. Each floor has a trash compactor room and utility room. A laundry room is located on the 2nd floor. The basement contains the building trash compactor, elevator well, electric motor rooms, preparation and storage areas or the Chinese restaurant and a hair salon.

3.2 Project Description

The project's objective includes evaluating the effectiveness of various cleaning procedures that may have been used in the residential spaces. The study will include 12 residential spaces and 3 commercial spaces. The two restaurants ad hair salon are not a part of the study, but will be cleaned at the completion of the study. Eight cleaning techniques will be evaluated:

1. Vacuuming with non-HEPA vacuums
2. Vacuuming with non-HEPA vacuums with Negative Air Machines (NAM)
3. Vacuuming with non-commercial HEPA vacuums
4. Vacuuming with non-commercial HEPA vacuums with NAM
5. Vacuuming with commercial HEPA vacuums
6. Vacuuming with commercial HEPA vacuums with NAM
7. Vacuuming heavy dust laden areas with commercial HEPA vacuums and 2 NAMs
8. Vacuuming heavy dust laden areas with commercial HEPA vacuums and 2 NAMs with vertical surface wet wiping and carpet shampooing.

Each cleaning technique will be evaluated on two rental units.
Activities will include the following:

- Mobilization to site

- Establishing Support Area and Facilities
- Assist with photo documentation and resident visits
- Isolate study areas from common areas (plastic sheeting and adhesive tape)
- Clean common areas (HEPA vacuum and wet wipe horizontal surfaces)
  Hallways,
  Building entry ways,
  Laundry rooms,
  Stairs and wells,
  Elevator well, roof mechanical room, interior and lobby,
  Trash compactor and utility rooms (5), and
  Basement
- Clean previously cleaned areas using the techniques to be evaluated
- Clean areas not previously cleaned using the techniques to be evaluated
- Clean non-study areas
- Dispose of wastes
- Decontaminate cleaning equipment
- Demobilization

4.0 HAZARD ANALYSIS

The evaluation of hazards is based upon the knowledge of project background information presented in Section 3, and anticipated risks posed by the specific tasks/operations to be performed. Section 4 presents a general description of project hazards. Section 4.2 describes the specific hazards associated with each task/activity, and identifies the hazard control measures to be implemented during completion of these tasks.

4.1 General Hazard Analysis

Potential/ Anticipated Hazards

CHEMICAL	YES	SLIPS, TRIPS, & FALLS SAME LEVEL	YES
ASBESTOS	YES	SLIPS, TRIPS, & FALLS DIFFERENT LEVEL	YES
FIRE/ EXPLOSION	NO	HEAVY EQUIPMENT/ VEHICULAR TRAFFIC	YES
HEAT STRESS	YES	OVERHEAD HAZARDS	YES
MACHINERY/ MECHANICAL EQUIPMENT	YES	ELECTRICAL/ UTILITY HAZARDS	YES
NOISE	YES	CONFINED SPACE	NO

4.1.1 Physical Hazards

Noise – vacuums produce noise exposures in excess of the permissible exposure limit (90dBA). Operators of these pieces of equipment must wear hearing protection (plugs). Others working in the same room/ area must wear hearing protection as well.

Ambient temperatures - capable of producing either heat are expected to impact the projec. The WRS SOP for Heat Stress Management is included as an Appendix B.

Motor vehicles – obey local traffic laws, use qualified drivers in insured vehicles. Seatbelt use is mandatory.

Flame, Heat or Spark Producing Operations - The use of flame, heat or spark producing equipment (e.g., cutting or welding torches and abrasive saws) is prohibited.

High or Elevated Work - All work near an unprotected side or edge (no handrail) which would allow a fall to a lower level of six feet or more will be performed using fall protection (e.g., body harness and lifeline). Fall protection equipment will provide continuous protection. Workers in aerial lift baskets will utilize full body harnesses with lanyards attached to the man basket. See the WRS Standard Operating Procedure for Fall Protection (Appendix D)

.

Electrical Safety - Ground fault protection devices (GFCI) will be provided for all electric power tools and extension cords. Vacuums directly (no extension cord) plugged into the building's outlets are exempt from this requirement when the outlet has been tested and verified to provide adequate grounding. Voltage detectors may be used to facilitate electrical safety. The WRS Lockout/ Tagout SOP (Appendix C) will be applied specifically to cleaning the elevator, and generally to activities specified in the SOP

Eye Protection - Eye protection is mandatory in all areas of the project site at all times. Eye protection will conform to ANSI Standard Z87.

Head Protection – Hardhats will be worn when overhead hazards exist and when the hazard of an employee bumping his head on an overhead object exists.

Floor Holes – cover floor holes in the building.

4.1.2 Chemical Hazards

SUBSTANCE	EXPOSURE LIMIT (PEL)	IDLH LEVEL	HEALTH EFFECTS	ROUTE OF ENTRY	FIRST AID By Route of Exposure
Polycyclic Aromatic Hydrocrbons (PAHs)	0.2 mg/m3	80 mg/m3	Dermatitis, bronchitis, potential occupational carcinogen	Inhalation, Contact	Eye: irrigate immediately, Skin: soap wash promptly
Lead	0.050 mg/m3	100 mg/m3	Weak, insomnia, gingival lead line, abdominal pain, irritated eyes	Inhalation Ingestion	Eye: irrigate immediately, Skin: soap wash promptly
Crystalline silica	Respirable 10 mg/m3 / % SiO2 +2	50 mg/m3	Cough, pain with breathing, wheezing, decreased pulmonary function, silicosis, cancer of lung	Inhalation	Eye: irrigate immed. Breath: fresh air
Asbestos	0.1 fiber/ cc	NA	Asbestosis, pain with breathing, restricted pulmonary function, finger clubbing, lung cancer	Inhalation Ingestion Contact	Eye: irrigate immed. Breath: fresh air

SUBSTANCE	EXPOSURE LIMIT (PEL)	IDLH LEVEL	HEALTH EFFECTS	ROUTE OF ENTRY	FIRST AID By Route of Exposure
Dioxin (1,1,2,2-Tetrachloro-debenzo-p-dioxin)	None	None	Eye irritation, allergic dermatitis, chloracne, digestive disturbances, possible reproductive effects, in animals produces liver/ kidney damage, cancer	Inhalation Ingestion Contact	Eye: irrigate immed. Skin wash with soap/ water Breath: fresh air Swallow: med attention
Man Made Vitreous Fibers (aka fiberglass and glass wool)	15 mg/m3 (total) 5 mg/m3 (respirable)	None	Irritation of eyes skin nose, throat, pain with breathing	Inhalation Contact	Eye: irrigate immed. Breath: fresh air
Gypsum (calcium (II) sulfate dihydrate)	15 mg/m3 (total) 5 mg/m3 (respirable)	None	Irritation of eyes, skin, mucous membranes, upper respiratory system, coughing, sneezing, runny nose	Inhalation Contact	Eye: irrigate immed. Breath fresh air

Concentrations of these materials in bulk samples collected to date include:

- Asbestos <1% (reported as chrysotile)
- Lead up to 300 ppm
- MMVF up to 40%
- Dioxin up to 0.088 ppb
- PAHs up to 340 ppm
- Crystalline silica (quartz) up to 10%
- Gypsum up to 14%

5.0 PERSONNEL TRAINING REUIREMENTS

5.1 General

All project personnel are trained in accordance with OSHA's 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response Standard. At a minimum, all personnel are required to be trained to recognize the hazards on-project, the provisions of this HASP, and the personnel responsible for safety on the project.

5.2 Pre-Assignment and Annual Refresher Training

Non required other than and orientation to the site including a walkthrough. All employees should have their current 8-hr annual refresher training and be medically qualified to wear a respirator.

5.3 Project Supervisors Training

Consistent with OSHA 29 CFR 1910.120 paragraph (e)(4), individuals designated as Project Supervisors receive an additional 8 hours of training in addition to the 40 hr certification.

5.4 Health and Safety Plan Review

Prior to working on the project, each person will review the HASP and will have the opportunity to ask questions of the Project Health and Safety Officer about the plan's contents. After reviewing the HASP, WRS employees and subcontractor employees will sign the HASP Review Sign-Off (Safety Briefing form) located in *Appendix A*.

5.5 Daily Safety Meetings

Project safety meetings will be conducted daily. The meeting will cover:

- The work to be completed.
- Hazards associated with the work. and,
- Hazard control measures to be implemented.

WRS subcontractor employees and their supervisor(s) are required to attend.

5.6 Asbestos Training

The clean up of the dust in this building is an unclassified task because the material does not contain enough asbestos (<1%) to be considered Asbestos Containing Material (ACM). Therefore the training requirements at 29 CFR 1926.1101(k)(9)(viii) apply. There is no minimum or maximum time allotted for completion of this training only a list of subjects to be covered. Employees performing dust removal activities will have training that meets or exceeds these requirements.

5.7 Lead Training

Lead is present in the dusts to be removed. Lead training is required at 29 CFR 1926.62 (l) when employee exposures exceed the Action Limit of 30 ug/m3. Because the dust removal methods are designed to minimize the aerosolization of the dust, and the low concentrations (< 300 ppm), it is not anticipated that Action Limit will be reached and lead training will therefore not be necessary. An exposure assessment will be used to verify this assumption.

6.0 PERSONAL PROTECTIVE EQUIPMENT

This section describes the specific levels of protection required for each task to be conducted at the project. The general requirements of the EPA designated Levels of Protection (A-D) are described in the WRS Health and Safety Program Manual. The level of protection to be worn by field personnel will be monitored by the IHSO.

6.1 Specific Levels of Protection Planned for the Project

PPE assignments are task specific. Table 6.1 on the following page lists task specific PPE levels. These levels are disqualified for use if air surveillance indicates that the upper action limit for the level of protection being used is exceeded.

TABLE 6.1: LEVELS OF PROTECTION

Location	Job Function/Task	PPE
Exclusion Zone	• Surveying and prep of previously cleaned areas • Surveying and prep of areas not previously cleaned • Vacuuming with Non-HEPA filtered equipment • Vacuuming with HEPA filtered equipment in previously cleaned areas • Wet wiping following non-HEPA vacuuming • Wet wiping following HEPA vacuuming • Cleaning equipment using air and vacuum • Removing/ Changing vacuum bags/ filters	C1/2 CPAPR CPAPR C1/2 C1/2 D+ CPAPR CPAPR
Support Zone	Project Management Activities Materials Storage	D

6.2 Ensemble Components

Level D

This is the basic work uniform and shall consist of the following items:

- Safety glasses
- Steel-toed boots
- Hearing protection (as applicable)
- Leather gloves

Level D+

- Safety glasses
- Disposable coverall (Tyvek or Kleengaurd)
- Disposable head covering
- Disposable undergarments
- Disposable gloves
- Disposable boot covers or reusable/ cleanable boots (e.g., PVC, latex)
- Steel toe boots
- Hearing protection
- Skin Barrier Cream for preventing fiberglass dermatitis (North Brand Model 222 available from Lab Safety)

Level C

- Air Purifying Respirator (1/2 mask or full face PAPR)
- P100 Cartridges
- Disposable coverall (Tyvek or Kleengaurd)
- Disposable head covering
- Disposable undergarments
- Disposable gloves
- Disposable boot covers or reusable/ cleanable boots (e.g., PVC, latex)
- Steel toe boots
- Hearing protection
- Skin Barrier Cream for preventing fiberglass dermatitis (North Brand Model 222 available from Lab Safety)

6.3 Application

Table 6.1 details the anticipated levels of protection for different tasks. However, project developments may prompt changes in the levels of PPE. Proper notification of the IHSO, HSA, and WRS Project manager is required to ensure continued safe operations.

NO CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL BE MADE WITHOUT THE KNOWLEDGE AND APPROVAL OF THE NORTHEAST SAFETY AND HEALTH ADMINISTRATOR, WRS PROJECT HEALTH AND SAFETY OFFICER, AND THE WRS PROJECT MANAGER.

6.4 Inspection

Before protective equipment is worn within the project area, its user will properly inspect it.

6.5 Respirator Cartridge Change-out Schedule

PAPR cartridges will be changed out when flow rate indicator (a.k.a. rotameter) measures unacceptably low flows. APR cartridges will be changed out when breathing becomes difficult or daily whichever comes first.

7.0 MEDICAL SURVILLANCE REQUIREMENTS

7.1 General

WRS utilizes a Medical Monitoring Program designed to determine each employee's health status and fitness (including the ability to utilize respiratory protection) for working at hazardous waste sites. All WRS personnel involved in hazardous waste project activities are required to undergo baseline, annual, and project specific examinations. WRS utilizes the services of physicians experienced in occupational medicine and the effects of toxic industrial substances. Medical surveillance records for WRS employees are retained for the length of employment plus 30 years.

7.2 Site Specific Medical Monitoring

No site specific medical monitoring is anticipated beyond that required under the Heat Stress Management SOP.

7.3 Substance Abuse Prevention

It is the policy of WRS to provide quality products and services to its customers and to maintain a safe and healthy workplace by assuring a work environment free of alcohol and other drugs. The unlawful manufacture, distribution, dispensation, possession, use or presence in one’s system of a controlled substance is prohibited in the workplace. Any employee who is in violation of this policy will be subject to disciplinary action up to and including discharge. Help is available to employees who have substance abuse problems through the Employee Assistance Program.

Federal law also requires that an employee of WRS notify WRS in writing of a conviction under a criminal drug statute for a violation occurring during the performance of work under a covered federal procurement. This project is covered. Such notifications must be made through the WRS Health and Safety Manager.

7.4 Asbestos

The medical surveillance program outlined under 7.1 of this Plan includes the medical surveillance components required by the Asbestos Standard at 29 CFR 1926.1101(m).

7.5 Lead

Blood lead and ZPP monitoring are required by 29 CFR 1926.62(j) when airborne exposures exceed the Action Level of 30 ug/m3. Because the dust removal methods are designed to minimize the aerosolization of the dust, and the low concentrations (< 300 ppm), it is not anticipated that Action Limit will be reached and blood lead/ ZPP monitoring will therefore not be necessary. An exposure assessment will be used to verify this assumption.

8.0 AIR SURVEILLANCE

This section specifies the surveillance activities that will take place during the project. Surveillance activities will achieve the following objectives:

- Characterize breathing zone (BZ) concentrations of site contaminants for comparison with published exposure limits;
- Determining the appropriateness of respiratory protective equipment; and,
- Monitoring the performance of emission control activities.

8.1 Monitoring

The usefulness of real time monitoring of respirable dust in this work environment is unknown to WRS. Collecting this data alongside air sampling activities may “calibrate” future real-time respirable dust monitoring and the establishment of Action Limits. WRS will perform real-time respirable dust monitoring to instruct the crew in relative dust levels. There will be no respirable dust Action Limits until or unless air-sampling data is available for comparison with real-time data.

8.2 Action Limits

None initially.

8.3 Air Sampling

Personal air sampling for lead, asbestos, and silica will be performed. Samples will be collected from the breathing zones of employees using the following NIOSH Methods. Analysis of samples will be made using NIOSH analytical method as well to facilitate comparisons with exposure limits.

Method	Flow Rate	Sample Train Media
7300 Lead	2 liters per minute minimum sample volume to achieve detection limits 50 liters	37 mm cellulose ester membrane (0.8 micron) Closed Face
7400 Fibers (Asbestos and Man Made Vitreous Fibers MMVF)	2 liters per minute** minimum sample volume to achieve detection limits – 400 liters	25 mm cellulose ester membrane (pore size 0.45 – 1.2 microns) with conductive cowl. Open face
7500 Respirable Silica/ Calcite/ Gypsum*	1.7 liters per minute** minimum sample volume to achieve detection limits – 400 liters	37 mm PVC membrane (pore size 5 micron) with 10 mm nylon cyclone

* This methods requires that a bulk respirable or settled dust sample be submitted with personal breathing zone sample to identify interferences with detection method.
**These methods are sensitive to filter over loading. Length of sampling period should not exceed 4 hours. Use multiple sample periods to represent entire shift exposure.

Samples will be collected on individuals performing tasks representative of exposure conditions. Specifically the following tasks will be characterized:

- Common area cleaning;
- Non-HEPA vacuuming; and,
- Cleaning of areas not previously cleaned.

Sample pumps will be pre- and post sample period calibrated using a sample train in-line between the pump and calibration unit to simulate pressure drop posed by the sample train. Calibrations will be made with a primary calibration device (e.g., film flow calibrator or near frictionless piston).

Sample results will be communicated by the SHSO to employees represented by the sample data within five days of receipt on the WRS Air Sampling Data Acknowledgement Form. This data is forwarded to the WRS H&S Manager for inclusion in the employee's medical file.

9.0 SITE CONTROL MEASURES

9.1 Control Zones

Control boundaries will be established at the site. The exclusion zone, contamination reduction zone (decontamination zone) and support zone will be designated. A decontamination corridor will separate the Support areas of the project site from exclusion zones. The corridor should be split down the middle with a control line. One side of the corridor is for clean entry into exclusion zones and the other side is for decontamination of personnel and equipment. It may be necessary to protect the support zone from fugitive dust by placing it under positive pressure with the exhaust of a Negative air machine.

The Response Manager has been designated to coordinate access control on the work site. No unauthorized person shall be allowed beyond the contamination control line. During all activities in the exclusion zone, the implementation of a buddy system is mandatory.

Standing orders for the exclusion zone and contamination reduction zone are presented on the following page.

9.2 Site Communications Plan

Hand signals, radios, and mobile telephones are the modes of communication to be used at the site. The Response Manager will review hand signals with all site personnel prior to the start of the project and periodically at daily safety meetings. Standard hand signals include:

ACTION	MEANING
Hands around throat	- out of air/can't breathe
Thumbs up	- OK/yes
Thumbs down	- negative, no
Hands on top of head	- need assistance
Grip partner's wrist/waist	- leave area immediately

No one will be permitted to break visual contact while in the exclusion zone or contamination reduction zone. The buddy system will be strictly adhered to. When working in the exclusion zone, personnel will not be allowed to work alone. The buddy system will be in place to provide aid in case of an emergency.

A telephone will be available in the support zone. Emergency assistance telephone numbers will be posted by this telephone. The Project Manager is responsible for the management of communications during normal and emergency operations.

9.3 Sanitation Facilities

Sanitation facilities will be located within the support zone. They will include hand and face washing facilities and toilets.

Standing orders for the exclusion zone and contamination reduction zone are as follows:	
•	No smoking, eating, or drinking in these zones. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of any material is prohibited in any area designated as a contamination reduction zone or exclusion zone.
•	No horse play.
•	No matches or lighters in these zones.
•	Check-in on entrance to the contamination reduction zone. Check-out on exit from this zone. Entrance and exit locations shall be designated and emergency escape routes delineated. Warning signals for site evacuation have been established.
•	Implement the communications system. Communications using radios, hand signals, signs, or other means shall be maintained between work crew members at all times. Emergency communication shall be prearranged in case of radio failure, necessity for evacuation off site, or other reasons.
•	Maintain visual contact between exclusion zone entrants.
•	Wear the appropriate level of protection as defined in the site specific Health and Safety Plan.
•	Work will only be performed during daylight hours unless adequate lighting is available.
•	Contact with known or suspected contaminated surfaces should be avoided. Whenever possible, there will be no walking through puddles or discolored surfaces; kneeling on ground; or leaning, sitting or placing equipment on drums, containers, or the ground.
•	Prescribed drugs should not be taken by personnel where the potential for absorption, inhalation, or ingestion of toxic substances exists, unless specifically approved by a qualified physician.
•	All respirator wearers must be certified as being capable of wearing respiratory protection (physician's approval, fit tested) while performing their assigned tasks. All respirator wearers must have been fit tested, within the past 12 months, with the make and size respirator to be worn. No facial hair is allowed that would interfere with respirator fit.
•	Work areas for all operational activities shall be clearly established and clearly delineated in the site specific Health and Safety Plan.
•	Work areas and decontamination procedures shall be established based on expected site conditions and clearly delineated in the site specific Health and Safety Plan.

Personnel and equipment in the exclusion zone(s) will be minimized, consistent with effective site operations.

10.0 DECONTAMINATION PLAN

Decontamination of equipment and personnel will be performed to limit the potential migration of contaminants outside the exclusion zone. All equipment and personnel will be decontaminated prior to leaving the exclusion zone.

10.1 Levels Of Decontamination Protection Required For Assisting Personnel

The level of protection required for personnel assisting with decontamination is one level below that of the person being decontaminated. The Industrial Hygiene and Safety Officer is responsible for monitoring decontamination procedures and determining their effectiveness.

10.2 Equipment Decontamination

All vacuums and Negative Air Machines will have filters and pre-filters removed and disposed of before demobilization. They will also be wet wiped. The Response Manager and SHSO are responsible for ensuring the cleanliness of equipment prior to leaving the site. Any other equipment not disposed of after the job will be wet wiped.

10.3 Personnel Decontamination

10.3.1 Procedure

All site personnel should minimize contact with contaminants in order to reduce the need for extensive decontamination. Personnel decontamination will be conducted in the decontamination zone. Gross decontamination for PPE Levels C and D+ will include:

1. Vacuum coverall/ boots with HEPA vacuum
2. Remove coveralls and dispose
3. Remove boot covers and dispose (alternate: rinse boots/ remove and hang for drying)
4. Remove gloves and dispose
5. Remove respirator
6. Wash/rinse respirator (inside and out) and hang for drying
7. Rinse hard hat (inside and out)

Personal hygiene following decontamination will take place in the support zone.

10.3.2 Equipment

Personal decontamination equipment will consist of trashcans with liners (for disposable PPE), three-gallon containers (respirator wash, sanitize and rinse), water supply, and detergent.

10.4 Disposition of Decontamination Wastes

All equipment used for decontamination shall be decontaminated or disposed of properly. Aqueous liquids will be disposed according to the Site Work Plan. All disposable PPE will be containerized and properly disposed.

11.0 EMERGENCY RESPONSE PLAN

This Emergency Response Plan has been prepared to define the responsibilities, resources and actions necessary to respond to uncontrolled releases of contaminated materials and injury to personnel.

11.1 Pre-Emergency Planning

This Emergency Response Plan will be reviewed and revised on a regular basis (if necessary) by the IHSO. This will ensure that the plan is adequate and consistent with prevailing project conditions.

Local emergency medical, fire, and police resources will be identified.

11.2 Personnel Roles and Lines of Authority

The Project manager has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measures to ensure the safety of project personnel and the public.
The individual subcontractor organizations are responsible for assisting the Project manager in his/her mission within the parameters of their scope of work.

11.3 Emergency Recognition/Prevention

Section 4.0 identifies the chemical and physical hazards on project. Additional hazards that may result from project activities are listed in Table 11.1. This table also lists prevention and control techniques/mechanisms. Personnel will be familiar with techniques of hazard recognition from pre-assignment training and project specific briefings. The IHSO is responsible for ensuring that prevention devices or equipment are available to personnel.

TABLE 11.1: EMERGENCY RECOGNITION/CONTROL MEASURES

Potential Hazard	Prevention/Control	Location of Response Equipment
Fire	• Fire Extinguisher (15 lb. dry chemical) • Ignition source control • Hot Work Prohibited	• One per floor
Eyewash Facility	• 15 Minute Drench	• At Building Entrance
Delayed Building Exit	• Mark routes of exit • Do not block stairs/ exits	• All stairways/ exits

11.4 Emergency Equipment/Facilities

- First aid kit
- Fire extinguishers
- Telephone

The following safety equipment and materials will be maintained on project.
Safety Equipment

Number	Item
1	Industrial First Aid Kit
1	Fire Extinguisher per floor
1	Eyewash Station

In the event of an injury requiring more than minor first aid, or any employee reporting any sign or symptom of exposure to hazardous substances, immediately take the victim to a local emergency medical provider. In the event of life-threatening or traumatic injury, implement appropriate first aid and immediately call for emergency medical assistance. If the patient's condition is serious first aid should be administered while awaiting an ambulance or paramedics.

When an individual(s) is being transported to a clinic or hospital for treatment, the Project manager, or IHSO should ensure that information on the chemical(s) the individual(s) have been exposed to at the project is taken. This information, which is included in Section 4.0, could also be given to the hospital during project set-up activities. Any vehicle used to transport contaminated personnel will be treated and cleaned as necessary.

11.5 Fire or Explosion

In the event of a fire or explosion, the local Fire Department should be summoned immediately. Upon their arrival, the Project manager or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on project.

The IHSO shall act as the designated project emergency coordinator and shall have final authority for initial response to on-project emergency situations. Upon arrival of the appropriate emergency response personnel, the IHSO shall defer all authority but shall remain on the scene to provide assistance, if necessary. At the earliest opportunity, the IHSO shall contact the Project manager.

11.6 Spill or Leaks

In the event of a spill or a leak, project personnel will:

- Inform the Project manager immediately

If a leak occurs containment procedures will begin if possible. Simultaneously, the source of the spill will be stopped if it is still releasing material Air monitoring should be conducted downwind. The WRS Representative will be responsible for any reporting procedures that are required as a result of the spill.

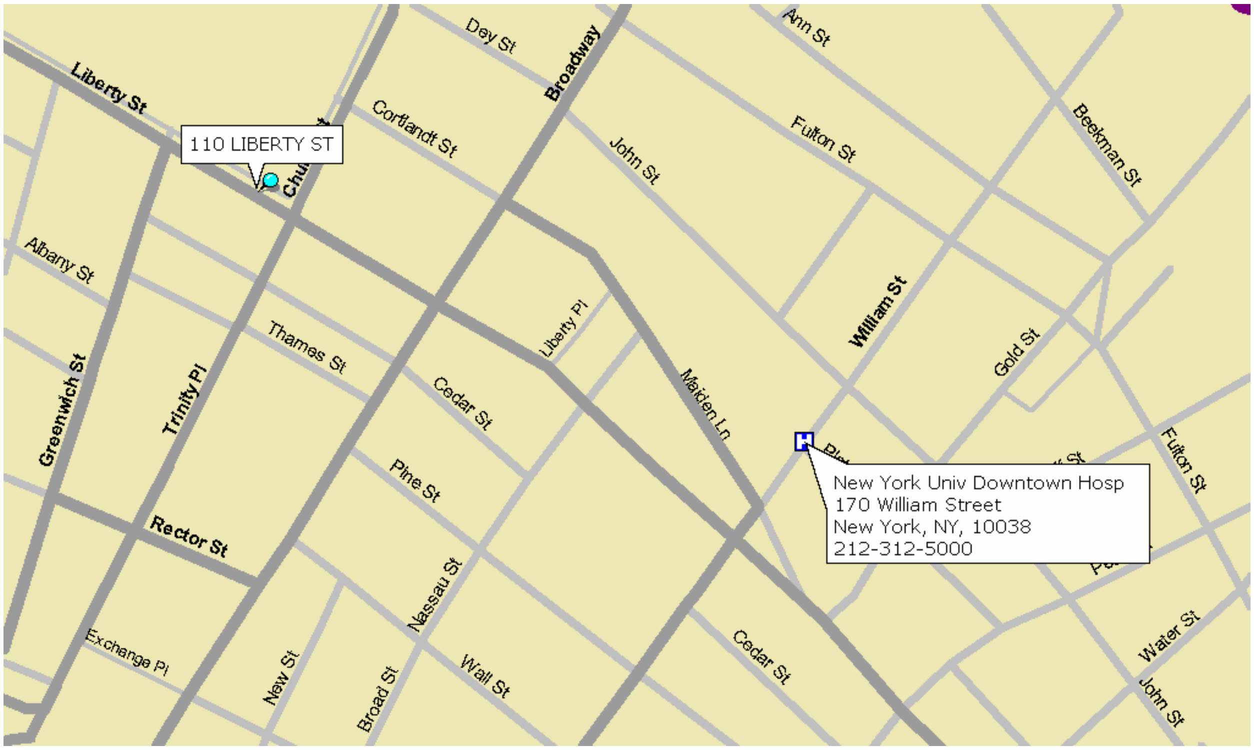


Figure 11-1
Route to Hospital

EMERGENCY TELEPHONE NUMBERS AND HOSPITAL ROUTE

EMERGENCY ASSISTANCE TELEPHONE LIST	
EMERGENCY ASSISTANCE ORGANIZATION	**TELEPHONE NUMBER**
New York University Downtown Hospital 170 William Street New York, NY 10038	**212-312-5000**
AMBULANCE/RESCUE SQUAD	**911**
FIRE	**911**
LOCAL POLICE	**911**
WRS BRISTOL OFFICE	**267-540-0048**
WRS H&S Manager	**770-469-6522**
CHEMTREC (24 HOURS)	**(800) 424-9300**
U. S. COAST GUARD NATIONAL RESPONSE CENTER (NRC)	**(800) 424-8802**
EPA OSC Communications	**732-689-0019**

APPENDIX A
HEALTH AND SAFETY FORMS

1. Accident/Incident Report

2. Daily Safety Meeting Form

3. Training Attendance Record

4. Qualitative Respirator Fit Test and Inspection Form

5. Daily Safety Report

6. SSHP Change Authorization

7. SSHP Sign-Off

8. Air Monitoring Log

9. Quantitative Respirator Fit Test Form

WRS INFRASTRUCTURE & ENVIRONMENT, INC.

INJURY/ILLNESS/INCIDENT INVESTIGATION AND REPORT (OSHA 301 Form Equivalent)

Supervisor Complete Both Pages/Forward to Branch and WRS H&S Manager within 48 hrs./Supervisor's Manager Review for Completeness

Personal & Background Information

1. Case Number	**2. Soc. Sec. No.**	**3. Name** *(Last name, first initial)*	**5. Date of Birth**

6. Gender ☐ M ☐ F	**7. Date of Hire**	**8. Job or Site Name**	**9. Job Number**

11. Time of Accident	**12. Time Employee Began Work**	**13. Date of Accident**	**14. Date Reported**	**15. Number of Others Involved in Accident**

16. Occupation at Accident Time	**17. Regular Occupation**	**18. Number of Others Injured in Accident**

19. Nature of Injuries (Bruise, Strain, etc.)	**20. Injured Body Part** (left index finger)
21. Names of Others Involved in Accident	**22. Names of Others Injured in Accident**

23. Chemicals Involved in Accident	**24. Exact Location of Accident** *(Sketch on Back)*	**25. On WRS Premises?** ☐ Yes ☐ No

26. Activity Injured was doing at time of accident or illness *(operating backhoe, unloading drums, etc.)*
--Try to Identify job in three words
-- Use no more than 30 spaces | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

27. What Occurred (Use single line descriptive sentences to tell the story of what occurred)

28. Check Type of Accident *(Check one)*

☐ a. Struck by	☐ c. Contacted by	☐ e. Trapped in	☐ g Caught between	☐ i Different level fall	☐ k. Exposure
☐ b. Struck against	☐ d. Contact with	☐ f. Caught on	☐ h Same level fall	☐ j Strain/overexertion	☐ l. Other

29. Accident Agent *(Limit to 21 spaces)*(i.e., equipment, machine, hand tool)	**30. Contact Agent** *(Limit to 22 spaces)*(i.e., machine part or material contacting)

31. UNSAFE ACTIONS - What did employee do or fail to do that caused or contributed to accident? *(Check no more than 2, give details on reverse)*

- ☐ a. Operating without authority
- ☐ b. Failure to make secure
- ☐ c. Operating unsafe speed
- ☐ d. Failure to warn/signal
- ☐ e. Nullified safety device
- ☐ f. Used defective equipment
- ☐ g. Used equipment unsafely
- ☐ h. Used wrong tool
- ☐ i. Failure to make inoperative
- ☐ j. Riding hazardous equipment
- ☐ k. Took unsafe position
- ☐ l. Horseplay, distractive
- ☐ m. No protective equip. worn
- ☐ n. Unsafe job procedure
- ☐ o. No unsafe action
- ☐ p. Other

32. UNSAFE CONDITIONS - What condition of tools, equipment or job site caused or contributed to accident? *(Check no more than 2, give details on reverse)*

- ☐ a.Inadequate guard/Safety device
- ☐ b. Hazardous personal attire
- ☐ c. Inadequate warning system
- ☐ d. Fire or Explosion hazard
- ☐ e. Unsecured against movement
- ☐ f. Poor housekeeping
- ☐ g. Protruding object
- ☐ h. Close clearance/congestion
- ☐ i. Hazardous arrange/storage
- ☐ j. Defective tools/equipment
- ☐ k. Atmospheric condition
- ☐ l. Illumination/noise
- ☐ m. Other unsafe condition
- ☐ n. No unsafe condition

33. What caused or influenced unsafe actions you identified above? *(Answer only if item 32 applies. Check no more than 2)*

- ☐ a. Unaware of job hazards
- ☐ b. Inattention to hazard
- ☐ c. Unaware of safe method
- ☐ d. Low level job skill
- ☐ e. Tried to gain or save time
- ☐ f. Tried to avoid extra effort
- ☐ g. Tried to avoid discomfort
- ☐ h. Influence of emotions
- ☐ i. Influence of fatigue
- ☐ j. Influence of intoxicant/drugs
- ☐ k. Defective vision
- ☐ l. Influence of illness
- ☐ m. Other personal factors
- ☐ n. Unknown personal factors

34. What caused or influenced unsafe condition you identified above? *(Answer only if item 33 applies. Check no more than 2)*

- ☐ a. Caused by employee
- ☐ b. Defective from normal use
- ☐ c. Defective via abuse/misuse
- ☐ d. Safety inspection failure
- ☐ e. Housekeeping/cleaning failure
- ☐ f. Faulty design/construction
- ☐ g. Inadequate illumination
- ☐ h. Preventive maintenance failure
- ☐ i. Defective tools/equipment
- ☐ j. Exposure to corrosion
- ☐ k. Extreme temperature
- ☐ l. Caused by other employees
- ☐ m. Other source cause
- ☐ n. Unknown source cause

35. What action has been taken *(Mark X box)* **or is planned** *(Mark P box)* **to prevent recurrence:** *(Mark no more than 5)*

X P
- ☐ ☐ a. Reinstruction of employee
- ☐ ☐ b.Reprimand/warning of employees involved
- ☐ ☐ c. Penalty discipline of employee involved
- ☐ ☐.Preventive instruction of others who do job
- ☐ ☐ e. Job reassignment of employee
- ☐ ☐ f. Improved inspection procedure
- ☐ ☐ g. Improved cleanup procedure

X P
- ☐ ☐ h. Action to improve enforcement
- ☐ ☐ i. Order JSA done on job
- ☐ ☐ j. Order JSA revision
- ☐ ☐ k. Install safety guard against
- ☐ ☐ l. Require protective equipment
- ☐ ☐ m. repair/replace equipment
- ☐ ☐ n. Improve storage/arrangement

X P
- ☐ ☐ o. Improve design/construction
- ☐ ☐ p. Eliminate congestion
- ☐ ☐ q. Use safer Materials/supplies
- ☐ ☐ r. Improve illumination/ventilation
- ☐ ☐ s. Mandatory pre-job instructions
- ☐ ☐ t. Correction other than above
- ☐ ☐ u. No action required

36. Immediate Supervisor *(Last name first, first initial)*	**37. Employee's Signature**
38. Investigated by *(Names and positions)* **Date**	**39. Reviewed and approved by** *(Name and position)* **Date**

Part 1. Accident Description and Direct Cause Analysis

WRS INFRASTRUCTURE & ENVIRONMENT, INC.

INJURY/ILLNESS/INCIDENT INVESTIGATION AND REPORT (OSHA 301 Form Equivalent)

Supervisor Complete Both Pages/Forward to Branch and WRS H&S Manager within 48 hrs./Supervisor's Manager Review for Completeness

1. What Occurred
Describe in sequence (1) relevant background information if any, (2) employee's location and position relative to immediate surroundings, (3) how employee was doing job, (4) what occurred that precipitated the accident, (5) the type of accident and contact agent.

2. Contributing "Unsafe" Action What did the injured (or other person) do or fail to do that contributed directly to accident? Be specific. *(Ex., Failed to use protective equipment, Failed to lock out machine)* *Don't report "Carelessness."*	**3. Contributing "Unsafe" Condition** What defective or otherwise unsafe conditions of tools, equipment, machines, structures or work equipment contributed directly to accident? *(Ex., Oil on floor, Broken or missing machine guard, Poor housekeeping)*

Part 2. Corrective Action Must Be Taken

4. Required Corrections
What corrective actions will be taken to prevent recurrence of accident? See Reverse Side, Item 35, for basic correction ideas.
(Ex., Job Safety Analysis (JSA), Training, Employee counseling, Machine Guarding)

Part 3. Witnesses:

Part 4. Accident Location Sketch

N ↑

Part 5. Extent and Outcome of Injury/Illness

Lost Time Case - Date Lost Time Began: ___/___/___ - Date Lost Time Ended: ___/___/___	**Restricted Duty Case** Date Restriction Began: ___/___/___ Date Restriction Ended: ___/___/___	Restrictions: ____________________ ____________________

Medical Treatment
- Name of Hospital or Clinic:

- Name of Physician:

Describe Treatment:

Was employee treated in an Emergency Room? Yes No Was employee hospitalized overnight as an in-patient? Yes No

WRS INFRASTRUCTURE & ENVIRONMENT, INC.
DAILY SAFETY MEETING

Date: ____________________________ Job Name: ______________________________

1. Work to be completed: ____
____

2. Hazards Associated with this work:____
____

3. Hazard control measures to be implemented:____
____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment:____
____

Chemical Hazards:____
____

Physical Hazards:____
____

Emergency Procedures:____
____

ATTENDEES

NAME PRINTED	SIGNATURE
____________________________	____________________________
____________________________	____________________________
____________________________	____________________________
____________________________	____________________________

Class Title:____

Class Content:____

Class Instructor(s):____

____

Date:____

ATTENDED BY

NAMES (PRINTED)	SIGNATURES

Instructor(s) Signature:____

____

Date(s):____

cc: Corporate File
Branch File

WRS INFRASTRUCTURE & ENVIRONMENT, INC.
RESPIRATOR FIT TESTING & INSPECTION

NAME ____________________________ EMPLOYEE NO.________ DATE ____________

TITLE _______________________ SERVICE CENTER _____________________________

HOOD/ ENCLOSURE MAY NOT BE USED WITH IRIITANT SMOKE.

IRRITANT SMOKE FIT TESTING:

No. of Squeezes	Activity	Reaction	
_______	Initial	___ Yes	___ No
_______	Head/Neck Motion	___ Yes	___ No
_______	Motion/Talking	___ Yes	___ No
_______	Motion/Deep Breathing	___ Yes	___ No
_______	Total Squeezes		
Seal Obtained ______	Type of Cartridge used	______________________	
	Type of respirator	______________________	
	Size of respirator	______________________	

RESPIRATOR INSPECTION:

Head Straps	ok / not ok	Inhalation valves/stems/bodies	ok / not ok
Face to Mask Sealing Surface	ok / not ok	Canister holder gasket/ threads	ok / not ok
Exhalation valves/cover/stems/bodies	ok / not ok	Lens	ok / not ok

Action Taken to Correct Deficiencies: ____

Fit Test/ Inspection performed by:___________________________ Date ___________

Employee signature: ___________________________Date ___________

WRS INFRASTRUCTURE & ENVIRONMENT, INC.
Daily Safety Report

Project:		
Contract No.:	**WRS Project No.:**	**Date:**
SHSO:	**PM:**	**Supervisor:**
Site Conditions (weather, temp., soil conditons, etc.):______________________________ ____		

Task/ Personnel/ PPE Matrix		
Task/Area	**Personnel**	**PPE Level**

Corrective Actions	
Unsafe Act/ Condition	**Corrective Action**

Signature:____ **Date:**_______________
SHSO

Attachments:
! Air Surveillance Log ! Accident Report ! Daily Safety Meeting ! Other ! None

WRS Infrastructure & Environment, Inc.
H&S Plan Change Authorization

Project Name:______________________ Date:__________________________

Project Number:____________________

Description of Change:

Reason for Change:

Person requesting Change: Signature Date

Approved By Signature Date
(WRS Health and Safety Administrator)

Attach sheets if necessary

SAFETY BRIEFING

Project Name:____ Date:__________________________

The following personnel were present at the pre-job safety briefing and having read the Health and Safety Plan, are familiar with its provisions, and will abide by the procedures set forth in this plan:

Name	**Signature**

Printed name of Site Supervisor or Site Health and Safety Officer

Signature Date

Health and Safety Plan Sign-off

By signing below, I am indicating that I have read and agree to comply with the contents of the Site Specific Health and Safety Plan prepared for the Project.

Name	Signature	Company	Date

WRS Infrastructure & Environment, Inc.
Air Monitoring Log

Project Site:	Project No.	Date:

Level of Protection:	Description of Site (e.g. weather, temp., soil conditions):

Instrument:	Instrument Response:	Location:	Time:	Comments:

Calibration Data (e.g. type & gas concentration, instrument adjustments if any):

Additional Notes:

Siganature:_________________________________ Date:_________________________
(Health and Safety Officer)

WRS Infrastructure & Environment, Inc.
Quantitative Fit Testing Certificate

Employee Name:________________________________ **Date:________________________________**

Dept.:________________________________ **Employee No.:________________________________**

Quantitative Fit Testing Device: DNI Nevada Fit Tester 3000 (Controlled Negative Pressure)

Test Parameters

Work Rate: Heavy 300 kcal/ hr.
Mask Type: Full Face or Half Face
Manufacturer:________________________
Model:________________________________
Size:__________________________________

Cartridge Type: Hi (Combination)
Challenge Pressure:______________" H2O
Breathing Rate:__________________ LPM
Gender:________________________________
Minimum Passing Fit Factor: 500

18 Step Protocol Exercises & Tests

Step 1: Breathing 60 seconds	Step 10: Test Face Forward FF:____________ Test Q:______________
Step 2: Test Face Forward FF:____________ Test Q:______________	Step 11: Grimace 20 seconds
Step 3: Move Head Side to Side 60 seconds	Step 12: Test Face Forward FF:____________ Test Q:______________
Step 4: Test Face Left FF:____________ Test Q:______________	Step 13: Bend at Waist 30 seconds
Step 5: Test Face Right FF:____________ Test Q:______________	Step 14: Test Face Forward FF:____________ Test Q:______________
Step 6: Move Head Up & Down 60 seconds	Step 15: Jog in place 30 seconds
Step 7: Test Head Up FF:____________ Test Q:______________	Step 16: Test: Face Forward FF:____________ Test Q:______________
Step 8: Test Head Down FF:____________ Test Q:______________	Step 17: Re-don Respirator 60 seconds
Step 9: Reading 30 seconds	Step 18: Test Face Forward FF:____________ Test Q:______________

Average of Fit Test Exercises

Average % Leak:__________Test Quality:________ Equivalent Fitactor:________

Employee Signature:________________________________ Date:________________

Tester's Signature:_________________________________ Date:_________________

APPENDIX B
HEAT STRESS

CONTENTS

1.0 PURPOSE

The Heat Stress Management SOP is intended to describe measures which will reduce the probability of workers experiencing a heat related disorder.

2.0 SCOPE

The Heat Stress Management SOP is applicable to all WRS project sites. Its implementation is mandatory when workers wearing impermeable personal protective equipment are exposed to ambient air temperatures above 70^{o}F.

3.0 DEFINITIONS

Stress can contribute significantly to accidents or harm workers in other ways.

The term "stress" denotes the physical (gravity, mechanical force, heat, cold, pathogens, injury) and psychological (fear, anxiety, crises, joy) forces that are experienced by individuals.

They body's response to stress occurs in three stages:

a. Alarm Reaction - The body recognizes the stress and the pituitary-adreno-cortical system responds by increasing the heart rate and blood sugar level, decreasing digestive activity and dilating the pupils.

b. Adaptive Stage - The body repairs the effect of stimulation and stress symptoms disappear.

c. Exhaustion Stage - The body can no longer adapt to stress and the individual may develop emotional disturbances and cardiovascular and renal diseases.

The most common types of stress that affect remediation personnel are heat stress and cold stress. Heat and cold stress can be the most serious hazards an employee encounters at hazardous waste sites.

Heat Stress usually is a result of protective clothing decreasing natural body ventilation, although it may occur at any time work is being performed at elevated temperatures.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because heat stress is one of the most common and potentially serious illnesses at hazardous waste sites, regular monitoring and other preventative measures are vital.

Site workers must learn to recognize and treat various forms of heat stress.

4.0 RESPONSIBILITIES

The Project Manager/ Supervisor is responsible for directing work in accordance with this procedure when implementation conditions are met. The PM is also responsible for providing resources necessary for implementation of the procedure.

The Site Health and Safety Officer is responsible for monitoring and facilitating employee compliance with the procedure. The SHSO is responsible for instructing employees in the recognition and control of heat related illnessess.

5.0 PROCEDURE

5.1 Symptom Recognition and Treatment

A large portion of heat stress control lies in the ability of an individual to recognize heat stress symptoms in themselves and co-workers. Early recognition and treatment of heat stress symptoms can prevent the development of more serious, debilitating and even life threatening conditions.

5.1.1 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the heat regulating mechanisms of the body. The individual's temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly. Heat stroke requires medical attention.

a. Symptoms - Red, hot dry skin, although person may have been sweating earlier. Nausea, dizziness, confusion, extremely high body temperature, rapid respiratory and pulse rate, convulsions, unconsciousness, or coma.
b. Treatment - Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool, but not cold, water; sponge the body with cool water; or pour water on the body to reduce the temperature to a safe level (102^{o}F). Observe the victim and obtain medical help. Do not give coffee, tea, or alcoholic beverages. Do give fluids by mouth if victim is in and out of consciousness

5.1.2 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. This condition is much less dangerous than heat stroke, but it nonetheless must be treated.

a. Symptoms - Pale, clammy moist skin, profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, and may be dizzy.

b. Treatment - Remove the person to a cool, air-conditioned place, loosen clothing, place in a head-low position, and provide bed rest. Consult a physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have the patient drink one to two cups of water immediately and every 20 minutes thereafter until symptoms subside. Total water consumption should be about one to two gallons per day.

5.1.3 Heat Cramps

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

a. Symptoms - Acute painful spasms of voluntary muscles: e.g., abdomen and extremities.

b. Treatment - Remove the victim to a cool area and loosen clothing. Have the patient drink one to two cups of water immediately and every 20 minutes thereafter until the symptoms subside. Total water consumption should be one to two gallons per day. Consult your physician.

5.1.4 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and is aggravated by chafing cloths. The condition decreases the ability to tolerate heat.

a. Symptoms - Mild red rash, especially in areas of body in contact with protective gear.
b. Treatment - Decrease the amount of time in protective gear and provide powder to help absorb moisture and decrease chafing.

5.2 Heat Stress Prevention Measures

What follows is a list of heat stress prevention measures which reduce the risk of an employee experiencing a heat related disorder. They are in no particular order. Successful heat stress prevention will require the implementation of all the control measures listed to varying degrees. No single control measure will prove to be either effective nor efficient for a given project site.

5.2.1 Fluid Replacement

Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable, four ounce cups and water that is maintained at 50 to 60°F. Urge workers to drink one to two gallons per day. To assist employees track their own fluid replacement, provide individual water coolers/ containers, fill the containers each day, and check consumption at the end of the day. The use of paper cups and a single cooler for the entire job site are difficult for both supervisors and employees to track. Provide cool, preferably air-conditioned, area for rest breaks. Discourage the use of alcohol in nonworking hours and discourage the intake of coffee during working hours. Monitor for signs of heat stress.

Use of electrolyte containing fluids (e.g., Gatorade) is more important for unacclimatized workers than acclimatized workers.

5.2.2 Acclimate Crew Members

Acclimatization is the process by which the body adapts to heat stress. Changes include increased sweating efficiency (earlier onset of sweating, increased sweat production, lower electrolyte loss) and stabilized blood circulation (less likelihood of blackout, dizziness, spots, etc.) It occurs with brief (~100 minutes) daily exposures to heat in 5 -7 days. Benefits of acclimatization are typically lost with no heat exposure for a week or more.

5.2.3 Reduce Heat Load (both environmental and metabolic)

Provide cooling devices to aid body cooling (i.e., Cool Vests). These devices, however, add weight, and their use should be balanced against worker efficiency.

Evaporative cooling is aided by clothing which wicks away perspiration from the skin. Long cotton underwear acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing. However, long cotton underwear is of no use and can aggravate heat stress symptoms once it becomes soaked with perspiration.

Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.

In hot weather, conduct field activities in the early morning or evening.

Reduce metabolic heat load by designing tasks such that employee exertion is kept to a minimum

Reduce environmental heat loads by reducing radiant heat exposure (sunshine). Working in shaded areas and taking breaks in shaded areas will reduce heat loads due to radiant heat.

5.2.4 Employee Rotation

In hot weather, rotate shifts of workers wearing impervious clothing. On project sites with large crews, stagger heat stress breaks so that tasks are not completely shut down. On sites with small crew sizes this may not be possible due to the “buddy system” rule.

5.2.5 Dry Clothing and Personal Hygiene

Good hygienic standards must be maintained by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

5.2.6 Avoid Diuretics and Stimulants

Avoid consuming alcoholic beverages which cause loss of body fluid water by urination. Avoid consumption of stimulants such some cold medicines and caffiene which increase heart rates.

5.2.7 Heat Stress Monitoring and Work/ Rest Cycle Management

For strenuous field activities that are part of on-going work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat and to manage the work/ rest cycle. These procedures are to be instituted when ambient temperatures exceed 70^{o}F and employees are wearing impervious (i.e., does not allow perspiration to evaporate) clothing (e.g., Tyvek, Saranex, PE Coated Tyvek, etc., coveralls).

a. Measure Heart Rate (HR) - The heart rate should be measured by the radial pulse at the wrist for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats per minute.

b. Measure Body Temperature - Body temperature should be measured orally or aurally by a clinical thermometer as early as possible in the resting period. The temperature (OT) at the beginning of the rest period should not exceed 99.6^{o}F, if it does, the next work period should be shortened by 33% while the length of the rest period stays the same. If the OT exceeds 99.6^{o}F at the beginning of the next period, the following work cycle should be further shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6^{o}F. Consuming fluids immediately prior to temperature measurement will give false, low readings. No one will continue to be exposed to hot conditions with an oral/ aural temperature in excess of 100.6^{o}F.

c. Rest Areas - Rest areas should be air conditioned if possible. The heart rates of workers who recover in air conditioned areas will be reduced faster and to lower rates than those that recover in non-air conditioned areas.

d. Manage Work/Rest Schedule - The following work/rest schedule shall be used as a guideline:

Adjusted Temperature (^{o}F)	**Active Work Time Using Impermeable Protective Gear**
75 or less	50
80	40
85	30
90	20
95	10
100	0

To calculate the adjusted temperature:
T (adjusted) = T (actual) + (13 X fraction sunshine)
Measure the air temperature with a standard thermometer. Estimate the fraction of sunshine by judging what percent the sun is out: 100% sunshine = no cloud cover = 1.0, 50% sunshine = 50% cloud cover = 0.5, and 0% sunshine = full cloud cover = 0.0.
Reduce or increase the work cycle according to the guidelines under heart rate and body temperature.

6.0 REFERENCES

- Occupational Safety and Health and Guidance Manual for Hazardous Waste Site Activities
- Patty's Industrial Hygiene and Toxicology, Fourth Edition
- OSHA Web Site http://www.osha-slc.gov/SLTC/heatstress/index.html

7.0 ATTACHMENTS

None

8.0 RECORD KEEPING

Records which facilitate the tracking of employee fluid consumption and work/ rest cycles will be generated.

9.0 EQUIPMENT

- Oral thermometers and hygienic slip covers or aural thermometers with hygienic slip covers
- Thermometer to measure air temperature
- Cool water and/ or electrolyte containing fluids (e.g., Gatorade)
- Ice cooled vests
- Materials to create shaded work areas

APPENDIX C
LOCKOUT/ TAGOUT
WRS STANDARD OPERATING PROCEDURE

CONTENTS

1.0 PURPOSE

WRS recognizes the hazards of unexpected:

- energization
- machine startup and/or
- release of stored energy

during service or maintenance activities on equipment/machines. The following Standard Operating Procedure: Control of Hazardous Energy - Lockout/Tagout, has been developed to provide for the isolation of all energy sources that could endanger employees.

This procedure establishes minimum requirements for the lockout and/or tagout of energy isolating devices and systems. Lockout and/or tagout shall be used to ensure that all equipment, machinery, systems and facilities are inoperable and isolated from all potentially hazardous energy. The Lockout/Tagout procedure shall be implemented before employees perform service or maintenance activities where the unexpected energization, start-up or release of stored energy could cause personal injury and/or damage to equipment, machinery, facilities or the environment.

2.0 SCOPE

A. Provisions outlined in this SOP include individual responsibilities, instructions for the implementation and removal of energy control procedures and employee training requirements.

B. Employees Covered - This procedure applies to all WRS employees and sub-contractors to the same.

C. Activities Covered

Service and maintenance activities on machines, equipment, systems and facilities during which the unexpected energization, start-up or release of stored energy could cause injury to employees must be conducted under the protection of a Lockout/Tagout SOP.

Operation/Production activities during which an employee must remove or bypass a guard or other safety device, or place his/her body into an area of machinery/equipment where work is actually performed upon the material being processed (point of operation) must also be conducted in accordance with a Lockout/Tagout SOP.

D. This SOP is generic in nature and applies to the portion of scenarios described above which meet the following criteria:

1. The machine, equipment or facility component has no potential for stored or residual energy or re-accumulation of stored energy after shut down which could endanger employees;

2. The machine, equipment or facility component has a single energy source which can be readily identified and isolated;

3. The isolation and locking out of that energy source will completely de-energize and deactivate the machine, equipment or facility component;

4. The machine, equipment or facility component is isolated from that energy source and locked out during servicing, maintenance or site operations;

5. A single lockout device will achieve a lock-out condition;

6. The lockout device is under the exclusive control of the authorized employee performing the servicing, maintenance or site operation;

7. The servicing, maintenance or site operation does not create additional hazards for other employees; and

8. Utilization of this procedure has resulted in no accidents involving the unexpected activation or re-energization of an electrical source during servicing, maintenance or site operations.

E. Activities which do not conform to these criteria must be conducted under equipment/machinery specific lockout/tagout procedures.

3.0. DEFINITIONS

AFFECTED EMPLOYEES - WRS employee and/or a subcontractor employee whose job includes activities such as operating machines or equipment on which servicing or maintenance is being performed under lockout or tagout action or whose job requires the employee to work in an area in which servicing or maintenance or site operations are being performed.

AUTHORIZED EMPLOYEE - An employee who locks or implements a tagout system procedure on electrical sources to perform the servicing or maintenance of the equipment, or site operations. An authorized employee and an affected employee may be the same person when the affected employee's duties also include performing maintenance, service on machinery/equipment or site operations which must be locked or a tagout system implemented. The authorized employee shall be properly trained and approved to apply and remove locks and tags.

BLANK - To introduce an obstruction or to replace an opening with a solid surface to prevent flow (e.g. pipeblank).

CAPABLE OF BEING LOCKED OUT - An energy isolating device will be considered to be capable of being locked out if it has a hasp or other attachment where a lock can be affixed, or has a locking mechanism built in.

DOUBLE ISOLATION - To isolate by closing two valves or inserting a blank within an area of two valves.

ENERGY ISOLATING DEVICE - A physical device which prevents the transmission or release of energy. Examples include, but are not limited to, restrain blocks, electrical circuit breakers, disconnect switches, slide gates, or line valves. Where possible, they shall provide visible indication of the position of the device. Push-buttons, selector switches, check valves, and other portions of the control circuit shall not be considered energy isolating devices.

ENERGY SOURCE - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

LOCKOUT - The placement of a lockout device on an energy isolation device, in accordance with an established procedure.

LOCKOUT DEVICE - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe "off" position for the purpose of protecting personnel.

TAGOUT - The placement of a tagout device on an energy isolation device in accordance with an established procedure. (See Attachment B for a suggested lockout/tagout tag.)

TAGOUT DEVICE - A prominent warning device, such as a tag and a means of attachment which can be securely fastened to an energy isolating device in accordance with the established procedure.

- Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal.
- Tagout devices' attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable, with a minimum unlocking strength of no less than fifty pounds.
- Tagout devices shall have the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.

ZERO ENERGY STATE - Removal of all potential energy within the designated area of a lockout or tagout.

4.0 RESPONSIBILITY

Appropriate (authorized and affected) employees shall be instructed in the safety significance of the lockout/tagout procedure. Each new or transferred affected employee and other employees whose work operations are or may be in the area shall be instructed in the purpose and use of the lockout/tagout procedure.

A. Affected Employees - shall conduct themselves in a manner which does not jeopardize the effectiveness of the Lockout/Tagout procedure. Assist Authorized Employees in the successful application, use and removal of the Lockout/Tagout SOP.

B. Authorized Employees - shall be familiar with that particular equipment and processes that are being locked/tagged out, and with the means and methods to isolate the energy source. Shall conduct service, maintenance and operation activities covered by this SOP in strict accordance with its provisions.

C. Industrial Hygiene and Safety Officer (IH&SO) - shall provide consultation to Operations Management on determining the applicability of this SOP to a particular activity. Develop equipment/machinery specific Lockout/Tagout SOPs not covered under this SOP. Assist Operations Management in determining the effectiveness of this SOP for a particular activity, conduct and/or coordinate the training of Authorized and Affected Employees. Audit and report on the effectiveness of the Lockout/Tagout SOP and training activities.

D. Operations Management - shall identify, with IH&SO's assistance, activities covered under this SOP and shall inform Affected and Authorized employees of same. Shall identify to the IH&SO and provide access to employees in need of training. Shall assign work activities to Authorized and Affected Employees in accordance with this SOP. Shall identify to the IH&SO machinery/equipment in need of SOPs beyond the scope of this SOP and assist in their preparation. Shall inform outside servicing personnel or contractors of this procedure whenever they are engaged in activities covered by the scope of this procedure.

5.0 PROCEDURE

5.1 TRAINING

Each WRS site/location shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the safe application, usage and removal of energy controls are acquired by the employees. Proper documentation with content and person's signature is required.

A. The training shall include the following:

1. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources.

2. Each affected employee shall be instructed on the purpose and use of the energy control procedure.

3. All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed concerning the procedure.

B. Additional training requirements when using Tagout Systems shall include the following:

1. Tags are warning devices and do not provide physical restraint as would be provided by a lock.

2. A tag shall not be removed without written approval of the authorized person responsible.

3. Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are in the area.

4. Tags and their means of attachment must be made of materials which will withstand the environmental conditions.

C. Additional retraining shall be conducted:

1. Whenever there is a change in an employee's job assignment.

2. Based on changing job assignments, methods of control and/or whenever a periodic inspection reveals a deviation from the energy control procedure.

D. Training on the use of the Energy Control Procedures shall be certified by WRS. The certification shall contain each employee's name, signature and date of training.

All WRS employees shall receive training sufficient to undertake the activities of an Authorized employee under this generic SOP.

5.2 APPLICATION OF THE ENERGY CONTROL PROCEDURE

The following steps shall be followed in the application of the lockout or tagout system.

A. Preparation for Shutdown - Authorized and affected employees shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

B. Machine or Equipment Shutdown - Machines or equipment shall be turned off or shut down using point of operation control switches.

C. Machine or Equipment Isolation - The energy isolating device for the machine or equipment shall be physically located and operated to ensure that the machine or equipment is isolated from the energy source.

D. Lockout or Tagout Device - The lockout or tagout device shall be affixed to each energy isolating device by authorized employees. The device shall be affixed in a manner that will hold the energy isolating device in a safe or off position.

E. Full Employee Protection - When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.

Means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as:

- Removal of an isolating circuit element
- Blocking of a controlling switch
- Opening of an extra disconnecting device
- Removal of a valve handle.

F. Stored Energy - All potentially hazardous stored or residual energy shall be relieved, disconnected and rendered safe.

G. Isolation of Energy Verification - Prior to starting work on machines or equipment, the authorized employee shall verify (per Section entitled "Removal of Lockout or Tagout Devices") that isolation and de-energization of the machine, equipment or electrical source has been accomplished.

5.3 REMOVAL OF LOCKOUT OR TAGOUT DEVICES

Before lockout or tagout devices are removed and energy is restored, the following procedures shall be followed:

A. Employees

- The work area shall be checked to ensure that all employees have been safely positioned or removed from the area.

- All affected employees shall be notified that the lockout or tagout devices have been removed before any machine, equipment or electrical source is energized.

B. The Machine or Equipment

- The work area shall be inspected to ensure that all non-essential items have been removed and the machine or equipment is ready for operation.

C. Removing the Lockout or Tagout Device

- Each lockout or tagout device shall be removed by the authorized employee who applied the device.

5.4 REMOVAL OF LOCKOUT OR TAGOUT DEVICE BY ANOTHER EMPLOYEE

When the authorized employee who applied the lockout or tagout device is not available to remove it, the following procedure must be in place with specific training for such removal.

- Verify by visual inspection or equivalent that the authorized employee who applied the device is not at the facility.
- Make a reasonable effort to contact and notify the authorized employee that the lockout or tagout device has been removed.
- Notify that employee's supervisor.
- Before resuming work, ensure that the authorized employee knows that the device has been removed.

5.5 GROUP LOCKOUT OR TAGOUT

When servicing and/or maintenance is performed by a crew, craft or other group, they shall utilize a procedure which affords the employees a level of protection that is equivalent to that provided by the implementation of a personal lockout device.

Group lockout or tagout procedures shall include the following specific requirements:

- An employee will be assigned primary responsibility as an authorized employee for a set number of employees working under the protection of a group lockout or tagout device.
- This employee will maintain a roster of group members and their job assignments.
- When more than one crew, craft, or department is involve, assignment of overall job-associated lockout or tagout control responsibility shall be designated to an authorized employee to coordinate affected work forces and ensure continuity of protection.
- Each authorized employee shall affix a personal lockout or tagout device to the group lockbox or device, group lockout box, or comparable mechanism on the machine or equipment being serviced or maintained.

5.6 OUTSIDE PERSONNEL (CONTRACTORS)

- All outside servicing personnel (contractors) and WRS personnel shall inform each other of their respective lockout or tagout procedures.
- All WRS locations and or facilities shall ensure that the employees understand and comply with the restriction and prohibitions of the outside contractor's energy control procedures.

Table I
LOCKOUT OR TAGOUT SEQUENCE

NOTIFY EMPLOYEES	ACTION
Site Supervisor	A. Notifies all personnel affected by the lockout or tagout application and the reason therefore.
SHUTDOWN PROCESS OR EQUIPMENT	
Authorized Employee	A. Turns off or returns operating controls to the neutral mode using appropriate equipment/process shutdown procedures. B. Operates switches and/or valves or any other energy isolating device(s) so that the equipment is isolated from its energy source(s).
PLACE LOCKOUT AND/OR TAGOUT	
Authorized employee	A. Applies safety locks and tags in all cases as required to isolate all energy devices. The lockout or tagout must be visible and accessible to anyone attempting to operate the isolated device.
VERIFY THE ABSENCE OR CONTROL OF ENERGY	
Authorized employee	A. Checks or tests all systems after the lockout and tagging procedures have been completed to insure that total energy isolation has occurred. **CAUTION**: Return operating control to neutral or off position, after verification of energy isolation.
REMOVE LOCKOUT/TAGOUT DEVICES	
Authorized Employee	A. Checks the area around the machine or equipment to ensure that no one is exposed. B. Removes all tools from machines or equipment. Ensures all guards have been reinstalled and employees are in the clear. C. Ensures that all pipes that were opened for repair or draining purposes are closed and connected properly. D. Ensures that all controls are in off position or neutral position. E. Removes safety locks and/or tags. F. Operates the energy isolating devices to restore energy to the machine or equipment
ADMINISTER LOCKOUT/TAGOUT DEVICES	
Site Supervisor	A. Maintains a lockout or tagout log at the lock cabinet. B. Schedules and performs surveillances so that proper lock and tag procedure is being followed. C. Schedules and performs audits of the proper lock and tag procedure.

5.7 PROCEDURE INVOLVING MORE THAN ONE PERSON

Each individual working on equipment or processes shall be required to place his/her own personal lockout device or tagout device on the energy isolating device.

When an energy isolating device cannot accept multiple locks or tags, a multiple lockout or tagout device (hasp) may be used. If a lockout is used, a single lock may be used with the key being placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will use his/her own lock to secure the box or cabinet.

6.0 <u>REFERENCES</u>

- 29 CFR 1910.147

- OSHA Web Page http://www.osha-slc.gov/SLTC/controlhazardousenergy/index.html

7.0 ATTACHMENTS

- Training Outline
- Sample Tag

8.0 RECORD KEEPING

- Employee training evets
- Inspections of ongoing LOTO's

9.0 EQUIPMENT

- Lockout device (e.g., hasp)
- Lock

ATTACHMENT A

Training Outline

CONTROL OF HAZARDOUS ENERGY
LOCKOUT/TAGOUT
Training Outline

I. Hazard Recognition
   A. Recognize the Scenario
      1. Unexpected Energization
      2. Unexpected Machine Startup
      3. Release of Stored Energy
      4. Our Equipment vs. Our Clients Equipment
      5. Suspect Activities
   B. Recognize the Energy
      1. Electric
      2. Hydraulic
      3. Pneumatic
      4. Mechanical
      5. Thermal
      6. Chemical

7. Combinations

II. Hazard Control Standard Operating Procedure

A. Activities Covered

B. Definitions

1. Affected Employees

2. Authorized Employees

3. Blank

4. Capable of Being Locked Out

5. Double Isolation

6. Energy Isolating Device

7. Lockout

8. Lockout Device

9. Tagout

10. Tagout Device

11. Zero Energy State

C. Lockout/Tagout Sequence

1. Notify Employees

2. Shutdown Process or Equipment

3. Place Lockout/Tagout Device

4. Verify Obsence or Control of Energy

5. Remove Lockout/Tagout Devices

D. Activities Not Covered by SOP

E. Removing Another Employee's Lock/Tag

F. Group Lockout/Tagout

G. Outside Personnel (Subcontractors, Clients)

ATTACHMENT B

Tag

APPENDIX D
WRS FALL PROTECTION
STANDARD OPERATING PROCEDURE

CONTENTS

1.0 PURPOSE

This procedure establishes minimum requirements to prevent injuries to employees from different level falls. It also defines minimum requirements for complying with OSHA's Fall Protection Standard (29 CFR 1926 Subpart M).

2.0 SCOPE

This procedure applies to all WRS employees and WRS subcontractor employees exposed to the following workplace conditions:

Unprotected Sides and Edges - employees on walking/working surfaces (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level.

Leading Edge Work - employees constructing a leading edge 6 feet (1.8 m) or more above lower levels.

Work In Hoist Areas - employees in a hoist area shall be protected from falling 6 feet (1.8 m) or more to lower levels.

Holes - employees on walking/working surfaces shall be protected from falling through holes (including skylights) more than 6 feet (1.8 m) above lower levels. Employees on a walking/working surface shall be protected from tripping in or stepping into or through holes (including skylights) Employees on a walking/working surface shall be protected from objects falling through holes (including skylights).

Formwork and Reinforcing Steel - employees on the face of formwork or reinforcing steel shall be protected from falling 6 feet (1.8 m) or more to lower levels.

Ramps Runways and Other Walkways - employees on ramps, runways, and other walkways shall be protected from falling 6 feet (1.8 m) or more to lower levels.

Excavations - employees at the edge of an excavation 6 feet (1.8 m) or more in depth shall be protected from falling by guardrail systems, fences, or barricades when the excavations are not readily seen because of plant growth or other visual barrier.

Wells, Pits and Shafts - employees at the edge of a well, pit, shaft, and similar excavation 6 feet (1.8 m) or more in depth shall be protected from falling.

Work Above Dangerous Equipment - employees working less than 6 feet (1.8 m) above dangerous equipment shall be protected from falling into or onto the dangerous equipment Employees working 6 feet (1.8 m) or more above dangerous equipment shall be protected from fall hazards.

Roof Work - employees engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling. Employees on a steep roof with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling.

Precast Concrete Erecetion - employees engaged in the erection of precast concrete members (including, but not limited to the erection of wall panels, columns, beams, and floor and roof "tees") and related operations such as grouting of precast concrete members, who are 6 feet (1.8 m) or more above lower levels shall be protected from falling.

Wall Openings - employees working on, at, above, or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 feet (1.8 m) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0 m) above the walking/working surface, shall be protected from falling.

Walking/ Working Surfaces Not Otherwise Addressed - employees on a walking/working surface 6 feet (1.8 m) or more above lower levels shall be protected from falling

3.0 DEFINITIONS

Anchorage - means a secure point of attachment for lifelines, lanyards or deceleration devices.

Body belt (safety belt) - means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

Body harness - means straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

Buckle - means any device for holding the body belt or body harness closed around the employee's body.

Connector - means a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabiner, or it may be an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

Controlled access zone (CAZ) - means an area in which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.

Dangerous equipment - means equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment, and other units) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.

Deceleration device - means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

Deceleration distance - means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate.

It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

Equivalent - means alternative designs, materials, or methods to protect against a hazard which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

Failure - means load refusal, breakage, or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

Free fall - means the act of falling before a personal fall arrest system begins to apply force to arrest the fall.

Free fall distance - means the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

Guardrail system - means a barrier erected to prevent employees from falling to lower levels.

Hole - means a gap or void 2 inches (5.1 cm) or more in its least dimension, in a floor, roof, or other walking/working surface.

Infeasible - means that it is impossible to perform the construction work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.

Lanyard - means a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

Leading edge - means the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.

Lifeline - means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Low-slope roof - a roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

Lower levels - means those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.

Mechanical equipment - means all motor or human propelled wheeled equipment used for roofing work, except wheelbarrows and mopcarts.

Opening - means a gap or void 30 inches (76 cm) or more high and 18 inches (48 cm) or more wide, in a wall or partition, through which employees can fall to a lower level.

Overhand bricklaying and related work - means the process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. Related work includes mason tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

Personal fall arrest system - means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. As of January 1, 1998, the use of a body belt for fall arrest is prohibited.

Positioning device system - means a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.

Rope grab - means a deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/level locking, or both.

Roof - means the exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily become the top surface of a building.
"Roofing work" means the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

Safety-monitoring system - means a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

Self-retracting lifeline/lanyard - means a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Snaphook - means a connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snaphooks must be the self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection.

Steep roof - means a roof having a slope greater than 4 in 12 (vertical to horizontal).

Toeboard - means a low protective barrier that will prevent the fall of materials and equipment to lower levels and provide protection from falls for personnel.

Unprotected sides and edges - means any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches (1.0 m) high.

Walking/working surface - means any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.

Warning line system - means a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.

Work area - means that portion of a walking/working surface where job duties are being performed.

4.0 RESPONSIBILITY

All WRS employees and subcontractor employees covered by this SOP are responsible for complying with its contents. Supervisors are responsible for implementing and enforcing the SOP and securing the resouces necessary to implement it.

5.0 PROCEDURE

5.1 TRAINING

Employees with potential exposure to fall hazards shall receive training that will enable them to recognize the hazards of falling and implement procedures to be followed in order to minimize these hazards.

Retraining will be performed when an employee who has already been trained does not have the understanding and skill required by paragraph to recognize and control fall hazards. Circumstances where retraining is required include, but are not limited to, situations where changes in the workplace render previous training obsolete, or changes in the types of fall protection systems or equipment to be used render previous training obsolete, or inadequacies in an employee's knowledge or use of fall protection systems or equipment indicate that the employee has not retained the requisite understanding or skill.

Training shall be performed by a competent person qualified in the following areas:

- The nature of fall hazards in the work area;
- The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used;
- The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used;
- The role of each employee in the safety monitoring system when this system is used;
- The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs;
- The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection; and
- The role of employees in fall protection plans;
- The applicable OSHA standards.

A written certification record of employee training will be maintained. The written certification record shall contain the name or other identity of the employee trained, the date(s) of the training, and the signature of the person who conducted the training.

5.2 GUARDRAIL SYSTEMS

The top edge height of top rails, or equivalent guardrail system members, shall be 42 inches (1.1 m) plus or minus 3 inches (8 cm) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of this paragraph. Note: When employees are using stilts, the top edge height of the top rail, or equivalent member, shall be increased an amount equal to the height of the stilts.

Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 inches (53 cm) high. Midrails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking/working level. Screens and mesh, when used, shall extend from the top rail to the walking/working level and along the entire opening between top rail supports.

Intermediate members (such as balusters), when used between posts, shall be not more than 19 inches (48 cm) apart. Other structural members (such as additional midrails and architectural panels) shall be installed such that there are no openings in the guardrail system that are more than 19 inches (.5 m) wide.

Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds (890 N) applied within 2 inches (5.1 cm) of the top edge, in any outward or downward direction, at any point along the top edge.

When the 200 pound (890 N) test load is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39 inches (1.0 m) above the walking/working level. Guardrail system components selected and constructed in accordance with the following specifications are deemed to meet this requirement.

(1) For wood railings: Wood components shall be minimum 1500 lb-ft/in(2) fiber (stress grade) construction grade lumber; the posts shall be at least 2-inch by 4-inch (5 cm x 10 cm) lumber spaced not more than 8 feet (2.4 m) apart on centers; the top rail shall be at least 2-inch by 4-inch (5 cm x 10 cm) lumber, the intermediate rail shall be at least 1-inch by 6-inch (2.5 cm x 15 cm) lumber. All lumber dimensions are nominal sizes as provided by the American Softwood Lumber Standards, dated January 1970.
(2) For pipe railings: posts, top rails, and intermediate railings shall be at least one and one-half inches nominal diameter (schedule 40 pipe) with posts spaced not more than 8 feet (2.4 m) apart on centers.
(3) For structural steel railings: posts, top rails, and intermediate rails shall be at least 2-inch by 2-inch (5 cm x 10 cm) by 3/8-inch (1.1 cm) angles, with posts spaced not more than 8 feet (2.4 m) apart on centers.

Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members shall be capable of withstanding, without failure, a force of at least 150 pounds (666 N) applied in any downward or outward direction at any point along the midrail or other member.

Guardrail systems shall be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing. The ends of all top rails and midrails shall not overhang the terminal posts, except where such overhang does not constitute a projection hazard. Steel banding and plastic banding shall not be used as top rails or midrails. Top rails and midrails shall be at least one-quarter inch (0.6 cm) nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for top rails, it shall be flagged at not more than 6-foot intervals with high-visibility material. Manila, plastic or synthetic rope being used for top rails or midrails shall be inspected as frequently as necessary to ensure that it continues to meet strength requirements.

When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section shall be placed across the access opening between guardrail sections when hoisting operations are not taking place.

When guardrail systems are used at holes, they shall be erected on all unprotected sides or edges of the hole. When guardrail systems are used around holes used for the passage of materials, the hole shall have not more than two sides provided with removable guardrail sections to allow the passage of materials. When the hole is not in use, it shall be closed over with a cover, or a guardrail system shall be provided along all unprotected sides or edges. When guardrail systems are used around holes which are used as points of access (such as ladderways), they shall be provided with a gate, or be so offset that a person cannot walk directly into the hole.

Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge.

5.3 SAFETY NET SYSTEMS

Safety nets shall be installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30 feet (9.1 m) below such level. When nets are used on bridges, the potential fall area from the walking/working surface to the net shall be unobstructed.

Safety nets shall extend outward from the outermost projection of the work surface as follows:

Vertical distance from working level to horizontal plane of net	Minimum required horizontal distance of outer edge of net from the edge of the working surface
Up to 5 feet	8 feet

More than 5 feet up to 10 feet	10 feet
More than 10 feet	13 feet

Safety nets shall be installed with sufficient clearance under them to prevent contact with the surface or structures below when subjected to an impact force equal to the drop test specified below. Safety nets and their installations shall be capable of absorbing an impact force equal to that produced by the drop test.

Safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. The drop-test shall consist of a 400 pound (180 kg) bag of sand 30 + or - 2 inches (76 + or - 5 cm) in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards, but not from less than 42 inches (1.1 m) above that level.

When it is unreasonable to perform the drop-test a designated competent person shall certify that the net and net installation is in compliance with the above listed specifications by preparing a certification record prior to the net being used as a fall protection system. The certification record must include an identification of the net and net installation for which the certification record is being prepared; the date that it was determined that the identified net and net installation were in compliance and the signature of the person making the determination and certification. The most recent certification record for each net and net installation shall be available at the jobsite for inspection.

Defective nets shall not be used. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Defective components shall be removed from service. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system.

Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.

The maximum size of each safety net mesh opening shall not exceed 36 square inches (230 cm) nor be longer than 6 inches (15 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, shall not be longer than 6 inches (15 cm). All mesh crossings shall be secured to prevent enlargement of the mesh opening. Each safety net (or section of it) shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds (22.2 kN). Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches (15 cm) apart.

5.4 PERSONAL FALL ARREST SYSTEMS

Connectors in a fall arrest system shall be drop forged, pressed or formed steel, or made of equivalent materials. They shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

Dee-rings and snaphooks shall have a minimum tensile strength of 5,000 pounds (22.2 kN). Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

Snaphooks shall be the self closing, self locking type.

Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:

- Directly to webbing, rope or wire rope;
- To each other;
- To a dee-ring to which another snaphook or other connector is attached;
- To a horizontal lifeline; or

- To any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.

On suspended scaffolds or similar work platforms with horizontal lifelines that may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.

Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.

Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds (22.2 kN).

When vertical lifelines are used, each employee shall be attached to a separate lifeline. During the construction of elevator shafts, two employees may be attached to the same lifeline in the hoistway, provided both employees are working atop a false car that is equipped with guardrails; the strength of the lifeline is 10,000 pounds [5,000 pounds per employee attached] (44.4 kN); and all other criteria specified in this paragraph for lifelines have been met.

Lifelines shall be protected against being cut or abraded.

Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less shall be capable of sustaining a minimum tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position. Self-retracting lifelines and lanyards which do not limit free fall distance to 2 feet (0.61 m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.

Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made from synthetic fibers.

Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as follows:

- As part of a complete personal fall arrest system which maintains a safety factor of at least two; and
- Under the supervision of a qualified person.

Personal fall arrest systems, when stopping a fall, shall:

- Limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt;
- Limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;
- Be rigged such that an employee can neither free fall more than 6 feet (1.8 m), nor contact any lower level;
- Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m); and,
- Have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

The attachment point of the body belt shall be located in the center of the wearer's back. The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined by a competent person to be undamaged and suitable for reuse.

The employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.

Personal fall arrest systems shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.

Body belts (to be used only as a positioning device) shall be at least one and five-eighths (1 5/8) inches (4.1 cm) wide.

Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in other subparts of this Part.

When a personal fall arrest system is used at hoist areas, it shall be rigged to allow the movement of the employee only as far as the edge of the walking/working surface.

5.5 POSITIONING DEVICE SYSTEMS

Positioning device systems and their use shall conform to the following provisions:

Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet (.9 m).

Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds (13.3 kN), whichever is greater.
Connectors used with positioning device systems shall be drop forged, pressed or formed steel, or made of equivalent materials. Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of this system.

Connecting assemblies shall have a minimum tensile strength of 5,000 pounds (22.2 kN)

Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contact of the snaphook keeper by the connected member. As of January 1, 1998, only locking type snaphooks shall be used.

Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:

- Directly to webbing, rope or wire rope;
- To each other;
- To a dee-ring to which another snaphook or other connector is attached;
- To a horizontal lifeline; or
- To any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional Disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.

Positioning device systems shall be inspected prior to each use for wear, damage, and other deterioration, and defective components shall be removed from service.

Body belts, harnesses, and components shall be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.

5.6 WARNING LINE SYSTEMS

Warning line systems and their use shall comply with the following provisions:

- The warning line shall be erected around all sides of the roof work area.
- When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge.
- When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.
- Points of access, materials handling areas, storage areas, and hoisting areas shall be connected to the work area by an access path formed by two warning lines.
- When the path to a point of access is not in use, a rope, wire, chain, or other barricade, equivalent in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or the path shall be offset such that a person cannot walk directly into the work area.
- Warning lines shall consist of ropes, wires, or chains, and supporting stanchions erected as follows:
- The rope, wire, or chain shall be flagged at not more than 6-foot (1.8 m) intervals with high-visibility material;
- The rope, wire, or chain shall be rigged and supported in such a way that its lowest point (including sag) is no less than 34 inches (.9 m) from the walking/working surface and its highest point is no more than 39 inches (1.0 m) from the walking/working surface;
- After being erected, with the rope, wire, or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (71 N) applied horizontally against the stanchion, 30 inches (0.8 m) above the walking/working surface, perpendicular to the warning line, and in the direction of the floor, roof, or platform edge;
- The rope, wire, or chain shall have a minimum tensile strength of 500 pounds (2.22 kN), and after being attached to the stanchions, shall be capable of supporting, without breaking, the loads applied to the stanchions described above; and
- The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.
- No employee shall be allowed in the area between a roof edge and a warning line unless the employee is performing roofing work in that area.
- Mechanical equipment on roofs shall be used or stored only in areas where employees are protected by a warning line system, guardrail system, or personal fall arrest system.

5.7 CONTROLLED ACCESS ZONES

Controlled access zones and their use shall conform to the following provisions.

When used to control access to areas where leading edge and other operations are taking place, the controlled access zone shall be defined by a control line or by any other means that restricts access. When control lines are used, they shall be erected not less than 6 feet (1.8 m) nor more than 25 feet (7.7 m) from the unprotected or leading edge, except when erecting precast concrete members.

When erecting precast concrete members, the control line shall be erected not less than 6 feet (1.8 m) nor more than 60 feet (18 m) or half the length of the member being erected, whichever is less, from the leading edge. The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge. The control line shall be connected on each side to a guardrail system or wall.

When used to control access to areas where overhand bricklaying and related work are taking place:

- The controlled access zone shall be defined by a control line erected not less than 10 feet (3.1 m) nor more than 15 feet (4.5 m) from the working edge.
- The control line shall extend for a distance sufficient for the controlled access zone to enclose all employees performing overhand bricklaying and related work at the working edge and shall be approximately parallel to the working edge.
- Additional control lines shall be erected at each end to enclose the controlled access zone.
- Only employees engaged in overhand bricklaying or related work shall be permitted in the controlled access zone.

Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:

- Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.
- Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m) [50 inches (1.3 m) when overhand bricklaying operations are being performed] from the walking/working surface.
- Each line shall have a minimum breaking strength of 200 pounds (.88 kN).

On floors and roofs where guardrail systems are not in place prior to the beginning of overhand bricklaying operations, controlled access zones shall be enlarged, as necessary, to enclose all points of access, material handling areas, and storage areas. On floors and roofs where guardrail systems are in place, but need to be removed to allow overhand bricklaying work or leading edge work to take place, only that portion of the guardrail necessary to accomplish that day's work shall be removed.

5.8 SAFETY MONITORING SYSTEMS

Safety monitoring systems and their use shall comply with the following provisions.

The employer shall designate a competent person to monitor the safety of other employees and the employer shall ensure that the safety monitor complies with the following requirements:

- The safety monitor shall be competent to recognize fall hazards;
- The safety monitor shall warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner;
- The safety monitor shall be on the same walking/working surface and within visual sighting distance of the employee being monitored;
- The safety monitor shall be close enough to communicate orally with the employee; and
- The safety monitor shall not have other responsibilities which could take the monitor's attention from the monitoring function.

Mechanical equipment shall not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs.

No employee, other than an employee engaged in roofing work [on low-sloped roofs] or an employee covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system.

Each employee working in a controlled access zone shall be directed to comply promptly with fall hazard warnings from safety monitors.

5.9 COVERS

Covers for holes in floors, roofs, and other walking/working surfaces shall meet the following requirements:

- Covers located in roadways and vehicular aisles shall be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.
- All other covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.
- All covers shall be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.
- All covers shall be color coded or they shall be marked with the word "HOLE" or "COVER" to provide warning of the hazard. Note: This provision does not apply to cast iron manhole covers or steel grates used on streets or roadways.

5.10 PROTECTION FROM FALLING OBJECTS

Falling object protection shall comply with the following provisions:

- Toeboards, when used as falling object protection, shall be erected along the edge of the overhead walking/working surface for a distance sufficient to protect employees below.
- Toeboards shall be capable of withstanding, without failure, a force of at least 50 pounds (222 N) applied in any downward or outward direction at any point along the toeboard.
- Toeboards shall be a minimum of 3 1/2 inches (9 cm) in vertical height from their top edge to the level of the walking/working surface. They shall have not more than 1/4 inch (0.6 cm) clearance above the walking/working surface. They shall be solid or have openings not over 1 inch (2.5 cm) in greatest dimension.

Where tools, equipment, or materials are piled higher than the top edge of a toeboard, paneling or screening shall be erected from the walking/working surface or toeboard to the top of a guardrail system's top rail or midrail, for a distance sufficient to protect employees below.

Guardrail systems, when used as falling object protection, shall have all openings small enough to prevent passage of potential falling objects.

During the performance of overhand bricklaying and related work:

- No materials or equipment except masonry and mortar shall be stored within 4 feet (1.2 m) of the working edge.
- Excess mortar, broken or scattered masonry units, and all other materials and debris shall be kept clear from the work area by removal at regular intervals.

During the performance of roofing work:

- Materials and equipment shall not be stored within 6 feet (1.8 m) of a roof edge unless guardrails are erected at the edge.
- Materials which are piled, grouped, or stacked near a roof edge shall be stable and self-supporting.

Canopies, when used as falling object protection, shall be strong enough to prevent collapse and to prevent penetration by any objects which may fall onto the canopy.

5.11 FALL PROTECTION PLANS

This option is available only to employees engaged in leading edge work, precast concrete erection work, or residential construction work who can demonstrate that it is infeasible or it creates a greater hazard to use conventional fall protection equipment. The fall protection plan must conform to the following provisions.

The fall protection plan shall be prepared by a qualified person and developed specifically for the site where the leading edge work, precast concrete work, or residential construction work is being performed and the plan must be maintained up to date. Any changes to the fall protection plan shall be approved by a qualified person. A copy of the fall protection plan with all approved changes shall be maintained at the job site. The implementation of the fall protection plan shall be under the supervision of a competent person.

The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) are infeasible or why their use would create a greater hazard.

The fall protection plan shall include a written discussion of other measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems. For example, the employer shall discuss the extent to which scaffolds, ladders, or vehicle mounted work platforms can be used to provide a safer working surface and thereby reduce the hazard of falling.

The fall protection plan shall identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones and operated accordingly.

Where no other alternative measure has been implemented, a safety monitoring system shall be implemented.

The fall protection plan must include a statement which provides the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones.

In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) an investigation of the circumstances of the fall or other incident shall be performed to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incidents.

6.0 REFERENCES

- 29 CFR 1926 Subpart M –
- http://www.osha-slc.gov/OshStd_toc/OSHA_Std_toc_1926_SUBPART_M.html

7.0 ATTACHMENTS

None

8.0 RECORD KEEPING

- Employee training certifications
- Inspections of Safety Nets (when applicable)
- Fall protection plans (when applicable)

9.0 EQUIPMENT

- Personal fall arrest system components

Attachment F

Scope A- Lower Manhattan Cleaning Procedures

World Trade Center Indoor Dust Cleaning Program

Scope of Work A

Application: These procedures apply to the cleaning of minimal dust accumulations (light coating). If a visual inspection indicates the presence of significant accumulations of dust and/or debris from the collapse of the WTC in residences or common spaces (including elevator shafts), Scope B procedures shall be applied (refer to Scope of Work B). Residents may be present during Scope A cleaning procedures.

1. Cleaning of Common Spaces

   Common spaces including hallways, stairways and the interior of elevator cars shall be cleaned, if requested by the building owner. The Monitoring Contractor in consultation with EPA, or EPA's designee will evaluate and determine if other common areas including utility rooms, laundry rooms, compactor rooms, elevator shafts require cleaning. Work will begin from the entrance and continue through all common spaces in an orderly fashion. A detailed description of the minimum cleaning requirements for common space is as follows:

   a. Vacuuming will begin with the ceiling, continue down the walls and include floors. A vacuum equipped with a motorized agitator bar will be used to vacuum carpets.
   b. Impermeable walls and floors will be wet wiped, after consultation with and approval by owner. Wet wiping will not be conducted if it is determined that it would cause damage to the surface.
   c. Carpets will be cleaned with a water extraction cleaner after consultation with and approval by owner. After cleaning, red rosin construction paper will be applied to high traffic areas to protect carpets from soiling. Water extraction cleaning will not be conducted if it would cause damage to the carpet.
   d. Surfaces that are not cleaned by wet methods (wet wiping and water extraction cleaner) will be vacuumed two times.

2. Cleaning of HVAC Systems

   HVAC systems that are determined by the Monitoring Contractor to be impacted by dust or debris from the collapse of the World Trade Center will be cleaned in accordance with the site-specific scope of work prepared by the Monitoring Contractor and approved by EPA. HVAC systems cleaning, if warranted, shall be completed prior to the initiation of the cleaning of common space or residences within an affected building. In the event that the HVAC system for an entire building requires cleaning, a separate, site specific contract will be awarded by DEP for this work. If only a portion of an HVAC system requires cleaning, then the cleaning contractor will conduct the cleaning utilizing specialized labor trained and experienced in duct cleaning.

   HVAC cleaning shall be conducted in accordance with National Air Duct Cleaners

Association (NADCA) General Specification for the Cleaning of Commercial Heating, Ventilating and Air Conditioning Systems and the NADCA Assessment, Cleaning and Restoration Standard (ACR 2002). Verification of the effectiveness of HVAC system cleaning will be determined by the Monitoring Contractor. If dust or other contaminants are evident through visual inspection, those portions of the system where dust or other contaminants are present shall be re-cleaned and subjected to re-inspection for cleanliness**.** If the cleaning contractor is not a member of the NADCA, a subcontractor that is a member may perform this portion of the work.

3. Cleaning of Residential Spaces

Residences will be cleaned using HEPA vacuums, water extraction cleaners and wet wiping as described below. Surfaces to be cleaned include but are not limited to walls, floors, ceilings, ledges, trims, furnishings, appliances, equipment, etc. Encapsulating agents shall not be applied. Dry sweeping is prohibited. The cleaning contractor will not clean inside of drawers, cabinets, breakfronts and similar enclosed storage or display pieces, however, the exterior of these pieces will be cleaned. Cleaning of clothing and accessories (handbags, shoes etc.) shall be the responsibility of the occupant. A detailed description of the minimum cleaning requirements is as follows:

a. Terraces, balconies, exterior window sills, window wells and window guards that are accessible from the interior of the dwelling, shall be cleaned.
b. Interior windows, screens, window sills and window guards will be cleaned
c. Vacuuming will begin with the ceiling, continue down the walls and include the floor. A vacuum equipped with a motorized agitator bar will be used to vacuum carpets.
d. Impermeable walls and floors will be wet wiped, after consultation with and approval by owner/resident. Wet wiping will not be conducted if it is determined that it would cause damage to the surface.
e. Carpets will be cleaned with a water extraction cleaner after consultation with and approval by owner/resident. After cleaning, red rosin construction paper will be applied to high traffic areas to protect carpets from soiling. Water extraction cleaning will not be conducted if it would cause damage to the carpet.
f. Fabric covered furniture will be vacuumed and then cleaned with a water extractions cleaner after consultation with and if approved by owner/resident. Water extraction cleaning will not be conducted if it would cause damage to the furniture.
g. All surfaces including but not limited to floors, walls, curtains, fabric window treatments, upholstery and other materials that are not cleaned by wet methods (wet wiping and water extraction cleaning) will be HEPA vacuumed two times. Fabric covered furniture that is not cleaned by wet methods will be vacuumed using an appropriate brush attachment.
h. Intake/discharge registers of HVAC systems (if present) will be removed/cleaned. The first foot of duct work will also be vacuumed; then the register will be reinstalled and covered with a layer of 6 mil polyethylene sheeting.
i. Window and room air conditioners will be vacuumed, wet wiped and removed

from their housing to allow access to internal portions of the air conditioner. The internal portions of the air conditioner and housing will then be vacuumed. Filters will be vacuumed and reinstalled. Air conditioners will be reassembled and reinstalled after cleaning.

j. Paperwork and books will be HEPA-vacuumed.
k. Electrical outlets will be vacuumed.
l. Appliances such as refrigerators and stoves will be cleaned and moved. The floor footprint of the appliances will be cleaned and the appliance will be reinstalled in their original positions.
m. Refrigerator cooling tubes will be brushed and vacuumed.
n. The first foot of all exhaust duct work (including stove, dryer and bathroom vents) where accessible, will be vacuumed. Exhaust fans will be vacuumed and wiped
o. Unobstructed closet floors will be vacuumed.
p. Solid objects (electrical equipment, exercise equipment, etc.) will be wet wiped, moved to allow cleaning of the underlying surface and will be returned to their original location.
q. Dishwasher toe plates will be removed and the floor beneath the appliance will be cleaned.
r. Baseboard heaters will be cleaned. Protective covers on finned radiant heaters and baseboard heaters will be removed to expose heat elements. Fins are to be brushed and vacuumed to remove dust.
s. All cleaning equipment will be vacuumed and/or wet wiped after completion of the cleaning and before removal from the work area.

4. HEPA air filtration devices (AFDs) will run continuously during all cleaning activities, as appropriate given site conditions. AFDs shall be installed and operated to provide a minimum of one air change every 15 minutes. Make up air should be derived from a non-impacted source (i.e. open window or common spaces previously cleaned).

5. A minimum of one asbestos supervisor shall be present in each building during work.

6. A Cleaning Checklist (to be developed by EPA) will be completed by the cleaning contractor as tasks are completed to document the progress of the cleaning.

7. The cleaning contractor shall notify the monitoring contractor immediately upon completion of the cleaning. The Monitoring Contractor will conduct a thorough visual inspection to verify the absence of visible dust accumulations. If dust is observed the cleaning contractor will re-clean as necessary at no additional cost.

8. Air sampling shall be performed by the Monitoring Contractor after the area is free of dust accumulations as determined by the Monitoring Contractor. The residence will be re-cleaned and re-tested if the clean-up criteria of 0.0009 fibers/cc (PCME measured by TEM) is not achieved or if determined necessary by EPA. This clean-up criterion may be reevaluated and revised, if determined necessary based on field conditions and analytical

limitations.

9. Any damage or loss that occurs during cleaning is the responsibility of the cleaning contractor. The cleaning contractor is not responsible for damage or loss caused by the acts of third parties not involved in the cleaning activities.

10. Owner/residents may identify and tag certain furnishings (e.g. carpets and fabric covered furniture) for disposal rather than cleaning. Disposal of residents' personal property shall not occur without prior written authorization by the owner.

11. Disposal of all wastes generated during the cleaning shall be the responsibility of the contractor. All waste generated shall be treated as asbestos-containing material (ACM). Transportation and disposal of generated waste shall be in compliance with all applicable rules and regulations.

12. If mold or peeling, flaking or chalking paint is observed in the work area, the cleaning contractor shall immediately contact the Monitoring Contractor.

13. If in-place materials suspected to contain asbestos are observed the Cleaning Contractor shall immediately notify the Monitoring Contractor. The Monitoring Contractor will evaluate the condition of the material to identify damaged, deterioration, delamination, etc. The Cleaning Contractor shall wrap suspect ACM that is in good or excellent condition with 6-mil polyethylene sheeting and seal airtight with duct tape or equivalent method prior to cleaning or air monitoring.

14. In the event that damaged, deteriorated, delaminated, etc. suspected ACM is observed, the Cleaning Contractor will notify the Monitoring Contractor. Cleaning or air monitoring will not proceed in areas where such suspected ACM is observed until instructed otherwise.

Attachment H

Synopsis of Cleaning Methods by Building Area and Fact Sheets

Basement Areas

Elevator Shaft and Motor Room, Trash Compactor Room, Fire Equipment Room.

Cleaning Method: Test 4A – Surface cleaning using industrial HEPA filtered vacuums. Air filtration using an air filtration device (AFD).
Equipment Used: Nilfisk™ Vacuum (CFM 127)
Filtration status: HEPA
Common Area Size: 642 sq. ft.; 5,136 cu. ft. (Total of all areas, elevator shaft not included.)
AFD Status: Required
AFD specification when required: 400/600 cfm
Unit air exchange rate: 12.8 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Description: Basement areas include: A trash compactor room, an equipment room containing the building fire protection controls to the ceiling sprinkler system, a motor control room for the elevator, and access to the elevator shaft containing the elevator compartment, as well as a common room which provided access to all the above areas. These basement areas are accessed through an outside stairwell located in the Cedar Street sidewalk.

The floors are constructed of concrete. The walls are composed of painted concrete block or brick. The elevator shaft floor is compacted soil. The shaft walls are composed of mortar and brick. Floor joists and decking of the first floor constitute the ceiling of the basement areas. All basement areas appeared to have been hose washed. No significant dust was present. With the exception of the ceiling materials, no porous materials were present. Debris such as cardboard boxes, used hydraulic oil, rags, discarded elevator parts, and dead rodents were disposed of prior to cleanup. The elevator shaft was inspected from the fifth floor to the below grade location when access was provided by the elevator contractor. The vertical wall surfaces of the shaft were constructed of brick and mortar and presented no visible dust down to the second floor. The lower section in the elevator shaft contained sand accumulation from natural deterioration. The exposed brick under the elevator framework, to a height of approximately six feet from the bottom of the shaft, was encrusted with mud, indicating a high water line some time during the building history.

Difficult Areas Encountered:

None

Lemongrass Grill

1st Floor and basement, Cedar & Liberty Streets

Cleaning Method: Test 4A - Surface cleaning using industrial HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all horizontal surfaces. **Test 4D** – A/C Duct Cleaning
Equipment Used: Nilfisk™ Vacuum (CFM 127), AFD
Filtration Status: HEPA
Unit Size: 1st floor: 2,451 sq. ft.; 33,134 cu. ft.; basement: 1,080 sq. ft.; 9,720 cu. ft.
AFD Status: Required
AFD Specification: 1000/2000 cfm
Unit Air Exchange Rate: 1st floor: 16.56 min @ 2,000 cfm; basement: 9.72 min @ 1000 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: The restaurant encompasses approximately 3,500 square feet. It has entrances on both Cedar and Liberty Streets. The establishment is comprised of two floors. The first floor is at street level and was used for food service and customer dining. The lower level (basement) was used for food preparation and storage. Gypsum ceilings and hard wood floors are present throughout the dining area. Wood floor joists from the first floor constitute the basement ceiling. The floor is concrete. The dining area is decorated with typical Thai accents consisting of bamboo, and thatch. Grills, ovens, refrigerators, tables, chairs and a bar are on the first floor. The basement contains a walk-in refrigerator, freezers, preparation table, a dishwasher and dry good storage. The establishment's HVAC system is suspended from the ceiling of the first floor. All exterior windows facing the WTC were blown inward depositing significant amounts of dust on all surfaces of the first floor. Minimal dust was present in the basement. Prior to cleaning all tables, chairs, containerized food and accent decorations were disposed of. Restaurant equipment including woks, utensils, pots, pans, and flatware were vacuumed and washed. Bottles of liquor were washed and removed by the owner.

The establishment has one HVAC system. This system provides heating and cooling to the dining area via solid metal supply ducts. The system's return is located in the dining area. A second system provides outdoor makeup air to the cooking stations. Cleaning of this system was performed in accordance with the site-specific HVAC cleaning procedures prepared by Covino Environmental Associates Inc.

<u>Unit 5C</u> - 5th floor, Northwest corner, Liberty Street

Cleaning Method: Test 3A - Surface cleaning with industrial HEPA filtered vacuums. Area air filtration not required. Soap and water wet wipe of all horizontal surfaces.
Test 3B - Surface cleaning with industrial HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Nilfisk™ Vacuum (CFM 127)
Filtration Status: HEPA
Unit Size: 968 sq. ft.; 10,648 cu. ft.
AFD Status: Not Required
AFD Specification: N/A
Unit Air Exchange Rate: 26.62 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 968 sq. ft. loft facing the WTC site has three bedrooms. The unit has hardwood floors and no carpeting. All exterior windows had been blown inward. Significant dust and debris had accumulated in the dwelling. All personal items, with the exception of fabric covered furniture, were disposed of prior to cleaning.

Difficult Areas Encountered:

- Hydronic baseboard heating units
- Boarded up window openings
- Cracks and crevices
- The fourth cleaning was necessary as a result of sawdust and debris deposited in areas previously cleaned, by a carpentry crew installing new hardwood flooring. This cleaning was conducted using the Test 3B cleaning method.

Unit 5A - 5th floor, Northeast corner, Cedar Street

Cleaning Method: Test 3B - Surface cleaned using industrial HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Nilfisk^{TM} Vacuum (CFM 127) AFD
Filtration Status: HEPA
Unit Size: 1,404 sq. ft.; 15,444 cu. ft.
AFD Status: Required
AFD Specification: 400/600 cfm
Unit Air Exchange Rate: 25.74 min @ 600 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 1,404 sq. ft. loft faces Cedar Street and has one bedroom. The unit has hardwood floors and no carpeting. It had one damaged window. The dwelling was fully furnished and had many personal items all of which were vacuumed, bagged and retained for the tenant. Minimal dust was present in the dwelling except for baseboard heating elements and window sash frames.

Difficult Areas Encountered:

- Owner's possessions required significant effort
- Exterior windows and sashes
- Hydronic baseboard heating units
- Cracks and crevices

Unit 4D - 4th Floor, Northeast corner, Liberty Street

Cleaning Method: Test 2A - Surface cleaning using HEPA filtered vacuums. Air filtration not required. Soap and water wet wipe of all horizontal surfaces
Equipment Used: Craftsman® Shop Vacuum, Hoover® Upright Vacuum
Filtration Status: HEPA
Unit Size: 968 sq. ft.; 9,196 cu. ft.
AFD Status: Not Required
AFD Specifications: N/A
Unit Air Exchange Rate: 22.99 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 968 sq. ft. open loft faces the WTC site. The unit has hardwood floors and no carpeting. All exterior windows had been blown inward. Significant dust had accumulated in the dwelling. All personal possessions to be retained by the tenant were vacuumed and bagged.

Difficult Areas Encountered:

- Exterior windows and sashes
- Hydronic baseboard heating units
- Boarded window openings
- Cracks and crevices
- Tenant possessions required special attention

<u>Unit 4C</u> - 4th Floor, Northwest corner, Liberty Street

Cleaning Method: Test 1A - Surface cleaning using non-HEPA filtered vacuums. Area air filtration not required. Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Eureka® Upright Vacuum, Craftsman® Shop Vacuum
Filtration Status: No HEPA
Unit Size: 655 sq. ft.; 6,222 cu. ft.
AFD Status: Not Required
AFD Specification: N/A
Unit Air Exchange Rate: 15.55 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 655 sq. ft. open loft faces the WTC site. The unit has hardwood flooring and no carpeting. All exterior windows had been blown inward. Significant dust had accumulated in the dwelling. All personal possessions to be retained by the tenant were vacuumed and bagged.

Difficult Areas Encountered:

- Exterior windows and sashes
- Hydronic baseboard heating units
- Boarded window openings
- Cracks and crevices

<u>Unit 4B</u> - 3rd Floor, Southeast corner, Cedar Street

Cleaning Method: Test 2B - Surface cleaning using HEPA filtered vacuums. Air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Ridgid® Shop Vacuum, Hoover® Upright Vacuum, AFD.
Filtration Status: HEPA
Unit Size: 968 sq. ft.; 10,164 cu. ft.
AFD Status: Required
AFD Specification: 400/600 cfm
Unit Air Exchange Rate: 22.99 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 968 sq. ft. loft facing Cedar Street has four bedrooms. The unit has hardwood floors and no carpeting. All exterior windows were intact. The bedrooms were temporary structures built of particle board which were dismantled prior to cleaning. Minimal dust was present in the dwelling, except for baseboard heating elements and window sash frames.

Difficult Areas Encountered:
- Exterior windows and sashes
- Hydronic baseboard heating units
- Cracks and crevices

<u>Unit 4A</u> - 4th Floor, Southeast corner, Cedar Street

Cleaning Method: Test 2A - Surface cleaning using HEPA filtered vacuums. Area air filtration not required. Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Hoover® Upright Vacuum, Craftsman® Shop Vacuum
Filtration Status: HEPA
Unit Size: 1,368 sq. ft.; 12,996 cu. ft.
AFD Status: Not Required
AFD Specification: N/A
Unit Air Exchange Rate: 21.66 min @ 600 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 1,368 sq. ft. open loft faces Cedar Street. The unit has hardwood floors and no carpeting. All exterior windows were intact. Minimal dust was present in the dwelling, except for the baseboard heating elements and window sash frames. All personal and business possessions to be retained by the tenant were vacuumed and bagged.

Difficult Areas Encountered:

- Dwelling used as a business for dressmaking, which resulted in cleaning of excessive amounts of personal and business related items.
- Exterior windows and sashes
- Hydronic baseboard heating units
- Appliances dirty with encrusted grease

<u>Unit 3D</u> - 3rd floor, Northeast corner, Liberty Street

Cleaning Method: Test 1A - Surface cleaning using non-HEPA filtered vacuums. Area air filtration not required. Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Hoover® Upright Vacuum, Ridgid® Shop Vacuum
Filtration Status: No HEPA
Unit Size: 968 sq. ft.; 10,164 cu. ft.
AFD Status: Not Required
AFD Specification: N/A
Unit Air Exchange Rate: 25.41 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 968 sq. ft. loft with three bedrooms faces the WTC site. The unit has hardwood floors and no carpeting. All exterior windows had been blown inward. Significant dust had accumulated in the dwelling. All personal items, with the exception of fabric-covered furniture and three pieces of hardwood furniture, were disposed of prior to cleaning.

Difficult Areas Encountered:

- Hydronic baseboard heating units
- Boarded window openings
- Cracks and crevices

<u>Unit 3C</u> - 3rd floor, Northwest corner, Liberty Street

Cleaning Method: Test 1A - Surface cleaning using non-HEPA filtered vacuums. Area air filtration not required. Soap and water wet wipe of all *horizontal and vertical* surfaces.
Test 3B - Surface cleaning with industrial HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all *horizontal and vertical* surface.
Equipment Used: Eureka® Upright Vacuum, Craftsman® Shop Vacuum
Filtration Status: No HEPA
Unit Size: 655 sq. ft.; 6,877 cu. ft.
AFD Status: Not Required
AFD Specification: N/A
Unit Air Exchange Rate: 17.19 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 655 sq. ft. loft with two bedrooms faces the WTC site. The unit has hardwood floors and no carpeting. All exterior windows had been blown inward. Significant dust had accumulated in the dwelling. All personal items with, the exception of fabric-covered furniture, were disposed of prior to cleaning.

Difficult Areas Encountered:

- Hydronic baseboard heating units
- Boarded window openings
- Cracks and crevices

<u>Unit 3B</u> - 3rd floor, Southwest corner, Cedar Street

Cleaning Method: Scope A - Lower Manhattan Cleaning Procedure - Surface cleaning using industrial HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all *horizontal and vertical* surfaces.
Equipment Used: Nilfisk™ Vacuum (CFM 127), AFD
Filtration Status: HEPA
Unit Size: 968 sq. ft.; 10,164 cu. ft.
AFD Status: Required
AFD Specification: 400/600 cfm
Unit Air Exchange Rate: 25.41 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 968 sq. ft. loft facing Cedar Street has three bedrooms. All personal items including clothing, kitchenware, books, furniture, and electronic devices were cleaned since the tenants plan to reoccupy the unit. Mattresses and carpets were disposed of. All exterior windows were intact. Minimal dust was present in the space, except for baseboard heating elements and window sash frames.

Difficult Areas Encountered:

- Exterior windows and sashes
- Hydronic baseboard heating units
- Cleaning of small items including CD's, tapes, clothes, shoes, kitchenware, etc.
- Cracks and crevices

Unit 2B - 2nd floor, Southwest corner, Cedar Street

Cleaning Method: Test 3A - Surface cleaning using industrial HEPA filtered vacuums. Area air filtration not required. Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Nilfisk™ Vacuum (CFM 127)
Filtration Status: HEPA
Unit Size: 946 sq. ft.; 9,460 cu. ft.
AFD Status: Not Required
AFD Specifications: N/A
Unit Air Exchange Rate: 23.65 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 946 sq. ft. loft facing Cedar Street has two bedrooms. The unit contains hardwood floors and no carpeting. All exterior windows were intact. Minimal dust was present in the dwelling except for baseboard heating elements and window sash frames. All personal items, with the exception of fabric-covered furniture, were disposed of prior to cleaning.

Difficult Areas Encountered:

- Exterior windows and sashes
- Hydronic baseboard heating units
- Cracks and crevices

Unit 2A – 2nd floor, Southeast corner, Cedar Street

Cleaning Method: Test 1B - Surface cleaning using non-HEPA filtered vacuums. Area air filtratation utilizing an air filtration device (AFD). Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Hoover® Upright, Ridgid® Shop Vacuum, AFD.
Filtration Status: No HEPA
Unit Size: 1,335 sq. ft.; 13,350 cu. ft.
AFD Status: Required
AFD Specification: 400/600 cfm
Unit Air Exchange Rate: 22.25 min @ 600 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 1,335 sq. ft. loft facing Cedar Street has two bedrooms. The unit has hardwood floors and no carpeting. All exterior windows were intact. Minimal dust was present in the dwelling, except for baseboard heating elements and window sash frames. All personal items were disposed of, with the exception of fabric-covered furniture and kitchenware, prior to cleaning.

Difficult Areas Encountered:

- Exterior windows and sashes
- Hydronic baseboard heating units
- Cracks and crevices

<u>Unit 3A</u> - 3rd floor, Southeast corner, Cedar Street

Cleaning Method: Test 2B - Surface cleaning using HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Eureka® Upright, Craftsman® Shop Vacuum and AFD.
Filtration Status: HEPA
Unit Size: 1,368 sq. ft.; 14,364 cu. ft.
AFD Status: Required
AFD Specification: 400/600 cfm
Unit Air Exchange Rate: 23.94 min @ 600 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 1,368 sq. ft. loft facing Cedar Street is utilized as office space for the Baldwin Realty Company. Carpeting covers half the floor space. The remainder is hardwood flooring. All exterior windows were intact. Minimal dust was present in the space, except for baseboard heating elements and window sash frames. The space is furnished with office equipment including desks, chairs, file cabinets, and tables.

Difficult Areas Encountered:

- Exterior windows and sashes
- Recessed lighting
- Fireplace interior
- Cracks and crevices
- Hydronic baseboard heating units

Synopsis of Cleaning Methods by Building Area

Residential Apartments and Common Areas

Unit 2A. Test: 1B- Ridgid® shop vacuum, Hoover® upright, AFD, no HEPA. Soap and water wet wipe of all horizontal surfaces. This 1,335 sq. ft. loft with one bedroom faces Cedar Street. Hardwood floors, no carpet, no windows blown in, all personal items disposed except for a couch and chairs. Minimal dust accumulation in dwelling except for baseboard heating elements.

Unit 2B. Test: 3A- Industrial HEPA-filtered vacuum, no AFD. Soap and water wet wipe of all horizontal surfaces. This 946 sq. ft. loft with 2 separate bedrooms faces Cedar Street. Hard wood floors, no carpet, no windows blown in, all personal items except a couch, disposed of prior to cleanup. Minimal dust accumulation in dwelling except for baseboard heating elements.

Second Floor Hallway. Test: 4A- Industrial HEPA-filtered vacuum, AFD. Test: 4B- Soap and water wet wipe of all *horizontal and vertical* surfaces (this hallway, ceiling and floors only). Vinyl tiles on floor, sheet rock walls covered with wall paper glue, painted sheet rock ceiling. Minimal dust accumulation.

Unit 3A. Test: 2B- Craftsman® shop vacuum, Eureka® upright, HEPA and AFD. Soap and water wet wipe of all horizontal surfaces. This 1,368 sq. ft. loft (utilized as office space for Baldwin Reality) faces Cedar Street. Carpet is present on half the floor space; the remainder is hardwood floors. No windows blown in. The area is furnished with 10 - 12 wood desks, files and office equipment. Minimal dust accumulation in dwelling.

Unit 3B. Scope A- Lower Manhattan Cleaning Procedure: Industrial HEPA-filtered vacuums, AFD. Soap and water wet wipe of all *horizontal and vertical* surfaces. This 968 sq. ft. loft with three bedrooms faces Cedar Street. Tenants plan to reoccupy dwelling, therefore personal items except for mattresses, carpet and magazines remained for cleaning. No windows blown in, hardwood floors, area completely furnished, tenants clothes present. Minimal dust accumulation in dwelling except for baseboard heating units.

Unit 3C. Test: 1A- Craftsman® shop vacuum, Eureka® upright, no HEPA, no AFD. Soap and water wet wipe of all *horizontal and vertical* surfaces. Test: 3B- Industrial HEPA-filtered vacuum, AFD, and soap and water wet wipe of all *horizontal and vertical* surfaces. This 655 sq. ft. loft with two bedrooms faces ground zero. Hardwood floors, windows blown in, no carpet, nearly all personal items disposed of prior to clean up. Significant accumulation of dust in dwelling.

Unit 3D. Test: 1A- Ridgid® shop vacuum, Hoover® upright, no HEPA, no AFD. Soap and water wet wipe of all horizontal surfaces. This 968 sq. ft. loft with three bedrooms faces ground zero. Hardwood floors, windows blown in, no carpet, all personal items except for three pieces of hardwood furniture disposed of. Significant accumulation of dust in dwelling.

Third Floor Hallway. Test: 4A- Industrial HEPA-filtered vacuums, AFD. Test: 4B- Soap and water wet wipe of all *horizontal and vertical* surfaces (this hallway, ceiling only). Plywood floors, sheet rock walls covered with wall paper glue, painted sheet rock ceiling. Minimal dust accumulation.

Unit 4A. Test: 2A- Craftsman® shop vacuum, Hoover® upright, HEPA, no, AFD. Soap and water wet wipe of all horizontal surfaces. This 1,368 sq. ft. open loft, faces Cedar Street. Hardwood floors, no windows blown in, all personal items removed prior to cleanup. Minimal dust accumulation in dwelling except for baseboard heating units.

Unit 4B. Test: 2B- Ridgid® shop vacuum, Hoover® upright, HEPA, AFD. Soap and water wet wipe of all horizontal surfaces. This 968 sq. ft. loft with 4 bedrooms faces Cedar Street. Personal items cleaned then bagged. Hardwood floors, no blown in windows. Minimal dust accumulation in dwelling except for baseboard heating units.

Unit 4C. Test: 1A- Craftsman® shop vacuum, Eureka® upright, no HEPA, no AFD. Soap and water wet wipe of all horizontal surfaces. This 655 sq. ft. open loft faces ground zero. Personal items cleaned then bagged. No carpet, hardwood floors, windows blown in. Significant accumulation of dust in dwelling.

Unit 4D. Test: 2A- Ridgid® shop vacuum, Eureka® upright, HEPA, no AFD. Soap and water wet wipe of all horizontal surfaces. This 968 sq. ft. open loft faces ground zero. Personal items cleaned then bagged. Hardwood floors, windows blown in. Significant accumulation of dust in dwelling.

Fourth Floor Hallway. Test: 4A- Industrial HEPA-filtered vacuum, AFD. Test: 4B- Soap and water wet wipe of all *horizontal and vertical* surfaces (this hallway, ceiling only). Plywood floors, sheet rock walls covered with wallpaper glue, painted sheet rock ceiling. Minimal dust accumulation.

Unit 5A. Test: 3B- Industrial HEPA-filtered vacuum, AFD. Soap and water wet wipe of all horizontal surfaces. This 1,404 sq. ft. loft with one bedroom faces Cedar Street. Personal items cleaned then bagged. Hardwood floors, no carpet, one blown in window. Minimal dust accumulation in dwelling except for baseboard heating units.

Unit 5C. Test: 3A- Industrial HEPA-filtered vacuum, no AFD. Soap and water wet wipe of all horizontal surfaces. Test: 3B- Industrial HEPA-filtered vacuum, AFD. Soap and water wet wipe of all horizontal surfaces. This 968 sq. ft. loft with three bedrooms faces ground zero. Hardwood floors, no carpet, all personal items removed, windows blown in. Significant accumulation of dust in dwelling.

Unit 5D. Test: 3B- Industrial HEPA-filtered vacuum, AFD. Soap and water wet wipe of all horizontal surfaces. This 1,024 sq. ft. open loft faces ground zero. All personal items removed prior to cleaning. Windows blown in, hardwood floors, no carpet. Significant accumulation of dust in dwelling.

Fifth Floor Hallway. Test: 4A- Industrial HEPA-filtered vacuum, AFD. Test: 4B- Soap and water wet wipe of all *horizontal and vertical* surfaces (this hallway, ceiling only). Plywood floors, sheet rock walls covered with wallpaper glue, painted sheet rock ceiling. Minimal dust accumulation.

Liberty Street Staircase. Test: 4A- Industrial HEPA-filtered vacuum, AFD. Test: 4B- Soap and water wet wipe of all *horizontal and vertical* surfaces. Cast concrete steps/landings, sheet rock walls and ceiling. All surfaces covered with gloss paint. Minimal dust accumulation.

Cedar Street Staircase. Test: 4A- Industrial HEPA-filtered vacuum, AFD. Test: 4B- Soap and water wet wipe of all *horizontal and vertical* surfaces. Wood steps/landings, sheet rock walls and ceiling. Floor covered with vinyl tiles, walls and ceilings covered with gloss paint. Minimal dust accumulation.

Commercial Units

Chiropractor's Office. Test: 4A- Industrial HEPA-filtered vacuums, AFD. Test: 4B- Soap and water wet wipe of all *horizontal and vertical* surfaces. Test: 4C- Carpet cleaning using a commercial carpet wet vacuum with warm water. Test: 4D- A/C Duct Cleaning. Test: 4E- Cleaning of bathroom tile floor and desk top wet wipe using water only. This 716 sq. ft. office space with 4 examination rooms faces ground zero. All front windows were blown in. Excessive amounts of dust present on all horizontal and vertical surfaces. Floor areas covered with wall-to-wall carpeting; suspended ceiling covered with fibrous tiles. A two foot high void space was above ceiling. Ceiling tiles, flexible ventilation ducts and office equipment were removed and disposed of prior to cleaning. Void space contained HVAC system, and wood floor joist system for third floor apartment. This area contained WTC-related and non-WTC-related dust. The space was extremely difficult to clean due to the present of electrical wires, recessed lighting fixtures, sprinkler systems and the dry friable nature of the wood support system.

Mattress Store. Test: 4A- Industrial HEPA-filtered vacuums, AFD. Test: 4B-Soap and water wet wipe of all *horizontal and vertical* surfaces. Test: 4C- Carpet cleaning using a commercial carpet wet vacuum with a warm water shampoo solution. Test: 4D- A/C Duct Cleaning.
Test: 4E- Cleaning of vinyl floor tile and window ledge wet wipe using water only. This 968 sq. ft. open space faces ground zero. All front windows blown in, excessive amounts of dust present on all horizontal surfaces. Floor areas covered with wall-to-wall carpeting and approximately 25 display mattresses and box springs. Ceiling tiles, mattresses, office equipment and flexible ventilation ducts removed and disposed of prior to cleanup. Void space above suspended ceiling exhibited same characteristics as in the Chiropractor's office.

Basement

Elevator Shaft/Compactor Room. Test: 4A- Industrial HEPA-filtered vacuum, AFD. Soil floor in elevator shaft, concrete floor in compactor room. Cinderblock walls, exposed floor joists.

Commercial Units (Non-Study)

Lemongrass Grill. Test: 4A-Industrial HEPA-filtered vacuum, AFD. Test 4D- A/C Duct Cleaning. This 3,500 sq. ft. unit has two floors. The first floor is at street level with entrances from both Liberty and Cedar Streets. The lower level (basement) was used for food preparation and storage. Gypsum ceilings and hard wood floors are present throughout the dining area. Wood floor joists from the first floor constitute the basement ceiling. The floor is concrete. The dining area is decorated with typical Thai accents consisting of bamboo and thatch. Grills, ovens, refrigerators, tables, chairs and a bar are on the first floor. The basement contains a walk-in refrigerator, freezers, preparation table, a dishwasher and dry good storage. The establishment's HVAC system is suspended from the ceiling of the first floor. All exterior windows facing the WTC were blown inward, depositing significant amounts of dust on all surfaces of the first floor. Minimal dust was present in the basement. Prior to cleaning, all tables, chairs, containerized food and accent decorations were disposed. Restaurant equipment including woks, utensils, pots, pans and flatware were vacuumed and washed.

The Food Exchange. Test: 4A- Industrial HEPA-filtered vacuum, AFD. Test 4D- A/C Duct Cleaning. This 5,000 sq. ft. unit has three floors. The first floor is at street level with entrances from both Liberty and Cedar Streets. This floor was used for food service and customer dining. The lower level (basement) was used for food preparation and storage. The third level (sub-basement) was used for storage of restaurant equipment. Ceramic tile covers the floor area in both the dining room and the basement. The floor of the sub-basement is packed soil. All exterior windows had been blown inward depositing significant amounts of dust on all surface areas of the first floor. Minimal dust was present in the basement. The first floor ceiling by the Liberty Street entrance is made of gypsum board. The ceiling on the Cedar Street entrance consists of suspended acoustical tile covered with a decorative tin facing. Above the suspended ceiling is a two foot void space that houses the HVAC system for the establishment. The basement ceiling is a suspended fibrous tile ceiling. The void space above both suspended ceilings and the gypsum ceiling contained both WTC-related and non-WTC-related dust. Asbestos pipe insulation was present in the void space of the basement. Grills, refrigerators, tables and chairs are present on the first floor. The basement contains walk-in refrigerators, preparation tables, stoves, dishwashing areas and dry good storage. Prior to cleaning, all open and bulk stored food; fibrous ceiling tiles in the basement; and wrap insulation that had surrounded the HVAC systems were disposed of. The HVAC system is located in the void space above the dining room ceiling.

The Barber Shop. Test: 4A- Industrial HEPA-filtered vacuum, AFD. Test 4E- Water wet wipe of all horizontal and vertical surfaces. This 1,268 sq. ft. open space facing the WTC Site is located below grade to Liberty Street. The front door of the business was blown inward depositing significant amounts of dust and debris down the staircase into the rental space. Floor areas were covered with ceramic tiles; the ceiling is a suspended system using fibrous tiles. Above the suspended ceiling is a void space which accommodates flexible A/C ducts, electrical conduit and lights. All structural support members above the ceiling were encapsulated with a non-asbestos insulating material. Equipment including chairs, wash sinks, counters and hair care displays were located in the shop. The head space above the entrance door houses an A/C condenser/compressor unit that was heavily impacted with WTC contaminated dust and debris. Ceiling tiles, flexible duct, chairs, display shelving and hair care merchandise were disposed of prior to cleaning. Ancillary rooms are adjacent to the shop space that extends under Liberty Street. These rooms have earthen floors and are believed to be associated with utility companies. They were not cleaned.

Exterior A/C Condenser/Compressor Units

A/C Condenser/Compressor Units. Test: 2A- Craftsman® shop vacuum, HEPA, no AFD. Three commercial condenser/compressor units and four residential condenser/compressor units were inspected to determine if they required cleaning of WTC-related dust. No significant dust was present on the exterior and interior surfaces of the four residential units. It is believed that the condenser/compressor units were cleaned prior to the study, by contractors retained by the owner, to remove dust and debris from the building roof. The three commercial condenser/compressor units had minimal to moderate WTC-related dust/debris.

Fact Sheets

Exterior A/C Condenser/Compressor Units

Three commercial size condenser/compressor units and one cooling tower are located on the atrium roof and four residential size condenser/compressor units are located on the 5th floor roof.

Cleaning Method: Test 2A - Surface cleaning utilizing a vacuum equipped with HEPA filtration.
Equipment Used: Craftsman® Shop Vacuum
Filtration Status: HEPA
Unit Size: N/A
AFD Status: Not Required
AFD Specifications: N/A
Unit Air Exchange Rate: N/A
Minimum Air Exchange Required: N/A

Description: Three condenser/compressor units and four residential condenser/compressor units were inspected to determine if they required cleaning of WTC-related dust. No significant dust was present on the exterior and interior surfaces of the four residential units. It is believed that the condenser/compressor units were cleaned prior to the pilot, by contractors retained by the owner, to remove dust and debris from the building roof. The three commercial condenser/compressor units had minimal to moderate WTC related dust/debris.

Units Inspected but not Cleaned:

The four condenser/compressor units for dwellings 3A, 5A, 5C, and 5D require no cleaning.

Units Cleaned:

- The Food Exchange restaurant cooling tower located on the building atrium roof
- THAI Restaurant condenser/compressor unit located on the atrium roof
- Commercial Unit 1, Chiropractors office, condenser/compressor unit
- Commercial Unit 2, Mattress showroom, condenser/compressor unit

Difficult Areas Encountered:

None

Mattress Store
2nd Floor, Northwest corner, Liberty Street

Cleaning Methods: Test
4A - Area air filtration utilizing an air filtration device (AFD). Surface cleaning using a vacuum equipped with HEPA filtration. Nilfisk® Vacuum (CFM 127), AFD

4B - Surface cleaning of horizontal and vertical surfaces using a wet wipe with soap and water.

4C - Carpet cleaning using a commercial carpet wet vacuum with a warm water shampoo solution. "Carpet Express" (Model C-4)

4D - A/C Duct Cleaning. One A/C system located above the suspended ceiling supplies the showroom with air conditioning. The system has two central return grills located under and adjacent to the air handler. All flexible duct lines were removed and disposed of. Supply diffusers and return grills were removed for cleaning and reinstalled. A professional HVAC cleaning company was contracted to clean the HVAC system in accordance with the following work outline.

- The workspace was protected using plastic and tape immediately under the duct system and in proximity of the working equipment.
- Diffusers and return grills were removed.
- Diffusers and return grills were treated with a degreasing agent.
- The distribution duct was sealed with a protective barrier to prevent blow back of debris.
- Diffusers and return grills were washed of degreasing agent and sanitized.
- The distribution duct and surrounding areas were HEPA vacuumed.
- The distribution duct openings degreased and sanitized.

4E - Surface cleaning of horizontal and vertical surfaces consisting of wet wipe using water only (vinyl floor tile and window ledge).

Equipment used: Nilfisk® Vacuum (CFM 127), AFD; Carpet wet vacuum, (Model C-4)
Filtration status: HEPA
Unit Size: 946 sq. ft.; 9,460 cu. ft.
AFD Status: Required under methods A and D
AFD specification: 400/600 cfm
Unit air exchange rate: 23.65 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 968 sq. ft. mattress showroom faces the WTC Site. An exterior window wall had been blown inward, depositing significant amounts of dust throughout the showroom. Approximately twenty-five mattresses were on display in the showroom. Floor areas were covered with wall-to-wall carpet and padding. A two-foot void space is located above the suspended fibrous tile ceiling. The void space contains an A/C air handling system that is suspended from the wood floor joist construction of the 3rd floor unit. The void space accommodates the sewer drain pipe, electrical and telephone wires, A/C system duct work, and lighting and fire protection systems. The void space contained dust both related to and not related to the WTC attack. Ceiling tiles, flexible ducts, furniture, and display items were disposed of prior to cleaning.

Mattress Store - Continued

Difficult Areas Encountered:

- Ceiling void space was cluttered with utilities.
- The wood structural members above the void space were porous and flaking.
- Minimal space was available in the void space making it difficult to work.
- Hydronic baseboard heating units were difficult to clean using vacuum equipment only.
- Wall-to-wall carpeting was difficult to clean thoroughly.
- Frequent clogging of vacuum filtration systems occurred due to the quantity of dust.

Chiropractor's Office

2^{nd} Floor, Northwest corner, Liberty Street

Cleaning Methods: Test

4A - Area air filtration utilizing an air filtration device (AFD). Surface cleaning utilizing an industrial vacuum equipped with HEPA filtration. Nilfisk™ Vacuum (CFM 127), AFD.

4B - Surface cleaning of horizontal and vertical surfaces using a wet wipe with soap and water.

4C - Carpet cleaning using a commercial carpet wet vacuum with warm water Carpet Express™ (Model C-4)

4D – A/C Duct Cleaning. One air handling system located above the suspended ceiling supplies interior offices with air conditioning. The system has a central return grill located under the air handler. All flexible duct lines were removed and disposed of. Supply diffusers and return grills were removed for cleaning and reuse. A professional HVAC cleaning company was contracted to clean the HVAC system in accordance with the following work outline:

- The work area immediately under the A/C system was protected using plastic sheeting.
- Diffusers and return grills were cleaned with a degreasing agent.
- Openings in the distribution duct were sealed with a protective barrier to prevent debris blow back.
- Distribution ducts were cleaned using mechanical brushes under negative air and HEPA filtration, then washed with a degreasing agent.
- The blower unit was washed with a degreaser, and the residues were removed using a vacuum.
- All distribution ducts were fogged with a biocide, then encapsulated with an FDA approved sealer.

4E - Surface cleaning of horizontal and vertical surfaces consisting of wet wipe using water only (bathroom floor and desk top).

Equipment Used: Nilfisk® Vacuum (CFM 127); AFD; Carpet wet vacuum, (Model C-4)
Filtration Status: HEPA
Unit Size: 836 sq. ft.; 8,360 cu. ft.
AFD Status: Required under method A and D
AFD Specifications: 400/600 cfm
Unit Air Exchange Rate: 20.9 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Chiropractor's Office – Continued

Unit description: This 716 sq.ft. commercial office space with four examination rooms faces the WTC site. All front windows had been blown inward, depositing significant amounts of dust and debris throughout the unit. Floor areas were covered with wall-to-wall carpet and padding. A two-foot void space is located above the suspended fibrous tile ceiling. The void space contains an A/C system suspended from the wood floor joist construction of the 3rd floor unit. The space accommodates sewer drain pipes, electrical and telephone wires, A/C system duct work, and lighting and fire protection systems. The void space contained dust both related and not related to the WTC attack. Ceiling tiles, flexible duct and office equipment were removed and disposed of prior to cleaning.

Difficult Areas Encountered:

- The ceiling void space was cluttered with utilities.
- The wood structural members above the void space were porous and flaking.
- Minimal space was available in the void spaces, making it difficult to work efficiently.
- The hydronic baseboard heating units were difficult to clean.
- The wall-to-wall carpeting was difficult to clean thoroughly.
- Frequent clogging of vacuum filtration systems occurred due to the quantity of dust.

Common Areas

Vestibule, Elevator, Stairwells, Hallways, Utility Rooms, Trash Chute Accesses and Laundry Room.

Cleaning Method: Test 4A, 4B - Surface cleaning using industrial filtered vacuums. Air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all *horizontal and vertical* surfaces.

Equipment Used: Nilfisk™ Vacuum (CFM 127), AFD.

Filtration Status: HEPA

Unit Size:

	Four Levels Total:	2,556 sq. ft.; 30,492 cu. ft.
	Hallways (per level)	639 sq. ft.; 7,623 cu. ft.
	Vestibule	150 sq. ft.; 1,500 cu. ft.
	Elevator Compartment	48 sq. ft.; 384 cu. ft.
	Laundry Room	(Included as hallway)
	Utility Rooms	(Included as hallway)

AFD Status: Required

AFD Specifications: 400/600 cfm

Unit Air Exchange Rate: 19.5 min at 400 cfm (hallway)

Minimum Air Exchange Required: Every 30 minutes

Description: The vestibule is located on Cedar Street and provides access to the building's only elevator and one stairwell. A second stairwell is accessed from Liberty Street. Four hallways connect the two stairwells and elevator access point on each floor (2nd floor to 5th floor). Each hallway contains a utility room with a trash chute access. The laundry room is located off of the 2nd floor hallway. The common areas contain no porous building material. All walls and ceilings in the stairwells are painted. Carpeting is not present in any of the common areas. Minimal dust was observed in the common areas.

Difficult Areas Encountered:

- The common areas were used daily by all individuals working in the building. These areas were frequently damp mopped to control the migration of dust.
- Dust accumulations were heavy at the base of the walls where the baseboard trims were removed.
- Hallway walls were vacuumed, but not wet wiped as a result of wallpaper paste residue left when the wallpaper was removed prior to the pilot study.

Barber Shop

This unit is located in the basement.

Cleaning Method: Test 4A - Surface cleaning using industrial HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). **Test 4E -** Water wet wipe of all *horizontal and vertical* surfaces.
Equipment Used: Nilfisk™ Vacuum (CFM 127), AFD.
Filtration Status: HEPA
Unit Size: 1,268 sq. ft.; 15,216 cu. ft.
AFD Status: Required
AFD Specification: 400/600 cfm
Unit Air Exchange Rate: 25.36 min @ 600 cfm
Minimum Air Exchange Rate: Every 30 minutes

Unit Description: This 1,268 sq. ft. open space facing the WTC Site is located below grade to Liberty Street. The front door of the business was blown inward depositing significant amounts of dust and debris down the staircase into the rental space. Floor areas are covered with ceramic tiles; the ceiling is a suspended system using fiberous tiles. Above the suspended ceiling is a void space which accommodates flexible A/C ducts, electrical conduit and lights. All structural support members above the ceiling are encapsulated with a non-asbestos insulating material. Equipment including chairs, wash sinks, counters and hair care displays are located in the shop. The headspace above the entrance door houses an A/C condenser/compressor unit that was heavily impacted with WTC contaminated dust and debris. Ceiling tiles, flexible duct, chairs, display shelving and hair care merchandise where disposed of prior to cleaning. Adjacent to the shop space are ancillary rooms that extend under Liberty Street. These rooms have earthen floors and are believed to be associated with utility companies. They were not cleaned.

Difficult Areas Encountered:

- Sprayed-on insulation/fire protection applied to structural members in the void space above the suspended ceiling prevented effective vacuuming of the area.
- Significant quantities of WTC dust and debris were deposited into the remote A/C condenser/compressor unit and associated housing.
- The space above the fixed ceiling at the entrance to the Barber Shop stairwell was heavily impacted, requiring special preparation for access and removal of bulk quantities of WTC dust/debris.

The Food Exchange

1st floor, basement and sub-basement Cedar & Liberty Street

Cleaning Method: Test 4A - Surface cleaning using industrial HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all horizontal surfaces.

Equipment Used: Nilfisk™ Vacuum (CFM 127), AFD

Filtration Status: HEPA

Unit Size: 1st floor- 2,324 sq. ft.; 31,606 cu. ft.; basement- 2,596 sq. ft.; 36,344 cu. ft.

AFD Status: Required

AFD Specification: 400/600 cfm

Unit air exchange rate: 1st floor 15.80 min @ 2000 cfm, basement 18.17 min @ 2000 cfm.

Minimum Air Exchange Required: Every 30 minutes

Unit Description: The restaurant encompasses approximately 5,000 square feet. It may be entered from either a Cedar Street or a Liberty Street entrance. The establishment is comprised of three floors. The first floor is at street level. This floor was used for food service and customer dining. The lower level (basement) was used for food preparation and storage. The third level (sub-basement) was used for storage of restaurant equipment. Ceramic tile covers the floor area in both the dining room and the basement. The floor of the sub-basement is packed soil. All exterior windows had been blown inward depositing significant amounts of dust on all surface areas of the first floor. Minimal dust was present in the basement. The first floor ceiling by the Liberty Street entrance is made of gypsum board. The ceiling on the Cedar Street entrance consists of suspended acoustical tile covered with a decorative tin facing. Above the suspended ceiling is a two-foot void space that houses the HVAC system for the establishment. The basement ceiling is a suspended fibrous tile ceiling. The void space above both suspended ceilings and the gypsum ceiling, contained both WTC related and non-WTC related dust. Asbestos pipe insulation was present in the void space of the basement. Grills, refrigerators, tables and chairs are present on the first floor. The basement contains walk-in refrigerators, preparation tables, stoves, dishwashing areas, and dry good storage. Prior to cleaning, all open and bulk stored food, fibrous ceiling tiles in the basement, and wrap insulation that had surrounded the HVAC systems, were disposed of. The HVAC system located in the void space above the dining room ceiling consists of two air handlers that provide heat or cooling to the first floor via separate solid metal supply ducts. The system return is from the dining area and void space located above the first floor. Cleaning of this system was performed by a subcontractor in accordance with a site-specific scope of work prepared by Covino Environmental Associates Inc.

The Food Exchange - Continued

Difficult Areas Encountered:

- The ceiling void space was cluttered.
- The wood structural members above void space were porous and flaking.
- Asbestos pipe wrap insulation was present in void space.
- Removal of ceiling tiles created dusty conditions.
- Insect and rodent infestations created unpleasant work conditions.
- Frequent clogging of vacuum filtration systems occurred due to the quantity of dust and rodent droppings.

Difficult Areas Encountered:

- Approximately 200 lbs. of spoiled fish, meat and poultry were removed from freezers and refrigerators.
- There was encrusted grease on, and adjacent to, all cooking surfaces, stove exhaust systems and floor areas.
- Wood structural members in the basement preparation area were porous and flaking.
- Insect and rodent infestations created unpleasant work conditions.
- Frequent clogging of vacuum filtration systems occurred due to the quantity of dust and rodent droppings.

Unit 5D - 5th floor, Northeast corner, Liberty Street

Cleaning Method: Test 3B - Surface cleaning using industrial HEPA filtered vacuums. Area air filtration utilizing an air filtration device (AFD). Soap and water wet wipe of all horizontal surfaces.
Equipment Used: Nilfisk™ Vacuum (CFM 127), AFD
Filtration Status: HEPA
Unit Size: 968 sq. ft.; 10,648 cu. ft.
AFD Status: Required
AFD Specification: 400/600 cfm
Unit Air Exchange Rate: 26.62 min @ 400 cfm
Minimum Air Exchange Required: Every 30 minutes

Unit Description: This 968 sq. ft. open loft faces the WTC Site. The unit has hardwood floors and no carpeting. All exterior windows had been blown inward depositing significant amounts of dust and debris throughout the dwelling. All personal items were disposed of prior to the cleanup. Significant dust was accumulated in the dwelling.

Difficult Areas Encountered:

- Hydronic baseboard heating units
- Boarded up window openings
- Cracks and crevices

Attachment I

HVAC Cleaning Procedures

General Procedures for Cleaning WTC-Related Contaminants from Ventilation Systems at 110 Liberty Street, New York, New York

1.0 SCOPE

The procedures contained in this document provide guidance for cleaning WTC-related dust in two commercial ventilation systems and in a combustion air make-up riser for the residential units within the building located at 110 Liberty Street, New York, New York, and for post-cleaning verification sampling. This document includes performance requirements and post-cleaning verification sampling for cleaning WTC-related dust and debris from ventilation systems consisting of fans, housings, ducts, air control devices, grilles and other components.

2.0 PURPOSE

The purpose of this document is to provide minimum requirements for cleaning ventilation system components that were impacted by airborne dust from the WTC collapse, and to provide procedures for post-cleaning verification sampling following clean-up.

WTC-related dust is generally considered to have common, consistent, and readily observable characteristics visually and tactilely differentiating it from common dust. WTC-related dust generally contains extremely fine particles similar in consistency to talcum powder, is light-colored, contains pulverized concrete and/or gypsum wallboard, and may contain asbestos fibers. Unless otherwise indicated by sampling and analytical testing, the following components shall be assumed to be present in WTC-related dust:

- Man-made Vitreous Fibers
- Crystalline Silica
- Lead
- Asbestos

For this project, all specified ventilation system components shall be assumed to contain WTC-related dust and shall be cleaned accordingly.

Where sampling and analysis indicate that dust and debris in ventilation systems contain only crystalline silica, man-made vitreous fibers, lead, or <1% asbestos contamination, this procedure specifies that duct systems shall be cleaned only while maintained under negative pressure using HEPA-filtered vacuum collection equipment specific to the duct cleaning industry. All cleaning of air handling equipment shall be performed within containment structures that are maintained under negative pressure using HEPA-filtered air filtration devices.

Where sampling and analysis indicate that dust and debris within a ventilation system contains 1% or greater asbestos as determined by standard sampling and analytical techniques, the ventilation system cleaning procedure shall be designed by a New York-licensed Project Designer. The cleaning will be performed in accordance with local, state and federal regulations as specified in the Project Design.

3.0 APPLICABLE DOCUMENTS

This section provides full bibliography for references made within this document, or considered in preparation of this document. Cleaning and post-cleaning verification sampling should be conducted in a manner that is fully compliant with the guidance provided in the following documents, to the extent applicable.

1. ACR 2002, *Assessment, Cleaning and Restoration of HVAC Systems*, National Air Duct Cleaning Association, Washington, D.C. (2002).

   ACR 2002 specifies procedures for cleaning HVAC systems.

2. NADCA Standard 97-05, *Requirements for the Installation of Service Openings in HVAC Systems,* National Air Duct Cleaning Association, Washington, D.C. (1997).

   NADCA 97-05 includes procedures for installing service openings in HVAC systems and construction and material specifications for replacement panels, plates or access doors to cover such openings.

3. *SMACNA HVAC Duct Construction Standards – Metal and Flexible*, Sheet Metal and Air Conditioning Contractors' National Association, Inc., 2nd Edition (1995).

   The SMACNA standard includes construction and material specifications for access doors for covering service openings as required under 7.5 and 11.1.3 of this document.

4. *SMACNA Fibrous Glass Duct Construction Standards,* Sheet Metal and Air Conditioning Contractors' National Association, Inc., 6th Edition (1992).

   The SMACNA standard includes construction and material specifications for access doors for covering service openings as required under item 6.5.1.2 of this document.

5. NFPA Standards 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* and 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems,* National Fire Protection Association (1999 Edition).

   The NFPA standards include construction and material specifications for replacement coverings on service openings as required under item 6.5.1.2 of this document.

6. Cleaning Fibrous Glass Insulated Air Duct Systems, North American Insulation Manufacturers Association (NAIMA), 1993

   This document provides guidance for cleaning fibrous glass-insulated interior ventilation system surfaces.

7. ASHRAE 33-78, Methods of Testing Forced Circulation Air Cooling and Air Heating Coils, American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), 1978

   This document contains procedures for testing air flow through ventilation system thermal coils.

8. ARI 410-91 Forced-Circulation Air-Cooling and Air-Heating Coils, Air Conditioning and

Refrigeration Institute (ARI), 1991

This document contains procedures for testing air flow through ventilation system thermal coils.

9. ASHRAE 62-2001, Ventilation for Acceptable Indoor Air Quality, American Society of Heating, Refrigeration, and Air Conditioning Clients (ASHRAE), 2001

   This document provides performance and evaluation criteria for acceptable general ventilation system operation.

10. Military Standard 282, United States Department of Defense (DOD), 1956

    This document contains leak testing procedures for in-place filters used in air filtration devices, HEPA vacuums and vacuum collection equipment.

11. AMCA 99-86, Standards Handbook, Air Movement and Control Association, 1986

    This document contains specifications for air filtration devices.

12. ASHRAE Terminology of Heating, Ventilation, Air Conditioning, and Refrigeration, American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), 1991

    This document defines terminology for use in referring to ventilation systems and components.

13. OSHA Regulations 29 CFR 1910, Occupational Health and Safety Standards

    The OSHA regulations specify health and safety requirements for protecting employees during the inspection procedures.

14. Title 15, Chapter 1, Rules of City of New York Asbestos Regulations

    This document contains New York City regulations regarding asbestos abatement.

15. NYSDOL – DOSH Regulations – Part 56. ASBESTOS

    This document contains New York State regulations regarding asbestos abatement.

16. NYC Guidelines on Assessment and Remediation of Fungi in Indoor Environments

This document contains New York City guidelines regarding microbial remediation.

4.0 CHARACTERIZATION OF DUST/ENVIRONMENTAL HAZARDS

Prior to the start of work, an evaluation of the dust shall be performed by an independent environmental service contractor. The independent environmental service Contractor shall be experienced in performing all necessary sampling procedures for analytical evaluation of the WTC –related dust.

Prior to the start of work, the independent environmental service Contractor shall make a determination as to whether the following contaminants are present:

- Man-made Vitreous Fibers
- Crystalline Silica
- Lead
- Asbestos

Bulk samples when applicable will be collected for quantitative analysis of the above-referenced analytes. Samples for analysis of man-made vitreous fibers, crystalline silica, lead and Asbestos may only be submitted to an EPA approved laboratory. Wipe samples and air samples may be taken when the quantity of dust to be analyzed is insufficient for bulk collection.

The onsite Environmental Cleaning Contractor shall note any mold growth, rodent droppings, or other biological hazards if observed.

5.0 SITE EXAMINATION

Prior to commencing work, all ventilation system/duct cleaning professionals shall visit the site to examine the conditions under which the work is to be performed in order to identify those conditions that might adversely affect the work. These conditions may include, but may not be limited to the following:

1. Difficulty accessing ventilation system components.

2. Ventilation systems components located in parts of the building that are not included in the scope of ventilation system cleaning, but that may cause the ventilation system components to become re-contaminated following cleaning.

3. Asbestos-containing materials on ventilation system components to be cleaned or damaged asbestos-containing materials in the vicinity of the ventilation system components to be cleaned.

4. Specific scaffolding and/or fall protection requirements.

6.0 VENTILATION SYSTEM/DUCT CLEANING FIRM REQUIREMENTS

6.1 The ventilation system/duct cleaning firm shall meet the following minimum health and safety requirements:

Appropriate Respiratory Protection Program as required by 29 CFR 1910.134.

Appropriate Hazard Communication Training as required by 29 CFR 1910.1200, to include health hazards associated with man-made vitreous fibers, crystalline silica, lead, asbestos, and microbiological hazards that may likely be encountered in ventilation systems, in addition to chemicals brought on site to perform the work.

Prior experience in cleaning HVAC systems.

Appropriate personal protective equipment and written program.

An experienced individual to act as a site health and safety supervisor to respond to unanticipated health hazards that may be encountered on the site and to ensure implementation of required health and safety practices.

6.2 In addition to the above minimum requirements, the duct cleaning professional shall meet the following contaminant-specific requirements:

6.2.1 Man-made Vitreous Fibers – appropriate Hazard Communication training and personal protective equipment

6.2.2 Crystalline Silica – appropriate Hazard Communication training and personal protective equipment

6.2.3 Lead – appropriate Hazard Communication training, ability to perform personal exposure monitoring for airborne lead, ability to comply with requirements of 29 CFR 1910.1025

6.2.4 Asbestos (< 1%) - – appropriate Hazard Communication training, ability to perform personal exposure monitoring for airborne asbestos, ability to comply with requirements of 29 CFR 1910.1001

6.3 All workers shall possess current EPA-accredited training as an Asbestos Worker (32-hour training) or as an Asbestos Supervisor (40-hour training).

7.0 GENERAL PERFORMANCE REQUIREMENTS

In general, all cleaning of air moving equipment and active plenums shall be performed under negative pressure using HEPA-filtered air filtration devices. All ducts that are cleaned shall be maintained under negative pressure using HEPA-filtered vacuum collection equipment specific to the duct cleaning industry. Air filtration devices and vacuum collection equipment shall be exhausted to the outdoors. After cleaning of the ventilation system, any areas that are affected by the work must be as clean or cleaner than their condition prior to the start of work, and must meet post-cleaning verification requirements contained in 8.2 of this document.

7.1 **Containment:** WTC-related dust and debris removed by cleaning/remediation process shall be collected and precautions taken to ensure that the debris is not otherwise dispersed outside the ventilation system during cleaning. After cleaning of the ventilation system, any areas that are affected by the work must be as clean or cleaner than their condition prior to the start of work.

7.1.1 When working outside the negative air pressure system the ventilation system/duct cleaning firm shall install plastic sheeting on the floor surface under and at a minimum of 3 feet outside the perimeter of the system. All exposed service tools and equipment shall be free of debris and contamination from the ventilation system. Tools and equipment include (but are not limited to): Vacuum collection equipment, vacuum hoses and attachments, air lines and hoses, brushes, extension rods, cables, ladders, power tools, hand tools, zoning devices, and inspection equipment.

7.1.1.2 Contaminated tools and equipment shall be maintained in poly bags until cleaned in the designated decontamination area at the work site.

7.1.1.3 Hoses, cables, and extension rods shall be cleaned free of visible debris with suitable sanitary damp wipes at the point they are withdrawn from exposed ventilation system components or containment areas into general occupant areas.

7.1.2 Upon removing duct diffusers and grilles prior to cleaning, the ventilation system/duct cleaning firm shall provide adequate containment measures to prevent contaminant exposure from accumulated debris on these devices.

7.2 **Equipment:** All service equipment must operate on standard 110 VAC, 20A circuits.

7.2.1 Vacuum Collection Equipment: All vacuum collection equipment or air filtration devices shall utilize a minimum of HEPA filtration (99.97% at 0.3 micron) final collection efficiency at the device's exhaust. Multi-sectioned equipment must not be opened or detached in occupied areas once contaminated with debris. Vacuum collection equipment shall provide sufficient negative airflow velocity in the ventilation system zone being serviced to draw dislodged debris from the mechanical cleaning device to the vacuum's collection chamber (typically a minimum of 3000 feet per minute (fpm) in the portion of the HVAC system being cleaned.

7.2.2 Pressurized Air Source Used for Cleaning Devices: Must provide a minimum of 175 PSI at a volume of 15 cubic feet per minute. Device must provide pressurized air free of significant moisture, oil and toxic vapors, or be equipped with adequate filtration and dryers to remove such contamination. The ventilation system/duct cleaning firm shall provide ongoing documentation of the device's delivery of contaminant-free pressurized air.

7.3 **Component Cleaning:** Mechanical Cleaning procedures include the dislodging of WTC-related dust and debris on the interior surfaces of the ventilation system by manual, mechanical, pneumatic, or hydro-agitation. Loosened debris shall be collected and removed from the ventilation system using suitable vacuum collection equipment and/or HEPA vacuuming methods, as specified.

7.3.1 **Cleaning Non-Porous ventilation system components:** Cleaning methods shall be used that will render the ventilation system components visibly clean. No cleaning method shall be used which will damage components of the ventilation system or significantly alter the integrity of the system.

7.3.2 **Cleaning Porous Ventilation System Components:** Cleaning method shall be used that will render the ventilation system components visibly clean and minimize fiber release from the porous ventilation system component surface. No cleaning method should be used which will damage components of the ventilation system or significantly alter the integrity of the system. Porous ventilation system components which exhibit increased potential for fiber release (i.e. damaged internal surface bond or coating, and open internal seams and joints) shall be replaced or encapsulated with a product approved for that purpose upon completion of Mechanical Cleaning procedures.

7.4 **Encapsulation of Ventilation System Components:** Encapsulation of porous or degraded porous ventilation system components shall be employed only after cleaning and successful completion of post-cleaning verification procedures by the Environmental Cleaning Contractor (see 8.2 of this document).

7.4.1 Encapsulant coatings shall be applied directly to the interior porous surfaces of ventilation system components by hand brushing, rolling, or troweling, or via spray system, with a maximum distance of 24" from the spray discharge tip to the surface being treated. Encapsulant coatings may not be fogged into the system. A continuous film thickness should be achieved in treated areas, as per manufacturer's instructions.

7.4.2 Ventilation system control devices, heating elements, sensing equipment, grilles, and fans must be adequately blocked off or masked so that they will remain free from over-spray from the Encapsulation process.

7.5 **Service openings:** All access ways cut in the ventilation system for inspection and/or cleaning must be repaired so that they shall not significantly alter the airflow or adversely impact the facility's indoor air quality. All openings made in the ventilation system must be sealed in accordance with industry standards and local codes, using materials acceptable under those standards and codes (see Appendix B).

7.6 **Disposal of Debris:** All waste and debris removed from the ventilation system shall be double-bagged in 6-mil polyethylene bags and disposed of in accordance with all applicable federal, state, and local requirements.

8.0 QUALITY ASSURANCE

8.1 **Health and Safety:** The ventilation system/duct cleaning firm shall comply with all applicable federal, state, and local requirements for protecting the safety of the ventilation system/duct cleaning firm's employees, building occupants, and the environment. No processes or materials shall be employed in such a manner that they will create adverse health effects to the building occupants, the ventilation system/duct cleaning firm's employees, or the general public.

8.1.1 The ventilation system/duct cleaning firm shall perform initial exposure monitoring of its employees for asbestos and lead in accordance with 29 CFR 1910. 1001 and 29 CFR 1910.1025, respectively.

8.1.2 Ventilation system/duct cleaning firm's employees shall use respiratory protection in compliance with OSHA 1910.134

8.1.3 Regardless of exposure assessment results, at minimum the ventilation system/duct cleaning firm’s employees shall wear properly fitted, HEPA-filtered (P-100) negative half-mask respirators when performing any work related tasks on site which might expose them to elevated levels of airborne particulate.

8.2 **Post-cleaning Verification:** Prior to re-commissioning a cleaned section of the ventilation system (at the end of the work shift, etc.), the ventilation system/duct cleaning firm will obtain cleanliness clearance from the Environmental Cleaning Contractor. Ventilation system cleanliness will be determined after mechanical cleaning and before the application of any surface treatment or introduction of any treatment-related substance to the ventilation system. Verification shall be conducted before the ventilation system is restored to normal operation.

Ventilation system components may be evaluated by the Environmental Cleaning Contractor for visible cleanliness via direct visual inspection or with a visual inspection system (i.e., mirrors, boroscope, remote camera). The Environmental Cleaning Contractor may direct the ventilation system/duct cleaning firm to provide additional access openings into the ventilation system, as deemed necessary to thoroughly verify cleanliness.

8.2.1 All porous and non-porous ventilation system surfaces must be visibly clean and capable of passing a visual inspection.

8.2.2 Cleaning of non-porous ventilation system surfaces shall be verified by surface wipe sampling performed by the Environmental Cleaning Contractor using specified methods. Surface wipe sampling for man-made vitreous fibers, crystalline silica, lead and asbestos will be performed. Wipe sample results must meet the following criteria to established that cleaning has been adequate:

- Lead – less that 25 micrograms of lead per square foot using the specified method
- Asbestos – no asbestos detected using the specified method

8.2.3 Pre-occupancy air testing: After successful completion of 8.2.1 and 8.2.2, and removal all polyethylene sheeting, containments and any remaining visible debris, the ventilation system shall be started up and air sampling for man-made vitreous fibers, crystalline silica, lead and asbestos will be performed performed by the Environmental Cleaning Contractor using specified methods. Airborne concentrations of these contaminants shall be within recommended guidelines for acceptable indoor air quality. Occupants may re-enter the building only after successful completion of air monitoring.

8.3 **Materials and Workmanship:**

8.3.1 Work shall be executed by skilled persons who are thoroughly trained, experienced and completely familiar with the specified requirements and the methods needed for proper performance of the project, and shall be in conformance with the best practices of each trade involved.

8.3.2 Work shall present a neat and workmanlike appearance when completed.

8.3.3 Finish of materials and components shall be consistent with industry good practice.

8.4 **Cleaning:** Work and storage areas shall be maintained and kept clean on a daily basis. The ventilation system/duct cleaning firm shall final clean the immediate work area(s) with a HEPA-filtered vacuum cleaner to be free of any residual visible WTC-related dust. Materials removed and debris resulting from the ventilation system/duct cleaning firm's work shall become the property of the ventilation system/duct cleaning firm and shall be removed for appropriate disposal (see 7.6 of this document).

9.0 WORK SEQUENCE AND SCHEDULING

9.1 As a general procedure, cleaning work should follow the ventilation system airflow, beginning at the system's return air intakes. Cleaning should proceed from those points to the air handling unit (AHU), then out through the air discharge points. This work sequence will reduce the likelihood of cleaned portions of the ventilation system being re-contaminated if the system is reactivated at the end of the work shift.

9.2 Additional precautions that may be used to protect cleaned surfaces of the ventilation system from being re-contaminated by uncleaned ventilation system surfaces. These may include: 1) the installation of temporary duct blanks or zoning devices to separate cleaned sections, and 2) installation of temporary air filters.

10.0 PRODUCTS

10.1 **Encapsulants**: Ventilation system encapsulation products shall be for specific use in ventilation systems and applied per manufacturer's instructions. Encapsulants shall be water-based, with low VOC (volatile organic compound) emissions, and meet NFPA smoke development and flame spread requirements for HVAC system products.

10.1.1 Ventilation system/duct cleaning firm shall maintain on-site MSDS copies for any encapsulant product used in the ventilation system.

10.1.2 Ventilation system/duct cleaning firm will apply product in strict compliance with manufacturer's recommended safety precautions for Ventilation system/duct cleaning firm's personnel and building occupants.

10.1.3 Ventilation system/duct cleaning firm shall comply with any applicable federal, state, or local regulations regarding the use of such products.

10.2 **Cleaning Chemicals:** Any chemicals used in cleaning ventilation system components (i.e. chemical cleaners, degreasers, etc.) shall be applied per manufacturer's instructions.

10.2.1 Ventilation system/duct cleaning firm shall maintain on-site MSDS copies for any cleaning chemical used in the ventilation system.

10.2.2 Ventilation system/duct cleaning firm shall comply with any applicable federal, state, or local regulations regarding the use of such products.

11.0 EXECUTION

11.1 Preparation - General

11.1.1 **Project Orientation/Preparation:** Ensure that a site examination has been performed in accordance with Section 5.0 of this document.

11.1.1.1 Task Coordination: A pre-task performance meeting shall be conducted for the project.

11.1.1.2 Walk-through**:** Visually inspect the ventilation system prior to the start of work and note any mechanical modifications. Note location of all electrical panels for fuse reset. Note condition of fans, visible buildups, and accessible ductwork.

11.1.2 **Site Preparation:** To minimize possible contamination and damage, the ventilation system/duct cleaning firm shall provide a negative pressure work area containment as necessary during ventilation system remediation.

11.1.2.1 Negative pressure must be maintained by way of an attached external HEPA-filtered air filtration device. The vacuum must provide at least eight (8) air-changes in the containment per hour.

11.1.2.2 The AHU servicing the area being cleaned must be shut down or zoned-off and remain so during the cleaning process.

11.1.2.3 Only properly trained, authorized individuals may enter the work area while cleaning is being performed.

11.1.3 **System Access:** Provide necessary access for cleaning and inspection of the ventilation system.

11.1.3.1 Remove and poly bag diffusers if transport to decontamination area will be through non-containment areas. Clean all grilles and diffusers. Thoroughly dry grilles and diffusers prior to re-installing after cleaning.

11.1.3.2 Install service openings as specified in Appendix B in return air handling systems as necessary to facilitate inspection and cleaning procedures. Access points should not exceed fifty (50) foot intervals to accommodate procedures and final inspection, unless otherwise deemed acceptable by the building management or Environmental Cleaning Contractor.

11.1.3.3 The structural integrity of the ductwork shall not be significantly altered by the installation of service openings (See APPENDIX B).

11.1.4 **Duct Zoning:** Ventilation system/duct cleaning firm will isolate sections of the ventilation system if needed to facilitate cleaning.

11.1.4.1 Prior to cleaning, ventilation system airflow control devices may be repositioned and zoning devices installed in diffusers and ductwork as necessary to facilitate negative airflow from vacuum collection equipment and to avoid contamination from entering the conditioned air spaces.

11.1.4.2 All zoning devices shall be removed and airflow control devices reset to their pre-cleaning positions upon completion of cleaning in the work area they serve.

11.1.4.3 Zoning devices must be disposed of or cleaned free of contaminant debris or other suitable measures employed to prevent cross-contamination prior to reuse in other ventilation system areas.

11.2 General Cleaning Procedures

11.2.1 Hand wet-wiping: Wiping may be performed in cases where dry cleaning methods such as HEPA vacuuming or mechanical brushing, cannot successfully remove contaminants of concern. Damp wiping should be performed with disposable towels or rags properly wetted with Simple Green or a similarly environmentally friendly degreasing agent. If disinfection is required, a Foster Products 40-80 HVAC and Wall Disinfectant or equivalent quarternary ammonium compound cleaning solution may be used.

It is not necessary to establish negative pressure in locations where wet wiping is the only cleaning performed. If possible, the components to be cleaned should be removed, placed in a 6-mil polyethylene bag, and cleaned outside of the occupant space. If removal of the components is not possible, use of a disposable drop cloth in the work area is recommended.

11.2.2 Manual HEPA vacuum with soft bristle brush attachment: Manually vacuum internal HVAC surfaces from top to bottom to remove all visible debris. Maintain the cleaning zone under negative pressure (minimum -0.02 inches water gauge) using a HEPA filtered air filtration device during manual vacuuming

11.2.3 Power driven mechanical or pneumatic brush system for duct runs: This type of equipment may only be used in ducts where negative pressure has been established using a HEPA filtered vacuum collection device (minimum of 3000 fpm air velocity in cleaning zone of the duct). Always work in the direction of the air flow. Apply the mechanical brushing equipment to dislodge debris from the interior surfaces of the duct. Following mechanical brushing, all surfaces of the cleaning zone shall be air washed with a pressurized air source to transport all dislodged debris to the vacuum collection device. *Note that air washing alone is not a sufficient cleaning method and will not be considered acceptable for proper duct cleaning.*

11.2.4 Chemical wet cleaning of evaporator or chilled water coils: Wet cleaning of the coils and drip pan shall be performed using commercially available coil cleaner, subject to approval of Environmental Professional. Saturate the coils with a pump sprayer and thoroughly rinse with clean water. Cleaning solution and rinse water will collect in the condensate drain pan; if significant lead or asbestos contamination has been identified in the dust on the coils and/or in the drain pan, the water must be collected and tested for proper disposal.

Maintain the cleaning zone under negative pressure using a HEPA filtered air filtration device. If odors are present and it is not possible to exhaust the HEPA filtered air filtration device outside the building, it may be necessary to use an activated carbon bed in air filtration device to eliminate odors.

11.2.5 Electric Heating and Reheat coils: Clean electric heating and reheat coils using only dry methods. No water or encapsulant may come into contact with electric heating or re-heat coils. Dry clean using one or more of the following methods:

11.2.6 Manual HEPA vacuum
11.2.7 Pressurized air cleaning (only if cleaning zone is maintained under negative pressure)
11.2.8 Manual brushing using manual HEPA vacuum to collect dust

Maintain the cleaning zone under negative pressure using a HEPA filtered air filtration device whenever possible.

11.3 Site-specific Cleaning Procedures

11.3.1 Lemon Grass Restaurant

This is a 2,351 sq ft space with variable ceiling height. One air handling unit is located above the ceiling toward the south end of the floor. This is a recirculating air unit with no outdoor air supply. Return air enters the unit through a grille located in the side of the unit. The air handling unit is accessible and is provided with access doors. The air handling unit distributes supply air through a main supply air duct and several branch ducts. Supply air diffuser openings are located on the underside of the supply duct (most of the diffusers have been removed). The supply diffuser openings extend in a line to the north of the air handling units and are spaced approximately 15' apart. There are approximately four 18" supply diffuser openings located to the north of the air handling unit. There is a separate ducted make-up air system that delivers outdoor air to the cooking stations. The make-up air system consists of a single duct with diffuser openings on the underside of the duct, and a blower assembly that is located in-line with the duct. Outdoor air is provided to the make-up air system through a ducted outdoor air intake located in an exterior wall of the building approximately 10' above ground level.

VENTILATION SYSTEM COMPONENTS TO BE CLEANED

The following system components will be cleaned in the Lemon Grass Restaurant:

a. Air handling unit and components
b. Reheat Coil
c. Supply air ducts and terminal diffusers
d. Makeup Air System
e. Dissembled Duct Sections on Floor

CLEANING PROCEDURES

General: Any interior surfaces of the air handling unit or ventilation system that are porous shall be cleaned using manual HEPA vacuuming methods. After successful completion of visual inspection and verification sampling, a lockdown encapsulant shall be applied to the porous surfaces using a hand-operated sprayer or brush, using care not to coat electrical or mechanical components.

Note that if any dissembly of the air handling units is required to complete the work, the air handling unit shall be reassembled by a qualified HVAC professional after all parts are dry and are verified clean.

Note that all HEPA air filtration devices and HEPA-filtered vacuum collection devices shall be exhausted to the outdoors.

Air Handling Unit

1. Ensure that the air handling unit motor is locked out and is electrically isolated, and place the air handling unit and its components under containment prior to beginning work. A temporary Zip-wall containment of 6-mil, fire retardant polyethylene sheeting extending from the floor to the ceiling deck, and maintained under negative pressure using a HEPA-filtered air filtration device is sufficient. The footprint of the containment should be large enough to accommodate a ladder or scaffolding. Note that WRS Infrastructure and Environment, Inc. may construct the containment prior to the start of ventilation system cleaning. In addition, WRS Infrastructure and Environment, Inc. shall install a service opening to facilitate cleaning of interior components. The access panel shall be installed in the supply air duct between the blower and the reheat coil.
2. Clean the filter racks at the return air side of the unit by damp wiping.
3. Prior to cleaning, place polyethylene sheeting underneath the coils. Wet clean the upstream and downstream sides of cooling coils. Apply manufacturer-approved cleaning solution to the coils using low pressure methods (i.e., airless sprayer, hand operated pump).
4. Clean the blower assembly and blower housing in place. The blower assembly and blower housing shall be cleaned by a combination of hand vacuuming, damp wiping and air washing. As required in this document, air washing shall only be performed after a vacuum collection device has been installed.
5. HEPA vacuum remaining interior surfaces and components (e.g., condenser equipment and compartment, controls, outside air vent to condenser compartment) to remove all visible debris. No encapsulant materials may be used inside the condenser compartment.
6. Perform a final cleaning by wet-wiping and/or HEPA vacuuming methods of the interior work area containment surfaces, ladders, equipment etc. prior to final visual inspection and wipe sampling.

Reheat Coils

1. Clean the electric reheat coil (located inside the supply air duct) by dry vacuuming or air washing. No liquids may come into contact with the electric reheat coil.

Supply Air Ducts and Terminal Diffusers

1. Remove all terminal diffusers into 6-mil polyethylene bags and proceed to the enclosure constructed for cleaning of the air handling unit. Terminal diffusers shall be wet-cleaned. The diffusers should be sprayed with Simple Green or a similar environmentally safe degreaser and hand washed as needed to remove adhered materials.
2. Seal the diffuser openings using 6-mil polyethylene sheeting to be secured with duct tape.
3. Install a vacuum collection device at the terminal end of the duct section to be cleaned. If the entire duct is not cleaned as one unit, then isolate the section of the duct to be cleaned using a zoning device.
4. The supply air duct shall be cleaned using a pressurized air/mechanical brush system in combination with a vacuum collection device. The direction of cleaning shall be from the air handler toward the terminal end of the duct. (It is permissible to use a mechanical brush followed by application of pressurized air in lieu of combination style equipment.) The

vacuum collection equipment shall be configured to maintain a minimum of 3000 feet per minute air velocity in the cleaning zone.

Make –Up Air System

1. All non-porous surfaces of the outdoor air intake located on the exterior of the building shall be cleaned using manual wet-wiping and HEPA vacuuming methods as needed to remove adhered materials. Note that the air intake for the condenser compartment of the air handling unit is located adjacent to the outdoor air intake for the makeup air system and should be cleaned concurrently.
2. The section of the duct from the outdoor air intake through the blower unit shall be cleaned using HEPA vacuum methods. It may be necessary to install a service opening in order to perform this cleaning.
3. Clean blower assembly and blower housing in place by a combination of hand vacuuming, damp wiping and air washing. As required in this document, air washing shall only be performed after a vacuum collection device has been installed.
4. Seal the diffuser openings using 6-mil ethylene sheeting to be secured with duct tape.
5. The makeup air duct shall be cleaned using a pressurized air mechanical brush system in combination with a vacuum collection device. The direction of cleaning shall be from the blower assembly toward the terminal end of the duct. (It is permissible to use a mechanical brush followed by application of pressurized air in lieu of combination style equipment.) It may be necessary to install a service opening in order to perform the duct cleaning. The vacuum collection equipment shall be configured to maintain a minimum of 3000 feet per minute air velocity in the cleaning zone.

Dissembled Duct Sections on Floor

1. Transport dissembled duct sections to the enclosure constructed for cleaning of the air handling unit for wet cleaning. The dissembled duct sections should be sprayed with Simple Green or a similar environmentally safe degreaser and hand washed as needed to remove adhered materials.

11.3.2 Food Exchange Restaurant

This is a 2,324 sq ft space with 10' high suspended acoustical ceiling on the south side and a solid gypsum drywall suspended ceiling on the north side. An older tin ceiling is present on the deck of the south side and an additional layer of gypsum is attached to the deck on the north side. Prior to the start of work, the suspended acoustical ceiling on the south side will be removed by WRS Infrastructure and Environment, Inc.

Two nearly side-by-side air handling units are located above the ceiling. These are recirculating air units with no outdoor air supply. Return air enters the ceiling plenum through passive return grilles located in the false ceiling below each unit. The air handling units draw return air from the ceiling plenum through grilles in the sides of the units. The air handling units distribute supply air to supply air ducts that extend to the north and to the south of the units. The ducts are approximately 50' long (north-south dimension). Supply air is distributed to the occupant space through supply diffusers off of the supply duct; the diffusers are flush with the false ceiling. There are supply grilles off the supply air duct that extend in a line to the north and to the south of the air handling units; these are spaced approximately 15' apart. There are 5 supply grilles each located to the north and south of the air handling units.. The air handling unit is not provided with access doors and is difficult to access.

VENTILATION SYSTEM COMPONENTS TO BE CLEANED

The following system components in the Food Exchange Restaurant will be cleaned:

a. Air handling units and components
b. Supply air ducts and terminal diffusers

CLEANING PROCEDURES

General: Any interior surfaces of the air handling unit or ventilation system that are porous shall be cleaned using manual HEPA vacuuming methods. After successful completion of visual inspection and verification sampling, a lockdown encapsulant shall be applied to the porous surfaces using a hand-operated sprayer or brush, using care not to coat electrical or mechanical components.

Note that if any dissembly of the air handling units is required to complete the work, the air handling unit shall be reassembled by a qualified HVAC professional after all parts are dry and are verified clean.

Note that all HEPA air filtration devices and HEPA-filtered vacuum collection devices shall be exhausted to the outdoors.

<u>Air Handling Units</u>

1. Ensure that the air handling unit motors are locked out and is electrically isolated, and place the air handling units and their components under containment prior to beginning work. A temporary Zip-wall containment of 6-mil, fire retardant polyethylene sheeting extending from the floor to the ceiling deck, and maintained under negative pressure using a HEPA-filtered air filtration device is sufficient. The footprint of the containment should be large enough to accommodate a ladder or scaffolding. Note that WRS Infrastructure and Environment, Inc. may construct the containment prior to the start of ventilation system cleaning.
2. Clean the filter racks at the return air sides of the units by damp wiping.
3. Prior to cleaning, place polyethylene sheeting underneath the coils. Wet clean the upstream and downstream sides of cooling coils. Apply manufacturer-approved cleaning solution to the coils using low pressure methods (i.e., airless sprayer, hand operated pump).
4. Clean the blower assembly and blower housing in place. The blower assembly and blower housing shall be cleaned by a combination of hand vacuuming, damp wiping and air washing. As required in this document, air washing shall only be performed after a vacuum collection device has been installed.
5. HEPA vacuum remaining interior surfaces and components to remove all visible debris. No encapsulant materials may be used inside the condenser compartment.

Reheat Coils

1. Note that if reheat coils are present, by dry vacuuming or air washing. No liquids may come into contact with the electric reheat coil.

Supply Air Ducts and Terminal Diffusers

1. Remove all terminal diffusers into 6-mil polyethylene bags and proceed to the enclosure constructed for cleaning of the air handling unit. Terminal diffusers shall be wet-cleaned. The diffusers should be sprayed with Simple Green or a similar environmentally safe degreaser and hand washed as needed to remove adhered materials.
2. Seal the diffuser openings using 6-mil polyethylene sheeting to be secured with duct tape.
3. Install a vacuum collection device at the terminal end of the duct section to be cleaned. If the entire duct is not cleaned as one unit, then isolate the section of the duct to be cleaned using a zoning device.
4. The supply air duct shall be cleaned using a pressurized air/mechanical brush system in combination with a vacuum collection device. The direction of cleaning shall be from the air handler toward the terminal end of the duct. (It is permissible to use a mechanical brush followed by application of pressurized air in lieu of combination style equipment.) The vacuum collection equipment shall be configured to maintain a minimum of 3000 feet per minute air velocity in the cleaning zone. (See Requirements Section for use of this equipment.)

11.3.3 Combustion Make-up Air Riser

The combustion make-up air riser extends from the ceiling of a second floor mechanical closet to the roof of the building.

VENTILATION SYSTEM COMPONENTS TO BE CLEANED

The following system components will be cleaned:

a. Combustion riser
b. Associated vents
c. Roof cap

CLEANING PROCEDURES

Note that the HEPA-filtered vacuum collection devices shall be exhausted to the outdoors.

Combustion riser, associated vents and roof cap

1. Remove all vents into 6-mil polyethylene bags and proceed to work area appropriate for cleaning the vents. The vents shall be wet-cleaned. The vents should be sprayed with Simple Green or a similar environmentally safe degreaser and hand washed as needed to remove adhered materials.
2. Seal the vent openings using 6-mil polyethylene sheeting to be secured with duct tape.
3. Install a vacuum collection device at the bottom of the riser on the second floor.

4. The combustion riser shall be cleaned using a pressurized air/mechanical brush system in combination with a vacuum collection device. The direction of cleaning shall be from the roof down toward the second floor. (It is permissible to use a mechanical brush followed by application of pressurized air in lieu of combination style equipment.) The vacuum collection equipment shall be configured to maintain a minimum of 3000 feet per minute air velocity in the cleaning zone. (See Requirements Section for use of this equipment.)
5. Remove the roof cap if possible and place on a polyethylene sheet. Wet-clean by damp wiping in place or if removed, spray with Simple Green or a similar environmentally safe degreaser and hand wash as needed to remove adhered materials.

APPENDIX A
DEFINITIONS

1. **Access Doors:** Covers for service openings consisting of pre-fabricated operable or removable entry panels, which are installed in a ventilation system to facilitate inspection and maintenance services.

2. **Air Conveyance System, Air Handling System, HVAC System, Ventilation System:** The ventilation system is any interior surface of a building's air distribution system for conditioned spaces and/or occupied zones (See definition of air handling system, ASHRAE 62-1989). This includes the entire air distribution system from the points that the air enters the system to the points that air is discharged from the system. The return air grilles, air ducts (except ceiling plenums) to the air handling unit (AHU), the interior surface of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers, and dehumidifiers, supply air ducts, fans, fan housing, fan blades, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the ventilation system.

3. **Air Filtration Device (also referred to as Negative Air Machine):** An external air moving device which can be temporarily connected to a section or sections of an ventilation system to create negative airflow for cleaning and remediation procedures, employing a minimum of DOP-tested HEPA final filtration if exhausted indoors.

4. **Air Washing**: For duct cleaning, this term applies to the use of pressurized air, in combination with a Vaccuum Collection Device, for transporting dislodged debris into the vacuum collection equipment.

5. **Ceiling Plenum:** A non-ducted area between the ceiling over a conditioned building space and the floor above, through which air is transported to a conditioned space from an ventilation system (ceiling supply air plenum), or from a conditioned space to an ventilation system (ceiling return air plenum).

6. **Coils:** Devices inside the ventilation system, which temper and/or dehumidify the air transported by the ventilation system. These include heat exchangers, with or without extended surfaces, through which either water, ethylene glycol solution, brine, volatile refrigerant, steam, or electricity is circulated for the purpose of total cooling (sensible cooling plus latent cooling) or sensible heating of a forced-circulation air stream (See ASHRAE 33-78 and ARI 410-91).

7. **Debris:** Any solid materials, including particulate substances, in the ventilation system not intended to be present.

8. **DOP Testing:** The percentage of removal of 0.3 micrometer particles of dioctylphthalate (DOP) is used to rate high efficiency air filters, those with efficiencies above about 98 percent (See Military Standard 282, U.S. Department of Defense, 1956).

9. **Ductwork (Ducts):** A system of passageways for distribution and extraction of air (See ASHRAE Terminology of Heating, Ventilation, Air Conditioning, and Refrigeration, 1991).

10. **Encapsulation:** The application of a bridging (resurfacing) or penetrating compound on internal ventilation system surfaces to bond, mechanically resurface, or lock-down fibrous and other ventilation system components which have deteriorated or been damaged, to control the entrainment of particulates from these components into the airstream.

11. **Environmental Cleaning Contractor:** The Environmental Cleaning Contractor at 110 Liberty Street is WRS Infrastructure and Environment, Inc., as the authorized by the USEPA .

12. **Environmental Service Contractor**: An independent environmental contractor performing an initial assessment of the WTC-related dust, as authorized by the USEPA

13. **Fan:** A power driven machine that moves a volume of air by converting rotational mechanical energy to an increase in the total pressure of the moving air (See AMCA 99-86).

14. **HEPA Filter:** High efficiency particulate air filter capable of a 99.97% collection efficiency for a 0.3 micron size particle as per DOP testing.

15. **Mechanical Cleaning:** Physical removal of debris and other foreign matter from ventilation system surfaces.

16. **Negative Air (Vacuum Collection) Cleaning:** Procedure for removal of debris from a ventilation system using a HEPA-filtered Vacuum Collection Device for particulate control and capture.

17. **Non-Porous Surface:** Any surface of the ventilation system in contact with the air stream which cannot be penetrated by either solutions or air. This would exclude ventilation system materials such as wood, fiberboard, thermal/acoustic insulation, and concrete.

18. **Porous Surface:** Any surface of the ventilation system in contact with the air stream which can be penetrated by either solutions or air, including but not limited to ventilation system materials such as wood, fiberboard (ductboard), fibrous thermal/acoustic insulation, and concrete.

19. **Pressure Drop:** (1) Loss in pressure, as from one end of a refrigerant line to the other, from friction, static, heat, etc. (2) Difference in pressure between two points in a flow system, usually caused by frictional resistance to fluid flow in a conduit, filter, or other flow system (See ASHRAE Terminology of Heating, Ventilation, Air Conditioning, and Refrigeration, 1991).

20. **Sanitization:** A process to reduce the proliferation of microbial growth in an ventilation system, usually involving the application of a biocide agent.

21. **Source Removal:** An HVAC hygiene mitigation process, which involves the physical capture, removal, and controlled containment of foreign matter from an ventilation system.

22. **Static Pressure:** The normal force per unit area that is exerted on the interior surfaces of the ventilation system by the air.

23. **ULPA Filter:** High efficiency particulate air filter capable of a 99.99% collection efficiency for a 0.1 micron size particle.

24. **Vacuum Collection Device or Equipment**: a HEPA-filtered device for duct cleaning used to place a duct system or sections of a duct system under negative pressure and to collect and transport dust and debris that has been dislodged by mechanical cleaning. This device overcomes greater static pressures than those typical of air filtration devices.

25. **Ventilation system/duct cleaning firm:** Service firm contracted to provide ventilation system cleaning and/or hygiene remediation for a facility.

26. **Visibly Clean:** Determined by internal visual inspection, that all portions or components of the ventilation system are free of any visible debris.

27. **Visual Inspection:** Examination of ventilation system components to evaluate the presence of visible contamination using the human eye other optical instrument. Visual inspection may be aided by the use of telescoping inspection mirrors and flashlights inserted through service openings.

28. **Visual Inspection System (VIS):** Optical device such as a still camera, borescope, or CCTV (closed circuit television) video camera system employed to perform a visual hygiene evaluation and/or documentation of internal areas in an HVAC system.

29. **Zoning Device**: A physical barrier consisting of a balloon or other device for blocking/segregating a ventilation duct.

APPENDIX B
INSTALLATION OF SERVICE OPENINGS IN AIR HANDLING SYSTEMS

[B.1] Service openings in Sheet Metal Ventilation System Components: Any Service openings shall be made in such a way as to not significantly weaken the structural integrity of the metal ventilation system component and provide an air tight seal once secured. Ventilation system/duct cleaning firm must provide a finished surface deemed visually acceptable by the Client and in the opinion of the Client, not reduce the building's aesthetic qualities. Work cut and patched in an unsatisfactory manner shall be removed and replaced by the Ventilation system/duct cleaning firm at no additional cost to the Client. Upon completion of inspection and/or cleaning services, the Service openings shall be sealed in accordance with job specifications, with one of the following closure techniques:

(1) Install gasketed removable Access Doors.

(2) Install sheet metal panels fastened with sheet metal screws and sealed with silicone chalk, mastic or duct sealant.

[B.2] Service openings in Externally Insulated Sheet Metal Ventilation System Components: (See [C.1] Service openings in Sheet Metal Ventilation System Components) Upon closure of Access Hole, external insulation must be replaced as necessary and the edges secured with either an approved water-based bridging encapsulant for canvas-wrapped insulated duct exteriors or reinforced 4" wide foil tape on foil-faced insulated duct exteriors.

[B.3] Service openings in Fibrous Lined Sheet Metal Ventilation System Components: Any Service openings shall be made in such a way as to not significantly weaken the structural integrity of the metal ventilation system component or create fiber shed from the internal insulation at the cut area once the Access Hole is closed. Upon completion of inspection and/or cleaning services, the Service openings shall be sealed in accordance with the following closure techniques:

(1) Install gasketed, insulated Access Doors. The cut edge of the internal insulation lining at the Access Hole must be sealed with an approved Bridging Encapsulant to prevent fiber shed, and the insulation on the cover plate should fit securely in the cut-out area.

(2) Pressure fitting round hole plugs (for Service openings 3" diameter or smaller in low/medium positive air pressure applications) after an approved ventilation system Bridging Encapsulant has been applied to the cut edge of the internal insulation to prevent fibershed.

(3) Install sheet metal panels affixed with similar insulation to match the removed portion of insulation from the service opening, fastened with sheet metal screws and sealed with silicone chalk, mastic or duct sealant. The cut edge of the internal insulation lining at the Access Hole must be sealed with an approved bridging encapsulant to prevent fiber shed, and the insulation on the cover plate should fit securely in the cut-out area.

[B.4] Service openings in Fibrous Glass Ventilation System Components (Duct board): Any Service openings shall be made in such a way as to not significantly weaken the structural integrity of the Fibrous Glass Ventilation System Component or create fiber shed from the product at the cut area once the Access Hole is closed. Upon completion of inspection and/or cleaning services, the Service openings shall be sealed in accordance with job specifications, with one of the following closure techniques:

(1) Install gasketed, insulated Access Doors which will seal the internal cut edge to prevent fibershed, or after an approved ventilation system Bridging Encapsulant has been applied to the cut edge of the internal insulation to prevent fibershed

(2) Make a shiplap or a 45 degree inward "pumpkin" access cut in the ductboard, and reinstall the cut piece after inspection and/or cleaning with a tape that complies with UL 181 or UL 181A closure systems (See NAIMA's Cleaning Fibrous Glass Insulated Air Duct Systems - Recommended Practice, 1993).

Attachment J

Reporting of Analytical Results

KEY FOR THE ANALYTICAL TABLES

Compound/Type	Analytical Method	Units	Criterion
Asbestos			
Air	PCM	f/cc	0.01 (secondary)
	TEM AHERA	S>0.5ɕ/cc	0.022 (secondary)
	TEM PCMe	S>5ɕ/cc	0.0009 (primary clearance))
Micro vacuum	TEM AHERA	S/cm^2	not available
Wipe	TEM AHERA	S/cm^2	not available
Dioxin - TEQ EMPC (ND=1/2)			
Air	Method 8290	ng/m^3	0.001 (primary clearance)
Wipe	Method 8290	ng/m^2	4 (primary clearance)
Gypsum			
Air	NIOSH 7500	mg/m^3	not available
Wipe	NIOSH 7500	mg/m^2	not available
Lead			
Air	NIOSH 7300	ɕg/m^3	1 (primary clearance)
Micro vacuum	NIOSH 7300	ɕg/ft^2	25 (comparison value)
Wipe	NIOSH 7300	ɕg/ft^2	25 (primary clearance)
Mineral: alpha-Quartz			
Air	NIOSH 7500	mg/m^3	4 (primary clearance)
Wipe	NIOSH 7500	mg/m^2	not available
Mineral: Calcite			
Air	NIOSH 7500	mg/m^3	not available
Wipe	NIOSH 7500	mg/m^2	not available
Mineral: Cristobalite			
Air	NIOSH 7500	mg/m^3	not available
Wipe	NIOSH 7500	mg/m^2	not available
Mineral: Tridymite			
Air	NIOSH 7500	mg/m^3	not available
Wipe	NIOSH 7500	mg/m^2	not available
MMVF			
Air	SEM/PLM	mmvf_S/L	10 (primary clearance)
Wipe	SEM/PLM	mmvf_S/c (=S/cm$^{2)}$	not available
PAH			
Air	Method 8270	ɕg/m^3	0.2 (primary clearance)
Wipe	Method 8270	ɕg/m^2	300 (primary clearance)
Total Dust			
Micro vacuum	NADCA	mg/cm^2	0.5 (secondary)

Unit 2B Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-2B-005	Microvac			6331.52	S/cm2	Chrysotile
9094-M-2B-006	Microvac			11871.6	S/cm2	Chrysotile
9094-M-2B-007	Microvac			25326.1	S/cm2	Chrysotile
9094-W-2B-001	Wipe	ND	<	2366.41	S/cm2	
9094-W-2B-002	Wipe	ND	<	2366.41	S/cm2	Anthophyllite/Chrysotile
9094-W-2B-003	Wipe			102096	S/cm2	Chrysotile
9094-W-2B-004	Wipe			5540.08	S/cm2	Chrysotile

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2B-008	Air			0.003	f/cc	
9094-A-2B-009	Air			0.005	f/cc	
9094-A-2B-010	Air			0.002	f/cc	
9094-A-2B-008	Air			0.0068	S>0.5u/cc	Chrysotile
9094-A-2B-009	Air			0.0095	S>0.5u/cc	Chrysotile
9094-A-2B-010	Air			0.0026	S>0.5u/cc	Chrysotile
9094-A-2B-008	Air	ND	<	0.0009	S>5u/cc	Chrysotile
9094-A-2B-009	Air	ND	<	0.0009	S>5u/cc	Chrysotile
9094-A-2B-010	Air	ND	<	0.0009	S>5u/cc	Chrysotile
9094-M-2B-020	Microvac			22160.3	S/cm2	Chrysotile
9094-M-2B-021	Microvac			10288.7	S/cm2	Chrysotile
9094-M-2B-022	Microvac			72284.9	S/cm2	Chrysotile
9094-M-2B-023	Microvac			11080.2	S/cm2	Chrysotile
9094-W-2B-015	Wipe	ND	<	5916.01	S/cm2	
9094-W-2B-016	Wipe	ND	<	5916.01	S/cm2	
9094-W-2B-017	Wipe	ND	<	5916.01	S/cm2	Chrysotile
9094-W-2B-018	Wipe	ND	<	5916.01	S/cm2	Chrysotile
9094-W-2B-019	Wipe			5935.8	S/cm2	Chrysotile

Unit 2B Results

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result	Comment
9094-W-2B-002	Wipe		0.488 ng/m2	
9094-W-2B-003	Wipe		0.526 ng/m2	
9094-W-2B-004	Wipe		0.642 ng/m2	

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected	Result	Comment
9094-W-2B-016	Wipe		0.556 ng/m2	
9094-W-2B-017	Wipe		0.522 ng/m2	
9094-W-2B-018	Wipe		0.476 ng/m2	
9094-W-2B-019	Wipe		0.563 ng/m2	

Gypsum

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected	Result	Comment
9094-A-2B-013	Air	ND	< 0.016 mg/m3	
9094-A-2B-014	Air	ND	< 0.016 mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected	Result	Comment
9094-M-2B-005	Microvac	ND	< 2.32 ug/ft2	
9094-M-2B-006	Microvac		4.54 ug/ft2	
9094-M-2B-007	Microvac	ND	< 2.32 ug/ft2	
9094-W-2B-002	Wipe	ND	< 4.65 ug/ft2	
9094-W-2B-003	Wipe		97 ug/ft2	
9094-W-2B-004	Wipe		17.5 ug/ft2	

Unit 2B Results

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2B-011	Air			0.197	ug/m3	
9094-A-2B-012	Air			0.193	ug/m3	
9094-M-2B-020	Microvac	ND	<	2.32	ug/ft2	
9094-M-2B-021	Microvac	ND	<	2.32	ug/ft2	
9094-M-2B-022	Microvac	ND	<	2.32	ug/ft2	
9094-M-2B-023	Microvac	ND	<	2.32	ug/ft2	
9094-W-2B-016	Wipe	ND	<	4.65	ug/ft2	
9094-W-2B-017	Wipe			9.9	ug/ft2	
9094-W-2B-018	Wipe			18.7	ug/ft2	
9094-W-2B-019	Wipe			7.41	ug/ft2	

Post 2nd cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2B-024	Air			0.309	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2B-013	Air	ND	<	0.004	mg/m3	
9094-A-2B-014	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2B-013	Air	ND	<	0.016	mg/m3	
9094-A-2B-014	Air	ND	<	0.016	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2B-013	Air	ND	<	0.016	mg/m3	
9094-A-2B-014	Air	ND	<	0.016	mg/m3	

Unit 2B Results

Mineral: Tridymite

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2B-013	Air	ND	<	0.016	mg/m3	
9094-A-2B-014	Air	ND	<	0.016	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-2B-002	Wipe			629.55	S/cm2	
9094-W-2B-003	Wipe			13163.22	S/cm2	
9094-W-2B-004	Wipe			400.62	S/cm2	

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2B-008	Air			6.645	S/L	
9094-A-2B-009	Air			1.685	S/L	
9094-A-2B-010	Air			3.922	S/L	
9094-W-2B-015	Wipe	ND	<	57.23	S/cm2	
9094-W-2B-016	Wipe			114.46	S/cm2	
9094-W-2B-017	Wipe			228.93	S/cm2	
9094-W-2B-018	Wipe			171.69	S/cm2	
9094-W-2B-019	Wipe			171.69	S/cm2	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-2B-002	Wipe	U		290	ug/m2	
9094-W-2B-003	Wipe	U		290	ug/m2	
9094-W-2B-004	Wipe	U		290	ug/m2	

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-W-2B-016	Wipe	U		290	ug/m2	
9094-W-2B-017	Wipe	U		290	ug/m2	
9094-W-2B-018	Wipe	U		290	ug/m2	
9094-W-2B-019	Wipe	U		290	ug/m2	

Unit 2A Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-2A-006	Microvac			3561.48	S/cm2	Chrysotile
9094-M-2A-007	Microvac			30866.2	S/cm2	Chrysotile
9094-M-2A-008	Microvac			20973.2	S/cm2	Chrysotile
9094-M-2A-009	Microvac	ND	<	1582.88	S/cm2	
9094-W-2A-001	Wipe	ND	<	2366.41	S/cm2	Chrysotile
9094-W-2A-002	Wipe	ND	<	2366.41	S/cm2	Chrysotile
9094-W-2A-003	Wipe			56192.2	S/cm2	Chrysotile
9094-W-2A-004	Wipe			18994.6	S/cm2	Chrysotile
9094-W-2A-005	Wipe			3165.76	S/cm2	Chrysotile

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected		Result		Comment
9094-A-2A-010	Air			0.003	f/cc	
9094-A-2A-011	Air			0.003	f/cc	
9094-A-2A-012	Air			0.002	f/cc	
9094-A-2A-010	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-2A-011	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-2A-012	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-2A-010	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-2A-011	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-2A-012	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-2A-022	Microvac			45903.5	S/cm2	Chrysotile
9094-M-2A-023	Microvac	ND	<	3165.76	S/cm2	Chrysotile. Asbestos detected below detection limit.
9094-M-2A-024	Microvac			13454.5	S/cm2	Chrysotile
9094-W-2A-017	Wipe	ND	<	1183.2	S/cm2	
9094-W-2A-018	Wipe	ND	<	1183.2	S/cm2	

Unit 2A Results

9094-W-2A-019	Wipe		4396.89	S/cm2	Chrysotile
9094-W-2A-020	Wipe	ND	< 2366.41	S/cm2	Chrysotile. Asbestos detected below detection limit.
9094-W-2A-021	Wipe	ND	< 1183.2	S/cm2	

Post 2nd Cleaning - Test 1B

Sample ID	Matrix	Detected	Result		Comment
9094-A-2A-025	Air		0.001	f/cc	
9094-A-2A-026	Air		0.001	f/cc	
9094-A-2A-027	Air		0.001	f/cc	
9094-A-2A-028	Air		0.002	f/cc	
9094-A-2A-029	Air		0.001	f/cc	
9094-A-2A-030	Air		0.001	f/cc	
9094-A-2A-025	Air		0.0022	S>0.5u/cc	Chrysotile
9094-A-2A-026	Air		0.0013	S>0.5u/cc	Chrysotile
9094-A-2A-027	Air		0.0042	S>0.5u/cc	Chrysotile
9094-A-2A-028	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-2A-029	Air		0.0005	S>0.5u/cc	Chrysotile
9094-A-2A-030	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-2A-025	Air		0.0004	S>5u/cc	Chrysotile
9094-A-2A-026	Air		0.0009	S>5u/cc	Chrysotile
9094-A-2A-027	Air		0.0004	S>5u/cc	Chrysotile
9094-A-2A-028	Air	ND	< 0.0005	S>5u/cc	
9094-A-2A-029	Air	ND	< 0.0005	S>5u/cc	
9094-A-2A-030	Air	ND	< 0.0005	S>5u/cc	

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-2A-002	Wipe		0.585	ng/m2	
9094-W-2A-003	Wipe		1.21	ng/m2	
9094-W-2A-004	Wipe		0.752	ng/m2	
9094-W-2A-005	Wipe		0.843	ng/m2	

Unit 2A Results

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected		Result		Comment
9094-W-2A-018	Wipe			0.557	ng/m2	
9094-W-2A-019	Wipe			0.507	ng/m2	
9094-W-2A-020	Wipe			0.556	ng/m2	
9094-W-2A-021	Wipe			0.647	ng/m2	

Gypsum

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected		Result		Comment
9094-A-2A-015	Air	ND	<	0.016	mg/m3	
9094-A-2A-016	Air	ND	<	0.016	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-2A-006	Microvac			4.03	ug/ft2	
9094-M-2A-007	Microvac			14.4	ug/ft2	
9094-M-2A-008	Microvac			3.89	ug/ft2	
9094-M-2A-009	Microvac	ND	<	2.32	ug/ft2	
9094-W-2A-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-2A-003	Wipe			49.4	ug/ft2	
9094-W-2A-004	Wipe			35.4	ug/ft2	
9094-W-2A-005	Wipe			44.6	ug/ft2	

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected		Result		Comment
9094-A-2A-013	Air	ND	<	0.052	ug/m3	
9094-A-2A-014	Air	ND	<	0.052	ug/m3	
9094-M-2A-022	Microvac	ND	<	2.32	ug/ft2	
9094-M-2A-023	Microvac	ND	<	2.32	ug/ft2	
9094-M-2A-024	Microvac	ND	<	2.32	ug/ft2	
9094-W-2A-018	Wipe	ND	<	4.65	ug/ft2	

Unit 2A Results

9094-W-2A-019	Wipe			11.3	ug/ft2
9094-W-2A-020	Wipe	ND	<	4.65	ug/ft2
9094-W-2A-021	Wipe	ND	<	4.65	ug/ft2

Mineral: alpha-Quartz

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected		Result		Comment
9094-A-2A-015	Air	ND	<	0.004	mg/m3	
9094-A-2A-016	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected		Result		Comment
9094-A-2A-015	Air	ND	<	0.016	mg/m3	
9094-A-2A-016	Air	ND	<	0.016	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected		Result		Comment
9094-A-2A-015	Air	ND	<	0.016	mg/m3	
9094-A-2A-016	Air	ND	<	0.016	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected		Result		Comment
9094-A-2A-015	Air	ND	<	0.016	mg/m3	
9094-A-2A-016	Air	ND	<	0.016	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-2A-002	Wipe	ND	<	57.23	S/cm2	
9094-W-2A-003	Wipe			629.55	S/cm2	
9094-W-2A-004	Wipe			2117.56	S/cm2	
9094-W-2A-005	Wipe			343.39	S/cm2	

Unit 2A Results

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected	Result		Comment
9094-A-2A-010	Air		0.825	S/L	
9094-A-2A-011	Air		0.617	S/L	
9094-A-2A-012	Air		1.284	S/L	
9094-W-2A-017	Wipe		57.23	S/cm2	
9094-W-2A-018	Wipe		114.46	S/cm2	
9094-W-2A-019	Wipe		171.69	S/cm2	
9094-W-2A-020	Wipe		57.23	S/cm2	
9094-W-2A-021	Wipe		114.46	S/cm2	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-2A-002	Wipe	U	290	ug/m2	
9094-W-2A-003	Wipe		290	ug/m2	
9094-W-2A-004	Wipe	U	290	ug/m2	
9094-W-2A-005	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 1B

Sample ID	Matrix	Detected	Result		Comment
9094-W-2A-018	Wipe	U	290	ug/m2	
9094-W-2A-019	Wipe	U	290	ug/m2	
9094-W-2A-020	Wipe	U	290	ug/m2	
9094-W-2A-021	Wipe	U	290	ug/m2	

2nd Floor Hallway Results

Asbestos

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2ND-001	Air			0.003	f/cc	
9094-A-2ND-002	Air			0.002	f/cc	
9094-A-2ND-001	Air			0.0011	S>0.5u/cc	Chrysotile
9094-A-2ND-002	Air			0.0025	S>0.5u/cc	Chrysotile
9094-A-2ND-001	Air			0.0005	S>5u/cc	Chrysotile
9094-A-2ND-002	Air	ND	<	0.0005	S>5u/cc	

Gypsum

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2ND-005	Air	ND	<	0.009	mg/m3	
9094-A-2ND-006	Air	ND	<	0.009	mg/m3	

Lead

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2ND-003	Air	ND	<	0.052	ug/m3	
9094-A-2ND-004	Air	ND	<	0.052	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2ND-005	Air	ND	<	0.004	mg/m3	
9094-A-2ND-006	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-2ND-005	Air	ND	<	0.017	mg/m3	
9094-A-2ND-006	Air	ND	<	0.017	mg/m3	

2nd Floor Hallway Results

Mineral: Cristobalite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-2ND-005	Air	ND	< 0.017	mg/m3	
9094-A-2ND-006	Air	ND	< 0.017	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-2ND-005	Air	ND	< 0.017	mg/m3	
9094-A-2ND-006	Air	ND	< 0.017	mg/m3	

MMVF

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-2ND-001	Air	ND	< 0.071	S/L	
9094-A-2ND-002	Air		0.067	S/L	

Unit 3A Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-A-3A-005	Air			0.006	f/cc	
9094-A-3A-006	Air			0.004	f/cc	
9094-A-3A-005	Air	ND	<	0.0009	S>5u/cc	
9094-A-3A-006	Air	ND	<	0.0008	S>5u/cc	
9094-M-3A-006	Microvac			116688	S/cm2	Chrysotile
9094-M-3A-007	Microvac			435336	S/cm2	Chrysotile
9094-M-3A-008	Microvac			72805.3	S/cm2	Chrysotile
9094-M-3A-009	Microvac			80784	S/cm2	Chrysotile
9094-W-3A-001	Wipe	ND	<	2366.41	S/cm2	
9094-W-3A-002	Wipe	ND	<	2366.41	S/cm2	
9094-W-3A-003	Wipe	ND	<	2366.41	S/cm2	
9094-W-3A-004	Wipe			4748.64	S/cm2	Chrysotile

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-3A-010	Air			0.004	f/cc	
9094-A-3A-011	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-3A-012	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-3A-010	Air			0.0009	S>0.5u/cc	Chrysotile
9094-A-3A-011	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3A-012	Air			0.0009	S>0.5u/cc	Chrysotile
9094-A-3A-010	Air	ND	<	0.0009	S>5u/cc	
9094-A-3A-011	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3A-012	Air	ND	<	0.0009	S>5u/cc	
9094-M-3A-022	Microvac			94972.8	S/cm2	Chrysotile
9094-M-3A-023	Microvac			23743.2	S/cm2	Chrysotile
9094-M-3A-024	Microvac			3957.2	S/cm2	Chrysotile
9094-M-3A-025	Microvac	ND	<	3165.76	S/cm2	
9094-W-3A-017	Wipe			15037.4	S/cm2	Chrysotile

Unit 3A Results

9094-W-3A-018	Wipe	ND	<	11832	S/cm2	Particulate matter; sensivity (11832 s/cm2) not reached.
9094-W-3A-019	Wipe			3957.2	S/cm2	Chrysotile
9094-W-3A-020	Wipe			3165.76	S/cm2	Chrysotile
9094-W-3A-021	Wipe	ND	<	2366.41	S/cm2	Chrysotile

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-3A-002	Wipe			0.54	ng/m2	
9094-W-3A-003	Wipe			0.616	ng/m2	
9094-W-3A-004	Wipe			0.592	ng/m2	

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-W-3A-018	Wipe			0.535	ng/m2	
9094-W-3A-019	Wipe			0.606	ng/m2	
9094-W-3A-020	Wipe			0.597	ng/m2	
9094-W-3A-021	Wipe			0.706	ng/m2	

Gypsum

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-3A-015	Air	ND	<	0.016	mg/m3	
9094-A-3A-016	Air	ND	<	0.017	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-3A-006	Microvac	ND	<	4.65	ug/ft2	
9094-M-3A-007	Microvac	ND	<	4.65	ug/ft2	
9094-M-3A-008	Microvac	ND	<	4.65	ug/ft2	
9094-M-3A-009	Microvac	ND	<	4.65	ug/ft2	
9094-W-3A-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-3A-003	Wipe			38.9	ug/ft2	
9094-W-3A-004	Wipe			12	ug/ft2	

Unit 3A Results

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-3A-013	Air			0.116	ug/m3	Field blank contamination (Validation = R).
9094-A-3A-014	Air			0.131	ug/m3	Field blank contamination (Validation = R).
9094-M-3A-022	Microvac			4.85	ug/ft2	
9094-M-3A-023	Microvac	ND	<	2.32	ug/ft2	
9094-M-3A-024	Microvac			4.39	ug/ft2	
9094-M-3A-025	Microvac	ND	<	2.32	ug/ft2	
9094-W-3A-018	Wipe	ND	<	4.65	ug/ft2	
9094-W-3A-019	Wipe			10.5	ug/ft2	
9094-W-3A-020	Wipe			9.29	ug/ft2	
9094-W-3A-021	Wipe	ND	<	4.65	ug/ft2	

Mineral: alpha-Quartz

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-3A-015	Air	ND	<	0.004	mg/m3	
9094-A-3A-016	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-3A-015	Air	ND	<	0.016	mg/m3	
9094-A-3A-016	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-3A-015	Air	ND	<	0.016	mg/m3	
9094-A-3A-016	Air	ND	<	0.017	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-3A-015	Air	ND	<	0.016	mg/m3	
9094-A-3A-016	Air	ND	<	0.017	mg/m3	

Unit 3A Results

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-3A-005	Air		3.283	S/L	
9094-A-3A-006	Air		0.903	S/L	
9094-W-3A-002	Wipe		57.23	S/cm2	
9094-W-3A-003	Wipe		801.24	S/cm2	
9094-W-3A-004	Wipe		686.78	S/cm2	

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result		Comment
9094-A-3A-010	Air		1.226	S/L	
9094-A-3A-011	Air		0.819	S/L	
9094-A-3A-012	Air		1.734	S/L	
9094-W-3A-017	Wipe	ND	< 22.89	S/cm2	
9094-W-3A-018	Wipe	ND	< 22.89	S/cm2	
9094-W-3A-019	Wipe	ND	< 22.89	S/cm2	
9094-W-3A-020	Wipe	ND	< 22.89	S/cm2	
9094-W-3A-021	Wipe	ND	< 22.89	S/cm2	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-3A-002	Wipe	U	290	ug/m2	
9094-W-3A-003	Wipe	U	290	ug/m2	
9094-W-3A-004	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result		Comment
9094-W-3A-018	Wipe	U	290	ug/m2	
9094-W-3A-019	Wipe	U	290	ug/m2	
9094-W-3A-020	Wipe	U	290	ug/m2	
9094-W-3A-021	Wipe	U	290	ug/m2	

Unit 3B Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-3B-009	Air		0.03	f/cc	
9094-A-3B-010	Air		0.006	f/cc	
9094-A-3B-009	Air	ND	< 0.0009	S>5u/cc	
9094-A-3B-010	Air	ND	< 0.0009	S>5u/cc	
9094-M-3B-006	Microvac		20944	S/cm2	Chrysotile
9094-M-3B-007	Microvac		4986.67	S/cm2	Chrysotile
9094-M-3B-008	Microvac	ND	< 4488	S/cm2	
9094-W-3B-001	Wipe	ND	< 2366.41	S/cm2	
9094-W-3B-002	Wipe	ND	< 2366.41	S/cm2	
9094-W-3B-003	Wipe		3165.76	S/cm2	Chrysotile
9094-W-3B-004	Wipe	ND	< 2366.41	S/cm2	

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3B-011	Air		0.003	f/cc	
9094-A-3B-012	Air		0.003	f/cc	
9094-A-3B-013	Air		0.004	f/cc	
9094-A-3B-011	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3B-012	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3B-013	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3B-011	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3B-012	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3B-013	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-3B-023	Microvac		22951.8	S/cm2	Chrysotile
9094-M-3B-024	Microvac		33240.5	S/cm2	Chrysotile
9094-M-3B-025	Microvac		13454.5	S/cm2	Chrysotile

Unit 3B Results

9094-W-3B-018	Wipe		741.975	S/cm2	Chrysotile
9094-W-3B-019	Wipe	ND	< 739.502	S/cm2	Chrysotile - Asbestos detected below detection limit.
9094-W-3B-020	Wipe		4699.18	S/cm2	Chrysotile
9094-W-3B-021	Wipe		3957.2	S/cm2	Chrysotile
9094-W-3B-022	Wipe		2473.25	S/cm2	Chrysotile

Post 2nd cleaning - Scope A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3B-039	Air	ND	< 0.001	f/cc	
9094-A-3B-040	Air	ND	< 0.001	f/cc	
9094-A-3B-041	Air		0.001	f/cc	
9094-A-3B-039	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-3B-040	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-3B-041	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-3B-039	Air	ND	< 0.0005	S>5u/cc	
9094-A-3B-040	Air	ND	< 0.0005	S>5u/cc	
9094-A-3B-041	Air	ND	< 0.0005	S>5u/cc	

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-3B-002	Wipe		0.712	ng/m2	
9094-W-3B-003	Wipe		0.506	ng/m2	
9094-W-3B-004	Wipe		1.13	ng/m2	
9094-W-3B-005	Wipe		0.526	ng/m2	

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected	Result		Comment
9094-W-3B-019	Wipe		0.913	ng/m2	
9094-W-3B-020	Wipe		0.94	ng/m2	
9094-W-3B-021	Wipe		0.915	ng/m2	
9094-W-3B-022	Wipe		0.866	ng/m2	

Unit 3B Results

Gypsum

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3B-016	Air	ND	<	0.008	mg/m3	
9094-A-3B-017	Air	ND	<	0.008	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-3B-006	Microvac	ND	<	4.65	ug/ft2	
9094-M-3B-007	Microvac	ND	<	4.65	ug/ft2	
9094-M-3B-008	Microvac	ND	<	4.65	ug/ft2	
9094-W-3B-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-3B-003	Wipe			11.5	ug/ft2	
9094-W-3B-004	Wipe			9.65	ug/ft2	
9094-W-3B-005	Wipe			0	ug/ft2	Sample lost by laboratory.

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3B-014	Air			0.225	ug/m3	
9094-A-3B-015	Air			0.238	ug/m3	
9094-M-3B-023	Microvac	ND	<	2.32	ug/ft2	
9094-M-3B-024	Microvac	ND	<	2.32	ug/ft2	
9094-M-3B-025	Microvac	ND	<	2.32	ug/ft2	
9094-W-3B-019	Wipe	ND	<	4.65	ug/ft2	
9094-W-3B-020	Wipe			51.6	ug/ft2	
9094-W-3B-021	Wipe			10.9	ug/ft2	
9094-W-3B-022	Wipe			7.27	ug/ft2	

Post 2nd cleaning - Scope A

Sample ID	Matrix	Detected		Result		Comment
9094-W-3B-037	Wipe				ug/ft2	Sample was received broken; not analyzed.
9094-W-3B-038	Wipe	ND	<	4.64	ug/ft2	

Unit 3B Results

Mineral: alpha-Quartz

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3B-016	Air	ND	<	0.004	mg/m3	
9094-A-3B-017	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3B-016	Air	ND	<	0.016	mg/m3	
9094-A-3B-017	Air	ND	<	0.016	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3B-016	Air	ND	<	0.016	mg/m3	
9094-A-3B-017	Air	ND	<	0.016	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3B-016	Air	ND	<	0.016	mg/m3	
9094-A-3B-017	Air	ND	<	0.016	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-3B-009	Air		14.78	S/L	
9094-A-3B-010	Air		2.644	S/L	
9094-W-3B-002	Wipe		744.01	S/cm2	
9094-W-3B-003	Wipe		2289.26	S/cm2	
9094-W-3B-004	Wipe		744.01	S/cm2	

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3B-011	Air		1.528	S/L	
9094-A-3B-012	Air		2.209	S/L	
9094-A-3B-013	Air		0.946	S/L	
9094-W-3B-018	Wipe		57.23	S/cm2	

Unit 3B Results

9094-W-3B-019	Wipe	ND	<	57.23	S/cm2
9094-W-3B-020	Wipe	ND	<	57.23	S/cm2
9094-W-3B-021	Wipe			57.23	S/cm2
9094-W-3B-022	Wipe	ND	<	57.23	S/cm2

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-3B-002	Wipe	U	290	ug/m2	
9094-W-3B-003	Wipe	U	290	ug/m2	
9094-W-3B-004	Wipe	U	290	ug/m2	
9094-W-3B-005	Wipe	U	290	ug/m2	

Post 1st cleaning - Scope A

Sample ID	Matrix	Detected	Result		Comment
9094-W-3B-019	Wipe	U	290	ug/m2	
9094-W-3B-020	Wipe	U	290	ug/m2	
9094-W-3B-021	Wipe	U	290	ug/m2	
9094-W-3B-022	Wipe	U	290	ug/m2	

Unit 3C Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-M-3C-005	Microvac		127160	S/cm2	Chrysotile
9094-M-3C-006	Microvac		286110	S/cm2	Chrysotile
9094-M-3C-007	Microvac		190740	S/cm2	Chrysotile
9094-M-3C-008	Microvac		589050	S/cm2	Chrysotile
9094-W-3C-001	Wipe	ND	< 2366.41	S/cm2	
9094-W-3C-002	Wipe		2374.32	S/cm2	Chrysotile
9094-W-3C-003	Wipe		55400.8	S/cm2	Chrysotile
9094-W-3C-004	Wipe		75978.2	S/cm2	Chrysotile/Amosite.

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3C-009	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-3C-010	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-3C-011	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-3C-009	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-010	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-011	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-3C-021	Microvac		223582	S/cm2	Chrysotile
9094-M-3C-022	Microvac		39967.7	S/cm2	1 Actinolite and 100 Chrysotile
9094-M-3C-023	Microvac		888172	S/cm2	Chrysotile
9094-M-3C-024	Microvac		147406	S/cm2	Chrysotile
9094-W-3C-016	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-3C-017	Wipe		12663	S/cm2	Chrysotile
9094-W-3C-018	Wipe		77561.1	S/cm2	Chrysotile
9094-W-3C-019	Wipe	ND	< 2366.41	S/cm2	
9094-W-3C-020	Wipe		13454.5	S/cm2	Chrysotile

Unit 3C Results

Post 2nd cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3C-025	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-3C-026	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-3C-027	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-3C-028	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-3C-029	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-3C-025	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-026	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-027	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-028	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-029	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-025	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-026	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-027	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-028	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3C-029	Air				S>5u/cc	Not analyzed due to overloading of particulates.

Post 3rd cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-3C-032	Air	ND	<	0.001	f/cc	
9094-A-3C-033	Air	ND	<	0.001	f/cc	
9094-A-3C-034	Air	ND	<	0.001	f/cc	
9094-A-3C-035	Air			0.004	f/cc	
9094-A-3C-036	Air			0.002	f/cc	
9094-A-3C-037	Air			0.002	f/cc	
9094-A-3C-032	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-3C-033	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-3C-034	Air	ND	<	0.0005	S>0.5u/cc	

Unit 3C Results

9094-A-3C-035	Air	ND	<	0.0005	S>0.5u/cc
9094-A-3C-036	Air	ND	<	0.0005	S>0.5u/cc
9094-A-3C-037	Air	ND	<	0.0005	S>0.5u/cc
9094-A-3C-032	Air	ND	<	0.0005	S>5u/cc
9094-A-3C-033	Air	ND	<	0.0005	S>5u/cc
9094-A-3C-034	Air	ND	<	0.0005	S>5u/cc
9094-A-3C-035	Air	ND	<	0.0005	S>5u/cc
9094-A-3C-036	Air	ND	<	0.0005	S>5u/cc
9094-A-3C-037	Air	ND	<	0.0005	S>5u/cc

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-3C-002	Wipe		0.558	ng/m2	
9094-W-3C-003	Wipe		6.2	ng/m2	
9094-W-3C-004	Wipe		1.32	ng/m2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-W-3C-017	Wipe		0.618	ng/m2	
9094-W-3C-018	Wipe		0.56	ng/m2	
9094-W-3C-019	Wipe		0.557	ng/m2	
9094-W-3C-020	Wipe		0.525	ng/m2	

Gypsum

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3C-014	Air	ND	< 0.016	mg/m3	
9094-A-3C-015	Air	ND	< 0.017	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-M-3C-005	Microvac		68.4	ug/ft2	
9094-M-3C-006	Microvac		135	ug/ft2	
9094-M-3C-007	Microvac		43.3	ug/ft2	
9094-M-3C-008	Microvac		39.4	ug/ft2	

Unit 3C Results

9094-W-3C-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-3C-003	Wipe			750	ug/ft2	
9094-W-3C-004	Wipe			48.7	ug/ft2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3C-012	Air			0.289	ug/m3	
9094-A-3C-013	Air			0.261	ug/m3	
9094-M-3C-021	Microvac			6.32	ug/ft2	
9094-M-3C-022	Microvac			9.66	ug/ft2	
9094-M-3C-023	Microvac			26.9	ug/ft2	
9094-M-3C-024	Microvac			6.47	ug/ft2	
9094-W-3C-017	Wipe			5.02	ug/ft2	
9094-W-3C-018	Wipe			8.03	ug/ft2	
9094-W-3C-019	Wipe			6.01	ug/ft2	
9094-W-3C-020	Wipe	ND	<	4.65	ug/ft2	

Post 2nd cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3C-030	Air			0.394	ug/m3	
9094-A-3C-031	Air			0.364	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3C-014	Air	ND	<	0.004	mg/m3	
9094-A-3C-015	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3C-014	Air			0.027	mg/m3	
9094-A-3C-015	Air	ND	<	0.019	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3C-014	Air	ND	<	0.016	mg/m3	
9094-A-3C-015	Air	ND	<	0.017	mg/m3	

Unit 3C Results

Mineral: Tridymite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3C-014	Air	ND	< 0.016	mg/m3	
9094-A-3C-015	Air	ND	< 0.017	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-3C-002	Wipe		343.39	S/cm2	
9094-W-3C-003	Wipe		744.01	S/cm2	
9094-W-3C-004	Wipe		343.39	S/cm2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3C-009	Air		1.793	S/L	
9094-A-3C-010	Air		2.431	S/L	
9094-A-3C-011	Air		3.883	S/L	
9094-W-3C-016	Wipe		57.23	S/cm2	
9094-W-3C-017	Wipe		171.69	S/cm2	
9094-W-3C-018	Wipe		400.62	S/cm2	
9094-W-3C-019	Wipe		114.46	S/cm2	
9094-W-3C-020	Wipe		114.46	S/cm2	

Post 2nd cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3C-025	Air		91.796	S/L	
9094-A-3C-026	Air		5.061	S/L	
9094-A-3C-027	Air		5.254	S/L	
9094-A-3C-028	Air		4.384	S/L	
9094-A-3C-029	Air		8.099	S/L	

Unit 3C Results

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-3C-002	Wipe	U	290	ug/m2	
9094-W-3C-003	Wipe		1046.6	ug/m2	
9094-W-3C-004	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-W-3C-017	Wipe	U	290	ug/m2	
9094-W-3C-018	Wipe	U	290	ug/m2	
9094-W-3C-019	Wipe	U	290	ug/m2	
9094-W-3C-020	Wipe	U	290	ug/m2	

Unit 3D Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-M-3D-005	Microvac		280500	S/cm2	Chrysotile
9094-M-3D-006	Microvac		44880	S/cm2	Chrysotile
9094-M-3D-007	Microvac		64114.3	S/cm2	Chrysotile
9094-W-3D-001	Wipe		4748.64	S/cm2	Chrysotile
9094-W-3D-002	Wipe	ND	< 2366.41	S/cm2	
9094-W-3D-003	Wipe		172534	S/cm2	Chrysotile
9094-W-3D-004	Wipe		118716	S/cm2	Chrysotile
9094-W-3D-005	Wipe		4748.64	S/cm2	Chrysotile

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-A-3D-008	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-3D-009	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-3D-010	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-3D-008	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3D-009	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3D-010	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-3D-008	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3D-009	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-3D-010	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-3D-020	Microvac	ND	< 3165.76	S/cm2	Chrysotile. Asbestos detected below detection limit.
9094-M-3D-021	Microvac		29283.3	S/cm2	Chrysotile
9094-M-3D-022	Microvac		34823.4	S/cm2	Chrysotile
9094-W-3D-015	Wipe		14245.9	S/cm2	Chrysotile
9094-W-3D-016	Wipe		3957.2	S/cm2	Chrysotile
9094-W-3D-017	Wipe		10288.7	S/cm2	Chrysotile

Unit 3D Results

9094-W-3D-018	Wipe			10288.7	S/cm2	Chrysotile
9094-W-3D-019	Wipe			10288.7	S/cm2	Chrysotile

Post 2nd cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3D-023	Air			0.001	f/cc	
9094-A-3D-024	Air	ND	<	0.001	f/cc	
9094-A-3D-025	Air			0.006	f/cc	
9094-A-3D-026	Air			0.005	f/cc	
9094-A-3D-023	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-3D-024	Air	ND	<	0.0004	S>0.5u/cc	
9094-A-3D-025	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-3D-026	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-3D-023	Air	ND	<	0.0005	S>5u/cc	
9094-A-3D-024	Air	ND	<	0.0004	S>5u/cc	
9094-A-3D-025	Air	ND	<	0.0005	S>5u/cc	
9094-A-3D-026	Air	ND	<	0.0005	S>5u/cc	

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-3D-002	Wipe		0.492	ng/m2	
9094-W-3D-003	Wipe		1.77	ng/m2	
9094-W-3D-004	Wipe		1.24	ng/m2	
9094-W-3D-005	Wipe		0.663	ng/m2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-W-3D-016	Wipe		0.568	ng/m2	
9094-W-3D-017	Wipe		0.533	ng/m2	
9094-W-3D-018	Wipe		0.576	ng/m2	
9094-W-3D-019	Wipe		0.556	ng/m2	

Unit 3D Results

Gypsum

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3D-013	Air	ND	<	0.008	mg/m3	
9094-A-3D-014	Air	ND	<	0.008	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-3D-005	Microvac			50.7	ug/ft2	
9094-M-3D-006	Microvac	ND	<	4.65	ug/ft2	
9094-M-3D-007	Microvac	ND	<	4.65	ug/ft2	
9094-W-3D-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-3D-003	Wipe			201	ug/ft2	
9094-W-3D-004	Wipe			112	ug/ft2	
9094-W-3D-005	Wipe	ND	<	4.65	ug/ft2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3D-011	Air			0.074	ug/m3	Field blank contamination (Validation = R).
9094-A-3D-012	Air			0.126	ug/m3	Field blank contamination (Validation = R).
9094-M-3D-020	Microvac	ND	<	2.32	ug/ft2	
9094-M-3D-021	Microvac			5.71	ug/ft2	Field blank contamination (Validation = R).
9094-M-3D-022	Microvac	ND	<	2.32	ug/ft2	
9094-W-3D-016	Wipe			8.22	ug/ft2	
9094-W-3D-017	Wipe			9.8	ug/ft2	
9094-W-3D-018	Wipe	ND	<	4.65	ug/ft2	
9094-W-3D-019	Wipe	ND	<	4.65	ug/ft2	

Mineral: alpha-Quartz

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3D-013	Air	ND	<	0.004	mg/m3	
9094-A-3D-014	Air	ND	<	0.004	mg/m3	

Unit 3D Results

Mineral: Calcite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3D-013	Air	ND	<	0.016	mg/m3	
9094-A-3D-014	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3D-013	Air	ND	<	0.016	mg/m3	
9094-A-3D-014	Air	ND	<	0.017	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3D-013	Air	ND	<	0.016	mg/m3	
9094-A-3D-014	Air	ND	<	0.017	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-3D-002	Wipe			228.93	S/cm2	
9094-W-3D-003	Wipe			572.31	S/cm2	
9094-W-3D-004	Wipe			1259.09	S/cm2	
9094-W-3D-005	Wipe			343.39	S/cm2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3D-008	Air			1.965	S/L	
9094-A-3D-009	Air			0.984	S/L	
9094-A-3D-010	Air			5.513	S/L	
9094-W-3D-015	Wipe	ND	<	22.89	S/cm2	
9094-W-3D-016	Wipe			22.89	S/cm2	
9094-W-3D-017	Wipe	ND	<	22.89	S/cm2	
9094-W-3D-018	Wipe	ND	<	22.89	S/cm2	
9094-W-3D-019	Wipe	ND	<	22.89	S/cm2	

Unit 3D Results

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-3D-002	Wipe	U	290	ug/m2	
9094-W-3D-003	Wipe		290	ug/m2	
9094-W-3D-004	Wipe	U	290	ug/m2	
9094-W-3D-005	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected	Result		Comment
9094-W-3D-016	Wipe	U	290	ug/m2	
9094-W-3D-017	Wipe	U	290	ug/m2	
9094-W-3D-018	Wipe	U	290	ug/m2	
9094-W-3D-019	Wipe	U	290	ug/m2	

3rd Floor Hallway Results

Asbestos

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3RD-001	Air			0.005	f/cc	
9094-A-3RD-002	Air			0.004	f/cc	
9094-A-3RD-001	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-3RD-002	Air			0.0005	S>0.5u/cc	Chrysotile
9094-A-3RD-001	Air	ND	<	0.0005	S>5u/cc	
9094-A-3RD-002	Air	ND	<	0.0005	S>5u/cc	

Gypsum

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3RD-004	Air	ND	<	0.008	mg/m3	
9094-A-3RD-005	Air	ND	<	0.008	mg/m3	

Lead

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3RD-003	Air	ND	<	0.052	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3RD-004	Air	ND	<	0.004	mg/m3	
9094-A-3RD-005	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3RD-004	Air	ND	<	0.017	mg/m3	
9094-A-3RD-005	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3RD-004	Air	ND	<	0.017	mg/m3	
9094-A-3RD-005	Air	ND	<	0.017	mg/m3	

3rd Floor Hallway Results

Mineral: Tridymite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3RD-004	Air	ND	<	0.017	mg/m3	
9094-A-3RD-005	Air	ND	<	0.017	mg/m3	

MMVF

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-3RD-001	Air			0.095	S/L	
9094-A-3RD-002	Air			0.147	S/L	

Unit 4A Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-4A-005	Microvac			4664.88	S/cm2	Chrysotile
9094-M-4A-006	Microvac			11874.2	S/cm2	Chrysotile
9094-M-4A-007	Microvac			1696.32	S/cm2	Chrysotile
9094-W-4A-001	Wipe	ND	<	2366.41	S/cm2	Chrysotile
9094-W-4A-002	Wipe	ND	<	2366.41	S/cm2	Chrysotile
9094-W-4A-003	Wipe			2374.32	S/cm2	Chrysotile
9094-W-4A-004	Wipe	ND	<	2366.41	S/cm2	

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4A-008	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-4A-009	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-4A-010	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-4A-008	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-4A-009	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-4A-010	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-4A-008	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-4A-009	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-4A-010	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-4A-020	Microvac			3165.76	S/cm2	Chrysotile
9094-M-4A-021	Microvac	ND	<	3165.76	S/cm2	Chrysotile. Asbestos detected below detection limit.
9094-M-4A-022	Microvac			47486.4	S/cm2	Chrysotile
9094-W-4A-015	Wipe			1978.6	S/cm2	Chrysotile
9094-W-4A-016	Wipe			1582.88	S/cm2	Chrysotile
9094-W-4A-017	Wipe	ND	<	1183.2	S/cm2	Chrysotile. Asbestos detected below detection limit.
9094-W-4A-018	Wipe			6331.52	S/cm2	Chrysotile
9094-W-4A-019	Wipe	ND	<	1183.2	S/cm2	Chrysotile. Asbestos detected below detection limit.

Unit 4A Results

Post 2nd cleaning - Test 2A

Sample ID	Matrix	Detected	Result		Comment
9094-A-4A-023	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-4A-024	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-4A-025	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-4A-023	Air	ND	< 0.0009	S>0.5u/cc	
9094-A-4A-024	Air	ND	< 0.0008	S>0.5u/cc	
9094-A-4A-025	Air	ND	< 0.0009	S>0.5u/cc	
9094-A-4A-023	Air	ND	< 0.0009	S>5u/cc	
9094-A-4A-024	Air	ND	< 0.0008	S>5u/cc	
9094-A-4A-025	Air	ND	< 0.0009	S>5u/cc	

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-4A-002	Wipe		0.836	ng/m2	
9094-W-4A-003	Wipe		0.583	ng/m2	
9094-W-4A-004	Wipe		0.553	ng/m2	

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result		Comment
9094-W-4A-016	Wipe		0.701	ng/m2	
9094-W-4A-017	Wipe		0.659	ng/m2	
9094-W-4A-018	Wipe		0.701	ng/m2	
9094-W-4A-019	Wipe		0.752	ng/m2	

Gypsum

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result		Comment
9094-A-4A-013	Air	ND	< 0.008	mg/m3	
9094-A-4A-014	Air	ND	< 0.008	mg/m3	

Post 2nd cleaning - Test 2A

Sample ID	Matrix	Detected	Result		Comment
9094-A-4A-026	Air	ND	< 0.008	mg/m3	
9094-A-4A-027	Air	ND	< 0.008	mg/m3	

Unit 4A Results

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-4A-005	Microvac	ND	<	4.65	ug/ft2	
9094-M-4A-006	Microvac	ND	<	4.65	ug/ft2	
9094-M-4A-007	Microvac	ND	<	4.65	ug/ft2	
9094-W-4A-002	Wipe			5.66	ug/ft2	
9094-W-4A-003	Wipe			21.5	ug/ft2	
9094-W-4A-004	Wipe			9.41	ug/ft2	

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4A-011	Air			0.442	ug/m3	
9094-A-4A-012	Air			0.31	ug/m3	
9094-M-4A-020	Microvac	ND	<	2.32	ug/ft2	
9094-M-4A-021	Microvac	ND	<	2.32	ug/ft2	
9094-M-4A-022	Microvac			2.58	ug/ft2	
9094-W-4A-016	Wipe	ND	<	4.65	ug/ft2	
9094-W-4A-017	Wipe			10.7	ug/ft2	
9094-W-4A-018	Wipe	ND	<	4.65	ug/ft2	
9094-W-4A-019	Wipe	ND	<	4.65	ug/ft2	

Mineral: alpha-Quartz

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4A-013	Air			0.008	mg/m3	
9094-A-4A-014	Air	ND	<	0.004	mg/m3	

Post 2nd cleaning - Test 2A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4A-026	Air	ND	<	0.004	mg/m3	
9094-A-4A-027	Air	ND	<	0.004	mg/m3	

Unit 4A Results

Mineral: Calcite

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4A-013	Air	ND	<	0.017	mg/m3	
9094-A-4A-014	Air	ND	<	0.016	mg/m3	

Post 2nd cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4A-026	Air	ND	<	0.017	mg/m3	
9094-A-4A-027	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4A-013	Air	ND	<	0.017	mg/m3	
9094-A-4A-014	Air	ND	<	0.016	mg/m3	

Post 2nd cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4A-026	Air	ND	<	0.017	mg/m3	
9094-A-4A-027	Air	ND	<	0.017	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4A-013	Air	ND	<	0.017	mg/m3	
9094-A-4A-014	Air	ND	<	0.016	mg/m3	

Post 2nd cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4A-026	Air	ND	<	0.017	mg/m3	
9094-A-4A-027	Air	ND	<	0.017	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result			Comment
9094-W-4A-002	Wipe			400.62	S/cm2	
9094-W-4A-003	Wipe			629.55	S/cm2	
9094-W-4A-004	Wipe			171.69	S/cm2	

Unit 4A Results

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result	Comment
9094-A-4A-008	Air		0.187 S/L	
9094-A-4A-009	Air		0.435 S/L	
9094-A-4A-010	Air		0.286 S/L	
9094-W-4A-015	Wipe	ND	< 22.89 S/cm2	
9094-W-4A-016	Wipe	ND	< 22.89 S/cm2	
9094-W-4A-017	Wipe		22.89 S/cm2	
9094-W-4A-018	Wipe	ND	< 22.89 S/cm2	
9094-W-4A-019	Wipe	ND	< 22.89 S/cm2	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result	Comment
9094-W-4A-002	Wipe	U	290 ug/m2	
9094-W-4A-003	Wipe	U	290 ug/m2	
9094-W-4A-004	Wipe	U	290 ug/m2	

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result	Comment
9094-W-4A-016	Wipe	U	290 ug/m2	
9094-W-4A-017	Wipe	U	290 ug/m2	
9094-W-4A-018	Wipe	U	290 ug/m2	
9094-W-4A-019	Wipe	U	290 ug/m2	

Unit 4B Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-4B-001	Wipe	ND	< 2366.41	S/cm2	
9094-W-4B-002	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-4B-003	Wipe		18203.1	S/cm2	Chrysotile
9094-W-4B-004	Wipe		13454.5	S/cm2	Chrysotile
9094-W-4B-005	Wipe		3165.76	S/cm2	Chrysotile

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result		Comment
9094-A-4B-006	Air		0.006	f/cc	
9094-A-4B-007	Air		0.004	f/cc	
9094-A-4B-008	Air		0.005	f/cc	
9094-A-4B-006	Air	ND	< 0.0009	S>5u/cc	
9094-A-4B-007	Air	ND	< 0.0009	S>5u/cc	
9094-A-4B-008	Air	ND	< 0.0009	S>5u/cc	
9094-W-4B-013	Wipe	ND	< 2366.41	S/cm2	
9094-W-4B-014	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-4B-015	Wipe		4748.64	S/cm2	1 Anthophyllite and 5 Chrysotile
9094-W-4B-016	Wipe	ND	< 2366.41	S/cm2	
9094-W-4B-017	Wipe	ND	< 2366.41	S/cm2	

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-4B-002	Wipe		1.14	ng/m2	
9094-W-4B-003	Wipe		0.653	ng/m2	
9094-W-4B-004	Wipe		0.979	ng/m2	
9094-W-4B-005	Wipe		0.889	ng/m2	

Unit 4B Results

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-W-4B-014	Wipe			2	ng/m2	
9094-W-4B-015	Wipe			0.614	ng/m2	
9094-W-4B-016	Wipe			0.647	ng/m2	
9094-W-4B-017	Wipe			0.582	ng/m2	

Gypsum

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-4B-011	Air	ND	<	0.016	mg/m3	
9094-A-4B-012	Air	ND	<	0.017	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-4B-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-4B-003	Wipe			50	ug/ft2	
9094-W-4B-004	Wipe			14	ug/ft2	
9094-W-4B-005	Wipe			30	ug/ft2	

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-4B-009	Air			0.241	ug/m3	
9094-A-4B-010	Air			0.246	ug/m3	
9094-W-4B-014	Wipe	ND	<	4.65	ug/ft2	
9094-W-4B-015	Wipe			6.68	ug/ft2	
9094-W-4B-016	Wipe	ND	<	4.65	ug/ft2	
9094-W-4B-017	Wipe	ND	<	4.65	ug/ft2	

Post 2nd cleaning - Test 2B

Sample ID	Matrix	Detected		Result		Comment
9094-A-4B-018	Air			0.183	ug/m3	
9094-A-4B-019	Air			0.171	ug/m3	

Unit 4B Results

Mineral: alpha-Quartz

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result			Comment
9094-A-4B-011	Air	ND	<	0.004	mg/m3	
9094-A-4B-012	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result			Comment
9094-A-4B-011	Air	ND	<	0.016	mg/m3	
9094-A-4B-012	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result			Comment
9094-A-4B-011	Air	ND	<	0.016	mg/m3	
9094-A-4B-012	Air	ND	<	0.017	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result			Comment
9094-A-4B-011	Air	ND	<	0.016	mg/m3	
9094-A-4B-012	Air	ND	<	0.017	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-4B-002	Wipe		286.16	S/cm2	
9094-W-4B-003	Wipe		629.55	S/cm2	
9094-W-4B-004	Wipe		400.62	S/cm2	
9094-W-4B-005	Wipe		686.78	S/cm2	

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result		Comment
9094-A-4B-006	Air		0.658	S/L	
9094-A-4B-007	Air		1.664	S/L	
9094-A-4B-008	Air		1.096	S/L	
9094-W-4B-013	Wipe		286.16	S/cm2	
9094-W-4B-014	Wipe		228.93	S/cm2	

Unit 4B Results

9094-W-4B-015	Wipe		400.62	S/cm2
9094-W-4B-016	Wipe		171.69	S/cm2
9094-W-4B-017	Wipe		57.23	S/cm2

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-4B-002	Wipe	U	290	ug/m2	
9094-W-4B-003	Wipe	U	290	ug/m2	
9094-W-4B-004	Wipe	U	290	ug/m2	
9094-W-4B-005	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 2B

Sample ID	Matrix	Detected	Result		Comment
9094-W-4B-014	Wipe	U	290	ug/m2	
9094-W-4B-015	Wipe	U	290	ug/m2	
9094-W-4B-016	Wipe	U	290	ug/m2	
9094-W-4B-017	Wipe	U	290	ug/m2	

Unit 4C Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-4C-005	Microvac			432562	S/cm2	Chrysotile
9094-M-4C-006	Microvac			349442	S/cm2	Chrysotile
9094-M-4C-007	Microvac			140795	S/cm2	Chrysotile
9094-M-4C-008	Microvac			252025	S/cm2	1 Amosite and 103 Chrysotile
9094-W-4C-001	Wipe	ND	<	2366.41	S/cm2	
9094-W-4C-002	Wipe	ND	<	2366.41	S/cm2	Chrysotile
9094-W-4C-003	Wipe			49069.3	S/cm2	Chrysotile
9094-W-4C-004	Wipe			3165.76	S/cm2	Chrysotile

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-009	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-4C-010	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-4C-011	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-4C-009	Air			0.0038	S>0.5u/cc	Chrysotile
9094-A-4C-010	Air			0.0026	S>0.5u/cc	Chrysotile
9094-A-4C-011	Air			0.0026	S>0.5u/cc	Chrysotile
9094-A-4C-009	Air			0.0009	S>5u/cc	Chrysotile
9094-A-4C-010	Air	ND	<	0.0009	S>5u/cc	
9094-A-4C-011	Air	ND	<	0.0009	S>5u/cc	
9094-M-4C-023	Microvac			23347.5	S/cm2	Chrysotile
9094-M-4C-024	Microvac			23743.2	S/cm2	29 Chrysotile and 1 Actinolite
9094-M-4C-025	Microvac			126630	S/cm2	Chrysotile
9094-W-4C-018	Wipe	ND	<	2366.41	S/cm2	
9094-W-4C-019	Wipe	ND	<	2366.41	S/cm2	
9094-W-4C-020	Wipe			3165.76	S/cm2	Chrysotile

Unit 4C Results

9094-W-4C-021	Wipe		<	2366.41	S/cm2	Chrysotile
9094-W-4C-022	Wipe		<	2366.41	S/cm2	Chrysotile

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-4C-002	Wipe			0.57	ng/m2	
9094-W-4C-003	Wipe			1.36	ng/m2	
9094-W-4C-004	Wipe			0.975	ng/m2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-W-4C-019	Wipe			0.507	ng/m2	
9094-W-4C-020	Wipe			0.606	ng/m2	
9094-W-4C-021	Wipe			0.511	ng/m2	
9094-W-4C-022	Wipe			0.512	ng/m2	

Gypsum

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-014	Air	ND	<	0.016	mg/m3	
9094-A-4C-015	Air	ND	<	0.016	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-4C-005	Microvac			76.1	ug/ft2	
9094-M-4C-006	Microvac			83.7	ug/ft2	
9094-M-4C-007	Microvac			69.8	ug/ft2	
9094-M-4C-008	Microvac			70.8	ug/ft2	
9094-W-4C-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-4C-003	Wipe			181	ug/ft2	
9094-W-4C-004	Wipe			77.5	ug/ft2	

Unit 4C Results

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-012	Air			0.131	ug/m3	
9094-A-4C-013	Air			0.195	ug/m3	
9094-M-4C-023	Microvac	ND	<	2.32	ug/ft2	
9094-M-4C-024	Microvac	ND	<	2.32	ug/ft2	
9094-M-4C-025	Microvac	ND	<	2.32	ug/ft2	
9094-W-4C-019	Wipe				ug/ft2	Sample was not received at the laboratory.
9094-W-4C-020	Wipe			14.9	ug/ft2	Field blank contamination (Validation = R).
9094-W-4C-021	Wipe			8.28	ug/ft2	Field blank contamination (Validation = R).
9094-W-4C-022	Wipe			7.81	ug/ft2	Field blank contamination (Validation = R).

Post 2nd cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-026	Air			0.374	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-014	Air	ND	<	0.004	mg/m3	
9094-A-4C-015	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-014	Air	ND	<	0.016	mg/m3	
9094-A-4C-015	Air	ND	<	0.016	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-014	Air	ND	<	0.016	mg/m3	
9094-A-4C-015	Air	ND	<	0.016	mg/m3	

Unit 4C Results

Mineral: Tridymite

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-014	Air	ND	<	0.016	mg/m3	
9094-A-4C-015	Air	ND	<	0.016	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-4C-002	Wipe			57.23	S/cm2	
9094-W-4C-003	Wipe			1030.17	S/cm2	
9094-W-4C-004	Wipe			343.39	S/cm2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4C-009	Air			6.316	S/L	
9094-A-4C-010	Air			4.119	S/L	
9094-A-4C-011	Air			2.549	S/L	
9094-W-4C-018	Wipe			57.23	S/cm2	
9094-W-4C-019	Wipe			228.93	S/cm2	
9094-W-4C-020	Wipe			343.39	S/cm2	
9094-W-4C-021	Wipe			114.46	S/cm2	
9094-W-4C-022	Wipe			228.93	S/cm2	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-4C-002	Wipe	U		290	ug/m2	
9094-W-4C-003	Wipe			290	ug/m2	
9094-W-4C-004	Wipe	U		290	ug/m2	

Post 1st cleaning - Test 1A

Sample ID	Matrix	Detected		Result		Comment

Unit 4C Results

9094-A-4C-016	Air	U	0.174	µg/m3
9094-A-4C-017	Air	U	0.16	µg/m3
9094-W-4C-019	Wipe	U	290	ug/m2
9094-W-4C-020	Wipe	U	290	ug/m2
9094-W-4C-021	Wipe	U	290	ug/m2
9094-W-4C-022	Wipe	U	290	ug/m2

Unit 4D Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-M-4D-006	Microvac		241883	S/cm2	Chrysotile
9094-M-4D-007	Microvac		101779	S/cm2	Chrysotile
9094-M-4D-008	Microvac		91601.3	S/cm2	Chrysotile
9094-M-4D-009	Microvac		79727	S/cm2	Chrysotile
9094-M-4D-010	Microvac		68700.8	S/cm2	Chrysotile
9094-M-4D-011	Microvac		39580.8	S/cm2	Chrysotile
9094-W-4D-001	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-4D-002	Wipe	ND	< 2366.41	S/cm2	
9094-W-4D-003	Wipe		34031.9	S/cm2	Chrysotile
9094-W-4D-004	Wipe		2374.32	S/cm2	Chrysotile
9094-W-4D-005	Wipe		3165.76	S/cm2	Chrysotile

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result		Comment
9094-A-4D-012	Air		0.004	f/cc	
9094-A-4D-013	Air		0.02	f/cc	
9094-A-4D-014	Air		0.004	f/cc	
9094-A-4D-012	Air		0.0009	S>0.5u/cc	Chrysotile
9094-A-4D-013	Air		0.0055	S>0.5u/cc	Chrysotile
9094-A-4D-014	Air		0.0009	S>0.5u/cc	Chrysotile
9094-A-4D-012	Air	ND	< 0.0009	S>5u/cc	
9094-A-4D-013	Air		0.0009	S>5u/cc	Chrysotile
9094-A-4D-014	Air	ND	< 0.0009	S>5u/cc	
9094-M-4D-024	Microvac		29679	S/cm2	Chrysotile
9094-M-4D-025	Microvac		44518.5	S/cm2	Chrysotile
9094-M-4D-026	Microvac		24732.5	S/cm2	Chrysotile

Unit 4D Results

9094-M-4D-027	Microvac	37593.4	S/cm2	Chrysotile
9094-M-4D-028	Microvac	45507.8	S/cm2	Chrysotile
9094-M-4D-029	Microvac	25721.8	S/cm2	Chrysotile
9094-W-4D-019	Wipe	2374.32	S/cm2	Chrysotile
9094-W-4D-020	Wipe	< 2366.41	S/cm2	Chrysotile
9094-W-4D-021	Wipe	26117.5	S/cm2	Chrysotile
9094-W-4D-022	Wipe	43529.2	S/cm2	Chrysotile
9094-W-4D-023	Wipe	18994.6	S/cm2	Chrysotile

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-4D-002	Wipe		0.878	ng/m2	
9094-W-4D-003	Wipe		2.51	ng/m2	
9094-W-4D-004	Wipe		0.728	ng/m2	
9094-W-4D-005	Wipe		0.692	ng/m2	

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result		Comment
9094-W-4D-020	Wipe		0.571	ng/m2	
9094-W-4D-021	Wipe		0.694	ng/m2	
9094-W-4D-022	Wipe		0.522	ng/m2	
9094-W-4D-023	Wipe		0.557	ng/m2	

Gypsum

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result		Comment
9094-A-4D-017	Air	ND	< 0.016	mg/m3	
9094-A-4D-018	Air	ND	< 0.016	mg/m3	

Unit 4D Results

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-4D-006	Microvac			83.5	ug/ft2	
9094-M-4D-007	Microvac			66	ug/ft2	
9094-M-4D-008	Microvac			26.2	ug/ft2	
9094-M-4D-009	Microvac			39.9	ug/ft2	
9094-M-4D-010	Microvac			78.2	ug/ft2	
9094-M-4D-011	Microvac			72.1	ug/ft2	
9094-W-4D-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-4D-003	Wipe			169	ug/ft2	
9094-W-4D-004	Wipe			17.4	ug/ft2	
9094-W-4D-005	Wipe			17.1	ug/ft2	

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4D-015	Air			0.146	ug/m3	Lab blank contamination (Validation = R).
9094-A-4D-016	Air			0.137	ug/m3	Lab blank contamination (Validation = R).
9094-M-4D-024	Microvac			2.4	ug/ft2	
9094-M-4D-025	Microvac	ND	<	2.32	ug/ft2	
9094-M-4D-026	Microvac	ND	<	2.32	ug/ft2	
9094-M-4D-027	Microvac	ND	<	2.32	ug/ft2	
9094-M-4D-028	Microvac	ND	<	2.32	ug/ft2	
9094-M-4D-029	Microvac	ND	<	2.32	ug/ft2	
9094-W-4D-020	Wipe			20.4	ug/ft2	Lab blank contamination (Validation = R).
9094-W-4D-021	Wipe			66	ug/ft2	Lab blank contamination (Validation = R).
9094-W-4D-022	Wipe			10.6	ug/ft2	Lab blank contamination (Validation = R).
9094-W-4D-023	Wipe			15.6	ug/ft2	Lab blank contamination (Validation = R).

Post 2nd cleaning - Test 2A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4D-030	Air			0.055	ug/m3	
9094-W-4D-031	Wipe	ND	<	4.65	ug/ft2	

Unit 4D Results

Mineral: alpha-Quartz

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4D-017	Air	ND	<	0.004	mg/m3	
9094-A-4D-018	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4D-017	Air	ND	<	0.016	mg/m3	
9094-A-4D-018	Air	ND	<	0.016	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4D-017	Air	ND	<	0.016	mg/m3	
9094-A-4D-018	Air	ND	<	0.016	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4D-017	Air	ND	<	0.016	mg/m3	
9094-A-4D-018	Air	ND	<	0.016	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result			Comment
9094-W-4D-002	Wipe			400.62	S/cm2	
9094-W-4D-003	Wipe			2174.79	S/cm2	
9094-W-4D-004	Wipe			286.16	S/cm2	
9094-W-4D-005	Wipe			457.85	S/cm2	

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result			Comment
9094-A-4D-012	Air			1.398	S/L	
9094-A-4D-013	Air			9.553	S/L	
9094-A-4D-014	Air			2.124	S/L	
9094-W-4D-019	Wipe			57.23	S/cm2	
9094-W-4D-020	Wipe			171.69	S/cm2	

Unit 4D Results

9094-W-4D-021	Wipe		572.31	S/cm2
9094-W-4D-022	Wipe		228.93	S/cm2
9094-W-4D-023	Wipe		228.93	S/cm2

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-4D-002	Wipe	U	290	ug/m2	
9094-W-4D-003	Wipe		325.8	ug/m2	
9094-W-4D-004	Wipe	U	290	ug/m2	
9094-W-4D-005	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 2A

Sample ID	Matrix	Detected	Result		Comment
9094-W-4D-020	Wipe	U	290	ug/m2	
9094-W-4D-021	Wipe	U	290	ug/m2	
9094-W-4D-022	Wipe	U	290	ug/m2	
9094-W-4D-023	Wipe	U	290	ug/m2	

Unit 4th Floor Hallway Results

Asbestos

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4TH-001	Air			0.003	f/cc	
9094-A-4TH-001	Air	ND	<	0.0009	S>0.5u/cc	
9094-A-4TH-001	Air	ND	<	0.0009	S>5u/cc	

Gypsum

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4TH-003	Air	ND	<	0.008	mg/m3	

Lead

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4TH-002	Air			0.184	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4TH-003	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4TH-003	Air	ND	<	0.016	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4TH-003	Air	ND	<	0.016	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-4TH-003	Air	ND	<	0.016	mg/m3	

Unit 4th Floor Hallway Results

MMVF

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-4TH-001	Air		0.735	S/L	

Unit 5A Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-M-5A-005	Microvac		319742	S/cm2	Chrysotile
9094-M-5A-006	Microvac		139821	S/cm2	Chrysotile
9094-M-5A-007	Microvac		5935.8	S/cm2	Chrysotile
9094-M-5A-008	Microvac	ND	< 3165.76	S/cm2	
9094-M-5A-009	Microvac		64106.6	S/cm2	Chrysotile
9094-M-5A-010	Microvac		33240.5	S/cm2	Chrysotile
9094-M-5A-011	Microvac		34625.5	S/cm2	Chrysotile
9094-W-5A-001	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-5A-002	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-5A-003	Wipe		233475	S/cm2	Chrysotile
9094-W-5A-004	Wipe		22951.8	S/cm2	Chrysotile

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-A-5A-012	Air		0.009	f/cc	
9094-A-5A-013	Air		0.005	f/cc	
9094-A-5A-014	Air		0.004	f/cc	
9094-A-5A-012	Air		0.0009	S>5u/cc	
9094-A-5A-013	Air	ND	< 0.0009	S>5u/cc	
9094-A-5A-014	Air	ND	< 0.0007	S>5u/cc	
9094-M-5A-024	Microvac		30866.2	S/cm2	Chrysotile
9094-M-5A-025	Microvac		41154.9	S/cm2	Chrysotile
9094-M-5A-026	Microvac		40363.4	S/cm2	Chrysotile
9094-M-5A-027	Microvac	ND	< 3165.76	S/cm2	Chrysotile
9094-M-5A-028	Microvac		3561.48	S/cm2	Chrysotile
9094-M-5A-029	Microvac		7914.4	S/cm2	Chrysotile

Unit 5A Results

9094-M-5A-030	Microvac		75186.8	S/cm2	Chrysotile
9094-W-5A-019	Wipe	ND	< 2366.41	S/cm2	
9094-W-5A-020	Wipe	ND	< 2366.41	S/cm2	
9094-W-5A-021	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-5A-022	Wipe	ND	< 2366.41	S/cm2	
9094-W-5A-023	Wipe	ND	< 2366.41	S/cm2	

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-5A-002	Wipe		0.528	ng/m2	
9094-W-5A-003	Wipe		0.565	ng/m2	
9094-W-5A-004	Wipe		0.747	ng/m2	

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-W-5A-020	Wipe		0.587	ng/m2	
9094-W-5A-021	Wipe		0.604	ng/m2	
9094-W-5A-022	Wipe		0.57	ng/m2	
9094-W-5A-023	Wipe		0.569	ng/m2	

Gypsum

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-A-5A-017	Air	ND	< 0.028	mg/m3	
9094-A-5A-018	Air	ND	< 0.016	mg/m3	

Post 2nd cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-A-5A-034	Air	ND	< 0.009	mg/m3	
9094-A-5A-035	Air	ND	< 0.009	mg/m3	

Unit 5A Results

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-5A-005	Microvac	ND	<	2.23	ug/ft2	
9094-M-5A-006	Microvac	ND	<	2.23	ug/ft2	
9094-M-5A-007	Microvac	ND	<	2.23	ug/ft2	
9094-M-5A-008	Microvac	ND	<	2.23	ug/ft2	
9094-M-5A-009	Microvac	ND	<	2.23	ug/ft2	
9094-M-5A-010	Microvac			3.46	ug/ft2	
9094-M-5A-011	Microvac	ND	<	2.23	ug/ft2	
9094-W-5A-002	Wipe			4.79	ug/ft2	
9094-W-5A-003	Wipe			191	ug/ft2	
9094-W-5A-004	Wipe			2000	ug/ft2	

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-015	Air			0.083	ug/m3	
9094-A-5A-016	Air			0.07	ug/m3	
9094-M-5A-024	Microvac			2.6	ug/ft2	Sample was analyzed by graphite furnace AA.
9094-M-5A-025	Microvac			4.15	ug/ft2	Sample was analyzed by graphite furnace AA.
9094-M-5A-026	Microvac			2.6	ug/ft2	Sample was analyzed by graphite furnace AA.
9094-M-5A-027	Microvac			0.78	ug/ft2	Sample was analyzed by graphite furnace AA.
9094-M-5A-028	Microvac			0.975	ug/ft2	Sample was analyzed by graphite furnace AA.
9094-M-5A-029	Microvac			1.02	ug/ft2	Sample was analyzed by graphite furnace AA.
9094-M-5A-030	Microvac			5.27	ug/ft2	Sample was analyzed by graphite furnace AA.
9094-W-5A-020	Wipe	ND	<	4.65	ug/ft2	
9094-W-5A-021	Wipe			43.5	ug/ft2	
9094-W-5A-022	Wipe			10.5	ug/ft2	
9094-W-5A-023	Wipe			39.7	ug/ft2	

Unit 5A Results

Post 2nd cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-W-5A-031	Wipe			8.55	ug/ft2	Estimated concentration (J).
9094-W-5A-032	Wipe	ND	<	4.65	ug/ft2	
9094-W-5A-033	Wipe	ND	<	4.65	ug/ft2	

Mineral: alpha-Quartz

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-017	Air	ND	<	0.007	mg/m3	
9094-A-5A-018	Air	ND	<	0.004	mg/m3	

Post 2nd cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-034	Air	ND	<	0.004	mg/m3	
9094-A-5A-035	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-017	Air	ND	<	0.028	mg/m3	
9094-A-5A-018	Air	ND	<	0.016	mg/m3	

Post 2nd cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-034	Air	ND	<	0.017	mg/m3	
9094-A-5A-035	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-017	Air	ND	<	0.028	mg/m3	
9094-A-5A-018	Air	ND	<	0.016	mg/m3	

Post 2nd cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-034	Air	ND	<	0.017	mg/m3	
9094-A-5A-035	Air	ND	<	0.017	mg/m3	

Unit 5A Results

Mineral: Tridymite

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-017	Air	ND	<	0.028	mg/m3	
9094-A-5A-018	Air	ND	<	0.016	mg/m3	

Post 2nd cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5A-034	Air	ND	<	0.017	mg/m3	
9094-A-5A-035	Air	ND	<	0.017	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-5A-002	Wipe		297.6	S/cm2	
9094-W-5A-003	Wipe		1308.15	S/cm2	
9094-W-5A-004	Wipe		792.45	S/cm2	

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-A-5A-012	Air		1.499	S/L	
9094-A-5A-013	Air		2.603	S/L	
9094-A-5A-014	Air		0.651	S/L	
9094-W-5A-019	Wipe		286.16	S/cm2	
9094-W-5A-020	Wipe		57.23	S/cm2	
9094-W-5A-021	Wipe		114.46	S/cm2	
9094-W-5A-022	Wipe		57.23	S/cm2	
9094-W-5A-023	Wipe		114.46	S/cm2	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-5A-002	Wipe	U	290	ug/m2	
9094-W-5A-003	Wipe	U	290	ug/m2	
9094-W-5A-004	Wipe	U	290	ug/m2	

Unit 5A Results

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-W-5A-020	Wipe	U	290	ug/m2	
9094-W-5A-021	Wipe	U	290	ug/m2	
9094-W-5A-022	Wipe	U	290	ug/m2	
9094-W-5A-023	Wipe	U	290	ug/m2	

Unit 5C Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-M-5C-005	Microvac		132284	S/cm2	Chrysotile
9094-M-5C-006	Microvac		136128	S/cm2	Chrysotile
9094-M-5C-007	Microvac		117133	S/cm2	Chrysotile
9094-W-5C-001	Wipe		9497.28	S/cm2	Chrysotile
9094-W-5C-002	Wipe		3165.76	S/cm2	Chrysotile
9094-W-5C-003	Wipe		97347.1	S/cm2	Chrysotile
9094-W-5C-004	Wipe		30074.7	S/cm2	Chrysotile

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected	Result		Comment
9094-A-5C-009	Air		0.004	f/cc	
9094-A-5C-010	Air		0.015	f/cc	
9094-A-5C-011	Air		0.005	f/cc	
9094-A-5C-009	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-010	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-011	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-5C-021	Microvac	ND	< 1582.88	S/cm2	Chrysotile
9094-M-5C-022	Microvac		174117	S/cm2	Chrysotile
9094-M-5C-023	Microvac		74395.4	S/cm2	Chrysotile
9094-W-5C-016	Wipe		2374.32	S/cm2	Chrysotile
9094-W-5C-017	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-5C-018	Wipe	ND	< 2366.41	S/cm2	
9094-W-5C-019	Wipe		3165.76	S/cm2	Chrysotile
9094-W-5C-020	Wipe		3165.76	S/cm2	Chrysotile

Post 2nd cleaning - Test 3A

Sample ID	Matrix	Detected	Result		Comment
9094-A-5C-024	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-5C-025	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-5C-026	Air			f/cc	Not analyzed due to overloading of particulates.

Unit 5C Results

9094-A-5C-027	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-5C-028	Air				f/cc	Not analyzed due to overloading of particulates.
9094-A-5C-024	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-025	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-026	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-027	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-028	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-024	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-025	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-026	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-027	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-5C-028	Air				S>5u/cc	Not analyzed due to overloading of particulates.

Post 3rd cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-031	Air			0.001	f/cc	
9094-A-5C-032	Air	ND	<	0.001	f/cc	
9094-A-5C-033	Air			0.001	f/cc	
9094-A-5C-034	Air			0.003	f/cc	
9094-A-5C-031	Air			0.0026	S>0.5u/cc	Chrysotile
9094-A-5C-032	Air			0.0004	S>0.5u/cc	Chrysotile
9094-A-5C-033	Air			0.0026	S>0.5u/cc	Chrysotile
9094-A-5C-034	Air			0.0021	S>0.5u/cc	Chrysotile
9094-A-5C-031	Air			0.0004	S>5u/cc	Chrysotile
9094-A-5C-032	Air	ND	<	0.0004	S>5u/cc	
9094-A-5C-033	Air			0.0016	S>5u/cc	Chrysotile
9094-A-5C-034	Air			0.0015	S>5u/cc	Chrysotile

Unit 5C Results

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-5C-002	Wipe			0.79	ng/m2	
9094-W-5C-003	Wipe			2.55	ng/m2	
9094-W-5C-004	Wipe			0.575	ng/m2	

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-W-5C-017	Wipe			0.794	ng/m2	
9094-W-5C-018	Wipe			0.494	ng/m2	
9094-W-5C-019	Wipe			0.567	ng/m2	
9094-W-5C-020	Wipe			0.556	ng/m2	

Gypsum

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-014	Air	ND	<	0.016	mg/m3	
9094-A-5C-015	Air	ND	<	0.016	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-5C-005	Microvac			104	ug/ft2	
9094-M-5C-006	Microvac			293	ug/ft2	
9094-M-5C-007	Microvac			133	ug/ft2	
9094-W-5C-002	Wipe			6.95	ug/ft2	
9094-W-5C-003	Wipe			336	ug/ft2	
9094-W-5C-004	Wipe			43.6	ug/ft2	

Unit 5C Results

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-012	Air			0.095	ug/m3	
9094-A-5C-013	Air			0.101	ug/m3	
9094-M-5C-021	Microvac	ND	<	2.32	ug/ft2	
9094-M-5C-022	Microvac	ND	<	2.32	ug/ft2	
9094-M-5C-023	Microvac	ND	<	2.32	ug/ft2	
9094-W-5C-017	Wipe				ug/m2	Sample was received broken; not analyzed.
9094-W-5C-018	Wipe			10.3	ug/ft2	
9094-W-5C-019	Wipe			7.69	ug/ft2	
9094-W-5C-020	Wipe			6.86	ug/ft2	

Post 2nd cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-029	Air			0.674	ug/m3	
9094-A-5C-030	Air			0.757	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-014	Air	ND	<	0.004	mg/m3	
9094-A-5C-015	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-014	Air	ND	<	0.016	mg/m3	
9094-A-5C-015	Air	ND	<	0.016	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-014	Air	ND	<	0.016	mg/m3	
9094-A-5C-015	Air	ND	<	0.016	mg/m3	

Unit 5C Results

Mineral: Tridymite

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-014	Air			0.027	mg/m3	
9094-A-5C-015	Air	ND	<	0.016	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-5C-002	Wipe			457.85	S/cm2	
9094-W-5C-003	Wipe			457.85	S/cm2	
9094-W-5C-004	Wipe			1144.63	S/cm2	

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-009	Air			13.399	S/L	
9094-A-5C-010	Air			19.25	S/L	
9094-A-5C-011	Air			8.129	S/L	
9094-W-5C-016	Wipe			1774.17	S/cm2	
9094-W-5C-017	Wipe			744.01	S/cm2	
9094-W-5C-018	Wipe			4211.37	S/cm2	
9094-W-5C-019	Wipe			2758.14	S/cm2	
9094-W-5C-020	Wipe			1316.32	S/cm2	

Post 2nd cleaning - Test 3A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-024	Air			2.266	S/L	
9094-A-5C-025	Air			16.598	S/L	
9094-A-5C-026	Air			12.621	S/L	
9094-A-5C-027	Air			1.614	S/L	
9094-A-5C-028	Air			0.829	S/L	

Post 3rd cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5C-031	Air	ND	<	0.066	S/L	
9094-A-5C-032	Air	ND	<	0.064	S/L	

Unit 5C Results

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-5C-002	Wipe	U	290	ug/m2	
9094-W-5C-003	Wipe		303.5	ug/m2	
9094-W-5C-004	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 3A

Sample ID	Matrix	Detected	Result		Comment
9094-W-5C-017	Wipe	U	290	ug/m2	
9094-W-5C-018	Wipe	U	290	ug/m2	
9094-W-5C-019	Wipe	U	290	ug/m2	
9094-W-5C-020	Wipe	U	290	ug/m2	

Unit 5D Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-M-5D-006	Microvac		83892.6	S/cm2	Chrysotile
9094-M-5D-007	Microvac		470907	S/cm2	Chrysotile
9094-W-5D-001	Wipe	ND	< 2366.41	S/cm2	Amosite
9094-W-5D-002	Wipe	ND	< 2366.41	S/cm2	
9094-W-5D-003	Wipe	ND	< 2366.41	S/cm2	Chrysotile
9094-W-5D-004	Wipe		4748.64	S/cm2	Chrysotile
9094-W-5D-005	Wipe		36406.2	S/cm2	Chrysotile

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-A-5D-008	Air		0.004	f/cc	
9094-A-5D-009	Air		0.002	f/cc	
9094-A-5D-010	Air		0.004	f/cc	
9094-A-5D-008	Air	ND	< 0.0006	S>5u/cc	
9094-A-5D-009	Air	ND	< 0.0007	S>5u/cc	
9094-A-5D-010	Air	ND	< 0.0007	S>5u/cc	
9094-M-5D-020	Microvac		284918	S/cm2	Chrysotile
9094-M-5D-021	Microvac		12267.3	S/cm2	Chrysotile
9094-W-5D-015	Wipe	ND	< 5916.01	S/cm2	
9094-W-5D-016	Wipe	ND	< 5916.01	S/cm2	
9094-W-5D-017	Wipe	ND	< 5916.01	S/cm2	
9094-W-5D-018	Wipe	ND	< 5916.01	S/cm2	
9094-W-5D-019	Wipe	ND	< 5916.01	S/cm2	

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-5D-002	Wipe		0.668	ng/m2	
9094-W-5D-003	Wipe		0.56	ng/m2	
9094-W-5D-004	Wipe		0.562	ng/m2	
9094-W-5D-005	Wipe		0.609	ng/m2	

Unit 5D Results

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-W-5D-016	Wipe			0.498	ng/m2	
9094-W-5D-017	Wipe			0.608	ng/m2	
9094-W-5D-018	Wipe			0.55	ng/m2	
9094-W-5D-019	Wipe			0.631	ng/m2	

Gypsum

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5D-013	Air	ND	<	0.016	mg/m3	
9094-A-5D-014	Air	ND	<	0.016	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-5D-006	Microvac			27.1	ug/ft2	
9094-M-5D-007	Microvac			49.1	ug/ft2	
9094-W-5D-002	Wipe			7.35	ug/ft2	
9094-W-5D-003	Wipe			4.68	ug/ft2	
9094-W-5D-004	Wipe			25.3	ug/ft2	
9094-W-5D-005	Wipe			32.1	ug/ft2	

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5D-011	Air			0.079	ug/m3	
9094-A-5D-012	Air			0.08	ug/m3	
9094-M-5D-020	Microvac	ND	<	2.32	ug/ft2	
9094-M-5D-021	Microvac	ND	<	2.32	ug/ft2	
9094-W-5D-016	Wipe	ND	<	4.65	ug/ft2	
9094-W-5D-017	Wipe			12.8	ug/ft2	
9094-W-5D-018	Wipe	ND	<	4.65	ug/ft2	
9094-W-5D-019	Wipe	ND	<	4.65	ug/ft2	

Unit 5D Results

Mineral: alpha-Quartz

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5D-013	Air	ND	<	0.004	mg/m3	
9094-A-5D-014	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5D-013	Air	ND	<	0.016	mg/m3	
9094-A-5D-014	Air	ND	<	0.016	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5D-013	Air	ND	<	0.016	mg/m3	
9094-A-5D-014	Air	ND	<	0.016	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected		Result		Comment
9094-A-5D-013	Air	ND	<	0.016	mg/m3	
9094-A-5D-014	Air	ND	<	0.016	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-5D-002	Wipe		251.82	S/cm2	
9094-W-5D-003	Wipe		206.03	S/cm2	
9094-W-5D-004	Wipe		712.21	S/cm2	
9094-W-5D-005	Wipe		595.21	S/cm2	

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-A-5D-008	Air		9.814	S/L	
9094-A-5D-009	Air		7.358	S/L	
9094-A-5D-010	Air		8.424	S/L	
9094-W-5D-015	Wipe		171.69	S/cm2	
9094-W-5D-016	Wipe		228.93	S/cm2	

Unit 5D Results

9094-W-5D-017	Wipe		171.69	S/cm2
9094-W-5D-018	Wipe		114.46	S/cm2
9094-W-5D-019	Wipe		228.93	S/cm2

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-W-5D-002	Wipe	U	290	ug/m2	
9094-W-5D-003	Wipe	U	290	ug/m2	
9094-W-5D-004	Wipe	U	290	ug/m2	
9094-W-5D-005	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 3B

Sample ID	Matrix	Detected	Result		Comment
9094-W-5D-016	Wipe	U	290	ug/m2	
9094-W-5D-017	Wipe	U	290	ug/m2	
9094-W-5D-018	Wipe	U	290	ug/m2	
9094-W-5D-019	Wipe	U	290	ug/m2	

5th Floor Hallway Results

Asbestos

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-5TH-001	Air		0.004	f/cc	
9094-A-5TH-002	Air		0.004	f/cc	
9094-A-5TH-001	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-5TH-002	Air			S>5u/cc	Not analyzed due to overloading of particulates.

Post 2nd cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-5TH-005	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-5TH-006	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-5TH-005	Air	ND	< 0.0009	S>0.5u/cc	
9094-A-5TH-006	Air	ND	< 0.0009	S>0.5u/cc	
9094-A-5TH-005	Air	ND	< 0.0009	S>5u/cc	
9094-A-5TH-006	Air	ND	< 0.0009	S>5u/cc	

Gypsum

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-5TH-004	Air	ND	< 0.016	mg/m3	

Lead

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-5TH-003	Air		0.189	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-5TH-004	Air	ND	< 0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-5TH-004	Air	ND	< 0.016	mg/m3	

Unit 5th Floor Hallway Results

Mineral: Cristobalite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5TH-004	Air	ND	<	0.016	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5TH-004	Air	ND	<	0.016	mg/m3	

MMVF

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-5TH-001	Air			0.617	S/L	
9094-A-5TH-002	Air			0.562	S/L	

Barber Shop Results

Asbestos

Post 1st cleaning - Test 4A, 4E

Sample ID	Matrix	Detected		Result		Comment
9094-A-BS-005	Air	ND	<	0.001	f/cc	
9094-A-BS-006	Air	ND	<	0.001	f/cc	
9094-A-BS-007	Air	ND	<	0.001	f/cc	
9094-A-BS-005	Air	ND	<	0.0004	S>0.5u/cc	
9094-A-BS-006	Air	ND	<	0.0004	S>0.5u/cc	
9094-A-BS-007	Air	ND	<	0.0004	S>0.5u/cc	
9094-A-BS-005	Air	ND	<	0.0004	S>5u/cc	
9094-A-BS-006	Air	ND	<	0.0004	S>5u/cc	
9094-A-BS-007	Air	ND	<	0.0004	S>5u/cc	

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-BS-001	Wipe			0.661	NG/M2	
9094-W-BS-002	Wipe			0.692	NG/M2	
9094-W-BS-003	Wipe			0.636	NG/M2	
9094-W-BS-004	Wipe			0.767	NG/M2	

Post 1st cleaning - Test 4A, 4E

Sample ID	Matrix	Detected		Result		Comment
9094-W-BS-010	Wipe			0.503	NG/M2	
9094-W-BS-011	Wipe			0.526	NG/M2	
9094-W-BS-012	Wipe			0.5	NG/M2	
9094-W-BS-013	Wipe			0.577	NG/M2	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-W-BS-001	Wipe	ND	<	4.64	ug/ft2	
9094-W-BS-002	Wipe			12.1	ug/ft2	Field blank contamination (Validation = R).
9094-W-BS-003	Wipe			25.9	ug/ft2	Field blank contamination (Validation = R).
9094-W-BS-004	Wipe			42.9	ug/ft2	

Barber Shop Results

Post 1st cleaning - Test 4A, 4E

Sample ID	Matrix	Detected	Result	Comment
9094-A-BS-008	Air	ND	< 0.051 ug/m3	
9094-A-BS-009	Air	ND	< 0.052 ug/m3	
9094-W-BS-010	Wipe	ND	< 4.65 ug/ft2	
9094-W-BS-011	Wipe	ND	< 4.65 ug/ft2	
9094-W-BS-012	Wipe	ND	< 4.65 ug/ft2	
9094-W-BS-013	Wipe	ND	< 4.65 ug/ft2	

MMVF

Post 1st cleaning - Test 4A, 4E

Sample ID	Matrix	Detected	Result	Comment
9094-A-BS-005	Air	ND	< 0.067 S/L	
9094-A-BS-006	Air		0.302 S/L	
9094-A-BS-007	Air		0.078 S/L	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result	Comment
9094-W-BS-001	Wipe	U	290 ug/m2	
9094-W-BS-002	Wipe	U	290 ug/m2	
9094-W-BS-003	Wipe	U	290 ug/m2	
9094-W-BS-004	Wipe	U	290 ug/m2	

Post 1st cleaning - Test 4A, 4E

Sample ID	Matrix	Detected	Result	Comment
9094-W-BS-010	Wipe	U	290 ug/m2	
9094-W-BS-011	Wipe	U	290 ug/m2	
9094-W-BS-012	Wipe	U	290 ug/m2	
9094-W-BS-013	Wipe		290 ug/m2	

Cedar Street Staircase Results

Asbestos

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CS3-001	Air			0.003	f/cc	
9094-A-CS5-001	Air			0.001	f/cc	
9094-A-CS3-001	Air			0.001	S>0.5u/cc	Chrysotile
9094-A-CS5-001	Air			0.0015	S>0.5u/cc	Chrysotile
9094-A-CS3-001	Air	ND	<	0.0005	S>5u/cc	
9094-A-CS5-001	Air			0.0005	S>5u/cc	Chrysotile

Gypsum

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CS3-003	Air	ND	<	0.009	mg/m3	
9094-A-CS5-003	Air	ND	<	0.009	mg/m3	

Lead

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CS3-002	Air	ND	<	0.052	ug/m3	
9094-A-CS5-002	Air	ND	<	0.051	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CS3-003	Air	ND	<	0.004	mg/m3	
9094-A-CS5-003	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CS3-003	Air	ND	<	0.017	mg/m3	
9094-A-CS5-003	Air	ND	<	0.017	mg/m3	

Cedar Street Staircase Results

Mineral: Cristobalite

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CS3-003	Air	ND	<	0.017	mg/m3	
9094-A-CS5-003	Air	ND	<	0.017	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CS3-003	Air	ND	<	0.017	mg/m3	
9094-A-CS5-003	Air	ND	<	0.017	mg/m3	

MMVF

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CS3-001	Air	ND	<	0.069	S/L	
9094-A-CS5-001	Air			0.068	S/L	

Chiropractor's Office Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-010	Air		0.016	f/cc	
9094-A-CHR-011	Air		0.006	f/cc	
9094-A-CHR-010	Air	ND	< 0.0009	S>5u/cc	
9094-A-CHR-011	Air	ND	< 0.0009	S>5u/cc	
9094-M-CHR-006	Microvac		601494	S/cm2	Chrysotile
9094-M-CHR-007	Microvac		166202	S/cm2	Chrysotile
9094-M-CHR-008	Microvac		1709500	S/cm2	Chrysotile
9094-M-CHR-009	Microvac		10967100	S/cm2	Chrysotile
9094-W-CHR-001	Wipe		17411.7	S/cm2	Chrysotile
9094-W-CHR-002	Wipe		145625	S/cm2	Chrysotile/Amosite.
9094-W-CHR-003	Wipe		18203.1	S/cm2	Chrysotile
9094-W-CHR-004	Wipe		84684.1	S/cm2	Chrysotile/Amosite.
9094-W-CHR-005	Wipe		51443.6	S/cm2	Chrysotile

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-014	Air			f/cc	Not analyzed, uneven distribution of material on the
9094-A-CHR-015	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-016	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-014	Air			S>0.5u/cc	Not analyzed, uneven distribution of material on the
9094-A-CHR-015	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-016	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-014	Air			S>5u/cc	Not analyzed, uneven distribution of material on the
9094-A-CHR-015	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-016	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-CHR-026	Microvac		4748.64	S/cm2	Chrysotile
9094-M-CHR-027	Microvac		164619.52	S/cm2	Chrysotile
9094-M-CHR-028	Microvac		22753.9	S/cm2	22 Chrysotile and 1 Anthophyllite

Chiropractor’s Office Results

9094-M-CHR-029	Microvac		23743.2	S/cm2	Chrysotile
9094-W-CHR-021	Wipe		2967.9	S/cm2	Chrysotile
9094-W-CHR-022	Wipe		3957.2	S/cm2	Chrysotile
9094-W-CHR-023	Wipe		109219	S/cm2	Chrysotile
9094-W-CHR-024	Wipe		89432.7	S/cm2	1 Amosite and 112 Chrysotile
9094-W-CHR-025	Wipe	ND	< 739.502	S/cm2	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-030	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-031	Air		0.441	f/cc	
9094-A-CHR-032	Air		0.018	f/cc	
9094-A-CHR-030	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-031	Air		0.1767	S>0.5u/cc	Chrysotile
9094-A-CHR-032	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-030	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-031	Air		0.039	S>5u/cc	Chrysotile
9094-A-CHR-032	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-W-CHR-037	Wipe		< 6720.06	S/cm2	Chrysotile
9094-W-CHR-038	Wipe		12480.1	S/cm2	Chrysotile
9094-W-CHR-039	Wipe		115201	S/cm2	1 Amosite and 59 Chrysotile
9094-W-CHR-040	Wipe		15360.1	S/cm2	Chrysotile
9094-W-CHR-041	Wipe		< 5740.85	S/cm2	Chrysotile

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-042	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-043	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-044	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-045	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-046	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-042	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.

Chiropractor's Office Results

9094-A-CHR-043	Air		0.0075	S>0.5u/cc	
9094-A-CHR-044	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-045	Air		0.0007	S>0.5u/cc	
9094-A-CHR-046	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-042	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-043	Air		0.0033	S>5u/cc	
9094-A-CHR-044	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-CHR-045	Air	ND	< 0.0007	S>5u/cc	
9094-A-CHR-046	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-CHR-051	Microvac		21504.2	S/cm2	Chrysotile
9094-M-CHR-052	Microvac		31488.3	S/cm2	Chrysotile
9094-M-CHR-053	Microvac		54144.5	S/cm2	Chrysotile
9094-M-CHR-054	Microvac		59520.6	S/cm2	Chrysotile

Post 1st cleaning - Test 4D

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-056	Air		0.001	f/cc	
9094-A-CHR-057	Air		0.001	f/cc	
9094-A-CHR-058	Air		0.003	f/cc	
9094-A-CHR-056	Air	ND	< 0.0004	S>0.5u/cc	
9094-A-CHR-057	Air	ND	< 0.0004	S>0.5u/cc	
9094-A-CHR-058	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-CHR-056	Air	ND	< 0.0004	S>5u/cc	
9094-A-CHR-057	Air	ND	< 0.0004	S>5u/cc	S>5u/cc

Chiropractor’s Office Results

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-012	Air		0.000305	ng/m3	
9094-W-CHR-002	Wipe		1.03	ng/m2	
9094-W-CHR-003	Wipe		0.547	ng/m2	
9094-W-CHR-004	Wipe		0.788	ng/m2	
9094-W-CHR-005	Wipe		0.544	ng/m2	
9094-A-CHR-058	Air		ND	<	0.0005

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-W-CHR-022	Wipe		1.01	ng/m2	
9094-W-CHR-023	Wipe		0.999	ng/m2	
9094-W-CHR-024	Wipe		1.2	ng/m2	
9094-W-CHR-025	Wipe		1.15	ng/m2	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result		Comment
9094-W-CHR-038	Wipe		0.933	ng/m2	
9094-W-CHR-039	Wipe		1.12	ng/m2	
9094-W-CHR-040	Wipe		0.982	ng/m2	
9094-W-CHR-041	Wipe		0.712	ng/m2	

Post 1st cleaning - Test 4E

Sample ID	Matrix	Detected	Result		Comment
9094-W-CHR-061	Wipe		0.598	NG/M2	
9094-W-CHR-062	Wipe		0.616	NG/M2	
9094-W-CHR-063	Wipe		0.645	NG/M2	

Pre-water wipe

Sample ID	Matrix	Detected	Result		Comment
9094-W-CHR-055	Wipe		0.708	NG/M2	

Gypsum

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-019	Air	ND	< 0.017	mg/m3	
9094-A-CHR-020	Air	ND	< 0.008	mg/m3	

Chiropractor’s Office Results

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-035	Air		0.014	mg/m3	
9094-A-CHR-036	Air		0.011	mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-049	Air		0.009	mg/m3	
9094-A-CHR-050	Air		0.012	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-M-CHR-006	Microvac		28.2	ug/ft2	
9094-M-CHR-007	Microvac		7.22	ug/ft2	Estimated concentration (J).
9094-M-CHR-008	Microvac		181	ug/ft2	Estimated concentration (J).
9094-M-CHR-009	Microvac		69.3	ug/ft2	Estimated concentration (J).
9094-W-CHR-002	Wipe		433	ug/ft2	
9094-W-CHR-003	Wipe		346	ug/ft2	
9094-W-CHR-004	Wipe		116	ug/ft2	
9094-W-CHR-005	Wipe		74.7	ug/ft2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-017	Air		0.617	ug/m3	
9094-A-CHR-018	Air		0.499	ug/m3	
9094-M-CHR-026	Microvac		9.66	ug/ft2	
9094-M-CHR-027	Microvac		3.67	ug/ft2	
9094-M-CHR-028	Microvac		5.25	ug/ft2	
9094-M-CHR-029	Microvac		9.23	ug/ft2	
9094-W-CHR-022	Wipe		11.2	ug/ft2	
9094-W-CHR-023	Wipe		146	ug/ft2	
9094-W-CHR-024	Wipe		64.5	ug/ft2	
9094-W-CHR-025	Wipe		5.97	ug/ft2	

Chiropractor's Office Results

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-033	Air			0.503	ug/m3	
9094-A-CHR-034	Air			0.486	ug/m3	
9094-W-CHR-038	Wipe			7.12	ug/ft2	
9094-W-CHR-039	Wipe			147	ug/ft2	
9094-W-CHR-040	Wipe			556	ug/ft2	
9094-W-CHR-041	Wipe			6.61	ug/ft2	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-047	Air			1.89	ug/m3	
9094-A-CHR-048	Air			2.56	ug/m3	
9094-M-CHR-051	Microvac			14.5	ug/ft2	
9094-M-CHR-052	Microvac			18.5	ug/ft2	
9094-M-CHR-053	Microvac			17.4	ug/ft2	
9094-M-CHR-054	Microvac			17.9	ug/ft2	

Post 1st cleaning - Test 4D

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-059	Air	ND	<	0.052	ug/m3	
9094-A-CHR-060	Air	ND	<	0.052	ug/m3	

Post 1st cleaning - Test 4E

Sample ID	Matrix	Detected		Result		Comment
9094-W-CHR-061	Wipe	ND	<	4.65	ug/ft2	
9094-W-CHR-062	Wipe			954	ug/ft2	
9094-W-CHR-063	Wipe	ND	<	4.65	ug/ft2	

Mineral: alpha-Quartz

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-019	Air	ND	<	0.008	mg/m3	
9094-A-CHR-020	Air	ND	<	0.004	mg/m3	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-035	Air	ND	<	0.004	mg/m3	
9094-A-CHR-036	Air	ND	<	0.004	mg/m3	

Chiropractor's Office Results

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result	Comment
9094-A-CHR-049	Air	ND	< 0.004 mg/m3	
9094-A-CHR-050	Air	ND	< 0.004 mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result	Comment
9094-A-CHR-019	Air	ND	< 0.034 mg/m3	
9094-A-CHR-020	Air	ND	< 0.016 mg/m3	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result	Comment
9094-A-CHR-035	Air	ND	< 0.017 mg/m3	
9094-A-CHR-036	Air	ND	< 0.016 mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result	Comment
9094-A-CHR-049	Air	ND	< 0.017 mg/m3	
9094-A-CHR-050	Air	ND	< 0.016 mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result	Comment
9094-A-CHR-019	Air	ND	< 0.034 mg/m3	
9094-A-CHR-020	Air	ND	< 0.016 mg/m3	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result	Comment
9094-A-CHR-035	Air	ND	< 0.017 mg/m3	
9094-A-CHR-036	Air	ND	< 0.016 mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result	Comment
9094-A-CHR-049	Air	ND	< 0.017 mg/m3	
9094-A-CHR-050	Air	ND	< 0.016 mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result	Comment
9094-A-CHR-019	Air	ND	< 0.034 mg/m3	
9094-A-CHR-020	Air	ND	< 0.016 mg/m3	

Chiropractor's Office Results

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-035	Air	ND	<	0.017	mg/m3	
9094-A-CHR-036	Air	ND	<	0.016	mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-049	Air	ND	<	0.017	mg/m3	
9094-A-CHR-050	Air	ND	<	0.016	mg/m3	

MMVF

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-010	Air			4.579	S/L	
9094-A-CHR-011	Air			7.869	S/L	
9094-W-CHR-002	Wipe			53415.98	S/cm2	
9094-W-CHR-003	Wipe			30523.42	S/cm2	
9094-W-CHR-004	Wipe			18314.25	S/cm2	
9094-W-CHR-005	Wipe			744.01	S/cm2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-014	Air			0.522	S/L	
9094-A-CHR-015	Air			1.461	S/L	
9094-A-CHR-016	Air			1.843	S/L	
9094-W-CHR-021	Wipe			57.23	S/cm2	
9094-W-CHR-022	Wipe			57.23	S/cm2	
9094-W-CHR-023	Wipe			515.08	S/cm2	
9094-W-CHR-024	Wipe			457.85	S/cm2	
9094-W-CHR-025	Wipe	ND	<	57.23	S/cm2	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-CHR-030	Air			17.579	S/L	
9094-A-CHR-031	Air			60.606	S/L	
9094-A-CHR-032	Air			5.598	S/L	
9094-W-CHR-037	Wipe	ND	<	57.23	S/cm2	

Chiropractor's Office Results

9094-W-CHR-038	Wipe		57.23	S/cm2	
9094-W-CHR-039	Wipe		228.93	S/cm2	
9094-W-CHR-040	Wipe		68.86	S/cm2	
9094-W-CHR-041	Wipe		171.69	S/cm2	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-042	Air		1.668	S/L	
9094-A-CHR-043	Air		0.35	S/L	
9094-A-CHR-044	Air		5.499	S/L	
9094-A-CHR-045	Air		0.126	S/L	
9094-A-CHR-046	Air		0.514	S/L	

Post 1st cleaning - Test 4D

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-056	Air		0.135	S/L	
9094-A-CHR-057	Air		0.539	S/L	
9094-A-CHR-058	Air		0.7	S/L	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-CHR-012	Air		0.15	µg/m3	
9094-A-CHR-013	Air		0.16	µg/m3	
9094-W-CHR-002	Wipe		290	ug/m2	Estimated concentration (J).
9094-W-CHR-003	Wipe		290	ug/m2	Estimated concentration (J).
9094-W-CHR-004	Wipe	U	290	ug/m2	
9094-W-CHR-005	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-W-CHR-022	Wipe	U	290	ug/m2	
9094-W-CHR-023	Wipe	U	290	ug/m2	
9094-W-CHR-024	Wipe	U	290	ug/m2	
9094-W-CHR-025	Wipe	U	290	ug/m2	

Chiropractor's Office Results

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result		Comment
9094-W-CHR-038	Wipe	U	290	ug/m2	
9094-W-CHR-039	Wipe	U	290	ug/m2	
9094-W-CHR-040	Wipe	U	290	ug/m2	
9094-W-CHR-041	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 4E

Sample ID	Matrix	Detected	Result		Comment
9094-W-CHR-061	Wipe	U	290	ug/m2	
9094-W-CHR-062	Wipe	U	290	ug/m2	
9094-W-CHR-063	Wipe	U	290	ug/m2	

Pre-water wipe

Sample ID	Matrix	Detected	Result		Comment
9094-W-CHR-055	Wipe	U	290	ug/m2	

Elevator Shaft Results

Asbestos

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-ELV-001	Air			0.001	f/cc	
9094-A-ELV-002	Air	ND	<	0.001	f/cc	
9094-A-ELV-005	Air	ND	<	0.001	f/cc	
9094-A-ELV-001	Air	ND	<	0.0004	S>0.5u/cc	
9094-A-ELV-002	Air	ND	<	0.0004	S>0.5u/cc	
9094-A-ELV-005	Air	ND	<	0.0004	S>0.5u/cc	
9094-A-ELV-001	Air	ND	<	0.0004	S>5u/cc	
9094-A-ELV-002	Air	ND	<	0.0004	S>5u/cc	
9094-A-ELV-005	Air	ND	<	0.0004	S>5u/cc	

Lead

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-ELV-003	Air	ND	<	0.05	ug/m3	
9094-A-ELV-004	Air	ND	<	0.052	ug/m3	

MMVF

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-ELV-001	Air			0.67	S/L	
9094-A-ELV-002	Air			0.167	S/L	
9094-A-ELV-005	Air			0.203	S/L	

The Food Exchange Results

Asbestos

Before Cleaning - HVAC System

Sample ID	Matrix	Detected	Result		Comment
9094-W-FE-001	Wipe	ND	< 302504	S/cm2	

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected	Result		Comment
9094-A-FE-018	Air		0.001	f/cc	
9094-A-FE-019	Air		0.001	f/cc	
9094-A-FE-020	Air		0.001	f/cc	
9094-A-FE-018	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-FE-019	Air		0.0005	S>0.5u/cc	Chrysotile
9094-A-FE-020	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-FE-018	Air	ND	< 0.0005	S>5u/cc	
9094-A-FE-019	Air		0.0005	S>5u/cc	Chrysotile
9094-A-FE-020	Air	ND	< 0.0005	S>5u/cc	
9094-W-FE-015	Wipe	ND	< 30250.4	S/cm2	
9094-W-FE-016	Wipe	ND	< 30250.4	S/cm2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-FE-002	Air		0.001	f/cc	
9094-A-FE-003	Air	ND	< 0.001	f/cc	
9094-A-FE-004	Air		0.001	f/cc	
9094-A-FE-005	Air	ND	< 0.001	f/cc	
9094-A-FE-008	Air	ND	< 0.001	f/cc	
9094-A-FE-009	Air	ND	< 0.001	f/cc	
9094-A-FE-010	Air	ND	< 0.001	f/cc	
9094-A-FE-011	Air	ND	< 0.001	f/cc	
9094-A-FE-002	Air		0.001	S>0.5u/cc	Chrysotile
9094-A-FE-003	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-FE-004	Air	ND	< 0.0005	S>0.5u/cc	Chrysotile
9094-A-FE-005	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-FE-008	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-FE-009	Air	ND	< 0.0005	S>0.5u/cc	

The Food Exchange Results

9094-A-FE-010	Air	ND	<	0.0005	S>0.5u/cc
9094-A-FE-011	Air	ND	<	0.0005	S>0.5u/cc
9094-A-FE-002	Air	ND	<	0.0005	S>5u/cc
9094-A-FE-003	Air	ND	<	0.0005	S>5u/cc
9094-A-FE-004	Air	ND	<	0.0005	S>5u/cc
9094-A-FE-005	Air	ND	<	0.0005	S>5u/cc
9094-A-FE-008	Air	ND	<	0.0005	S>5u/cc
9094-A-FE-009	Air	ND	<	0.0005	S>5u/cc
9094-A-FE-010	Air	ND	<	0.0005	S>5u/cc
9094-A-FE-011	Air	ND	<	0.0005	S>5u/cc

Gypsum

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-023	Air	ND	<	0.008	mg/m3	

Lead

Before Cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-W-FE-001	Wipe			1310	ug/ft2	

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-021	Air	ND	<	0.053	ug/m3	Estimated concentration (J).
9094-A-FE-022	Air	ND	<	0.052	ug/m3	Estimated concentration (J).
9094-W-FE-015	Wipe			136	ug/ft2	
9094-W-FE-016	Wipe			183	ug/ft2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-006	Air	ND	<	0.053	ug/m3	
9094-A-FE-007	Air	ND	<	0.05	ug/m3	
9094-A-FE-012	Air	ND	<	0.052	ug/m3	
9094-A-FE-013	Air	ND	<	0.052	ug/m3	
9094-A-FE-014	Air	ND	<	0.05	ug/m3	

The Food Exchange Results

Mineral: alpha-Quartz

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-023	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-023	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-023	Air	ND	<	0.017	mg/m3	

Mineral: Tridymite

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-023	Air	ND	<	0.017	mg/m3	

MMVF

Before Cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-W-FE-001	Wipe			11732.44	S/cm2	

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-018	Air	ND	<	0.066	S/L	
9094-A-FE-019	Air	ND	<	0.066	S/L	
9094-A-FE-020	Air	ND	<	0.067	S/L	
9094-W-FE-015	Wipe	ND	<	57.23	S/cm2	
9094-W-FE-016	Wipe	ND	<	57.23	S/cm2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-FE-002	Air	ND	<	0.069	S/L	
9094-A-FE-003	Air	ND	<	0.072	S/L	
9094-A-FE-004	Air	ND	<	0.086	S/L	
9094-A-FE-005	Air	ND	<	0.074	S/L	
9094-A-FE-008	Air			0.14	S/L	

The Food Exchange Results

9094-A-FE-009	Air			0.145	S/L
9094-A-FE-010	Air	ND	<	0.079	S/L
9094-A-FE-011	Air	ND	<	0.072	S/L

Total Dust - NADCA vacuum

Post 1st cleaning - HVAC System (NADCA)

Sample ID	Matrix	Detected		Result		Comment
9094-M-FE-017	Microvac			0.013	mg/cm2	

Lemongrass Grill Results

Asbestos

Before cleaning - HVAC System

Sample ID	Matrix	Detected	Result		Comment
9094-W-LG-009	Wipe	ND	< 30250.4	S/cm2	

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected	Result		Comment
9094-A-LG-023	Air		0.001	f/cc	
9094-A-LG-024	Air		0.001	f/cc	
9094-A-LG-025	Air		0.001	f/cc	
9094-A-LG-026	Air		0.001	f/cc	
9094-A-LG-023	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-LG-024	Air		0.0005	S>0.5u/cc	Chrysotile
9094-A-LG-025	Air		0.0005	S>0.5u/cc	Chrysotile
9094-A-LG-026	Air	ND	< 0.0005	S>0.5u/cc	
9094-A-LG-023	Air	ND	< 0.0005	S>5u/cc	
9094-A-LG-024	Air	ND	< 0.0005	S>5u/cc	
9094-A-LG-025	Air	ND	< 0.0005	S>5u/cc	
9094-A-LG-026	Air	ND	< 0.0005	S>5u/cc	
9094-W-LG-020	Wipe	ND	< 12100.2	S/cm2	
9094-W-LG-021	Wipe	ND	< 12100.2	S/cm2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-LG-001	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-LG-002	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-LG-003	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-LG-004	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-LG-005	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-LG-018	Air	ND	< 0.001	f/cc	
9094-A-LG-001	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-002	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-003	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.

Lemongrass Grill Results

9094-A-LG-004	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-005	Air				S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-018	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-LG-001	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-002	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-003	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-004	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-005	Air				S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-LG-018	Air	ND	<	0.0005	S>5u/cc	

Post 2nd cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-010	Air	ND	<	0.001	f/cc	
9094-A-LG-011	Air	ND	<	0.001	f/cc	
9094-A-LG-012	Air	ND	<	0.001	f/cc	
9094-A-LG-013	Air	ND	<	0.001	f/cc	
9094-A-LG-014	Air			0.001	f/cc	
9094-A-LG-015	Air			0.001	f/cc	
9094-A-LG-016	Air			0.001	f/cc	
9094-A-LG-010	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-LG-011	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-LG-012	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-LG-013	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-LG-014	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-LG-015	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-LG-016	Air			0.0005	S>0.5u/cc	Chrysotile
9094-A-LG-010	Air	ND	<	0.0005	S>5u/cc	
9094-A-LG-011	Air	ND	<	0.0005	S>5u/cc	
9094-A-LG-012	Air	ND	<	0.0005	S>5u/cc	
9094-A-LG-013	Air	ND	<	0.0005	S>5u/cc	
9094-A-LG-014	Air	ND	<	0.0005	S>5u/cc	

Lemongrass Grill Results

9094-A-LG-015	Air	ND	<	0.0005	S>5u/cc	
9094-A-LG-016	Air			0.0005	S>5u/cc	Chrysotile

Gypsum

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-030	Air	ND	<	0.009	mg/m3	

Lead

Before cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-W-LG-009	Wipe			10700	ug/ft2	Estimated concentration (J)

Post 1st Cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-027	Air	ND	<	0.053	ug/m3	Estimated concentration (J).
9094-A-LG-028	Air	ND	<	0.052	ug/m3	Estimated concentration (J).
9094-A-LG-029	Air	ND	<	0.053	ug/m3	Estimated concentration (J).
9094-W-LG-020	Wipe			25.9	ug/ft2	Method blank contamination (Validation = R).
9094-W-LG-021	Wipe			166	ug/ft2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-006	Air			0.168	ug/m3	
9094-A-LG-007	Air			0.16	ug/m3	
9094-A-LG-008	Air			0.347	ug/m3	
9094-A-LG-019	Air	ND	<	0.059	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-030	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-030	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-030	Air	ND	<	0.017	mg/m3	

Lemongrass Grill Results

Mineral: Tridymite

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-030	Air	ND	<	0.017	mg/m3	

MMVF

Before cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-W-LG-009	Wipe	ND	<	57.23	S/cm2	

Post 1st cleaning - HVAC System

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-023	Air	ND	<	0.096	S/L	
9094-A-LG-024	Air	ND	<	0.086	S/L	
9094-A-LG-025	Air	ND	<	0.067	S/L	
9094-A-LG-026	Air	ND	<	0.089	S/L	
9094-W-LG-020	Wipe	ND	<	57.23	S/cm2	
9094-W-LG-021	Wipe	ND	<	57.23	S/cm2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-LG-001	Air	ND	<	0.075	S/L	
9094-A-LG-002	Air	ND	<	0.068	S/L	
9094-A-LG-003	Air	ND	<	0.082	S/L	
9094-A-LG-004	Air	ND	<	0.066	S/L	
9094-A-LG-005	Air	ND	<	0.063	S/L	
9094-A-LG-018	Air	ND	<	0.072	S/L	

Total Dust - NADCA vacuum

Post 1st cleaning - HVAC System (NADCA)

Sample ID	Matrix	Detected		Result		Comment
9094-M-LG-022	Microvac			0.005	mg/cm2	

Liberty Street Staircase Results

Asbestos

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-LS3-001	Air			0.005	f/cc	
9094-A-LS5-001	Air			0.003	f/cc	
9094-A-LS3-001	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-LS5-001	Air			0.0005	S>0.5u/cc	Chrysotile
9094-A-LS3-001	Air	ND	<	0.0005	S>5u/cc	
9094-A-LS5-001	Air			0.0005	S>5u/cc	Chrysotile

Gypsum

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-LS3-003	Air	ND	<	0.009	mg/m3	
9094-A-LS5-003	Air	ND	<	0.008	mg/m3	

Lead

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-LS3-002	Air	ND	<	0.052	ug/m3	
9094-A-LS5-002	Air	ND	<	0.052	ug/m3	

Mineral: alpha-Quartz

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-LS3-003	Air			0.022	mg/m3	
9094-A-LS5-003	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-LS3-003	Air	ND	<	0.017	mg/m3	
9094-A-LS5-003	Air	ND	<	0.017	mg/m3	

Mineral: Cristobalite

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-LS3-003	Air	ND	<	0.017	mg/m3	
9094-A-LS5-003	Air	ND	<	0.017	mg/m3	

Liberty Street Staircase Results

Mineral: Tridymite

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected	Result	Comment
9094-A-LS3-003	Air	ND	< 0.017 mg/m3	
9094-A-LS5-003	Air	ND	< 0.017 mg/m3	

MMVF

Post 1st cleaning - Test 4A, 4B

Sample ID	Matrix	Detected	Result	Comment
9094-A-LS3-001	Air		0.14 S/L	
9094-A-LS5-001	Air		0.072 S/L	

Mattress Shop Results

Asbestos

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-MAT-012	Air		0.025	f/cc	
9094-A-MAT-013	Air		0.283	f/cc	
9094-A-MAT-014	Air		0.008	f/cc	
9094-A-MAT-015	Air		0.004	f/cc	
9094-A-MAT-012	Air	ND	< 0.0009	S>5u/cc	
9094-A-MAT-013	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-014	Air	ND	< 0.0008	S>5u/cc	
9094-A-MAT-015	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-M-MAT-005	Microvac		378132	S/cm2	Chrysotile
9094-M-MAT-006	Microvac		371977	S/cm2	Chrysotile
9094-M-MAT-007	Microvac		39572	S/cm2	Chrysotile
9094-M-MAT-008	Microvac		823098	S/cm2	Chrysotile
9094-M-MAT-009	Microvac		182031	S/cm2	Chrysotile
9094-M-MAT-010	Microvac		123465	S/cm2	Chrysotile
9094-M-MAT-011	Microvac		72812.5	S/cm2	Chrysotile
9094-W-MAT-002	Wipe		7122.96	S/cm2	Chrysotile
9094-W-MAT-003	Wipe		11080.2	S/cm2	Chrysotile
9094-W-MAT-004	Wipe		10288.7	S/cm2	Chrysotile

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-A-MAT-018	Air		0.006	f/cc	
9094-A-MAT-019	Air		0.006	f/cc	
9094-A-MAT-020	Air		0.009	f/cc	
9094-A-MAT-018	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-019	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-020	Air		0.0009	S>0.5u/cc	Chrysotile
9094-A-MAT-018	Air			S>5u/cc	Not analyzed due to overloading of particulates.

Mattress Shop Results

9094-A-MAT-019	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-020	Air		0.0009	S>5u/cc	Chrysotile
9094-M-MAT-030	Microvac		18203.1	S/cm2	Chrysotile - Field Blank contamination (Validation = J).
9094-M-MAT-031	Microvac		35614.8	S/cm2	Chrysotile - Field Blank contamination (Validation = J).
9094-M-MAT-032	Microvac		53817.9	S/cm2	Chrysotile - Field Blank contamination (Validation = J).
9094-M-MAT-033	Microvac		56983.7	S/cm2	Chrysotile - Field Blank contamination (Validation = J).
9094-M-MAT-034	Microvac		58566.6	S/cm2	Chrysotile - Field Blank contamination (Validation = J).
9094-M-MAT-035	Microvac		23743.2	S/cm2	Chrysotile - Field Blank contamination (Validation = J).
9094-M-MAT-036	Microvac		47486.4	S/cm2	Chrysotile - Field Blank contamination (Validation = J).
9094-W-MAT-026	Wipe		1582.88	S/cm2	Chrysotile
9094-W-MAT-027	Wipe		48277.8	S/cm2	Chrysotile
9094-W-MAT-028	Wipe		197860	S/cm2	Chrysotile
9094-W-MAT-029	Wipe		134545	S/cm2	Chrysotile

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result		Comment
9094-A-MAT-037	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-038	Air		0.042	f/cc	
9094-A-MAT-039	Air			f/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-037	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-038	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-039	Air			S>0.5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-037	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-038	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-A-MAT-039	Air			S>5u/cc	Not analyzed due to overloading of particulates.
9094-W-MAT-045	Wipe		2374.32	S/cm2	Chrysotile
9094-W-MAT-046	Wipe		27304.7	S/cm2	Chrysotile
9094-W-MAT-047	Wipe		35614.8	S/cm2	44 Chrysotile and 1 Anthophyllite
9094-W-MAT-048	Wipe	ND	< 23664.1	S/cm2	Particulate matter; sensitivity (7914 s/cm2) not reached.

Mattress Shop Results

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-049	Air			0.006	f/cc	
9094-A-MAT-050	Air			0.006	f/cc	
9094-A-MAT-051	Air			0.008	f/cc	
9094-A-MAT-052	Air			0.008	f/cc	
9094-A-MAT-053	Air			0.007	f/cc	
9094-A-MAT-049	Air			0.0067	S>0.5u/cc	Chrysotile
9094-A-MAT-050	Air			0.0032	S>0.5u/cc	Chrysotile
9094-A-MAT-051	Air			0.0106	S>0.5u/cc	Chrysotile
9094-A-MAT-052	Air			0.0041	S>0.5u/cc	Chrysotile
9094-A-MAT-053	Air			0.0047	S>0.5u/cc	Chrysotile
9094-A-MAT-049	Air			0.0025	S>5u/cc	Chrysotile
9094-A-MAT-050	Air			0.0016	S>5u/cc	Chrysotile
9094-A-MAT-051	Air			0.0025	S>5u/cc	Chrysotile
9094-A-MAT-052	Air			0.0016	S>5u/cc	Chrysotile
9094-A-MAT-053	Air			0.0016	S>5u/cc	Chrysotile
9094-M-MAT-058	Microvac	ND	<	3840.04	S/cm2	
9094-M-MAT-059	Microvac	ND	<	3840.04	S/cm2	Chrysotile - Asbestos detected below detection limit.
9094-M-MAT-060	Microvac			12480.1	S/cm2	Chrysotile
9094-M-MAT-061	Microvac			95040.9	S/cm2	Chrysotile
9094-M-MAT-062	Microvac			6720.06	S/cm2	Chrysotile
9094-M-MAT-063	Microvac			4800.04	S/cm2	Chrysotile
9094-M-MAT-064	Microvac	ND	<	3840.04	S/cm2	Chrysotile - Asbestos detected below detection limit.

Post 1st cleaning - Test 4D

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-067	Air	ND	<	0.001	f/cc	
9094-A-MAT-068	Air	ND	<	0.001	f/cc	
9094-A-MAT-071	Air	ND	<	0.001	f/cc	
9094-A-MAT-067	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-MAT-068	Air	ND	<	0.0005	S>0.5u/cc	
9094-A-MAT-071	Air	ND	<	0.0005	S>0.5u/cc	

Mattress Shop Results

9094-A-MAT-067	Air	ND	<	0.0005	S>5u/cc
9094-A-MAT-068	Air	ND	<	0.0005	S>5u/cc
9094-A-MAT-071	Air	ND	<	0.0005	S>5u/cc

Dioxin TEQ EMPC (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-MAT-016	Air		0.000221	ng/m3	
9094-A-MAT-017	Air		0.00017	ng/m3	
9094-W-MAT-002	Wipe		0.584	ng/m2	
9094-W-MAT-003	Wipe		0.647	ng/m2	
9094-W-MAT-004	Wipe		0.598	ng/m2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-W-MAT-026	Wipe		0.797	ng/m2	
9094-W-MAT-027	Wipe		0.805	ng/m2	
9094-W-MAT-028	Wipe		0.691	ng/m2	
9094-W-MAT-029	Wipe		0.846	ng/m2	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result		Comment
9094-W-MAT-045	Wipe		0.812	ng/m2	
9094-W-MAT-046	Wipe		0.903	ng/m2	
9094-W-MAT-047	Wipe		0.838	ng/m2	
9094-W-MAT-048	Wipe		0.678	ng/m2	

Post 1st cleaning - Test 4E

Sample ID	Matrix	Detected	Result		Comment
9094-W-MAT-072	Wipe		0.647	NG/M2	
9094-W-MAT-073	Wipe		0.613	NG/M2	

Pre-water wipe

Sample ID	Matrix	Detected	Result		Comment
9094-W-MAT-065	Wipe		0.849	NG/M2	
9094-W-MAT-066	Wipe		0.698	NG/M2	

Unit Mattress Shop Results

Gypsum

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-023	Air	ND	<	0.008	mg/m3	
9094-A-MAT-024	Air	ND	<	0.008	mg/m3	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-042	Air	ND	<	0.008	mg/m3	
9094-A-MAT-043	Air	ND	<	0.008	mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-056	Air	ND	<	0.008	mg/m3	
9094-A-MAT-057	Air	ND	<	0.008	mg/m3	

Lead

Before cleaning

Sample ID	Matrix	Detected		Result		Comment
9094-M-MAT-005	Microvac			5.56	ug/ft2	Estimated concentration (J).
9094-M-MAT-006	Microvac			18.4	ug/ft2	Estimated concentration (J).
9094-M-MAT-007	Microvac			7.66	ug/ft2	Estimated concentration (J).
9094-M-MAT-008	Microvac			5.28	ug/ft2	
9094-M-MAT-009	Microvac			3.52	ug/ft2	
9094-M-MAT-010	Microvac			2.62	ug/ft2	
9094-M-MAT-011	Microvac	ND	<	2.32	ug/ft2	
9094-W-MAT-002	Wipe	ND	<	4.65	ug/ft2	
9094-W-MAT-003	Wipe			38.9	ug/ft2	
9094-W-MAT-004	Wipe			77	ug/ft2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-021	Air			0.198	ug/m3	
9094-A-MAT-022	Air			0.195	ug/m3	
9094-M-MAT-030	Microvac	ND	<	2.32	ug/ft2	
9094-M-MAT-031	Microvac	ND	<	2.32	ug/ft2	
9094-M-MAT-032	Microvac	ND	<	2.32	ug/ft2	

Mattress Shop Results

9094-M-MAT-033	Microvac	ND	<	2.32	ug/ft2	
9094-M-MAT-034	Microvac			3.29	ug/ft2	
9094-M-MAT-035	Microvac			2.56	ug/ft2	
9094-M-MAT-036	Microvac	ND	<	2.32	ug/ft2	
9094-W-MAT-026	Wipe	ND	<	4.65	ug/ft2	
9094-W-MAT-027	Wipe			22.2	ug/ft2	
9094-W-MAT-028	Wipe			43.9	ug/ft2	
9094-W-MAT-029	Wipe			42.2	ug/ft2	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-040	Air			0.363	ug/m3	
9094-A-MAT-041	Air			0.352	ug/m3	
9094-W-MAT-045	Wipe	ND	<	4.65	ug/ft2	
9094-W-MAT-046	Wipe			10.6	ug/ft2	
9094-W-MAT-047	Wipe			91.5	ug/ft2	
9094-W-MAT-048	Wipe			79.3	ug/ft2	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-054	Air			0.174	ug/m3	
9094-A-MAT-055	Air			0.189	ug/m3	
9094-M-MAT-058	Microvac	ND	<	2.32	ug/ft2	
9094-M-MAT-059	Microvac	ND	<	2.32	ug/ft2	
9094-M-MAT-060	Microvac	ND	<	2.32	ug/ft2	
9094-M-MAT-061	Microvac	ND	<	2.32	ug/ft2	
9094-M-MAT-062	Microvac			3.82	ug/ft2	
9094-M-MAT-063	Microvac	ND	<	2.32	ug/ft2	
9094-M-MAT-064	Microvac	ND	<	2.32	ug/ft2	

Post 1st cleaning - Test 4D

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-069	Air	ND	<	0.051	ug/m3	
9094-A-MAT-070	Air	ND	<	0.051	ug/m3	

Mattress Shop Results

Post 1st cleaning - Test 4E

Sample ID	Matrix	Detected		Result		Comment
9094-W-MAT-072	Wipe			19.5	ug/ft2	Sample was broken at the laboratory; ID not confirmed.
9094-W-MAT-073	Wipe			5.06	ug/ft2	Sample was broken at the laboratory; ID not confirmed.
9094-W-MAT-074	Wipe			38.2	ug/ft2	

Pre-water wipe

Sample ID	Matrix	Detected		Result		Comment
9094-W-MAT-065	Wipe	ND	<	4.65	ug/ft2	
9094-W-MAT-066	Wipe			20	ug/ft2	Estimated concentration (J).

Mineral: alpha-Quartz

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-023	Air	ND	<	0.004	mg/m3	
9094-A-MAT-024	Air	ND	<	0.004	mg/m3	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-042	Air	ND	<	0.004	mg/m3	
9094-A-MAT-043	Air	ND	<	0.004	mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-056	Air	ND	<	0.004	mg/m3	
9094-A-MAT-057	Air	ND	<	0.004	mg/m3	

Mineral: Calcite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-023	Air	ND	<	0.016	mg/m3	
9094-A-MAT-024	Air	ND	<	0.016	mg/m3	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-042	Air	ND	<	0.016	mg/m3	
9094-A-MAT-043	Air	ND	<	0.016	mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-056	Air	ND	<	0.017	mg/m3	
9094-A-MAT-057	Air	ND	<	0.017	mg/m3	

Mattress Shop Results

Mineral: Cristobalite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-023	Air	ND	<	0.016	mg/m3	
9094-A-MAT-024	Air	ND	<	0.016	mg/m3	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-042	Air	ND	<	0.016	mg/m3	
9094-A-MAT-043	Air	ND	<	0.016	mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-056	Air	ND	<	0.017	mg/m3	
9094-A-MAT-057	Air	ND	<	0.017	mg/m3	

Mineral: Tridymite

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-023	Air	ND	<	0.016	mg/m3	
9094-A-MAT-024	Air	ND	<	0.016	mg/m3	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-042	Air	ND	<	0.016	mg/m3	
9094-A-MAT-043	Air	ND	<	0.016	mg/m3	

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-056	Air	ND	<	0.017	mg/m3	
9094-A-MAT-057	Air	ND	<	0.017	mg/m3	

Mattress Shop Results

MMVF

Before cleaning

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-012	Air			11.716	S/L	
9094-A-MAT-013	Air			92.184	S/L	
9094-A-MAT-014	Air			3.766	S/L	
9094-A-MAT-015	Air			4.159	S/L	
9094-W-MAT-002	Wipe			1201.86	S/cm2	
9094-W-MAT-003	Wipe			23710.15	S/cm2	
9094-W-MAT-004	Wipe			572.31	S/cm2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-018	Air			3.19	S/L	
9094-A-MAT-019	Air			2.834	S/L	
9094-A-MAT-020	Air			3.802	S/L	
9094-W-MAT-026	Wipe			114.46	S/cm2	
9094-W-MAT-027	Wipe	ND	<	57.23	S/cm2	
9094-W-MAT-028	Wipe			228.93	S/cm2	
9094-W-MAT-029	Wipe			686.78	S/cm2	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result			Comment
9094-A-MAT-037	Air			1.457	S/L	
9094-A-MAT-038	Air			6.206	S/L	
9094-A-MAT-039	Air			1.753	S/L	
9094-W-MAT-045	Wipe	ND	<	57.23	S/cm2	
9094-W-MAT-046	Wipe			171.69	S/cm2	
9094-W-MAT-047	Wipe			286.16	S/cm2	
9094-W-MAT-048	Wipe			286.16	S/cm2	

Mattress Shop Results

Post 1st cleaning - Test 4C

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-049	Air			4.723	S/L	
9094-A-MAT-050	Air			1.051	S/L	
9094-A-MAT-051	Air			1.203	S/L	
9094-A-MAT-052	Air			2.127	S/L	
9094-A-MAT-053	Air			2.092	S/L	

Post 1st cleaning - Test 4D

Sample ID	Matrix	Detected		Result		Comment
9094-A-MAT-067	Air	ND	<	0.067	S/L	
9094-A-MAT-068	Air	ND	<	0.069	S/L	
9094-A-MAT-071	Air	ND	<	0.047	S/L	

PAH TEF (ND=1/2)

Before cleaning

Sample ID	Matrix	Detected	Result		Comment
9094-A-MAT-016	Air	U	2.7	µg/m3	
9094-W-MAT-002	Wipe	U	290	ug/m2	
9094-W-MAT-003	Wipe		290	ug/m2	
9094-W-MAT-004	Wipe		290	ug/m2	

Post 1st cleaning - Test 4A

Sample ID	Matrix	Detected	Result		Comment
9094-W-MAT-026	Wipe	U	290	ug/m2	
9094-W-MAT-027	Wipe	U	290	ug/m2	
9094-W-MAT-028	Wipe	U	290	ug/m2	
9094-W-MAT-029	Wipe	U	290	ug/m2	

Post 1st cleaning - Test 4B

Sample ID	Matrix	Detected	Result		Comment
9094-W-MAT-045	Wipe	U	290	ug/m2	
9094-W-MAT-046	Wipe	U	290	ug/m2	
9094-W-MAT-047	Wipe	U	290	ug/m2	
9094-W-MAT-048	Wipe	U	290	ug/m2	

Mattress Shop Results

Post 1st cleaning - Test 4E

Sample ID	Matrix	Detected	Result		Comment
9094-W-MAT-072	Wipe	U	290	ug/m2	
9094-W-MAT-073	Wipe	U	290	ug/m2	

Pre-water wipe

Sample ID	Matrix	Detected	Result		Comment
9094-W-MAT-065	Wipe	U	290	ug/m2	
9094-W-MAT-066	Wipe	U	290	ug/m2	

Attachment K

Summary of Mercury Vapor Results Using the Lumex Vapor Analyzer

Summary of Mercury Vapor Results
Using the Lumex® Vapor Analyzer

Statistics for Combined Data
WTC Residential Confirmation Cleaning Study[1]

Statistic	*Value*
N	163
Mean	53.6
Std	39.1
Skew	1.3
cv	0.73
var	1525
stderr	3.1
max	210
P99	180
P95	130
P90	107
Q3	74
median	46
Q1	22
P5	11
min	3
S-W[a]	0.90
P_S-W[b]	2.64E-09

[a]Shapiro-Wilk test statistic for normality

[b]Probability that the data come from a normal distribution

[1]This information was provided by Dr. Clyde Johnson, Assistant Professor of Environmental Sciences at Medgar Evers College (City University of New York).

Summary of Mercury Vapor Results
Using the Lumex® Vapor Analyzer

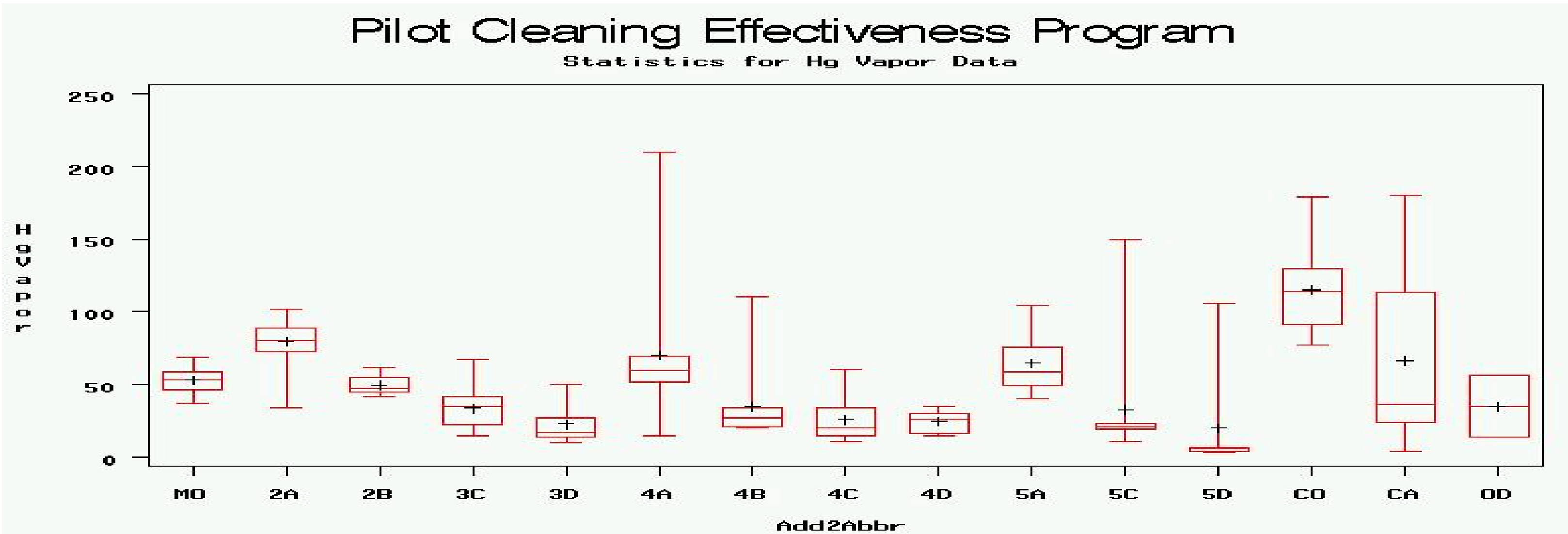
WTC Residential Confirmation Cleaning Study – Statistics by Area Type

Area	n	mean	std	skew	cv	var	Std err	max	P99	P95	P90	Q3	Median	Q1	P5	min	S-W[a]	P_S-W[b]
Apt 2A	16	79.7	15.9	-1.42	0.20	252.8	4.0	102	102	102	99	89	80	72.5	34	34	0.89	0.05
Apt 2B	11	49.5	6.6	0.81	0.13	43.7	2.0	62	62	62	59	55	47	45	42	42	0.91	0.25
Apt 3C	13	33.5	14.6	0.88	0.44	213.4	4.1	67	67	67	49	42	35	22	15	15	0.93	0.31
Apt 3D	10	22.8	13.9	1.35	0.61	193.5	4.4	50	50	50	47.5	27	17	14	10	10	0.80	0.02
Apt 4A	20	70.1	41.9	2.35	0.60	1753.9	9.4	210	210	177	125.5	69.5	59.5	52	28.5	15	0.72	< 0.00
Apt 4B	11	34.8	25.7	2.97	0.74	661.6	7.8	110	110	110	40	34	27	21	20	20	0.57	< 0.00
Apt 4C	11	25.9	14.8	1.35	0.57	218.1	4.5	60	60	60	41	34	20	15	11	11	0.87	0.08
Apt 4D	10	24.4	8.2	-0.02	0.34	67.4	2.6	35	35	35	34.5	30	26	16	15	15	0.85	0.05
Apt 5A	12	64.6	20.0	1.00	0.31	401.2	5.8	104	104	104	98	75.5	58.5	49.5	40	40	0.89	0.12
Apt 5C	10	32.3	41.6	3.08	1.29	1733.3	13.2	150	150	150	88	23	20.5	19	11	11	0.47	< 0.00
Apt 5D	7	19.9	38.0	2.64	1.91	1445.1	14.4	106	106	106	106	7	6	4	3	3	0.49	< 0.00
1800 Mattress Office	7	53.0	10.3	-0.01	0.19	106.3	3.9	69	69	69	69	59	53	46	37	37	0.99	> 0.99
Chiropractor Office	15	114.9	27.5	0.59	0.24	756.8	7.1	179	179	179	144	130	114	91	77	77	0.95	0.58
Common Areas[c]	8	66.4	66.1	1.15	1.00	4371.4	23.4	180	180	180	180	113.5	36	24	4	4	0.82	0.04
Outdoor	2	35.0	29.7	.	0.85	882.0	21.0	56	56	56	56	56	35	14	14	14	.	.

[a]Shapiro-Wilk test statistic for normality
[b]Probability that the data come from a normal distribution
[c]Common Areas: lobbies, hallways, trash compactor room

[1]This information was provided by Dr. Clyde Johnson, Assistant Professor of Environmental Sciences at Medgar Evers College (City University of New York).

WTC Residential Confirmation Cleaning Study
Summary of Mercury Vapor Results Using the Lumex® Vapor Analyzer



Legend

Abbreviation	Description	Sample Size
O	1800 Mattress Office	7
2#	Apartment Number	7 - 20
CO	Chiropractor Office	15
CA	Common Areas (hallways, lobbies)	8
OD	Outdoor	2

Note: The figure shows **'box and wisker' plots** for each room type. The plus signs (+) in the 'box' represent the mean mercury vapor reading; the horizontal bars within the box represent the median; the bottom and top of the box represent the 25th and 75th percentiles (or Q1 and Q3), respectively; and the bottom and top wiskers represent the 5th and 95th percentiles (P5 and P95), respectively.

[1]This information was provided by Dr. Clyde Johnson, Assistant Professor of Environmental Sciences at Medgar Evers College (City University of New York).

Attachment L

Photo Documentation

WTC Residential Confirmation Cleaning Study

110 Liberty St.
New York, NY

United States
Environmental Protection
Agency

Lemongrass Grill
Dsc00042

Pre-Cleaning Conditions

Lemongrass Grill
080102-002

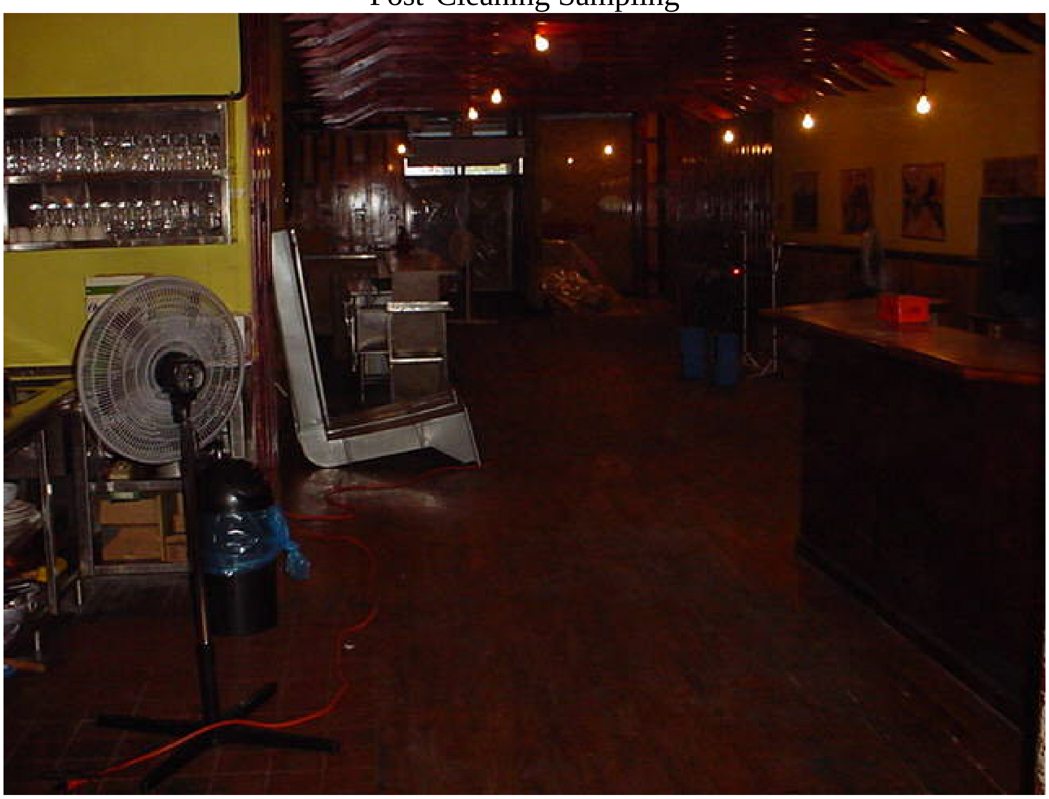
Vacuuming Dust

Lemongrass Grill
092702-001

Post-Cleaning Sampling

Lemongrass Grill
082102-006

Post-Cleaning Sampling



The Food Exchange
081502-D2-011

Pre-Cleaning Conditions

The Food Exchange
081602-006

Vacuuming Dust

The Food Exchange
092402-005

Post-Cleaning Sampling

The Food Exchange
092402-004

Post-Cleaning Sampling

Barber Shop
090902-018

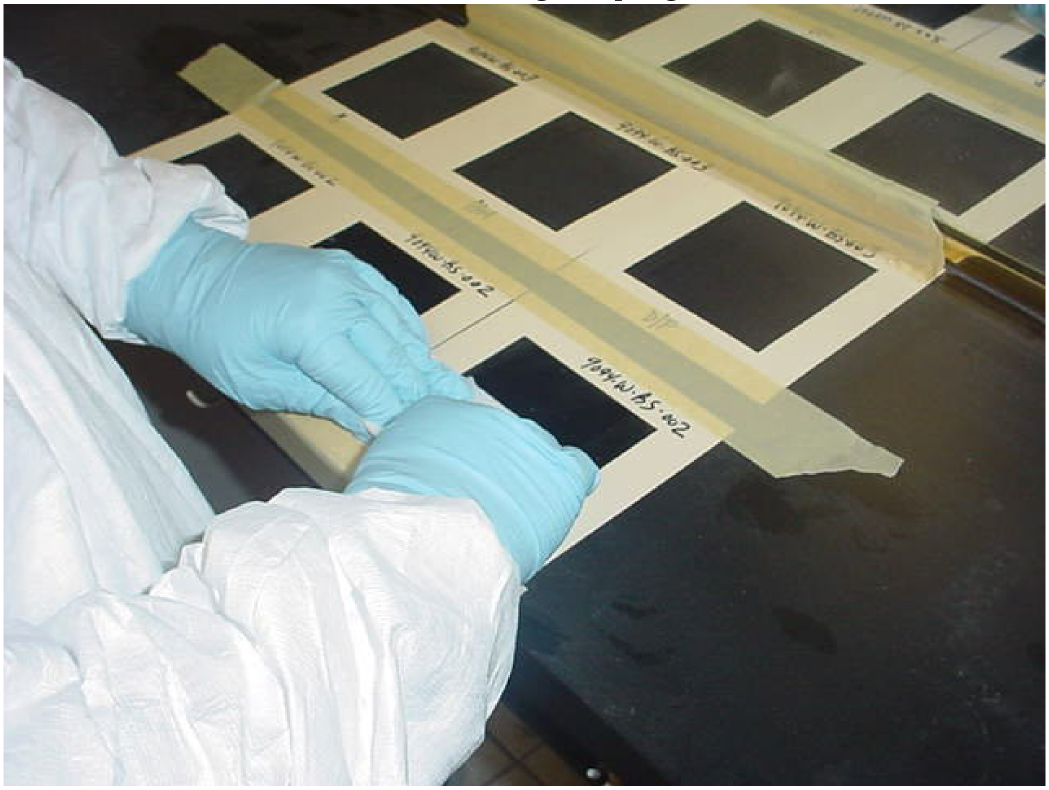
Pre-Cleaning Conditions

Barber Shop
091702-006

Vacuuming Dust

Barber Shop
092502-008

Post-Cleaning Sampling



Barber Shop
100302-002

Post-Cleaning Sampling

Chiropractor’s Office
062102-D1-011

Pre-Cleaning Conditions

Chiropractor’s Office
072402-011

Vacuuming Dust

Chiropractor's Office
080202-011

Post-Cleaning Sampling

Chiropractor's Office
100102-001

Post-Cleaning Sampling

Mattress Store
062102-D1-027

Pre-Cleaning Conditions

Mattress Store
071802-009

Vacuuming Dust

Mattress Store
100102-005

"Water Only" Washing of Floor

Mattress Store
100202-003

Post-Cleaning Sampling

Unit 2A
062102-D1-006

Pre-Cleaning Conditions

Unit 2A
071602-001

Wet Wiping Dust

Unit 2A
072202-005

Post-Cleaning Sampling

Unit 2A
091802-003

Post-Cleaning Sampling

Unit 2B
062102-D2-011

Pre-Cleaning Conditions

Unit 2B
062802-006

Pre-Cleaning Conditions

Unit 2B
070102-002

Post-Cleaning Sampling

Unit 2B
081402-015

Cleaned Unit

Unit 3A
Dsc00261

Pre-Cleaning Conditions

Unit 3A
071802-002

Vacuuming Dust

Unit 3A
072302-004

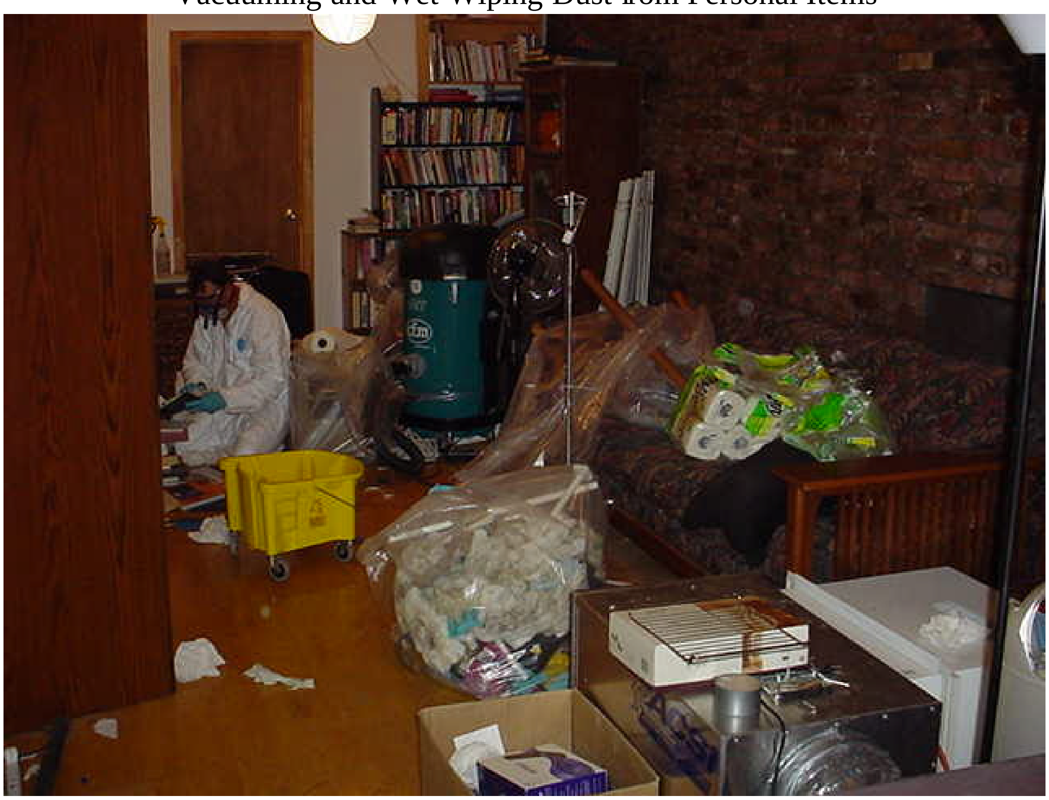
Post-Cleaning Sampling

Unit 3B
Dsc00230

Pre-Cleaning Conditions

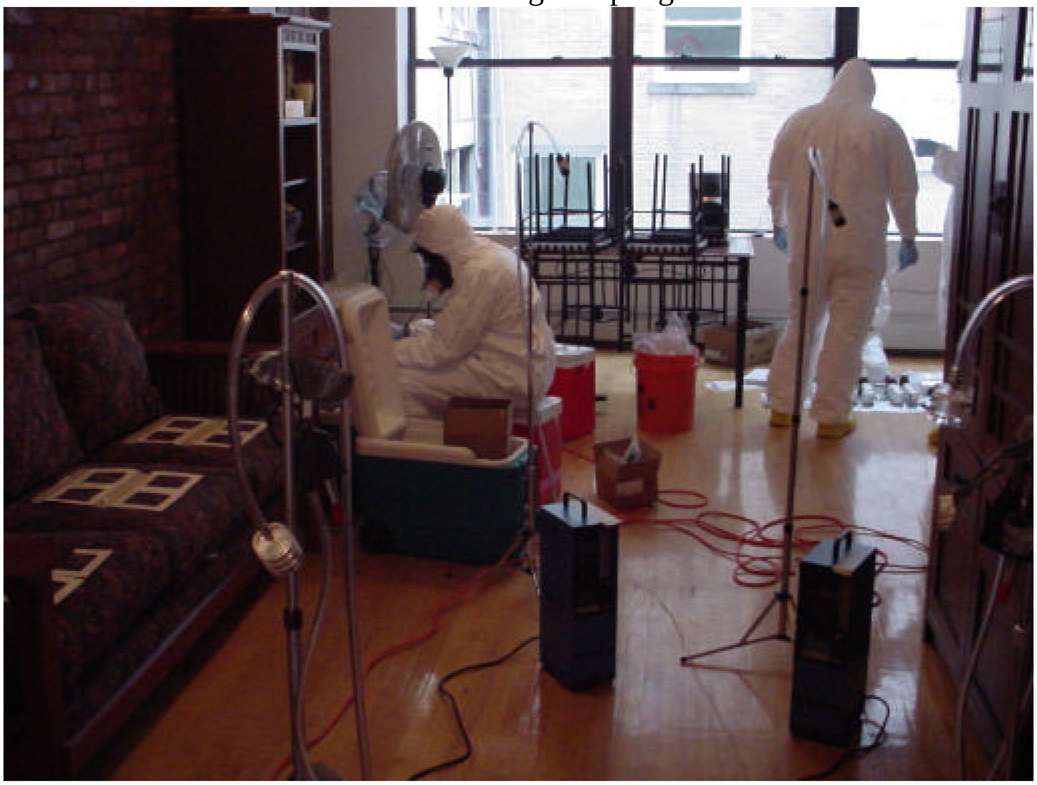
Unit 3B
072502-010

Vacuuming and Wet Wiping Dust from Personal Items



Unit 3B
Dsc00025

Post-Cleaning Sampling



Unit 3B
091702-019

Cleaned Unit

Unit 3C
Dsc00321

Pre-Cleaning Conditions

Unit 3C
071102-018

Vacuuming Dust

Unit 3C
071302-D1-003

Post-Cleaning Sampling

Unit 3C
091202-003

3rd Cleaning – Vacuuming Dust

Unit 3D
Dsc00366

Pre-Cleaning Conditions

Unit 3D
071102-010

Vacuuming Dust

Unit 3D
072402-032

Post-Cleaning Sampling

Unit 3D
091302-004

Post-Cleaning Sampling

Unit 4A
061902-Dsc00017

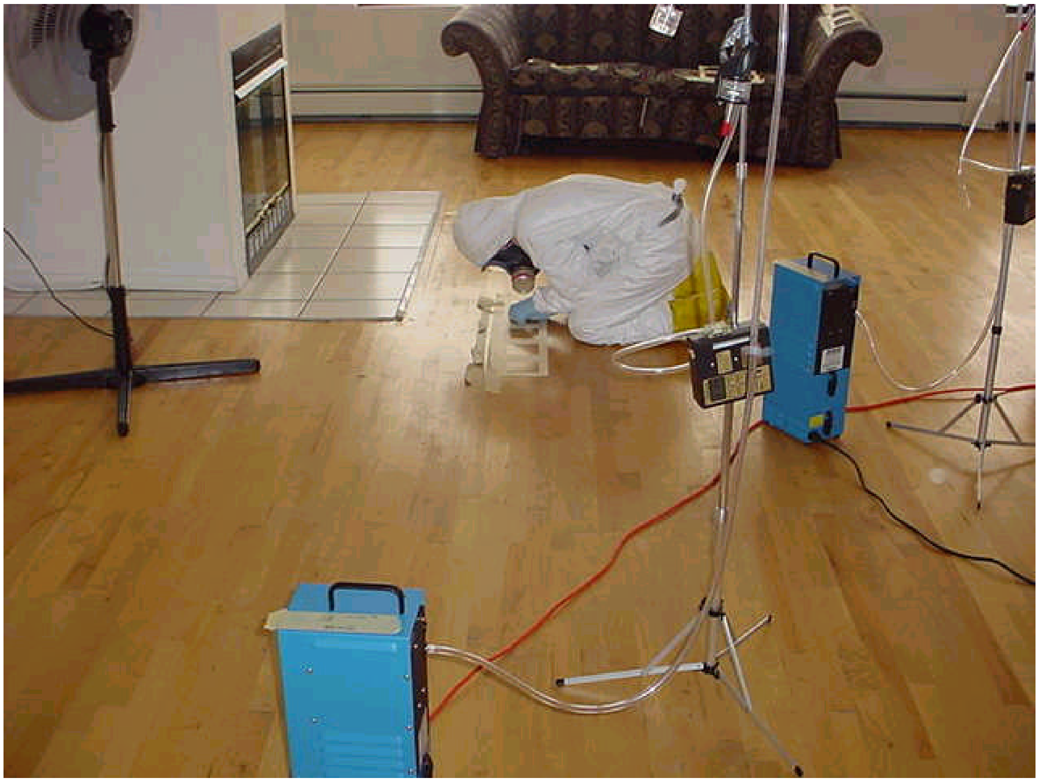
Pre-Cleaning Conditions

Unit 4A
071902-003

Vacuuming Dust

Unit 4A
072502-017

Post-Cleaning Sampling



Unit 4A
091002-002

Post-Cleaning Sampling

Unit 4B
061902-Dsc00109

Pre-Cleaning Conditions

Unit 4B
070902-007

Vacuuming Dust

Unit 4B
071202-013

Post-Cleaning Sampling

Unit 4B
081202-011

Completed Unit

Unit 4C
061902-Dsc00189

Pre-Cleaning Conditions

Unit 4C
070802-001

Wet Wiping Dust

Unit 4C
Dsc0038

Post-Cleaning Sampling

Unit 4C
072402-009

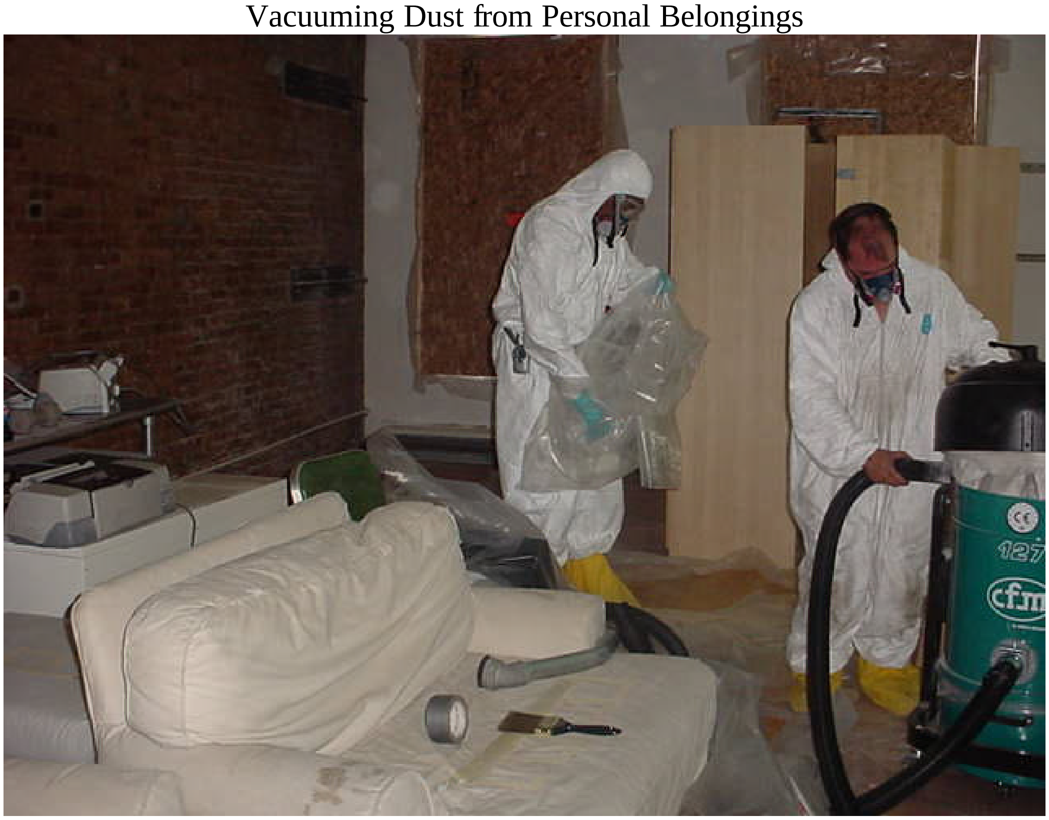
Completed Unit

Unit 4D
061902-Dsc00149

Pre-Cleaning Conditions

Unit 4D
070102-004

Vacuuming Dust from Personal Belongings



Unit 4D
082002-016

Post-Cleaning Sampling

Unit 4D
081302-005

2^{nd} Cleaning – Washing Floor

Unit 5A
061802-D2-030

Pre-Cleaning Conditions

Unit 5A
071002-012

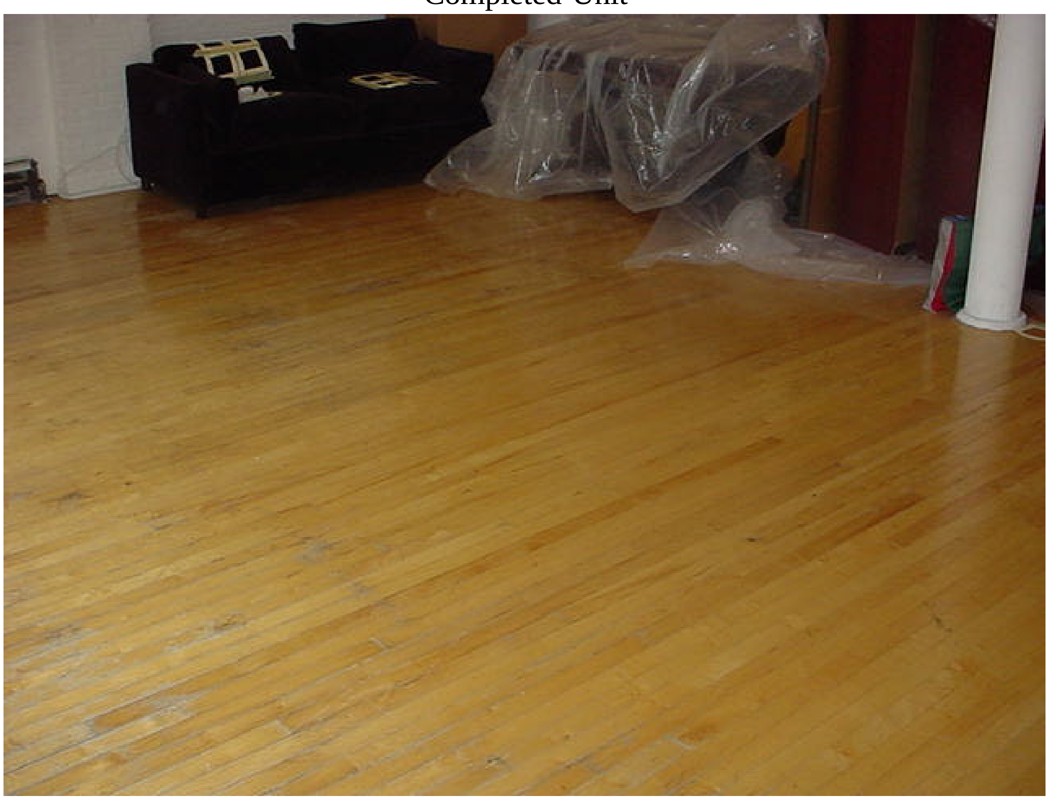
Vacuuming Dust

Unit 5A
071102-010

Post-Cleaning Sampling

Unit 5A
081202-014

Completed Unit



Unit 5C
061802-D1-020

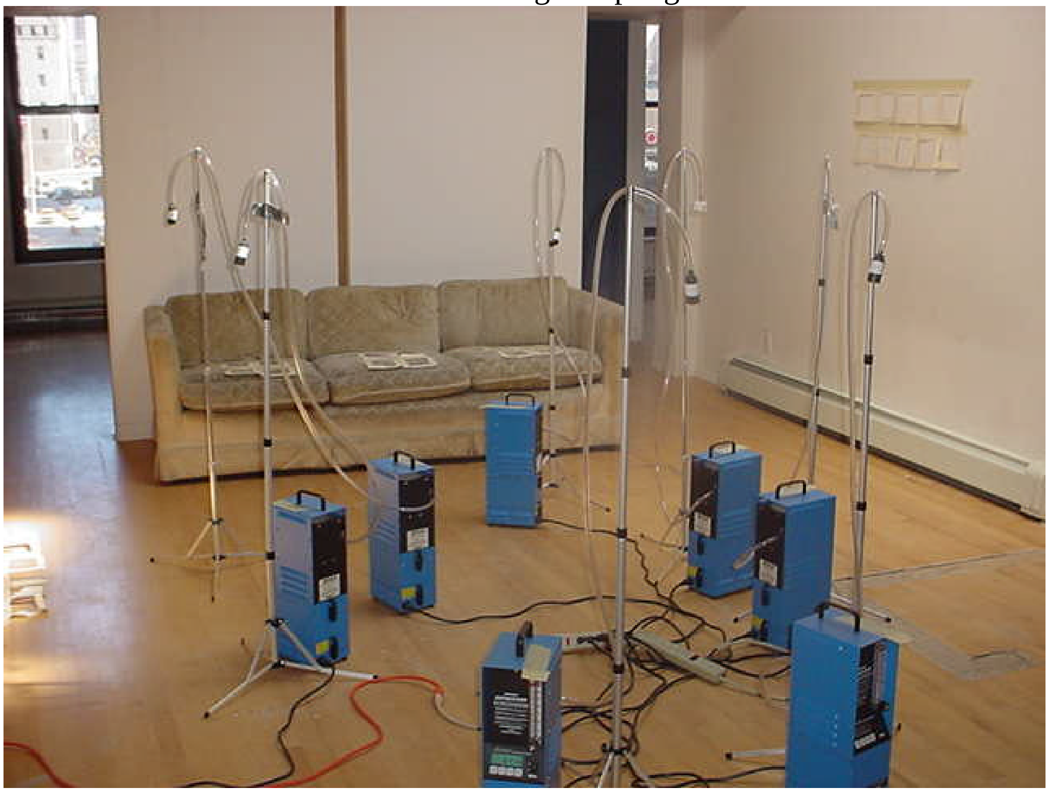
Pre-Cleaning Conditions

Unit 5C
062802-009

Vacuuming Dust

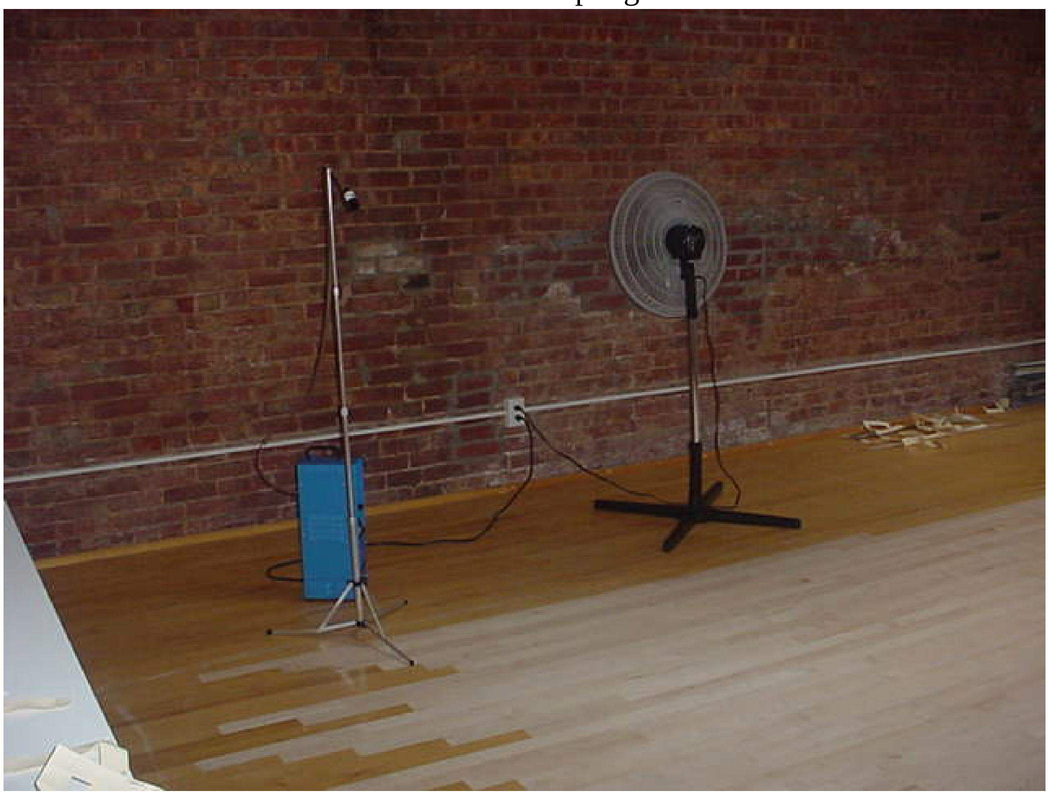
Unit 5C
080902-002

Post-Cleaning Sampling



Unit 5C
092002-001

3^{rd} Post-Sampling



Unit 5D
061802-D2-021

Pre-Cleaning Conditions

Unit 5D
062602-019

Vacuuming Dust

Unit 5D
062902-003

Post-Cleaning Sampling

Unit 5D
062802-002

Completed Unit

Common Areas
092502-S.stairs-003

Wet Wiping Dust

Common Areas
092602-S.stairs2fl-007

Post-Cleaning Sampling