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Agency

Bio-response Operational Testing and Evaluation (BOTE) Project

Phase 1: Decontamination Assessment

Office of Research and Development
National Homeland Security Research Center

EPA-600-R-13-168

BIO-RESPONSE OPERATIONAL TESTING AND EVALUATION (BOTE) PROJECT

PHASE 1: DECONTAMINATION ASSESSMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

NOTICE

The Bio-Response Operation Testing and Evaluation (BOTE) Project was a joint effort among the Department of Homeland Security Science and Technology Directorate (DHS S&T), the U.S. Environmental Protection Agency (EPA), and the Centers for Disease Control and Prevention (CDC). DHS and EPA managed and funded this effort through an interagency agreement (IA DW-89923315) with the Idaho National Laboratory (INL) for providing and establishing the test bed and on-site execution support. Additional planning and execution support was provided by:

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Questions concerning this document or its application should be addressed to:

Christopher E. Russell*, DHS
BOTE co-Program Manager
*formerly DHS, currently a government contractor
chris.russell1@us.army.mil

Shawn P. Ryan, EPA
BOTE co-Program Manager
ryan.shawn@epa.gov

Shannon D. Serre, EPA
BOTE co-Program Manager and Decontamination Assessment Group Lead
serre.shannon@epa.gov

Leroy Mickelsen, EPA
pH Adjusted BleachDecontamination Process Development Lead
mickelsen.leroy@epa.gov

Dino Mattorano, EPA
Sampling Planning and Execution Group Lead
mattorano.dino@epa.gov

Paul Lemieux, EPA
Waste Management and Cost Analysis Group Lead
lemieux.paul@epa.gov

Erin Silvestri, EPA
Exposure Assessment Group Lead
silvestri.erin@epa.gov

DISCLAIMER

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FOREWORD

Following the tragic events of September 11, 2001, new legislation, Presidential Directives and national plans called upon the U.S. Environmental Protection Agency (EPA) to support government-wide efforts to prevent, protect, mitigate, respond to, and recover from terrorist attacks, natural disasters, catastrophic incidents and other hazards. Although these homeland security responsibilities can be traced to EPA's traditional role in consequence management, they took on renewed focus and urgency as the Agency confronted evolving threats and hazards.

Biological agents such as *Bacillus anthracis* ("anthrax") became a major concern following *Amerithrax* --several incidents that impacted both public health and safety when several buildings became contaminated and people died from exposures to anthrax spores. Under Homeland Security Presidential Directive-10, EPA was tasked with leading, in coordination with the other agencies and departments, the development of specific standards, protocols, and capabilities to address the risks of contamination following a biological attack. The Directive required the development of strategies, guidelines, and plans for the decontamination that would be needed in response to such an incident. Building preparedness required a concerted effort to understand the current cleanup capabilities and the research that was needed to address knowledge gaps.

Over the past decade, EPA's research has advanced understanding of the nature and risks of biological agent contamination and examined the need to develop reliable technologies that can effectively contribute to short- and long-term remediation solutions. Based on interagency planning and assessments, EPA has focused primarily on anthrax due to its persistence and the challenges associated with cleaning it up. We believe that building the capacity to respond to and decontaminate indoor and outdoor areas following an anthrax incident is critical to understanding remediation of other biological threats as well. And yet, depending on the extent of contamination in a wide area incident, current and often untested capabilities may be significantly challenged and prove to be impracticable. EPA, therefore, continues to explore and develop technologies that will enhance remediation capabilities for responding to large-scale biological incidents.

This report documents the results of one of these efforts to advance the practice of biological agent cleanup. The *Bio-response Operational Testing and Evaluation (BOTE)* Project was a multi-agency effort designed to operationally test and evaluate, at the scale of a moderately sized building, a response to a *B. anthracis* spore release from initial public health and law enforcement investigation through environmental remediation. The effort involved more than 300 participants from across the government, including representatives from the Department of Homeland Security; EPA; Centers for Disease Control and Prevention and the Laboratory Response Network; Department of Energy National Laboratories; Department of Defense - Defense Threat Reduction Agency; Federal Bureau of Investigation; Coast Guard; and National Guard.

The BOTE Project was divided into two phases: a field-level decontamination assessment and an operational exercise. This report documents the results from Phase 1, designed to bring the latest cleanup-related research to the field to operationally transfer, assess, and study current remediation capabilities. The results of this phase were expected to contribute to response and remediation activities utilized during the functional exercise that followed as Phase 2. An After Action Report has been put together separate from the Phase 1 report, to document Phase 2.

The results of the BOTE Project build national resilience against biological attacks, both in terms of evaluating technologies at the operational scale and as a collaborative interagency response and recovery effort. EPA is pleased to make these findings available, which is an important step towards fulfilling the Agency's Homeland Security responsibilities and achieving EPA's overall mission to protect human health and the environment.

Juan Reyes
Acting Associate Administrator
EPA's Office of Homeland Security

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M. Worth Calfee, Ph.D., EPA, Office of Research and Development
Bruce A. Hinds, DTRA, DTRAJ9-CXT
Paul M. Lemieux, Ph.D., EPA, Office of Research and Development
Cmdr. Dino Mattorano, EPA, Office of Solid Waste and Emergency Response
Leroy Mickelsen, EPA, Office of Solid Waste and Emergency Response
Scott Minamyer, EPA, Office of Research and Development
Tonya Nichols, Ph.D., EPA, Office of Research and Development
Shawn P. Ryan, Ph.D., EPA, Office of Research and Development
Shannon D. Serre, Ph.D., EPA, Office of Research and Development
Sanjiv R. Shah, Ph.D., EPA, Office of Research and Development
Erin Silvestri, EPA, Office of Research and Development
Sarah Taft, Ph.D., EPA, Office of Research and Development
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Brent Pulsipher, PNNL

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Lance Brooks, formerly with DHS S&T
M. Worth Calfee, Ph.D., EPA, Office of Research and Development
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Raymond Ippolito, National Guard Civil Support Team
Laura Jevitt, formerly with CDC
CDR Paul Judice, DTRA, DTRAJ9-CXT
Sang Don Lee, Ph.D., EPA, Office of Research and Development

Paul M. Lemieux, Ph.D., EPA, Office of Research and Development
Cmdr. Dino Mattorano, EPA, Office of Solid Waste and Emergency Response
Leroy Mickelsen, EPA, Office of Solid Waste and Emergency Response
Scott Minamyer, EPA, Office of Research and Development
Stephen Morse, Ph.D., CDC
Tonya Nichols, Ph.D., EPA, Office of Research and Development
Lt. Col. Nik Putnam, DTRA
Frank Roberto, INL
Jacky Rosati Rowe, Ph.D., EPA, Office of Research and Development
Christopher E. Russell, formerly with DHS, S&T Directorate
Shawn P. Ryan, Ph.D., EPA, Office of Research and Development
Frank Schaefer, Ph.D., EPA, Office of Research and Development
Shannon D. Serre, Ph.D., EPA, Office of Research and Development
Sanjiv Shah, EPA, Office of Research and Development
Erin Silvestri, EPA, Office of Research and Development
Sarah Taft, Ph.D., EPA, Office of Research and Development
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EPA, Office of Research and Development
Brian Attwood, Ph.D. (formerly EPA)
Eletha Brady-Roberts
Hiba Ernst, Ph.D.
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Joseph P. Wood

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William Albrecht (formerly EPA)
Michele Burgess
Mario Ierardi
James Michael
Marissa Mullins
Curtis Snook, M.D. (formerly EPA)

EPA, Office of Chemical Safety and Pollution Prevention
Carlton “Jeff” Kempter (formerly EPA)
Stephen Tomasino, Ph.D.

EPA, Regional Offices
Deborah McKean, Region 8
Mike Nalipinski, Region 1
Dave Rees, Region 10
Richard Rupert, Region 3
Terry Stilman, Region 4
Wendy O'Brien, Region 8

Non-EPA contributors
Martin Meltzer, CDC
Robert Knowlton, SNL
Sharna Rossberg, INL
Michael Carpenter, INL
Jesse Bennett, INL
Kelly Bonjour, INL
Stephen Reese, INL

Region 10 START
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Margaret Chong, EPA Region 2 On-scene Coordinator
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Rich Fetzer, EPA Region 3 On-scene Coordinator
Charlie Fitzsimmons, EPA Region 3 On-scene Coordinator
Jordan Garrard, EPA Region 4 On-scene Coordinator
Jayson Griffin, EPA, Office of Solid Waste and Emergency Response
Elsbeth Hearn, EPA Region 1 On-scene Coordinator
Matt Huyser, EPA Region 4 On-scene Coordinator
Steve Jarvela, EPA Region 3 On-scene Coordinator
Janice Kroone, EPA Region 7 On-scene Coordinator
H. Alan Lindquist, EPA, Office of Research and Development
Jeanelle Martinez, EPA, Office of Solid Waste and Emergency Response
Dennis Matlock, EPA Region 3 On-scene Coordinator

Don McLaughlin, EPA Region 3 On-scene Coordinator
Steve Merritt, EPA Region 8 On-scene Coordinator
Craig Meyers, EPA Region 8 On-scene Coordinator
Jose Negron, EPA Region 4 On-scene Coordinator
Kathy Nickel, EPA, Office of Research and Development
Lukas Oudejans, Ph.D., EPA, Office of Research and Development
Randy Schademann, EPA Region 7 On-scene Coordinator
Manuel Schmaedick, EPA Region 7 On-scene Coordinator
Megan Schuette, EPA Region 7 On-scene Coordinator
Mia Pasquerella, EPA Region 1 On-scene Coordinator
Subash Patel, EPA Region 4 On-scene Coordinator
Dominic Ventura, EPA Region 3 On-scene Coordinator
Chris Wagner, EPA Region 3 On-scene Coordinator
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LCPL Jonathan A. Cullbreath
LCPL Herbert L. Dowlearn

National Guard Civil Support Teams
James Kivlehan, National Guard 1st Civil Support Team
Jason Maguire, National Guard 1st Civil Support Team
Tyler Pobiedzinski, National Guard 1st Civil Support Team
David Whitaker, National Guard 1st Civil Support Team
SGT Christian Gonzales, National Guard 8th Civil Support Team
SGT Matthew Mitchell, National Guard 8th Civil Support Team
SSG Amadeus Weeks, National Guard 8th Civil Support Team
MAJ Mark Bianchi, National Guard 12th Civil Support Team
SFC Harvey, National Guard 12th Civil Support Team
SSG Jordan, National Guard 12th Civil Support Team
SSG Christopher Mason, National Guard 12th Civil Support Team
SSG Matthew Maguire, National Guard 12th Civil Support Team
SSG Robert Mingolla, National Guard 12th Civil Support Team
SFC Michael Owens, National Guard 12th Civil Support Team
SGT David Turner, National Guard 12th Civil Support Team
SSG Darren Odom, National Guard 24th Civil Support Team
SSgt Kim Teakwan, National Guard 24th Civil Support Team
SSG Joe Cavada, National Guard 33rd Civil Support Team
SFC Dericko Gaither, National Guard 33rd Civil Support Team
SSG Earl Johnson, National Guard 33rd Civil Support Team
SGT Tanisha Mercado, National Guard 33rd Civil Support Team

SGT Tyrone Perry, National Guard 33rd Civil Support Team
SGT Joelray Campbell, National Guard 41st Civil Support Team
SGT Scott Terrill, National Guard 41st Civil Support Team
CPT Bliven, National Guard 42nd Civil Support Team
SGT Kenna, National Guard 42nd Civil Support Team
MSgt Kuberacki, National Guard 42nd Civil Support Team
SGT Kubas, National Guard 42nd Civil Support Team
SSG Robert Ricks, National Guard 42nd Civil Support Team
2LT Stern, National Guard 42nd Civil Support Team
SGT Joseph G Berenzden, National Guard 43rd Civil Support Team
SSG Edward J. Edgerton, National Guard 43rd Civil Support Team
SGT Robert L. Nelson, National Guard 43rd Civil Support Team
1LT John R. Ptak, National Guard 43rd Civil Support Team
SGT Jason Michael Barfield, National Guard 45th Civil Support Team
1LT Shawn Paul Chance, National Guard 45th Civil Support Team
SSG Tony Edward Dooley, National Guard 45th Civil Support Team
SGT Stephen Anthony Evans, National Guard 45th Civil Support Team
SGT Gregory Allen Manning, National Guard 45th Civil Support Team
SSG William Michael McIntyre, National Guard 45th Civil Support Team
SGT David Joseph Owen, National Guard 45th Civil Support Team
SFC Wendell Dean Reed, National Guard 45th Civil Support Team
SSG Jeremy Murry, National Guard 46th Civil Support Team
SGT Dan Pose, National Guard 46th Civil Support Team
SSG Sarah Allder, National Guard 48th Civil Support Team
SGT Ketner Jackson, National Guard 48th Civil Support Team
SGT Michael Mitchell, National Guard 48th Civil Support Team
SSG Robert Kirk, National Guard 48th Civil Support Team
SSgt Erik Partridge, National Guard 48th Civil Support Team
TSgt Raymond Simpson, National Guard 48th Civil Support Team
Nicholas Kenton, National Guard 54th Civil Support Team
Terek Taillon, National Guard 54th Civil Support Team
1LT Dustin Nash, National Guard 73rd Civil Support Team
TSgt Jarod Smith, National Guard 73rd Civil Support Team
SPC Claude Williams, National Guard 73rd Civil Support Team
Alex Smith, National Guard 81st Civil Support Team
Shane Anderson, National Guard 83rd Civil Support Team
Casey Carnahan, National Guard 83rd Civil Support Team
Jason Green, National Guard 83rd Civil Support Team
Jed Reeves, National Guard 83rd Civil Support Team
Nate Velin, National Guard 83rd Civil Support Team
SSG Zackery Hauf, National Guard 84th Civil Support Team
SGT Chris Rosentreter, National Guard 84th Civil Support Team
SSG Robert McCree, National Guard 102nd Civil Support Team
SGT Dutch Inman, National Guard 103rd Civil Support Team

SSgt Nina Kolyvanova, National Guard 103rd Civil Support Team

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Laura Jevitt, formerly with CDC
Stephen Morse, CDC
Frank Roberto, INL
Kara Cafferty, INL
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ACRONYMS AND ABBREVIATIONS

AAS	aggressive air sampling
ANOVA	analysis of variance
ATCC	American Type Culture Collection
AWBERC	Andrew W. Breidenback Environmental Research Center
Ba	*Bacillus anthracis*
Bg	*Bacillus atrophaeus* subspecies *globigii*
BI	biological indicator
BOTE	Bio-Response Operational Testing and Evaluation
BROOM	Building Restoration Operations Optimization Model
BSC	biological safety cabinet
CBRN	Chemical, Biological, Radiological, and Nuclear
CDC	Centers for Disease Control and Prevention
CFU	colony forming unit(s)
CI	chemical indicator
ClO_2	chlorine dioxide gas
CMAT	(EPA's CBRN) Consequence Management Advisory Team
COA	Constant Output Atomizer
COC	chain of custody
COTS	commercial off-the-shelf
CST	Civil Support Team, National Guard
CT	concentration x time
Ct	cycle threshold (time)
DD	diffusion dryer
DE	decontamination efficiency
DHS	Department of Homeland Security
DNA	deoxyribonucleic acid
DOD	Department of Defense
DOE	Department of Energy
DTRA	Defense Threat Reduction Agency
EDTA	ethylenediaminetetraacetic acid
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ET	exposure time
FAS	filtered air supply
FBI	Federal Bureau of Investigation
GEq	genomic equivalent(s)
H_2O_2	hydrogen peroxide
HCl	hydrochloric acid
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HVAC	heating, ventilation, and air conditioning
IBAC	real-time aerosol particle monitor
IC	Incident Command
ICx	ICx Technologies, Inc.
INL	Idaho National Laboratory
IPC	internal positive control
LLNL	Lawrence Livermore National Laboratory

LOD	limit of detection
LR	log reduction
LRN	Laboratory Response Network
MFP	mandatory full participation
MLB	Microbiology Laboratory Branch
MSW	municipal solid waste
N/A	not applicable
NA	not analyzed
NAM	negative air machine
NC	negative control
ND	non-detect
NHSRC	National Homeland Security Research Center
NRC	National Research Council
NRT	National Response Team
NTC	no template control
NTU	nephelometric turbidity unit
OPP	Office of Pesticide Programs
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PBST	phosphate buffered saline plus Tween® 20
PC	positive control
PCR	polymerase chain reaction
PDA	personal digital assistant
PEL	permissible exposure limit
PNNL	Pacific Northwest National Laboratory
POTW	publicly owned treatment works
PPE	personal protective equipment
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
qPCR	quantitative polymerase chain reaction
RCRA	Resource Conservation and Recovery Act
RFID	radio frequency identification
RH	relative humidity
RMC	reference material coupon
RV-PCR	rapid-viability polymerase chain reaction
SD	standard deviation
SNL	Sandia National Laboratory
SOP	standard operating procedure
STA	Mattson-Garvin Model 220 slit-to-agar air sampler
START	Superfund Technical Assessment and Response Team
swab	macrofoam swab
TB	true blank
TNTC	too numerous to count
TSA	tryptic (trypticase) soy agar
TSB	tryptic soy broth
UNG	uracil-N-glycosilase
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey
UV	ultraviolet

UV-APS	ultraviolet aerodynamic particle sizer
VHP®	vaporized hydrogen peroxide
XMX	Dycor® XMX/2L-MIL Aerosol Collection System

Units

µg	microgram(s)
µL	microliter(s)
µm	micrometer(s)
µM	micromolar
Btu	British thermal unit(s)
°C	degree(s) Celsius
CFM	cubic foot/feet per minute
cm	centimeter(s)
cm^2	square centimeter(s)
cm^3	cubic centimeter(s)
°F	degree(s) Fahrenheit
fg	femtogram(s)
ft	foot/feet
ft^2	square foot/feet
ft^3	cubic foot/feet
g	grams
gal	gallon(s)
gpm	gallons per minute
hp	horsepower
hr	hour(s)
in	inch(es)
kg	kilogram(s)
km	kilometer(s)
L	liter(s)
Lpm	liter(s) per minute
lb	pound(s)
m	meter(s)
m^{-1}	per meter
m^2	square meter(s)
m^3	cubic meter(s)
mg	milligram(s)
mi	mile(s)
min	minute(s)
mL	milliliter(s)
mm	millimeter(s)
mM	millimolar
N	number of particles
ng	nanogram(s)
pg	picogram(s)
ppm	part(s) per million
ppmv	part(s) per million by volume
psi	pounds per square inch
psig	pound(s)-force per square inch gauge
rpm	revolutions per minute
SCFM	standard cubic foot/feet per minute
sec	second

EXECUTIVE SUMMARY

The Bio-response Operational Testing and Evaluation (BOTE) Project was a multi-agency effort designed to operationally test and evaluate a response to a biological incident (release of *Bacillus anthracis* [*Ba*] spores, the causative agent for anthrax) from initial public health and law enforcement response through environmental remediation. The BOTE Project consisted of two distinct phases, both using the same non-pathogenic simulant (or surrogate) for *Ba*. Phase 1 was a field-level decontamination assessment, and Phase 2 was an operational exercise involving key federal agencies responsible for the forensic investigation, public health assessment, and remediation following a biological incident. The effort included the coordinated project planning, support, and/or involvement from:

- Department of Homeland Security, Science and Technology Directorate (DHS S&T);
- U.S. Environmental Protection Agency (EPA);
- Centers for Disease Control and Prevention (CDC);
- Department of Energy (DOE) National Laboratories;
- Department of Defense (DOD) Defense Threat Reduction Agency (DTRA); and
- Federal Bureau of Investigation (FBI).

This report addresses Phase 1 of the BOTE Project. Phase 1 was designed to address site remediation after the release of a *Ba* simulant, *Bacillus atrophaeus spp. globigii* (*Bg*), within a facility in an operational setting, drawing upon the recent advances in both the biological sampling and decontamination areas. The four principal objectives of the BOTE Project Phase 1 included:

- Objective 1: Conduct and evaluate field-level application of three decontamination technologies/protocols, bringing the results of laboratory-scale studies to the field;
- Objective 2: Demonstrate that biological sampling and analysis methods evaluated in previous studies provide accurate characterization of *Ba* simulant concentration challenges for detection/identification purposes;
- Objective 3: Collect and analyze the results from the decontamination study and perform a cost analysis of all aspects of the remediation approaches; and
- Objective 4: Determine the exposure associated with reentry into a building that has been contaminated with surrogate *Ba* spores and subsequently decontaminated.

These objectives were addressed in three rounds of testing during Phase 1, with each round employing a different decontamination method as a primary study parameter. Three decontamination methods were chosen based on results that had been obtained in laboratory studies.

The BOTE Project test facility was a two story unoccupied office building with approximately 4,025 square feet (ft^2) per floor (90,000 cubic feet [ft^3] total volume for the facility). Rooms on each floor were set up identically and configured to contain a mixture of porous and nonporous

materials, to simulate both commercial office and residential environments. Each floor had an independent heating, ventilation, and air conditioning (HVAC) system that functioned only as an air handling unit for each floor of the facility (i.e., no heating or cooling). The facility was surrounded by a secondary containment enclosure to assist in preventing cross-contamination during the project activities.

Each of the three rounds in Phase 1 included dissemination of the *Bg* spores throughout the facility, characterization sampling, decontamination, waste management, and post-decontamination sampling. After each round, the facility was set back up (re-set) to its initial configuration for the start of the next round. For each round, *Bg* surface loadings (as determined by pre-decontamination surface sampling), room configurations, and sampling procedures were maintained consistent. Dissemination for each round was designed to result in a relatively higher level *Bg* surface loading (1E4 to 1E6 colony forming units [CFU]/ft^2) on the first floor and a lower level (1E2 to 2E2 CFU/ft^2) on the second floor. The three decontamination methods that were used were:

- Round 1: fumigation with hydrogen peroxide (H_2O_2) vapor by STERIS Corporation, using their vaporized hydrogen peroxide (VHP®) technology;
- Round 2: surface decontamination using pH-adjusted bleach; and
- Round 3: fumigation with chlorine dioxide gas (ClO_2) by Sabre Technical Services, LLC.

To achieve the objectives of the BOTE Project Phase 1, a total of 3,259 samples were collected using different environmental sampling methods for spores. These sampling methods included surface, air, sand, and wash water media. Surface samples (cellulose sponge-stick wipes, swabs, vacuum socks, and Versalon® wipes) were used to assess the concentration of spores pre- and post-decontamination; these data (with the exception of the Versalon® wipes) were utilized primarily to assess the effectiveness of each decontamination method. The Versalon® wipes were used to evaluate the EPA's rapid-viability polymerase chain reaction (RV-PCR) analytical method. Air sampling data were used to provide feedback on the dissemination method, to assess the potential for indoor reaerosolization during remediation activities (e.g., sampling), to assess the use of aggressive air sampling (AAS) as a post-decontamination sampling method, and to assist in the development of the exposure assessment framework. Sand samples were placed outside the building but within the secondary enclosure, to assess whether viable *Bg* spores might have migrated outside the facility during the project activities. Wash water samples were utilized to assess the efficacy of onsite treatment of the wash water to inactivate *Bg* spores. The Building Restoration Operations Optimization Model (BROOM) tool was used to track sample collection, sample location, sample types, sample matrices, date, time, samplers used, and other pertinent data.

The project sampling strategy was designed to maximize the use of the data generated to achieve the four objectives stated above. A brief summary of the findings from the BOTE Project Phase 1, correlated according to the objectives, is provided below.

Assessment of Decontamination Methods

Within each round, the specific decontamination method was required to be completed within three days, from setup through return of the facility for post-decontamination sampling. In Round 2, an additional three days were allotted for the facility to dry after spraying with pH-adjusted bleach and prior to surface sampling. For each method, the decontamination contractor or performer decided upon their decontamination strategy, e.g., which materials inside the building to remove prior to decontamination and treat *ex situ* as waste and how to perform distribution or application of the decontaminant. This strategic decision included determination of conditions considered appropriate for effective decontamination within the BOTE Project scenario, e.g., concentration of fumigant or solution, contact or dwell time, relative humidity, temperature. For each decontamination method, the efficacy, waste generation, and effects on the facility were determined. The approximate total cost of the decontamination method employed was also assessed.

The decontamination efficacy in each round was determined qualitatively via comparison of the number of surface samples in which *Bg* was detected pre- and post-decontamination. Additionally, quantitative surface sample results provided an indication of the relative surface loading pre- and post-decontamination. In general, fumigation with ClO_2 or using the decontamination procedure incorporating spraying with pH-adjusted bleach resulted in similar overall effectiveness in reducing detection of viable *Bg* throughout the facility. Both methods were considerably more effective than fumigation with VHP® as implemented in the BOTE Project Phase 1. Each decontamination method was performed a single time in the BOTE Project; the results and conclusions should be considered based upon the implementation as described. Potential variance in effectiveness due to differences in implementation of each method on subsequent uses was not determined in this project. Highlights of the decontamination processes and results are presented in the following sections.

Fumigation by STERIS VHP®

STERIS Corporation's VHP® technology was used for the decontamination process in Round 1. The fumigation contractor decided to leave all materials in place, i.e., *in situ* decontamination of all facility contents. Fumigation of the facility, including the HVAC system on each floor, was accomplished by initially plumbing one VHP® generation system into the air handling unit on each floor. Fans were also placed throughout the facility to facilitate distribution of H_2O_2. The target decontamination parameters selected by the fumigation contractor, having had the ability to consider EPA research products and past use of VHP®, were set as 250 parts per million by volume (ppmv) of H_2O_2 throughout the facility for 90 minutes or a cumulative exposure of 400 ppmv-hours (hr) at 65 °F or higher. Additionally, Spor-Klenz® Ready to Use was sprayed on any surface on which equipment was placed during the decontamination process setup.

The fumigation concentration, temperature, and relative humidity (RH) were monitored at numerous locations throughout both floors of the facility. Throughout the fumigation process (when H_2O_2 was injected into the facility), the temperature remained above 65 °F and RH above 30% (no RH requirement was set). The target H_2O_2 concentration was not achieved at all monitored locations (three per floor), despite a mid-process change to have both VHP® generators plumbed into the first floor HVAC system.

Following aeration of the facility to a safe concentration of H_2O_2 after decontamination, a total of 276 surface samples were collected and shipped for analysis via the Laboratory Response Network (LRN) for the assessment of the decontamination efficacy. Of these samples, roughly one third (94) contained detectable viable *Bg*. Average surface loadings of detectable viable *Bg* were reduced by approximately 1 log on each floor as a result of the decontamination process. These results indicate that the H_2O_2 exposure was not sufficient to inactivate all the spores at the high or low challenge/test levels (surface loading). A significantly greater percentage of samples with detected *Bg* were obtained from the residential rooms compared to the other types of rooms. A total of 90 chemical indicators were placed in the facility, and all indicated that they had been exposed to H_2O_2 at the end of fumigation. Ninety biological indicators (BIs) were also placed throughout the facility. (BIs do not accurately predict decontamination efficacy of environmental contamination; rather, BIs are useful for identifying when sporicidal conditions have not been achieved.) Of the 90 BIs, 56 showed no growth at the 6 log level.

No damage to the building contents was observed from exposure to the VHP® process. A total of 1,350 pounds (lbs) of solid waste was generated from the sampling activities. Liquid waste was also generated during this round (e.g., during sampling) from rinsate recovered from the personnel decontamination area ("Decontamination Line"). The Decontamination Line consisted of three chambers including an entry area connected to the building, a personnel wash down area, and an exit area leading to the outside.

Surface Decontamination Approach using pH-Adjusted Bleach

For the second round of Phase I, a surface decontamination process using readily available supplies from local hardware stores was utilized. A sporicidal liquid (pH-adjusted bleach) was used to treat waste items removed from the facility and surfaces within the facility. Elements of the decontamination approach were recently used to remediate residential structures following natural *B. anthracis* contamination events (i.e., Danbury, CT; and Durham, NH)[1] and were used in addition to volumetric decontamination strategies within federal facilities following the anthrax letter incident of 2001[2].

After *Bg* spore dissemination and characterization sampling, the decontamination procedure began with the removal of all porous materials (ceiling tiles, furniture, carpet, etc.) from the facility for subsequent treatment with pH-adjusted bleach (1 part bleach, 1 part white vinegar, and 8 parts water; used within three hours after preparation), bagging, and disposal. Waste items were sprayed during bagging, and bags were moved to a waste staging area before exiting the facility through the personnel Decontamination Line or through a roll-off dumpster. During this source reduction step, approximately 68 cubic yards (7,100 lb) of waste was removed from the facility. Within this round, most of the waste was generated during the decontamination phase, more specifically during source reduction. In contrast, during Rounds 1 and 3, the bulk of the waste was generated during sampling operations (i.e., personal protective equipment [PPE] waste).

The source reduction step was followed by spray application of pH-adjusted bleach to all remaining surfaces in the facility using a gas-powered sprayer. All surfaces were completely wetted with pH-adjusted bleach for a target 10-minute (min) contact time. The HVAC return air

ducts were decontaminated using a modified spray nozzle attached to the pH-adjusted bleach chemical sprayer line. The spray nozzle was pulled through the duct while dispensing a mist of pH-adjusted bleach. The treatment was then repeated five minutes later as the spray nozzle was pulled in the opposite direction during its retrieval from the duct. Decontamination of the supply HVAC ducts was notionalized (not conducted in reality, but considered with respect to implication on the overall cost and time of the process), as this flexible ductwork would be removed for decontamination in an actual remediation. The HVAC was not operated during the decontamination operation.

Chlorine gas concentrations within the facility necessitated the use of level-B PPE (self-contained breathing apparatus) during decontamination spraying operations; chlorine gas is known to be generated in the pH-adjusted bleach solution and readily off-gases. Typically, the decontamination crew consisted of six entry personnel and two support personnel. Decontamination personnel entered through one end of the building and exited through a Decontamination Line at the opposite end. Negative air machines (NAMs) were used to control airflow into and within the facility, to reduce the chlorine gas concentrations within the facility, to aid in drying after decontamination, and to prevent cross-contamination. Electric heaters and box fans were also deployed within the facility after decontamination to expedite the drying process.

Overall, the surface sampling results indicated that the pH-adjusted bleach decontamination procedure was effective for reducing contamination. Only 8 out of 244 (3.2%) post-decontamination surface samples were positive for viable *Bg*. Interestingly, seven of these eight positive samples were from the less-contaminated second floor. All seven of these samples required filter-plate methods for detection, suggesting a low level of contamination. HVAC return duct decontamination procedures were also effective at removing contamination, as all five HVAC samples collected post-decontamination were non-detect.

Fumigation with ClO_2

After Round 2, the facility was again re-set to its planned configuration, and *Bg* spore dissemination and characterization sampling was conducted for Round 3. Sabre Technical Services, LLC (“Sabre”) was selected to fumigate the facility with ClO_2 as the Round 3 decontamination process. This decontamination method was chosen because of its high degree of effectiveness in laboratory testing and previous use in *Ba* remediation actions. Due to having only one day of aeration following fumigation, Sabre decided to remove (treat *ex situ*) a few porous items (mattresses and foam cushions) due to their anticipated residual off-gassing. All other materials were left in place and the facility was fumigated at a target concentration of 3,000 ppmv ClO_2 for three hours (target concentration-time product [CT] of 9,000 ppmv-hr at a minimum temperature of 65 °F and RH of 65%). These conditions were set by Sabre in consideration of their past experience and published EPA research findings. Sabre generated the ClO_2 on site in a closed loop process while maintaining negative pressure on the facility via tenting and the use of a NAM (scrubbing via carbon adsorption). The gas entered via the emitter on the first floor and returned via the duct on the second floor. Gas distribution was done using the HVAC system on each floor, with additional box fans placed throughout the facility to assist in gas distribution.

Measurements of ClO_2 concentration, temperature and RH were made at several locations on each floor. The data indicated that the target minimum ClO_2 concentration and CT were achieved at all monitoring locations throughout the first and second floors. The average temperatures on both floors were maintained above the target, as well as the RH on the first floor. However, the RH on the second floor was significantly lower than the first floor (15 - 20 % lower RH) and at or slightly below the target value of 65%.

In addition to the process data measurements, BIs were placed throughout the facility to provide an indication that sporicidal conditions had been achieved. Only one BI was positive for the surrogate organism from the first floor after fumigation; this BI was located inside a filing cabinet. However, 31 of 45 BIs on the second floor were positive. These results suggest that the conditions (i.e., RH) on the second floor were not sufficient to result in a 6-log reduction in spores on the BIs.

However, the surface loading of *Bg* spores on the second floor was targeted at 1E2 to 2E2 CFU/ft^2; the actual loading was on average 1.4E4 CFU/ft^2 based upon pre-decontamination surface sampling. Of the 265 post-decontamination surface samples that were collected for analysis by the LRN, only six had detectable *Bg* (three samples from each floor). Only one of these samples had detectable *Bg* via spread plate analysis; the other five required more sensitive filter plate analysis for the detection of *Bg* in the samples. Spore loadings on these few post-decontamination samples were extremely low, all less than 9 CFU/ft^2.

Overall, this decontamination process was effective, with nearly all facility contents left in place. Further, because this building had been used in previous studies it was difficult to assess whether any oxidation of the structural components had occurred as a specific result of these tests. Materials that were placed in the building for these tests were inspected for damage. The only objects that showed any damage were ring stand clamps and quick connects on gas sample lines. All other surfaces and materials retained their original condition and color. Additionally, a total of 877 lb of waste was generated from the sampling and decontamination activities. As in all rounds, liquid waste was also generated from rinsate recovered from the personnel Decontamination Line.

Decontamination Line Wash Water Treatment

While chlorine bleach has been shown to be effective for *Ba* inactivation in buffered water, wash water such as Decontamination Line wash water may present a different challenge. The BOTE Project provided an opportunity to collect realistic wash water to assess chlorine bleach treatment methods. Water from the Decontamination Line was collected for each sampling event and chlorinated to test the effectiveness of such treatment. The water was sampled and tested by Idaho National Laboratory (INL) technical personnel before and after treatment for pH, total suspended solids, free chlorine, turbidity, chemical oxygen demand and the presence of *Bg* spores.

Use of an ultrafiltration concentrator allowed collection of concentrated water samples. However, the high turbidity of the wash water under the conditions experienced made the operation of the concentrator difficult due to filter clogging. Additionally, due to the small number of viable spores present in the wash water, evaluation of the efficacy of thechlorine bleach treatment method for

the collected water was not initially possible. Subsequently, a greater than three log inactivation (i.e., log reduction) was achieved using the proposed protocol when the wash water was spiked with *Bg* spores (the level of spores added was only high enough to demonstrate a three log inactivation; a six log inactivation was not observed).

Demonstration and Assessment of Biological Sampling and Analysis Methods

One objective of the BOTE Project was to demonstrate that surface sampling methods previously evaluated for effectiveness of spore detection could be used to provide accurate characterization of *Bg* (i.e., *Ba* simulant) concentration for detection/identification purposes. Sub-objectives included the demonstrated use of current surface sampling methods, the evaluation of the RV-PCR analytical method, and the use of AAS for post-decontamination sampling.

The following sampling and analysis methods were used and are described below:

- Surface sampling methods used pre- and post-decontamination;
- RV-PCR analysis for selected samples pre- and post-decontamination; and
- AAS post-decontamination.

Surface Sampling

Surface sampling was the primary method used to collect samples to determine surface concentrations or loadings (CFU per ft^2) of *Bg* spores. The purpose of surface sampling was to characterize the extent of contamination both pre- and post-decontamination within each round to determine the effectiveness of the decontamination for the three technologies. Sampling methods including cellulose sponge-stick wipes, swabs, and vacuum socks were the primary collection methods used to evaluate the three decontamination technologies consistent with current validated or recommended sampling for *Ba* spores. These samples were analyzed via the LRN.

Versalon® wipes (gauze wipes, rather than cellulose sponge-stick wipes) were also collected throughout the facility both pre- and post- decontamination to evaluate EPA's RV-PCR analytical method (see Appendix K for details). The Versalon® wipes were used for consistency with the previously-developed RV-PCR analysis protocol. Analysis of these samples occurred at Lawrence Livermore National Laboratory (LLNL) and EPA's Microbiology Laboratory Branch (MLB) of the Office of Pesticide Programs (OPP) at Ft. Meade, MD. Additional Versalon® wipes were also collected in two rooms (Rooms 101A and 102) to determine surface contamination concentrations pre- and post-decontamination for the reaerosolization study, with samples analyzed onsite by the INL Microbiology Laboratory.

The measured surface loading for all rounds on Floor 1 was within the target range of 1E4 to 1E6 CFU/ft^2. The measured surface loading for all rounds on Floor 2 was an order of magnitude higher than the target range of 1E2 to 2E2 CFU/ft^2. Although the surface loading on Floor 2 was above the target range, there was still a significant difference between the measured surface loadings on the two floors. Establishing this difference was the primary objective for the decontamination efficacy assessment. Additional statistical analysis confirmed that the *Bg*

spores were disseminated on each floor in such a manner that the first floor was significantly more contaminated than the second floor for each of the three events.

RV-PCR

RV-PCR is a research method developed under an interagency agreement between EPA and the LLNL to detect and identify live *Ba* spores rapidly during a bioterrorism event. The RV-PCR method is a combination of both culture and real-time PCR and supports additional preparedness to meet the challenge of analysis of a large number of samples. The current version of the RV-PCR method had not previously been tested with large numbers of samples in a field setting and, especially, had not been tested using post-decontamination field samples. The opportunity afforded by the BOTE Project was to demonstrate the performance of the RV-PCR method with field samples, both before and after decontamination treatments.

A total of 264 Versalon® wipe samples were spliot and analyzed using the RV-PCR and the traditional microbiological culture methods (see Appendix K for details) to detect the presence of viable *Bg* spores. The RV-PCR method was shown to work well for *Bg* spores exposed to decontaminants at real-world application levels and for Versalon® wipe samples containing background debris and indigenous microbial populations. Greater than 97% agreement was observed between RV-PCR and culture results (detect/non-detect for *Bg*) for the field test that included samples with low spore levels (at or below the detection limit of the traditional culture method) after treatment with fumigants and surface disinfectants. The nine-hour endpoint appeared to be sufficient to detect any spores that might have been delayed in germination due to decontaminant exposure.

Aggressive Air Sampling

The main objective of AAS in the BOTE Project was to determine if, after application of decontamination technology, disturbing indoor surfaces resulted in the detection of reaerosolized residual spores via air sampling. AAS offers the potential to reduce the post-decontamination sampling burden by collecting bulk air samples that could be used to determine if contamination exists following decontamination. An AAS protocol was utilized that incorporated two air sampling collection methods, including Dycor® XMX/2L-MIL Aerosol Collection Systems and Mattson-Garvin Model 220 slit-to-agar air samplers to provide a secondary evaluation of decontamination effectiveness.

AAS was conducted in two first-floor rooms after post-decontamination surface sampling in each round. The procedure incorporated the use of a leaf blower to disturb surfaces within the room, oscillating fans to keep reaerosolized *Bg* spores airborne and the two different air samplers mentioned above. All air samples were analyzed on-site by the INL Microbiology Laboratory.

The operation was conducted successfully after all three decontamination rounds, and AAS sample results were comparable to surface sample results. AAS results after Round 1 (fumigation with VHP®) showed the highest concentrations of spores detected in the air; the lowest spore concentrations were detected for Round 3 (fumigation with ClO_2).

Overall Cost Analysis

One of the main objectives of the BOTE Project was to develop a methodology to estimate the

overall cost of the application of various decontamination technologies as a function of materials, time (including labor hours), and other resources.

The cost analysis approach attempted to capture incident- and site-specific information, so that the results could be extrapolated to other incidents, using appropriate scaling factors based on labor hours, numbers of samples, size of affected areas, and quantities of waste that were generated.

A detailed cost analysis was performed for the use of three different decontamination technologies for the inactivation of *Bg* spores (although cost estimates were based on assuming the occurrence of an actual *Ba* incident). The parameters examined in this cost analysis include sampling activities, application of decontamination technologies for the building and personnel entering and leaving the building, equipment rentals and consumables, and waste management.

Based on subsequent analysis of the cost data, the following major cost-related observations were noted:

- Sampling and analysis costs were the largest contributors to the overall cost. This statement must add the caveat that this was a research operational testing and evaluation project, and that estimates of laboratory labor hours and materials were based only on a single laboratory's submission of level of effort data. In a real incident for a building this size, fewer samples would most likely be taken. However, sampling and analysis costs are still anticipated to be a major cost factor to consider.
- The costs of the decontamination processes alone (the actual fumigation or surface decontamination) were roughly equivalent for all three rounds. Overall costs for the fumigation methods (VHP® and ClO_2) were very similar (between $800,000 and $900,000), while the cost for the pH-adjusted bleach was nearly $1,200,000. The pH-adjusted bleach decontamination process employed in this effort was more expensive than either of the fumigation technologies, due largely to waste management costs. These costs are specific to the processes as they were employed in the BOTE Project.
- Waste management costs were a significant component of all three technologies, particularly for the pH-adjusted bleach decontamination process; waste characterization sampling was the largest single component of waste management costs. Almost all of the waste generated during the fumigations was a result of personnel decontamination operations. In addition, waste management costs could be reduced significantly if the State allows disposal of treated and/or decontaminated items in a Resource Conservation and Recovery Act (RCRA) Subtitle D landfill or allows the wastewater to be sent to a publicly owned treatment works (POTW); and
- The cost of personnel decontamination was also a significant contribution to cost due to the standby procedures that required Decontamination Line personnel to be on-site at all times when entries into the building were considered.

Assessment of Potential Exposure

Exposure to *Ba* spores during a release may be due to the primary release or secondary exposure due to contact with reaerosolized spores or a contaminated surface. Spread of

contamination (e.g., via reaerosolization and dispersion, inside to outside facilities [or vice versa]) may further increase the potential for exposure. The BOTE Project provided an opportunity to investigate some aspects of exposure in a field setting:

- Assess *Bacillus* spore migration from inside to outside a contaminated building.
- Investigate potential spore reaerosolization inside a contaminated building.
- Develop the concept of an exposure assessment plan.

Assessment of Reaerosolization

Inhalation is the route of exposure to *Ba* spores that has the highest likelihood of causing adverse health effects. The challenges of estimating airborne spore concentrations from the reaerosolization of deposited spores are influenced by many factors including residual aerosolized spores, surface loading, surface material type, activity levels, and other site-specific characteristics. The purpose of the reaerosolization study within the BOTE Project was to provide a preliminary assessment of the potential reaerosolization of *Bg* during remediation activities, and not to quantify actual potential exposure.

For this effort, surface and air concentrations of the *Bg* spores were assessed by standing sampling stations in two rooms before (following *Bg* spore dissemination) and after the application of a decontamination technology in each decontamination round. The activities associated with the disturbance of the settled *Bg* spores were limited to the activities of the sampling personnel and were not controlled or scripted to simulate typical residential or office activities.

Reaerosolized spores were measured at both high (pre-decontamination) and low (post-decontamination) levels of *Bg* spore surface contamination in some cases (i.e., not in all rounds). There were no significant differences in *Bg* spore concentrations associated with sampling heights or locations within the rooms. The findings do suggest that reaerosolization and its impacts should be considered during response and remediation activities.

Assessment of Bacillus Spore Migration from Inside to Outside a Contaminated Building

The BOTE Project spore migration study was designed to examine the potential transportation of disseminated spores from the initial area of contamination inside the building to outside the facility (however, inside the tent enclosure). Sand samples (Petri dishes containing sterilized sand to provide outdoor “soil” reservoirs) were placed directly outside the test facility, within the secondary containment enclosure and around the building near entrances, exits and high traffic areas.

The detection of *Bg* deoxyribonucleic acid (DNA) in previously uncontaminated sand samples outside the building suggests that spores have the potential to migrate out of a contaminated building and settle into the surrounding environment. This migration was outside the facility but within the secondary enclosure. No samples were taken outside the secondary enclosure. The study did not differentiate when exfiltration occurred from the facility (i.e., during dissemination or subsequent remediation activities).

Exposure Assessment Plan

Based upon *post-hoc* interagency review of the exposure assessment methodology, the objective of the Exposure Objective Plan was revised to the development of an exposure assessment plan that can be used to determine the exposure associated with reentry into a building that has been contaminated with surrogate *Ba* spores and subsequently decontaminated. A methodology for qualitative characterization of inhalational exposure associated with an adult's re-entry into the BOTE Project facility contaminated with *Bg* spores, before and after decontamination, was developed. The current methodology takes into account the specific site and the utilization of both indoor air and surface sample analytical data. During development of the methodology, several areas of uncertainty and variability were acknowledged and included: lack of knowledge of recovery efficiencies for sampling methods; how to approach analysis of non-detect data; choice of statistical software and data distributions used to calculate exposure point concentrations; use of existing reaerosolization data from the literature; and choice of surrogate used. These areas of uncertainty and variability will need to be examined prior to implementation of the exposure assessment methodology to limit the potential bias in the final exposure calculation. While the exposures calculated using this initial methodology will be limited by uncertainties and should be considered qualitative. This is the first effort of its kind and the lessons learned from development of the methodology are critical to moving the science forward to determine the gaps and research needed to develop a quantitative exposure assessment methodology for *B. anthracis*.

Summary

The intent of Phase 1 of the BOTE Project was to develop an improved understanding of response strategies for a single building, ultimately to extrapolate for use in wide area remediation. This project was the first field level evaluation of decontamination technologies under similar conditions outside a laboratory-controlled environment. The decontamination efficacy, cost, labor, and waste analyses provide invaluable information to decision-makers regarding time and resources required for each decontamination approach. Furthermore, the BOTE Project provided an opportunity for improving the readiness for mitigating the effects of a release of a bioagent over a wide area by allowing for:

- EPA cross-regional training and biosampling experience;
- Collaboration across regions and government agencies; and
- Real-world experience with biological agent decontamination.

The information and experience obtained during Phase 1 was used in Phase 2, the interagency response and remediation exercise, to aid in the development of sampling, risk mitigation, decontamination, and waste management plans. (Phase 2 involved the interagency response to a covert release of *Ba* (simulant); the exercise initiated with public health and federal law enforcement notification and completed through facility remediation.) Overall, the BOTE Project provided the opportunity to assess the interagency's current response and remediation capabilities and areas of need for future capability enhancements.

1. INTRODUCTION

The Bio-response Operational Testing and Evaluation (BOTE) Project was a multi-agency effort designed to operationally test and evaluate biological incident (anthrax release) response from initial public health and law enforcement response through environmental remediation. The effort included the coordinated project planning, support, and/or involvement from:

- Department of Homeland Security Science and Technology Directorate (DHS S&T);
- Environmental Protection Agency (EPA);
- Centers for Disease Control and Prevention (CDC);
- Department of Energy (DOE) National Laboratories;
- Department of Defense (DOD) Defense Threat Reduction Agency (DTRA); and
- Federal Bureau of Investigation (FBI).

The project was established through initial interactions between DHS S&T and EPA/Office of Research and Development's National Homeland Security Research Center (NHSRC) in partnership to further develop research products to support interagency Homeland Security responsibilities.

Homeland Security-related research efforts by the EPA, DHS S&T, and others have culminated in products that have contributed to significant advances in understanding of biological agent remediation. The impacts of these products and developed expertise have been realized in field responses (such as the natural anthrax responses in Region 1[1]), table top exercises, and EPA/Office of Solid Waste and Emergency Response (OSWER) guidance and policy documents. This research has helped improve the nation's preparedness and capability to respond to a biological incident, setting the foundation for improving the readiness to mitigate the effects of the release of a bioagent over a wide area.

Further significant advances in preparedness achieved through research and development were recognized as requiring a scaled-up systems-oriented approach to research efforts in an operational environment. Building on past DHS S&T collaborative efforts with EPA, the BOTE Project was conceived within NHSRC and supported by Homeland Security-relevant Program Offices throughout EPA and by EPA Regional offices.

The BOTE Project was divided into two distinct phases: (1) a field-level decontamination assessment and (2) a functional operational evaluation. In Phase 1, three decontamination methods that had shown effectiveness against *Ba* spores in laboratory and/or field use were tested under field-relevant conditions. The three decontamination methods utilized independently in three separate testing events (referred to as rounds) were: (Round 1) fumigation with hydrogen peroxide (H_2O_2); (Round 2) a decontamination process incorporating the spraying of surfaces with pH-adjusted (or amended) bleach; and (Round 3) fumigation with chlorine dioxide gas (ClO_2). Test parameters for each round included the decontamination method, level of contamination, and contaminated environment (e.g., office setting, residential area, heating, ventilation and air conditioning (HVAC)). An assessment of effectiveness and a cost effectiveness analysis of application of each decontamination method (or process) were

completed. The intent was to develop an improved understanding of response strategies on a single building for use in wide area remediation.

In Phase 2, an interagency exercise simulating a response to a covert *Ba* release in a facility was conducted. This interagency response included law enforcement, public health, decontamination, and facility clearance. The exercise included coordination with the local/state/regional response community and the establishment of both a Technical Working Group and an Environmental Clearance Committee. The exercise was planned in accordance with the guidance provided in the Homeland Security Exercise and Evaluation Program.

This report discusses the results of Phase 1 of the BOTE Project, the field-level decontamination assessment. Information on Phase 2 can be found in the Exercise After Action Report[3].

1.1. Background

The release of *Ba* spores from envelopes mailed through the U.S. Postal Service system in 2001 (henceforth Amerithrax, after the FBI case code-name[4]) resulted in the first bioterrorism-related anthrax cases in the U.S.[5] Twenty-three facilities were confirmed to be contaminated to at least some degree.[6] In total, remediation occurred over several years[6], and the total recovery costs have been reported as nearing a billion dollars[7]. In this context, remediation refers to the entire cleanup process of which sampling, decontamination, and waste management are a part. Decontamination costs alone (not overall remediation costs) have been estimated to have totaled at least $290 million[8].

Response to the incidents and the resulting cleanup activities required unprecedented cross-government efforts and led to the realization that development of capabilities to lessen the impact of future bioterrorism incidents was vital. Although considerable experience was gained from the many Amerithrax cleanup efforts, review of these efforts concluded that improved methods were needed for remediation following contamination with *Ba* spores.[9] Significant uncertainty remains regarding the number of spores that constitutes an infectious dose[6], the efficiency of sampling and analysis methods, the relationship between inhalation infectious dose and surface sampling, the most effective and appropriate decontamination methods, and accepted waste handling, treatment, and disposal methods.

Comments from government reports and congressional inquiries pointed out that sampling and decontamination methods were not standardized or validated and that deficiencies were observed when attempts were made to locate and characterize *Ba* contamination. Recommendations were made to standardize and validate procedures that could be used to characterize biological agent contamination and follow on with efficient decontamination measures that would effectively clear buildings and associated areas.[10-12]

To address some of the sampling-related concerns, two interagency efforts were completed to test and verify some of the progress made in the sampling and analysis area. The methodologies applied and the results from these two studies are presented in the DHS S&T and Joint Programs Executive Office-Chemical and Biological Division reports[13, 14]. The first

effort has been termed “INL-1” and the second “INL-2”. Both efforts were conducted in a two-story office building (PBF-632) at the INL facilities located west of Idaho Falls, ID.

INL-1 was conducted in 2007 with the primary objectives of understanding the differences among sampling strategies (e.g., judgmental, probabilistic, and hybrid) and assessing the effectiveness of sampling methods (e.g., wipes, swabs, and vacuum socks) in an operational setting. For each test during INL-1, the facility was contaminated with one gram (1 g) of *B. atrophaeus* subspecies *globigii* (formerly *Bacillus globigii* [*Bg*]*)* spores as a surrogate for *Ba* spores, sampled (characterization sampling), decontaminated via fumigation with ClO_2, and sampled again (clearance sampling). From the summation of all tests, the three sample collection methods tested (wipes, swabs, and vacuum socks) were shown to be capable of collecting positive samples with a range of concentrations of spores. The statistical analysis in the study showed that wipes have greater overall organism recovery rates than vacuum socks or swabs. These results were independent of the sampling strategy used.

INL-2 was conducted in 2008 as a follow-up to INL-1. The primary objectives of INL-2 were to operationally evaluate judgmental and probabilistic sampling strategies for characterization, as well as evaluate and compare probabilistic and hybrid (judgmental and probabilistic) sampling strategies for clearance in the building. In summary, results from INL-2 indicated that there was no significant fundamental difference between detection rates using judgmental versus probabilistic sampling strategies when examining the overall contamination of all rooms.

In addition to these operational sampling studies, significant efforts have also been ongoing to address the limitations in decontamination methods (overall site remediation) experienced in the 2001 incidents. This work has included contributions made as a result of research to better understand the effectiveness and improve implementation of decontamination methods[15]. These studies have focused on several different fumigants and liquid chemistries, evaluating effectiveness as a function of material types and decontaminant application conditions.[16-18] Such studies have been primarily on the bench-top scale using standardized test methods adapted for the scale of the study. Some efficacy studies on a larger scale, investigating application procedures in addition to the sporicidal properties of a decontaminant, have more recently been undertaken[19]. Studies have also been conducted to understand the demand of building materials for fumigants to assess the generation capacity requirements necessary to achieve target gas/vapor concentrations in the enclosed volumes being treated[20, 21]. The impact of decontaminants on materials and equipment has also been assessed for many of the most effective decontamination chemicals and processes[22, 23]. The combination of effectiveness as a function of the materials, materials impacting the ability to achieve effective conditions, and the impact of decontamination on materials/equipment ties directly to the waste management requirements for a specific site. Understanding of the interconnections and trade-offs between the decontamination and waste management options contributes significantly to the site-specific decisions to be made for an effective, yet efficient, remediation effort. While information is necessary to understand the interconnection and trade-offs, true cost and time impacts can be understood only from larger scale testing, functional exercises and real incidents.

In addition to the remediation activities discussed above, several remediation efforts pertaining to residences contaminated with natural *Bacillus anthracis* (*Ba*) spores have also contributed to advances in the understanding of successful decontamination approaches. While these efforts pertained generally to contamination from working with contaminated imported animal hides, several impacts have been realized from these experiences. For example, the successful implementation of a treatment process for the contaminated wooden shed in Danbury, CT, in a 2007 response[1] led to the development of a joint research project between EPA responders and researchers. The objective of this research project was to assess the effectiveness of the treatment steps (e.g., vacuuming, spraying with a pH-adjusted bleach solution, washing, scrubbing, and rinsing) individually and in combinations. The goal of these assessments was to understand the most effective combination of steps and situation-specific benefits of utilizing such an approach.

When considering the decontamination plan to be used at a contaminated site, applicable sampling data from the field may be used to perform a risk assessment to inform risk management decisions. Microbial exposure assessments are conducted as part of the risk assessment process to identify exposure pathways and determine the extent to which the applicable population is exposed to a biological agent of concern. Although guidelines for risk and exposure assessment such as the guidelines provided by EPA's risk assessment guidance for Superfund sites[24], EPA's framework for ecological risk assessment[25], the National Research Council's (NRC's) paradigm for human health risk assessments[26] and the NRC's framework for risk-based decision making[27], and the NRC's Exposure Science in the 21st Century guidance[28] do exist, guidelines specific to microbial exposure assessment are lacking. While the International Life Sciences Institute has developed a framework for microbial risk assessment [29], the framework is limited to waterborne pathogen exposure and does not cover exposure in indoor settings. Because of the lack of available standardized protocols or methodologies and data usability criteria, the field of microbial exposure assessment remains limited to qualitative rather than quantitative assessments.

The effectiveness of the decontamination strategy for facilities is tied directly to the efficiency of the sampling strategy. Decontamination effectiveness is determined by the ability to assess the amount of contamination pre- and post-application of the decontamination strategy. In the aftermath of the aforementioned activities and findings, the BOTE Project was developed to address site remediation after the release of *Bacillus* spores within a facility in an operational setting, drawing upon the advances in both the general sampling and decontamination areas over the past several years.

This section of the report provides an outline of the specific test objectives and methodologies for the BOTE Project.

1.2. Study Objectives

The BOTE Project Phase 1 was a field-level decontamination assessment managed by the EPA and DHS with the DOD/DTRA serving as the interagency coordinating study directorate. Phase 1 included an assessment of three decontamination methods and a cost analysis of the test and subsequent sampling results. The three decontamination methods were chosen by a group of

subject matter experts from EPA and DHS S&T based upon laboratory study results, field experience, gaps in operational understanding, and the project objectives. The three methods ultimately decided upon were fumigation with vaporized hydrogen peroxide (VHP®), a treatment process including the use of pH-adjusted bleach, and fumigation with ClO_2. Results from the BOTE Project Phase 1 contributed, in part, to the Incident Command (IC)/Unified Command decision making in the BOTE Project Phase 2. (Phase 2 involved the interagency response to a covert release of Ba (simulant); the exercise iniatied with public health and federal law enforcement notification and completed through facility remediation. Information on Phase 2 can be found in the Exercise After Action Report[3].)

The four principal objectives of the BOTE Project Phase 1 decontamination assessment included:

- Objective 1: Conduct and evaluate field-level studies of three decontamination technologies/protocols;
- Objective 2: Demonstrate that biological sampling and analysis methods evaluated in previous studies provide accurate characterization of *Ba* simulant concentration challenges for detection/identification purposes.
- Objective 3: Collect and analyze the results from the decontamination study and perform a cost analysis of all aspects of the remediation approaches.
- Objective 4: Determine the exposure associated with reentry into a building that has been contaminated with surrogate *Ba* spores and subsequently decontaminated.

Some of the main objectives listed above had sub-objectives. The specific study objectives and sub-objectives are described below.

1.2.1. Objective 1: Decontamination Efficacy Assessment

The main objective of the decontamination efficacy assessment was to conduct and evaluate field-level facility remediation studies using various decontamination technologies. A considerable amount of research has been done in the area of indoor decontamination. This research has been completed mostly in a laboratory environment looking at the efficacy of several approaches to decontaminate building materials. Several methods with high efficacy results in the laboratory were identified for testing at the field level where not all of the variables can be controlled. In addition to the facility decontamination assessment, the effectiveness of chlorine for inactivating spores in personnel Decontamination Line wash water generated during the remediation of the building was also assessed. The objective of this assessment was to develop a standard operating procedure that can be used in the field.

Key sub-objectives were to:

- Assess the effectiveness of the decontamination technologies as a function of room type (materials common to a commercial, residential, or industrial setting).
- Identify any damage to the building or materials/objects that are located inside the building arising from the application of the decontamination technologies.

- Determine waste generation and waste management approaches.
- Evaluate the effectiveness of wastewater/wash water collection, treatment, and disposal procedures.

The results from the decontamination efficacy assessment, combined with the other objectives in this project, will provide decision makers with information that will allow them to make informed decisions when selecting a decontamination strategy in the event of a biological incident.

Some background on the key sub-objectives of Objective 1 is presented below.

1.2.1.1. Decontamination Technologies Efficacy Assessment

Remediation strategies for the cleanup of a biological agent will vary depending upon site-specific considerations such as types of materials contaminated, extent of contamination, and whether the release occurred indoors or outdoors. Testing to date has revealed that efficacy of a particular technology can depend to a large degree on the materials with which the spores are in contact. Generally, liquid technologies are more effective on hard nonporous surfaces such as glass, metal, and laminate. Porous surfaces such as carpet, concrete, and wood prove to be the most challenging for such technologies[17]. Discussions of efficacy test results have focused on porous versus nonporous materials because several studies have indicated this gross parameter as explaining observed differences in decontamination efficacy with respect to material types[30, 18]. In addition, decontaminants may react with certain material types and reduce the effectiveness of the decontamination process. For example, H_2O_2 has been shown to break down rapidly on contact with galvanized metal[31]. The ability to test the effectiveness of the decontamination approach on relevant or representative material types is essential. For this reason, the BOTE Project facility was furnished with a variety of porous and nonporous materials that would be found in both commercial and residential settings.

1.2.1.2. Material Impact

Building decontamination following a biological agent release can be performed using different decontamination techniques such as fumigation of the building with ClO_2 or VHP® or with a liquid decontaminant. Although a decontaminant may be very effective at inactivating or removing the intended contamination, the decontaminant may have negative effects on the material or equipment being decontaminated. The impact of decontamination methods on materials and building items must, therefore, be a consideration when determining which method to employ in a particular decontamination scenario. The impact of decontamination methods on both material and equipment using ClO_2 and H_2O_2 fumigation on building materials has been studied[32, 33]. Assessments for the same fumigants have also recently been completed for sensitive electronics and other high value materials[22, 23]. In the BOTE project, visual observations were used to identify any damage to building materials/objects arising from the use of the three decontamination approaches.

1.2.1.3. Waste Management

The proper management of waste from the cleanup after a biological event is a key element of the remediation process. Different decontamination strategies result in different waste quantities

and characteristics, and the management of those wastes can significantly affect the overall remediation timeline, resource requirements, and costs.

The likely waste streams that will be generated from a *Ba* response would predominantly include: 1) personal protective equipment (PPE) items such as suits, gloves, and footwear covers ("booties"); 2) sampling waste; 3) porous materials removed either before or after decontamination operations; and 4) aqueous waste streams. Decontamination strategies will have a profound effect on the quantities of potential residual contaminating agent in the waste streams. The amount of residual contaminating agent will in turn impact the available disposal pathways and waste management costs.

One of the waste management challenges that the BOTE Project presented was the need to address waste issues (costs, quantities, logistics, etc.) as if the waste had been contaminated with *Ba*, even though a nonpathogenic surrogate was used ("notional" waste). In addition, as a constraint of the tests, all waste that was generated needed to be handled in accordance with INL waste management practices ("real" waste). This effort manifested itself mainly as a need to keep any biohazard-labeled bags (supplied to the sampling teams in the sampling kits) out of the trash. Discarding the biohazard-labeled bags in the trash would not be consistent with waste handling procedures associated with a real *Ba* contamination incident. The waste management practices from a real anthrax contamination incident would be determined by the waste acceptance criteria of the State where the incident occurred and how the responders characterize the waste, as well as the owner-operators of the waste management facilities who have to ultimately accept the waste. For example, in the recent naturally-occurring *Ba* response in Durham, NH[1], the State indicated that if the pH-adjusted bleach decontamination process was followed properly, the waste could be disposed of as solid waste in a Resource Conservation and Recovery Act (RCRA) Subtitle D facility without any additional waste characterization sampling. It is advantageous, from a waste management cost standpoint, to make sure that the decontamination process (and sampling, if required) results in the least restrictive (i.e., Subtitle D) waste designation, thus reducing remediation costs. However, there is no guarantee that waste disposal capacity would be available in the State where the incident occurred, which may necessitate decisions by State regulatory personnel from States outside the State where the incident occurred. For this and other reasons, there is a need for pre-incident waste management planning so that these issues can be identified and resolved prior to an incident. The results from this study may be expected to pertain to a single building contamination incident. There may be significant additional complexities in the event of a wide-area incident involving many buildings.

It is necessary to properly estimate the cost of and issues related to management of the different "notional" waste streams generated during the BOTE Project while still properly addressing INL's requirements for the "real" waste streams. To perform this estimate, a waste management approach was developed that identified, quantified, and characterized the waste after it left the building, but prior to placing the waste in the dumpster for disposal through INL's waste management program. (This approach is described in detail in Section 4.5.) In this approach, the waste was treated as *Ba*-contaminated waste up to the point at which it entered

its temporary waste management staging area in preparation for final disposition in the INL waste management process.

1.2.1.4. Decontamination Line Wash Water – Handling, Treatment, and Disposal

During past *Ba*-related cleanups, sampling and decontamination personnel were washed down upon exiting the buildings with disinfection/cleaning solutions prior to removing PPE. In typical operations of this type, the Decontamination Line wash water generated from these processes is collected in containers and treated prior to discharge to a publicly owned treatment works (POTW), when possible. In some of these *Ba* remediation efforts, local POTWs would not accept the Decontamination Line wastewater because of the nature of the organism and public perceptions of potential risks. For example, in 2001, approximately 14,000 gal of Decontamination Line wash water were collected during the cleanup of seven *Ba* spore-contaminated Capitol Hill buildings in Washington, DC[34]. The water was stored in 55-gal drums while on site, then transferred to tanker trucks and transported to Fort Detrick, MD, after the local wastewater utility declined to accept the water. The wash water was treated at Fort Detrick's on-site wastewater treatment facility. In a smaller scale incident, state POTWs did agree to accept Decontamination Line wash water, highlighting the differing scenarios. Regardless, the cost and effort potentially associated with limitations on discharge of the wash water accentuate the need for on-site treatment of the water. Therefore, *Ba* spore inactivation studies need to be conducted with water that is typical of what would be generated in such a remediation scenario. Additional scientific data verifying the effectiveness of treatment will increase confidence of POTWs to allow them to accept the water. The BOTE Project provided an opportunity to collect realistic wash water to assess chlorine bleach treatment methods.

1.2.2. Objective 2: Demonstration and Assessment of Biological Sampling and Analysis Methods

Critical measurements for the BOTE Project included the determination of viable spores at different times within a test round, specifically before and after decontamination. Testing for viable spores was done for the surface, air, water, and sand samples collected in the BOTE project. Surface and air sampling were primary methods used in conjunction with other objectives, i.e., determination of decontamination efficacy and the exposure assessment. The primary purpose of the surface sampling was to generate data to determine decontamination efficacy. In addition, key sub-objectives were to:

- Demonstrate use of current surface sampling methods.
- Evaluate the performance of the rapid-viability polymerase chain reaction (RV-PCR) analytical method.
- Assess the performance of aggressive air sampling (AAS) for post-decontamination sampling.

Some background on the key sub-objectives of Objective 2 is presented below.

1.2.2.1. Surface Sampling

Surface sampling was the primary measurement method to assess viable surrogate *Ba* presence per unit area prior to and after application of a decontamination method. Comparison of surface sampling results pre-decontamination and post-decontamination allowed a determination of the effectiveness of the decontamination method that had been applied in a specific testing round. Pre- and post- decontamination sampling was done using collocated sampling locations to allow for resolution of material types or locations that were potentially problematic for the decontamination method. The sampling strategy was developed to provide an opportunity to resolve decontamination effectiveness based upon the facility setting, i.e., a residential setting with typical porous materials such as furniture, appliances, and bedding; a commercial space with typical office materials; an industrial setting representing a workshop; and an office mail room. In addition, the surface sampling was an essential measurement as a reference for all other BOTE Project studies discussed below.

Surface sampling strategies for biological agents (i.e., *Ba* spores) incorporate different techniques depending upon the surface type and intended use of the results. The BOTE Project surface sampling methods utilized typical surface sampling methods, with the strategy biased to best achieve the primary project objectives (see Section 2.6.1). This sampling strategy also offered the opportunity to assess the detection of viable surrogate *Ba* spores as a function of sampling method, particularly during pre-decontamination sampling at both a high and a low surface loading of surrogate *Ba* spores.

1.2.2.2. Rapid Viability-Polymerase Chain Reaction

The strategy also offered the opportunity to assess new analysis methods (i.e., RV-PCR) for both pre- and post-decontamination samples. The RV-PCR is a research method developed under an interagency agreement between EPA and the Lawrence Livermore National Laboratory (LLNL) of the DOE to detect and identify the presence of live *Ba* spores rapidly during a bioterrorism event. Briefly, the RV-PCR is a combination of a reliable broth culture method (for viability determination) and the commonly-used real-time PCR (for highly sensitive, specific, and rapid detection and identification)[35-37]. The RV-PCR method presents an additional factor of preparedness to meet the challenge of analyses of large numbers of samples. The current version of the RV-PCR methodology had not previously been tested with a large number of actual field samples and especially with post-decontamination field samples. The opportunity afforded by the BOTE Project was to demonstrate the performance of the RV-PCR method with field samples.

1.2.2.3. Aggressive Air Sampling

The main objective of AAS in the BOTE Project was to determine if, after application of decontamination technology, disturbing indoor surfaces resulted in the detection of reaerosolized residual spores via air sampling. This procedure was being tested as a supplemental measurement for the determination of effectiveness of the decontamination process.

The sampling methodology used documented AAS techniques[38] that physically disturbed surfaces inside an enclosure and sampled large volumes of air using different sampling

equipment to corroborate the success or failure demonstrated by the results from the previous surface sampling. In a real *Ba* contamination event, the target clearance level would most likely require that all final air samples be free of viable spores to achieve the ultimate goal of successful remediation of the facility and restoring the facility to productive use. Any finding of a viable spore of *Ba* would be considered a potential indication of ineffective decontamination that may necessitate further decontamination and retesting of the area where the sample was collected. In some past *Ba* remediation actions, after a facility was opened and reoccupied, a transitional monitoring program, as recommended by the Occupational Safety and Health Administration (OSHA), was instituted.[39]

The determination of whether disturbing indoor surfaces resulted in reaerosolization of residual spores was accomplished by achieving the following goals:

- Explore the feasibility of using a risk-based strategy consisting of multiple air sampling techniques to verify the effectiveness of three decontamination technologies (post-decontamination) and post-remedial surface sampling activities for future comparative studies, and
- Evaluate possible protocols to establish facility clearance after decontamination using the three technologies in each study area.

The objectives of the AAS methodology conducted at the BOTE Project testing facility are summarized below and addressed in detail in Section 2.6:

- Ensure that sampling technicians are adequately protected during the sampling process;
- Establish the necessary parameters to conduct a successful evaluation of AAS by establishing critical barriers and creating adequate negative pressure;
- Use different sampling techniques and media to ensure a more robust strategy and to explore the strengths of each method;
- Use AAS techniques and high sampling flow rates as a sampling approach supplemental to surface sampling for supporting clearance decisions; and
- Collect sufficient sample volumes of air through sampling media that will be analyzed subsequently for the target organism (*Bg*).

1.2.3. Objective 3: Overall Cost Analysis

The main purpose of the cost analysis in the BOTE Project was to estimate the overall cost of the application of various decontamination technologies as a function of materials, time (including labor hours), and other resources.

The cost analysis made the general assumption that, although certain pieces of information derived from the BOTE Project are incident- and site-specific, the information can still be extrapolated to other incidents, using appropriate scaling factors based on labor hours, numbers of samples, size of affected area, and quantities of waste that are generated. The parameters examined in this cost analysis include sampling activities, application of decontamination technologies for the building and personnel entering and leaving the building, and equipment rentals and consumables. Some costs that are critical to the analysis (i.e., waste management)

could not be assessed based purely on the BOTE Project. Some BOTE-derived costs may be unrealistic because the BOTE Project used a *Ba* spore surrogate *Bg* (not actual *Ba* spores). Costs such as these were estimated using the BOTE Project data where appropriate, with adjustments to include the impact of actual *Ba* contamination added using information from past *Ba* responses and best engineering judgment. Although waste management costs could not be estimated based purely on the BOTE Project, the BOTE Project data provided the information to allow the EPA to better estimate what the waste management costs would likely be.

1.2.4. Objective 4: Assessment of Potential Exposure

Exposure to *Ba* spores during a release may be due to the primary release, or exposure may be secondary due to contact with reaerosolized spores or a contaminated surface. Spread of contamination (e.g., via reaerosolization and dispersion, inside to outside facilities [or vice versa]) may further increase the potential for exposure. The BOTE Project provided an opportunity to investigate some aspects of exposure in a field setting. Key sub-objectives were to:

- Assess *Bacillus* spore migration from inside to outside a contaminated building.
- Investigate potential spore reaerosolization inside a contaminated building.
- Develop the concept of an exposure assessment plan.

Some background on the key sub-objectives is presented below.

1.2.4.1. Assessment of *Bacillus* Spore Migration from Inside to Outside a Contaminated Building

The fate and transport of *Ba* spores in indoor and outdoor environments is not well understood. Even less is known about spore migration into and out of buildings. The BOTE Project provided a test bed to evaluate the potential for bacterial spores of a microbial agent dispersed inside a building to migrate to the outside.

A review on the persistence of select agents by Sinclair et al.[40] found references that suggested that *Bacillus* species spores *(*including *Ba)* have the potential to remain viable in soil for many years. For instance, viable *Ba* spores were repeatedly recovered in samples taken on Gruinard Island for as long as 40 years post-inoculation[41]. One study also showed that soil samples containing *Ba* spores that had been sealed and stored for up to 68 years still contained viable spores[42].

Following the intentional release of many *Ba* spores, Turnbull[43] reports the possibility of lasting environmental contamination and ensuing reaerosolization of spores. Ibraham[44] found that reaerosolized spores may be transported for up to 20 hours (hr) in the air, with the duration of the transport contingent on the meteorological conditions at the time of the release.

While there have been numerous studies on spore transport within ventilation systems and in buildings, a review of the literature resulted in few studies of the potential for outdoor transport of an interior release of spores. One study by Sextro et al. [45] hypothetically modeled the spread of anthrax in office settings to examine the fate and transport of *Ba* spores. The modeling

predicted that during the first 48 hr, more than 90% of the disseminated spores may stay inside a contaminated facility, while approximately 6% of the spores would be transported outside the facility. The study also acknowledged that the number of spores migrating outside the facility could increase if the model were run to include increased activity within the facility or were extended to take into account longer time durations[45].

Spores deposited and persisting outdoors have the potential to reaerosolize and pose a threat to populations living downwind. Doolan et al.*[46]* examined the epidemiological characteristics of the U.S. Capitol bioterrorism anthrax exposures and found immune responses in individuals who had been outside an epidemiologically defined exposure zone. This observation potentially suggests that the migration of spores outside the exposure zone might have been caused either by environmental influences or by cross-contamination from individuals not properly decontaminated. Taking this background information into consideration, spores are postulated to migrate from a building through air circulation/ventilation systems, loose seals around doors and windows, and human movement. The BOTE Project spore migration study was designed to shed light on the potential transportation of disseminated spores from the initial area of contamination inside the building to the outside (however, within the facility enclosure). The study sought to determine the extent to which sterile sand samples were contaminated when placed exterior to a contaminated building.

Both the methods and results from two separate laboratories, each using a different analytical method to obtain qualitative data indicative of the presence/absence of *Bg* deoxyribonucleic acid (DNA) deposited into the laboratory-prepared sand samples, are discussed in this report. In addition to providing information on the methods used to collect and analyze the sand samples from a field site, the data resulting from analysis of the samples were used to assess the transport of aerosolized spores from the initial area of contamination. The results of this preliminary study will inform additional research to better characterize spore migration from indoor environments to outdoor areas.

1.2.4.2. Assessment of Reaerosolization

Following a bioterrorism event, assessment of human health risks from exposure to microorganisms requires reliable data on exposure pathways including transport mechanisms and potential routes of exposure such as inhalation. One mechanism being studied is the reaerosolization of deposited spores or particles back into the air due to human or mechanical activity following an initial release. To date, the risk of infection from exposure to *Ba* spores via reaerosolization is unclear[47]. Meselson et al.[48] reported on the Sverdlovsk anthrax outbreak of 1979 and concluded that attribution of the inhalational anthrax cases to reaerosolization of *B. anthracis* spores was unlikely. However, following the anthrax attacks of 2001, Weis et al.[49] observed reaerosolization through collected air and surface samples in the Hart Senate Office Building under low activity levels typical of an office environment. The authors concluded that the *Ba* spores used in the attack reaerosolized under active office conditions, but also acknowledged that quantifying the associated risk of developing inhalational anthrax is uncertain. From an exposure perspective, quantifying reaerosolization of spores is likely complicated by dynamic spatial and temporal aspects as well as by the influence of numerous variables. For example, Price et al.[50] noted that reaerosolization is affected by the specific

surface onto which spores are deposited and the cause of the reaerosolization. The level of spores deposited on the surface and properties of the spore or powder used in the initial release also likely influence reaerosolization.[51] Additional examples of how variables such as activity level, surface type, temporal considerations, and surface loadings affect reaerosolization of particles and spores (fungal and bacterial) are briefly provided in the following paragraphs.

- Reaerosolization is dependent on activity level and, accordingly, extent of reaerosolization is likely to vary considerably[52]. Ferro et al.[53] found that the reaerosolization of particulate matter was influenced by the type and intensity of the activity as well as the number of active persons. Gomes et al.[54] reported that the air swirls associated with walking affected particle reaerosolization one to three orders of magnitude more than the floor vibrations associated with walking. Oberoi et al.[55] observed that the net mass of reaerosolized particles associated with human foot stomping in place while rotating around the person's center axis was two times greater than foot stomping in place without rotating.

- Surface type may influence reaerosolization. For example, fungal (*Penicillium chrysogenum*) spore reaerosolization was higher after walking on cut pile carpet (typical residential carpet) than after walking on loop pile carpet (typical commercial carpet) or vinyl tile[56]. At contamination levels of 1E6 colony forming units (CFU) per cubic meter (m^3), differences in *P. chrysogenum* spore reaerosolization were not observed between the vinyl tile and loop pile carpet[56]. Interestingly, quartz particles and laboratory-produced cockroach allergen dust had greater reaerosolization rates from linoleum than from carpet[54]. Krauter and Biermann[57] reported reaerosolization of *B. atrophaeus* spores from steel and plastic at similar levels under constant airflow.

- Contaminant loading on surfaces could also affect reaerosolization. After walking on contaminated surfaces, more *P. chrysogenum* spores were observed in air when surface loadings were higher[56]. Gomes et al.[54] noted that the proportion of dust particles reaerosolized from a surface decreases with higher loadings of dust, although a higher total number of particles may be reaerosolized as loading is increased.

- Some of the reaerosolization studies indicate a decrease in reaerosolization over time. For example, Buttner et al.[56] noted that the reaerosolization of *P. chrysogenum* spores from floors due to walking was reduced with repeated disturbances. Gomes et al.[54] also reported that for a ten-minute vibration and air swirl disturbance, reaerosolization of particles occurred primarily during the initial two minutes even though dust particles remained on the surface the entire ten minutes. The initial reaerosolization rate of *B. atrophaeus* spores exposed to airflow in a ventilation system was rather reduced within 30 minutes[57]. Oberoi et al.[55] reported that particles were readily reaerosolized from carpet during the initial ten seconds of human activity (e.g., walking and foot stomping). Over time, larger particles (mass mean diameter = 7.7 micrometers [µm]) settle while smaller particles (mass mean diameter = 2.7 µm) continue to be airborne and to move on air currents[55].

The BOTE Project presented an opportunity to gain a better understanding of reaerosolization of spores from surfaces during remediation activities. For this effort, surface and air concentrations of the *Bg* spores were measured before (following *Bg* spore dissemination) and after the application of the decontamination technology for each decontamination round in Rooms 101A and 102, both configured to represent typical office settings. Surface samples for *Bg* spores were collected using various sampling methods, indoor air concentrations of *Bg* spores were measured, and continuous particle measurements were taken in these two rooms. For each decontamination technology, samples were collected at various stages before and after decontamination so that the reaerosolization of settled spores into the ambient air could be characterized. The activities associated with the disturbance of the settled *Bg* spores were limited to the activities of the sampling personnel and were not controlled or scripted to simulate typical residential or office activities. The data were not collected under isolated (i.e., activity-specific or surface material-specific) conditions. The contribution of *Bg* spore loadings on specific objects/materials to the overall *Bg* spore concentrations in air could not be established. Nevertheless, the factors affecting the reaerosolization of *Bg* spores during the BOTE Project were collectively considered so the distribution of *Bg* spores on surfaces and in the air might be considered as representing rather real-world conditions.

1.2.4.3. Exposure Assessment Plan

The potential for exposure to *Ba* spores via inhalation, dermal, or gastrointestinal pathways[58] is a concern when considering re-entry into a building that has been intentionally or unintentionally contaminated. Through microbial exposure assessment, the relationship between the biological agent of concern, the environmental setting, and the affected population is determined by developing an exposure profile[29]. The exposure assessment helps provide quantitative or qualitative input into the risk characterization[29]. But, to date, no standardized protocols or methodologies exist for conducting quantitative microbial exposure assessments.

The BOTE Project provided a unique opportunity to develop a site-specific methodology that could be used to prepare a qualitative characterization of potential inhalation exposure associated with reentry into the building pre- and post-decontamination using the semi-quantitative/qualitative data generated in a field setting. Based upon *post-hoc* interagency review of exposure assessment methodology, the objective was revised to the development of an exposure assessment plan that can be used to determine the exposure associated with reentry into a building that has been contaminated with surrogate *Ba* spores and subsequently decontaminated. Key assumptions for handling the analytical data and exposure calculations are being derived from chemical risk assessment guidelines and standard microbiological practices. Analysis of the data set using this methodology will provide a qualitative inhalation exposure assessment and is critical to moving the science forward and determining the gaps/needs for quantitative exposure assessments. While the samplers did not wear personal monitors to measure true exposure, the collected data from the air samplers indicate spore reaerosolization and possible exposure hazard. The preliminary exposure calculations and subsequent follow-on evaluations of the data can help guide data usability considerations and statistical treatment of data for exposure analysis. Results and lessons learned can be used to help inform development of an exposure assessment framework for microbial agents.

2. MATERIALS AND METHODS

Details of the test facility, organism, and dissemination method are discussed in this section.

Three rounds of Phase 1 testing were conducted from April 11 to May 19, 2011. The project was carried out in accordance with a Test Plan and Quality Assurance Project Plan (QAPP) endorsed by EPA, DHS, and DTRA[59].

Each of the three rounds in Phase 1 included dissemination, characterization sampling, decontamination, waste management, and post-decontamination sampling. For each round, simulant levels, room configurations, and sampling procedures were virtually the same inside the test facility. *Bg* dissemination for each round resulted in a high level of contamination on the ground floor and a low level of contamination on the top floor, and each round employed different decontamination technologies (see Table 2-1).

Table 2-1. Definitions for anticipated contamination levels and decontamination technologies.

Contamination Levels	
Low (top floor)	100 to 200 CFU/ft^2
High (first floor)	1.0E5 to 1.0E7 CFU/ft^2
Decontamination Technologies	
Round 1 (Apr 16–23, 2011)	Fumigation with VHP® (STERIS Corporation, Inc.) (H_2O_2)
Round 2 (Apr 25 – May 6, 2011)	Treatment process incorporating pH-adjusted (amended) bleach
Round 3 (May 10–17, 2011)	Fumigation with chlorine dioxide gas (ClO_2) (Sabre Technical Services, LLC)

Prior to Round 1, a mandatory full participation (MFP) round was conducted as a dry run for dissemination and sampling. The MFP provided an opportunity to test operational systems developed for the project (e.g., related to communication and coordination) and to train sampling teams inside the facility while collecting background (pre-test) samples. The MFP was conducted on April 14-15, 2011.

2.1. Facility

The test facility for the BOTE Project was PBF-632, a two-story unoccupied office building owned by INL and located on INL property approximately 45 miles (mi) west of Idaho Falls, ID. A site view of the INL test facility is shown in Figure 2-1. For future reference in this report, the north end of the facility is located on the left side in the figure; the south end is on the right side (i.e., facing the blue tank). Hence, the west side of the building is visible in the figure.

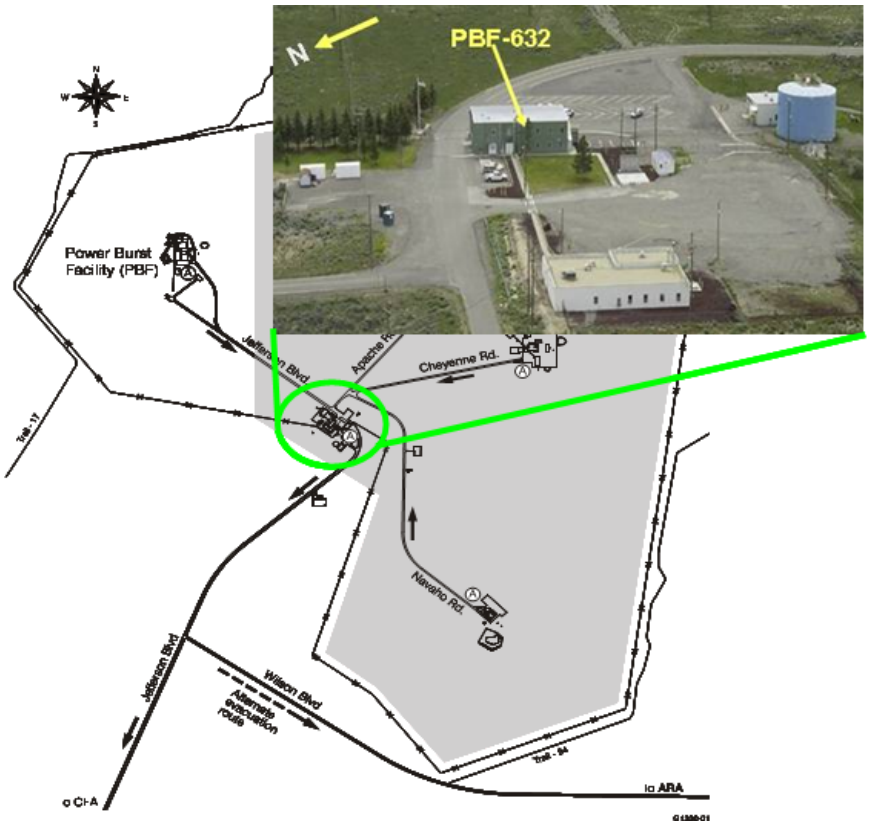

Figure 2-1. Site layout of PBF-632.

The interior of the facility was prepared in a manner consistent with the objectives of the project, i.e., having specific areas containing different materials in common on each floor. The layout of both floors is illustrated in Figure 2-2 and Figure 2-3. Each floor was approximately 4,025 square feet (ft^2). The first floor was made up of 11 rooms consisting of a reception area, men's and women's restrooms, a mechanical room, and a hallway. The second floor was made up of 15 rooms consisting of two storage rooms, men's and women's restrooms, a mechanical room, and a hallway. In this facility, each floor had an independent HVAC system. The ceiling, approximately 8 feet (ft) in height, incorporated a "dropped ceiling" design that utilized ceiling tiles to separate the occupied space from the utilities that run above the ceiling. The area above the ceiling on the first floor is approximately 25 inches (in), and the area above the ceiling on the second floor is approximately 53 in. The total building volume is approximately 90,000 cubic feet (ft^3).

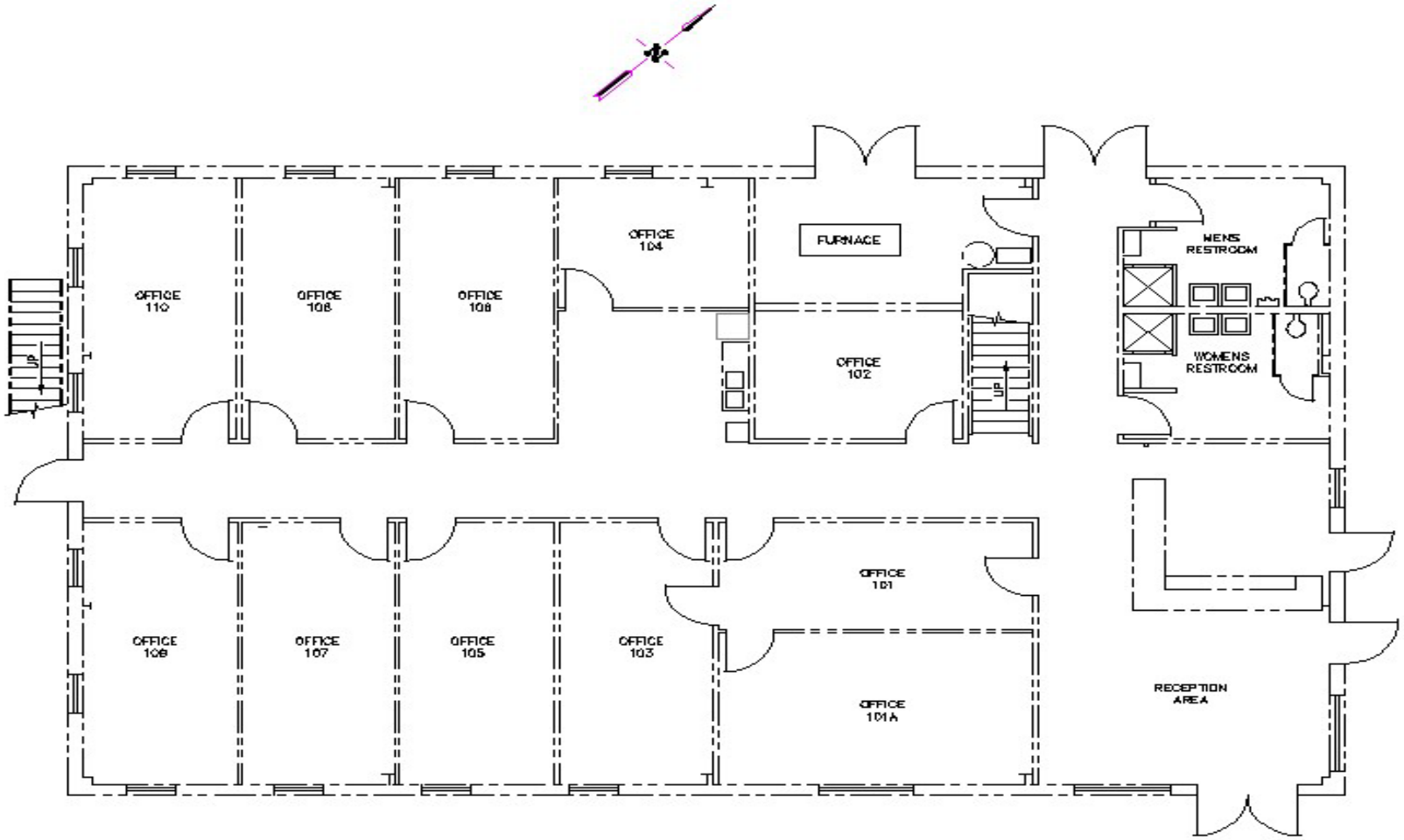

Figure 2-2. INL Building PBF-632, Floor 1.

Figure 2-3. INL Building PBF-632, Floor 2.

The first and second floors each had three rooms (Rooms 106, 108, 110, 208, 210, 212) that were configured to represent a commercial office setting (see Figure 2-4 and Figure 2-5). Each of the three "office" rooms on each floor contained furnishings representative of that type of setting, such as:

- Flooring: Wood laminate.
- Furnishings: Desk, chair, filing cabinet (with one drawer full of papers), book case (one shelf occupied by books), dividing partition, and computer with monitor.
- Walls: Latex-painted wallboard.
- Ceiling: Ceiling tile.
- Materials: Paper, files, books, etc.

The first and second floors each had three rooms configured to represent residential settings (kitchen setting [Rooms 105 and 209], bedroom setting [Rooms 109 and 213], and living room setting [Rooms 107 and 211]) (see Figure 2-4 and Figure 2-5). The types of furnishings in these settings included materials such as:

- Flooring: Carpet.
- Furnishings: Couch, bed, tables, chairs, TV, kitchen oven/range, refrigerator, sink, and countertop.
- Walls: Latex-painted wallboard.
- Ceiling: Ceiling tile.
- Materials: Paper, magazines, etc.

One room on each floor (Rooms 104 and 204) was configured to represent an industrial setting (see Figure 2-4 and Figure 2-5). These "industrial" rooms contained a workbench and tools set up to resemble an industrial workshop setting, with an epoxy-covered floor (epoxy over wood in Room 204 and over concrete in Room 104). Approximately 1.8 pounds (lb) of pine shavings (animal bedding) was distributed in the industrial room to represent an organic load common to such settings. One room on each floor (Rooms 103 and 207) was configured to represent a mailroom and included a holding unit with mail slots containing paper and envelopes (see Figure 2-4 and Figure 2-5). Photos of each of the rooms can be found in Appendix A.

Two additional rooms (Rooms 101A and 102) on the bottom floor were configured as commercial offices for the reaerosolization study, with the following furnishings:

- Flooring: Carpet.
- Furnishings: Desks, chairs, metal filing cabinets, plastic Ultraviolet-Aerodynamic Particle Sizer® (UV-APS) case.
- Walls: Painted wallboard.
- Ceiling: Ceiling tile.

Room 101A had dimensions of 20 ft x 10 ft x 8 ft high and Room 102 had dimension of 11 ft x 13 ft x 8 ft high. There was one door to Room 101A, and access was through Room 101. Room 102 had direct access to the main hallway through a single door. In these rooms, stands for the

SKC BioSamplers® were bolted to the floor in three locations per room (See Figure 2-6). One UV-APS was placed on top of a desk in each room (Figure 2-6).

The remainder of the rooms on each floor did not contain any furnishings. The walls in the rooms that did not have painted wallboard installed were comprised of a plastic/polymeric material. The plastic-walled rooms represent the remainder of the building other than the ten rooms on the bottom floor and the eight rooms on the second floor that were set up in the configurations described above. The floor material in all other areas (i.e., not the commercial, residential, industrial or mailroom settings) was epoxy-covered concrete (first floor) or epoxy-covered wood (second floor), except for the furnace rooms on each floor (concrete). A complete inventory of the contents of each room can be found in Appendix A.

Figure 2-4. Schematic diagram of PBF-632 first floor.

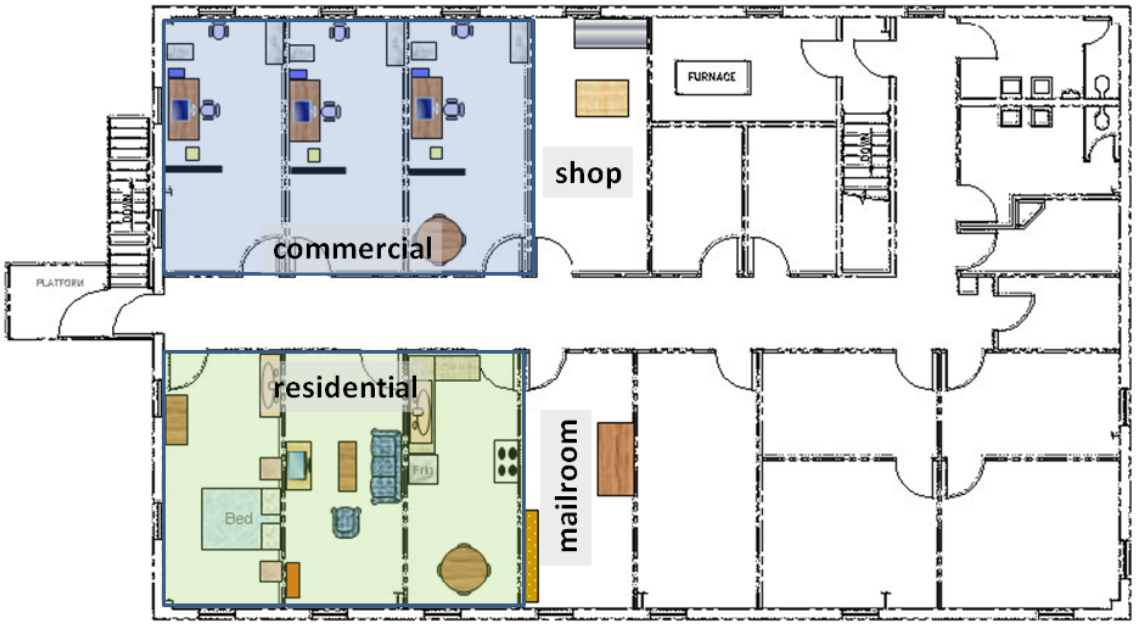

Figure 2-5. Schematic diagram of PBF-632 second floor.

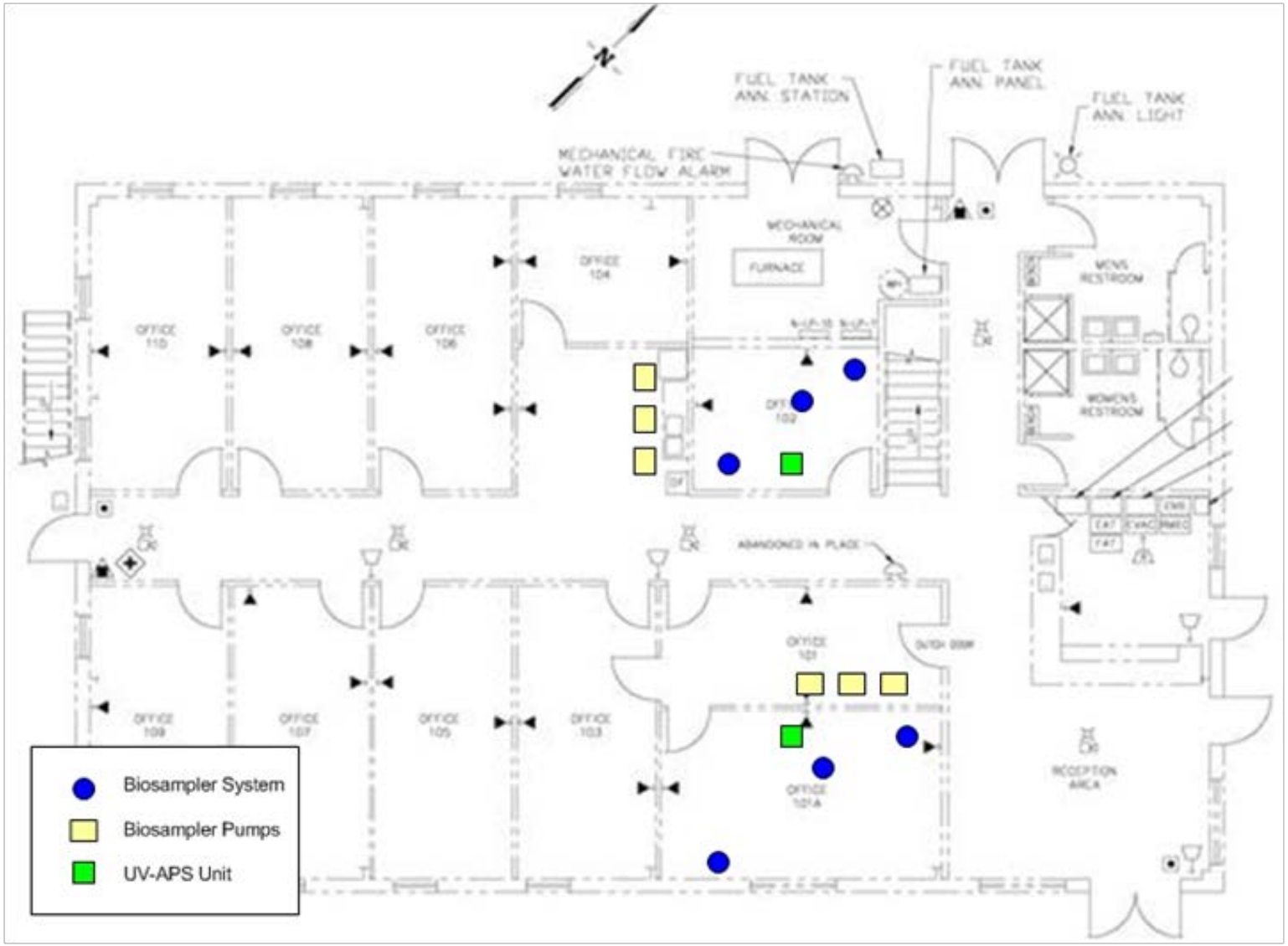

Figure 2-6. Location of air sampling equipment in Rooms 101A and 102.

The facility had dual HVAC systems, one system for each floor. Neither HVAC system had a heating or air conditioning component installed in the system but the HVAC system was otherwise functional with a supply and return plenum on each floor. Both the HVAC supply duct and return line were constructed of galvanized metal. The supply duct contained an insulating material on the inside of the duct, leading from the boiler. The supply side had been modified several times since the building was constructed, and insulation was not present throughout the entire supply line. The return duct was added prior to the BOTE Project, for the INL-1 and INL-2 studies, to provide more control of return air flow within the building. The HVAC contained standard air filters on the intake side.

The PBF-632 facility had a polymeric secondary containment structure (secondary enclosure) outside the building, as shown in the right photo in Figure 2-7. This containment served as a barrier to assist in preventing contamination of the surrounding area during testing, i.e., one method for cross-contamination control. Additionally, as discussed in Section 2.10.3, the facility was tented (under the secondary enclosure, directly on the building) during the fumigation with ClO_2.

Figure 2-7. PBF-632 before and after setup of outer secondary enclosure.

The facility was equipped with a closed-circuit camera system that recorded activities in the facility throughout the project. For this system and other equipment, a wireless network (802.11a and an 802.11b) was set up inside PBF-632 with coverage to the five surrounding support trailers provided by INL (described below). This network was connected to the wired gigabit network switch inside the building and transported data to the trailers. The wireless system incorporated standard encryption protocols to limit network access. The internal radios were powered by the Ethernet switch through Power Over Ethernet. The external radios had line-of-sight to the trailers and transmitted signals directly to the trailer network terminal through the 802.11a backhaul radios. The Engenius EOA3630 access point radio was used for the internal network. Three radios were placed on each floor in the hallway at evenly spaced intervals across the PBF-632 building. Two Engenius EOA7535 radios were placed at a minimum of 100 ft from each end of the PBF-632 building, and a third radio was located at the

command-control trailer. Fourteen Vivotek FD7141 Pan, Tilt, Zoom network cameras were located within the PBF-632 building, with six each on the first and second floors. One was also located at the entrance of the facility and at the exit containing the personnel Decontamination Line tent. All of the cameras were enclosed in a weather resistant dome and wired to a Power over Ethernet switch. Video from the cameras could be viewed, recorded and controlled at the command-control trailer and viewed in the decontamination support trailer. Recorded video was archived to a computer hard drive. Video was recorded during any period when event personnel were active within the structure. A list of the locations of the cameras is reported in Table 2-2.

Table 2-2. List of closed-circuit camera locations within PBF-632.

First Floor	Second Floor
Entry (ingress) door (south end)	Room 208
Personnel Decontamination line (egress door)	Room 209
Room 105	Room 210
Room 106	Room 211
Room 107	Room 212
Room 108	Room 213
Room 109	
Room 110	

An overhead view of the test site and proximity of the various assets is shown in Figure 2-8. This aerial view shows the location of the facility in relation to the support trailers for the project. The ingress to the facility was located on the south end. Ingress to the first floor was permitted through an entrance located under the stairwell to the second floor or via interior stairwell from the second floor. Ingress to the second floor was permitted only from the exterior stairwell under the secondary enclosure. The interior stairwell was located toward the north end/west side of the facility; an airlock was placed on the second floor landing to aid in the prevention of cross-contamination between floors. This air lock at the top of the stairs isolated one room, the second-floor men's restroom, which was right across the hall from the stair entry. Personnel had to enter the air lock to access this second-floor men's room. For contamination control, no entry to the second floor was permitted from the first floor. The egress from the facility was from the first floor located on the north end/west side of the facility. Egress occurred through the personnel Decontamination Line, represented by Location 5 in Figure 2-8.

The command and control trailer (Location 1 in Figure 2-8) served as the main briefing location for all on-site activity during the project. The sampling and decontamination support trailer (Location 7 in Figure 2-8) was divided into two distinct areas separated by a soft wall. Samples were brought in through the east side of the trailer and passed into the west side of the trailer

through the window in the soft wall. Personnel on the west side received the samples for tracking, shipping or processing. A control room for monitoring decontamination and waste management activities was also located on the east side of this trailer. This area was used to track waste generated from each decontamination method and monitor project activities via the closed- circuit TV feed.

Personnel entering the facility used the sampling prep trailer (Location 2 in Figure 2-8) to don their PPE. This trailer contained all PPE needed during the project. The trailer was divided into two distinct areas: one area for readying sampling personnel and one for preparing sampling materials. Additionally, the office space in the trailer was used for sampling team coordination, e.g., preparation of sampling maps and on-site support for the sample tracking system (i.e., the Building Restoration Operations Optimization Mode (BROOM)[60], described in Section 2.7).

Location 8 (in Figure 2-8) served as a break and recovery trailer. This area was provided for sampling and decontamination crews to rest and recover before or after their entry into the facility. Sampling team training, pre-briefing, and debriefing were also held in this trailer.

The red outline in the figure shows the exclusion zone around the facility utilized during decontamination activities (fumigation or spraying of pH-adjusted bleach). This zone was set to avoid exposure of personnel to gaseous toxic hazards per the BOTE Project Health and Safety Plan[59].

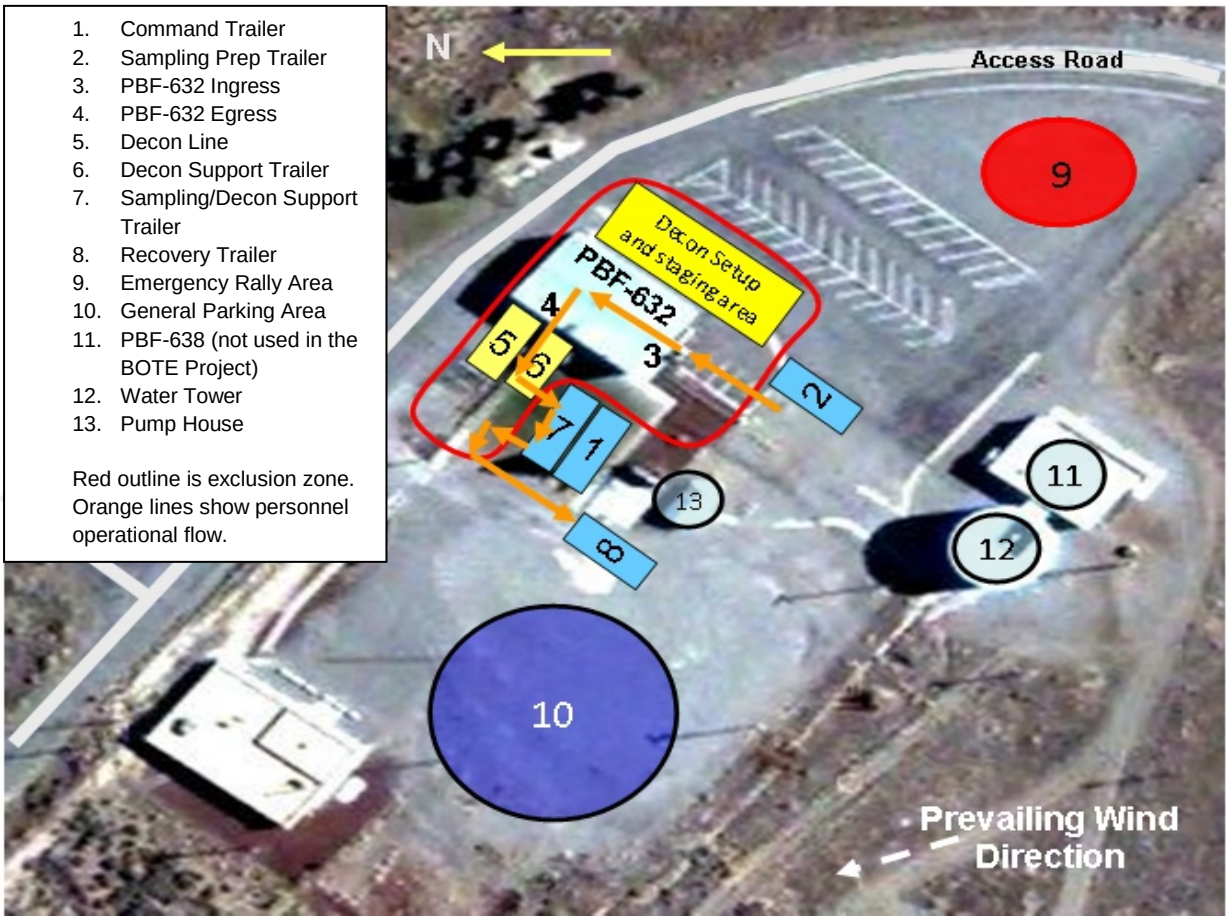

Figure 2-8. BOTE Project site configuration.

2.2. Test Organism

To meet the objectives of the project, the use of a nonpathogenic surrogate organism representative of *Ba* with respect to decontamination resistance and physical properties was required. A number of building dispersal and fumigation studies using *Bg* spores as a surrogate for *Ba* spores have been conducted at the INL PBF-632 facility since the Amerithrax incident of 2001[13, 14]. From each of these studies, information on *Bacillus* spore dispersion, site characterization, fumigation, on-site laboratory capacity, and site clearance has been learned.

Bg is a Biosafety Level 1 organism and is not a Select Agent (www.selectagents.com). However, *Bg* serves as a nonpathogenic surrogate for *Ba*. The *Bg* spore preparation was obtained from DOD's Critical Reagents Program Antigen Repository and was prepared by growing *Bg* (American Type Culture Collection (ATCC) 9372; also known as *B. atrophaeus* and *B. subtilis* var. *niger*) in tryptic soy broth (TSB) supplemented with magnesium sulfate until 80 to 90% sporulation occurred. After purification and drying, the spores were dry-blended with Aerosil R812S fumed silica particles. The spore-silica mixture, with a ratio of 80% dry spore material to 20% silica, was jet-milled to a uniform particle size. The final powdered spore preparation contained approximately 10^{11} spores/gram (g)[61].

Prior to its use, the *Bg* spore preparation was evaluated by the EPA's Aerosol Testing Facility and BSL-2 Microbiology Laboratory in Research Triangle Park, NC, and the BSL-2 Biocontaminant Suite at EPA Andrew W. Breidenbach Environmental Research Center (AWBERC) in Cincinnati, OH, using the following metrics:

- Viability (CFU/g on tryptic soy agar [TSA]).
- Appearance of spore preparation using phase contrast microscopy.
- Aerosol particle size distribution of the spore preparation.
- CFU/g of spore preparation after heat shock compared to a positive control.
- CFU/g of spore preparation and positive control after exposure to hydrochloric acid (HCl).
- Colony morphology on TSA of spore preparation compared to positive control.
- Confirmatory quantitative polymerase chain reaction (qPCR) comparison of spore preparation and positive control.
- DNA sequencing of the qPCR products of the spore preparation and positive control.

The results of these analyses can be found in Appendix B.

2.3. Spore Dissemination

In accordance with the BOTE Project objectives, the surface loading of viable *Bg* spores prior to the testing of each decontamination method was intended to be approximately 1.0E6 CFU of *Bg* per ft^2 in the rooms on the first floor and 1.0E2 CFU of *Bg* spores per ft^2 in the rooms on the second floor. The surface loadings were determined by surface sampling (see Section 2.5.4) after each release of *Bg* spores into the facility, prior to the application of a decontamination method.

Dissemination of the *Bg* spores was performed by FLIR Systems, Inc. (27700 SW Parkway Ave., Wilsonville, OR 97070; formerly ICx Technologies, Inc., 4343 Pan American Freeway NE, Albuquerque, NM 87107*)* prior to each test event. A wet aerosol dispersion of *Bg* spores was used for this dissemination. The aerosol generator used for the dissemination was a microcontroller driven medical nebulizer (Aeroneb Go 7070), manufactured by ICx (now FLIR Systems, Inc.). The nebulizer was a battery-powered aerosol generator that produces aerosol by the application of ultrasonic energy to a microporous disc. The generator was controlled by an on-board microcontroller controlling the output from micrograms (µg) to g/minute (min). The release of the desired amount of the stock preparation of *Bg* spores occurred within several minutes of activation of the aerosol generator.

During the release, ICx (now FLIR Systems, Inc.) Instantaneous Biological Analyzers and Collectors (IBACs) were used to provide a measure of the particle concentrations in the air. These measurements provided on-site real-time feedback related to the release that could be compared to expectations based upon pre-test data. A total of 21 IBACs were utilized throughout both floors to measure the concentration gradient for each trial. The locations of the IBACs are shown in Table 2-3, and results are shown in Appendix I. On each floor, two IBAC sensors were placed in the hallway near the HVAC returns, and the remaining eight sensors were placed individually within rooms. The IBAC sensors were positioned near the center of the

room, placed either on the floor or on a desk/chair. The location of the IBACs was kept consistent to monitor the particle concentrations during each run. Because there were more offices than available IBAC sensors, several rooms were not monitored. More information on the IBACs is provided in Section 2.4.

Table 2-3. Location of IBAC Sensors during Dissemination.

First Floor	Second Floor
Reception Area	Hallway Outside Janitor's Closet
Furnace Room	Room 201
Room 101A	Room 206
Room 103	Room 207
Room 104	Room 208
Room 105	Room 209
Room 106	Room 210
Room 107	Room 211
Room 108	Room 212
Room 109	Room 213
Room 110	

The dissemination procedure was as follows:

1. IBAC sensors were deployed throughout both floors of the building. All sensors were remotely monitored in real-time by a laptop located in the command-control trailer utilizing the pre-wired Ethernet connections.
2. A final walk-through of PBF-632 was performed to ensure that no personnel were in the building. All windows and building entrances were checked to ensure that they were sealed.
3. *Bg* spore powder was weighed out in advance and stored in a sample vial. Distilled water was then added to the *Bg* powder to provide a liquid suspension for the nebulizers. This solution was thoroughly mixed using a vortexer. The amount released on the top floor was 0.5 milligrams (mg) and 200 mg on the bottom floor to achieve the desired surface loading targets on each floor.
4. The solution was transferred into the nebulizer well using a measuring pipette. The nebulizer well was capped and then placed into the furnace filter (see Figure 2-9).
5. The IBAC sensors were set up and allowed to collect data for at least 30 minutes prior to the release to characterize the particulate matter background inside the facility.

6. Nebulizers (ten on the first floor and one on the second floor) were carried into the building by an FLIR Systems, Inc., employee and set up at the release point on each floor. The release point was at the return filters of the HVAC system for each floor. The FLIR Systems, Inc., employee left the building via the PBF-632 egress location and closed the door. The dissemination was triggered by the FLIR Systems, Inc. employee by applying power to the nebulizers using a cord located outside the facility. The outer facility secondary enclosure was sealed and a sign was put up saying “Testing in Progress – Do Not Enter”. No test personnel were allowed to enter the facility at this time. The HVAC fan on both floors was on and operational during the duration of the release event. The HVAC fans were turned off two hours following dissemination; this duration had been determined during pre-testing to achieve the target loading on each floor. The HVAC fan for both floors was controlled externally using a breadboard that was located in the command trailer.
7. IBAC sensor(s) were monitored during dissemination to ensure that the release was successful.
8. Particles were given time to settle overnight (12-14 hr) before sampling teams entered the building the next morning.

Figure 2-9. Nebulizers on the first floor releasing into the air intake on the HVAC system.

2.4. Reference Dissemination and Surface Loading Determination (Referee Methods)

Reference (or referee) samples were utilized to provide an indication that the dissemination process was successful at meeting the target surface loading criteria for the first and second

floors (see Table 2-1). Real-time particle measurements were taken at 20 locations throughout the facility during dissemination using the FLIR Systems, Inc., IBACs to provide an indication of the success of the spore release (as mentioned in Section 2.3).

The IBAC provided near real-time and fully automatic detection of concentrated biological aerosols. Air and aerosolized particles were pulled into the IBAC at a rate of 3 liters (L)/min by means of a diaphragm pump. The particles passed through an optical illumination region where they were excited by a continuous-wave blue laser diode. Elastically scattered light and auto-fluorescence-produced light were observed simultaneously on independent optical channels. All acquired data were transmitted through a network cable as well as stored on an internal flash memory card.

Additionally, surface loadings (CFU/ft^2) were indicated using reference material coupons (RMCs) and TSA settling plates (Remel, Catalog Number R01917, 12 x 85 mm "monoplates"). The inside diameter of the plate half with the TSA medium was 85 millimeters (mm) (3.35 in). The RMCs were polished stainless steel rectangles measuring 1 in by 2 in (2.5 centimeters [cm] by 5 cm). The RMCs were sterilized via an autoclave with a 1-hr gravity autoclave cycle at 121 degrees Celsius (°C), 15 pounds per square inch (psi) and then packaged in groups of 30 per small plastic box (pipette tip box). The sterilized RMCs and TSA settling plates were placed in the facility just prior to dissemination.

All three referee methods were used during the three decontamination events. The use of the IBACs is discussed in the previous section; however, the description of the equipment is included in this section. The RMCs and TSA settling plates were collected by the Surface Sampling Teams (see Section 2.5.2) prior to surface sampling at each nearest location within a room during the pre-decontamination (characterization) sampling in each round.

Each of the reference methods is shown in Table 2-4. The RMCs were used on both the first and second floors; the TSA settling plates were used only on the second floor. Because the maximum countable number of CFU on a settling plate was 300, use of settling plates on the first floor was not considered useful as all plates were projected to be overgrown (too numerous to count [TNTC]). Multiple RMCs were placed in each of the 18 study rooms prior to dissemination. TSA settling plates were collocated with RMCs in the study rooms on the second floor.

After collection, the RMCs and settling plates were sent to the Idaho National Laboratory (INL) Microbiology Laboratory for analysis. The RMCs were extracted and dilution-plated in accordance with the procedures described in Section 2.9. Both TSA settling plates and RMC dilution plates were incubated at 37 ^oC for 18-24 hr. Following incubation, plates were enumerated and correct morphology was confirmed via visual inspection. Surface loadings were indicated by dividing the CFU/plate by the surface area of the collection media (i.e., 0.014 ft^2 for the RMCs and 0.061 ft^2 for the TSA settling plates).

Table 2-4. Referee Samples for the BOTE Project.

Referee Device	Description	Application	Analysis
IBAC Sensor	Particle counter that counts particles in the air	Used to provide real-time feedback during dissemination in Rounds 1 – 3; the information was used to corroborate previous air concentrations during pre-test dissemination trials.	Real-time Particle Count
Settling Plates	Culture plate with TSA (85 mm [3.35 in] diameter)	Indicated target pre-decontamination surface loadings (CFU/ft^2) for each round	Quantitative Analysis (Incubation and enumeration)
Stainless Steel RMC	Polished stainless steel squares measuring 1 in by 2 in (2.5 by 5 cm)	Indicated target pre-decontamination surface loadings (CFU/ft^2)for each round	Quantitative Analysis (Extraction, culture plating, incubation, and enumeration)

2.5. Sampling Methods and Equipment

The sampling of surfaces, air, sand and water for viable *Bg* spores was a critical component of the measurement methods encompassing all objectives. To achieve all objectives, a number of different sampling and subsequent analytical methods (see Section 2.9) were required. Table 2-5 lists the different sampling methods that were used, the locations where they were used, the analysis location, and the relationship to the BOTE Project objectives. Several different laboratories or Agencies were involved in analyzing the samples or raw data. For analysis of surface samples, the Laboratory Response Network (LRN), INL, and LLNL were used. More details on the laboratory analysis can be found in Section 2.9.1.

Sampling was conducted at multiple times within each round of testing listed in Table 2-1. For Rounds 1-3, surface sampling was conducted after dissemination (pre-decontamination or characterization sampling event) and after decontamination (post-decontamination or clearance sampling event). Air sampling was conducted during dissemination for real-time feedback on the release/contamination event for each round, during the aggressive air sampling event for each round (after post-decontamination surface sampling) and at specific times during each round specifically in the reaerosolization study rooms (Rooms 101A and 102). Wastewater sampling from the water collected from the Decontamination Line was also done within each round. A timeline of sampling events within each round is shown in Figure 2-10. The subsections below describe all sampling methods in detail. All sampling was conducted in accordance with the BOTE Project Test Plan/QAPP[59].

Table 2-5. Summary of sampling methods and the uses related to the BOTE Project objectives.

Media Sampled	Sampling Method	Locations	Analysis Location	Data Use
Surface	Cellulose Sponge-stick Wipes	All Rooms on Floor 1 and 2	LRN	Pre-decontamination and post-decontamination sampling to determine surface loading (CFU/ft^2) on each floor; used for assessment of effectiveness of the decontamination method in each test round and for residual contamination amount after decontamination in the exposure assessment
	Macrofoam Swabs			
	Vacuum Socks			
	Versalon Wipes®	All Rooms on Floor 1	LLNL	Pre-decontamination and post-decontamination sampling for the assessment of RV-PCR
	Versalon Wipes®	Rooms 101A and 102	INL	Pre-decontamination and post-decontamination sampling as surface loading measurements for the assessment of reaerosolization
Air	SKC BioSamplers®	Rooms 101A and 102	INL	Pre-decontamination and post-decontamination time-integrated air measurements (CFU/ft^3) for the assessment of reaerosolization
	UV-APS		INL	Pre-decontamination and post-decontamination real-time air measurements (particles/ft^3) for the assessment of reaerosolization
	Dycor XMX/2L-MIL Aerosol Collection System	Rooms 105 and 106; Hallway outside Rooms 105 and 106	INL	Post-decontamination, after surface sampling, time-integrated air measurements (CFU/ft^3) for the assessment of AAS
	Mattson-Garvin Model 220 slit-to-agar		INL	Post-decontamination, after surface sampling, time-integrated air measurements (CFU/ft^3) for the assessment of AAS
Sand	Sand-filled Petri plates	Around the outside of the facility, within the outer enclosure; 1st floor reception; 2nd floor hallway	EPA and USGS	Assessment of the potential migration of viable *Bg* outside the facility and assessment of *Bg* detection methods in sand (soil)
Water	EPA Water Pathogen Concentrator	Wash water collected at the Decontamination Line	INL	Assessment of the effectiveness of chlorine to inactivate spores in wash water from the decontamination process (i.e., Decontamination Line)

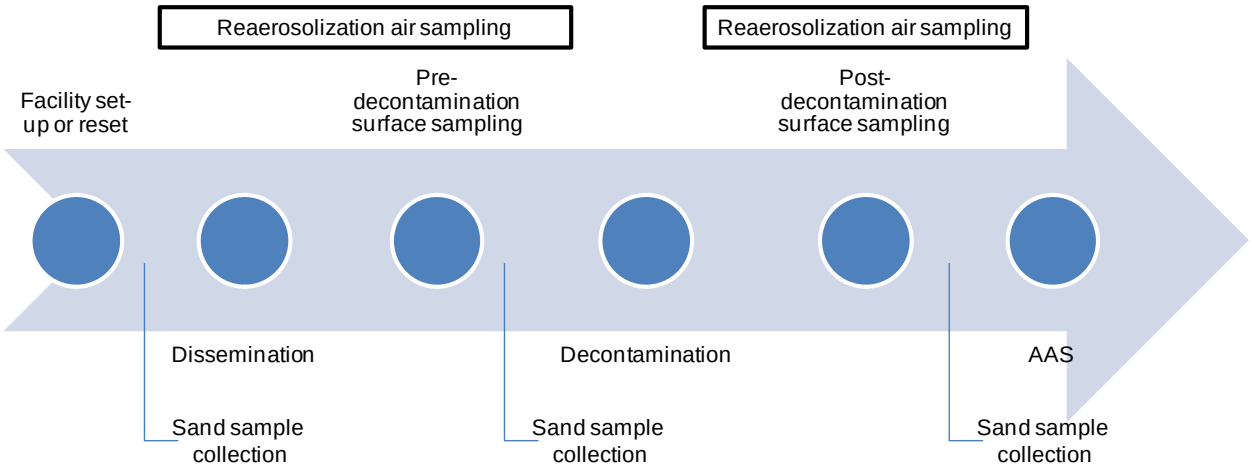

Figure 2-10. Timeline of sampling events within each round.

2.5.1. General Sampling Schedule

As discussed above, sampling (surface, air, sand, and water) was conducted at pre-specified times within each round. The actual dates of sampling events are shown in Table 2-6.

Table 2-6. Sampling event dates.

Sampling Event	Test Round	Dates	Test Round	Dates	Test Round	Dates
Background	MFP	April 14-15, 2011	N/A	N/A	N/A	N/A
Pre-decontamination	1	April 17-18, 2011	2	April 27-28, 2011	3	May 11-12, 2011
Post-decontamination	1	April 22-23, 2011	2	May 4-5, 2011	3	May 16-17, 2011
Air sampling for reaerosolization assessment	1	April 16-18, 2011 and April 22-23, 2011	2	April 26-28, 2011 and May 4-5, 2011	3	May 10-12, 2011 and May 16-17, 2011
AAS	1	April 23, 2011	2	May 6, 2011	3	May 17, 2011
Sand	1	April 16,18 and 23, 2011	2	April 25 and 26, 2011 and May 6, 2011	3	May 10, 12, and 17, 2011
Water	1	April 16-18, 2011 and April 22-23, 2011	2	April 26-28, 2011 and May 4-5, 2011	3	May 11-12, 2011 and May 16-17, 2011

N/A = not applicable

2.5.2. Sample Collection Teams and PPE

The sample collection effort was conducted by members of the National Guard Bureau Civil Support Teams (CSTs), U.S. Coast Guard (USCG) Pacific Strike Team, U.S. Marine Corps Chemical Biological Incident Response Force, INL, DTRA and EPA personnel. All sampling personnel received classroom training regarding sampling protocols and also received hands-on training on using the BROOM system.

Samplers wore level C PPE for sample collection which included Tyvek® suits, full-face respirators (air purifying or powered air purifying), booties, and nitrile gloves. The seams, including the Tyvek® hoods to the respirators, were taped to prevent exposure or cross-contamination. The only exception was that the sand sampling team was not required to wear a respirator for sample collection outside the facility (within the secondary enclosure) following the facility decontamination in each round. Each sampler wore a base pair of gloves. Samplers then donned several pairs of nitrile gloves over a base pair of gloves. One pair of gloves was removed before each sample was taken. Samplers donned additional gloves when they were down to the base pair. All personnel entering the test structure donned two pair of booties; one was removed prior to entering the building, and the other was removed before exiting the facility at the entrance to the Decontamination Line.

Additional information regarding sample team make-up and procedures is included with each sampling method section. The use of the above mentioned PPE was ito simulate sampling during an actual biological incident, although a benign surrogate was used in the BOTE Project.

2.5.3. Summary of Sample Collection Methods used during the BOTE Project

As discussed in Section 2.4 and summarized in Table 2-5, a number of different sample collection methods were used to achieve the BOTE Project objectives. Surface samples were used primarily to assess the contamination pre- and post-decontamination; the data were utilized primarily to assess the effectiveness of each decontamination method. Air monitoring data were utilized to provide feedback on the dissemination method (i.e., was it expected to achieve the target surface loading levels?), to assess the potential for reaerosolization, and during AAS. The sand samples were used to assess whether viable *Bg* spores might be detected as escaping the facility (but within the secondary enclosure) during the project activities. The water samples were utilized to assess the measurement methods for the potential detection of viable *Bg* spores in wash water from the decontamination process (i.e., decontamination line and Round 2 decontamination process). In addition, referee sampling methods were used to provide an indication of surface and air *Bg* concentration at specific times during each round of testing (i.e., during and immediately after dissemination).

Detailed descriptions of each sampling method are included in the following sections.

2.5.4. Surface Sampling Methods

Surface sampling was the primary method used to collect samples to determine surface concentrations or loading (CFU/ft^2) of *Bg* spores. The purpose of surface sampling was to characterize the extent of contamination (post-dissemination, also referred to as pre-decontamination) following the dissemination of a surrogate and after the application of a decontamination process (post-decontamination) to determine the effectiveness of the

decontamination for the three technologies used in each study area. Hence, surface sampling was done both pre- and post-decontamination within each round (see Figure 2-10) as well as during the MFP. As summarized in Table 2-5, sponge-stick wipes, swabs and vacuum socks were the primary collection methods used to evaluate the three decontamination technologies. These types of samples were utilized because they have typically been used to characterize *Ba* (or simulant) presence within facilities such as PBF-632[13, 14]. All study rooms and accessory rooms (i.e., those not having furnishings) were sampled before and after application of each decontamination approach. In addition, the HVAC system was sampled.

Versalon® wipes were also collected throughout the facility both pre- and post- decontamination to evaluate EPA's RV-PCR analytical method. Additional Versalon® wipes were also collected in Rooms 101A and 102 to determine surface contamination concentrations pre- and post-decontamination for the reaerosolization study.

Surface samplers were grouped into three person teams: the support/documentation person (Person A), the Supplier (Person B), and the Collector (Person C) (see Appendix C for more information on Sampler roles). Sampling carts were provided to each team and included: a sample kit box (including swabs, sponge-sticks, wipes, vacuum socks, and templates, as appropriate) for each room, a sample map detailing locations of each sample to be taken, bags of gloves for each member of the sampling team, markers, flashlight, vacuum, garbage bags, and separate bags into which to place collected samples. In addition to pushing/maneuvering the cart, Person A carried a hand-held radio and the BROOM personal digital assistant (PDA) that was used to scan samples, track the location of the sample, and record any observations of samples taken.

The sample collection procedures for each surface sample method were based upon validated CDC sampling methods (i.e., sponge-stick wipes and swabs)[62, 63] or recommended procedures (i.e., vacuum socks and wipes)[64, 65] for *Ba*. The sampling method protocols are found in Appendix C. Samplers utilized a paper template to standardize the collection area (size) for each sample and sample type. Each template was used for one sample only and then discarded. During pre-decontamination sampling, sampling teams used markers to outline the perimeter of the sampling area after a sample had been collected. Templates for post-decontamination samples were laid adjacent to the pre-decontamination sample (trying not to overlap, if possible). Samplers used sampling maps to identify which sampling method should be used on which surfaces and the order in which the samples were to be taken. Samplers took care not to step over or disturb areas that had not yet been sampled.

Detailed descriptions of each sampling method are provided in the following subsections. All sampling teams underwent on-site training, including proficiency testing, to promote use of the prescribed techniques.

2.5.4.1. Cellulose Sponge-stick Wipes

Cellulose sponge-stick wipes were used to sample hard nonporous surfaces such as desk tops, hard floors, tables, and nonupholstered chairs. An area of 10 in x 10 in was sampled with the sponge stick, using a disposable cardboard template. Samplers collected in the following

pattern: (1) using the flat side of the sponge stick, the surface was sampled using horizontal S-strokes, covering the entire template area; (2) the sponge stick was then flipped over to the opposite side to sample the surface in a vertical pattern, covering the entire template area; (3) using a narrow edge of the sponge stick, the surface was sampled using the same S-strokes but applied diagonally across the template; and (4) the tip of the sponge stick was then used to sample the perimeter of the sampling area. The sponge-stick wipes come pre-moistened.

2.5.4.2. Macrofoam Swabs

Pre-moistened macrofoam swab kits were used on nonporous hard-to-reach surfaces including air vents, computers, and pictures. Swabs were taken using a 2 in x 2 in disposable cardboard template. Samplers utilized the same S-stroke horizontal, vertical, and diagonal sampling procedure rotating the surface of the swab 90° with each step.

2.5.4.3. Vacuum Socks

Vacuum socks were used to collect samples on porous surfaces including carpet, unfinished wood, concrete, cinderblock, cloth furniture, file cabinet drawers, book-laden bookshelves, and ventilation filters. Vacuum sampling used a 2 ft x 2 ft disposable cardboard template and a fresh disposable sock/nozzle attachment to collect the sample. Holding the nozzle at a 45° angle and placed onto the sample area, samples were taken using the same S-strokes in the horizontal and vertical direction.

2.5.4.4. Versalon® Wipes

As summarized in Table 2-5, Versalon® wipe samples were utilized for both the reaerosolization study and assessment of RV-PCR. The pre-moistened wipes were used to sample hard nonporous surfaces including, but not limited to, desktops, filing cabinets, hard floors, and the UV-APS units (plastic). Wipes also used the 10 in x 10 in disposable cardboard template. The wipe was folded into quarters, and, using two fingers, the sampler used the same four-step sampling pattern of horizontal S-strokes, vertical S-strokes, and diagonal S-strokes of the sample area. After each step, the wipe was folded inward to expose a clean sample collection surface.

2.5.5. Air Sampling Methods

During the BOTE Project Phase 1, sampling teams conducted air sampling during the different events within each round. Air samples utilizing SKC BioSamplers® and UV-APS measurements were taken specifically in Rooms 101A and 102 related to the reaerosolization study. Air samples using the Dycor XMX/2L-MIL Aerosol Collection System and Mattson-Garvin Model 220 slit-to-agar sampler were taken during the AAS assessment after post-decontamination surface sampling within each round.

A description of these air sampling instruments and methods is found in the following subsections.

2.5.5.1. SKC BioSamplers®

The SKC BioSampler® (SKC Inc., Eighty Four, PA) is a bioaerosol and airborne particle collection device that traps airborne microorganisms in swirling liquid for subsequent analysis. The SKC BioSampler® is made of glass and consists of three parts: inlet, nozzle section (with

three tangential sonic nozzles), and collection vessel. The three nozzles of the SKC BioSamplers® are designed to work as sonic orifices. Each orifice allows approximately 4.2 L/min of air to pass through when the pump establishes a downstream pressure of 15–30 pound-force per square inch gauge (psig). SKC BioSamplers® achieve a flow rate of approximately 12-14 L/min during active sampling. During the study, a DryCal flowmeter (DEFENDER 510, SKC Inc., Eighty Four, PA) was utilized to confirm flow, and values were recorded.

The SKC BioSamplers® were remotely controlled and powered via the Bio Sampler Test System (BioSeq-12) (developed by Honeywell Technology Solutions Inc., Morris Township, NJ) as diagrammed in Figure 2-11. The BioSeq-12 is a protective housing case and vacuum manifold system that contains multiple redundant vacuum pumps with inlet check valves. If one pump failed, a check valve closed on the failed pump allowing the second pump to continue to pull a vacuum on the system through metered flow restrictors and remotely controlled flow meters to record and report air flow (used for data reduction) for the active samplers.

The vacuum pumps attached to each BioSeq-12 system were operated within sealed ruggedized cases (Pelican Cases, Pelican Products, Tempe, AZ) to prevent biological contamination and to guard against any potential corrosion caused by the decontamination methods. These pumps were located exterior to Rooms 101A and 102 and were connected to the instruments with inert nonconductive polyethylene tubing run through the walls. In addition, the sealed cases were ventilated to allow for air intake as well as cooling of the pumps inside the cases. The air drawn in from the ventilation system was passed through a High Efficiency Particulate Air (HEPA) filter to prevent contamination in the system from outside the building.

All parts of the SKC BioSamplers® were sterilized via autoclave prior to use. All parts of the SKC BioSamplers® were maintained as a set because each inlet, nozzle, and collection vessel is not interchangeable with other SKC BioSamplers®. Each SKC BioSampler® part had an etched part number to assist in maintaining organized SKC BioSamplers®.

Prior to placement for sampling, 15 milliliters (mL) of sterilized Phosphate Buffer Solution plus 0.05% Tween® 20 (PBST), pH 7.4, was aseptically pipetted into the SKC BioSampler® collection vessel. The SKC BioSampler® collection vessel was then assembled with a clean sterilized inlet and nozzle in an aseptic area (in the off-site microbiology lab). The complete SKC BioSampler® was then placed in a bag and wrapped in foam for transport. These SKC BioSamplers® were then placed in the Pelican Cases and taken to the testing facility. Care was used to ensure that the SKC BioSamplers® maintained an upright position at all times to avoid leakage or loss of the sampling media during transport.

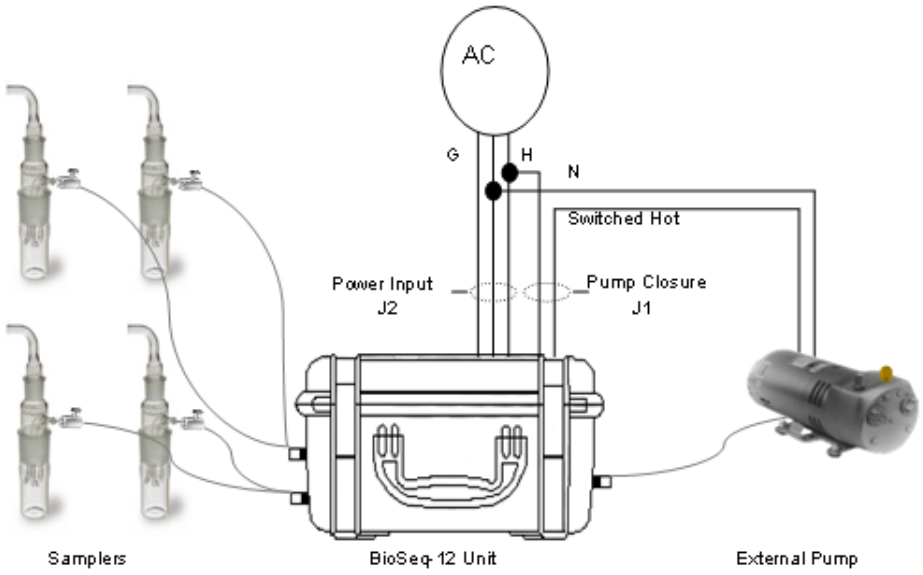

Figure 2-11. Instrumentation setup and remote design using the BioSeq-12.

All SKC BioSamplers® were labeled and tracked using bar codes attached to the actual samplers and each sample location. This information was recorded and scanned by field personnel using the BROOM PDA and iPad, both during SKC BioSampler® setup and during sampler removal. The information recorded on the BROOM PDA and iPad was then uploaded or synced to a database to maintain records of each SKC BioSampler® (sampling time and location). More information on the use of the iPad can be found in Appendix M.

2.5.5.2. Model 3314 UV-APS™ Spectrometer

The Model 3314 UV-APS™ spectrometer (TSI Inc., Shoreview, MN) measures the aerodynamic diameter, scattered light intensity, and fluorescence intensity of individual airborne particles in real time. Samples are collected by drawing sheath (clean) and particle-laden (sample) air through the UV-APS with respective flow rates of 4.0 L/min and 1.0 L/min. The aerodynamic diameter based on time-of-flight principles and particle counts based on light scattering can be found from the UV-APS laser measurements. The UV-APS also measures the fluorescence properties of individual particles, thus allowing for the distinction of biological particles from nonbiological particles. Particle fluorescence is excited by a pulsed ultraviolet laser and is collected real-time using a photomultiplier tube. Because these instruments measure particle number (particle number (N)/cm^3), knowledge of particle density is required to convert to mass concentration (mg/m^3).

The UV-APS was initially factory-calibrated to identify sizing characteristics for each size bin processed by the UV-APS. Additionally, a calibration unit was used to perform field-level day-of-

test calibrations. The mobile calibration system consisted of a Model 3014B Filtered Air Supply (FAS) (TSI Inc., Shoreview, MN), which filters, dries and regulates the air pressure provided to the rest of the system setup. The FAS was connected to a Model 3076 Constant Output Atomizer (COA) (TSI Inc., Shoreview, MN) that generates aerosols with particles of known size from a liquid suspension. The output of the COA is evacuated through a Model 3062 Diffusion Dryer (DD) (TSI Inc., Shoreview, MN), which dries the output using silica gel with minimal aerosol loss. Pressurized air is forced through the FAS at 60 psig and stepped down to 32 psig for routing to the COA. A suspension of nonfluorescent polystyrene latex beads at 1.034 µm was used for primary calibration in the COA (at a concentration of 0.5 mL/L). The output from the COA was then dried in the DD and sampled using the UV-APS system.

While no adjustments to the factory calibration were made during the calibration process on site, the factory calibration was verified at the 1.0 µm range and at the 0.5 µm range using a separate 0.5 µm bead suspension.

2.5.5.3. Dycor XMX/2L-MIL Aerosol Collection System

The Dycor XMX/2L-MIL Aerosol Collection System (Dycor Technologies Ltd., Edmonton, Alberta, Canada) sampler is an aerosol separator and high mass flow concentrator system designed for sampling spores under harsh field conditions (see Figure 2-12). The Dycor XMX/2L-MIL Aerosol Collection System collects high volumes of air, strips away the large dust particles and very small micro-debris and concentrates the particles of interest (respirable range of 1 to 10 µm diameter) through a two-stage virtual impactor. The Aerosol Collection System samples the air at a rate of 530 L/min, and the particles are collected onto a dry 37 mm three-piece cassette filter with a 0.8 µm pore mixed cellulose ester filter, which is then removed and soaked in sterile PBST solution for further analysis. According to the manufacturer, the Aerosol Collection System has demonstrated collection efficiencies between 55 and 88% for 1.9 to 5 µm particles in wind speeds of 2 kilometers (km)/hr and 54 to 84% in wind speeds of 8 km /hr. Sample collection can be triggered remotely by a switch or by a biodetector such as the Dycor Technologies Ltd. C-FLAPS (Dycor Technologies Ltd., Edmonton, Alberta, Canada). The collection system is a portable device that weighs 17 kilograms (kg) (37.5 lb) and measures 58 cm x 46 cm x 33 cm (22.8 in x 18.1 in x 12.9 in).

Calibration of the flow rate was performed before and after sampling using two types of calibrated mass flow meters with capacities to measure from 0 to 1,000 liters per minute (Lpm). After collection, each filter was left in the sample cassette filter holder and sent to the appropriate laboratory for analysis.

Figure 2-12. Dycor XMX/2L-MIL Aerosol Collection System.

2.5.5.4. Mattson-Garvin Model 220 Slit-to-Agar Sampler

The Mattson-Garvin Model 220 slit-to-agar (Barramundi Corp., Homosassa Springs, FL) sampler is a device that utilizes a rotating stage that holds a Petri plate. The air impacts the surface of the agar with whatever bioaerosols are present and the organisms impinge directly onto the nutrient agar. The plate is then incubated, and the organisms are allowed to grow. This process eliminates the need for extraction of spores from a sampling medium. The slit-to-agar sampler draws air through a 0.152 mm slit at 28.3 L/min ($1ft^3$/min) and impinges the particles upon an agar surface 2 to 3 mm below the slit. The distance from the calibrated slit to the agar surface is critical for proper impingement. The cut point particle size was 0.53 µm. The agar is contained in a standard commercially available 150 mm disposable Petri plate that is rotated by a synchronous drive motor. The rate of rotation can be varied by the interchangeable drive motors. For the BOTE Project (and in situations where low or no target organisms are expected, as is the case with post-decontamination sampling), the 60-min drive motor was utilized, resulting in one revolution of the plate in 60 min. After sampling, the plate was incubated and the colonies counted. This count reflects the number of target organisms collected from the sampled air. No dilution or plating steps were required. Results were expressed as viable particles or CFU per unit of air, and a time-concentration relationship was determined.

Figure 2-13. Mattson-Garvin Model 220 Slit-to-Agar Air Sampler.

2.6. Test Design and Sampling Methodology

To accomplish the objectives defined in the BOTE Project, utilizing the sampling methods described in Section 2.5 required different yet nonexclusive sampling and test designs related to each objective. For each objective, sampling strategies were developed to determine the types, numbers, and locations of the samples. The total numbers of samples of each type for each round are presented in Table 2-7. The numbers of quality control (QC) samples (i.e., blanks) are reported in parentheses. These numbers are in addition to the sample numbers listed for each sampling event (e.g., MFP, Round 1 Pre- or Post-decontamination). When N/A is reported, the sampling method was not used in the specified sampling event. The laboratory in parentheses next to the sampling method indicates the location where the samples were analyzed (e.g., INL, LRN). The sampling and testing designs or strategies related to each major objective/sub-objective guiding the development of the matrix shown in Table 2-7 are described in the following subsections.

Table 2-7. Type and number of samples collected during each BOTE Project round.

Sampling Method (Laboratory)	Floor	MFP	Round 1		Round 2		Round 3		Total
			Pre	Post	Pre	Post	Pre	Post	
RMCs (INL)	1	NA	30	NA	30	NA	30	NA	90
	2	NA	24	NA	23	NA	24 (3)	NA	71 (3)
Settling Plates (INL)	2	NA	24	NA	24	NA	24	NA	72
Sponge-stick wipes (LRN)	1	14 (3)	95 (11)	93 (10)	109 (10)	130 (10)	89 (16)	85 (11)	615 (71)
	2	12 (2)	77 (8)	79 (7)	95 (8)	105 (8)	77 (8)	77 (8)	522 (49)
Vacuum socks (LRN)	1	14 (3)	49 (10)	48 (10)	45 (7)	8 (3)	44 (10)	42 (10)	250 (53)
	2	13 (2)	47 (7)	46 (8)	18 (5)	4 (3)	42 (8)	40 (8)	210 (41)
Swabs (LRN)	1	5 (1)	13 (8)	11 (5)	10 (5)	1 (1)	11 (5)	11 (5)	62 (30)
	2	5 (2)	10 (8)	9 (5)	9 (6)	0	10 (5)	10 (5)	53 (31)
Versalon® wipes (INL)	1	5 (1)	20 (2)	20 (2)	20 (2)	20 (2)	20 (2)	20 (2)	125 (13)
Versalon® wipes (LLNL and EPA [Ft. Meade])	1	8 (2)	10 (8)	59 (8)	21 (8)	38 (8)	10 (6)	60 (8)	206 (48)
	2	7 (2)	NA	NA	NA	NA	NA	NA	7 (2)
SKC BioSampler® (INL)	1	NA	72 (24)	18 (6)	72 (24)	18 (6)	72 (24)	18 (6)	270 (90)
XMX (INL)	1	NA	NA	9 (3)	NA	9 (3)	NA	9 (3)	27 (9)
STA (INL)	1	NA	NA	9 (3)	NA	9 (3)	NA	9 (3)	27 (9)
Sand (EPA and USGS*)	Secondary Containment	NA	40 (2)	20	40 (2)	20 (1)	40 (3)	20 (1)	180 (9)
	1	NA	2	2	2	2	2	2	12
	2	NA	2	2	2	2	2	2	12
Wash water grab sample (INL)	NA	NA	4	NA	8	4	4	NA	20
Wash water ultrafiltration sample (INL)	NA	NA	4	NA	8	4	4	NA	20

*U.S. Geological Survey

2.6.1. Decontamination Efficacy Assessment

A primary objective of the BOTE Project was to assess the effectiveness of three different decontamination methods for a facility as a function of controlled parameters (e.g., bacterial spore surface loading [i.e., degree of contamination], facility type [e.g., residential or commercial]). Surface sampling results from pre- and post-decontamination were compared to assess the effectiveness of the decontamination method that was applied within a test round. A statistically-based sampling plan was designed for this assessment. This design focused on a determination of the number of samples required to achieve the desired confidence in the ability to discern differences in efficacy. This statistical analysis is included as Appendix J.

Three decontamination methods were chosen based on results that had been obtained in laboratory studies. An interagency group examined the best available science for decontaminating a facility that has been contaminated with a *Bacillus* species and selected three separate approaches:

- fumigation with H_2O_2 using STERIS vaporized hydrogen peroxide (VHP®);
- surface decontamination using pH-adjusted bleach (amended bleach); and
- fumigation with ClO_2.

The BOTE Project provided an opportunity for operational testing of the performance of these three decontamination approaches. A general overview of each decontamination method is included in Section 2.10.The decontamination methods and the results are discussed in detail in Sections 4.1.1, 4.1.2, and 4.1.3 for Rounds 1 through 3, respectively.

2.6.2. Wash Water Collection and Treatment

For the BOTE Project, water from the washdown of personnel exiting the contaminated building and going through the decontamination line was collected for each sampling event in a 55-gallon (gal) drum and chlorinated to test the effectiveness of chlorine treatment of wash water under field conditions. The wash water was analyzed for pH, Total Suspended Solids, Free Chlorine, Turbidity, and Chemical Oxygen Demand and the presence of *Bg* spores before and after chlorination. Sampling and analysis were conducted by INL on site or in the INL Laboratory. Because relatively few spores were expected to be present in the collected PPE washdown water, a field-portable ultrafiltration water concentrator device developed by EPA and INL[66] was used to concentrate *Bg* spores into 450 mL wash water samples for analysis. Grab samples of wash water from the barrels were also collected and analyzed.

The BOTE Project Decontamination Line consisted of three chambers including an entry area connected to the building, a personnel washdown area, and an exit area leading to the outside. As they exited the building and before entering the Decontamination Line, sampling personnel doffed outer gloves and booties and deposited them in a waste container. Sampling personnel then turned over contaminated equipment and waste materials to Decontamination Line personnel who disinfected them with bleach wipes (Dispatch® Hospital Cleaner Disinfectant Towels with Bleach, The Clorox® Company, Oakland, CA). Sampling personnel then entered the PPE washdown area, stepping into a pool where they were sprayed down with tap water through a hose connected to a building faucet. Decontamination Line personnel scrubbed the

feet of the individuals using a scrub brush dipped in a bucket of tap water containing Spartan Blue-Glo detergent (Spartan Chemical Company , Inc., Maumee, OH) before they exited the pool and entered the exit area. Periodically, collected water was transferred to a 55-gal drum using a submersible pump. Sampling personnel doffed PPE and disinfected masks in the exit area prior to exiting. Water was generally collected over two days of sampling activity to obtain the amount needed for the subsequent inactivation studies. Collected wash water remaining after each sampling event was turned over to INL for disposal.

Decontamination Line PPE wash water was collected, sampled, and treated at five different points during the BOTE study as follows:

- Following dissemination in Round 1;
- Following dissemination in Round 2;
- During pH-adjusted bleach decontamination;
- During post pH-adjusted bleach decontamination sampling; and
- Following dissemination in Round 3.

For each sampling event, PPE decontamination wash water was pumped from the collection pool into a 208 L (55 gal) metal drum with a plastic disposable liner insert. Each drum liner was marked on the inside using an indelible ink marker to indicate water level when 146 L (38.5 gal) had been added (calculated based on dimensions of the actual drum used). Each drum was filled to the 146 L mark. If less than 146 L was collected during the sampling event, nonchlorinated tap water was added to fill the drum to the 146 L mark and the amount of water added was noted. One drum containing 146 L of water was collected for each sampling event, and sampling and analysis were conducted when this volume was achieved.

To ensure adequate mixing of chlorine and additives, an electric barrel mixer was attached to the side of the drum and run periodically while the sampling and inactivation procedures were being conducted. Because the wash water contained surfactant from the foot washing procedure, 5-7 mL of Antifoam A (Y-30, Sigma A5278, Sigma-Aldrich Corp., St. Louis, MO) was added and the wash water in the drum was mixed for a period of two minutes at the beginning of the sampling procedure to minimize foaming that could impair operation of the ultrafiltration concentrator device. Immediately after mixing, the temperature of the water in the drum was measured using a digital thermometer (Traceable® 15-077-9E, Control Company, Friendswood, TX) and noted.

Three 600 mL and one 1 L grab samples were collected from the drum. For each 600 mL sample collected, aliquots were distributed into appropriate vials for the individual analyses. The 1 L sample was used for total suspended solids analysis. The following water quality parameters were measured following the instructions in the manufacturers' operation manuals compiled by INL and described in the BOTE QAPP[59]:

- pH level (YSI Professional Plus pH Meter, Serial number #11B 101328, YSI Inc., Yellow Springs, OH).
- Total Suspended Solids (Orbeco-Hellige MC500 Colorimeter, Orbeco-Hellige Inc., Sarasota, FL).

- Free Chlorine level, analyze immediately (DPD Method using Orbeco-Hellige MC500 Colorimeter).
- Turbidity level (Orbeco-Hellige TB200 Turbidimeter, Orbeco-Hellige Inc., Sarasota, FL).
- Chemical Oxygen Demand (Acid-dichromate Method using Orbeco-Hellige MC500 Colorimeter).
- *Bg* enumeration following the LRN "*B. anthracis* Spore Environmental Wipe Processing Procedure" included in the BOTE Project QAPP[59]. (Note: sample volumes for the membrane filter were 10 mL done in triplicate for wash water samples). Samples were not heat-treated for any of the five sampling events.

Upon completion of grab sample collection, the barrel mixer was switched on and the ultrafiltration concentrator device operated following procedures described in the BOTE Project QAPP[59] to process 72 L (19 gal) of the wash water contained in the collection drum. The concentrator device uses the principles of tangential flow filtration to concentrate microbes and other particles present in a large volume of water to a smaller volume sample. The concentration step was added because the *Bg* spore concentration of the grab samples was expected to be below the detection limit of the microbiological analytical method for sampling events that did not include the spiking of spores to the collected wash water prior to sampling. Concentrating samples was expected to increase the likelihood of capturing an adequate number of spores needed to measure the effectiveness of chlorine inactivation. In this study, concentrated samples had a volume of 450 mL. *Bg* enumeration of the concentrated sample was performed by INL.

Following this initial pre-chlorination concentration step, the remaining water in the drum (approximately 72 L) was treated by chlorinating using bleach. Before adding the bleach solution, the mixer was switched on. The volume of bottled bleach (Clorox® bleach, 6% sodium hypochlorite) needed to achieve a 1/20 dilution was calculated to be 3.8 L (1 gal) of bleach to 72 L of water. Bleach was added to the drum and a laboratory timer set to 15 min was started. After one minute of mixing following the addition of chlorine, the water temperature was measured, and a grab sample was collected and analyzed for pH and free chlorine concentration. The volume of sodium thiosulfate needed to quench the chlorine residual was calculated to be 977 g anhydrous or 1,533 g hydrated form added to 72 L (the amounts were based on the assumption that 2 moles of sodium thiosulfate quenches 1 mole of sodium hypochlorite). At 15 min, sodium thiosulfate was added to the drum, and the free chlorine level was measured. If the free chlorine level was still above the detection limit, more sodium thiosulfate was added, and the free chlorine level was measured again. Samples were collected from the drum and water quality parameters were measured following the procedures described above. Samples were analyzed for *Bg*.

The remaining quenched wash water in the drum was concentrated using the ultrafiltration concentrator device to obtain a 450 mL sample and analyzed for *Bg*.

Log reduction (LR) was calculated as follows:

$$LR = \log_{10} (N_O/N_T)$$

Equation 2-1

where N_O is the starting number of cells, and N_T is the number of cells at time T.

2.6.3. Assessment of the RV-PCR Method

Versalon® wipe samples were collected and analyzed for the presence of *Bg* spores before and after decontamination with fumigants and surface disinfectants. A selected number of Versalon® wipe samples from both pre- and post-decontamination sampling were analyzed by the RV-PCR method at LLNL. The accuracy of the RV-PCR method was evaluated by comparison with traditional culture-based methods. Accordingly, the sample extract following spore removal was split into two equal parts, with one part used for RV-PCR analysis and the other part used for culture analysis after appropriate concentration. Additionally, as a practice run, the scientists from Microbiology Laboratory Branch (MLB) of the EPA Office of Pesticide Programs (OPP) at Ft. Meade, MD, also processed and analyzed a subset of the samples following the same protocol.

2.6.4. Aggressive Air Sampling Assessment

The objective of the use of AAS in the BOTE Project was to assess the results post-decontamination compared to surface sampling as a function of air sampler type. In general, the AAS process consists of isolating a location, applying air pressure to a surface with a leaf blower to attempt to reaerosolize any spores on the surface and collect airborne spores via high volume air sampling. This sampling methodology has been used for biothreat agent air sampling by drawing a known volume of air through a dry filter and/or impacting particles directly upon agar. The filters and/or agar plates are then sent to a laboratory for analysis. These sampling and analysis procedures, which may be varied or changed as required depending on site conditions, equipment limitations or limitations imposed by the procedure are standard (i.e., typically applicable) methods. The AAS process employed in the BOTE Project is described in detail in the following subsections.

2.6.4.1. Aggressive Air Sampling Methodology

An AAS protocol was utilized that incorporated two air sampling collection methods, including Dycor® XMX/2L-MIL Aerosol Collection Systems (XMX) and Mattson-Garvin Model 220 slit-to-agar (STA) air samplers, to provide a secondary evaluation of decontamination effectiveness. The sample collection procedures for each of these methods were based upon accepted protocols from the USEPA's Asbestos Hazard Emergency Response Act requirements, good industrial hygiene practices, and past methods recommended by Technical Working Groups during the 2001 Anthrax attacks. AAS was conducted by applying the applicable methods related to USEPA's Asbestos Hazard Emergency Response Act requirements.[38]

Aggressive air sampling was conducted in two first-floor rooms during Rounds 1, 2, and 3, after the post-decontamination surface sampling was completed. Prior to the beginning of air sampling, forced air equipment (i.e., one horsepower mechanical leaf blowers) was used to direct a jet of air toward all surfaces in a room for a period of 20 min to dislodge and re-aerosolize any remaining contamination. In addition, two 16 in oscillating floor fans were

positioned in the room to increase air circulation and maintain mixing of air in the room. Subsequently, three high volume air samplers (two XMXs and one STA) collected air samples to measure airborne *Bg* in the room. In addition, one XMX and one STA sampler collected air samples in adjoining areas outside the rooms to determine if there was any migration of contamination outside the rooms. INL analyzed all AAS air samples. A photograph of an example room is shown in Figure 2-14; visible are the two oscillating fans, STA (on the stove), one of the two XMX units (middle of floor) and sampling personnel using the leaf blower.

Previous large-scale facility fumigations required that AAS be done throughout the entire facility, even in areas where no *Ba* contamination was found during the facility contamination characterization process. The rationale for this approach is that spores, once made airborne by activities within a facility, have the potential to move anywhere within the facility via existing air currents. It is therefore important to ensure that post-contamination AAS is performed everywhere in the facility, even in areas where contamination has not previously been identified. However, for the BOTE Project, the AAS was not conducted as a mandatory clearance method or primary measurement for decontamination efficacy assessment. The AAS was therefore conducted only in two designated rooms. In general, to ensure that AAS data are characteristic of all usage airspace throughout a facility, all rooms and hallways would be evaluated.

Detailed description of sampling equipment and sample collection procedures for each method can be found in Appendix D, and detailed sample analysis materials and procedures can be found in Section 2.9. The total number of samples collected by event, room, and method can be found in Table 2-8.

Figure 2-14. Photograph of AAS being performed in Room 105 during Round 1.

2.6.4.2. Aggressive Air Sampling Area Preparation

2.6.4.2.1. Pre-cleaning Surfaces

No pre-cleaning of surfaces was done as part of the AAS procedure in the BOTE Project. This decision was based upon the following circumstances: (1) the study rooms were newly refurbished, and levels of dust and debris were therefore very low; and (2) AAS was used after decontamination procedures were completed. However, in past *Ba* remediation actions, prior to AAS, rooms or areas that had abundant surface residue (dust and debris) that may have interfered with sampling media analysis due to increased particle loading were further cleaned by washing, wiping and/or HEPA-vacuuming.

2.6.4.2.2. Establishing Isolation

Integral to the successful completion of past AAS efforts during *Ba* remediation actions was the assurance that airflow within the specific area being sampled remained isolated from adjoining areas. In the BOTE Project test facility, isolation was maintained only between the two floors and not between rooms or areas on each floor. Some isolation between rooms may have been provided by the drop ceiling within each room. In addition, the room door was kept closed when the rooms were sampled to minimize the migration of air outside the rooms, and the facility HVAC unit was not operated during the AAS operation. The drop ceiling was removed as part of the Round 2 decontamination procedure; therefore, the drop ceiling was not in place for the Round 2 AAS in the sampled rooms.

Any air infiltration through window frames, other penetrations in the walls, and floors must be minimized. Minimizing air leaks will lessen the amount of air to be exhausted to maintain adequate negative pressure in the enclosure. The BOTE Project facility secondary enclosure maintained negative pressure environments between the interior of the facility and the surrounding areas outside the secondary enclosure.

2.6.4.2.3. Establishing a Negative Pressure Environment

Due to the small size of the rooms (under 2,500 ft^3 in volume), the large flow rate of the negative air machines (NAMs) on-site (2,000 cubic feet per minute [CFM]), the logistical constraints of reconfiguring the NAMs, and the constraints on time, the rooms that were sampled were not maintained under negative pressure to the neighboring rooms or the interior of the facility during the AAS operation.

For reference, the premise of AAS is to collect samples that have the highest probability of detecting any potential reaerosolized spores. To accomplish this objective, NAMs and isolation practices may be used to establish a pressure differential of at least 0.02 in (0.5 mm) of water, and room air exchanges should be kept at a minimum to ensure that as many respirable particles in the disturbed air (that potentially contains spores) pass through or onto the aerosol sampling media. To determine the number of NAMs needed for each enclosure to be sampled, calculations that determine volume of the enclosure, required airflow, and NAM capacity are used. Critical barriers established with the facility can help establish a negative pressure enclosure that maintains the spatial integrity of the area being sampled. HEPA-filtered portable ventilation units (NAMs) should be placed at one end of the enclosure and used to achieve the negative pressure environment by exhausting air outside the enclosure. “Make-up air” should come mainly from an airlock at the opposite end of the enclosure. This air should be HEPA-filtered to prevent any contaminants from entering the facility. This setup places the air inside the enclosure at a negative pressure relative to the outside air.

While AAS was conducted inside each of the two rooms, additional air samples were collected with XMX and STA samplers placed outside the rooms in an adjacent zone (hallway) to document if any potential migration of contamination had occurred. AAS was performed simultaneously in each of the two rooms on the first floor. If AAS was conducted in more rooms/areas in the facility, the operation would have started in areas previously known to be least contaminated and moved to those areas known to be more contaminated.

2.6.4.3. Sampling Strategy

While the facility (not specific rooms) was maintained under negative pressure, all surfaces were aggressively agitated, and the room air was continuously disturbed while air samples were being collected. The goal was to use air sampling methods that maximize the likelihood of detecting any residual contamination.

To evaluate the AAS procedure, two rooms were sampled (Rooms 105 and 106). Each of the two rooms (105 and 106) to be sampled is 18.6 m^2 or 226 ft^2 and 42.7 m^3 or 1,700 ft^3. The drop ceiling in each of the rooms resulted in a lower actual room volume than utilizing facility

specifications of 3 m or 10 ft ceiling heights. However, the drop ceiling tiles were removed during the pH-adjusted bleach decontamination and were not present during that AAS event.

A total of 90 samples (72 air samples and 18 field blanks) were collected during the AAS procedure and analyzed for *Bg* by culture and enumeration. Thirty samples were collected following each decontamination event. The 90 samples were collected as detailed in Table 2-8.

Table 2-8. AAS sample locations, types, and numbers.

Facility Area	Number of XMX Samples	Number of STA Samples
Room 105	6 one-hr + Field Blank	3 one-hr + Field Blank
Room 106	6 one-hr + Field Blank	3 one-hr + Field Blank
Hallway outside Rooms 105 and 106	3 one-hr + Field Blank	3 one-hr + Field Blank
Total per decontamination event	15 + 3 Field Blanks	9 + 3 Field Blanks
Total	45 + 9 Field Blanks	27 + 9 Field Blanks

Two rooms were sampled during each of the three decontamination events, and each of the eight collectors (four XMXs and two STAs in the two rooms and one XMX and one STA in the hallway outside the two rooms) collected three samples, resulting in 24 air samples per decontamination event. In addition, six field blanks were collected for each decontamination event, resulting in a total of 30 samples collected (18 XMX samples [12 inside rooms, 3 hallway, 3 blanks] and 12 STA samples [6 inside rooms, 3 hallway, 3 blanks]) for each decontamination event. The total number of samples collected for the three decontamination events resulted in 90 samples. Lastly, two media blank samples were submitted for analysis.

2.6.4.4. Sampling Procedures

The AAS sampling procedures described in the following subsections were prepared to provide standardized methods for industrial hygienists or other trained samplers under the direction of sampling experts to use when sampling for *Ba* spores. These procedures are meant to be used for collection of samples in indoor environments. AAS guidance should be updated as new information becomes available. Product manufacturer recommendations, LRN guidance and best professional judgment were followed. Detailed sampling equipment and sample collection procedures for each method can be found in Appendix D.

2.6.4.5. Sampling Team Organization and Roles

Personnel were grouped into three, three-person AAS teams, with one person assigned as the team supervisor to coordinate activities. Each of the two rooms to be sampled had an independent sampling team; an additional team was assigned to conduct the sampling in the hallway. The sampling teams were formed during an initial training session for AAS. Sampling teams were organized to perform each aspect of the air sampling process effectively, including identification of sampling points, placement of sampling equipment, collection of samples,

decontamination of sample containers and equipment, and packaging and shipment of air samples.

The roles of AAS collection team members were carefully defined to ensure conformance with good aseptic techniques. Each team had two sample collection people and one support/documentation person. Sample collection team members were responsible for donning, removing and disposing of nitrile gloves donned specifically for sampling purposes over standard PPE. Each person put on and removed a new pair of gloves at each sampling location. Once each sample collection team member donned a pair of gloves for sampling, that person replaced these gloves immediately if they touched any surface or object other than their equipment/supplies. All discarded gloves were placed in a large plastic bag that was taken out of the building and decontaminated. Once the sample collection person donned a new pair of nitrile gloves at a given sampling location, he did not touch anything other than the aerosol sampler filter assembly piece and the sample filter cassette being installed or removed or, in the case of STAs, the agar plate.

The support/documentation person was responsible for handling and setting up all sampling equipment and supplies, and for the proper documentation of all sampling activities, including completion of checklists and initiating the chain of custody using the BROOM PDA. The support/documentation person handled sample containers and sample bags for the sample collection people, but at no time did the support person come into direct contact with the sample filter or agar plate. The support/documentation person made sure nothing passed over the sample container or sample bag and kept the sample containers and sample bags closed at all times when not specifically required being open for the purpose of sampling.

2.6.4.6. Initial Sampling Team Training Session

Prior to beginning AAS, an initial training session was conducted for all personnel involved. This initial training session included a detailed explanation and thorough demonstration of the Standard Operating Procedures (SOPs) developed for AAS and surface sampling in the BOTE Project (see Appendices C and D). The SOPs for surface sampling that also applied to AAS tasks included sample location marking, equipment placement, sample preparation and collection, sample decontamination, and shipment.

As part of initial training, each sampling team member was required to demonstrate proficiency in performing each applicable SOP. Proficiency was shown through satisfactory completion of a hands-on demonstration of each applicable SOP. The initial training session included an in-depth discussion of the importance of following proper aseptic technique when collecting and handling samples to prevent possible cross-contamination. The most common sources of cross-contamination were from dust, air movement and people. Sampling personnel were properly trained to prepare and handle sampling equipment and materials to minimize cross contamination potential from these sources. A written record was made of all personnel who had successfully completed initial training for AAS procedures.

2.6.4.7. Sampling Equipment and Supplies

All XMX air sample filters were loaded into the sample filter cassette assemblies under aseptic laboratory conditions by the manufacturer prior to being brought to the site for labeling. Preparation of STA samples was not necessary because commercially manufactured agar plates were used. A staging area where materials needed to be stored and assembled to complete sample collection was established in the Sampling and Decontamination Support Trailer, outside the facility (see Figure 2-8). All sampling supplies were individually packed and pre-labeled prior to entering the facility to begin sampling activities both to reduce the potential for cross-contamination and to reduce the complexity of performing sample collection activities while wearing the prescribed PPE. To limit the potential for cross-contamination further, only equipment and supplies to be used during a given day's sampling activities were brought into the facility.

2.6.4.8. Sample Collection

During the BOTE Project, AAS was conducted on the day of surface sampling or the day after, surface sampling was complete, prior to the receipt of any surface sampling results. In real contamination scenarios, AAS would likely begin after the results of clearance surface sampling had been received (based upon past use), and a determination had been made that no viable *Ba* spores (culture technique) had been found. If viable *Ba* spores were detected through surface sampling, AAS would not begin until further remedial activities were performed in that area, and subsequent surface sampling had demonstrated that no residual contamination remained.

Prior to the start of each post-decontamination sampling event, the volumetric flow rate of each air sampler (XMX and STA) was measured with a high volume dry cell airflow calibrator (0-1,000 Lpm, Aalborg, Orangeburg, NY), adjusted as needed, and recorded. Next, the calibration sampling media in each air sampler were replaced with sampling media for collecting the first AAS sample within the round. Approximately fifteen minutes prior to the start of the sampling event, all team members made building entries and were responsible for bringing equipment and supplies into the facility. Once sampling personnel arrived at their designated sampling locations in the facility, all team members set up and plugged in equipment. Once all aerosol samplers at the location were ready to sample, one team member remained in each room, closed the office door, turned on the oscillating fans and simultaneously activated all aerosol samplers. The team member remaining in each room agitated all surfaces with a 1-horsepower leaf blower (i.e., Toro Power Sweep Electric Blower, Model # 51585, The Home Depot, Atlanta, GA) for a period of 20 min. When the agitation phase was completed, all aerosol samplers continued to sample for three total hr, collecting three, one-hour samples each. The filters were aseptically removed from the filter assembly and placed in pre-labeled sample containers. Sample start and stop times were recorded for determination of the total air sampling time.

After the first iteration of sample collection (one hr), the sample collection team members donned a new pair of gloves and aseptically removed the sampling media from each air sampler and placed the exposed sampling media in individual pre-labeled sample containers or bags. A new collection medium was put in each air sampler for collection of the second one-hr sample. During the three total hr of sample collection, sample collection team members were

responsible for installing and removing the XMX filter assembly into and from the XMX sampling manifold and the STA agar plate into and from the aerosol samplers and nothing else, until sampling was completed. Aerosol sampler airflow rates were monitored periodically during the sampling period. At the conclusion of the three-hr sampling period, all aerosol samplers were stopped and the final sample filters aseptically removed from the filter assembly pieces and placed in pre-labeled sample containers or bags.

The support/documentation person assisted the sample collection team members in opening and closing the sample container or agar plate sample bag. Once the sample container or agar plate bag had been sealed, the support/documentation person placed a tamperproof custody seal on the bag. The custody seal listed the date and time of sample collection and the initials of the support/documentation person. The sample container or agar plate sample bag was then placed into an outer Ziploc® bag to prevent decontamination solutions from entering or smudging the sample ID number during decontamination of the outermost sample container. All air samples were sent to the INL Microbiology Laboratory for analysis.

2.6.5. Assessment of *Bacillus* Spore Migration from Inside to Outside a Contaminated Building

Laboratory-prepared sand samples (Petri dishes containing sterilized sand) were placed directly outside the test facility, within the secondary enclosure, around the building near entrances, exits and high traffic areas. Duplicate samples were collected from each location at specified times during each round within Phase 1 of the BOTE Project. Samples were collected before dissemination to assess background levels of the test organism, after dissemination to assess spore transport, and after decontamination of the interior of the building to assess if spores remained detectable in dishes outside the facility over the course of the round (because only the interior of the building was decontaminated, no significant decrease in detectable spores outside the building was expected to occur). Additionally, two sets of laboratory-prepared sand samples were placed within the building to acquire field positive samples, one set on each floor.

The details of the methods are described in the sections below.

2.6.5.1. Selection of Sample Matrix

Six *in situ* soil samples had been collected exterior to the BOTE Project building in the fall of 2010. Surface grab samples were analyzed by USGS using the same techniques as described in Appendix F. Four of the six samples collected were positive for *Bg* at estimated concentrations ranging from 30-900 spores/g of soil. Due to the presence of elevated background levels of *Bg* in the test area, a clean soil matrix was required. Pro-Com® silica sand (Cat. # 4315024) purchased from a local hardware store (Cincinnati, OH) was used as the capture medium. The decision to utilize fresh sterile sand was based on several factors. Because the soil from the BOTE Project test site had been characterized by the USGS prior to conducting the BOTE Project and was found to be contaminated with *Bg* from previous exercises, sterile samples were needed to reduce the potential for confounding background contamination. A matrix needed to be selected to limit inhibition of the analytical technique (qPCR). qPCR is a rapid molecular biology technique that identifies the presence of a specific DNA sequence in a sample; the sequence selected in this study targeted the *recF* gene of *Bg*

DNA[35]. This method does not indicate viability of the sampled cell or spore, and known interferences and inhibitors of the qPCR process such as calcium, excessive levels of magnesium, and humic acid are likely to be found in native soil. A balance must be achieved between the primers, reaction temperatures, DNA, and magnesium for a successful PCR assay to take place[67]. The amount of PCR product may be reduced if magnesium levels are inadequate[67] or magnesium is unable to bind with the DNA polymerase[68]. However, excessive magnesium concentrations can actually prevent complete denaturing of the DNA and reduce the available product as well[67]. Calcium can also compete with magnesium and reduce the reaction efficiency and total amount of PCR product[69]. Humic acids are a product of biodegradation of organic matter in soil. For environmental samples, these compounds are the most frequently mentioned inhibitor of PCR and can cause false negative results[70, 71]. Studies suggest that humic acids may also hinder PCR efficiency by limiting the amount of DNA template available for the reaction[69]. Previous studies confirm these geochemical properties of sand vs. soil[72].

Geochemical analysis of the sterilized sand was performed by Midwest Laboratories, Inc. (Omaha, NE). The average total concentrations as determined through dissolution and inductively Coupled Argon Plasma detection were 8,037 (±1,372) parts per million (ppm), 183 (± 56) ppm, and 1.38 (± 0.24) ppm for calcium, magnesium, and zinc, respectively.

Microbiological analysis was also performed on the sterilized sand to confirm the absence of *Bg* by the EPA laboratory (Cincinnati, OH) prior to the start of the BOTE Project. Aliquots of sterilized sand were cultured in TSB overnight. After incubation, the enriched broth was plated onto agar plates and incubated overnight again before the final determination. All sand aliquots were deemed sterile after double enrichment. USGS separately assessed sterile sand samples for *Bg* presence prior to the start of the BOTE Project through two separate analyses. DNA was directly extracted from aliquots of sand, while additional aliquots of sand were enriched in TSB overnight at room temperature before DNA extraction. No *Bg* DNA was detected within the sand samples. Therefore, the reference sand was free of *Bg* prior to the experiment and was a suitable matrix for the remainder of the project.

2.6.5.1.1. Laboratory Preparation of Sample Matrix and Containers

Fifty gram aliquots of sand were placed into aluminum weigh boats and then heat-sterilized (250 °C for 10 hr). After sterilization, 50 g of the cooled sand was aseptically transferred to sterile polystyrene (150 mm) Petri dishes at EPA (Cincinnati, OH). The top and bottom of each Petri plate wase then sealed with Parafilm® (Pechiney Plastic Packaging Company, Chicago, IL) and secured with cellophane tape. The sealed samples were bagged in lots of ten, boxed, and shipped to INL prior to the project.

2.6.5.1.2. Preparation of Sampling Kits

Once on site, each laboratory-prepared Petri dish containing sand was labeled with a barcode (placed on the bottom of the Petri dish). Each sand sample was then placed in a Ziploc® bag by itself, and a corresponding barcode was placed on the outside of the bag. Dishes were then organized into sample placement boxes according to sampling round and event. Each round had samples stacked in one box for pre-dissemination (background) sample placement and

then a second box that contained placement kits for placing both the post-dissemination and the post-facility-decontamination samples at the same time. The Round 1 (VHP®) background samples were not individually bagged but instead were stacked in the sample collection box without any bag. This design flaw, corrected for Round 2 and Round 3, might have introduced contamination to the samples (i.e., blanks for Round 1 were positive). The Round 1 samples were subsequently removed from statistical analysis. Collection kits (individually bagged empty Petri dish and 14 in x 1 in [35.6 cm x 2.5 cm] piece of Parafilm®) were also assembled into boxes before each sample collection event and round and were labeled with barcodes. All supplies were stored under ambient conditions prior to placement.

2.6.5.2. Sand Sampling Process

Laboratory-prepared sand samples were placed within the secondary enclosure, around the building near entrances, exits, and high traffic areas. Duplicate samples (Samples A and B) were collected from each location at the specified times during the event. Samples were collected before dissemination, after dissemination, and after decontamination. The samples collected within the secondary enclosure following decontamination were not directly decontaminated. Two sets of laboratory-prepared sand samples were placed within the building, one on each floor, to acquire field positive samples within the two concentration environments. These laboratory-prepared sand samples were placed prior to spore dissemination and were collected after dissemination and after decontamination. The purpose of collection of the indoor samples after decontamination was to assess PCR inhibition due to the presence of decontamination agents. See Table 2-10 for a full description of sample collection/placement procedures, sample purpose, and blanks.

2.6.5.3. Placement and Retrieval of Sand Dishes

EPA sampling personnel placed the laboratory-prepared sand samples in the designated sampling locations. As each of the sand samples was placed, the lid was removed and discarded. The sand samples were placed within orange-painted trays to aid visibility and tracking of samples and to minimize location inconsistencies among the three testing rounds. Within the building, the sand samples were placed in locations that minimized the risk of disturbance due to foot traffic and activity. On the first floor, the sampling tray was located in the reception area (see Figure 2-2) under the counter. The tray on the second floor was placed on the floor in a corner of the hallway (see Figure 2-3). Trays were taped down within the building to minimize movement. Samples were placed in an order that avoided walking by the sample tray multiple times to prevent contamination during the placement process. Two personnel were needed for the placement process: one to carry and provide supplies and one to place the sand samples. Placement with two people averaged approximately 45 minutes per event.

Sampling personnel collected samples from the trays at the designated time: pre-dissemination, post-dissemination, or post-decontamination. Samples were retrieved in the same order as placement for each decontamination technology event. A list of the sampling site locations is reported in Table 2-9. Retrieval started with Tray 1 and personnel moved counterclockwise around the building (Figure 2-15). Personnel then entered the second floor of the building and collected at location B2, passed through the airlock and down the stairwell to the first floor to collect B1, and then exited from the tent to the decontamination area.

Site blanks and trip blanks were retrieved midway through the sampling process, at Tray 5, away from tent entrances throughout the exercise. Site blanks were opened on site, immediately closed, and retrieved. Trip blanks were carried to the sample site but remained unopened. Additional site blanks were collected during post-decontamination sampling during Round 2 (pH-adjusted bleach decontamination process) and Round 3 (fumigation with ClO_2) and post-dissemination during Round 3 (see Table 2-10). Tracking labels with barcodes were affixed to the individual sand samples and each tray. After exposure, the sand samples were capped with new lids, sealed with Parafilm® and office tape, and individually bagged. During retrieval, labels were scanned into the BROOM system for tracking the timestamp and tray location.

The BOTE Project protocol used for the retrieval process can be found in Appendix F. Three personnel were required for sample retrieval, one supplier, one collector, and a separate individual to operate the BROOM tool. A third person dedicated to the BROOM allowed for the collection process to move efficiently. Retrieval of all samples averaged approximately 1.25 hr per event. See Table 2-11 for actual dates and times of collection.

Table 2-9. Sand sampling site locations.

Label	Sample Site Description
1	Secondary Enclosure sample located in the northwest corner of the Secondary Enclosure, to the left side of personnel doorway.
2	Secondary Enclosure sample located just north of Floor 1 entrance, under the staircase.
3	Secondary Enclosure sample located just south of Floor 1 entrance near the walkway.
4	Secondary Enclosure sample located in the southwest corner of the Secondary Enclosure, near the negative air machine (NAM) tubing.
5	Secondary Enclosure sample located along the south wall of the Secondary Enclosure, near a UV-APS pump. Trip blanks and site blanks were also collected at this location.
6	Secondary Enclosure sample located at the southeast corner of the Secondary Enclosure, near NAM tubing.
7	Secondary Enclosure sample located along the eastern wall of the Secondary Enclosure, between the two building doorways.
8	Secondary Enclosure sample located just to the east of the Secondary Enclosure exit.
9	Secondary Enclosure sample located just to the west of the Secondary Enclosure exit.
10	Secondary Enclosure sample located along the north wall of the Secondary Enclosure, next to a UV-APS pump.
B1	Control positive sample located within the building on the first floor.
B2	Control positive sample located within the building on the second floor.

Table 2-10. Description of sand sample placement and purpose.

Round	Sample Set	Schedule	Total # of Samples (Not including blanks)	Purpose	Blanks
1	Pre-Dissemination	Place during R1 setup/retrieve before R1 dissemination	Secondary Enclosure: 20	Assess spore pre-dissemination levels	Site blank and trip blank
			Building: 0	N/A	
	Post-Dissemination	Place before R1 dissemination/retrieve after R1 dissemination reference sampling	Secondary Enclosure: 20	Assess spore migration from building and spore presence following dissemination	N/A
			Building: 2	Assess concentration of deposited spores into test containers; provide positive control	
	Post-Decontamination	Place before R1 dissemination/retrieve after R1 decontamination reference sampling	Secondary Enclosure: 20	Assess spore presence amassed throughout entire round via spore migration from building	N/A
			Building: 2	Determine if analytical interference occurs from decontamination process	
2	Pre-Dissemination	Place during R2 setup/retrieve before R2 dissemination	Secondary Enclosure: 20	Assess spore pre-dissemination levels	Site blank and trip blank
			Building: 0	N/A	
	Post-Dissemination	Place before R2 dissemination/retrieve after R2 dissemination reference sampling	Secondary Enclosure: 20	Assess spore migration from building and spore presence following dissemination	N/A
			Building: 2	Assess concentration of deposited spores into test containers; provide positive control	
	Post-Decontamination	Place before R2 dissemination/retrieve after R2 decontamination reference sampling	Secondary Enclosure: 20	Assess spore presence amassed throughout entire round via spore migration from building	Site blank
			Building: 2	Determine if analytical interference occurs from decontamination process	
3	Pre-Dissemination	Place during R3 setup/retrieve before R3 dissemination	Secondary Enclosure: 20	Assess spore pre-dissemination levels	Site blank and trip blank
			Building: 0	N/A	
	Post-Dissemination	Place before R3 dissemination/retrieve after R3 dissemination reference sampling	Secondary Enclosure: 20	Assess spore migration from building and spore presence following dissemination	Site blank
			Building: 2	Assess concentration of deposited spores into test containers; provide positive control	
	Post-Decontamination	Place before R3 dissemination/retrieve after R1 decontamination reference sampling	Secondary Enclosure: 20	Assess spore presence amassed throughout entire round via spore migration from building	Site blank
			Building: 2	Determine if analytical interference occurs from decontamination process	

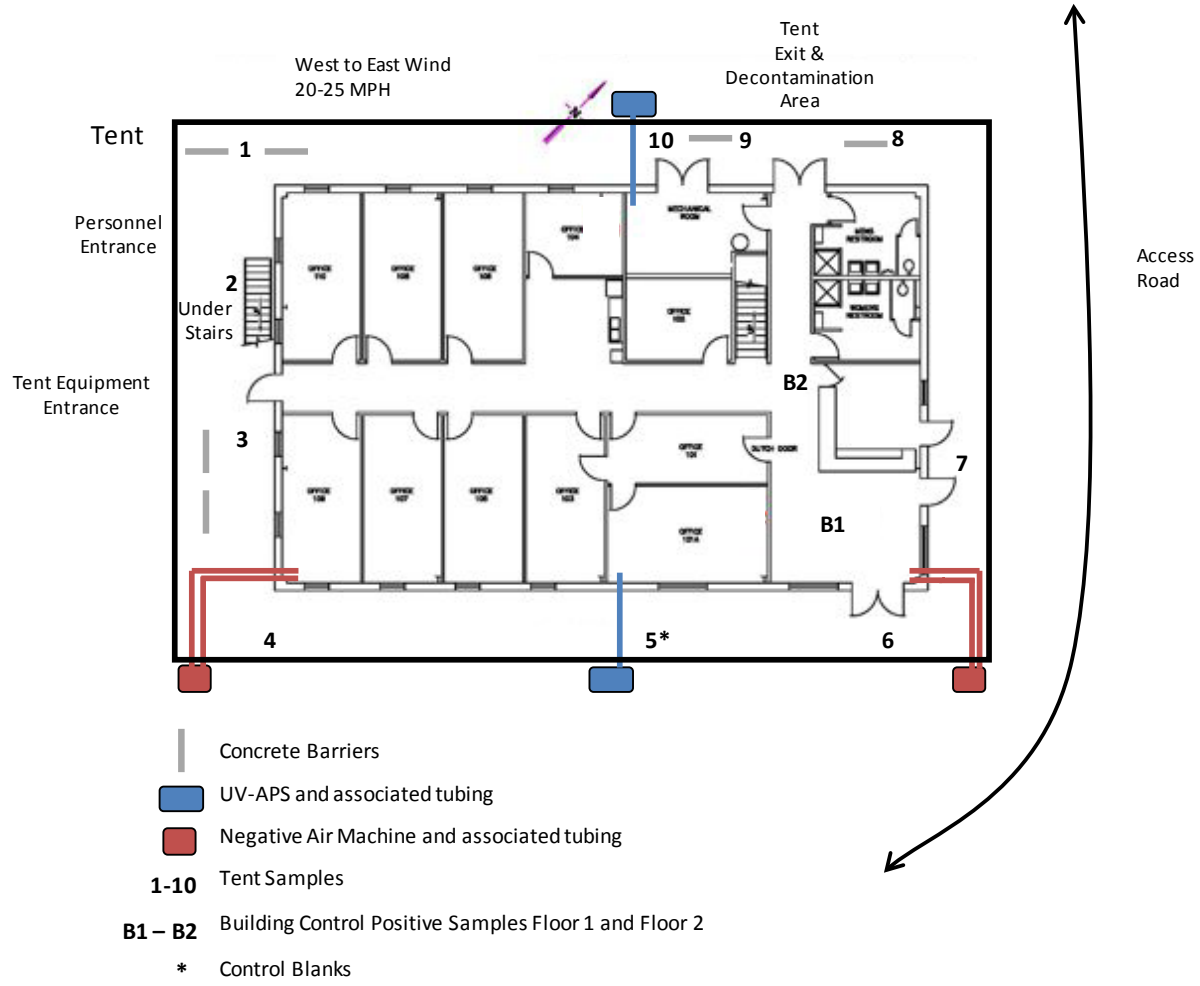

Figure 2-15. Schematic of sample placement during the BOTE Project.

Table 2-11. BOTE Project sand sample schedule.

Date / Time	Action	Time In Place	Number of Sampling Personnel
April 14, 1700*	Place R1 Pre-Dissemination Samples		2
April 16, 0817	Retrieve R1 Pre-Dissemination Samples	39.25 hr	3
April 16, 0945	Place R1 Post-Dissemination and Post-Decontamination Samples		2
April 16, 1317	R1 Dissemination		
April 18, 1123	Retrieve R1 Post-Dissemination Samples	49.75 hr	2
April 19-21	R1 VHP® Decontamination		
April 23, 0838	Retrieve R1 Post-Decontamination Samples	167 hr	3
April 23, 1200*	Place R2 Pre-Dissemination Samples		2
April 25, 0805	Retrieve R2 Pre-Dissemination Samples	45 hr	3
April 25, 0901	Place R2 Post-Dissemination and Post-Decontamination Samples		2
April 25, 1415	R2 Dissemination		
April 26, 1551	Retrieve R2 Post-Dissemination Samples	30 hr	3
April 28 – May 4	R2 Amended Bleach Decontamination		
May 6, 0822	Retrieve R2 Post-Decontamination Samples	262.5 hr	3
May 6, 1413	Place R3 Pre-Dissemination Samples		3
May 10, 0834	Retrieve R3 Pre-Dissemination Samples	90.25 hr	3
May 10, 1100*	Place R3 Post-Dissemination and Post-Decontamination Samples		2
May 10, 1515	R3 Dissemination		
May 12, 0804	Retrieve R3 Post-Dissemination Samples	45 hr	3
May 13-15	R3 ClO_2 Decontamination		
May 17, 1300	Retrieve R3 Post-Decontamination Samples	170 hr	3

*Denotes estimated time, data not available.

2.6.6. Reaerosolization Assessment and Measurement Protocols

Air sampling was conducted to capture and potentially characterize reaerosolization. Airborne *Bg* spore concentrations were measured in indoor air in two rooms (Room 101A and 102) of the BOTE Project test facility using SKC BioSamplers®. The SKC BioSamplers® collected airborne spore samples from three locations per room and three heights per sampling location at five

different time stages. Additionally, the UVAPS units took continuous measurements in these reaerosolization study rooms. The sampling design for the reaerosolization study is detailed in the following subsections.

2.6.6.1. Sampling Design and Layout

The SKC BioSamplers® were installed in both rooms (Room 101A and 102) prior to dissemination. Forty-eight SKC BioSamplers® were initially placed in each room, with the final twelve samplers placed in each room after decontamination occurred. Four samplers were placed at each of the four specified heights (12 in (low), 24 in (blank), 36 in (medium) and 48 in (high) from the floor) at each of the three locations in each room. There were three SKC BioSamplers® run at a time at each sampling location in the room as specified below. Due to the configuration of the SKC BioSamplers®, lack of vacuum pressure, and the minimal air movement in the room, passive sampling was not expected to occur with these instruments. The blank SKC BioSampler® inlets were left uncovered during test events with no vacuum hoses connected.

2.6.6.2. Testing and Measurement Protocols

Fifteen-min long SKC BioSampler® samples were collected at five different time stages (background, dissemination, prior to surface sampling, during characterization [pre-decontamination] surface sampling, and after decontamination [post-decontamination] surface sampling) for each decontamination round (See Table 2-12). Sampling was limited to 15 min per SKC BioSampler® due to sampler fluid limitations; further sampling would have resulted in evaporation of the sampling media and would have skewed the results. During each of the three decontamination rounds, the first samples (Background/Stage 1) were drawn 30 min prior to the initial dispersion of spores into the building. The second stage of sampling (Dissemination/Stage 2) was taken 10 min after dispersion of the spores in the building. The second stage had three individual sampler sets; each set was sampled for 15 min totaling 45 min total sampling time for the second stage. The third set of samples was taken 30 min prior to the entrance of personnel into the facility for characterization (pre-decontamination) surface sampling (before Pre-Decontamination Surface Sampling/Stage 3). The fourth set of samples was taken during characterization surface sampling (Pre-Decontamination Surface Sampling/Stage 4), again each set was staggered at intervals of approximately 15 min, totaling 45 min total sampling time. This stage was coordinated with the surface sampling team's movement through the room to try to capture reaerosolization of deposited spores (see Table 2-12). The fifth set of samples was taken post-decontamination during clearance (post-decontamination) surface sampling (Post-Decontamination Surface Sampling/Stage 5). Three field blank samples were collected per room for each of the five sampling stages; field blank samplers were not turned on. The staggered timing design attempted to be as representative as possible across the times, sampling locations, and sampling heights (see Table 2-13 and Table 2-14).

After the sampling was complete, SKC BioSamplers® were collected in whole units and not disassembled. The SKC BioSamplers® were collected, sealed within a bag, wrapped with foam and transported using a Pelican Case. All individual sample containers were sealed to prevent contamination during transport and properly labeled with the sample identification. Samples were transported immediately after collection/removal from rooms. Collection/removal of the first

four stages of samples occurred immediately following pre-decontamination surface sampling. The fifth stage of samples was placed prior to post-decontamination surface sampling and collected/removed and transported immediately following post-decontamination surface sampling. All SKC Bio-samplers® were labeled and tracked using scanable barcodes on each individual sampler.

Table 2-12. SKC BioSampler® stages.

Timing	Description
Stage 1: Background	
T-30 min to Dissemination	Samples Taken Prior to Dissemination
T-0 Dissemination	Initiate Dissemination
Stage 2: Dissemination	
T+10 min After Dissemination Initiation	Samples Taken During Dissemination
Stage 3: Before Surface Sampling	
T-30 min Prior to Entry	Samples Taken Prior to Personnel Entry
Stage 4: Pre-Decontamination Surface Sampling	
T+15 min Post Entry	Samples Taken During Wipe Sampling
Stage 5: Post-Decontamination Surface Sampling	
T+15 min Post Entry	Samples Taken After Decontamination During Wipe Sampling

Table 2-13. Staggered timing design for SKC BioSamplers® during dissemination (Stage 2) and pre-decontamination surface sampling (Stage 4) for all three rounds.

Round	Room	Time min	Location 1 Height	Location 2 Height	Location 3 Height
1	1	0-15	L	M	H
1	1	15-30	M	H	L
1	1	30-45	H	L	M
1	2	0-15	M	H	L
1	2	15-30	L	M	H
1	2	30-45	H	L	M
2	1	0-15	H	M	L
2	1	15-30	L	H	M
2	1	30-45	M	L	H
2	2	0-15	L	H	M
2	2	15-30	M	L	H
2	2	30-45	H	M	L
3	1	0-15	M	L	H
3	1	15-30	L	H	M
3	1	30-45	H	M	L
3	2	0-15	H	L	M
3	2	15-30	L	M	H
3	2	30-45	M	H	L

Table 2-14. Staggered timing design for SKC BioSamplers® during post-decontamination surface (Stage 5) sampling for all three rounds.

Round	Room	Time min	Location 1 Height	Location 2 Height	Location 3 Height
1	1	0-15	L	M	H
1	1	15-30	H	L	M
1	1	30-45	M	H	L
1	2	0-15	M	L	H
1	2	15-30	H	M	L
1	2	30-45	L	H	M
2	1	0-15	H	M	L
2	1	15-30	M	L	H
2	1	30-45	L	H	M
2	2	0-15	L	H	M
2	2	15-30	H	M	L
2	2	30-45	M	L	H
3	1	0-15	M	H	L
3	1	15-30	H	L	M
3	1	30-45	L	M	H
3	2	0-15	H	L	M
3	2	15-30	M	H	L
3	2	30-45	L	M	H

In addition, two UV-APS units were placed in PBF-632 building on the first floor. One UV-APS was placed inside Room 101A, and the second UVAPS was placed in Room 102. To prevent contamination, the UV-APS units were enclosed within a ventilated Pelican Case and maintained operating temperatures within the range of 50-104 degrees Fahrenheit (°F). Both UV-APS units were remotely operated through an RS-232 to Ethernet media converter and wired into the Ethernet switch located outside the building. Computer control of the system was performed through manufacturer-supplied software (Aerosol Instrument Manager® Software for Aerodynamic Particle Sizer).

The UV-APS collected samples continuously from 60 min prior to dissemination until building clearance. The Pelican Case was left in the facility for VHP® decontamination (Round 1) but was removed from the facility for the pH-adjusted bleach decontamination process (Round 2) and fumigation with ClO_2 (Round 3).

2.7. Sample Tracking and Shipping

The BROOM[60] PDA was used by sample collection teams to track sample location, sample types, sample matrices, date, time, samplers, and other pertinent data. BROOM comprises both a hardware and software solution set. The hardware is commercial off-the-shelf (COTS) equipment that was used in the data collection phase (i.e., during sampling). The software was used both on the COTS hardware and on a laptop to communicate with the COTS hardware and provide the data management and data analysis capabilities. As part of the hardware, a PDA was used by the sampling teams to manage data acquisition. A laser range finder connected to the PDA was used to determine indoor x, y, z locations. The software on the PDA provided the following capabilities during the BOTE Project sample collection:

- Predefined sampling locations shown on the facility floor plan on the PDA, with pan and zoom capabilities;
- Laser rangefinder positioning and touch screen capability to record or locate (respectively) the position of a sample;
- Documentation of the sampling method (e.g., swab, sponge-stick wipe, wipe, or vacuum sock), the area sampled, the orientation of the sampled surface (e.g., vertical or horizontal upward), the texture of the surface (e.g., smooth or porous), the type of surface (e.g., wallboard or carpet), and notes about any observations;
- Scan unique barcode label on each sample collected;
- Capture and storage of pictures for each sample entry; and
- Signature capture of the user on completion of sampling for record of chain of custody.

The PDA data were uploaded to the BROOM system server located in the sampling prep trailer (Location 2 in Figure 2-8). The server software provided the following capabilities that were used during the BOTE Project:

- Ability to query the data by a number of means (e.g., pop-up information balloons);
- Filter or cull the data to be displayed (e.g., look at swab samples only);
- Display any photos that were taken during sampling;
- Design of sampling plans (e.g., statistical, random, or gridded);
- Sampling design optimization using geostatistical models and optimization routines;
- Geostatistical analyses to produce maps of the nature and extent of contamination, uncertainty maps, and the probability of exceedance of a user-specified concentration;
- A unique geostatistical algorithm that accounts for the influence of walls and open doorways;
- Mapping using an inverse-square distance method; and
- Ability to import/export in various formats (e.g., .csv, Excel, XML, KML).

Relevant sample identification data such as barcode ID, location information, and surface and sample type were captured on the PDA by the sampling teams. This information was then

uploaded and stored in the BROOM database. The database also stored any photos taken using the PDA during the sampling process.

Environmental surface samples (sponge-stick wipes, Versalon® wipes, swabs, vacuum socks) were collected by EPA-led sampling teams during the BOTE Project as described in the previous section. The samples were collected using pre-labeled and barcoded sample/specimen kits provided by EPA. The sampling kits included all supplies needed to collect, label and package each sample. As each sample was collected, sampling personnel entered the data into the BROOM PDA and scanned the bar code on the sample bag. Next, the samples were placed into a specimen transport bag, decontaminated and packaged appropriately for shipping. The BROOM system was used to generate chain of custody (COC) forms, which were completed on site and shipped with the samples. The samples were transported overnight in a cooler at 35 °F to the specified laboratories listed in Table 2-5, to conduct the analysis (EPA, LRN, LLNL, and USGS). Samples were packaged and shipped in high quality Styrofoam boxes with cardboard overpack (i.e., Polyfoam Packers or Thermosafe). Each cooler contained a temperature and relative humidity (RH) data logger (Onset Computer Corp., HOBO U10 #U10-003). Samples were gathered and shipped by INL Laboratories through an EPA Interagency Agreement (DW89923315).

All sand samples were collected by EPA-led sampling teams during the BOTE Project as described in the previous section. Collected sand samples were transferred to the INL support staff for packaging and shipping after scanning the bar- code and decontaminating the outer transport bag. No ice or cold packs were used for shipment. Samples were shipped using FedEx® priority overnight to the EPA AWBERC. A total of 214 sand samples were collected and transported to EPA. COC forms generated by the BROOM system were included with each shipment.

2.8. Cross-Contamination Reduction Methods

Several methods were employed during the BOTE Project to prevent cross-contamination and included secondary enclosure of the facility, personnel entry methods, and decontamination of samples and personnel leaving the building. Each method will be discussed below.

The first effort to prevent cross-contamination included the use of a polymeric secondary enclosure structure which was fitted over PBF-632 by INL as shown in Figure 2-7. This structure served as a barrier to assist in preventing contamination of the surrounding area during the testing. An additional secondary containment tent was also placed directly over the building by Sabre during fumigation with ClO_2.

The second method utilized to prevent the spread of contamination was establishing a single entry point to the facility and a single exit point at a location different than the entry point. It is recognized that this idea may not be possible in all situations due to various factors such as building structure (limited entry points), space available to set up decontamination line, location and magnitude of contamination, and wind direction.

The third method of cross-contamination prevention included precautions taken by sampling personnel prior to, during, and following sampling. Samplers donned all PPE except respirators in the sample preparation trailer (Location 2, Figure 2-8). (Note that the the trailer was divided into two distinct areas: PPE storage/donning and sample preparation.) PPE consisted of full face-piece air purifying respirator (or powered air purifying respirator) with P100 cartridges, hooded Tyvek® suits with attached booties, and a base pair of nitrile gloves. The base pair of gloves and respirator were typed to seal openings. Respirators and used cartridges remained outside the sample preparation trailer (and break and recovery trailer) at all times to prevent contamination from entering the trailer via used respirators.

After entering the secondary enclosure structure and before entering the PBF-632 facility, samplers doffed one pair of booties to aid in preventing secondary contamination from outside the test bed. This is especially important for clearance sampling so that any potential outdoor contamination is not brought into the facility. Once in the building, samplers used a fresh pair of gloves prior to handling each new sample or any time personnel may have touched a contaminated surface. Use of a three-person sampling team, which included Person A (BROOM operator), Person B (supplier), and Person C (collector), allowed aseptic techniques to be used during sampling. Person A handled the BROOM PDA and all communication on the two-way radio. Person B provided prepared sampling materials to Person C and was the only person to handle sample bags before and after sampling. Person C handled only the sampling device (swab, sponge-stick, wipe, vacuum sock). After collection, the samples were placed into large bags, one for each sample type, which were attached to each cart used by each sampling team.

Sampling teams entered the building in stages, with the first team collecting samples in the hallway or other areas that might be disturbed by foot traffic. Samplers followed the sampling maps provided, taking care to sample first near doorways or in areas that might be disturbed by foot traffic. Sampling teams on the first floor did not enter the second floor to prevent bringing spores from the higher contamination level to the lower contamination level. Personnel on the second floor moved through an airlock to enter the stairwell and then proceeded to the first floor exit.

The last effort to prevent cross-contamination included a Decontamination Line. After all samples were collected, and the BROOM PDA operator signed the COC form and uploaded the BROOM data, samplers proceeded to the first floor exit. Samplers doffed the last pair of booties before exiting the building and entering the Decontamination Line. Samplers kept one pair of nitrile gloves over their base pair while in the Decontamination Line. Roles were assigned for each member of the sampling team to streamline the decontamination process. Person A broke down cardboard sample boxes and wiped unused sample kits with Dispatch® bleach wipes (Medline Industries, Mundelein, IL). Person A then entered the Decontamination Line. Person B wiped each sample bag with Dispatch® bleach wipes and then packed the sample bags into large Ziploc® bags. (Note: Dispatch® bleach wipes are not proven sporicidal for use against *Ba* spores. The bleach wipes were used here for contamination control related to the use of the surrogate spores, *Bg*.) The exterior of the large Ziploc® bags was also wiped with Dispatch® wipes and then transferred outside the Decontamination Line for shipment to the appropriate analytical laboratory. Person B then proceeded to the Decontamination Line. Person C was in

charge of wiping down the cart, vacuum, flashlight, and markers with Dispatch® wipes and disposing of trash. If Person C completed tasks before Person B, Person C assisted with the task of wiping sample bags to allow Person B to go through the Decontamination Line to move personnel quickly through decontamination.

The Decontamination Line was set up in a tent immediately outside the secondary enclosure structure and consisted of washing, rinsing, and doffing stations. Personnel exiting the facility first removed the top layer of gloves and booties and placed them into trash bags located at the facility exit and entry way to the Decontamination Line. The personnel then stepped into the first pool; samplers were rinsed with water and their feet were washed and scrubbed with soapy water by the decontamination team. Care was taken to step into the second pool and not back into the first pool after each foot was scrubbed. Walkers were placed between pools to aid in balance. The second pool was used to rinse personnel with clean water. After stepping into the third pool, samplers removed the last layer of gloves, were assisted with removing the Tyvek® suit, and the decontamination team wiped down the exterior of the sampler's respirator with Dispatch® bleach wipes. After stepping out of the pools to the final Decontamination Line area, samplers were assisted with removing and cleaning (the interior) their respirators. Respirator cartridges were either discarded or tape was placed over the opening to prevent contamination outside the facility.

2.9. Sample Analysis Methods

The LRN laboratories, INL, LLNL, EPA, and the USGS conducted sample processing for the Phase 1 project samples (See Table 2-5 and Table 2-7). The analysis methods for each sample type are described in the sections below.

2.9.1. Surface Sample Analysis Methods

Surface samples were analyzed for viable *Bg* by either the LRN or INL, in accordance with standardized procedures (see Appendix E). All surface samples intended for use in the assessment of decontamination effectiveness were analyzed via the LRN. Surface samples used for assessment of RV-PCR and reaerosolization were analyzed by LLNL and INL, respectively. All samples were analyzed for quantifiable viable *Bg* using dilution plating methods. Surface samples with less than 30 CFU present at the lowest dilution were to be filter-plated to attain lower detection limits. The analysis procedures are described in detail in the following subsections. The difference in the selection point for triggering filter plating was dependent upon the intended use of the data. LRN data only were used for the assessment of decontamination effectiveness. This difference is not significant with respect to reported data by any analysis method used in the BOTE Project.

2.9.1.1. Analysis of Environmental Surface Samples by the LRN

The LRN is a network of Federal, State, and Local laboratories that was formed to increase the Nation's capacity to respond to bioterrorism incidents as well as to new and emerging diseases that threaten public health. The LRN's mission is to develop, maintain and strengthen an integrated national and international network of laboratories that can respond quickly to needs for rapid testing, timely notification and secure messaging of results associated with acts of biological or chemical terrorism and other high priority public health emergencies.

The following LRN laboratories participated in the BOTE Project Phase 1, analyzing 1,937 samples:

- Dallas County Health and Human Services;
- Idaho Bureau of Laboratories;
- Florida Department of Health Bureau Laboratories;
- Minnesota Department of Health;
- State Hygienic Laboratory at the University of Iowa;
- Virginia Division of Consolidated Laboratory Services;
- Unified State Laboratories: Utah Public Health; and
- Wadsworth Center, New York State Department of Health.

To replicate to the greatest extent practicable the procedures likely to be used following an actual bioterrorism incident, the LRN was tasked with receiving and analyzing surface samples from the BOTE Project. Procedures for sample processing and culture analysis were identical to the methods outlined for *Ba* but amended for *Bg* where necessary.

At a minimum, LRN laboratories conducted all procedures with *Bg* according to BSL-2 guidelines established in the Biosafety in Microbiological and Biomedical Laboratories, 5th edition[73]. Samples were processed using existing LRN procedures for sponge-stick wipes, swabs, and vacuum socks (draft, interim procedure) for identification of *Ba*. Methods were modified, where necessary, to reflect analysis of *Bg*. LRN analyzed samples by culture method only (no PCR), because previous contamination events conducted at the INL facility (PBF-632) used in the BOTE Project resulted in residual *Bg* DNA in the environment. A detailed description of the LRN sample analysis procedures is included in Appendix E.

For the BOTE Project Phase I, samples from the pre-decontamination (characterization) sampling events in each round were processed using dilution plating. Post-decontamination samples were processed by dilution plating, as well as filter plating to enhance detection of *Bg* which may be at low concentrations. Because viable spore concentrations were expected to be low on the second floor, pre-decontamination samples from the second floor were also filter-plated.

Eight different LRN laboratories (listed above) were used in Phase 1 of the BOTE Project as listed above. Following arrival at the destination laboratory, custody was transferred according to COC procedures and samples were unpackaged, inventoried, and processed. The initial plan was for samples collected during characterization events to be processed using dilution plating only for first floor samples and dilution plating plus filter plating for second floor samples. In reality, not all second floor samples received the prescribed filter plate analysis, presumably due to labeling errors, illegible labels, and/or laboratory worker misinterpretation of sample labels. The intial plan for post-decontamination samples was dilution plating as well as filter plating (when spread plates returned results below 30 CFU) as prescribed for all samples to ensure detection of *Bg* which may be at low concentrations. Again, not all samples that required filter

plating were filter plated. There was little impact on the BOTE project due to the few samples that were not filter plated and should have been according to the original project plan. The impact is discussed in more detail in Section 6.

2.9.1.2. Analysis of Surface and Referee Samples by INL

INL provided the analysis for the TSA settling plates and RMCs collected during pre-decontamination surface sampling. INL also analyzed Versalon® wipes from the reaerosolization study, taken in Rooms 101A and 102. Details regarding these analyses are in the sections below.

2.9.1.2.1. Processing of Settling Plates

Upon receipt at the laboratories, settling plates were immediately incubated at 35 ± 2 ºC for a maximum of three days. Plates were counted as described in Section 3.6 after incubation.

2.9.1.2.2. Analysis of RMCs

To prepare the laboratory work areas, all laboratory benches and associated equipment were pre-sterilized, autoclaved, or wiped with a pH-adjusted bleach solution followed by 70% isopropyl alcohol. For RMC samples, three replicate TSA plates were labeled with the specific sample identification number and dilution (10^{-1}, 10^{-2}, 10^{-3}). Also, two 15 mL conical test tubes were labeled with the sample identification number and dilution (10^{-1} and 10^{-2}) for each RMC.

To process the RMCs, 20 mL of PBST was pipetted into each of the conical tubes containing the collected RMC. The tubes were then capped and shaken for 30 min at 300 revolutions per minute (rpm) in a platform shaker (such as New Brunswick Stackable Incubator Shaker I2500, New Brunswick Scientific, Enfield, CT). The RMCs were removed from the tubes while allowing excess liquid to drain back into the tubes. The samples were then dilution and filter plated, as described in Sections 2.9.1.2.4 and 2.9.1.2.5, respectively.

2.9.1.2.3. Wipe Sample Processing

Upon receipt of the Versalon® wipes from the reaerosolization study at the INL laboratories, wipe samples were refrigerated at approximately 4 ºC until analyzed within 72 hr of receipt. The viable count method was used to obtain *Bg* counts of samples by diluting the samples and plating to enumerate the number of CFU present.

To prepare the laboratory work areas, all laboratory benches and associated equipment were pre-sterilized, autoclaved, or wiped with a pH-adjusted bleach solution followed by 70% isopropyl alcohol. For each wipe sample, three replicate TSA plates were labeled with the specific sample identification number and dilution (10^{-1}, 10^{-2}, 10^{-3}).

Also, for each wipe sample, one sterile 50 mL conical test tube was labeled with the specific sample identification number and 10^{0} dilution. Two additional 15 mL conical test tubes were labeled with the sample identification number and serial dilution series (i.e., one with 10^{-1} and one with 10^{-2}).

To process the wipe samples for culture, the wipe samples were transferred in a biological safety cabinet (BSC) to sterile 50 mL conical tubes labeled with the appropriate sample

identification number and 10^0 dilution, and 20 mL of PBST was added. The tubes were capped and shaken for 30 min at 300 rpm in a New Brunswick shaker (Eppendorf AG, Hamburg, Germany). The wipes were then removed from the tubes, wringing excess liquid back into the tubes. The samples were then dilution and filter plated, as described in Sections 2.9.1.2.4 and 2.9.1.2.5, respectively.

2.9.1.2.4. RMC and Wipe Sample Serial Dilutions and Plating

After vortexing on high for 30 seconds, 1 mL of the 10^0 sample was removed and placed in the tube labeled 10^{-1} with 9 mL of PBST. After vortexing on high for 30 seconds, 1 mL of the 10^{-1} sample was removed and placed in the tube labeled 10^{-2} with 9 mL of PBST. All wipe and RMC sample dilutions were retained at 4 ºC until additional dilutions were found to be unnecessary. After vortexing each dilution tube well, 100 µL of all dilutions were removed with a pipette and placed on the corresponding labeled TSA plates and spread with sterile, disposable Lazy-L cell spreaders (Catalog # 89042-018, VWR International, LLC, Radnor, PA). With the triplicate sample dilution plates, a negative control of PBST was plated to check sterility.

2.9.1.2.5. RMC and Wipe Sample Filter Plating

To increase the chance of detection, all wipe and RMC samples were also processed for capture on microfunnel filter membranes and cultured. Pall Microfunnel filters (Catalog # 55095-060, VWR International, LLC, Radnor, PA) with 0.45 µm pore size were placed on the vacuum manifolds and moistened with 5 mL PBST. After opening and closing the vacuum valve, 10 mL of PBST was placed in each filter cup with 10 mL of the 10^0 dilution sample. The vacuum valves were opened and the suspension was vacuumed through the filter at a pressure <20 cm mercury. Following vacuuming, the filters were removed and placed on the surfaces of TSA plates making sure that there was good contact with the agar and no visible air pockets.

2.9.1.3. Plate Incubation and Counts

All settling plates and dilution and filter plates were incubated at 35 ± 2 ºC for a maximum of three days. All plates were examined within 18-24 hr after the start of the incubation and again at three days. After the incubation period, all colonies were enumerated for countable plates (30-300 CFU) and recorded with two significant figures on the viable count worksheet for the dilutions plated. CFU on each plate were counted and recorded as follows:

- If the CFU count was <300/plate, recorded actual number.
- If the CFU count was >300/plate, recorded as TNTC.
- If the CFU count was <30/plate, then the filter plating data were used. If filter plating was not completed, then the spread plate data was used and noted as such.
- If no growth of suspect colonies, recorded as non-detect (ND).

The middle range countable plates were used to determine the CFU/mL by using the following formula (Equation 2-2):

$$CFU/mL = \frac{\left(average\,\frac{CFU}{plate}\right)(dilution\ factor)}{volume\ plated}$$

$$Average\ CFU/plate = \frac{CFU\ on\ Plate\ 1 + CFU\ on\ Plate\ 2 + CFU\ on\ Plate\ 3}{3}$$

Equation 2-2

All calculations and counts were recorded in the appropriate laboratory notebook and the viable count worksheet and archived. All quantitative results were recorded in Excel spreadsheets according to sample identification number and sent to the EPA project officer after analysis and quality control checks.

For some samples, filter plating either was not used or resulted in ND (when dilution plating yielded data for *Bg*). In these cases, as noted in the results (Section 3) or discussion (Section 4), the actual dilution plate counts were used below the lower quantitation limit. The use of data below the lower quantitation limit as an estimated count is supported by the ASTM Method D5465-93[74].

2.9.2. Rapid Viability-Polymerase Chain Reaction Analysis of Wipe Samples

The RV-PCR method is a research method developed under an interagency agreement between EPA and the LLNL of the DOE to rapidly detect and identify the presence of viable *Ba* spores from samples collected during a bioterrorism event. Briefly, the RV-PCR is a combination of a reliable broth culture method (for viability determination) and the popularly used real-time polymerase chain reaction (PCR) method (for highly sensitive, specific, and rapid detection and identification)[35-37]. The RV-PCR method uses the difference in real-time PCR cycle threshold (Ct) value between DNA extracts processed from the sample culture at the starting time point (T0) and the ending time point, after nine hours incubation (T9) as well as the Ct at T9 to detect viable target spores in the sample (in this case, *Bg* spores). The method lyses only vegetative cells and not spores, so that only DNA from cells is detected and the DNA from spores (live or dead) does not interfere with the determination of viability.

A protocol for combined RV-PCR and culture analyses from the same wipe sample was used in the BOTE Project Phase-I evaluation of the RV-PCR method; protocol steps are outlined in Figure 2-15 and Figure 2-16. A step-by-step detailed protocol is also provided in Appendix K (as an attached SOP). Briefly, samples were shipped from the field test site and processed on the sample receipt date unless changes to the shipment schedule impacted staff availability. The RV-PCR protocol with a nine hour incubation and DNA extraction and purification (modified Promega MagneSil® method[75]) was used. In addition, culture analysis was performed on the same sample after removal of spores from wipe samples as described in the SOP developed for the BOTE Project (see Appendix K). The spore extraction step was repeated once with separate extracts pooled to provide sufficient volume to conduct both RV-PCR and culture analyses on the same sample. To accommodate parallel culture analysis, the sample extract following spore removal was split in half with half used for culture and half used for RV-PCR. The portion for RV-PCR analysis was processed by the following steps: 1) collection of spores by filtration; 2) washes to remove soluble contaminants/inhibitors; 3) addition of growth medium and aliquoting of the culture for a baseline PCR measurement; 4) nine hour incubation of the remainder for germination and outgrowth of viable spores; 5) aliquoting of the culture for an endpoint PCR measurement. The portion for culture analysis was concentrated by centrifugation prior to

performing the following steps: 1) serial dilution and plating; 2) collection of spores using microfunnel filtration and plating of the filter membrane; and 3) enrichment of the remaining suspension. If colonies were not observed from serial dilution or filter membrane plates but the enrichment culture appeared turbid (i.e., due to bacterial growth), the culture was re-streaked onto agar plates in an attempt to obtain *Bg* colonies.

Bg colony counts (CFU) were based on morphology and presence of orange pigmentation. Colony counts were corrected for dilution factor to determine CFU/mL and CFU/sample. Real-time PCR was used to confirm selected *Bg* colonies (two per sample if CFU were observed) or the enrichment culture (if CFU were not observed but the culture was turbid). The protocol for combined culture and RV-PCR analysis from the same sample was standardized prior to BOTE Project sample analysis because it was a new protocol. The results of culture and RV-PCR methods were compared using detection/non-detection of viable *Bg* spores (i.e., qualitative analysis). The details on the materials and methods are presented below.

2.9.2.1. Sample Type and Sampling Plans

Versalon® Wipe samples used in the study consisted of 2 in x 2 in wipes purchased from Kendall Inc. (Cat. No. 8042, 50% rayon and 50% polyester gauze). Pre-wetted sterile wipes were prepared at LLNL and provided to field sampling personnel for the BOTE Project sample collection. Briefly, a 2 in x 2 in sterile gauze wipe was placed into a 30 mL tube with screw cap, and 1.5 mL of sterile PBST buffer was added to the wipe. Each tube was barcoded (barcode label parallel to tube graduations), placed into a 4 in x 6 in Ziploc® bag, and a replicate barcode was placed on the bag (a third replicate barcode was kept at LLNL). The barcoded tubes in bags were grouped into batches of 25 and placed into larger Ziploc® bags and stored at 4 ºC until shipment to INL. In addition, 20 wipe samples remained at LLNL for use as true blanks (TBs), and 10 wipe samples were shipped to the Ft. Meade Laboratory for use as TBs. Prior to shipment to field personnel, random wipe samples were tested for sterility by washing in buffer and plating onto TSA. No growth was observed after incubation for two days at 35 °C.

2.9.2.2. Sample Receiving

Samples received from the field included QC samples that were opened during sampling, but were not used to wipe surfaces. No indication was made on the COC forms to distinguish surface sampling versus QC wipes, to conduct a blind study. During receiving, outer surfaces of bags containing sample tubes were decontaminated by wiping the outsides with a Disptach® bleach wipe. The outside of the tubes containing the samples were decontaminating in the same manner as it was removed from the bag and placed into a tube rack. The barcode was scanned according to the position in the rack, and a written record was also maintained including a physical description of the sample (i.e., amount of debris present). One sample was processed at a time, and gloves were changed between samples to prevent cross-contamination. Prior to conducting spore recovery, a sterile forceps was used to place a mesh support over the wipe sample to keep the wipe clear of pipetting activities. Previous work showed that extraction efficiency could also be enhanced when mesh was used to hold the wipe to the side of the tube while buffer was washed through the wipe sample during vortexing.

2.9.2.3. Sample Processing: Spore Recovery from Wipe

For each sample tube rack accommodating up to 24 tubes, up to 21 samples were processed along with one negative control (NC) and one positive control (PC), and at least one TB. PCs consisted of wipes spiked with *Bg* spore suspensions (Apex Laboratories, Apex, NC). While a level of approximately 5E2 to -1E3 CFU/sample was targeted, actual CFU determined by plating were approximately 1E5 CFU per sample initially (MFP and Round 1 test samples), later adjusted to 50-100 CFU per sample (for Round 2 and Round 3 test samples). The NCs were wipes spiked with PBST buffer only. In addition, one to three TBs were included for each set of samples. To each wipe sample in a 30 mL tube, 20 mL of cold Extraction Buffer with Tween® (70% of 0.25 mM KH_2PO_4/0.1% Tween® 80 [pH 7.4] and 30% ethanol; final pH ~9.5) was added, and the tubes were vortexed for 20 min on a platform vortexer (Multi-tube Vortexer, VWR Part# 58816-115, Radnor, PA) to remove spores from the sample matrix. Cold buffers were used to minimize the potential for spore germination prior to incubation that could contribute to a PCR response at T0. Fourteen mL were then transferred to a 50 mL tube and a second spore recovery step was conducted by addition of 14 mL cold Extraction Buffer without Tween® (70% of 0.25 mM KH_2PO_4 [pH 7.4] and 30% ethanol). After brief vortexing, the second extraction volume was combined with the first to give 28 mL total volume to allow sufficient volume for equally splitting the sample between RV-PCR and culture analysis methods.

More detailed information on RV-PCR sampling and analysis can be found in Appendix K.

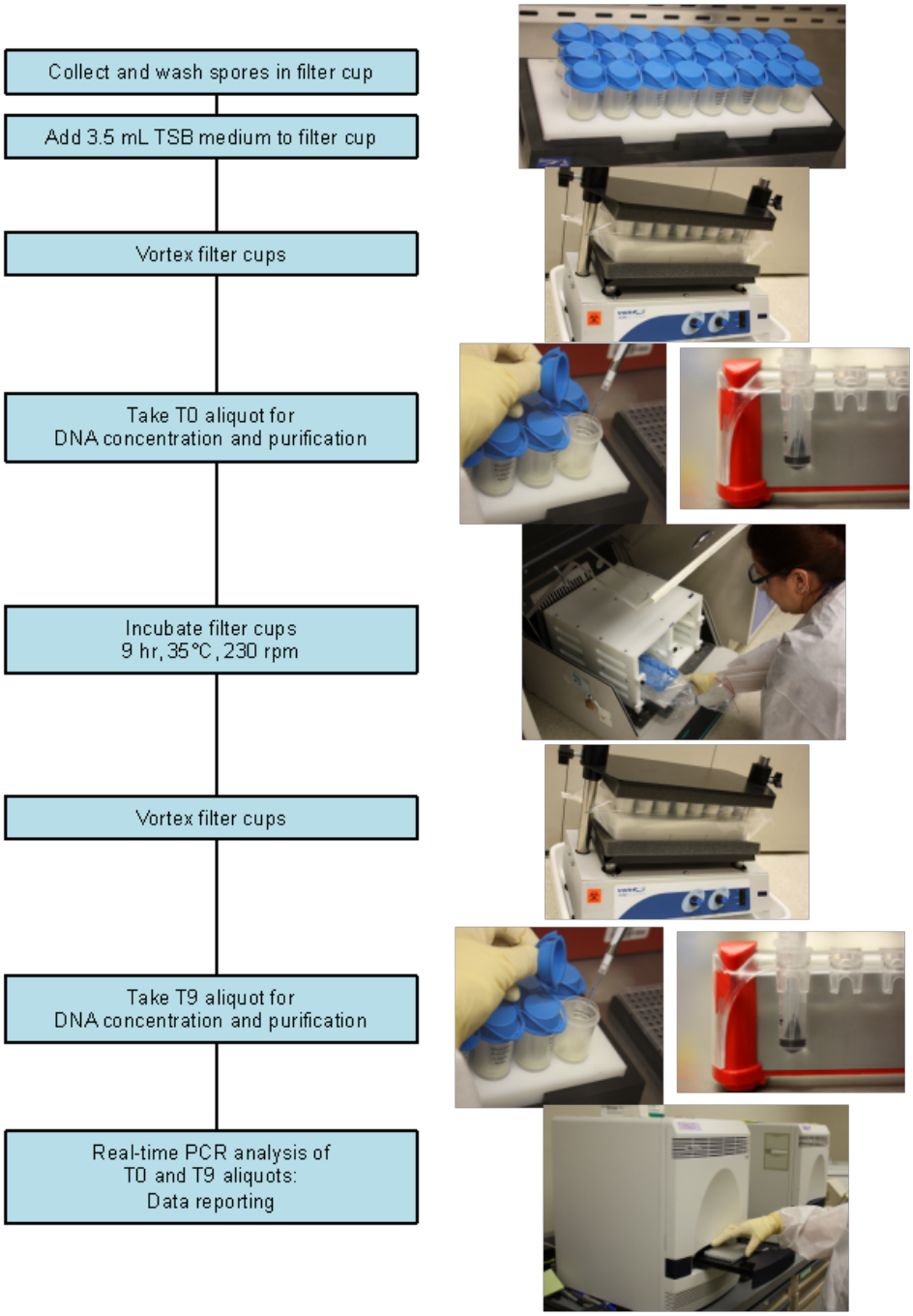

Figure 2-16. Summary of manual RV-PCR protocol steps and pictures of equipment used to process samples.

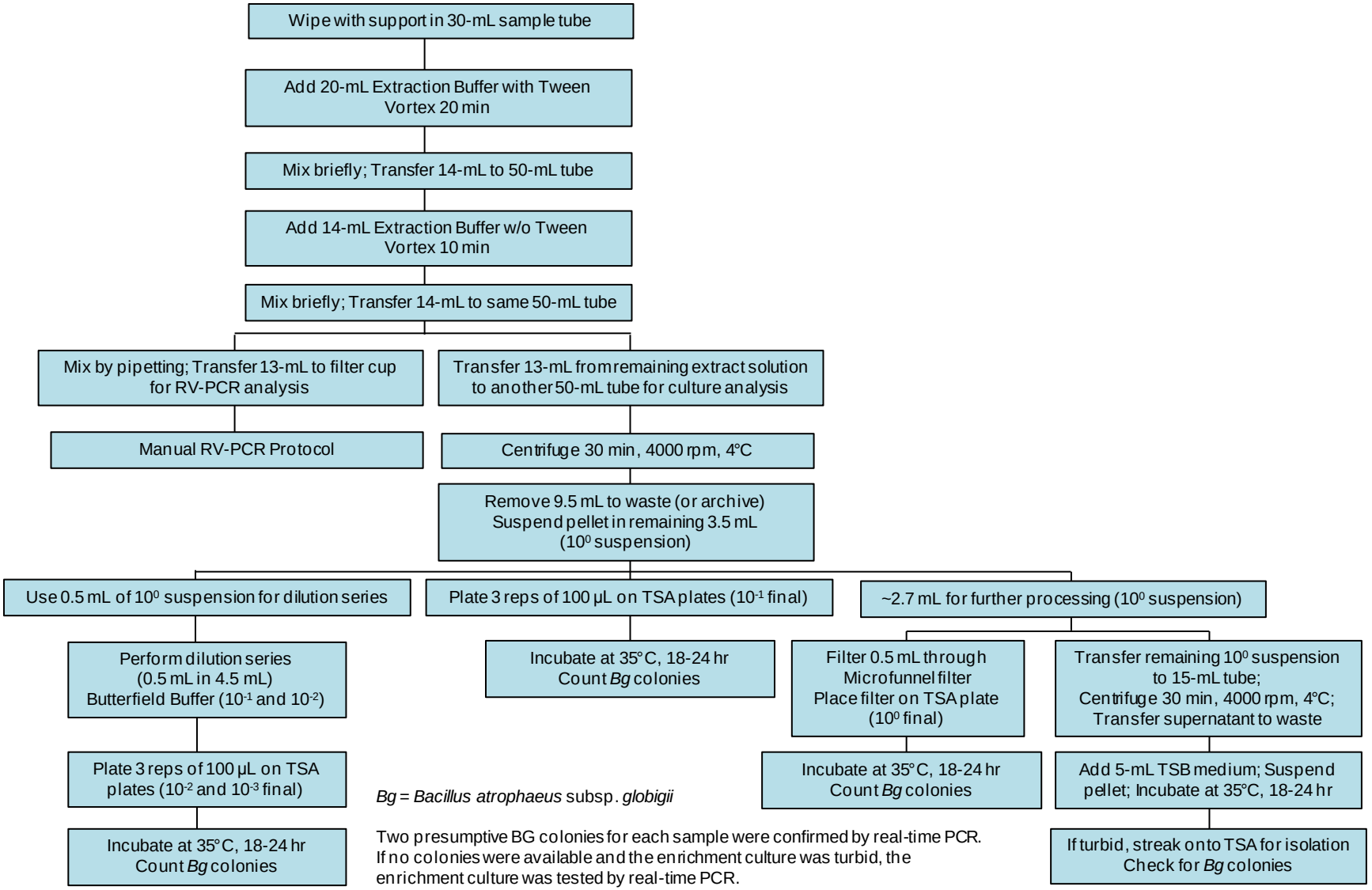

Figure 2-17. Combined BOTE Project protocol for RV-PCR and culture analyses including details of culture analysis.

2.9.2.4. Rapid Viability-Polymerase Chain Reaction Sample Processing and Analysis

After mixing, 13 mL of the suspension was transferred to a filter cup, and spores were collected on a 0.45 µm filter using a vacuum manifold and a vacuum pump. The remaining spore extract was processed by traditional culture analysis described in the following section. After filtration, filter cups were washed with 20 mL of cold filter-sterilized 210 mM KH_2PO_4 buffer (pH 6.0) followed by washing with 7 mL of cold 25 mM KH_2PO_4 buffer (pH 7.4). Filter cups were sealed on the bottom, 3.5 mL cold TSB medium was added, and top caps were added. The filter cup manifold was vortex-mixed for 10 min, after which 1 mL (T0) aliquots were withdrawn from filter cups for processing by magnetic bead-based DNA extraction and analysis by real-time PCR (see section below)[75]. The filter cups were sealed on the top and incubated for nine hr (T9) at 35 °C and 230 rpm. At T9, another 1 mL aliquot was withdrawn and processed as described for the T0 aliquot. In addition, 100 µL aliquots at T0 and T9 were processed using a heat lysis protocol (including incubation at 95 °C for 10 min). Heat lysis DNA extraction was performed in parallel for all samples as another check on performance of the magnetic bead-based DNA extraction protocol. Results from heat lysis DNA extraction are reported only where there was a discrepancy between RV-PCR analysis using magnetic bead-based DNA extraction and culture analysis.

2.9.2.5. Analysis of Concentrated Enrichment Culture

Additional culture analysis was conducted in cases where positive RV-PCR results [cycle threshold ≥ 6 and cycle threshold (T9) ≥ 39] and/or cycle threshold (T9) values less than 45 were obtained, but initial culture results were negative (no *Bg* colonies were evident and/or results were negative from initial real-time PCR analysis of the enrichment culture). The additional analysis described below was performed to provide more accurate data for comparison of the two methods, including a more accurate assessment of the false positive and false negative percentages. The LRN protocol includes steps to analyze the enrichment culture using a rapid boil DNA extraction method in the event that colonies are not evident (and therefore cannot be confirmed by real-time PCR). However, the protocol does not include concentration of the enrichment culture prior to analysis, so only about $1/50^{th}$ of the total enrichment culture volume is processed (100 µL of the total 5 mL culture), and only about $1/20^{th}$ of the crude DNA extract volume is analyzed by PCR (5 mL of the total 100 mL). In this study, 1 mL of culture was concentrated by centrifugation and resuspension of the pellet in 0.1 mL (representing a concentration factor of 10 over the LRN protocol). However, in some cases, negative *Bg* PCR results were still obtained. Therefore, for samples showing discrepancies between methods, the remaining enrichment culture was harvested by repeated centrifugation and the resulting pellet was suspended in 1 mL of Tris buffer (10 mM, pH 8) (Tris-ethylenediaminetetraacetic acid (EDTA) buffer solution, Teknova, Hollister, CA) and processed using the 1 mL magnetic bead-based DNA extraction protocol. The protocol provided an additional concentration factor of $1/5^{th}$ and also produced a cleaner DNA extract than that produced by the LRN rapid boil protocol.

2.9.2.6. *Bg* DNA Standards for Real-time PCR

The DNA standards were generated for the *Bg* strain. DNA was extracted from cultured cells using a MasterPure™ Complete DNA and RNA Purification Kit (Epicentre® Biotechnologies Inc., Madison, WI), followed by RNase treatment. The DNA concentration was measured with a Qubit™ fluorometer (Life Technologies Corporation, Grand Island, NY) using the PicoGreen™ assay (Invitrogen™, Quant-iT™ dsDNA HS assay kit for Qubit fluorometer, Cat. No. Q32854, Carlsbad, CA). Standard concentrations were prepared in PCR-grade water. On each sample PCR plate, three replicates of 1 nanogram (ng) per 25 mL PCR, three replicates of 100 femtogram (fg) per 25 mL PCR, and one no-template control were included.

2.9.2.7. *Bg* Real-time PCR Analysis

Five microliter (µL) sample aliquots were transferred to a 96-well PCR plate with 20 mL of PCR mix. PCR mix was prepared for the *Bg* primer-probe set according to conditions detailed in Annex B of Appendix F, using TaqMan™ 2X Universal Master Mix (Applied Biosystems, Cat. No. 4305719, Carlsbad, CA). After mixing and centrifugation, PCR was run using the ABI 7500 Fast platform (Applied Biosystems® 7500 Fast Real-Time PCR System, Carlsbad, CA). The PCR thermal cycling parameters were as follows: 2 min at 50 ºC for Uracil-N-Glycosilase (UNG) incubation, 10 min at 95 ºC for AmpliTaq Gold™ activation, followed by 45 amplification cycles (5 seconds (sec) at 95 ºC for denaturation and 20 sec at 60 ºC for annealing/extension). For RV-PCR, each sample was analyzed in triplicate with the *Bg* primer/probe set. The ROX reference dye contained in the ABI Universal Master Mix was used to normalize the fluorescent reporter signal. Automated analysis settings (baseline and threshold) were used throughout. If triplicate PCR results were not consistent (e.g., 1 of 3 or 2 of 3 positive), PCR was repeated until consistent results (i.e., three out of three PCR reactions were positive) were obtained.

2.9.2.8. Data Interpretation and Reporting

For RV-PCR, initial and final PCR cycle thresholds (Ct (T0) and Ct (T9), respectively), were used in the algorithm to determine whether viable (live) spores were present in the sample. Average values from triplicate analyses were used. T0 and T9 results that were ND ("Undetermined" with the PCR system software) were set to 45 to calculate a ΔCt value. For the BOTE Project, a Ct [T9] ≤ 39 with a ΔCt (Ct[T0] – Ct[T9]) ≥ 6 was set as a cutoff value for positive detection of viable *Bg* spores. The ΔCt ≥ 6 criterion represents an increase in DNA concentration at T9 relative to detectable DNA at T0, if any, as a result of the presence of viable spores in the sample that germinated and propagated during the nine hours of incubation in growth medium.

The presumptive *Bg* CFU were determined based on colony morphology, and counts between 25 and 250 were recorded. For plates or filters containing more than 250 colonies, the number was recorded as TNTC. Presence of *Bg* colonies on any of the sample culture plates (from serial dilution and filter membrane plates) including those that were TNTC represented a positive result (*Bg* detected) for that sample. CFU values were corrected for the dilution factor and expressed as CFU/sample. Real-time PCR data obtained from selected *Bg* colonies (two per sample) and/or the enrichment culture were also reported. Analysis of enrichment cultures was conducted only if no *Bg* colonies were detected for serial dilution or filter membrane plates, and cultures were turbid. The sample was also considered positive by culture analysis if the

real-time PCR Ct value of the enrichment culture was ≤ 35. The false positive percentage was determined by dividing the number of samples with positive RV-PCR results but negative culture results by the total number of samples and multiplying by one hundred. The false negative percentage was calculated by dividing the number of samples with negative RV-PCR results but positive culture results by the total number of samples and multiplying by one hundred.

Excel spreadsheets were generated to streamline sample analysis and reporting including results from positive and negative PCR controls. Sample results by sample barcode were reported via Excel spreadsheet for each sample batch. Data reports consisted of both RV-PCR cycle threshold values (for T0 and T9) and plate counts corrected for sample dilution as well as qualitative data (positive/negative) for both RV-PCR and traditional culture analysis. Control results from field and laboratory blanks/controls were also included in the reports. As per the SOP (see Appendix K), the results (data) were submitted using the Data Report Form during the BOTE Project. The data forms were generated and pasted into this report and are therefore presented as figures.

Because the RV-PCR method is qualitative, the comparison between RV-PCR and the culture method was performed in terms of positive/negative determination (detection/non-detection) of viable *Bg* spores. However, average cycle threshold values (with standard deviations) and average plate count data (CFU/sample) were also reported.

2.9.2.9. Culture Sample Processing and Analysis

The remaining suspension was used for culture analysis. Briefly, 13 mL was transferred to a 50 mL conical tube, followed by centrifugation to pellet the spores. After centrifugation, 9.5 mL of the supernatant were removed to give the same concentration factor as that obtained for RV-PCR analysis (i.e., 13 mL filtered and resuspended in 3.5 mL in the filter cup). The pellet was then resuspended and used to generate a serial dilution for plating. Two 10-fold dilutions (1E-1 and 1E-2) as well as the undiluted spore suspension (1E0) were cultured on TSA plates in triplicate and incubated 18-24 hr at 35 °C. In addition, 0.5 mL of undiluted spore suspension was collected onto a filter membrane using a filter funnel apparatus, with the resulting filter placed onto a TSA plate for incubation (18-24 hr, 35 °C). Finally, the remaining undiluted spore suspension was centrifuged, the supernatant was removed, and the pellet was suspended in 5 mL TSB medium to create an enrichment culture; the culture was incubated for 18-24 hr at 35 °C and 200 rpm. Colony counts were obtained the next day and corrected for dilution to determine the number of CFU per sample. If CFU were not evident and enrichment cultures were turbid, 10 µL aliquots were sampled by sterile inoculation loop and streaked for isolated *Bg* colonies onto TSA plates (18-24 hr, 35 °C). For each sample with presumptive *Bg* colonies and/or a turbid enrichment culture, *Bg* real-time PCR analysis of colony DNA (from two colonies for each sample if available) or the enrichment culture DNA extract was used to confirm the culture results. The CDC LRN protocol based on the rapid boil DNA extraction method was used and *Bg* real-time PCR cycle threshold values less than 35 were used to confirm that the sample contained viable *Bg* spores.

2.9.3. Air Sample Analysis Methods

Air samples were collected from the SKC BioSamplers®, XMX, STA and the UV-APS. The first three methods required laboratory analysis of the collected samples to report air concentrations. Laboratory analyses of these collected samples were performed by INL. The UV-APS data required post-analysis to report air concentrations as a function of particle size. Details of the sample and data analysis methods are reported in the following subsections.

2.9.3.1. SKC BioSampler®

2.9.3.1.1. Analysis Method

Upon receipt at the INL Microbiology Laboratory, samples were refrigerated at approximately 4 ºC until analyzed within 72 hr of receipt. The viable count method was used to obtain *Bg* counts of samples by diluting the samples and plating to enumerate the number of CFU present.

To prepare the laboratory work areas, all laboratory benches and associated equipment were pre-sterilized, autoclaved, or wiped with a pH-adjusted bleach solution followed by 70% isopropyl alcohol. For each sample, three replicate TSA plates were labeled with the specific sample identification number and dilution (1E-1, 1E-2, 1E-3). Also, for each sample, three sterile 15 mL conical test tubes were labeled with the specific sample identification number and dilution (1E0, 1E-1, 1E-2).

To process the SKC BioSamplers® samples for culture, the samples were first removed from their foam sleeve from the transport case. The samples were then placed in a rack inside a BSC and disassembled. Each liquid sample was measured, removed from the SKC BioSampler® bottom collection vessel with a graduated 10 mL disposable pipette and transferred to the sterile 15 mL conical tube labeled with the appropriate sample identification number and 1E0 dilution. After vortexing on high for 30 seconds, 1 mL of the 1E0 sample was removed and placed in the tube labeled 1E-1 with 9 mL of PBST. After vortexing on high for 30 seconds, 1 mL of the 1E-1 sample was removed and placed in the tube labeled 1E-2 with 9 mL of PBST. All SKC BioSampler® sample dilutions were retained at 4 ºC until additional dilutions were determined to be unnecessary. After vortexing each dilution tube, 100 µL of all dilutions were removed with a pipette and placed on the corresponding labeled TSA plates (e.g., 1E-1 tube dilution plated on the 1E-2 TSA plate), and spread with sterile, disposable Lazy-L cell spreaders. Along with the triplicate sample dilution plates, a negative control of PBST was plated to check sterility.

To increase the chance of detection, all SKC BioSampler® samples were also processed for capture on Microfunnel filter membranes and cultured. Pall Microfunnel filters (Pall Corp., Port Washington, NY) with 0.45 µm pore size were placed on the vacuum manifolds and moistened with 5 mL PBST. After opening and closing the vacuum valve, 10 mL of PBST was placed in each filter cup along with 10 mL of the 1E0 SKC BioSampler® samples. The vacuum valves were opened and the suspension was vacuumed through the filter at a pressure <20 cm Hg. Following vacuuming, the filters were removed and placed on the surfaces of TSA plates making sure that there was good contact with the agar and no visible air pockets.

All dilution and filter plates were incubated at 35 ± 2 ºC for a maximum of three days. All plates were examined within 18-24 hr after the start of the incubation and within 72 hr of sample collection. CFU on each plate were counted and recorded as follows:

- If the CFU was <300/plate, recorded actual number.
- If the CFU was >300/plate, recorded as TNTC.
- If no growth of suspect colonies, recorded as ND.

After the incubation period, all colonies were enumerated for countable plates (30-300 CFU) and recorded with two significant figures on the viable count worksheet for the dilutions plated. The middle range countable plates were used to determine the CFU/mL by using Equation 2-2.

All calculations and counts were recorded in the appropriate laboratory notebook and the viable count worksheet and archived. All quantitative results were recorded in Excel spreadsheets according to sample identification number and sent to the EPA project officer after analysis and quality control checks.

2.9.3.1.2. Data Reduction

Viable *Bg* spore concentrations were determined for the SKC BioSampler® samples using dilution plating and filter plating. For each airborne particulate sample, the dilution plate result was used except when below the typical quantifiable range (i.e., the mean dilution plate count for each serial dilution was <30 CFU). More CFU are generally detected using the dilution plate method than the filter plate method when 30 or more colonies are detected using the dilution plate method. Because each CFU represents one or more culturable spores, the higher number would be expected to be more accurate. If the mean dilution plate counts were <30 CFU, then nonzero filter plate results were used because dilution plates with mean counts below 30 have high variability and, historically, dilutions with counts of 30 to 300 were considered to be in a quantifiable range. The SKC BioSampler® CFU results were first transformed to CFU/m^3 by dividing the CFU sample measurement (rounded to the nearest integer) by the product of the measured flow rate of the sampler (L/min) and the sampling duration (15 min), then dividing by 1,000 to convert L to m^3 and rounded to the nearest integer. This result was then converted to CFU/ft^3 by dividing by 35.3 (i.e., the number of cubic feet in one cubic meter) and rounding to the nearest integer. For each SKC BioSampler® sample, the dilution plate results were used in the subsequent analysis except when TNTC or equal to 0-30 CFU. In the latter case, the filter result was used.

2.9.3.2. Dycor® XMX/2L-MIL Aerosol Collection Systems

2.9.3.2.1. Analysis Method

Upon receipt at the INL Microbiology Laboratory, samples were refrigerated at approximately 4 ºC until analyzed within 72 hr of receipt. XMX samples were processed under aseptic conditions, typically inside a BSC. Briefly, the filter cartridge was reopened to expose the filter. A blunt instrument such as a slot screwdriver was used to pry apart the lower joint between the lower and middle portion of the cartridge, which holds the filter in place. Sterile forceps with flattened ends (filter forceps) were used to lift the filter carefully from the cartridge. The filter was then placed into a 50 mL conical tube containing 20 mL of extraction buffer (i.e., PBS). The lid

was returned to the 50 mL conical tube, and the filter was allowed to soak in the buffer for 10 min. The filter was vortexed for 2 min and then placed on a wrist action shaker for 15 min. Following extraction, the fluid was decanted into a new, sterile 50 mL conical tube. The volume collected was recorded in the laboratory notebook.

The viable count method was used to obtain *Bg* counts of samples by diluting the samples and plating to enumerate the number of CFU present. To prepare the laboratory work areas, all laboratory benches and associated equipment were pre-sterilized, autoclaved, or wiped with a pH-adjusted bleach solution followed by 70% isopropanol. For each sample, three replicate TSA plates were labeled with the specific sample identification number and dilution (1E-1, 1E-2, 1E-3). Also, for each sample, three sterile 15 mL conical test tubes were labeled with the specific sample identification number and dilution (1E0, 1E-1, 1E-2).

2.9.3.2.2. Data Reduction

Viable *Bg* spore concentrations were determined for the XMX samples using dilution plating and filter plating. For each airborne particulate sample, the dilution plate result was used except when below the typical quantifiable range (i.e., the mean dilution plate count for each serial dilution was <30 CFU). More CFU are generally detected using the dilution plate method than the filter plate method when 30 or more colonies are detected using the dilution plate method. Because each CFU represents one or more culturable spores, the higher number would be expected to be more accurate. If the mean dilution plate counts were <30 CFU (i.e., considered "non-detect" or 0 CFU), then nonzero filter plate results were used because dilution plates with mean counts below 30 have higher relative uncertainty and, historically, dilutions with counts of 30 to 300 were considered to be in a quantifiable range. The results were first transformed to CFU/m^3 by dividing the CFU sample measurement (rounded to the nearest integer) by the product of the measured flow rate of the sampler (L/min) and the sampling duration (min), then dividing by 1,000 to convert Lrs to m^3 and rounded to the nearest integer. This result was then converted to CFU/ft^3 by dividing by 35.3 (i.e., the number of ft^3 in one m^3) and rounding to the nearest integer. For each sample, the dilution plate results were used in the subsequent analysis except when TNTC or equal to 0-30 CFU. In the latter case, the filter result was used.

2.9.3.3. Mattson-Garvin Model 220 slit-to-agar

2.9.3.3.1. Analysis Method

STA samples were comprised of 150 mm x 15 mm TSA agar plates. Following the collection procedure, the lid for each Petri dish sample was carefully placed onto the agar-containing portion. The plates were then transported to the INL laboratory where they were incubated at 35°C for 20 ± 4 hr. Following incubation, CFU were enumerated visually and recorded in the notebook.

2.9.3.3.2. Data Reduction

The data were transformed by dividing the recorded CFU abundance by the volume of air sampled. Thus, data are reported as CFU per volume of air sampled.

2.9.3.4. Ultraviolet Aerodynamic Particle Sizer

Software (Aerosol Instrument Manager®) provided by the UV-APS manufacturer (TSI, Inc., Shoreview, MN) was used to review and evaluate the UV-APS measurements performed in Rooms 101A and 102. The raw data files were exported to a text-based format in units of particles per cm^3. These data contained 52 size bins ranging from 0.5 micrometer (μm) to 20 μm. The UV-APS data were imported into spreadsheets and further smoothed by calculating a running average over ten-sample intervals.

For comparison with the UV-APS data, the data from the IBAC monitors located in the first floor mechanical equipment room (HVAC-1) and Room 101A were also evaluated. IBAC monitors count particles in sizes ranging nominally from 1.0 μm to 10 μm in diameter, and the data are collected in the form of total counts, i.e., not distinguished by size bins. The raw data files contained particle concentrations in units of particles per L at one second intervals. To reduce the number of data points to be used for plot generation, the values that occurred on the minute were extracted, converted to units of #/cm^3 and smoothed via 10-min running averages for comparison with the UV-APS data within the plots below. In some cases, noisy data were further modified by ignoring apparent outliers in determining the running averages.

2.9.4. Analysis of Sand Samples for the Study of *Bacillus* Spore Migration from Inside the Building to Outside

The exposed sand samples were analyzed for the presence of *Bg* DNA by EPA (Cincinnati, OH) and USGS, each utilizing different processing techniques. The primers used during PCR dictate the specificity and sensitivity of the final limit of detection (LOD). However, the DNA extraction method influences the quantity and quality of template DNA. EPA indirectly extracted DNA from spores within the sample, while USGS directly extracted DNA from an aliquot of the sand sample. Direct and indirect DNA extraction techniques each have associated advantages and disadvantages. Direct extraction yields DNA from any organism within the sample and may therefore dilute the DNA target of interest among excess DNA. Indirect extraction uses a washing step to separate the spores from a sample prior to DNA extraction, increasing the proportion of the target DNA within the final extract. However, the washing step increases the chance of spore loss prior to detection.

2.9.4.1. Division of Sand Samples between USGS and EPA

Sand samples were aseptically divided between USGS and EPA. The BOTE Project protocol for division of the sand samples can be found in Appendix F. Aliquots (5 g) of each sample were sent to the USGS laboratory. No ice or cold packs were used for shipment. The remaining portion of each sample (~45 g) was held at EPA for analysis.

2.9.4.2. Spore Concentration and DNA Extraction

Each sand sample aliquot kept at EPA was weighed, and the data were recorded before indirect DNA extraction. Spores from the EPA aliquots were first separated from the sand and concentrated (See Appendix F). In short, the entire sand sample (mean sample weight 43.4 ± 2.3 g) was washed with PBST. After vigorous mixing and a settling period, the spore-laden supernatant was transferred to a centrifuge tube. The sample was then centrifuged to pellet the spores. EPA then used the entire spore pellet for DNA extraction. In comparison, the USGS

method directly extracted DNA from 0.25 g of the original 5 g ± 0.1 g sand sample that was received.

Both EPA and USGS extracted *Bg* DNA using the MO BIO vacuum-based protocol from the PowerSoil™ DNA Isolation Kit (MO BIO Laboratories, Inc., Carlsbad, CA). This kit was selected to process the samples due to its ability to limit humic acid and other PCR-inhibitor carryover per previous laboratory evaluation. Research has shown that bead-beating-based protocols such as the Powersoil® DNA Isolation Kit are effective assays for extraction of DNA from environmental samples of spores and vegetative cells[76]. Two µL of kit eluent (100 µL total) were utilized per qPCR reaction. The extraction protocol is found in Appendix F.

2.9.4.3. Quantitative PCR Detection of *B. globigii*

EPA and USGS evaluated the extracted sample DNA for the presence of *Bg* DNA by qPCR analysis using the specifications outlined by Kane et al. (2009)[35]. This analysis utilized Bg42F and Bg104R, forward and reverse primers with probe Bg60FT to detect a 63-base pair amplicon of the *recF* gene of *Bg* (Table 2-15). LLNL developed and tested the sensitivity of these primer sequences[35]. The probe was labeled with fluorescein amidite on the 5 ft end and the quencher tetramethylrhodamine on the 3 ft end. All real-time digital data files were cataloged and backed up on an external drive.

Both laboratories utilized the same primer sequences and cycle numbers. However, there were slight differences between the primer concentration and cycle times (Table 2-16). While an in-depth study was not conducted to determine the actual differences between the two methods utilized, a comparison of the instrument LODs suggests that there was not a significant difference between the two methods.

Table 2-15. *Bg* primer and probe sequences.

Label	Sequence
Bg42F	5’-CGCGCCCGAGGACTTAA -3’
Bg104R	5’-ATGTCAAGGAAACCGCCGTC -3’
Bg60FT	5’-FAM-TCTCGTAAAGGGCAGCCCGCAAG -TAMRA-3’

Table 2-16. Differences between EPA and USGS qPCR parameters.

Parameter	EPA	USGS
Thermocycler	ABI Prism® 7900HT	ABI StepOne™
Reaction Volume, µL	20	25
Probe Concentration , µM	0.4	1
Primer Concentration, µM	0.5	1
95 °C Denature Time, min	1	10
60 °C Annealing Time/ Cycle, s	60	15

2.9.4.4. EPA Analytical Specifics

EPA used an ABI Prism® 7900HT (Life Technologies Corporation, Carlsbad, CA) for qPCR analysis. Each reaction consisted of 2 µL template DNA within a 20 µL PCR reaction. For each sample, three replicates per dilution were assayed for 45 cycles. Each PCR run utilized a 96-well plate that contained 14 samples, 3 no template controls (NTCs), and amplification positive and negative controls (three of each; see (Table 2-17). Specificity of qPCR detection was determined by comparison of results to nontarget DNA (*Escherichia coli*) and positive control DNA from *Bg* spore preparations that had formerly been characterized. A total of 16 qPCR 96 well plates were required to assay all the samples. Results for samples and controls are listed in Section 3.2.4.

Table 2-17. EPA PCR analytical controls used for each of the sixteen 96-well plate assays.

Control ID	Purpose	Frequency
Bg BOTE DNA (10,100 GEq)	Amplification positive PCR Control	3 PCR reactions per run
Bg BOTE DNA (1,010 GEq)	Amplification positive PCR Control	3 PCR reactions per run
E. coli DNA (E-2 dilution)	Amplification negative PCR Control	3 PCR reactions per run
NTC	Negative PCR Control	3 NTC samples per run

Criteria for acceptance of negative controls required that all replicates be reported as ND. The acceptance criterion for positive controls was for the cycle threshold time to be within 5% of the prior determined cycle threshold time. Samples with higher target cell numbers will have a lower cycle threshold time, while those with lower target cell numbers will have a higher cycle threshold time. The *Bg* BOTE DNA control positive stock solution was obtained by culturing *Bg*

spores used in the BOTE Project and extracting the DNA within a controlled laboratory setting. The concentrations were measured as genomic equivalents (GEq).

2.9.4.5. EPA PCR Inhibition Analysis

PCR inhibition due to the decontamination chemicals used during the BOTE Project was tested by spiking selected samples with an internal positive control (IPC). One post-decontamination sample from each floor and round that showed a loss of sensitivity when compared to its pre-decontamination counterpart and one post-dissemination sample from the first floor of each decontamination technology round were selected as controls (see Table 2-18). The IPC consisted of ~10 GEq of *Bg* control DNA. The goal was to have a low concentration of target DNA in each spiked reaction tube that was reliably within the detectable limit.

Table 2-18. Samples selected for BOTE Project PCR inhibition due to decontamination agent test.

Sample ID	Description
48	Round 1/VHP®/decontamination/B1b
49	Round 1/VHP®/decontamination/B2a
91	Round 2/pH-adjusted bleach/dissemination/B1a
117	Round 2/pH-adjusted bleach /decontamination/B1a
119	Round 2/pH-adjusted bleach /decontamination/B2a
164	Round 3/ClO_2/dissemination/B1a
190	Round 3/ClO_2/decontamination/B2a
212	Round 3/ClO_2/decontamination/B1b

2.9.4.6. USGS Analytical Controls

The USGS used the ABI StepOne™ (Life Technologies Corporation, Carlsbad, CA) with a 48 well format for all qPCR analysis. Within each 25 µL qPCR reaction, USGS utilized 2 µL of template DNA. Duplicate reactions followed the specifications outlined by Kane et al.[35]. DNA concentrations of *Bg* standards were measured using an Invitrogen Qubit® Fluorometer (Invitrogen Life Technologies, Grand Island, NY). Various standard concentrations were prepared in PCR-grade water, and three dilutions of the standards were run with each set of qPCR plates in addition to a negative control (Table 2-19).

Table 2-19. USGS PCR analytical controls.

Control ID	Purpose	Frequency
Bg DNA (32.5 GEq)	Amplification positive PCR Control	2 PCR reactions per run
Bg DNA (325 GEq)	Amplification positive PCR Control	2 PCR reactions per run
Bg DNA (3250 GEq)	Amplification positive PCR Control	2 PCR reactions per run
NTC	Negative PCR control	2 NTC samples per run

2.10. Decontamination Methods

Three decontamination methods were chosen based on results that had been obtained in laboratory studies. An interagency group examined the best available science for decontaminating a facility that had been contaminated with a *Bacillus* species and selected three separate approaches:

- fumigation with H_2O_2 using STERIS VHP®;
- surface decontamination using pH-adjusted bleach (amended bleach); and
- fumigation with ClO_2.

The BOTE Project provided an opportunity to test the performance of these three decontamination approaches operationally. The decontamination methods are discussed in Sections 4.1.1, 4.1.2, and 4.1.3.

2.10.1. Fumigation by STERIS Corporation VHP®

The first decontamination method utilized in this project was the full-facility fumigation with hydrogen peroxide vapor. Both the BIOQUELL HPV and STERIS Corporation VHP® processes were considered for use in this project. Based upon the results of laboratory testing and past use, STERIS Corporation ("STERIS") was selected to fumigate the facility using their VHP® technology. The facility configuration, as described in Section 2.1, contained a mixture of porous and nonporous surfaces throughout the building. The details of the decontamination process are introduced briefly below and discussed in detail in Section 4.1.1.

During the VHP® process, an aqueous solution of H_2O_2 is flash-vaporized into a stream of dehumidified heated air. This stream of H_2O_2 vapor is then injected into the area to be decontaminated. The fumigation proceeds until a sufficient exposure of the VHP®, in terms of time and concentration, to the contaminated space has been achieved. After sufficient exposure has been achieved, the concentration of VHP® remaining in the space is reduced by the use of a decomposition catalyst, natural decomposition and the introduction of fresh air.

2.10.2. Surface Decontamination Approach using pH-Adjusted Bleach

The second round of the BOTE Project utilized a decontamination process that employed pH-adjusted bleach as the decontaminant. The details of the decontamination process are introduced briefly below and discussed in detail in Section 4.1.2. The process started with the generation of air flow in and out of the facility using a filtered NAM to reduce any airborne *Bg* in

the facility. This filtered flow was maintained throughout the process to attempt to remove any airborne *Bg* that might be generated via reaerosolization due to decontamination activities in the facility. Decontamination personnel in Level C PPE then entered the facility to remove all porous materials that were deemed to present a significant challenge for successful decontamination using pH-adjusted bleach. These items were bagged, sprayed thoroughly with pH-adjusted bleach, and removed from the facility for treatment as waste. The interior of the facility was then sprayed with pH-adjusted bleach by decontamination personnel in Level B PPE. The spraying was completed with a chemical sprayer and thoroughly wetted all surfaces in the facility. The day after the majority of the spraying was completed, standing water was vacuumed up, and heaters and fans were used to promote drying.

2.10.3. Fumigation by Sabre Technical Services, LLC, with Chlorine Dioxide Gas

The third and final round of the BOTE Project utilized fumigation with ClO_2. Sabre Technical Services LLC ("Sabre") was selected to fumigate the facility with ClO_2 based upon technical considerations and cost. The same facility configuration as in the previous two rounds was used, as described in Section 2.1, and the facility contained a mixture of porous and nonporous surfaces throughout the building. The details of the decontamination process using ClO_2 are discussed in Section 4.1.3.

Sabre utilizes a wet generation system by mixing water, sodium hypochlorite, hydrochloric acid, and sodium chlorite to generate ClO_2 in the liquid phase. A liquid-air stripper is then used to transfer the ClO_2 from the liquid phase to the vapor phase. The vapor phase ClO_2 is then blown into a facility using a 7,000 CFM fan. Following fumigation, the ClO_2 must be removed from the air. Sodium hydroxide is added to the generation system to neutralize the ClO_2, and then the air in the facility is polished using an activated carbon scrubber.

2.10.4. Treatment of Decontamination line Wash Water

Chlorine bleach has been shown to be effective for *Ba* inactivation in buffered water at certain contact times[77-79]. However, wastewater represents a different matrix for which the effectiveness of chlorine is not well known. Wastewater generated during washdown may contain components with a chlorine demand that could lessen the effectiveness of chlorine in the inactivation of *Ba* spores.

EPA is currently conducting bench-scale studies to determine the effectiveness of chlorine to inactivate a *Ba* spore surrogate, *Bg*, in wash water generated during a decontamination event. *Bg* is more resistant to chlorine than *Ba* and serves as a conservative indicator of inactivation. The research involves testing a *Ba* decontamination technique recommended by the NRT[80]. The NRT method calls for 1 part (by volume) household bleach and 1 part white vinegar for every 10 parts wash water. The chlorine concentration resulting from this method is approximately 0.5 % sodium hypochlorite, assuming a starting concentration of 6% sodium hypochlorite in household bleach. The pH will be 7. At pH 7, the bleach solution contains a greater amount of hypochlorous acid, a more effective disinfecting agent for *Ba* spores than the hypochlorite ion. The recommended contact time is 1-2 hr.

In preparation for the BOTE Project wash water inactivation study, EPA conducted bench-scale inactivation research at the EPA Test and Evaluation facility in Cincinnati, OH, using water that

was representative of incident cleanup activities (report in development). This study included bench-scale tests using a 5 L glass reactor and subsequently a scaleup to 55-gal drums. Simulated decontamination wash water was obtained by washing down laboratory walls, floors and other external surfaces and then spiking with *Bg* spores resulting in a concentration of 1.0E6 spores/1 mL. This research indicated that a > six log inactivation (i.e., log reduction) can be achieved under laboratory conditions using a 5% concentration of bleach (0.25 % sodium hypochlorite) without the addition of vinegar.

For the BOTE Project, water from the washdown of personnel exiting the contaminated building and going through the Decontamination Line was collected for each sampling event in a 55-gal drum and chlorinated to test the effectiveness of chlorine treatment of wash water under field conditions. The calculation of *Bg* spore log reduction was possible only for the last sampling event on May 12, 2011, for which 0.15 mL of an estimated 1.5E8 CFU/mL suspension was spiked into the wash water. All other sampling events resulted in non-detection of spores. For the spiked sampling event, log reduction was calculated in accordance with Equation 2-1.

3. RESULTS

This section of the BOTE Project report outlines the sampling results. Use of these results relative to the project objectives is discussed in Section 4. All sample results are reported in Appendix G.

For analysis of results in this chapter, these data were analyzed by one-way analysis of variance (ANOVA) for each round. Bonferroni *post-hoc* tests were subsequently conducted to evaluate each contrast. Significance was assessed using a p-value equal to 0.05. SigmaPlot 11 (Systat Software Inc., San Jose, CA) was utilized for the above mentioned statistical analyses. Average results are provided, along with one standard deviation (SD) in parentheses (±SD).

3.1. Reference Method Results

3.1.1. Settling Plates

If the settling plate count was > 300 CFU, the plate result was recorded as TNTC. For all of the countable plates (up to 300 CFU), the results were transformed to CFU/ft^2 by dividing the CFU final laboratory counts by the surface area of the plate. Settling plates were collected only on the second floor to provide an indication of dissemination concentrations and potential gradients in the facility. No plates were used on the first floor because surface loadings were expected to yield TNTC on all plates and would not be of particular use. Further, the settling plate results were used to provide an indication of the surface loadings expected in the rooms prior to surface sampling. Surface sampling results were ultimately used to determine if the target loading requirements were achieved and for assessment of decontamination efficacy.

3.1.1.1. Round 1 Settling Plate Results

All settling plate results on the second floor were identified as TNTC, indicating that surface loadings were expected to be > 4.9E3 CFU/ft^2 (i.e., 3.0E2 CFU divided by 0.061 ft^2 [surface area of 85 mm TSA settling plate]).

3.1.1.2. Round 2 Settling Plate Results

Settling plates ranged from 2.1E3 to TNTC (> 4.9E3) CFU/ft^2. The average loading based upon the settling plate data was 3.6E3 (± 9.6E2) CFU/ft^2; TNTC values were included as 4.9E3 CFU/ft^2. The settling plate results per second floor room are listed in Table 3-1.

3.1.1.3. Round 3 Settling Plate Results

All settling plate results on the second floor were identified as TNTC, indicating that surface loadings were expected to be > 4.9E3 CFU/ft^2 (i.e., 3.0E2 CFU divided by 0.061 in^2 [surface area of 85 mm TSA settling plate]).

Table 3-1. Summary of settling plate results from Round 2

Room	Barcode	Settling Plate Area (ft^2)	Result (CFU)	Result (CFU/ ft^2)
Room 206	4565	0.061	TNTC	TNTC
Room 206	4567	0.061	TNTC	TNTC
Room 206	4574	0.061	TNTC	TNTC
Room 207	4544	0.061	TNTC	TNTC
Room 207	4573	0.061	2.1E2	3.5E3
Room 207	4577	0.061	2.1E2	3.4E3
Room 208	4547	0.061	2.6E2	4.2E3
Room 208	4548	0.061	1.7E2	2.8E3
Room 208	4575	0.061	2.9E2	4.8E3
Room 209	4550	0.061	2.0E2	3.2E3
Room 209	4578	0.061	1.7E2	2.8E3
Room 209	4589	0.061	2.2E2	3.6E3
Room 210	4546	0.061	2.4E2	4.0E3
Room 210	4569	0.061	2.9E2	4.7E3
Room 210	4584	0.061	1.9E2	3.1E3
Room 211	4583	0.061	1.3E2	2.1E3
Room 211	4586	0.061	1.3E2	2.2E3
Room 211	4588	0.061	1.5E2	2.5E3
Room 212	4570	0.061	2.6E2	4.3E3
Room 212	4572	0.061	2.4E2	3.9E3
Room 212	4576	0.061	1.7E2	2.8E3
Room 213	4549	0.061	1.6E2	2.6E3
Room 213	4571	0.061	1.5E2	2.5E3
Room 213	4579	0.061	2.1E2	3.4E3

TNTC = Too Numerous to Count (> 4,900 CFU/ft^2)

3.1.2. Reference Material Coupons

RMCs were placed on both Floor 1 and Floor 2 (collocated with TSA settling plates). The RMCs were collected during the pre-decontamination (characterization) surface sampling phase in each round and prior to surface sampling at nearest locations within a specific room (as with the TSA settling plates). The RMCs were sent to the INL Microbiology Laboratory to be extracted and dilution plated. The ability to dilution plate the RMCs provided for a higher dynamic range with respect to the indication of surface loading (hence their use on both floors). For all of the countable plates (30-300 CFU), the results were transformed to CFU/ft^2 by dividing the CFU final laboratory counts by the surface area of the RMC (0.012 ft^2).

3.1.2.1. Round 1 RMC Results

The results for the Round 1 RMCs placed prior to dissemination and picked up before pre-decontamination surface sampling at nearest locations in a particular room are reported in Table 3-2. The mean RMC loading for first floor rooms was 3.7E5 (±1.6E5) CFU/ft^2. This average was within the target range specified for surface loading on the first floor (1E4 to 1E6 CFU/ft^2). The mean RMC loading for second floor rooms was 1.1E4 (±4.5E3) CFU/ft^2. All quantified RMC samples associated with the second floor rooms were higher than the target spore loading of 1E2 to 2E2 CFU/ft^2. However, the results did indicate a significant difference ($p < 0.001$) between first and second floor surface loadings, which was the critical criterion for the decontamination efficacy study.

Table 3-2. Summary of RMC results from Round 1

Room	Barcode	RMC Area (ft^2)	Result (CFU)*	Result (CFU/ft^2)
Room 101A	1047	0.012	3.2E3	2.7E5
Room 101A	1062	0.012	3.5E3	3.0E5
Room 101A	1064	0.012	3.4E3	2.8E5
Room 102	1056	0.012	7.8E3	6.5E5
Room 102	1066	0.012	3.0E3	2.5E5
Room 102	1069	0.012	3.2E3	2.7E5
Room 103	1004	0.012	4.4E3	3.7E5
Room 103	1022	0.012	3.1E3	2.6E5
Room 103	1053	0.012	6.0E3	5.0E5
Room 104	1070	0.012	3.7E3	3.1E5
Room 104	1077	0.012	5.6E3	4.7E5
Room 104	1087	0.012	3.9E3	3.3E5
Room 105	1003	0.012	4.8E3	4.0E5
Room 105	1076	0.012	6.4E3	5.3E5
Room 105	1095	0.012	4.6E3	3.8E5
Room 106	1058	0.012	3.6E3	3.0E5
Room 106	1082	0.012	6.0E3	5.0E5
Room 106	1083	0.012	4.2E3	3.5E5
Room 107	1075	0.012	2.8E3	2.3E5
Room 107	1081	0.012	2.5E3	2.1E5
Room 107	1119	0.012	2.3E3	1.9E5
Room 108	1059	0.012	1.1E4	9.2E5
Room 108	1079	0.012	3.7E3	3.1E5
Room 108	1084	0.012	3.2E3	2.7E5
Room 109	1078	0.012	6.0E3	5.0E5
Room 109	1080	0.012	3.2E3	2.6E5
Room 109	1160	0.012	6.8E3	5.7E5
Room 110	1033	0.012	2.8E3	2.3E5

Room	Barcode	RMC Area (ft^2)	Result (CFU)*	Result (CFU/ft^2)
Room 110	1072	0.012	3.9E3	3.3E5
Room 110	1085	0.012	2.9E3	2.5E5
Room 206	1074	0.012	1.2E2	1.0E4
Room 206	1090	0.012	1.2E2	1.0E4
Room 206	1091	0.012	1.2E2	1.0E4
Room 207	1051	0.012	1.0E2	8.3E3
Room 207	1092	0.012	1.0E2	8.3E3
Room 207	1113	0.012	1.0E2	8.3E3
Room 208	1055	0.012	2.0E2	1.7E4
Room 208	1073	0.012	1.2E2	1.0E4
Room 208	1154	0.012	2.0E1	1.7E3
Room 209	1018	0.012	4.0E1	3.3E3
Room 209	1019	0.012	1.4E2	1.2E4
Room 209	1063	0.012	6.0E1	5.0E3
Room 210	1024	0.012	2.6E2	2.2E4
Room 210	1045	0.012	1.2E2	1.0E4
Room 210	1046	0.012	1.6E2	1.3E4
Room 211	1031	0.012	2.0E2	1.7E4
Room 211	1097	0.012	1.6E2	1.3E4
Room 211	1121	0.012	1.0E2	8.3E3
Room 212	1025	0.012	1.6E2	1.3E4
Room 212	1050	0.012	1.0E2	8.3E3
Room 212	1138	0.012	1.8E2	1.5E4
Room 213	1040	0.012	2.0E2	1.7E4
Room 213	1133	0.012	1.4E2	1.2E4
Room 213	1157	0.012	1.6E2	1.3E4

*CFU results based on dilution plating with mean CFU plate counts of 30-300 CFU; if lowest dilution plate counts were <30 CFU, filter plate results were used if available.

3.1.2.2. Round 2 RMC Results

The results for the Round 2 RMCs placed prior to dissemination and picked up before pre-decontamination surface sampling at nearest locations in a particular room are reported in Table 3-3. The mean RMC loading for first floor rooms was 1.4E4 (±3.8E4) CFU/ft^2, considering ND as equal to 0 CFU. This average is within the target range specified for surface loading on the first floor (1E4 to 1E6 CFU/ft^2). However, all RMC samples associated with Rooms 102, 105, 106, 107, 108, 109, and 110 were ND for *Bg* spores. Excluding these NDs, the mean loading for RMCs on the first floor was 1.1E5 (±3.6E4) CFU/ft^2. This value was more consistent with the Round 1, Floor 1 results and consistent with the target loading criteria. However, the majority of RMC samples on the first floor in Round 2 were reported as ND for unknown reasons. The RMCs were meant to provide an indication of the surface loading; ultimately, surface sampling was used to determine if the criterion was met and for the decontamination efficacy

assessment. Based upon surface sampling results (see below), the RMC results for this round did not impact the project or data analysis.

The mean RMC loading for second floor rooms was 7.0E3 (±4.8E3) CFU/ft^2. All quantified RMC samples associated with the second floor rooms were higher than the target spore loading of 1E2 to 2E2 CFU/ft^2. One RMC on the second floor was ND for *Bg*. Excluding the inclusion of this value as 0 CFU, the mean loading for second floor RMCs was 7.3E3 (±4.7E3) CFU/ft^2. When the unexplained NDs are included, the results did not indicate a significant difference ($p = 1.0$) between first and second floor surface loadings. Excluding the NDs, the results did indicate a significant difference ($p < 0.001$) between first and second floor surface loadings. These results were meant to provide an indication of surface loading; the surface sampling results were the critical criteria for the decontamination assessment.

Table 3-3. Summary of RMC Results from Round 2

Room	Barcode	RMC Area (ft^2)	Result (CFU)*	Result (CFU/ft^2)
Room 101A	1028	0.012	1.1E3	9.2E4
Room 101A	1110	0.012	7.6E2	6.3E4
Room 101A	1134	0.012	ND	ND
Room 102	1140	0.012	ND	ND
Room 102	1155	0.012	ND	ND
Room 102	1158	0.012	ND	ND
Room 103	1029	0.012	1.5E3	1.3E5
Room 103	1153	0.012	ND	ND
Room 103	1159	0.012	ND	ND
Room 104	1114	0.012	ND	ND
Room 104	1147	0.012	ND	ND
Room 104	1152	0.012	1.7E3	1.4E5
Room 105	1023	0.012	ND	ND
Room 105	1112	0.012	ND	ND
Room 105	1141	0.012	ND	ND
Room 106	1116	0.012	ND	ND
Room 106	1131	0.012	ND	ND
Room 106	1156	0.012	ND	ND
Room 107	1101	0.012	ND	ND
Room 107	1123	0.012	ND	ND
Room 107	1137	0.012	ND	ND
Room 108	1100	0.012	ND	ND
Room 108	1124	0.012	ND	ND
Room 108	1151	0.012	ND	ND
Room 109	1108	0.012	ND	ND
Room 109	1132	0.012	ND	ND
Room 109	1148	0.012	ND	ND

Room	Barcode	RMC Area (ft^2)	Result (CFU)*	Result (CFU/ft^2)
Room 110	1043	0.012	ND	ND
Room 110	1094	0.012	ND	ND
Room 110	1109	0.012	ND	ND
Room 206	1021	0.012	1.0E2	8.3E3
Room 206	1088	0.012	2.4E2	2.0E4
Room 206	1146	0.012	2.0E1	1.7E3
Room 207	1012	0.012	1.0E2	8.3E3
Room 207	1030	0.012	1.4E2	1.2E4
Room 207	1144	0.012	6.0E1	5.0E3
Room 208	1037	0.012	4.0E1	3.3E3
Room 208	1120	0.012	2.0E1	1.7E3
Room 208	1126	0.012	4.0E1	3.3E3
Room 209	1042	0.012	1.4E2	1.2E4
Room 209	1068	0.012	1.0E2	8.3E3
Room 209	1118	0.012	6.0E1	5.0E3
Room 210	1015	0.012	2.0E1	1.7E3
Room 210	1032	0.012	1.2E2	1.0E4
Room 210	1089	0.012	8.0E1	6.7E3
Room 211	1049	0.012	1.8E2	1.5E4
Room 211	1117	0.012	6.0E1	5.0E3
Room 212	1007	0.012	1.0E2	8.3E3
Room 212	1009	0.012	1.0E2	8.3E3
Room 212	1057	0.012	ND	ND
Room 213	1014	0.012	1.2E2	1.0E4
Room 213	1052	0.012	2.0E1	1.7E3
Room 213	1129	0.012	6.0E1	5.0E3

*CFU results based on dilution plating with mean CFU plate counts of 30-300 CFU; if lowest dilution plate counts were <30 CFU, filter plate results were used if available.
ND = non-detect.

3.1.2.3. Round 3 RMC Results

The results for the Round 3 RMCs placed prior to dissemination and picked up before pre-decontamination surface sampling at the nearest locations in a particular room are reported in Table 3-4.The mean RMC loading for first floor rooms was 2.1E5 (±7.3E4) CFU/ft^2. This average was within the target range specified for surface loading on the first floor (1E4 to 1E6 CFU/ft^2). The mean RMC loading for second floor rooms was 1.2E4 (±6.1E3) CFU/ft^2. All quantified RMC samples associated with the second floor rooms were higher than the target spore loading of 1E2 to 2E2 CFU/ft^2 (see Table 3-4). However, the results did indicate a significant difference ($p < 0.001$) between first and second floor surface loadings, which was the critical criterion for the decontamination efficacy study. Both first and second floor RMC results

were highly consistent with the results from Round 1. This consistency further highlights an unexplained anomaly with respect to the RMC results for Round 2.

Three blanks (negative controls) were included during Round 3, as shown in Table 3-4. These blanks were included to assess potential contamination during handling and transport of the RMCs. All three blank RMCs were ND for *Bg*.

Table 3-4. Summary of RMC results from Round 3

Room	Barcode	RMC Area (ft^2)	Result (CFU)*	Result (CFU/ ft^2)
Room 101A	1026[β]	0.012	4.4E3	3.7E5
Room 101A	1145 [β]	0.012	4.6E3	3.8E5
Room 101A	1162	0.012	2.9E3	2.5E5
Room 102	1020	0.012	2.3E3	1.9E5
Room 102	1048	0.012	2.5E3	2.1E5
Room 102	1067	0.012	3.2E3	2.7E5
Room 103	1001 [β]	0.012	2.6E3	2.2E5
Room 103	1035 [β]	0.012	4.4E3	3.7E5
Room 103	1061 [β]	0.012	3.2E3	2.7E5
Room 104	1130	0.012	2.2E3	1.8E5
Room 104	1135	0.012	2.9E3	2.4E5
Room 104	1161	0.012	4.2E2	3.5E4
Room 105	1060 [β]	0.012	2.2E3	1.8E5
Room 105	1115	0.012	2.1E3	1.8E5
Room 105	1136	0.012	2.0E3	1.6E5
Room 106	1005	0.012	2.2E3	1.8E5
Room 106	1036	0.012	2.0E3	1.6E5
Room 106	1149	0.012	1.9E3	1.6E5
Room 107	1008	0.012	1.5E3	1.2E5
Room 107	1039	0.012	1.6E3	1.4E5
Room 107	1096	0.012	2.3E3	1.9E5
Room 108	1006	0.012	2.6E3	2.2E5
Room 108	1065	0.012	2.1E3	1.8E5
Room 108	1093	0.012	2.0E3	1.7E5
Room 109	1016	0.012	1.7E3	1.4E5
Room 109	1054	0.012	2.2E3	1.8E5
Room 109	1143	0.012	2.8E3	2.4E5
Room 110	1103	0.012	2.3E3	1.9E5
Room 110	1139	0.012	3.1E3	2.6E5
Room 110	1027	0.012	2.9E3	2.4E5
Room 206	4804	0.012	6.0E1	5.0E3
Room 206	4805	0.012	1.0E2	8.3E3

Room	Barcode	RMC Area (ft^2)	Result (CFU)*	Result (CFU/ ft^2)
Room 206	4812	0.012	2.0E1	1.7E3
Room 206	4806†	0.012	ND	ND
Room 207	1086	0.012	1.6E2	1.3E4
Room 207	1099	0.012	1.4E2	1.2E4
Room 207	1125	0.012	4.0E1	3.3E3
Room 207	4810†	0.012	ND	ND
Room 208	1002	0.012	8.0E1	6.7E3
Room 208	1107	0.012	1.0E2	8.3E3
Room 208	1128	0.012	1.4E2	1.2E4
Room 209	1013	0.012	1.2E2	1.0E4
Room 209	1038	0.012	1.4E2	1.2E4
Room 209	1111	0.012	2.2E2	1.8E4
Room 210	4807	0.012	2.8E2	2.3E4
Room 210	4808	0.012	2.6E2	2.2E4
Room 210	4811	0.012	2.2E2	1.8E4
Room 211	1044	0.012	1.8E2	1.5E4
Room 211	1098	0.012	2.0E2	1.7E4
Room 211	1102	0.012	1.2E2	1.0E4
Room 212	1010	0.012	1.8E2	1.5E4
Room 212	1041	0.012	2.6E2	2.2E4
Room 212	1150	0.012	1.6E2	1.3E4
Room 213	1017	0.012	2.2E2	1.8E4
Room 213	1034	0.012	4.0E1	3.3E3
Room 213	1105	0.012	1.2E2	1.0E4
Room 213	4813†	0.012	ND	ND

*CFU results based on dilution plating with mean CFU plate counts of 30-300 CFU; if lowest dilution plate counts were <30 CFU, filter plate results were used if available.
† = Quality control blank samples.
β = Lowest serial dilution values were below the quantitation limit of 30 CFU; however, filter plate results were TNTC. Therefore, the serial dilution values were reported.

3.1.2.4. Comparisons of RMC Results

For Floor 1, the difference between the average RMC values were considered statistically significant for each round ($p<0.001$ for all *post-hoc* comparisons). Round 3 had the highest average loading, and Round 2 had the lowest. For Floor 2, the average RMC loading for Round 2 was lower than that of Round 1 and 3. The differences were not suggested to be statistically significant at the 95% confidence value. Likewise, the settling plates for Round 2 also had the lowest average CFU; Round 2 was the only round in which all plates were not TNTC.

3.2. Surface, Air, Sand, and Water Sampling Results

During the BOTE Project Phase 1, sampling teams collected a total of 3,259 samples across all media (surface, air, sand and water), including quality assurance (QA) samples (blanks). A total of 2,801 test and 458 blank samples were collected. Sampling teams collected 83 test and 18 blank samples during the MFP event (background samples). The teams collected a total of 1,130 (975 test, 155 blank), 1,039 (911 test, 128 blank), and 989 (832 test, 157 blank) samples during Rounds 1-3, respectively. A summary and breakdown of air and surface samples collected is shown in Table 2-7.

Surface samples including sponge-stick wipes, Versalon® wipes, macrofoam swabs (swabs), and vacuum socks were taken during two events within each round: pre-decontamination and post-decontamination. The pre-decontamination sampling is generally referred to as characterization sampling. The post-decontamination surface sampling is often synonymous with clearance sampling. These samples were used for the determination of decontamination efficacy within each round.

Air sampling was conducted for several purposes during the BOTE project. First, XMX and STAs were used to conduct an assessment of AAS. Second, the UV-APS and SKC BioSampler® were used in support of a reaerosolization study. The results from the SKC BioSamplers® were also used during an exposure assessment.

The sand dish results were used to assess the potential for viable spores to be transported from inside the facility to outside the facility during the BOTE Project.

Lastly, wash water from the Decontamination Line and waste water from the pH-adjusted bleach decontamination process were analyzed for viable *Bg*. The intent of these results was to test the effectiveness of chlorine to inactivate spores in the Decontamination Line wash water and assess on-site wash/wastewater treatment.

The results from the surface, air, sand, and water sampling and analysis are presented in the subsections below. The analysis of these data with respect to the study objectives is detailed in Section 4.

3.2.1. Surface Sampling Results

Surface sampling was conducted for three primary purposes: (1) assessment of decontamination efficacy, (2) reaerosolization study, and (3) RV-PCR method evaluation. For the assessment of decontamination efficacy, swab, sponge-stick wipes, and vacuum sock samples were collected and analyzed by the LRN. Versalon® wipe samples were collected and analyzed by INL for the reaerosolization study and by LLNL for the RV-PCR method evaluation. The results from the surface samples analyzed by the LRN or INL are reported below for each round. Results from the samples for the RV-PCR evaluation are reported in Section 3.2.2. Details for all samples and sample results, compiled from the BROOM database, can be found in Appendix G.

All quantitative results should be considered with appropriate variance (i.e., confidence intervals). While contributions to variance for microbial sampling and analysis are

acknowledged, the quantitative variance has not been established to date for any sampling or analysis methods. Comparison of quantitative values presented in this report is done using an internal determination of the variance in the data due to the number, types, and replication of sampling performed. This analysis is suitable for the internal comparisons used with the BOTE Project; however, the reported confidence levels should not be assumed as standardized for use elsewhere.

3.2.1.1. MFP (Baseline Assessment) Surface Sampling Results

During the MFP event, sample teams collected 63 surface samples comprised of swabs, sponge-stick wipes, and vacuum socks. An additional 13 blank (QC) samples of these types were also collected. The total number of samples (surface and blank) for each floor along with the number of samples in which *Bg* was detected are reported in Table 3-5. The facility was widely contaminated with detectable *Bg* prior to the start of the BOTE Project rounds. Nearly 48% of all surface samples sent to the LRN laboratories resulted in detectable *Bg*. A higher percentage of baseline assessment samples from the second floor contained detectable *Bg*.

Data similar to the data described above are presented for swab samples in Table 3-6, sponge-stick wipes in Table 3-7, and vacuum socks in Table 3-8. These data are also shown graphically in Figure 3-1. The locations of all samples are shown in Figure 3-2 (Floor 1) and Figure 3-3 (Floor 2). Overall, the highest percent detection was from vacuum sock samples (Floor 1 and Floor 2) and sponge-stick wipe samples (Floor 2). These data should not be taken to indicate the effectiveness or efficiency of a particular sampling type, as comparable samples were not taken across each type. Swabs were used for small areas or hard to reach locations such as HVAC supply diffusers or light fixtures, sponge-stick wipes were used over larger areas on nonporous surfaces, and vacuum socks were used over the largest areas for porous materials.

Table 3-5 through Table 3-8 also show the number of samples that showed detection of *Bg* on spread plates and/or filter plates. Samples with less than 30 CFU on the lowest dilution spread plate were filter plated. Therefore, some samples may have had *Bg* detected on both spread and filter plates. Additionally, not all samples that had less than 30 CFU on the lowest dilution spread plate were filter plated (as discussed in Section 2.9.1.1). In the MFP event, two samples that had less than 30 CFU were not filter plated. Both samples had an average of approximately 9 CFU on the lowest dilution spread plates (triplicate plates at each dilution for each sample). These data were used as estimated CFU counts for subsequent surface concentration analysis, consistent with ASTM D5465-93[74]. As a point of reference, both samples with missing filter plate data were from Floor 1 vacuum sock samples. The average surface concentration using these two data points as estimated values is 10 (±47) CFU/ft^2. Considering these two values at the quantification limit (30 CFU), the average loading is 1.4E2 (±3.7E2) CFU/ft^2. These averages consider ND values as equal to zero. Using the *t*-test[81], the two-tailed p-value is 0.0556 and the difference between the two averages is not quite statistically significant at a 95% confidence level.

Detectable *Bg* was found in 11 of 33 samples on Floor 1 and 20 of 33 samples on Floor 2. One of the samples with detectable *Bg* was one of the six blank samples from Floor 2. This sample was ND by spread plating and had 2 CFU detected by filter plating. Of the other 19 samples

with detectable *Bg* from Floor 2, 10 used filter plate data and resulted in an average of 62 (±66) CFU. Three samples were at or no more than twice the CFU determined in the blank sample. The other seven samples were at least ten times greater than the blank sample. While any detectable *Bg* in a blank raises concerns with respect to laboratory and field contamination control measures, the very low CFU detected in the single sample provided a strong indication that MFP results were not impacted by any source of confounding contamination.

The conclusion was that the average surface concentration determined during the MFP did not impact the BOTE Project, since the values were not greater than the target surface loading desired for Rounds 1-3. The background contamination in the facility was determined not to add significantly to the contamination after Round 1 dissemination (compare MFP and Round 1 pre-decontamination results). Surface concentrations in the MFP were an insignificant fraction of the concentrations measured after dissemination in Round 1, 2, or 3.

The results from the wipe samples analyzed by INL for the reaerosolization study, targeted in Rooms 101A and 102, are reported in Section 3.2.3.2.2.

3.2.1.2. Round 1 Surface Sampling Results

There were two surface sampling events in Round 1: pre-decontamination (characterization) and post-decontamination (clearance).

3.2.1.2.1. Round 1 Pre-decontamination Surface Sampling Results

During Round 1 pre-decontamination sampling, sample teams collected 291 surface samples comprised of swabs, sponge-stick wipes, and vacuum socks. An additional 52 blank (QC) samples of these types were also collected. The locations and types of samples collected are shown in Figure 3-4 (Floor 1) and Figure 3-5 (Floor 2).

The total number of samples collected on each floor with the number of samples in which *Bg* was detected are reported in Table 3-9. In total, *Bg* was detected in approximately 97% of the surface samples. The percent detection was equivalent for both floors; in total, *Bg* was detected in 283 samples. In 270 samples, *Bg* was detected and quantified in the spread plate analysis. Filter plating was used for the quantitation of 13 samples (i.e., the spread plate data were below the quantitation limit). In six samples, *Bg* was detected only by filter plating (i.e., spread plating was ND). Nineteen samples that should have been filter plated according to the BOTE Project sample analysis plan were not filter plated. However, in all cases, these samples had detectable *Bg* via spread plating; the resulting spread plate CFU were used below the quantitation limit in these cases, as discussed previously.

A summary of *Bg* detection by sample type and floor is shown in Figure 3-6. *Bg* was detected in more than approximately 98% of all sponge-stick wipe and vacuum sock samples collected in PBF-632. Considerably fewer swab samples were taken; swab sampling was focused on sampling supply vents, computer monitors, and small areas of the floor or ceiling (e.g., along the lights or drop ceiling supports).

The average CFU/ft^2 was 3.1E5 (±5.0E5) on Floor 1 and 1.3E4 (± 5.0E4) on Floor 2. The measured surface loading on Floor 1 was within the target criteria of 1E4 to 1E6 CFU/ft^2. This

measured loading was consistent with the loading estimated from the RMCs; there was no statistically significant difference between the surface sampling and RMC average values (t-test, two-tailed p-value = 0.5479).[81] (Note that the *t-test*, as per the cited reference, was used for this analysis due to both normality and equal variance failing for ANOVA. A confidence level of 99% was used here, in consideration that t-tests inflate the Type I error.) The measured surface loading on Floor 2 was two orders of magnitude higher than the target range of 1.0E2 to 2.0E2 CFU/ft^2. The RMCs, again, provided a good estimation of the surface loading; there was no statistically significant difference between the surface sampling and RMC average values (t-test, two-tailed p-value = 0.8282).[81] Supporting these results, three-way ANOVA considering both floors together did not indicate a statistically significant difference between the RMCs and surface sampling (p-value = 1.0). Although the surface loading on Floor 2 was above the target range, there was still a significant difference between the measured surface loadings on the two floors (p-value < 0.001), as determined via three-way ANOVA.

A total of 10 blank samples out of 52 from the pre-decontamination sampling resulted in detectable *Bg* (Table 3-10). For six of the samples, *Bg* was detected only by filter plating. Seven of the blank samples with detected *Bg* were from Floor 1 sampling teams. The results from each of the blank samples in which *Bg* was detected are shown in Table 3-11. The blank results show only very low levels of contamination compared to the bulk of the surface samples taken on each floor.

3.2.1.2.2. Round 1 Post-decontamination Surface Sampling Results

During Round 1 post-decontamination sampling, sampling teams collected 276 surface samples comprised of swabs, sponge-stick wipes, and vacuum socks. An additional 45 blank (QC) samples of these types were also collected. The locations and types of samples collected are shown in Figure 3-7 (Floor 1) and Figure 3-8 (Floor 2).

The total number of samples for each floor along with the number of samples in which *Bg* was detected are reported in Table 3-12. In total, *Bg* was detected in approximately 34% of the surface samples. Percent detection was significantly greater on Floor 1 (51%) than on Floor 2 (13%). In 47 samples, *Bg* was detected and quantified in the spread plate analysis. Filter plating was used for the quantitation of 47 samples (i.e., the spread plate data were below the quantitation limit). In 43 samples, *Bg* was detected only by filter plating (i.e., spread plating was ND). Nine samples that should have been filter plated per the BOTE Project sample analysis plan were not filter plated. However, in all cases, these samples had detectable *Bg* via spread plating; the resulting spread plate CFU were used below the quantitation limit in these cases as discussed previously. The Floor 1 average loading after decontamination was 8.5E3 CFU/ft^2 with a standard deviation of 1.2E5. The average surface loading determined by the vacuum sock samples was two orders of magnitude lower than the average surface loading determined by swabs and sponge-stick wipes; this difference led to the high standard deviation.

A summary of *Bg* detection by sample type and floor is shown in Figure 3-9. The highest percentage of samples in which *Bg* was detected were from sponge-stick wipes and vacuum socks. Considerably fewer swab samples were taken; swab sampling was focused on sampling

supply vents, computer monitors, and small areas of the floor or ceiling (e.g., along the lights or drop ceiling supports).

A total of four blank samples out of 45 from the post-decontamination sampling resulted in detectable *Bg* (Table 3-13). For three of the samples, *Bg* was detected only by filter plating. All blank samples with detected *Bg* were from Floor 1 sampling teams. The results from each of the blank samples in which *Bg* was detected are shown in Table 3-14. The blank results show only very low levels of contamination compared to the bulk of the surface samples taken on each floor. For example, even the two blank samples that had over 1.0E3 CFU on each sample are two orders of magnitude lower than the average CFU per sample determined from Floor 1 pre-decontamination samples.

3.2.1.3. Round 2 Surface Sampling Results

There were two surface sampling events in Round 2: pre-decontamination (characterization) and post-decontamination (clearance).

3.2.1.3.1. Round 2 Pre-decontamination Surface Sampling Results

During Round 2 pre-decontamination sampling, sample teams collected 268 surface samples comprised of swabs, sponge-stick wipes, and vacuum socks. An additional 41 blank (QC) samples of these types were also collected. The locations and types of samples collected are shown in Figure 3-10 (Floor 1) and Figure 3-11 (Floor 2).

The total number of samples for each floor with the number of samples in which *Bg* was detected are reported in Table 3-15. A summary of *Bg* detection by sampling type and floor is shown in Figure 3-12. In total, *Bg* was detected in approximately 97% of the surface samples. This percentage was identical to the value determined in Round 1 pre-decontamination sampling. There was a slightly higher percentage of detection for Floor 1 sampling than for Floor 2 sampling. In total, *Bg* was detected in 259 samples. In 242 samples, *Bg* was detected and quantified in the spread plate analysis. Filter plating was used for the quantitation of 17 samples (i.e., the spread plate data were below the quantitation limit). In seven samples, *Bg* was detected only by filter plating (i.e., spread plating was ND). Ten samples that should have been filter plated per the BOTE Project sample analysis plan were not filter plated. However, in all cases, these samples had detectable *Bg* via spread plating; the resulting spread plate CFU were used below the quantitation limit in these cases as discussed previously (see Section 3.2.1.1. regarding ASTM D5465-93[74]).

The average CFU/ft^2 was 2.1E5 (±2.9E5) on Floor 1 and 4.8E4 (±2.1E5) on Floor 2. The measured surface loading on Floor 1 was within the target criteria of 1E4 to 1E6 CFU/ft^2. This measured loading was consistent with that estimated from the four Floor 1 RMCs with *Bg* detected (see Section 3.2.1.1); there was no statistically significant difference between the surface sampling and RMC average values (t-test, two-tailed p-value = 0.4838).[81] As in Round 1, the measured surface loading on Floor 2 was two orders of magnitude higher than the target range of 1E2 to 2E2 CFU/ft^2. The RMCs, again, provided a good estimation of the surface loading; there was no statistically significant difference between the surface sampling and RMC average values (t-test, two-tailed p-value = 0.2918).[81] Supporting these results, three-way

ANOVA considering both floors together did not indicate a statistically significant difference between the RMCs and surface sampling (p-value = 1.0). Although the surface loading on Floor 2 was above the target range, there was still a significant difference between the measured surface loadings on the two floors (p-value = 0.003).

The Floor 1 pre-decontamination surface loadings in Round 1 and Round 2 were within the acceptable target loading range, and both were within the same order of magnitude; the difference was not suggested to be statistically significant (p-value = 0.296). Likewise, there was no statistically significant difference suggested between the Floor 2 pre-decontamination results in Round 1 compared to Round 2 (p-value > 0.05).

A total of two blank samples out of 41 from the pre-decontamination sampling resulted in detectable *Bg* (Table 3-16). For one of the samples, *Bg* was detected only by filter plating. Both blank samples with detected *Bg* were from Floor 1 sampling teams. The results from each of the blank samples in which *Bg* was detected are shown in Table 3-17. The blank results show only very low levels of contamination compared to the bulk of the surface samples taken on each floor.

3.2.1.3.2. Round 2 Post-decontamination Surface Sampling Results

During Round 2 post-decontamination sampling, sampling teams collected 244 surface samples comprised of swabs, sponge-stick wipes, and vacuum socks. An additional 25 blank (QC) samples of these types were also collected. The locations and types of samples collected are shown in Figure 3-13 (Floor 1) and Figure 3-14 (Floor 2).

The total number of samples for each floor along with the number of samples in which *Bg* was detected are reported in Table 3-18. A summary of *Bg* detection by sample type and floor is show in Figure 3-15. In total, *Bg* was detected in approximately 3% of the surface samples. Percent detection was significantly greater on Floor 2 (6%) than on Floor 1 (1%). In one sample, *Bg* was detected and quantified in the spread plate analysis. Filter plating was used for the quantitation of seven samples (i.e., the spread plate data were below the quantitation limit). In seven samples, *Bg* was detected only by filter plating (i.e., spread plating was ND). All samples that required filter plating per the sample analysis plan were filter plated.

One blank sample out of 25 from the post-decontamination sampling resulted in detectable *Bg* (Table 3-19). *Bg* was detected only in the filter plating of the sample, i.e., spread plating results were ND (Table 3-20).

3.2.1.4. Round 3 Surface Sampling Results

Two surface sampling events occurred in Round 3: pre-decontamination (characterization) and post-decontamination (clearance).

3.2.1.4.1. Round 3 Pre-decontamination Surface Sampling Results

During Round 3 pre-decontamination sampling, sampling teams collected 273 surface samples comprised of swabs, sponge-stick wipes, and vacuum socks. An additional 52 blank (QC) samples of these types were also collected. The locations and types of samples collected are shown in Figure 3-16 (Floor 1) and Figure 3-17 (Floor 2).

The total number of samples for each floor along with the number of samples in which *Bg* was detected are reported in Table 3-21. A summary of *Bg* detection by sampling type and floor is shown in Figure 3-18. In total, *Bg* was detected in approximately 96% of the surface samples. This percentage was nearly identical to the value determined in Round 1 and Round 2 pre-decontamination sampling. There was a slightly higher percentage of detection for Floor 1 sampling than for Floor 2 sampling. In total, *Bg* was detected in 262 samples. In 247 samples, *Bg* was detected and quantified in the spread plate analysis. Filter plating was used for the quantitation of 15 samples (i.e., the spread plate data were below the quantitation limit). In eight samples, *Bg* was detected only by filter plating (i.e., spread plating was ND). Nine samples that should have been filter plated per the BOTE Project sample analysis plan were not filter plated. However, in all cases, these samples had detectable *Bg* via spread plating; the resulting spread plate CFU were used below the quantitation limit in these cases as discussed previously.

The average CFU/ft^2 was 2.4E5 (±5.4E5) on Floor 1 and 1.4E4 (±3.9E4) on Floor 2. The measured surface loading on Floor 1 was within the target criteria of 1E4 to 1E6 CFU/ft^2. This measured loading was consistent with the loading estimated from the Floor 1 RMCs; no statistically significant difference was observed between the surface sampling and RMC average values (t-test, two-tailed p-value = 0.6249).[81] As in Round 1, the measured surface loading on Floor 2 was an order of magnitude higher than the target range of 1E2 to 2E2 CFU/ft^2. The RMCs, again, provided a good estimation of the surface loading; no statistically significant difference was observed between the surface sampling and RMC average values (t-test, two-tailed p-value = 0.6353).[81] Supporting these results, three-way ANOVA considering both floors together did not indicate a statistically significant difference between the RMCs and surface sampling (p-value = 0.260) Although the surface loading on Floor 2 was above the target range, there was still an insignificant difference between the measured surface loadings on the two floors (p-value < 0.001).

No statistically significant difference was indicated between the Floor 1 surface loadings for Round 3 compared to Round 1 (p-value > 0.05) or Round 2 (p-value > 0.05). Likewise, no statistically significant difference was indicated between the Floor 2 surface loadings for Round 3 compared to Round 1 (p-value > 0.05) or Round 2 (p-value > 0.05).

A total of four blank samples out of 52 from the pre-decontamination sampling resulted in detectable *Bg* (Table 3-22). For two of the samples, *Bg* was detected only by filter plating. All blank samples with detected *Bg* were from Floor 1 sampling teams. The results from each of the blank samples in which *Bg* was detected are shown in Table 3-23. Three of the blank results show only very low levels of contamination compared to the bulk of the surface samples taken on each floor. One sponge-stick wipe blank sample (from Room 108) was of the same order of magnitude as the surface samples.

3.2.1.4.2. Round 3 Post-decontamination Surface Sampling Results

During Round 3 post-decontamination sampling, sampling teams collected 265 surface samples comprised of swabs, sponge-stick wipes, and vacuum socks. An additional 47 blank (QC) samples of these types were also collected. The locations and types of samples collected are shown in Figure 3-19 (Floor 1) and Figure 3-20 (Floor 2).

The total number of samples for each floor along with the number of samples in which *Bg* was detected are reported in Table 3-24. A summary of *Bg* detection by sampling type and floor is shown in Figure 3-21. In total, *Bg* was detected in approximately 2% of the surface samples. Percent detection was identical on both floors, i.e., irrespective of the difference in pre-decontamination surface loading. In one sample, *Bg* was detected and quantified in the spread plate analysis. Filter plating was used for the quantitation of five samples (i.e., the spread plate data were below the quantitation limit). In those five samples, *Bg* was detected only by filter plating (i.e., spread plating was ND). All samples that required filter plating per the sample analysis plan were filter plated.

None of the blanks out of 47 from the post-decontamination sampling resulted in detectable *Bg* (Table 3-25).

Table 3-5. LRN samples (swabs, sponge-stick wipes, vacuum socks) collected in the MFP event.

	Pre-Decontamination				
	Total Number of Samples Collected	Total Number with Detected CFU	Total Number with Detected CFU on Spread Plate	Total Number with Detected CFU on Filter Plate	Percentage of Detection
MFP	76	31	20	19	40.8%
Blanks	13	1	0	1	7.7%
Floor 1 Blanks	7	0	0	0	0.0%
Floor 2 Blanks	6	1	0	1	16.7%
Surface Samples	63	30	20	18	47.6%
Floor 1 Surface Samples	33	11	10	2	33.3%
Floor 2 Surface Samples	30	19	10	16	63.3%

Table 3-6. LRN swab samples collected in the MFP event.

	Pre-Decontamination				Percentage of Detection
	Total Number of Samples Collected	Total Number with Detected CFU	Total Number with Detected CFU on Spread Plate	Total Number with Detected CFU on Filter Plate	
Swabs	13	0	0	0	0.0%
Swab Blanks	3	0	0	0	0.0%
Floor 1 Swab Blanks	1	0	0	0	0.0%
Floor 2 Swab Blanks	2	0	0	0	0.0%
Swab Surface Samples	10	0	0	0	0.0%
Floor 1 Swab Surface Samples	5	0	0	0	0.0%
Floor 2 Swab Surface Samples	5	0	0	0	0.0%

Table 3-7. LRN sponge-stick wipe samples collected in the MFP event.

	Pre-Decontamination				Percentage of Detection
	Total Number of Samples Collected	Total Number with Detected CFU	Total Number with Detected CFU on Spread Plate	Total Number with Detected CFU on Filter Plate	
Sponge-stick Wipes	31	10	6	8	32.3%
Sponge-stick Wipes Blanks	5	1	0	1	20.0%
Floor 1 Sponge-stick Wipe Blanks	3	0	0	0	0.0%
Floor 2 Sponge-stick Wipe Blanks	2	1	0	1	50.0%
Sponge-stick Wipes Surface Samples	26	9	6	7	34.6%
Floor 1 Sponge-stick Wipes Surface Samples	14	1	1	0	7.1%
Floor 2 Sponge-stick Wipes Surface Samples	12	8	5	7	66.7%

Table 3-8. LRN vacuum sock samples collected in the MFP event.

	Pre-Decontamination				Percentage of Detection
	Total Number of Samples Collected	Total Number with Detected CFU	Total Number with Detected CFU on Spread Plate	Total Number with Detected CFU on Filter Plate	
Vacuum Socks	32	21	14	11	65.6%
Vacuum Socks Blanks	5	0	0	0	0.0%
Floor 1 Vacuum Socks Blanks	3	0	0	0	0.0%
Floor 2 Vacuum Socks Blanks	2	0	0	0	0.0%
Vacuum Socks Surface Samples	27	21	14	11	77.8%
Floor 1 Vacuum Socks Surface Samples	14	10	9	2	71.4%
Floor 2 Vacuum Socks Surface Samples	13	11	5	9	84.6%

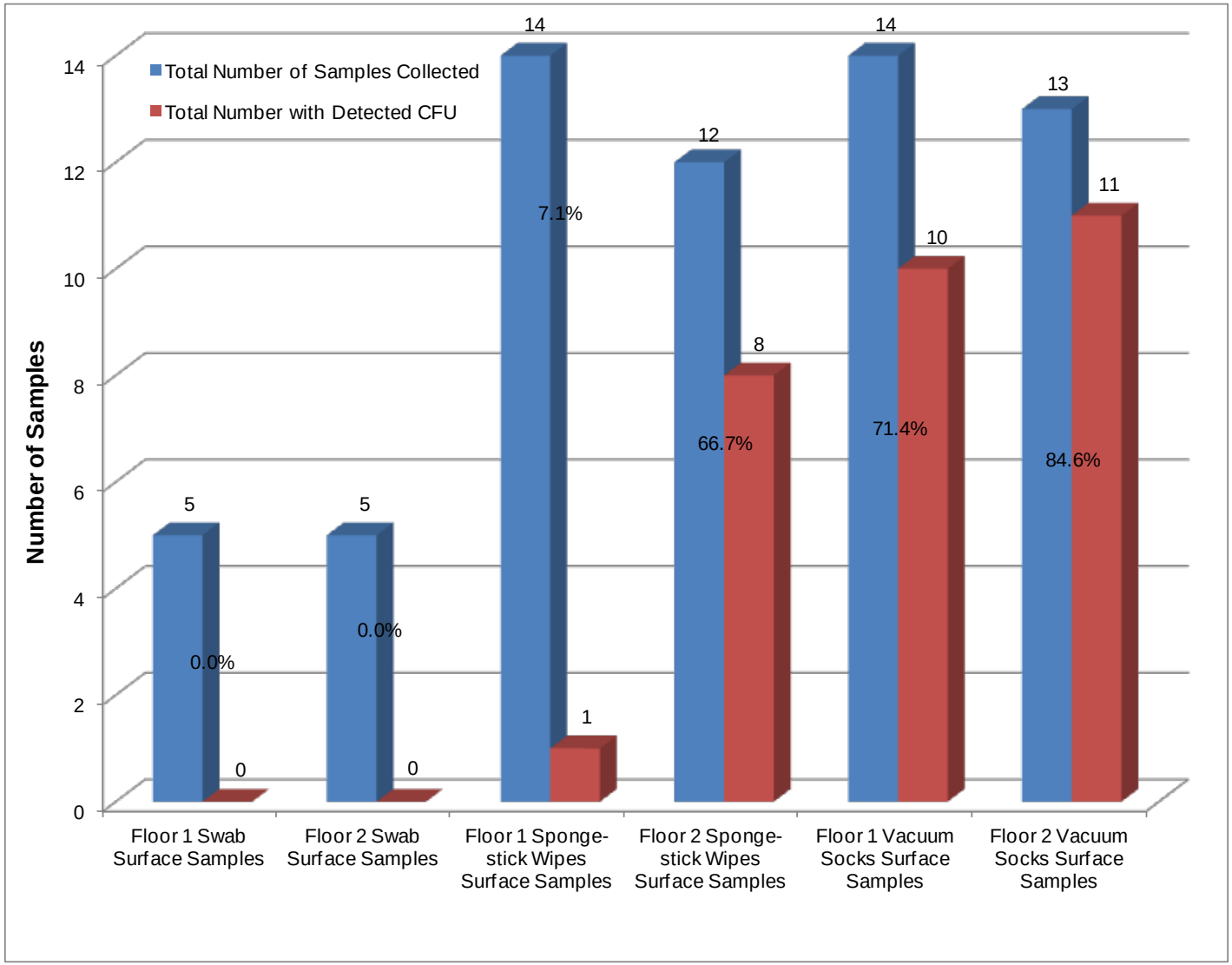

Figure 3-1. Summary of samples taken for LRN analysis during the MFP event.

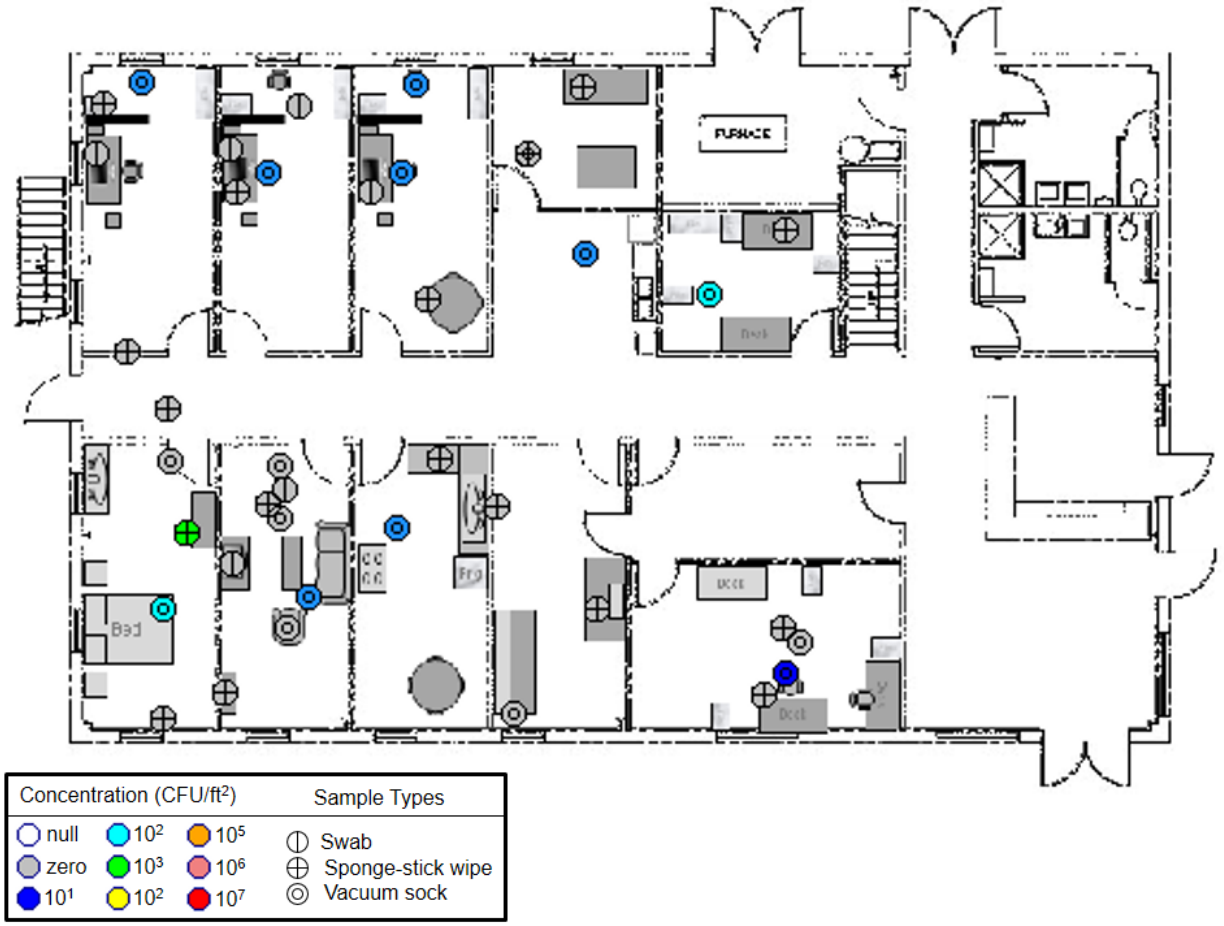

Figure 3-2. Sample map for Floor 1 during MFP.

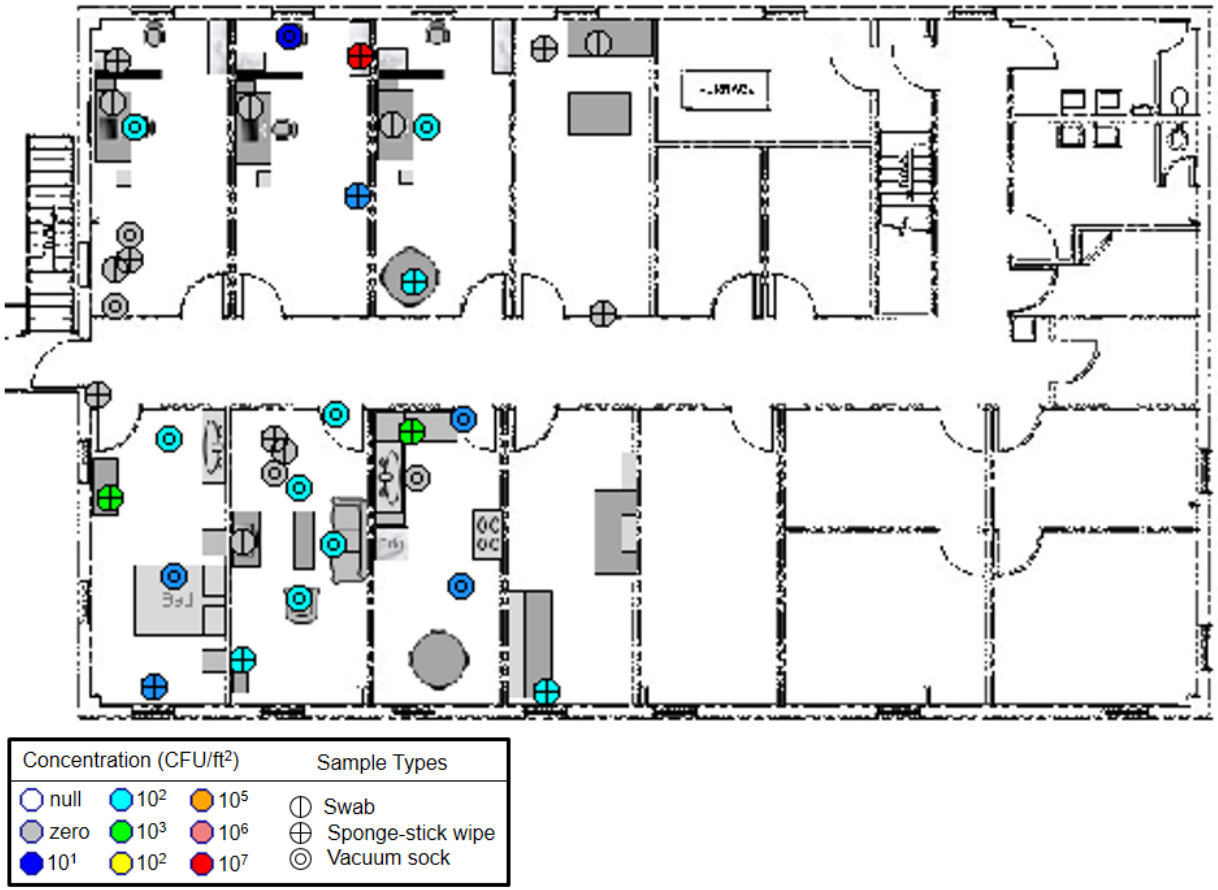

Figure 3-3. Sample map for Floor 2 during MFP.

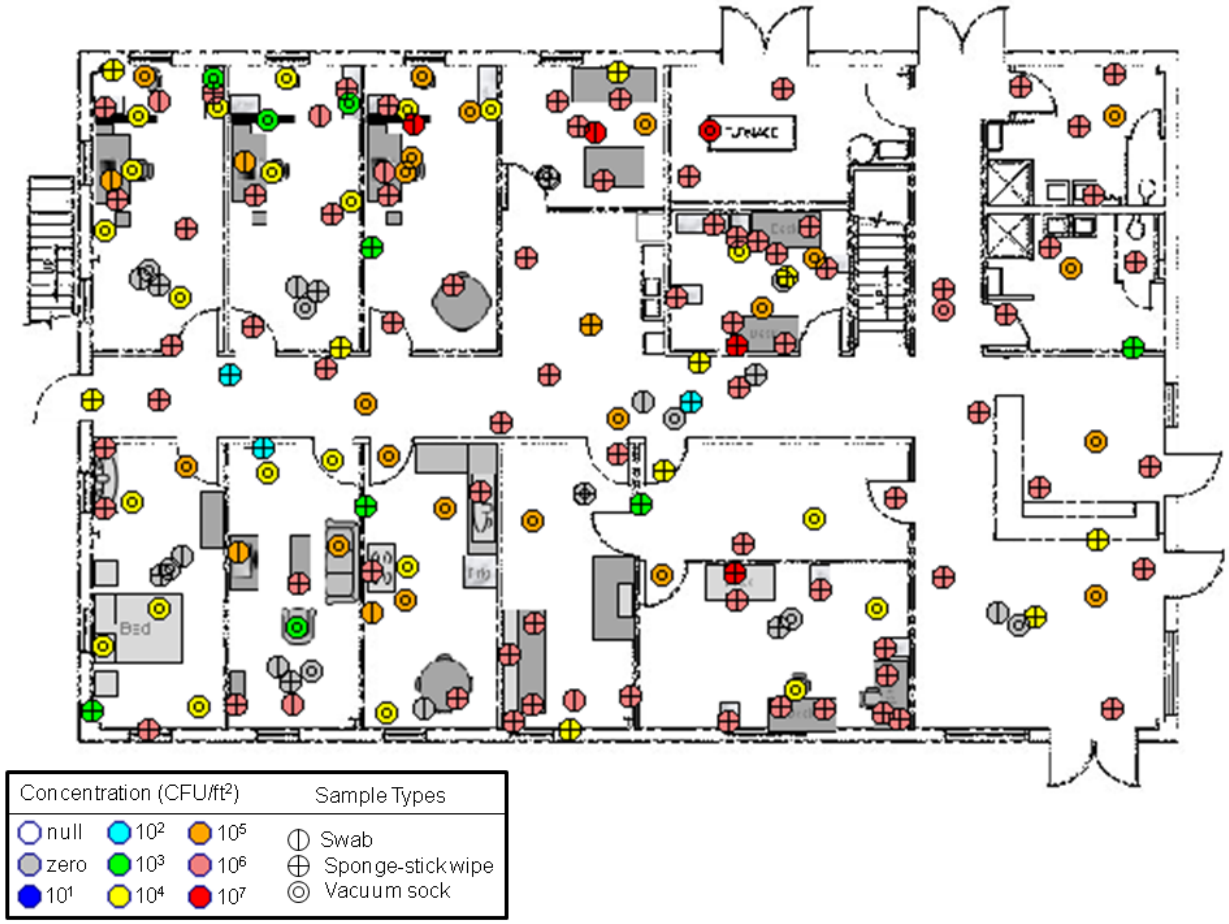

Figure 3-4. Sample map for Floor 1 during Round 1 pre-decontamination sampling.

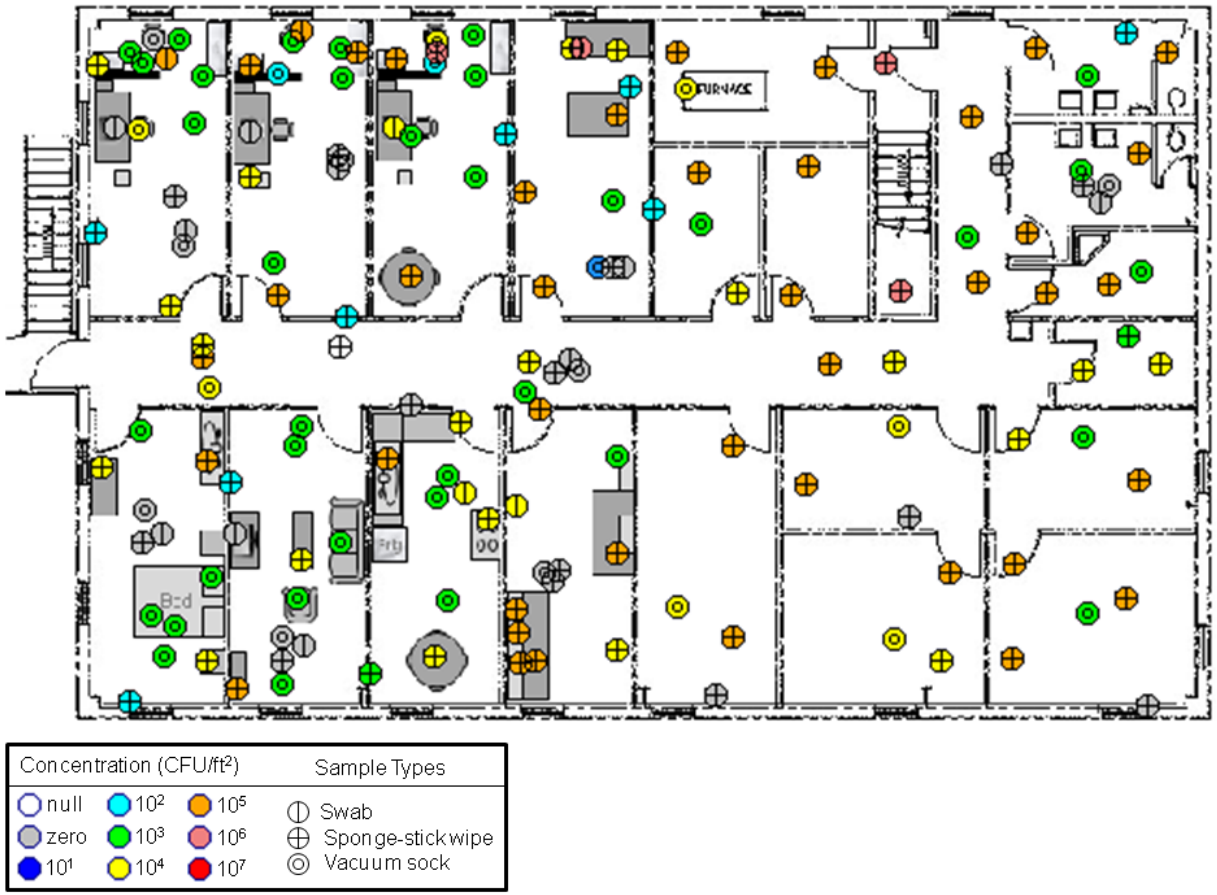

Figure 3-5. Sample map for Floor 2 during Round 1 pre-decontamination sampling.

Table 3-9. LRN pre-decontamination surface sampling results for Round 1.

	# of Samples Collected	# with *Bg* Detected	# with *Bg* Detected and Quantified by		# of Samples with *Bg* Detected Only by Filter Plating	Percent Detection	Average Surface Loading		Average Loading per Sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	291	283	270	13	6	97%	1.7E5	4.0E5	1.3E5	4.1E5
Swab	23	20	16	4	2	87%	3.4E5	7.1E5	9.4E3	2.0E4
Sponge-stick Wipe	172	169	161	8	4	98%	2.3E5	4.2E5	1.6E5	2.9E5
Vacuum Sock	96	94	93	1	0	98%	2.4E4	1.5E5	9.7E4	5.9E5
Floor 1 Surface Samples	157	153	151	2	0	97%	3.1E5	5.0E5	2.3E5	5.3E5
Swab	13	11	11	0	0	85%	5.8E5	8.8E5	1.6E4	2.4E4
Sponge-stick Wipe	95	93	91	2	0	98%	4.1E5	5.0E5	2.8E5	3.5E5
Vacuum Sock	49	49	49	0	0	100%	4.7E4	2.1E5	1.9E5	8.2E5
Floor 2 Surface Samples	134	130	119	11	6	97%	1.3E4	5.0E4	8.5E3	3.4E4
Swab	10	9	5	4	2	90%	2.6E4	4.3E4	7.3E2	1.2E3
Sponge-stick Wipe	77	76	70	6	4	99%	1.9E4	6.3E4	1.3E4	4.4E4
Vacuum Sock	47	45	44	1	0	96%	4.7E2	5.0E2	1.9E3	2.0E3

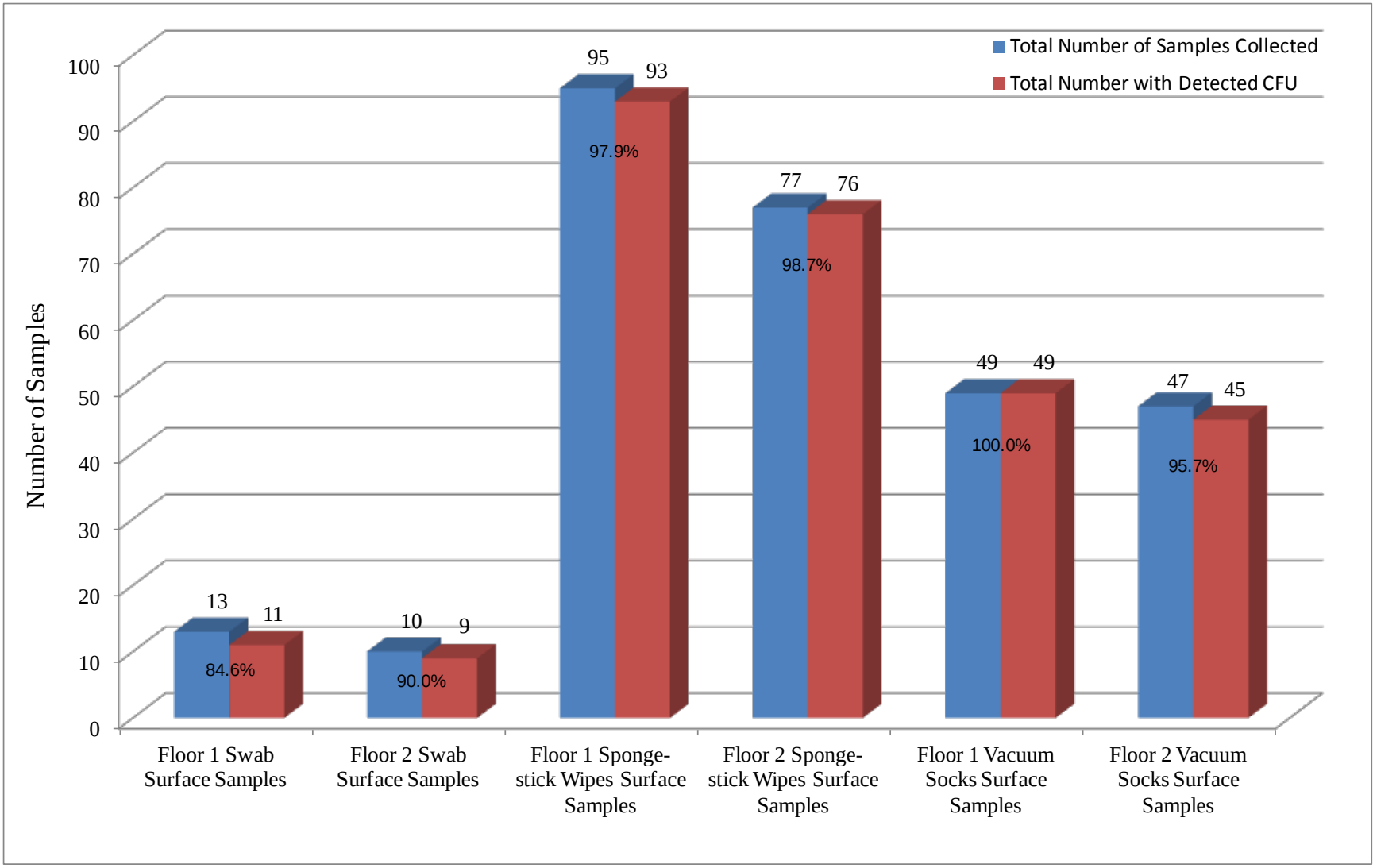

Figure 3-6. Summary of samples taken for LRN analysis during pre-decontamination sampling in Round 1.

Table 3-10. LRN pre-decontamination blank results for Round 1.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	52	10	4	6	6	19%	1.6E2	8.6E2	1.1E2	6.0E2
Swab	16	1	0	1	1	6%	5.2E0	2.1E1	1.4E-1	5.8E-1
Sponge-stick Wipe	19	4	3	1	1	21%	4.2E2	1.4E3	2.9E2	9.8E2
Vacuum Sock	17	5	1	4	4	29%	2.4E-1	5.1E-1	9.8E-1	2.1E0
Floor 1 Surface Samples	29	7	3	4	4	24%	2.8E2	1.1E3	1.9E2	8.0E2
Swab	8	1	0	1	1	13%	1.0E1	2.9E1	2.9E-1	8.1E-1
Sponge-stick Wipe	11	3	3	0	0	27%	7.3E2	1.8E3	5.1E2	1.3E3
Vacuum Sock	10	3	0	3	3	30%	1.2E-1	2.2E-1	4.6E-1	8.6E-1
Floor 2 Surface Samples	23	3	1	2	2	13%	9.6E-1	4.0E0	1.1E0	3.2E0
Swab	8	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	8	1	0	1	1	13%	2.4E0	6.7E0	1.7E0	4.7E0
Vacuum Sock	7	2	1	1	1	29%	4.3E-1	7.5E-1	1.7E0	3.0E0

Table 3-11. Round 1 pre-decontamination blank samples with *Bg* detected.

Floor	Room	Sampling Method	CFU/sample	
			Spread Plating	Filter Plating
Floor 1	Corridor+Lobby	Sponge-stick wipe	1.4E3	NA
Floor 1	Corridor+Lobby	Sponge-stick wipe	3.4E1	NA
Floor 1	Room 102	Sponge-stick wipe	4.1E3	NA
Floor 1	Room 104	Vacuum Sock	ND	2.4E0
Floor 1	Room 104	Swab	ND	2.3E0
Floor 1	Room 107	Vacuum Sock	ND	4.0E-1
Floor 1	Room 108	Vacuum Sock	ND	2.0E0
Floor 2	Room 206	Vacuum Sock	7.2E0	ND
Floor 2	Room 210	Sponge-stick wipe	ND	1.3E1
Floor 2	Room 212	Vacuum Sock	ND	4.8E0

ND = Not detected. NA = Not analyzed.

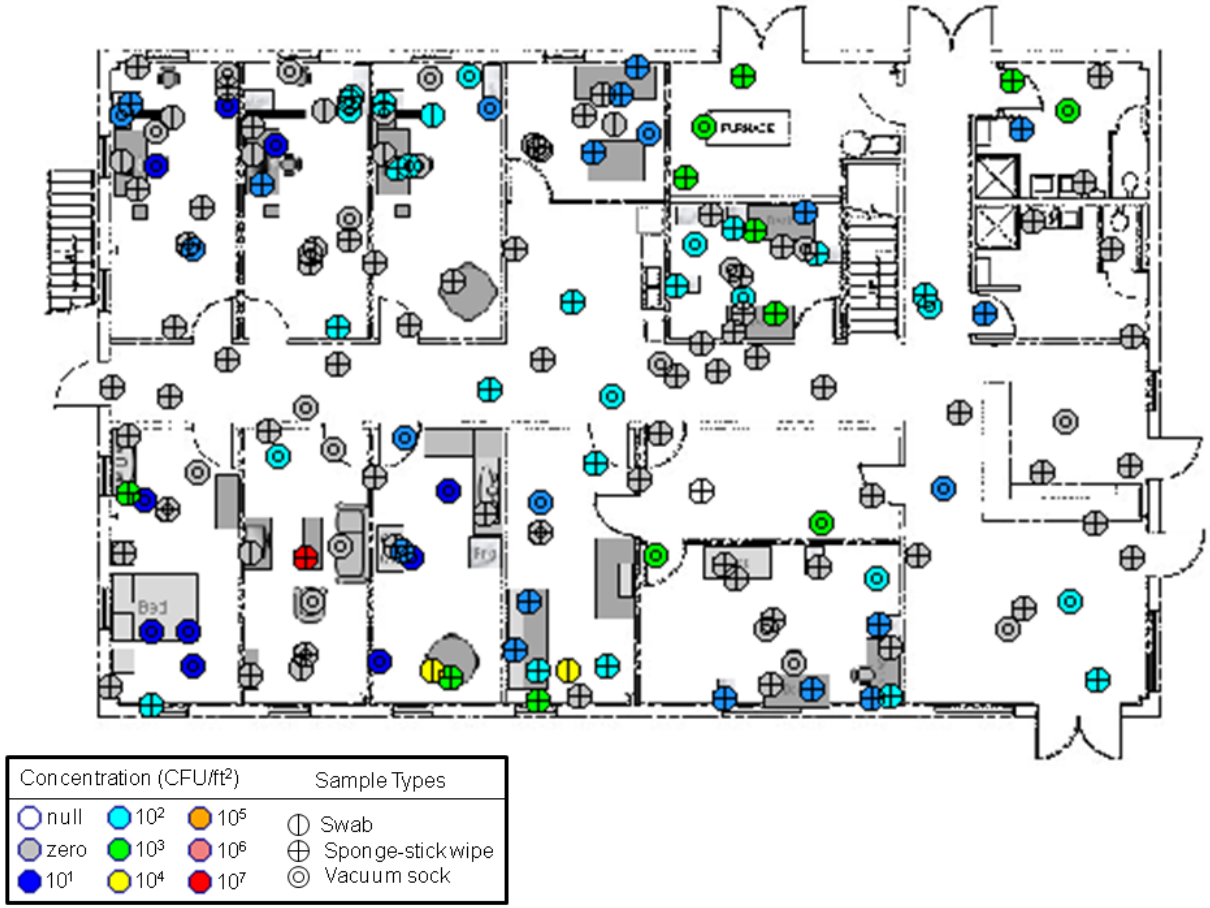

Figure 3-7. Sample map for Floor 1 during Round 1 post-decontamination sampling.

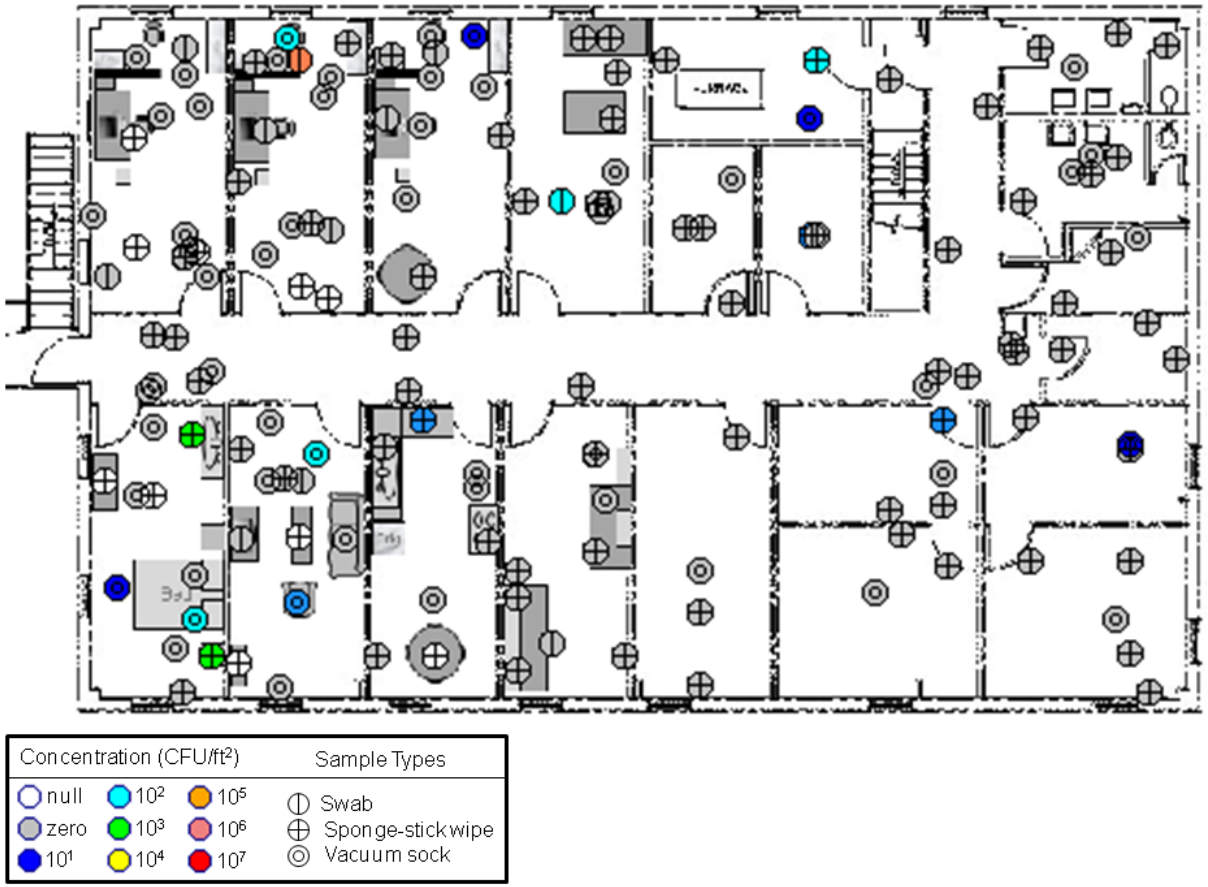

Figure 3-8. Sample map for Floor 2 during Round 1 post-decontamination sampling.

Table 3-12. LRN post-decontamination surface sampling results for Round 1.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	276	94	47	47	43	34%	8.5E3	1.2E5	5.0E3	8.2E4
Swab	20	5	3	2	2	25%	1.8E4	7.8E4	5.0E2	2.2E3
Sponge-stick Wipe	162	48	20	28	24	30%	1.2E4	1.5E5	8.5E3	1.1E5
Vacuum Sock	94	41	24	17	17	44%	1.6E1	6.0E1	6.3E1	2.4E2
Floor 1 Surface Samples	152	78	40	38	34	51%	1.3E4	1.6E5	9.1E3	1.1E5
Swab	11	3	2	1	1	27%	8.9E2	2.0E3	2.5E1	5.6E1
Sponge-stick Wipe	93	42	18	24	20	45%	2.1E4	2.0E5	1.5E4	1.4E5
Vacuum Sock	48	33	20	13	13	69%	2.8E1	8.1E1	1.1E2	3.2E2
Floor 2 Surface Samples	124	16	7	9	9	13%	2.8E3	3.1E4	8.8E1	8.7E2
Swab	9	2	1	1	1	22%	3.9E4	1.2E5	1.1E3	3.2E3
Sponge-stick Wipe	69	6	2	4	4	9%	1.1E1	6.4E1	7.9E0	4.4E1
Vacuum Sock	46	8	4	4	4	17%	3.4E0	1.5E1	1.4E1	5.9E1

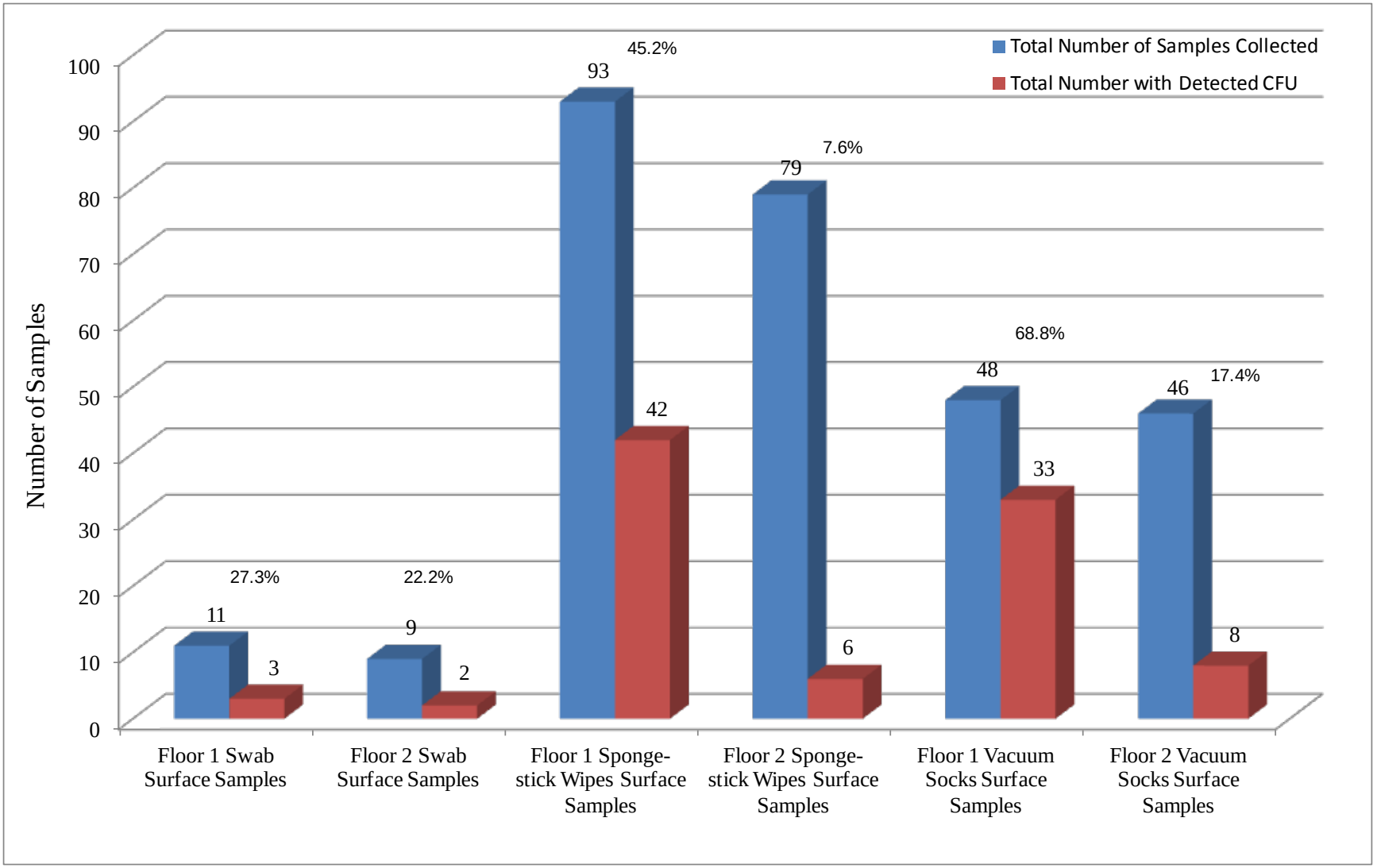

Figure 3-9. Summary of samples taken for LRN analysis during post-decontamination sampling in Round 1.

Table 3-13. LRN post-decontamination blank results for Round 1.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	45	4	1	3	3	9%	1.3E1	8.9E1	5.7E-1	2.6E0
Swab	10	1	1	0	0	10%	6.0E1	1.9E2	1.7E0	5.3E0
Sponge-stick Wipe	17	1	0	1	1	6%	1.9E-1	8.0E-1	1.4E-1	5.6E-1
Vacuum Sock	18	2	0	2	2	11%	1.0E-1	3.0E-1	3.8E-1	1.2E0
Floor 1 Surface Samples	25	4	1	3	3	16%	2.4E1	1.2E2	1.0E0	3.4E0
Swab	5	1	1	0	0	20%	1.2E2	2.7E2	3.3E0	7.5E0
Sponge-stick Wipe	10	1	0	1	1	10%	3.3E-1	1.1E0	2.3E-1	7.3E-1
Vacuum Sock	10	2	0	2	2	20%	1.7E-1	3.9E-1	6.9E-1	1.6E0
Floor 2 Surface Samples	20	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Swab	5	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	7	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	8	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0

Table 3-14. Round 1 post-decontamination blank samples with *Bg* detected.

Floor	Room	Sampling Method	CFU/Sample	
			Spread Plating	Filter Plating
Floor 1	Room 103	Sponge-stick Wipe	ND	2
Floor 1	Room 107	Vacuum Sock	ND	5
Floor 1	Room 107	Swab	17	3
Floor 1	Room 110	Vacuum Sock	ND	2

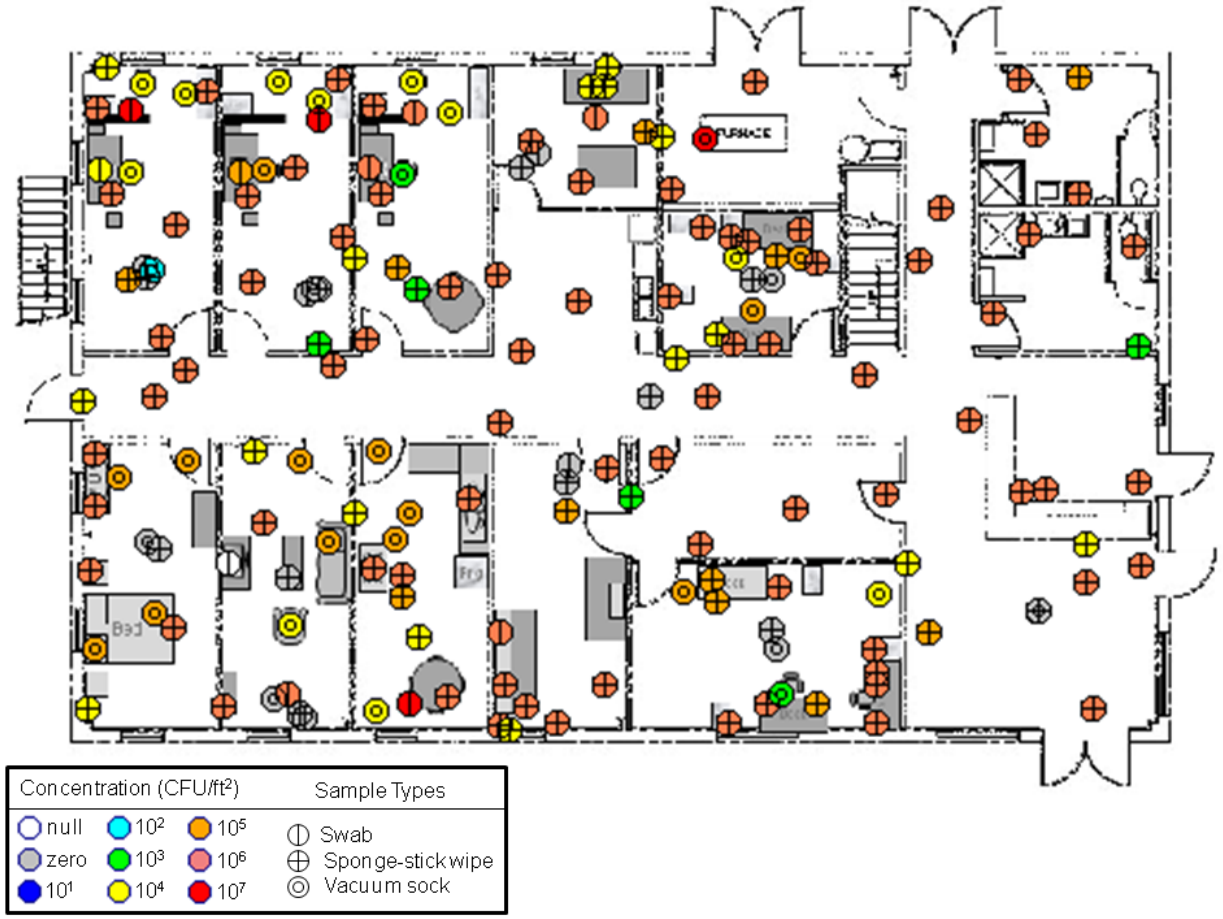

Figure 3-10. Sample map for Floor 1 during Round 2 pre-decontamination sampling.

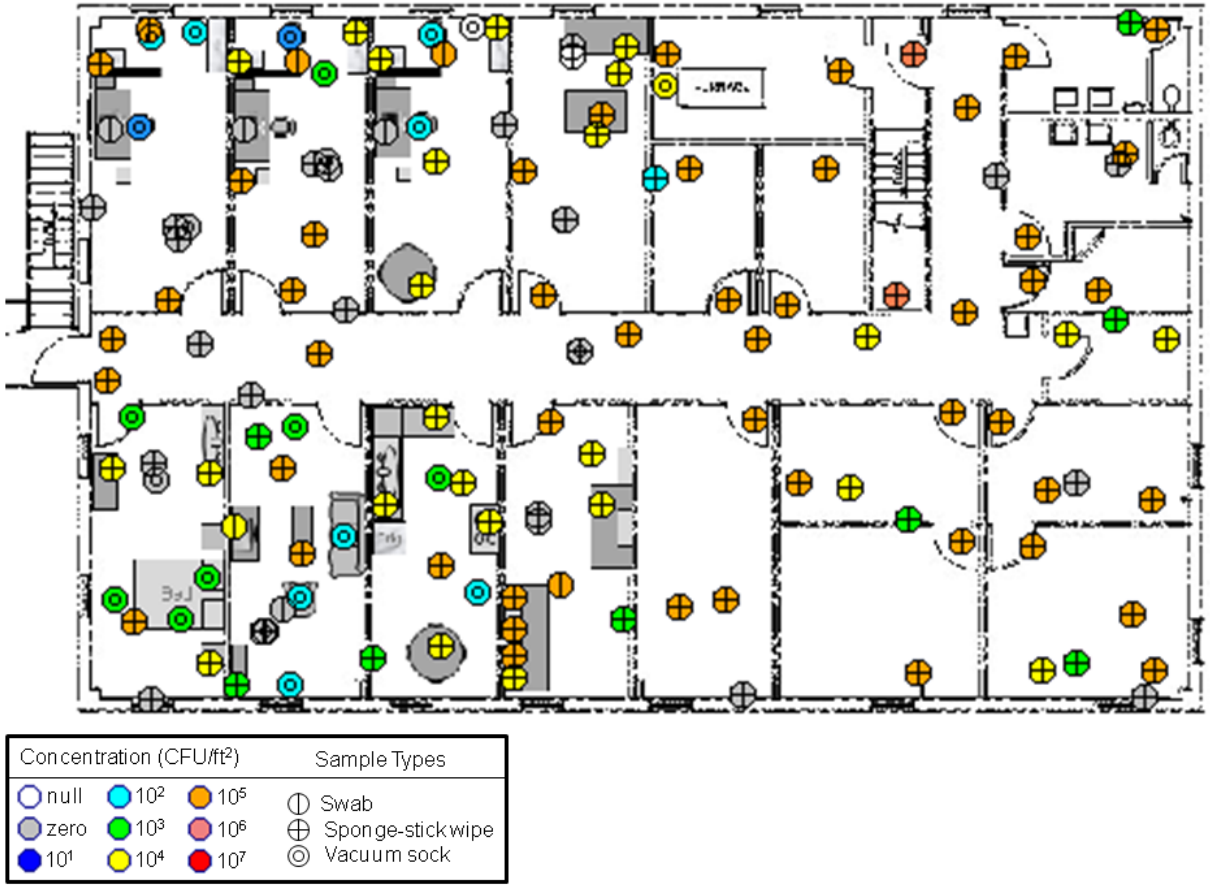

Figure 3-11. Sample map for Floor 2 during Round 2 pre-decontamination sampling.

Table 3-15. LRN pre-decontamination surface sampling results for Round 2.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	268	259	242	17	7	97%	1.4E5	2.7E5	1.1E5	4.9E5
Swab	19	17	15	2	2	89%	2.9E5	5.1E5	8.1E3	1.4E4
Sponge-stick Wipe	204	197	186	11	5	97%	1.4E5	2.3E5	9.8E4	1.6E5
Vacuum Sock	45	45	41	4	0	100%	5.0E4	2.9E5	2.0E5	1.2E6
Floor 1 Surface Samples	146	145	144	1	0	99%	2.1E5	2.9E5	1.7E5	6.5E5
Swab	10	10	10	0	0	100%	5.3E5	6.1E5	1.5E4	1.7E4
Sponge-stick Wipe	109	108	107	1	0	99%	2.1E5	2.0E5	1.5E5	1.4E5
Vacuum Sock	27	27	27	0	0	100%	8.3E4	3.7E5	3.3E5	1.5E6
Floor 2 Surface Samples	122	114	98	16	7	93%	4.8E4	2.1E5	3.2E4	1.5E5
Swab	9	7	5	2	2	78%	2.7E4	3.6E4	7.5E2	9.9E2
Sponge-stick Wipe	95	89	79	10	5	94%	5.9E4	2.4E5	4.1E4	1.7E5
Vacuum Sock	18	18	14	4	0	100%	5.9E2	1.9E3	2.4E3	7.5E3

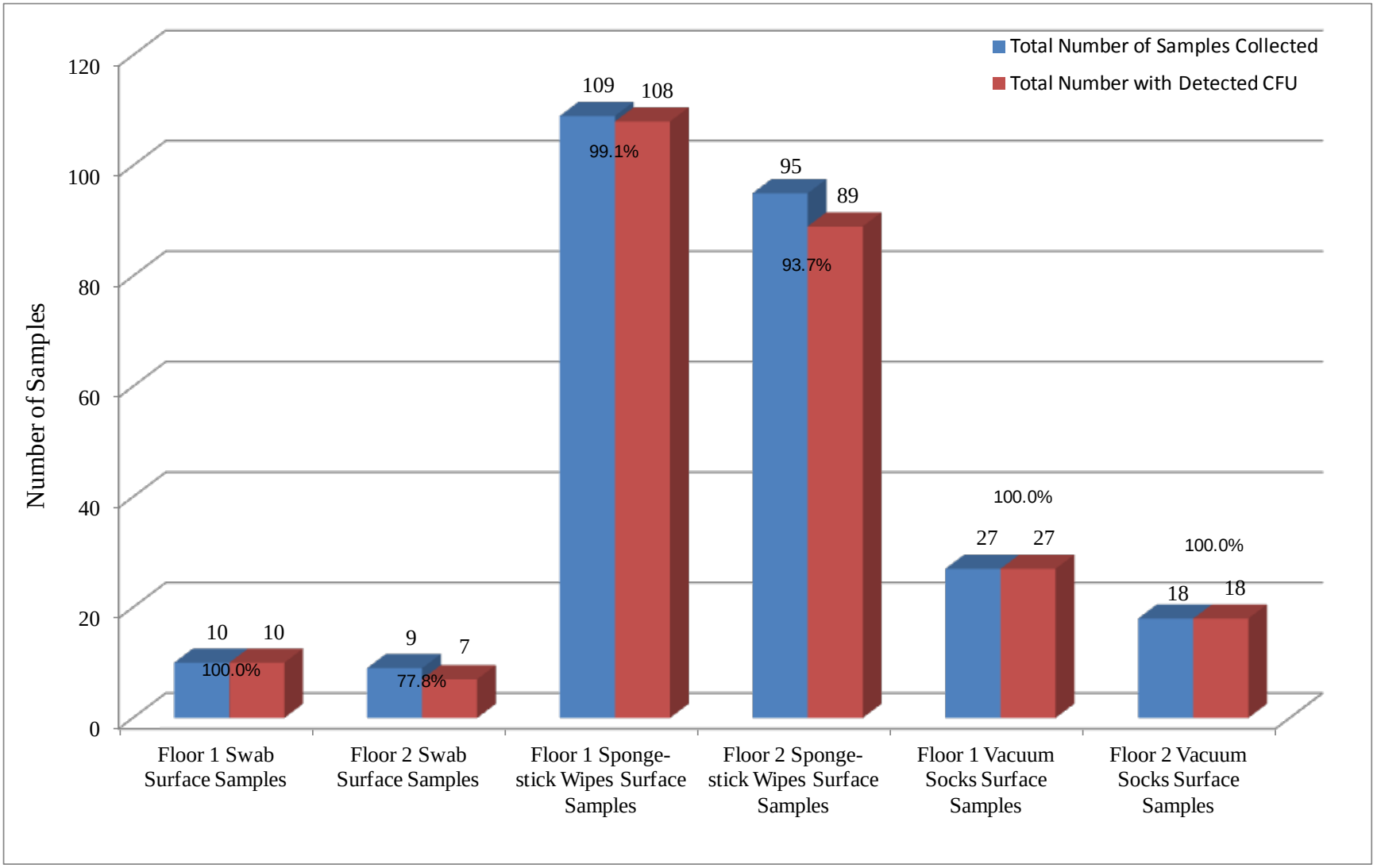

Figure 3-12. Summary of samples taken for LRN analysis during pre-decontamination sampling in Round 2.

Table 3-16. LRN pre-decontamination blank results for Round 2.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average Loading per Sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	41	2	1	1	1	5%	5.1E-1	2.7E0	1.7E0	1.0E1
Swab	11	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	18	1	0	1	1	6%	2.4E-1	1.0E0	1.7E-1	7.1E-1
Vacuum Sock	12	1	1	0	0	8%	1.4E0	4.8E0	5.6E0	1.9E1
Floor 1 Surface Samples	22	2	1	1	1	9%	9.5E-1	3.6E0	3.2E0	1.4E1
Swab	5	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	10	1	0	1	1	10%	4.3E-1	1.4E0	3.0E-1	9.5E-1
Vacuum Sock	7	1	1	0	0	14%	2.4E0	6.3E0	9.5E0	2.5E1
Floor 2 Surface Samples	19	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Swab	6	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	8	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	5	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0

Table 3-17. Round 2 pre-decontamination blank samples with *Bg* detected.

Floor	Room	Sampling Method	CFU/Sample	
			Spread Plating	Filter Plating
Floor 1	Room 109	Sponge-stick Wipe	ND	3.0E0
Floor 1	Room 110	Vacuum Sock	6.7E1	4.2E1

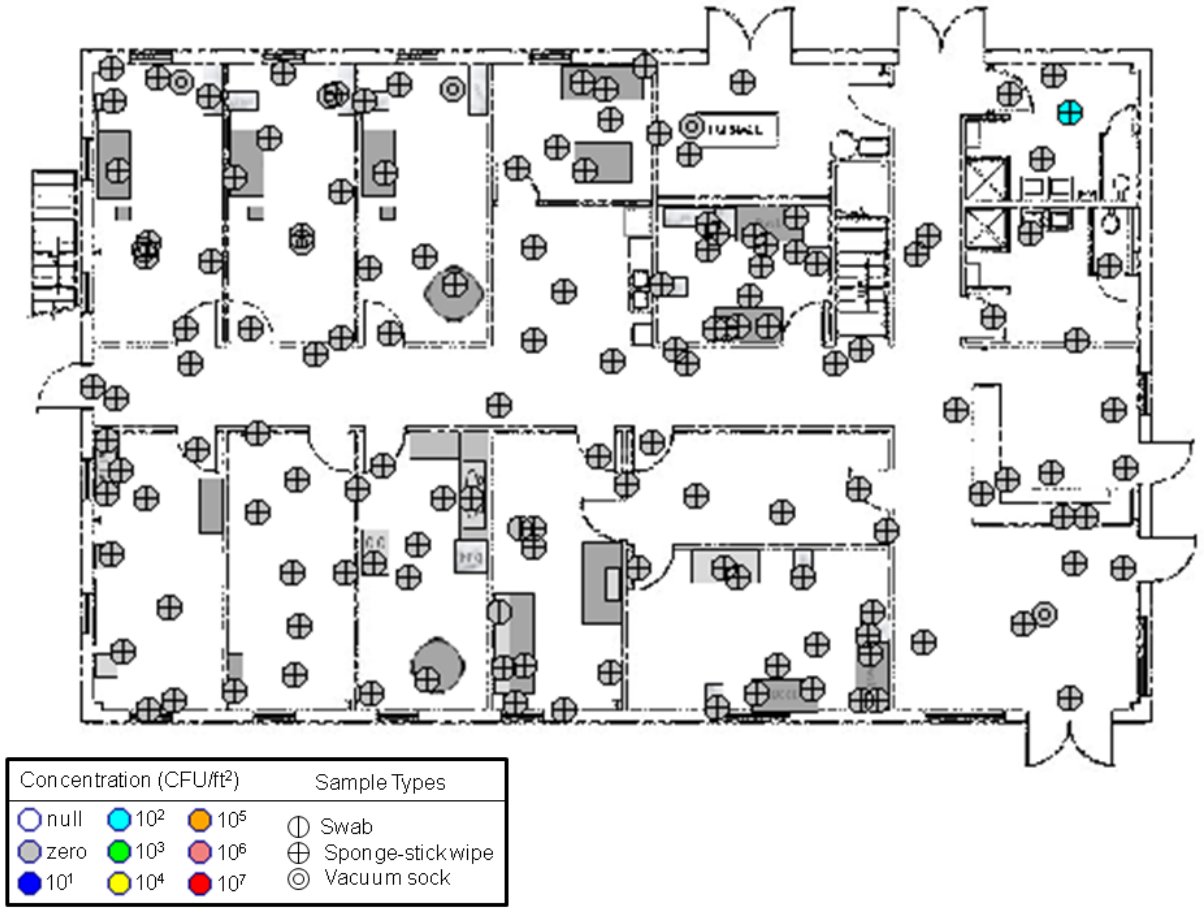

Figure 3-13. Sample map for Floor 1 during Round 2 post-decontamination sampling.

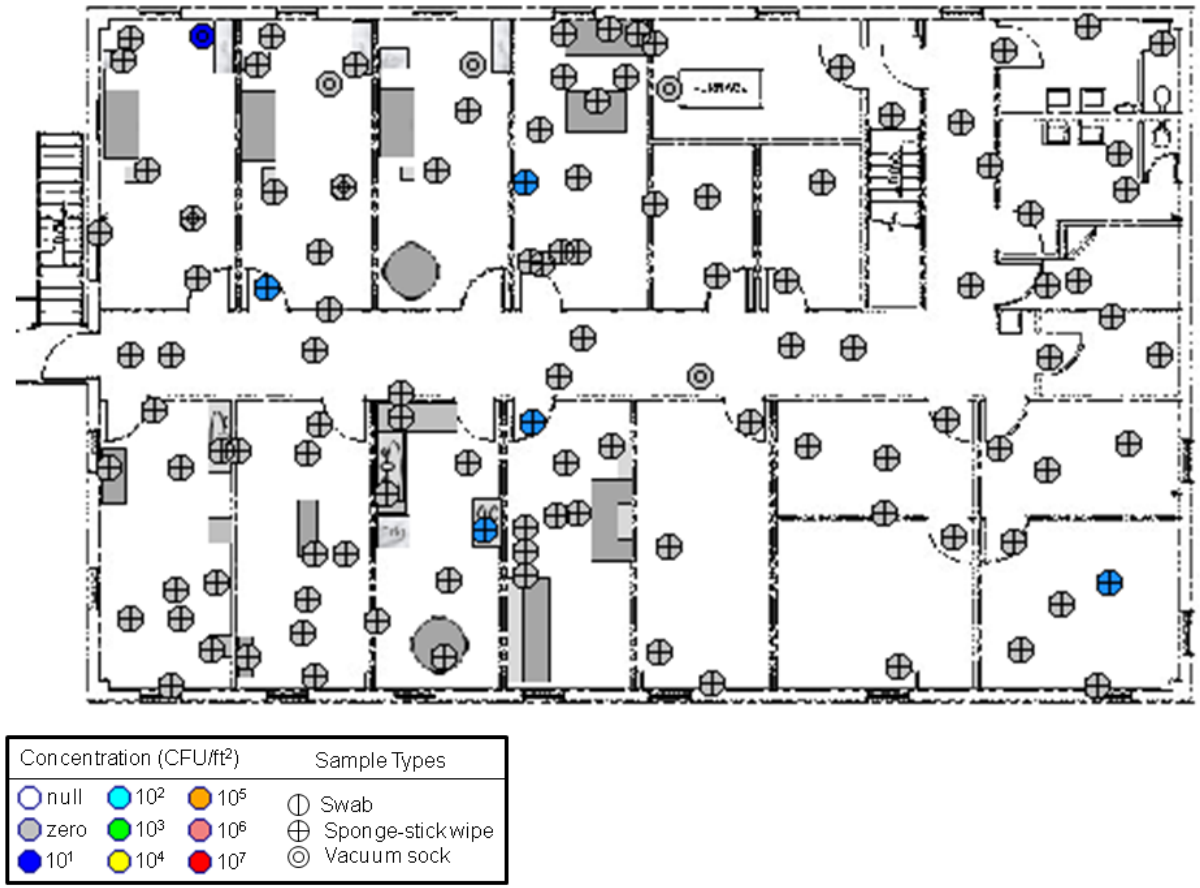

Figure 3-14. Sample map for Floor 2 during Round 2 post-decontamination sampling.

Table 3-18. LRN post-decontamination surface sampling results for Round 2.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	244	8	1	7	7	3%	2.0E-1	1.7E0	1.5E-1	1.2E0
Swab	1	0	0	0	0	0%	0.0E0	-	0.0E0	-
Sponge-stick Wipe	235	7	1	6	6	3%	2.1E-1	1.7E0	1.4E-1	1.2E0
Vacuum Sock	8	1	0	1	1	13%	7.8E-2	2.2E-1	3.1E-1	8.8E-1
Floor 1 Surface Samples	135	1	1	0	0	1%	1.7E-1	2.0E0	1.2E-1	1.4E0
Swab	1	0	0	0	0	0%	0.0E0	-	-	-
Sponge-stick Wipe	130	1	1	0	0	1%	1.8E-1	2.1E0	1.3E-1	1.4E0
Vacuum Sock	4	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Floor 2 Surface Samples	109	7	0	7	7	6%	2.4E-1	1.1E0	1.8E-1	7.8E-1
Swab	0	0	0	0	0	-	-	-	-	-
Sponge-stick Wipe	105	6	0	6	6	6%	2.4E-1	1.1E0	1.7E-1	7.7E-1
Vacuum Sock	4	1	0	1	1	25%	1.6E-1	3.1E-1	6.3E-1	1.3E0

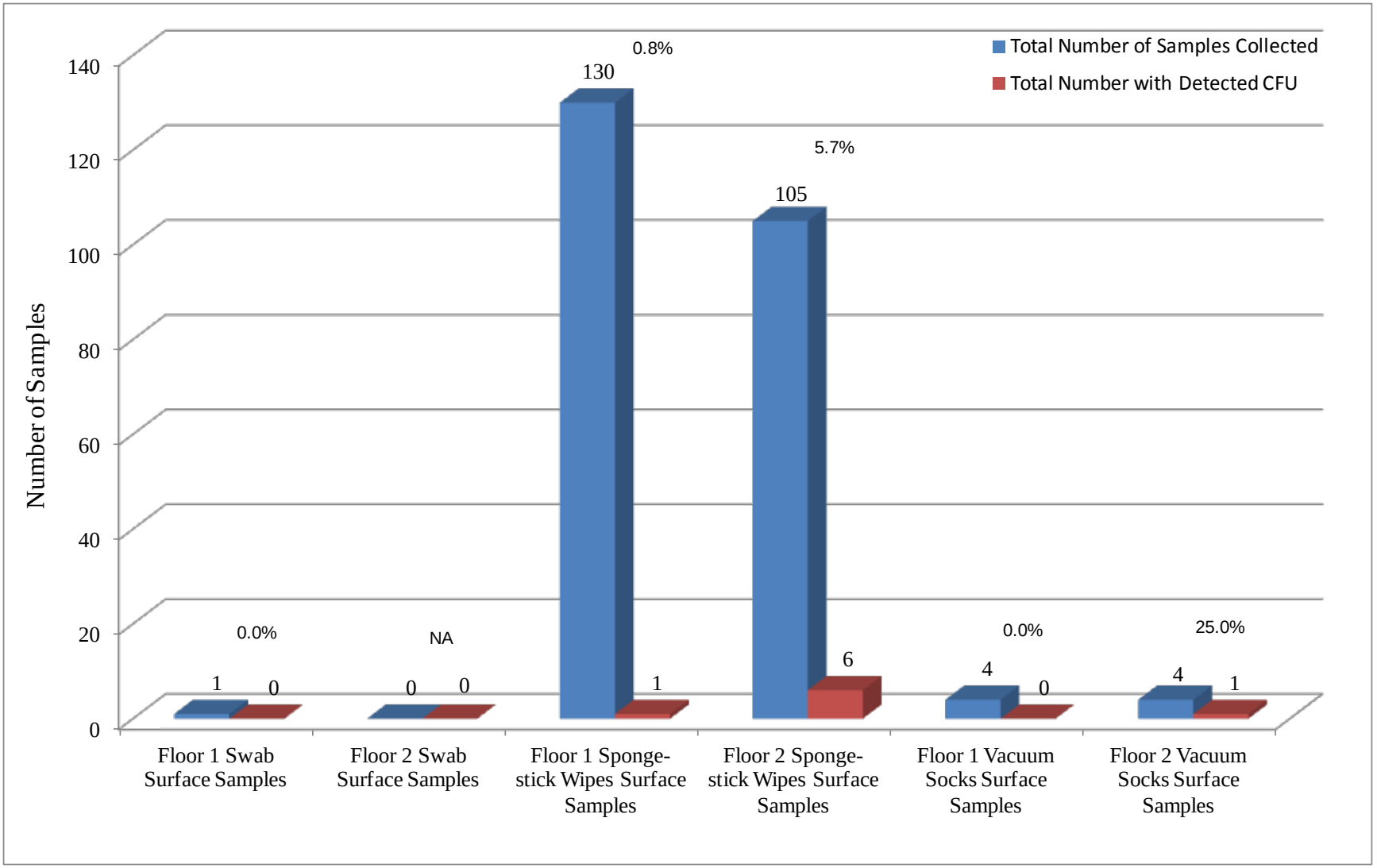

Figure 3-15. Summary of samples taken for LRN analysis during post-decontamination sampling in Round 2.

Table 3-19. LRN post-decontamination blank results for Round 2.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	25	1	0	1	1	4%	6.4E-2	3.2E-1	2.6E-1	1.3E0
Swab	1	0	0	0	0	0%	0.0E0	-	0.0E0	-
Sponge-stick Wipe	18	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	6	1	0	1	1	17%	2.7E-1	6.5E-1	1.1E0	2.6E0
Floor 1 Surface Samples	14	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Swab	1	0	0	0	0	0%	0.0E0	-	0.0E0	-
Sponge-stick Wipe	10	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	3	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Floor 2 Surface Samples	11	1	0	1	1	9%	1.5E-1	4.8E-1	5.8E-1	1.9E0
Swab	0	0	0	0	0	-	-	-	-	-
Sponge-stick Wipe	8	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	3	1	0	1	1	33%	5.3E-1	9.2E-1	2.1E0	3.7E0

Table 3-20. Round 2 post-decontamination blank samples with *Bg* detected.

Floor	Room	Sampling Method	CFU/Sample	
			Spread Plating	Filter Plating
Floor 2	Room 212	Vacuum Sock	ND	6

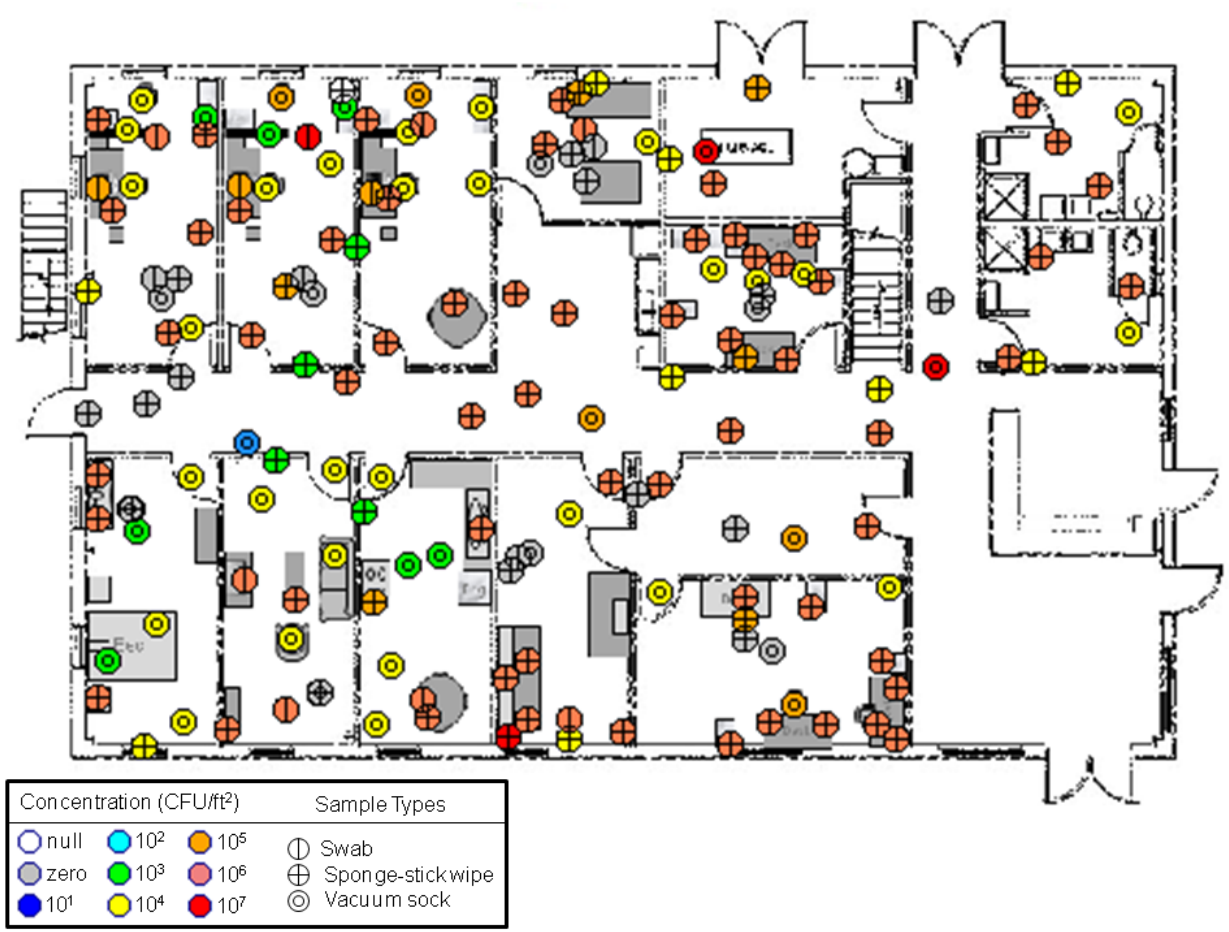

Figure 3-16. Sample map for Floor 1 during Round 3 pre-decontamination sampling.

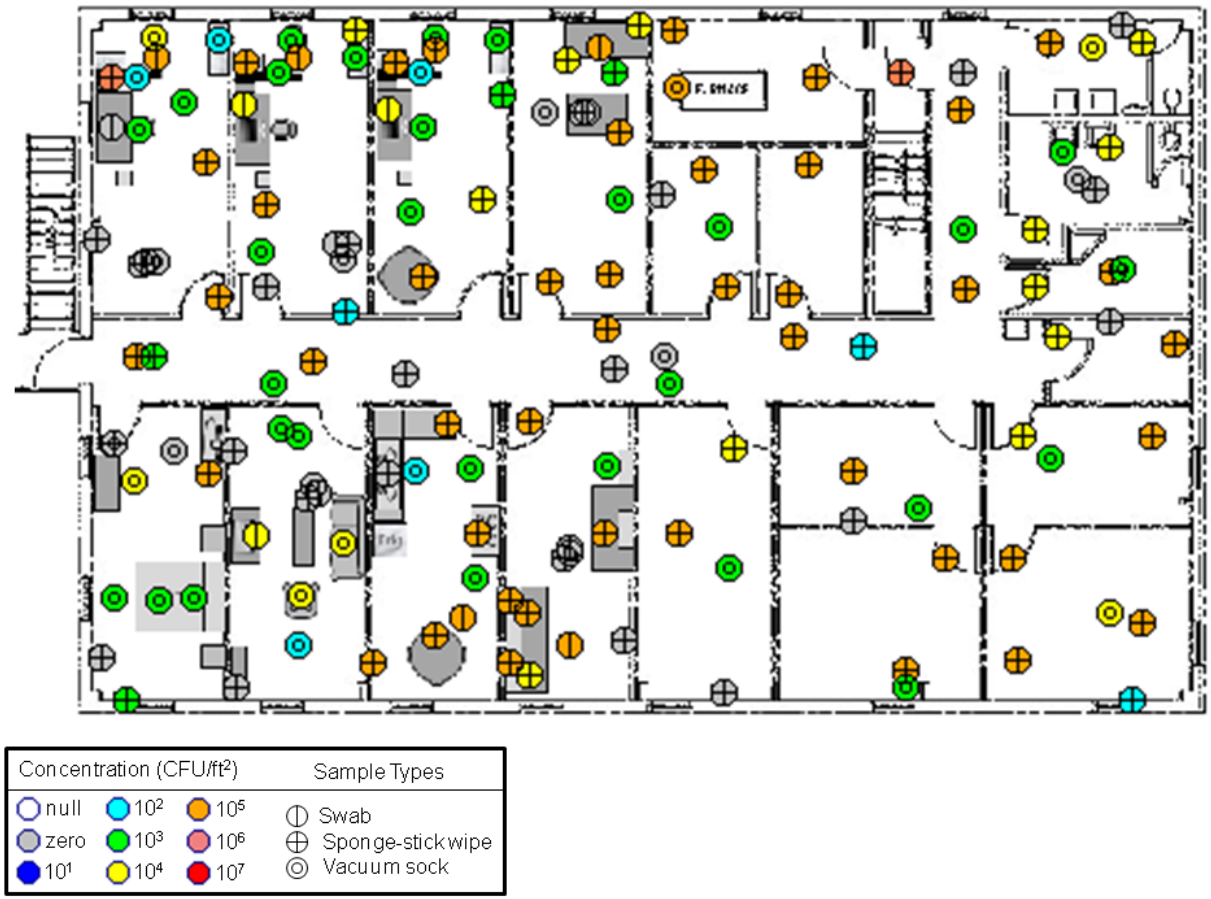

Figure 3-17. Sample map for Floor 2 during Round 3 pre-decontamination sampling.

Table 3-21. LRN pre-decontamination surface sampling results for Round 3.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	273	262	247	15	8	96%	1.3E5	4.1E5	1.6E5	1.2E6
Swab	21	21	18	3	1	100%	3.9E5	6.8E5	1.1E4	1.9E4
Sponge-stick Wipe	166	155	145	10	7	93%	1.3E5	2.8E5	8.8E4	1.9E5
Vacuum Sock	86	86	84	2	0	100%	8.3E4	5.2E5	3.3E5	2.1E6
Floor 1 Surface Samples	144	141	139	2	1	98%	2.4E5	5.4E5	2.9E5	1.6E6
Swab	11	11	10	1	0	100%	7.0E5	8.3E5	2.0E4	2.3E4
Sponge-stick Wipe	89	86	85	1	1	97%	2.2E5	3.5E5	1.5E5	2.4E5
Vacuum Sock	44	44	44	0	0	100%	1.6E5	7.2E5	6.3E5	2.9E6
Floor 2 Surface Samples	129	121	108	13	7	94%	1.4E4	3.9E4	1.2E4	4.8E4
Swab	10	10	8	2	1	100%	3.4E4	3.3E4	9.5E2	9.2E2
Sponge-stick Wipe	77	69	60	9	6	90%	1.8E4	4.7E4	1.2E4	3.2E4
Vacuum Sock	42	42	40	2	0	100%	3.7E3	1.8E4	1.5E4	7.1E4

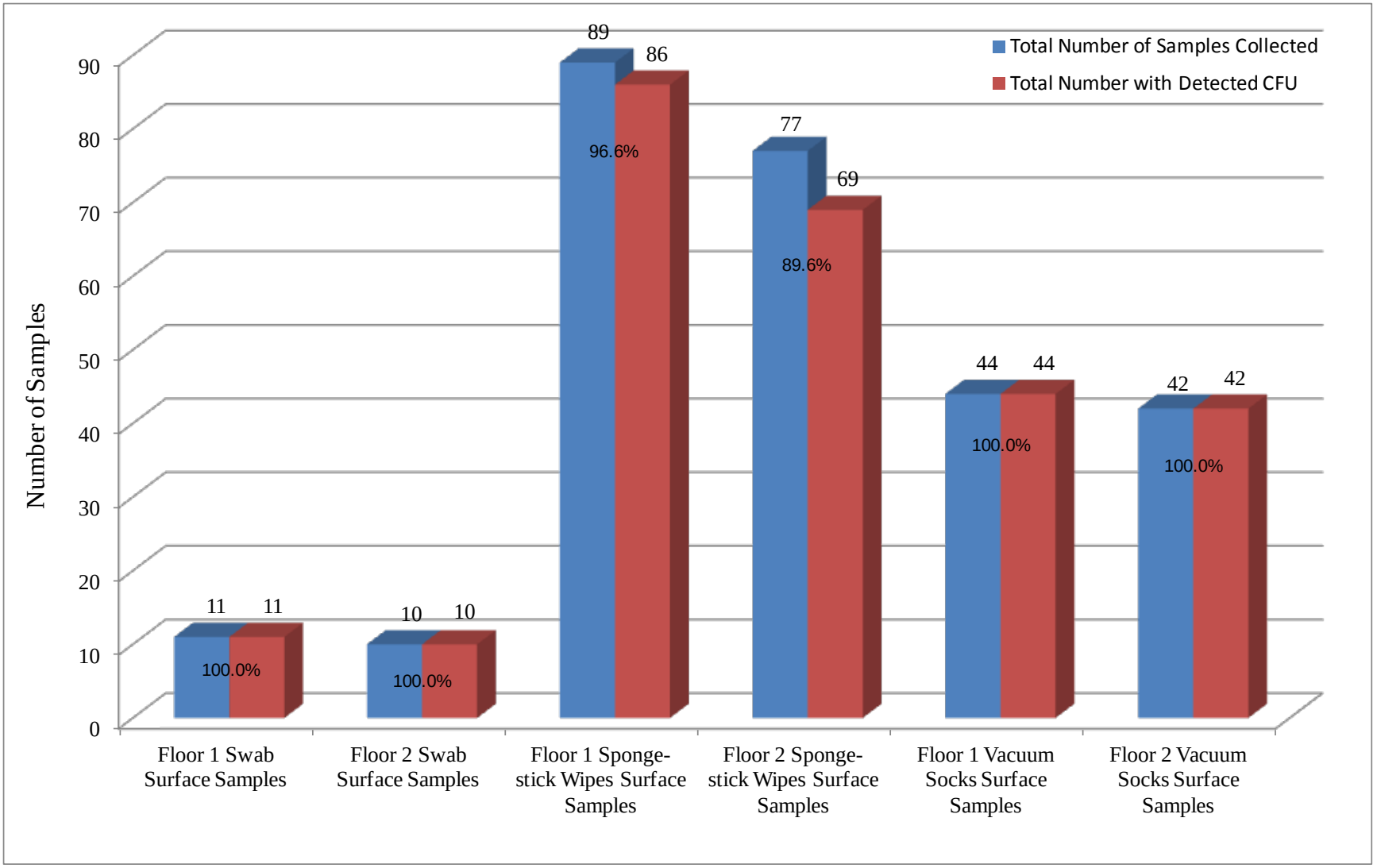

Figure 3-18. Summary of samples taken for LRN analysis during pre-decontamination sampling in Round 3.

Table 3-22. LRN pre-decontamination blank results for Round 3.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	52	4	2	2	2	8%	4.7E2	3.4E3	3.3E2	2.3E3
Swab	10	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	24	2	1	1	1	8%	1.0E3	4.9E3	7.0E2	3.4E3
Vacuum Sock	18	2	1	1	1	11%	1.5E0	4.7E0	6.0E0	1.9E1
Floor 1 Surface Samples	31	4	2	2	2	13%	7.8E2	4.3E3	5.5E2	3.0E3
Swab	5	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	16	2	1	1	1	13%	1.5E3	6.0E3	1.1E3	4.2E3
Vacuum Sock	10	2	1	1	1	20%	2.7E0	6.2E0	1.1E1	2.5E1
Floor 2 Surface Samples	21	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Swab	5	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	8	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	8	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0

Table 3-23. Round 3 pre-decontamination blank samples with *Bg* detected.

Floor	Room	Sampling Method	CFU/Sample	
			Spread Plating	Filter Plating
Floor 1	Corridor+Lobby	Vacuum Sock	3.3E1	NA
Floor 1	Room 103	Vacuum Sock	ND	7.4E1
Floor 1	Room 107	Sponge-stick Wipe	ND	3.0E0
Floor 1	Room 108	Sponge-stick Wipe	1.7E4	NA

ND = Not detected. NA = Not analyzed.

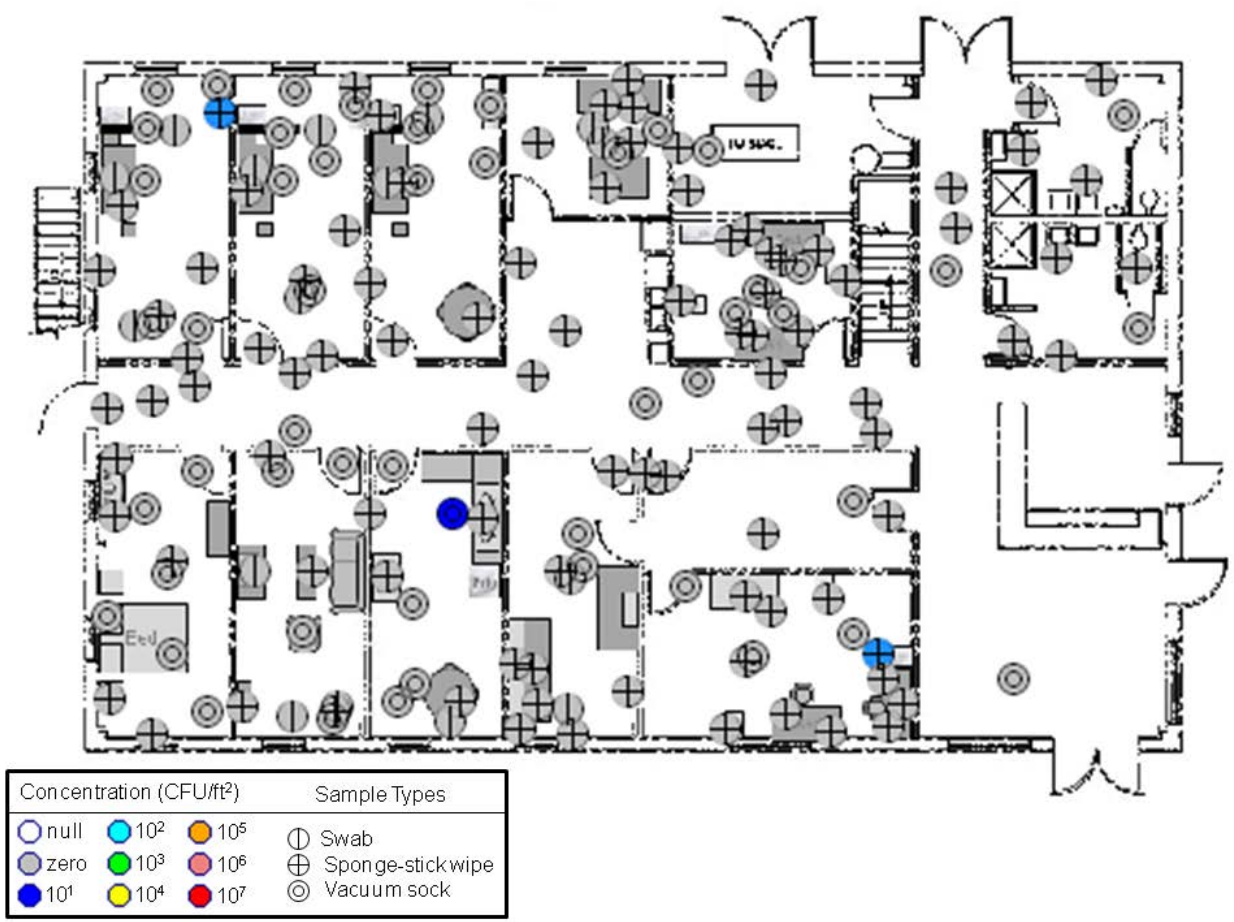

Figure 3-19. Sample map for Floor 1 during Round 3 post-decontamination sampling.

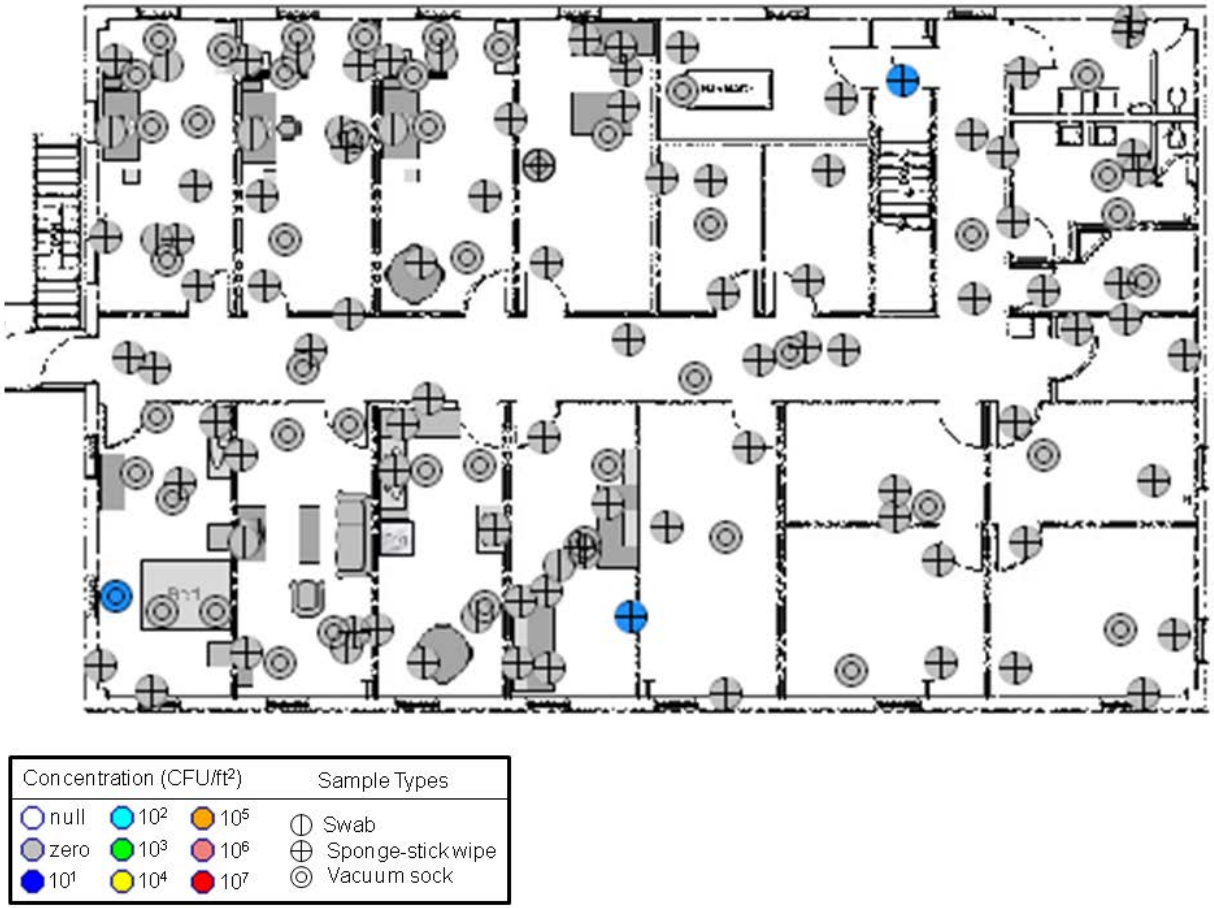

Figure 3-20. Sample map for Floor 2 during Round 3 post-decontamination sampling.

Table 3-24. LRN post-decontamination surface sampling results for Round 3.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	265	6	1	5	5	2%	1.0E-1	7.4E-1	1.3E-1	1.1E0
Swab	21	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	162	4	0	4	4	2%	1.3E-1	8.9E-1	9.0E-2	6.2E-1
Vacuum Sock	82	2	1	1	1	2%	6.0E-2	4.6E-1	2.3E-1	1.9E0
Floor 1 Surface Samples	138	3	0	3	3	2%	5.0E-2	4.0E-1	5.0E-2	3.3E-1
Swab	11	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	85	2	0	2	2	2%	8.0E-2	5.0E-1	5.0E-2	3.5E-1
Vacuum Sock	42	1	0	1	1	2%	1.0E-2	9.0E-2	5.0E-2	3.5E-1
Floor 2 Surface Samples	127	3	1	2	2	2%	1.4E-1	9.9E-1	2.1E-1	1.6E0
Swab	10	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	77	2	0	2	2	3%	1.8E-1	1.2E0	1.3E-1	8.2E-1
Vacuum Sock	40	1	1	0	0	3%	1.0E-1	6.6E-1	4.2E-1	2.6E0

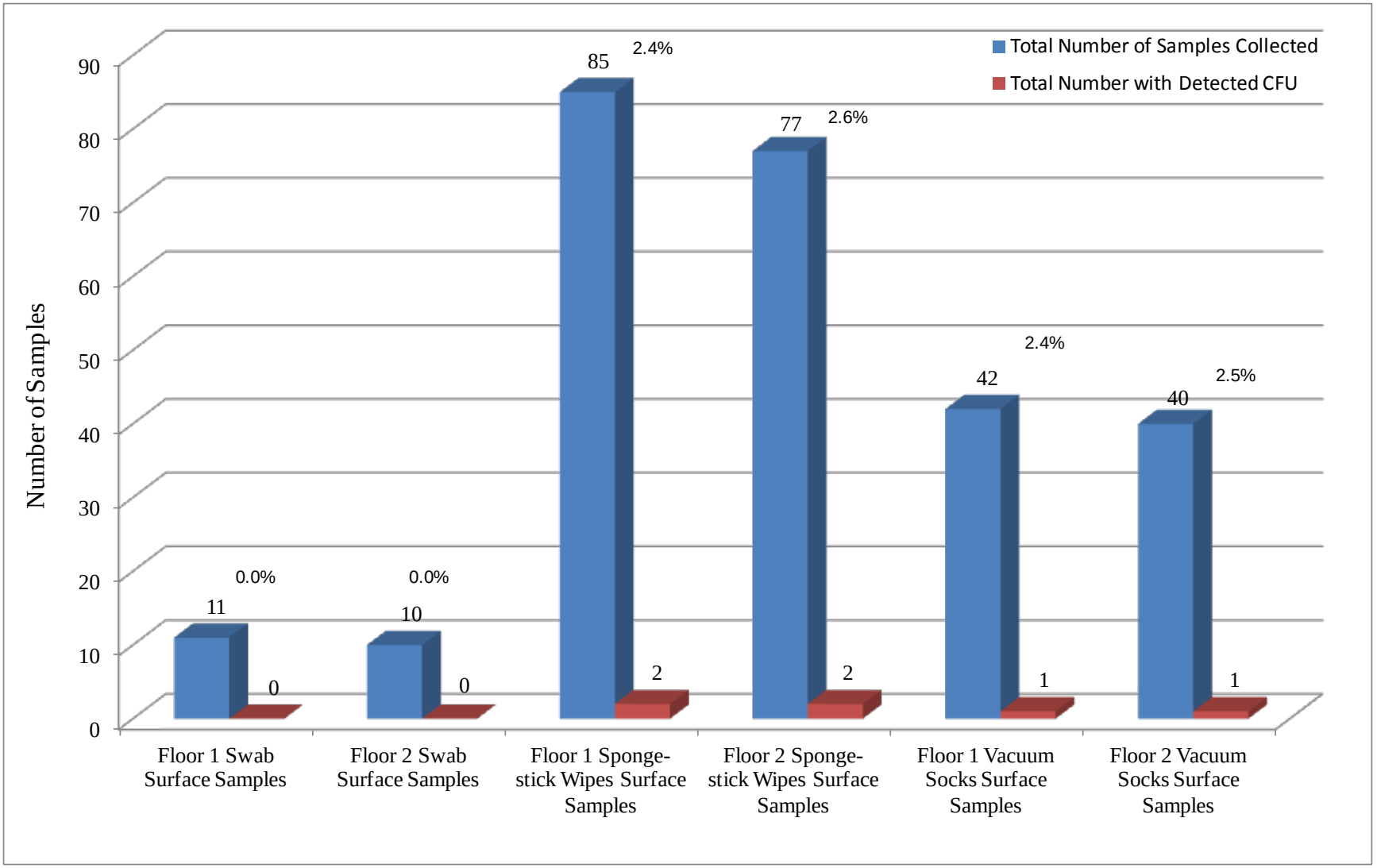

Figure 3-21. Summary of samples taken for LRN analysis during post-decontamination sampling in Round 3.

Table 3-25. LRN post-decontamination blank results for Round 3.

	# of samples collected	# with *Bg* detected	# with *Bg* detected and quantified by		# of samples with *Bg* detected only by filter plating	Percent detection	Average surface loading		Average loading per sample	
			Spread plating	Filter plating			Average CFU/ft^2	SD	Average CFU	SD
Total Surface Samples	47	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Swab	10	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	19	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	18	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Floor 1 Surface Samples	26	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Swab	5	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	11	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	10	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Floor 2 Surface Samples	21	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Swab	5	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Sponge-stick Wipe	8	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0
Vacuum Sock	8	0	0	0	0	0%	0.0E0	0.0E0	0.0E0	0.0E0

3.2.2. Results from Rapid Viability-Polymerase Chain Reaction Analysis

The RV-PCR research method developed and optimized for surface wipe samples was evaluated during the BOTE Project Phase I[36, 37]. Samples collected from the event site at the INL were shipped to LLNL and EPA-OPP-MLB laboratories. To evaluate the performance of the RV-PCR method against the traditional microbiological culture method, the original protocol had to be modified. Specifically, instead of using the whole sample for RV-PCR-based analysis, the spore suspension was split into two equal parts after spore recovery from each of the BOTE Project wipe samples with one part analyzed by RV-PCR and the other part analyzed by the traditional culture method upon concentrating to the same volume. While this procedure might have compromised the results for the low spore level samples, it was necessary for the most appropriate method performance comparison. Therefore, any conclusions on the performance of the RV-PCR research method must be carefully derived. Also, the current version of the RV-PCR method provides qualitative analyses of the samples (detection/non-detection of live spores), and the method had not previously been tested for post-decontamination samples.

A total of 262 BOTE Project samples were analyzed using the RV-PCR and the traditional microbiological culture methods to detect the presence of viable *Bg* spores. The samples were collected during the MFP (background samples) and Rounds 1-3 pre- and post-decontamination sampling events. The BOTE Project samples collected at INL for the RV-PCR method-based analysis were split between LLNL (214 samples) and the EPA-OPP-MLB Laboratory (50 samples). Also, as stated earlier, the participation of the EPA-OPP-MLB Laboratory in this effort was mainly for the EPA scientists to acquire more practice and experience with the RV-PCR method. Accordingly, for the evaluation of the RV-PCR research method, a majority of the BOTE Project samples were shipped to LLNL. The identity of QC and real surface samples was not known to either of the laboratories at the time of analysis. The same RV-PCR protocol was followed for both the pre- and post-decontamination events. The results from each laboratory are presented separately in the following sections of this report.

3.2.2.1. LLNL RV-PCR Results

A total of 214 samples (including QC samples) were analyzed at LLNL during the BOTE Phase I (Table 3-26). The QC samples (also called field blanks) were opened during sampling but not used to sample surfaces. The distribution of QC and surface samples was not known to LLNL before the sample analysis, although the total number per event was verified. Due to the complexity and difficulties with the sample shipment at INL, the desired sample distribution plan as recommended by the statisticians could not be followed for some events. In addition to the samples from INL, 20 TBs and 14 each of NCs and PCs were also analyzed. The TBs were sterile pre-wetted wipes prepared in the same manner and at the same time as the wipes sent to the field team to use for sampling. One PC, one NC, and at least one TB were included with the samples on each tray/manifold. For a data table containing results for more than one tray/manifold, more than one PC, NC, and TB are included in the table. The sample receipt dates included: April 19, 2011 for MFP; April 19, 26, and 28, 2011 for Round 1; May 3 and 10, 2011 for Round 2; and May 14, 17, and 19, 2011 for Round 3. Samples were processed on the receipt date unless there was a change from the original schedule resulting in a conflict with staff availability. There were nine sample-processing dates and up to 48 samples and controls were processed on the same day through both RV-PCR and traditional culture analyses. For

some events, sample analysis (i.e., Round 3 post-decontamination samples) was split into two days to accommodate the multiple steps required for culture analysis; however, the same sample was processed concurrently by RV-PCR and culture to allow direct comparison of results.

Table 3-26. Summary of LLNL samples received and processed by event type.

BOTE Project Event	Sample Type	Number of Samples	Samples/Event	Total Samples
MFP	MFP	17	17	214
Round 1	QC Pre-decontamination	2	46	
	Pre-decontamination	0		
	QC Post-decontamination	3		
	Post-decontamination	41		
Round 2	QC Pre-decontamination	6	67	
	Pre-decontamination	14		
	QC Post-decontamination	8		
	Post-decontamination	39		
Round 3	QC Pre-decontamination	6	84	
	Pre-decontamination	10		
	QC Post-decontamination	8		
	Post-decontamination	60		

The following section summarizes results for culture and RV-PCR analyses for the different events. Data tables including both types of analyses are shown below for each event; in some cases, the table for an event occupies multiple pages dependent on the sample number. RV-PCR results were based on magnetic bead-based DNA extraction (Promega Magnesil® kit) unless otherwise noted.

3.2.2.1.1. Samples from the MFP Event

Results from MFP (background) samples showed that 17 of 17 (100%) agreed between culture and RV-PCR analyses, with 14 positive and three negative for *Bg* (Table 3-27). Since the MFP samples represented background levels from past dissemination events (INL-1 and INL-2 studies), they appeared to have very low viable spore levels. For the culture analysis, many of the samples did not yield CFU on the TSA plates, but were positive only by analyzing the enrichment culture using real-time PCR analysis. For these samples, RV-PCR analysis also gave positive results showing agreement between methods (real-time PCR of the enrichment culture and RV-PCR). In some cases (where noted in the tables), additional culture analysis (beyond the current LRN protocol) was used to analyze a greater portion of the enrichment culture and compare culture results with RV-PCR results more accurately. In the standard LRN protocol, only a small fraction of the enrichment culture is analyzed by real-time PCR, whereas RV-PCR uses a larger portion of the original spore suspension, therefore resulting in increased sensitivity.

3.2.2.1.2. Samples from Round 1

Only two Round 1 pre-decontamination samples were received and analyzed at LLNL due to a mix-up in sample distribution between LLNL and EPA-OPP-MLB during the sample shipment. Results are shown in Table 3-28 including results for controls (same controls as shown in Table 3-27, but also included here for comparison purposes). These samples represented QC (field blank) samples rather than wipe samples from surface sampling. For these samples, only one of two (50%) showed agreement between methods due to a technical issue with one of the RV-PCR samples (the filter cup leaked during incubation so spore outgrowth and subsequent cell growth were compromised in this sample). Based on this issue, a change was instituted in the protocol to cap the filter cup bottom before adding growth medium, rather than after. Because capping is performed in the BSC, there is little risk for the additional handling of the filter cups containing dry spores. After the protocol change was made, no issues with filter cup leakage were noted.

For Round 1 post-decontamination samples, 41 of 44 (93%) were consistent between culture and RV-PCR analyses (Table 3-29), including three samples that met the criteria for positive detection based on heat lysis results, whereas the ΔCt values were < 6 for the magnetic bead-based DNA extraction (as noted). Several MFP samples did not show CFU on the TSA plates for culture analysis but were positive by PCR analysis of the concentrated enrichment culture. Many of these samples were positive by RV-PCR. While two samples showed a PCR response, these samples did not meet the criteria for positive detection by RV-PCR, namely Ct (T9) ≤ 39 and ΔCt [Ct (T0)-Ct (T9)] ≥ 6 (e.g., samples had ΔCt values of 5.6 and 3.7). In addition, one of the samples was positive by RV-PCR but could not be confirmed by culture analysis. Such discrepancies are expected since samples contained very low spore levels (no CFU measured on plates) and, as previously mentioned, there are likely to be heterogeneities in partitioning spores when splitting the extract for parallel culture and RV-PCR analyses.

3.2.2.1.3. Samples from Round 2

For Round 2 pre-decontamination samples, 19 of 20 samples (95%) showed consistent results between culture and RV-PCR analyses, with only one sample not meeting the criteria for

positive detection by RV-PCR (ΔCt value of 2.7 instead of ≥ 6) (Table 3-30). As for the Round 1 post-decontamination samples mentioned above, this sample did not generate CFU on the TSA plates from culture analysis and had low spore levels present. For the other Round 2 pre-decontamination samples, 13 were positive for both methods, and six were negative for both methods.

For Round 2 post-decontamination samples, there was 100% consistency between culture and RV-PCR results, with 47 of 47 samples in agreement. Results are shown in Table 3-31. For these samples, three samples were positive and 44 samples were negative for both methods. Results for one negative control sample showed positive results for culture analysis likely due to extra handling steps in the culture processing protocol.

3.2.2.1.4. Samples from Round 3

For Round 3 pre- and post-decontamination samples, there was 100% consistency between culture and RV-PCR results, with 16 of 16 and 68 of 68 samples in agreement, respectively. Results are shown in Table 3-32 for pre-decontamination samples and Table 3-33 for post-decontamination samples. For pre-decontamination samples, 11 samples were positive and five samples were negative for both methods. For post-decontamination samples, all 68 samples were negative for both methods. In some cases (Table 3-33), negative control samples were positive by culture analysis possibly due to cross-contamination. Protocol modifications including extra glove changes were incorporated to prevent this error in the culture sample analysis that followed.

3.2.2.2. EPA-OPP-MLB Results

A total of 50 samples were analyzed by the EPA-OPP-MLB Laboratory. Overall, the RV-PCR method provided rapid results that were 86% consistent (43/50 samples) with results from culture analysis. Among the seven samples showing disagreement between the methods, six were culture positive and RV-PCR negative (12% false negative) while one was culture negative and RV-PCR positive (2% false positive). A likely contributing factor to RV-PCR performance involved inexperience with the magnetic bead-based DNA extraction procedure. Additional experience and ongoing research on this method will address the problems with the reproducibility of performance of the DNA extraction and purification protocol. However, considering that the main purpose for participation of the MLB Laboratory in the BOTE Project was to gain practice and experience with the RV-PCR method, the laboratory performed well. The results are presented in Table 3-34, Table 3-35, Table 3-36, and Table 3-37.

Table 3-27. LLNL RV-PCR results for MFP samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			Notes
	Average CFU/ Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	
1192	0	EC	23.4	Pos	15.6	0.2	Pos	See Footnote (1)
1203	0	EC	32.8	Pos	7.2	1.0	Pos	See Footnote (1)
1204	0	EC	21.5	Pos	9.5	0.5	Pos	
1205	0	EC	31.6	Pos	11.2	0.1	Pos	See Footnote (1)
1206	0	N/A	N/A	Neg	0.0	0.0	Neg	
1207	0	EC	30.3	Pos	18.2	0.1	Pos	
1209	0	RS	17.2	Pos	18.2	0.3	Pos	
1211	0	N/A	N/A	Neg	0.0	0.0	Neg	
1212	0	EC	21.1	Pos	16.0	0.1	Pos	See Footnote (1)
1213	3.6E1	EC	19.1	Pos	17.7	0.1	Pos	See Footnote (1)
1214	3.6E1	FF	20.9	Pos	17.6	0.1	Pos	
1215	0	EC	33.4	Pos	14.3	0.3	Pos	
1216	1.8E1	EC, RS	17.7	Pos	16.9	0.1	Pos	
1218	1.1E2	Plates	19.4	Pos	15.8	0.1	Pos	
1220	0	N/A	Undetermined	Neg	0.0	0.0	Neg	
1221	2.3E2	Plates	18.4	Pos	13.4	0.2	Pos	
1222	0	EC, RS	17.0	Pos	16.8	0.1	Pos	
1461 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
1462 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
1463 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	3.7E5	Plates	18.1	Pos	24.5	0.3	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC), re-streak (RS) from enrichment culture, or Promega-extracted concentrated EC (EC-PE). Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): To confirm culture result, the EC was concentrated 10-20 fold prior to PCR analysis.

Abbreviations: PC, positive control; NC, negative control; TB, true blank

Table 3-28. LLNL RV-PCR results for Round 1 pre-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1196	0	EC	16.0	Pos	0.0	0.0	Neg	See Footnote (1)
1234	3.6E2	Plates	18.0	Pos	6.5	0.3	Pos	
1461 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
1462 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
1463 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	3.7E5	Plates	18.1	Pos	24.5	0.3	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC). Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): Sample ID No. 1196 dried out due to a capping problem. At T9, filter cup contents were resuspended in 1.5 mL medium for analysis.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-29. LLNL RV-PCR results for Round 1 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1185	0	EC-PE	25.2	Pos	7.1	1.8	Pos	See Footnote (1)
1198	0	N/A	N/A	Neg	0.0	0.0	Neg	
1199	0	N/A	N/A	Neg	0.0	0.0	Neg	
1243	3.0E1	Plates	15.7	Pos	6.5	0.9	Pos	
1246	3.0E1	Plates	13.7	Pos	6.5	0.9	Pos	
1255	0	EC	25.6	Pos	5.6	0.3	Neg	RV-PCR Ave. ΔCt from 1:20 dilution
1257	3.0E1	Plates	14.6	Pos	6.1	1.3	Pos	
1259	0	EC	21.9	Pos	0.0	0.0	Neg	Heat Lysis Ave. ΔCt = 3.7
1261	0	EC-PE	25.8	Pos	7.8	1.2	Pos	See Footnote (1)
1290	0	EC-PE	23.8	Pos	8.6	0.6	Pos	See Footnote (1)
1291	0	EC	25.6	Pos	10.9	0.1	Pos	See Footnote (2)
1292	0	EC	25.5	Pos	12.9	0.2	Pos	See Footnote (2)
1298	1.3E3	Plates, FF	12.9	Pos	8.3	0.7	Pos	
1300	3.0E1	Plates	13.6	Pos	6.7	0.8	Pos	
1301	0	EC	25.4	Pos	4.2	2.0	Pos	Ave. ΔCt from 1:20 dilution; Heat Lysis Ave. ΔCt = 8.4
1302	0	N/A	N/A	Neg	0.0	0.0	Neg	
1303	0	EC	35.0	Pos	9.6	2.2	Pos	
1304	0	EC	23.8	Pos	14.8	0.1	Pos	See Footnote (2)
1305	5.3E1	Plates, FF	13.3	Pos	20.2	1.8	Pos	
1306	1.8E1	FF, RS	14.5	Pos	16.0	1.7	Pos	
1475 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
1476 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	2.9E5	Plates	14.0	Pos	23.6	0.0	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC), re-streak (RS) from enrichment culture or Promega-extracted concentrated EC (EC-PE). Green shading indicates when results were positive for *Bg*. Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS. N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC). Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): EC concentrated 10-20-fold and DNA prepared using Promega extraction prior to PCR analysis to confirm culture result (EC-PE).

Footnote (2): PCR repeated to confirm RVPCR result; 1:20 dilution result shown.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-29 (continued). LLNL RV-PCR results for Round 1 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1307	0	EC	35.0	Pos	6.7	0.4	Pos	
1308	8.9E1	Plates, FF	13.6	Pos	7.9	0.6	Pos	
1309	0	N/A	N/A	Neg	0.0	0.0	Neg	
1310	0	EC	16.2	Pos	8.7	0.3	Pos	
1311	0	N/A	Undetermined	Neg	6.4	0.3	Pos	RV-PCR Ave. ΔCt from 2 replicates (1:20 dilution)
1312	0	EC	26.0	Pos	7.7	0.3	Pos	
1374	0	N/A	N/A	Neg	0.0	0.0	Neg	
1375	0	N/A	N/A	Neg	0.0	0.0	Neg	
1377	0	N/A	N/A	Neg	0.0	0.0	Neg	
1379	0	EC-PE	24.8	Pos	12.3	0.5	Pos	See Footnote (3)
1382	0	EC-PE	27.0	Pos	12.6	0.1	Pos	See Footnote (3)
1383	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	4.7E5	Plates	14.0	Pos	24.9	0.1	Pos	
1163	0	EC	Undetermined	Neg	0.0	0.0	Neg	
1164	0	RS	15.0	Pos	5.9	0.6	Pos	See Footnote (4): Heat Lysis Ave. ΔCt = 8.3
1165	5.9E1	Plates	14.7	Pos	8.8	0.2	Pos	
1168	0	RS	14.9	Pos	6.1	0.4	Pos	
1171	0	N/A	N/A	Neg	0.0	0.0	Neg	
1177	0	RS	15.2	Pos	8.6	0.7	Pos	
1179	0	RS	14.7	Pos	4.9	1.0	Pos	See Footnote (4): Heat Lysis Ave. ΔCt 8.7

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC), re-streak (RS) from enrichment culture or Promega-extracted concentrated EC (EC-PE). Green shading indicates when results were positive for *Bg*. Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS. N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC). Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (3): RVPCR results based on repeated PCR analysis with 1:20 dilution (1:10 dilution showed PCR inhibition); EC concentrated 10-20-fold and DNA prepared using Promega extraction prior to PCR to confirm culture result (EC-PE).

Footnote (4): Low spore level, post-decontamination sample; sample positive by heat lysis RV-PCR.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-29 (continued). LLNL RV-PCR results for Round 1 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1180	0	FF, RS	34.6	Pos	9.3	0.3	Pos	
1181	0	EC	Undetermined	Neg	0.0	0.0	Neg	
1182	3.0E1	Plates, FF	14.4	Pos	7.0	0.8	Pos	
1186	0	EC	19.9	Pos	7.5	0.8	Pos	
1210	3.6E1	FF, EC	14.1	Pos	6.9	2.0	Pos	
1464 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
1465 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
1466 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	3.4E5	Plates	13.5	Pos	20.6	0.0	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC), or re-streak (RS) from enrichment culture. Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-30. LLNL RV-PCR results for Round 2 pre-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1187	0	N/A	N/A	Neg	0.0	0.0	Neg	
1293	1.5E5	Plates	15.1	Pos	6.4	1.0	Pos	
1294	2.2E5	Plates	15.6	Pos	6.2	0.6	Pos	
1345	0	N/A	N/A	Neg	0.0	0.0	Neg	
1347	2.3E5	Plates	15.5	Pos	21.7	0.2	Pos	
1351	1.9E5	Plates	15.5	Pos	20.4	0.3	Pos	
1365	2.2E5	Plates	15.2	Pos	12.8	0.3	Pos	
1366	2.2E5	Plates	15.4	Pos	13.9	0.0	Pos	
1367	0	N/A	Undetermined	Neg	0.0	0.0	Neg	
1369	1.5E5	Plates	15.4	Pos	9.7	0.4	Pos	
1371	0	N/A	N/A	Neg	0.0	0.0	Neg	
1372	1.9E5	Plates	14.9	Pos	18.2	0.1	Pos	See Footnote (1): RV-PCR 1/10 dilution Ave. ΔCt = 8.2
1373	0	EC, RS	21.3	Pos	0.0	0.0	Neg	See Footnote (2): Heat Lysis 1/10 dilution Ave. ΔCt = 2.7
1378	5.2E4	Plates	14.8	Pos	17.2	0.2	Pos	See Footnote (1): RV-PCR 1/10 dilution Ave. ΔCt = 7.4
1385	1.3E5	Plates	15.2	Pos	19.8	0.2	Pos	See Footnote (1): RV-PCR 1/10 dilution Ave. ΔCt = 3.4
1467	0	N/A	N/A	Neg	0.0	0.0	Neg	
1468	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	5.3E1	Plates, FF	15.6	Pos	16.6	0.1	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC), or re-streak (RS) from enrichment culture. Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS. N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): RV-PCR Ave. Delta Ct data from 1:20 dilution; 1:10 dilution showed inhibition.

Footnote (2): Low spore level, variability when sample split; RV-PCR negative by 1:10 dilution, 1:20 dilution, and undiluted heat lysis RV-PCR).

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-30 (continued). LLNL RV-PCR results for Round 2 pre-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1363	5.9E4	Plates	16.6	Pos	20.8	0.1	Pos	
1364	0	N/A	N/A	Neg	0.0	0.0	Neg	
1368	0	N/A	N/A	Neg	0.0	0.0	Neg	
1370	2.0E4	Plates	16.5	Pos	18.8	0.2	Pos	
1380	1.7E5	Plates	16.2	Pos	19.0	0.2	Pos	
1474	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	5.3E1	Plates, FF	15.6	Pos	7.1	0.1	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (Plates), or filter funnel (FF) plate. Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-31. LLNL RV-PCR results for Round 2 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1260	0	N/A	N/A	Neg	0.0	0.0	Neg	
1314	0	N/A	N/A	Neg	0.0	0.0	Neg	
1315	0	N/A	N/A	Neg	0.0	0.0	Neg	
1316	1.8E1	FF	16.8	Pos	9.0	0.3	Pos	See Footnote (1)
1317	0	N/A	N/A	Neg	0.0	0.0	Neg	
1318	0	N/A	N/A	Neg	0.0	0.0	Neg	
1319	0	N/A	N/A	Neg	0.0	0.0	Neg	
1320	0	EC-PE	27.4	Pos	6.9	0.2	Pos	See Footnote (2)
1322	0	N/A	N/A	Neg	0.0	0.0	Neg	
1324	0	N/A	N/A	Neg	0.0	0.0	Neg	
1325	0	N/A	N/A	Neg	0.0	0.0	Neg	
1328	0	N/A	N/A	Neg	0.0	0.0	Neg	
1329	0	N/A	N/A	Neg	0.0	0.0	Neg	
1332	0	N/A	N/A	Neg	0.0	0.0	Neg	
1337	0	N/A	N/A	Neg	0.0	0.0	Neg	
1479 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	1.8E1	Plates, FF	15.3	Pos	0.0	0.0	Neg	Cross-contamination for culture portion only
PC	7.1E1	Plates, FF	15.1	Pos	11.4	0.3	Pos	
1341	0	N/A	N/A	Neg	0.0	0.0	Neg	
1342	0	N/A	N/A	Neg	0.0	0.0	Neg	
1344	0	N/A	N/A	Neg	0.0	0.0	Neg	
1346	0	N/A	N/A	Neg	0.0	0.0	Neg	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC). Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): Culture-PCR result based on repeated analysis and 1:10 dilution.

Footnote (2): EC concentrated 10-20-fold and DNA prepared using Promega extraction prior to PCR, to confirm culture results (EC-PE).

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-31 (continued). LLNL RV-PCR results for Round 2 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1348	0	N/A	N/A	Neg	0.0	0.0	Neg	
1349	0	N/A	N/A	Neg	0.0	0.0	Neg	
1352	0	N/A	N/A	Neg	0.0	0.0	Neg	
1354	0	N/A	N/A	Neg	0.0	0.0	Neg	
1355	0	N/A	N/A	Neg	0.0	0.0	Neg	
1356	0	N/A	N/A	Neg	0.0	0.0	Neg	
1357	0	EC-PE	25.0	Pos	7.5	0.3	Pos	See Footnote (1)
1358	0	N/A	N/A	Neg	0.0	0.0	Neg	
1359	0	N/A	N/A	Neg	0.0	0.0	Neg	
1360	0	N/A	N/A	Neg	0.0	0.0	Neg	
1361	0	N/A	N/A	Neg	0.0	0.0	Neg	
1480 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	8.9E1	Plates, FF	15.1	Pos	15.9	0.5	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC). Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): Culture EC concentrated 10-20-fold and DNA prepared using Promega extraction prior to PCR, to confirm culture result (EC-PE).

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-31 (continued). LLNL RV-PCR results for Round 2 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1238	0	N/A	N/A	Neg	0.0	0.0	Neg	
1313	0	N/A	N/A	Neg	0.0	0.0	Neg	
1321	0	N/A	N/A	Neg	0.0	0.0	Neg	
1323	0	N/A	N/A	Neg	0.0	0.0	Neg	
1326	0	N/A	N/A	Neg	0.0	0.0	Neg	
1327	0	N/A	N/A	Neg	0.0	0.0	Neg	
1331	0	N/A	N/A	Neg	0.0	0.0	Neg	
1333	0	N/A	N/A	Neg	0.0	0.0	Neg	
1334	0	N/A	N/A	Neg	0.0	0.0	Neg	
1335	0	N/A	N/A	Neg	0.0	0.0	Neg	
1338	0	N/A	N/A	Neg	0.0	0.0	Neg	
1339	0	N/A	N/A	Neg	0.0	0.0	Neg	
1340	0	N/A	N/A	Neg	0.0	0.0	Neg	
1343	0	N/A	N/A	Neg	0.0	0.0	Neg	
1350	0	N/A	N/A	Neg	0.0	0.0	Neg	
1473 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	8.9E1	Plates, FF	15.6	Pos	10.1	0.1	Pos	
1353	0	N/A	N/A	Neg	0.0	0.0	Neg	
1362	0	N/A	N/A	Neg	0.0	0.0	Neg	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), or filter funnel (FF) plate. Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS. N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-32. LLNL RV-PCR results for Round 3 pre-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			Notes
	Average CFU/Sample	Source of Culture Result*	Culture- PCR (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	
1241	0	N/A	N/A	Neg	0.0	0.0	Neg	
1247	9.6E4	Plates	19.2	Pos	21.9	0.2	Pos	See Footnote (1)
1266	7.6E4	Plates	19.4	Pos	21.7	0.1	Pos	See Footnote (1)
1271	0	N/A	N/A	Neg	0.0	0.0	Neg	
1273	1.7E5	Plates	18.8	Pos	9.6	0.4	Pos	
1277	2.2E5	Plates	17.8	Pos	20.5	0.2	Pos	
1278	2.1E5	Plates	18.0	Pos	20.4	0.1	Pos	
1279	0	N/A	N/A	Neg	0.0	0.0	Neg	
1280	1.8E1	Plates, FF	21.4	Pos	22.5	0.1	Pos	See Footnote (1)
1283	2.0E5	Plates	18.8	Pos	10.4	0.4	Pos	
1285	7.1E3	Plates	19.8	Pos	21.2	0.1	Pos	See Footnote (1)
1287	1.4E4	Plates	18.9	Pos	20.8	0.1	Pos	See Footnote (1)
1478 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	2.4E2	Plates, FF	19.8	Pos	0.0	0.0	Neg	Cross-contamination for culture portion only
PC	1.8E1	Plates, FF	18.4	Pos	12.0	0.3	Pos	
1240	2.1E4	Plates	15.1	Pos	14.4	0.2	Pos	
1275	1.3E5	Plates	15.1	Pos	16.7	0.8	Pos	
1276	0	N/A	N/A	Neg	0.0	0.0	Neg	
1472 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	5.3E1	Plates, FF	17.8	Pos	7.8	0.6	Pos	
1264	0	N/A	N/A	Neg	0.0	0.0	Neg	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), or filter funnel (FF) plate. Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): RV-PCR results based on 1:20 dilution (1:10 dilution showed PCR inhibition).

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-33. LLNL RV-PCR results for Round 3 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1242	0	N/A	N/A	Neg	0.0	0.0	Neg	
1244	0	N/A	N/A	Neg	0.0	0.0	Neg	
1245	0	N/A	N/A	Neg	0.0	0.0	Neg	
1248	0	N/A	N/A	Neg	0.0	0.0	Neg	
1250	0	N/A	N/A	Neg	0.0	0.0	Neg	
1251	0	N/A	N/A	Neg	0.0	0.0	Neg	
1252	0	N/A	N/A	Neg	0.0	0.0	Neg	
1253	0	N/A	N/A	Neg	0.0	0.0	Neg	
1256	0	N/A	N/A	Neg	0.0	0.0	Neg	
1263	0	N/A	N/A	Neg	0.0	0.0	Neg	
1267	0	N/A	N/A	Neg	0.0	0.0	Neg	
1268	0	N/A	N/A	Neg	0.0	0.0	Neg	
1269	0	N/A	N/A	Neg	0.0	0.0	Neg	
1270	0	N/A	N/A	Neg	0.0	0.0	Neg	
1272	0	N/A	N/A	Neg	0.0	0.0	Neg	
1274	0	N/A	N/A	Neg	0.0	0.0	Neg	
1469 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	1.8E1	Plates, FF	Undetermined	Pos	0.0	0.0	Neg	Cross-contamination observed for culture only
PC	3.6E1	Plates, FF	29.7	Pos	12.3	0.1	Pos	
1281	0	N/A	N/A	Neg	0.0	0.0	Neg	
1282	0	N/A	N/A	Neg	0.0	0.0	Neg	
1284	0	N/A	N/A	Neg	0.0	0.0	Neg	
1286	0	N/A	N/A	Neg	0.0	0.0	Neg	
1330	0	N/A	N/A	Neg	0.0	0.0	Neg	
1336	0	N/A	N/A	Neg	0.0	0.0	Neg	
1402	0	N/A	N/A	Neg	0.0	0.0	Neg	
1403	0	N/A	N/A	Neg	0.0	0.0	Neg	
1404	0	N/A	N/A	Neg	0.0	0.0	Neg	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates) or filter funnel (FF) plate. Green shading indicates when results were positive for *Bg*. Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS. N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-33 (continued). LLNL RV-PCR results for Round 3 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1242	0	N/A	N/A	Neg	0.0	0.0	Neg	
1244	0	N/A	N/A	Neg	0.0	0.0	Neg	
1245	0	N/A	N/A	Neg	0.0	0.0	Neg	
1248	0	N/A	N/A	Neg	0.0	0.0	Neg	
1250	0	N/A	N/A	Neg	0.0	0.0	Neg	
1251	0	N/A	N/A	Neg	0.0	0.0	Neg	
1252	0	N/A	N/A	Neg	0.0	0.0	Neg	
1253	0	N/A	N/A	Neg	0.0	0.0	Neg	
1256	0	N/A	N/A	Neg	0.0	0.0	Neg	
1263	0	N/A	N/A	Neg	0.0	0.0	Neg	
1267	0	N/A	N/A	Neg	0.0	0.0	Neg	
1268	0	N/A	N/A	Neg	0.0	0.0	Neg	
1269	0	N/A	N/A	Neg	0.0	0.0	Neg	
1270	0	N/A	N/A	Neg	0.0	0.0	Neg	
1272	0	N/A	N/A	Neg	0.0	0.0	Neg	
1274	0	N/A	N/A	Neg	0.0	0.0	Neg	
1469 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	1.8E1	Plates, FF	Undetermined	Pos	0.0	0.0	Neg	Cross-contamination observed for culture only
PC	3.6E1	Plates, FF	29.7	Pos	12.3	0.1	Pos	
1281	0	N/A	N/A	Neg	0.0	0.0	Neg	
1282	0	N/A	N/A	Neg	0.0	0.0	Neg	
1284	0	N/A	N/A	Neg	0.0	0.0	Neg	
1286	0	N/A	N/A	Neg	0.0	0.0	Neg	
1330	0	N/A	N/A	Neg	0.0	0.0	Neg	
1336	0	N/A	N/A	Neg	0.0	0.0	Neg	
1402	0	N/A	N/A	Neg	0.0	0.0	Neg	
1403	0	N/A	N/A	Neg	0.0	0.0	Neg	
1404	0	N/A	N/A	Neg	0.0	0.0	Neg	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates) or filter funnel (FF) plate. Green shading indicates when results were positive for *Bg*. Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS. N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-33 (continued). LLNL RV-PCR results for Round 3 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1406	0	N/A	N/A	Neg	0.0	0.0	Neg	
1407	0	N/A	N/A	Neg	0.0	0.0	Neg	
1409	0	N/A	N/A	Neg	0.0	0.0	Neg	
1410	0	N/A	N/A	Neg	0.0	0.0	Neg	
1411	0	N/A	N/A	Neg	0.0	0.0	Neg	
1412	0	N/A	N/A	Neg	0.0	0.0	Neg	
1415	0	N/A	N/A	Neg	0.0	0.0	Neg	
1470 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	1.2E2	Plates, FF	29.5	Pos	12.1	0.1	Pos	See Footnote (1)
1249	0	N/A	N/A	Neg	0.0	0.0	Neg	
1418	0	N/A	N/A	Neg	0.0	0.0	Neg	
1422	0	N/A	N/A	Neg	0.0	0.0	Neg	
1423	0	N/A	N/A	Neg	0.0	0.0	Neg	
1426	0	N/A	N/A	Neg	0.0	0.0	Neg	
1427	0	N/A	N/A	Neg	0.0	0.0	Neg	
1428	0	N/A	N/A	Neg	0.0	0.0	Neg	
1429	0	N/A	N/A	Neg	0.0	0.0	Neg	
1434	0	N/A	N/A	Neg	0.0	0.0	Neg	
1435	0	N/A	N/A	Neg	0.0	0.0	Neg	
1436	0	N/A	N/A	Neg	0.0	0.0	Neg	
1437	0	N/A	N/A	Neg	0.0	0.0	Neg	
1440	0	N/A	N/A	Neg	0.0	0.0	Neg	
1442	0	N/A	N/A	Neg	0.0	0.0	Neg	
1449	0	N/A	N/A	Neg	0.0	0.0	Neg	
1471 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	3.6E1	Plates, FF	15.5	Pos	10.2	0.3	Pos	See Footnote (1)

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), or filter funnel (FF) plate. Green shading indicates when results were positive for *Bg*. Positive culture results obtained if > 0 *Bg* CFU are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC). Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): The PC results are from PCs prepared in different batches (spiked at either the 10^1 or 10^2 spores per wipe level).

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-33 (continued). LLNL RV-PCR results for Round 3 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1450	0	N/A	N/A	Neg	0.0	0.0	Neg	
1390	0	N/A	N/A	Neg	0.0	0.0	Neg	
1391	0	N/A	N/A	Neg	0.0	0.0	Neg	
1392	0	N/A	N/A	Neg	0.0	0.0	Neg	
1393	0	N/A	N/A	Neg	0.0	0.0	Neg	
1398	0	N/A	N/A	Neg	0.0	0.0	Neg	
1399	0	N/A	N/A	Neg	0.0	0.0	Neg	
1400	0	N/A	N/A	Neg	0.0	0.0	Neg	
1401	0	N/A	N/A	Neg	0.0	0.0	Neg	
1405	0	N/A	N/A	Neg	0.0	0.0	Neg	
1439	0	N/A	N/A	Neg	0.0	0.0	Neg	
1441	0	N/A	N/A	Neg	0.0	0.0	Neg	
1443	0	N/A	N/A	Neg	0.0	0.0	Neg	
1444	0	N/A	N/A	Neg	0.0	0.0	Neg	
1472 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	5.3E1	Plates, FF	17.8	Pos	7.8	0.6	Pos	
1430	0	N/A	N/A	Neg	0.0	0.0	Neg	
1431	0	N/A	N/A	Neg	0.0	0.0	Neg	
1433	0	N/A	N/A	Neg	0.0	0.0	Neg	
1445	0	N/A	N/A	Neg	0.0	0.0	Neg	
1446	0	N/A	N/A	Neg	0.0	0.0	Neg	
1447	0	N/A	N/A	Neg	0.0	0.0	Neg	
1448	0	N/A	N/A	Neg	0.0	0.0	Neg	
1474 (TB)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	5.3E1	Plates, FF	15.6	Pos	7.1	0.1	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), or filter funnel (FF) plate. Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-34. EPA-OPP-MLB RV-PCR results for MFP samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1201	0	N/A	N/A	Neg	0.0	0.0	Neg	
1208	0	N/A	N/A	Neg	13.5	0.5	Pos	
TB (1451)	0	N/A	N/A	Neg	3.0	2.7	Neg	
NC	0	N/A	N/A	Neg	5.0	1.2	Neg	
PC	1.0E3	Plates	ND	Pos	14.1	0.4	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates). Green shading indicates when results were positive for *Bg*.
Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.
N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.
**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).
Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.
Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-35. EPA-OPP-MLB RV-PCR results for Round 1 pre-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	Culture- PCR (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1217	1.8E5	Plates	ND	Pos	19.4	0.2	Pos	
1219	0	N/A	N/A	Neg	0.0	0.0	Neg	
1223	3.6E5	Plates	ND	Pos	21.8	1.8	Pos	
1224	0	N/A	N/A	Neg	0.0	0.0	Neg	
1225	4.4E5	Plates	21.7	Pos	10.4	0.2	Pos	
1226	4.3E5	Plates	ND	Pos	13.3	0.3	Pos	
1227	5.4E4	Plates	ND	Pos	0.0	0.0	Pos	Footnote (1): Heat Lysis Ave. ΔCt = 17.9
1228	4.4E0	Plates	22.4	Pos	0.0	0.0	Neg	Footnote (1): Heat Lysis Ave. ΔCt = 0
1229	1.8E1	FF	21.5	Pos	13.8	0.1	Pos	
1230	0	EC	19.5	Pos	0.0	0.0	Pos	Footnote (1): Heat Lysis Ave. ΔCt = 17.0
1231	3.4E5	Plates	ND	Pos	12.9	2.4	Pos	
1232	5.8E5	Plates	ND	Pos	23.9	0.1	Pos	
1233	2.0E5	Plates	ND	Pos	0.0	0.0	Pos	Footnote (1): Heat Lysis Ave. ΔCt = 17.0
1235	3.4E5	Plates	ND	Pos	28.0	0.0	Pos	
1236	2.9E5	Plates	ND	Pos	12.5	0.2	Pos	
1237	0	N/A	N/A	Neg	0.0	0.0	Neg	
TB (1451)	0	N/A	N/A	Neg	3.0	2.7	Neg	
NC	0	N/A	N/A	Neg	5.0	1.2	Neg	
PC	1.0E3	Plates	ND	Pos	14.1	0.4	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC). Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct <35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

ND = Not Determined.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): Sample also tested by heat lysis RV-PCR with results shown.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-36. EPA-OPP-MLB RV-PCR results for Round 1 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1166	0	N/A	N/A	Neg	0.0	0.0	Neg	
1167	0	N/A	N/A	Neg	0.0	0.0	Neg	
1169	0	N/A	N/A	Neg	0.0	0.0	Neg	
1170	0	N/A	N/A	Neg	0.0	0.0	Neg	
1172	0	N/A	N/A	Neg	0.0	0.0	Neg	
1173	0	N/A	N/A	Neg	0.0	0.0	Neg	
1174	0	N/A	N/A	Neg	0.0	0.0	Neg	
1175	0	N/A	N/A	Neg	0.0	0.0	Neg	
1176	0	N/A	N/A	Neg	0.0	0.0	Neg	
1178	0	N/A	N/A	Neg	0.0	0.0	Neg	
1183	0	N/A	N/A	Neg	0.0	0.0	Neg	
1184	0	EC	18.2	Pos	0.0	0.0	Neg	Footnote (1): Heat Lysis Ave. ΔCt = 0
1188	3.6E4	Plates	23.3	Pos	0.0	0.0	Pos	Footnote (1): Heat Lysis Ave. ΔCt = 13.1
1189	0	N/A	N/A	Neg	0.0	0.0	Neg	
1190	0	N/A	N/A	Neg	0.0	0.0	Neg	
1193	0	N/A	N/A	Neg	0.0	0.0	Neg	
1194	4.4E1	Plates	18.9	Pos	0.0	0.0	Neg	Footnote (1): Heat Lysis Ave. ΔCt = 0
1197	0	N/A	N/A	Neg	0.0	0.0	Neg	
1239	4.4E1	Plates	17.8	Pos	0.0	0.0	Neg	Footnote (1): Heat Lysis Ave. ΔCt = 0
1288	0	N/A	N/A	Neg	0.0	0.0	Neg	
1295	0	N/A	N/A	Neg	0.0	0.0	Neg	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates), filter funnel (FF) plate, and/or enrichment culture (EC). Green shading indicates when results were positive for *Bg*.

Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS. N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC). Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): Sample also tested by heat lysis RV-PCR with results shown.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-36 (continued). EPA-OPP-MLB RV-PCR results for Round 1 post-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1296	0	N/A	N/A	Neg	0.0	0.0	Neg	
1299	0	N/A	N/A	Neg	0.0	0.0	Neg	
TB (1452)	0	N/A	N/A	Neg	0.0	0.0	Neg	
NC	0	N/A	N/A	Neg	0.0	0.0	Neg	
PC	6.4E2	Plates	ND	Pos	12.5	3.4	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates). Green shading indicates when results were positive for *Bg*.
Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.
N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.
ND = Not Determined.
**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).
Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.
Abbreviations: PC, positive control; NC, negative control; TB, true blank.

Table 3-37. EPA-OPP-MLB RV-PCR results for Round 2 pre-decontamination samples.

Sample ID	Culture (24-48 hr)				RV-PCR (9 hr)			
	Average CFU/Sample	Source of Culture Result*	PCR of Culture (Ct)**	Culture Result (Pos/Neg)	Average ΔCt	Std Dev ΔCt	RV-PCR Results (Pos/Neg)	Notes
1384	6.7E5	Plates	ND	Pos	10.0	2.8	Pos	
1289	0	N/A	N/A	Neg	0.0	0.0	Neg	
1262	5.6E5	Plates	ND	Pos	0.0	0.0	Pos	Footnote (1): Heat Lysis Ave. ΔCt = 25.7
1387	6.3E5	Plates	18.2	Pos	11.0	0.9	Pos	
1258	0	N/A	N/A	Neg	3.0	0.0	Neg	
1381	2.3E5	Plates	ND	Pos	0.0	0.0	Neg	Footnote (1): Heat Lysis Ave. ΔCt = 0
1254	3.0E5	Plates	ND	Pos	11.7	0.8	Pos	
1376	3.6E5	Plates	ND	Pos	0.0	0.0	Neg	Footnote (1): Heat Lysis Ave. ΔCt = 0
1386	3.6E5	Plates	ND	Pos	6.2	1.9	Pos	
TB (1455)	0	N/A	N/A	Neg	3.0	2.7	Neg	
NC	0	N/A	N/A	Neg	5.0	1.2	Neg	
PC	5.5E2	Plates	ND	Pos	17.1	2.3	Pos	

*Positive (pos) or negative (neg) culture determination based upon the serial dilution (plates). Green shading indicates when results were positive for *Bg*. Positive culture results obtained if > 0 *Bg* colonies are presented on serial dilution or filter membrane plates, and/or *Bg*-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS.

N/A = not applicable; No CFU for analysis and EC not turbid and/or no growth from RS.

ND = Not Determined.

**Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC).

Positive RV-PCR result based upon average ΔCt ≥ 6 and T9 Ct ≤ 39.

Footnote (1): Sample also tested by heat lysis RV-PCR with results shown.

Abbreviations: PC, positive control; NC, negative control; TB, true blank.

3.2.3. Air Sampling

This section reports the results from the air sampling performed during the BOTE Project for (1) AAS, and (2) the reaerosolization study.

3.2.3.1. Aggressive Air Sampling Results

The INL Microbiology Laboratory reported all sample results as CFU. The quantification range was 30-300 CFU per plate. Concentrations in CFU per cubic foot (ft^3) (or m^3) of air were derived by dividing the reported CFU for each sample by the volume of air drawn through the samplers. Each sample was collected for one hr; the volume of air drawn through the XMXs was therefore 1,123 ft^3 (31.8 m^3, 530 L/min x 60 min), and the volume of air drawn through the STAs was 60 ft^3 (1.70 m^3, 28.3 L/min x 60 min). At the minimum quantification limit (30 CFU), the corresponding minimum quantifiable level for the STA was 0.50 CFU/ft^3 (17.6 CFU/m^3). For the XMX, the laboratory analyzed 1/20th of the sample, so the minimum quantifiable level was 0.54 CFU/ft^3 (18.9 CFU/m^3). Technically, the LOD is 1 CFU. The estimated LODs for the XMX and STA are therefore 0.018 and 0.017 CFU/ft^3 (0.63 and 0.59 CFU/m^3), respectively. Values below the lower quantification limit (for CFU) or minimum quantifiable level (for air concentrations) were used as estimates, consistent with ASTM Method D5465-93[74].

Background air samples in the facility were collected and analyzed prior to the *Bg* release, duirng the MFP. All three XMX results were ND and one of the three STAs resulted in detectable *Bg* (8 CFU). However, upon further investigation, six of the CFUs were discovered to be located in the middle of the agar plate where particles would not impact. Sampling of the STA samplers revealed that four of the nine were contaminated with *Bg* prior to sampling. All STA samplers were decontaminated with pH-adjusted bleach and placed in the facility during the VHP® fumigation in Round 1 to further sterilize the STA samplers.

Table 3-38. through Table 3-40. display the AAS results after each decontamination event. Three one-hr samples were collected by each XMX and STA sampler during each sampling event (except for the Hallway STA sampler during the hydrogen peroxide event, due to equipment failure). This equipment failure reduced the statistical power of the data, however, it did not nullify the test results. The three one-hr time intervals are noted in

Table 3-38., Table 3-39., and Table 3-40. as “H + 0” for the first hr of sampling, “H + 60” for the second hr of sampling, and “H + 120” for the third hr of sampling. Rooms 105 and 106 had two XMX samplers and one STA sampler, and the hallway had one XMX sampler and one STA sampler during each sampling event. There are therefore two XMX sampler concentrations reported during the three time intervals in each room. All results for blanks are reported in total CFU. One XMX blank (Round 3, Room 105) had 1 *Bg* CFU. This result was reported as 20 CFU because the laboratory analyzed only 1/20th of the total sample.

Table 3-38. Aggressive air sampling results for Round 1

Location	Sample Type	Time Interval (1^{st} , 2^{nd}, or 3^{rd} hour of sampling)	Concentrations (CFU/ft^3 or CFU/Blank)
Room 105	XMX	H + 0	1.4, 1.4
Room 105	XMX	H + 60	0.24, 0.18
Room 105	XMX	H + 120	ND, 0.18
Room 105	STA	H + 0	ND
Room 105	STA	H + 60	ND
Room 105	STA	H + 120	ND
Room 105	XMX-Blank	N/A	ND
Room 105	STA-Blank	N/A	0.057
Room 106	XMX	H + 0	0.12, 0.54
Room 106	XMX	H + 60	0.18, 0.18
Room 106	XMX	H + 120	ND, ND
Room 106	STA	H + 0	0.082
Room 106	STA	H + 60	ND
Room 106	STA	H + 120	ND
Room 106	XMX-Blank	N/A	ND
Room 106	STA-Blank	N/A	ND
Hallway	XMX	H + 0	0.65
Hallway	XMX	H + 60	0.24
Hallway	XMX	H + 120	ND
Hallway	STA	H + 0	ND
Hallway	STA	H + 60	Not collected
Hallway	STA	H + 120	Not collected
Hallway	XMX-Blank	N/A	ND
Hallway	STA-Blank	N/A	ND

ND = Not detected. N/A = Not applicable.

Table 3-39. Aggressive air sample results for Round 2

Location	Sample Type	Time Interval (1^{st}, 2^{nd}, or 3^{rd} hour of sampling)	Concentrations (CFU/ft^3 or CFU/Blank)
Room 105	XMX	H + 0	0.054, 0.054
Room 105	XMX	H + 60	ND, ND
Room 105	XMX	H + 120	ND, ND
Room 105	STA	H + 0	0.034
Room 105	STA	H + 60	ND
Room 105	STA	H + 120	ND
Room 105	XMX-Blank	N/A	ND
Room 105	STA-Blank	N/A	ND
Room 106	XMX	H + 0	ND, 0.037
Room 106	XMX	H + 60	ND, 0.018
Room 106	XMX	H + 120	0.018, ND
Room 106	STA	H + 0	ND
Room 106	STA	H + 60	ND
Room 106	STA	H + 120	ND
Room 106	XMX-Blank	N/A	ND
Room 106	STA-Blank	N/A	ND
Hallway	XMX	H + 0	0.054
Hallway	XMX	H + 60	ND
Hallway	XMX	H + 120	ND
Hallway	STA	H + 0	ND
Hallway	STA	H + 60	ND
Hallway	STA	H + 120	ND
Hallway	XMX-Blank	N/A	ND
Hallway	STA-Blank	N/A	0.028

ND = Not detected. N/A = Not applicable.

Table 3-40. Aggressive air sample results for Round 3

Location	Sample Type	Time Interval (1^{st}, 2^{nd}, or 3^{rd} hour of sampling)	Concentrations (CFU/ft^3 or CFU/Blank)
Room 105	XMX	H + 0	0.018, ND
Room 105	XMX	H + 60	ND, ND
Room 105	XMX	H + 120	ND, ND
Room 105	STA	H + 0	ND
Room 105	STA	H + 60	ND
Room 105	STA	H + 120	ND
Room 105	XMX-Blank	N/A	0.57
Room 105	STA-Blank	N/A	ND
Room 106	XMX	H + 0	ND, ND
Room 106	XMX	H + 60	ND, ND
Room 106	XMX	H + 120	ND, ND
Room 106	STA	H + 0	ND
Room 106	STA	H + 60	ND
Room 106	STA	H + 120	ND
Room 106	XMX-Blank	N/A	ND
Room 106	STA-Blank	N/A	ND
Hallway	XMX	H + 0	ND
Hallway	XMX	H + 60	ND
Hallway	XMX	H + 120	ND
Hallway	STA	H + 0	ND
Hallway	STA	H + 60	ND
Hallway	STA	H + 120	ND
Hallway	XMX-Blank	N/A	ND
Hallway	STA-Blank	N/A	ND

ND = Not Detected. N/A = Not applicable.

3.2.3.2. Reaerosolization Assessment Results

3.2.3.2.1. Indoor Air SKC BioSampler® Data

3.2.3.2.1.1. Descriptive Statistics

Descriptive statistics for the SKC BioSampler® data (CFU/ft^3) are provided by round, stage, and room in Table 3-41. These statistics were empirically-based (i.e., not based on an assumed statistical distribution fit to the data) and include the number of measurements, arithmetic and geometric means, standard deviation, minimum and maximum observed measurement, and the 50th percentile.

Of the 54 samples collected in Stage 1 (background), only three samples yielded detectable CFU measurements:

- A measurement of 10 CFU/ft^3 for a sample collected in Round 2 (pH-adjusted bleach) at Location #3 within Room 101A, at a medium height.
- A measurement of 2 CFU/ft^3 for each of two samples collected in Round 3 (ClO_2) at Location #1 within Room 101A, at heights of medium and high.

These three detectable outcomes were at very low concentrations compared to concentrations measured during spore dissemination (Stage 2). Hence, the three detectable outcomes did not impact Stage 2 results. However, the three detectable outcomes do need to be considered when drawing conclusions from Stage 5 data.

All measurements for samples taken in Stages 2, 3, and 4 were nonzero.

Of the 54 samples collected in Stage 5 (after decontamination), all Round 2 (pH-adjusted bleach) and Round 3 (ClO_2) samples yielded non-detectable results. In contrast, eight of the nine samples in each room during Stage 5 of Round 1 (VHP®) yielded detectable measurements (ranging from 2 to 8 CFU/ft^3 in Room 101A and from <1 to 3 CFU/ft^3 in Room 102). The Round 1, Stage 5 arithmetic mean *Bg* spore concentrations in air, based on the nine samples in each room, were 4 CFU/ft^3 in Room 101A and 2 CFU/ft^3 in Room 102.

While the descriptive statistics in Table 3-41 present a tabular summary of the observed airborne sample measurements, the box plots in Figure 3-22 through Figure 3-24 provide a graphical portrayal of the overall distribution of these measurements across the range of observed values and for different decontamination rounds, stages, and rooms with quartiles being displayed relative to each other. Each figure represents a specific decontamination round and contains box plots for each combination of stage and room (i.e., 5 stages x 2 rooms = 10 box plots per figure). Within a box plot, the bottom and top of the boxes represent the 25th and 75th percentiles of the observed sample measurements, respectively, with the line within the box representing the 50th percentile. The “whiskers” on either side of the box extend to the highest (or lowest) measurement that falls within 1.5 times the interquartile range of the data (i.e., within 1.5 times the difference between the 75th and 25th percentiles). Points falling outside these whiskers are noted as points on the plot; points falling far from the boxes may signify outliers. These box plots are presented on a log-axis, with the labels on the axis denoting powers of 10 (i.e., axis labels of E1 through E6 denoting values of 10 through 1,000,000). Note that sample

measurements of non-detect were represented by 1 CFU/ft^3 in constructing these plots, and most results for Rounds 1 and 5 are, therefore, represented by a single line at 1 CFU/ft^3, indicating all sample results that were ND.

The box plots show that after approximately a day and before re-entry for surface sampling, substantial settling has occurred. Levels of spores in the air have declined from >100,000 CFU/ft^3 to about 10 to 100 CFU/ft^3. Whether the residual spore density is due to continued suspension of small particles or reaerosolization of spores cannot be determined from the data. Whether sampling activities result in reaerosolization is unclear from the data. The mean spore densities in the air after sampling activities were <100 CFU/ft^3 and, in some cases, were <10 CFU/ft^3.

The descriptive statistics and box plots demonstrate that the patterns of air measurements were generally similar between the two rooms and decontamination rounds, with the expected large difference occurring between Stage 2 (spore dissemination) and the other four stages. The range of measurements in Stage 3 (before surface sampling) appears to be higher within the ClO_2 round (where the geometric means equaled 43 and 60 CFU/ft^3 in the two rooms) compared to the other two rounds (where the geometric means ranged from 3 to 13 CFU/ft^3). In addition, while the measurements tended to increase from Stage 3 (before surface sampling) to Stage 4 (pre-decontamination) during the VHP® round and to increase slightly from Stage 3 to Stage 4 during the pH-adjusted bleach rounds (Rounds 1 and 2), a general decreasing pattern from Stage 3 to Stage 4 was observed with ClO_2 (Round 3).

Table 3-41. Descriptive statistics for air concentration of *Bg* spores (CFU/ft^3), calculated by Round, Stage, and Room.

Round*	Stage†	Room	N‡	Arithmetic Mean	Standard Deviation	Minimum	Maximum	50th Percentile	Geometric Mean
1	1	101A	9 (0)	0.0E0	0.0E0	0.0E0	0.0E0	0.0E0	--
1	1	102	9 (0)	0.0E0	0.0E0	0.0E0	0.0E0	0.0E0	--
1	2	101A	9	3.2E5	3.0E5	1.2E5	8.4E5	1.8E5	2.4E5
1	2	102	9	2.1E5	1.1E5	1.1E5	4.7E5	2.0E5	2.0E5
1	3	101A	9	4.0E0	2.0E0	2.0E0	7.0E0	2.0E0	3.0E0
1	3	102	9	8.0E0	4.0E0	2.0E0	1.5E1	8.0E0	7.0E0
1	4	101A	9	2.0E1	7.0E0	5.0E0	3.0E1	2.1E1	1.8E1
1	4	102	9	3.2E1	8.0E0	2.0E1	4.6E1	3.0E1	3.1E1
1	5	101A	9 (8)	4.0E0	2.0E0	0.0E0	8.0E0	4.0E0	4.0E0
1	5	102	9 (8)	2.0E0	1.0E0	0.0E0	3.0E0	1.0E0	2.0E0
2	1	101A	9 (1)	1.0E0	3.0E0	0.0E0	1.0E1	0.0E0	1.0E1
2	1	102	9 (0)	0.0E0	0.0E0	0.0E0	0.0E0	0.0E0	--
2	2	101A	9	2.7E5	2.3E5	8.0E4	7.4E5	1.8E5	2.0E5
2	2	102	9	2.5E5	7.9E4	1.5E5	3.4E5	2.4E5	2.3E5
2	3	101A	9	1.5E1	2.1E1	4.0E0	7.2E1	9.0E0	1.0E1
2	3	102	9	2.1E1	3.0E1	6.0E0	1.0E2	1.1E1	1.3E1
2	4	101A	9	1.6E1	6.0E0	8.0E0	2.4E1	1.5E1	1.5E1
2	4	102	9	1.4E1	3.0E0	8.0E0	1.9E1	1.4E1	1.3E1
2	5	101A	9 (0)	0.0E0	0.0E0	0.0E0	0.0E0	0.0E0	--
2	5	102	9 (0)	0.0E0	0.0E0	0.0E0	0.0E0	0.0E0	--
3	1	101A	9 (2)	<1.0E0	1.0E0	0.0E0	2.0E0	0.0E0	2.0E0
3	1	102	9 (0)	0.0E0	0.0E0	0.0E0	0.0E0	0.0E0	--
3	2	101A	9	2.3E5	1.7E5	7.5E4	5.2E5	1.5E5	1.8E5
3	2	102	9	2.0E5	8.2E4	9.3E4	3.2E5	2.1E5	1.9E5
3	3	101A	9	4.4E1	1.2E1	2.9E1	6.3E1	4.0E1	4.3E1
3	3	102	9	7.2E1	6.2E1	4.3E1	2.4E2	5.3E1	6.0E1
3	4	101A	9	2.4E1	8.0E0	1.1E1	3.8E1	2.4E1	2.3E1
3	4	102	9	9.0E0	2.0E0	5.0E0	1.2E1	9.0E0	8.0E0
3	5	101A	9 (0)	0.0E0	0.0E0	0.0E0	0.0E0	0.0E0	--
3	5	102	9 (0)	0.0E0	0.0E0	0.0E0	0.0E0	0.0E0	--

* Rounds represent decontamination technology used: 1 = VHP®; 2 = pH-Adjusted bleach; 3 = ClO_2.
† Stages: 1=background; 2=spore dissemination; 3=before surface sampling; 4=pre-decontamination surface sampling; 5=post-decontamination surface sampling.
‡ Total number of samples entering into the calculations (collected from three locations per room, at three heights per location). For Stages 1 and 5, the number of samples yielding nonzero measurements is given in parentheses.

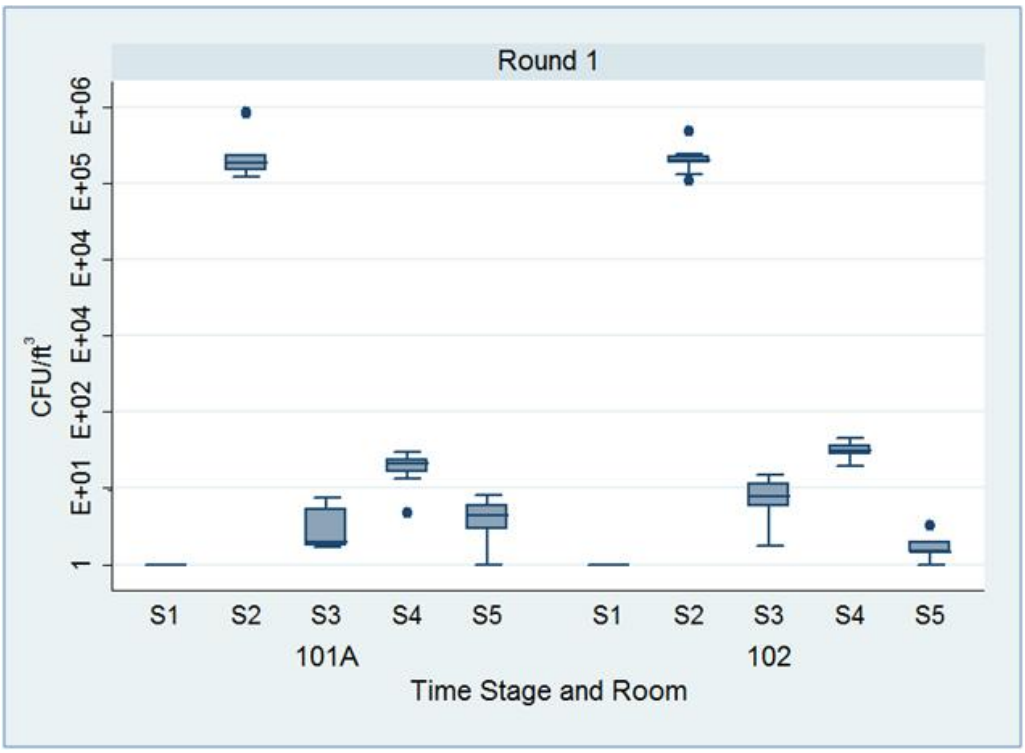

Figure 3-22. Box plots of Round 1 (VHP®) air concentration data for Bg spores (CFU/ft^3), by stage (S1 through S5) and room (101A and 102).

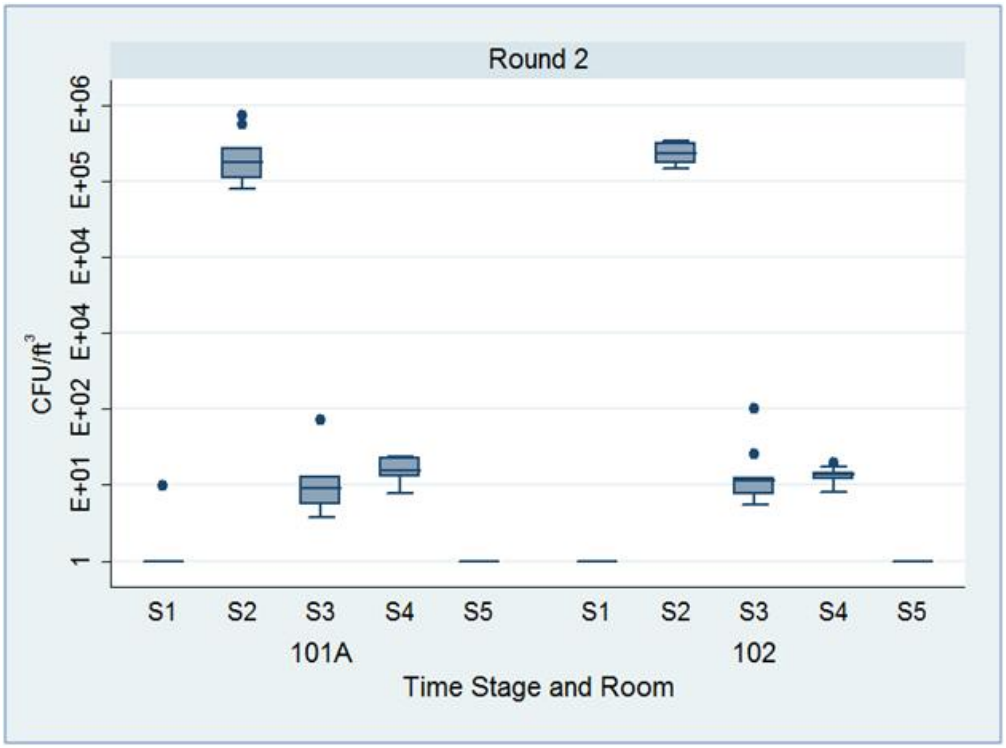

Figure 3-23. Box plots of <u>Round 2</u> (pH-Adjusted Bleach) air concentration data for *Bg* spores (CFU/ft^3), by stage (S1 through S5) and room (101A and 102).

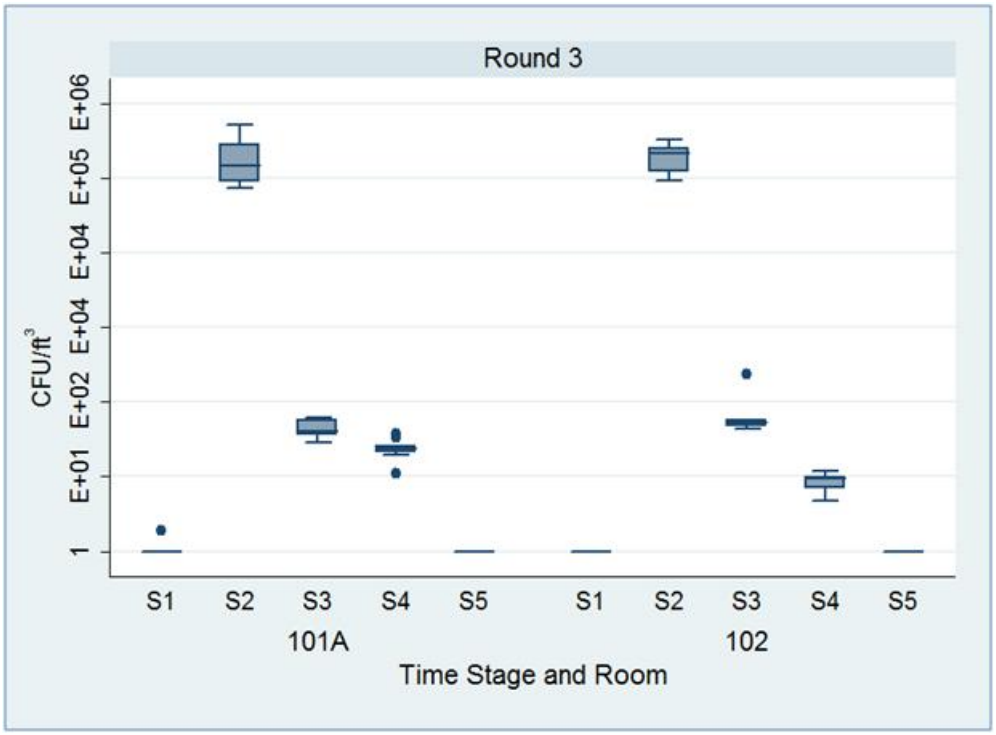

Figure 3-24. Box plots of <u>Round 3</u> (ClO_2) air concentration data for *Bg* spores (CFU/ft^3), by stage (S1 through S5) and room (101A and 102).

3.2.3.2.1.2. Statistical Analysis

The statistical analysis was conducted by performing parametric ANOVA on log-transformed CFU/ft^3 measurements, hence the reference to testing for significant differences among geometric means versus arithmetic means. (The measurements were log-transformed because the range of observed measurements covered several orders of magnitude, and the inherent assumptions necessary for the ANOVA were better satisfied after making a log transformation.) The ANOVA model included fixed effects of round, stage, room, sampling height, and all two-way interactions of these factors. The model also included a fixed effect of sampling location within a room, but this factor was nested within the room effect because the three locations differed from one room to the next. Significance of a two-way interaction implies that the presence of significant differences between levels of one factor is dependent on the other factor. When factors were statistically significant and had more than three levels, linear contrasts were established and tested to identify those pairs of levels that were significantly different. All tests were performed at the 0.05 significance level (95% confidence), while the significance levels of the tests of linear contrasts were adjusted to control the false discovery rate to within 0.05. Only air data associated with Stages 2, 3, and 4 (i.e., from dissemination to pre-decontamination) were considered in the statistical analyses, as the air data associated with Stages 1 and 5 (i.e., background and post-dissemination) were dominated by ND results.

The ANOVA was performed twice: once including data for Stages 2 through 4, and again after excluding Stage 2 data. The 54 Stage 2 measurements (samples collected during

dissemination) were several orders of magnitude higher than the measurements from Stages 3 and 4 (samples collected before surface sampling and pre-decontamination) – the smallest Stage 2 measurement was 7.5E4 CFU/ft^3, while the largest of the 108 measurements from Stages 3 and 4 was 2.4E2 CFU/ft^3 (the next largest was 1.0E2 CFU/ft^3). Because the effect of stage on the measurements was so great, it was necessary to assess the effects of the other factors both including and excluding the Stage 2 measurements.

The results of the statistical analyses follow (all references to statistical significance are at the 95% confidence level):

Effect of Stage. Differences in the geometric means among Stages 2 through 4 were highly significant ($p<0.0001$), as data from Stage 2 were from three to four orders of magnitude higher than any data from Stages 3 and 4 (Table 3-9). Regardless of whether Stage 2 measurements were included or excluded in the analysis, the interaction of stage and round was highly significant ($p<0.0001$), and the interaction of stage and room was significant at the 0.05 level, indicating that the effect of stage needed to be assessed by room and round. In both analyses, significant differences between Stages 3 and 4 were observed in the following situations:

- Within Room 101A (where the Stage 4 geometric mean was nearly 50% higher than in Stage 3).
- Within Round 1 (VHP®, where the Stage 4 geometric mean was six times higher than in Stage 3).
- Within Round 3 (ClO_2, where the Stage 3 geometric mean was nearly double that of Stage 4).

Differences in the geometric means between Stages 3 and 4 were not statistically significant for either Room 102 or Round 2 (pH-adjusted bleach).

Effect of Round. As noted above, the BOTE Project test round effect interacted significantly with the stage effect ($p<0.0001$). When measurement data for Stage 2 were included in the analysis, significant differences among rounds were not observed within Stage 2, as the intent of dissemination was to introduce an equivalent number of spores in each round. However, regardless of whether Stage 2 data were included or excluded from the analysis, significant differences were present between rounds within Stages 3 and 4.

- Within Stage 3 (before surface sampling), all three rounds differed significantly, with the geometric mean for Round 3 (ClO_2) being higher than for Round 2 (pH-adjusted bleach), which in turn was higher than for Round 1 (VHP®).
- Within Stage 4 (pre-decontamination), Round 1 (VHP®) differed significantly from Rounds 2 and 3, where the geometric mean for Round 1 (23 CFU/ft^3) was nearly two-thirds higher than the other two rounds (each having a geometric mean of 14 CFU/ft^3). While this outcome suggests that more spores may have remained in the air prior to VHP® fumigation, the geometric mean prior to treatment with VHP® was observed to be lower than the geometric mean prior to ClO_2 treatment in Room 101A. Thus, it appears unlikely that the observed differences among decontamination rounds in aerosolized

spores within Stage 4 are of practical importance. No significant difference occurred in the geometric means between Rounds 2 and 3.

In both analyses, the interaction of room and round was significant at the 95% confidence level. Similar to the bullets above, all three rounds differed significantly within Room 101A (with Round 3 having the highest geometric mean and Round 1 the smallest), while only Rounds 2 and 3 differed significantly within Room 102 (where Round 3 had a geometric mean of 22 CFU/ft^3, compared to 13 CFU/ft^3 for Round 2, when data for only Stages 3 and 4 were considered).

Effect of Room. In both analyses, the interaction of room effect and stage was significant (p=0.011 in the analysis including Stage 2 data; p=0.002 in the analysis excluding Stage 2 data). When the analysis excluded Stage 2 data, the two rooms differed significantly only in Stage 3, where the geometric means for Rooms 101A and 102 were 11 CFU/ft^3 and 17 CFU/ft^3, respectively.

In addition, within the analysis excluding Stage 2 data, the interaction of room and round was significant (p=0.0011). Here, the two rooms differed significantly only in Round 1, where the geometric means for Rooms 101A and 102 were 7 CFU/ft^3 and 14 CFU/ft^3, respectively. However, these rooms are similar in size and materials present, and the extent to which differences in spore concentrations are present among rooms can vary under different conditions. Different outcomes could possibly occur if greater disparity in the room setups were present. Further research would be required to investigate this possibility.

Effect of Location Within Room. The effect of location within room was not significant at the 95% confidence level.

Effect of Sampling Height. The statistical analysis found no significant differences among different sampling heights, regardless of the levels of other factors. The geometric means were very similar between the three heights: from 3.5E2 to 3.7E2 CFU/ft^3 when Stage 2 data were included and from 14 to 17 CFU/ft^3 when Stage 2 data were excluded. These results suggest that up to a height of 48 inches from the floor, aerosolized spores may be well mixed in rooms similar in size to those considered in this study, and, therefore, the height at which the samplers are placed within this space is not critical when characterizing aerosolized spores in such rooms.

3.2.3.2.2. Indoor Surface Sampling in Reaerosolization Study Rooms

For complete details on the materials and methods used in the collection of indoor surface data, please see Section 2.5.3.1 for Indoor Surface Sampling.

Surface samples for *Bg* spores within Rooms 101A and 102 of the BOTE Project facility were collected via wipes, vacuum socks, and sponge-stick wipes. The wipe samples were analyzed by INL, and the vacuum socks and sponge-stick wipe samples were analyzed by the LRN. Surface samples were collected during the last two stages (Stages 4 and 5, corresponding to pre- and post-decontamination) in each round. For the reaerosolization comparison, results for blank samples were excluded, as were results for any samples collected using a vertical sampling orientation. Although surface sample results (expressed in CFU) were generally

reported for both spread plate and filter plate results, most data presented in this assessment are based on the spread plate results. Surface loadings were expressed as CFU/ft^2 sampled.

This study design did not allow for an appropriate estimation of the resuspension factor (as a ratio of surface to air concentrations). There were multiple surfaces in the room and activity on all surfaces was not equivalent. No effort was made in the test design to attempt to isolate air concentrations coming from specific surfaces due to a specific activity (i.e., force). Hence, the data do not allow for a simple estimation of a resuspension factor.

3.2.3.2.2.1. Indoor Surface Sampling Data for Reaerosolization Study Rooms – Stage 4

All surface sample results from Stage 4 were based on spread plate results. As might be expected with sampling during this stage, where contamination levels remain high prior to decontamination (post-*Bg* spore dissemination), filter plating of samples was not necessary.

The analysis of Stage 4 data considered only those outcomes associated with 125 of the 128 surface samples that were collected using a horizontal upward sampling orientation. (The three excluded samples had reported results of either TNTC or ND (meaning that the spread plate count was below 30 CFU following any necessary dilutions, which, by protocol, were not quantifiable.) The surfaces sampled were characterized by the object (cabinet, desk, UV-APS [the surface of this instrument was sampled], floor, chair) and the texture of the surface (metal, plastic, smooth, carpet, cloth).

- Among the wipe samples, only three combinations of object and texture were represented, resulting in a total of 54 wipe sample measurements: ten observations per each round/stage combination for Room 101A and eight observations per each round/stage combination for Room 102.
- Of the 18 collected vacuum samples, the analysis included surface concentrations for 16 samples. These concentrations corresponded to 14 of the 15 floor carpet samples (two to three carpet samples per round/room combination) and two of the three chair cloth surface samples (one collected in Room 101A in each of the three rounds). One carpet sample result labeled as TNTC was excluded and one non-quantifiable cloth sample result from Round 2 was excluded.
- Of the 56 collected sponge samples, 55 samples reported nonzero surface concentrations that could be used in the statistical analysis. (The result for one sample taken from a desk in Room 102 in Round 3 was specified as TNTC and was therefore excluded from analysis.) Of these 55 samples, nine samples were collected in Room 101A in each round, and from nine to ten samples were collected in Room 102 in each round. These samples were collected from plastic, smooth, and metal surfaces from UV-APS, cabinets, and desks (surfaces and drawers).

To assess how surface loadings differ among surface types, the 125 pre-decontamination surface samples with results entered into the analysis were classified into six categories based on the object and surface texture:

- Cabinet, metal (41 samples, with three samples collected by each of wipe and sponge in each round within Room 101A -- with the exception of Round 3, where only two wipe samples were collected – and four samples were collected each by wipe and sponge in each round within Room 102).
- UV-APS, plastic case (18 samples collected via wipe and sponge, rather evenly divided among rooms, rounds, and sample types).
- Desk, smooth laminate surface (47 samples collected via wipe and sponge – 31 samples in Room 101A, and 16 samples collected in Room 102, nearly evenly divided among rounds and sample types).
- Desk drawer, smooth metal surface (three samples collected via sponge in Room 102, one sample per round).
- Floor, carpet (14 samples, with two or three samples collected using vacuum sampler in each room in each round).
- Chair, cloth (two samples, collected in Rounds 1 and 3 from Room 101A).

Table 3-42 presents the arithmetic mean surface and airborne spore concentration data for the pre-decontamination stage (Stage 4) for each of the 47 combinations of round, room, surface, surface type, and sample type that had at least one quantifiable (nonzero) surface sample measurement.

Within Table 3-42, the arithmetic means of the spore measurements in air are specific only to a round and room. When considering reaerosolization, airborne spores collected in a given air sample cannot be attributed directly to spores present on a particular surface within the room.

Table 3-42. Arithmetic means of surface and air concentrations of *Bg* spores collected and analyzed by dilution plate method in Stage 4 (pre-decontamination), by round, room, surface, surface type, and sample type

Round[†]	Room	Surface	Surface Type	Sample Type	N[‡]	Arithmetic Mean		Standard Deviation	
						Surface (CFU/ft^2)	Air[§] (CFU/ft^3)	Surface (CFU/ft^2)	Air[§] (CFU/ft^3)
1	101A	Cabinet	Metal	Wipe	3	6.2E5	2.0E1	1.1E5	7.0E0
1	101A	Cabinet	Metal	Sponge	3	4.3E5		3.9E4	
1	101A	Desk	Smooth	Wipe	5	6.3E5		1.0E5	
1	101A	Desk	Smooth	Sponge	5	6.2E5		2.5E5	
1	101A	UVAPS	Plastic	Wipe	2	1.2E6		1.8E5	
1	101A	UVAPS	Plastic	Sponge	1	2.6E6		--	
1	101A	Chair	Cloth	Vacuum	1	9.0E3		--	

Round[†]	Room	Surface	Surface Type	Sample Type	N[‡]	Arithmetic Mean		Standard Deviation	
						Surface (CFU/ft^2)	Air[§] (CFU/ft^3)	Surface (CFU/ft^2)	Air[§] (CFU/ft^3)
1	101A	Floor	Carpet	Vacuum	2	8.2E3		4.5E3	
1	**101A**	**All Surfaces and Sample Types**			22	6.6E5		6.6E5	
1	102	Cabinet	Metal	Wipe	4	4.1E5		4.1E4	
1	102	Cabinet	Metal	Sponge	4	4.3E5		2.1E5	
1	102	Desk	Smooth	Wipe	3	4.3E5		5.6E4	
1	102	Desk	Smooth	Sponge	3	4.7E5		3.8E4	
1	102	Desk Drawer	Smooth	Sponge	1	2.2E5	3.2E1	--	7.0E0
1	102	UVAPS	Plastic	Wipe	1	1.7E6		--	
1	102	UVAPS	Plastic	Sponge	2	2.2E6		2.7E6	
1	102	Floor	Carpet	Vacuum	3	1.1E4		2.5E3	
1	**102**	**All Surfaces and Sample Types**			21	5.9E5		5.9E5	
2	101A	Cabinet	Metal	Wipe	3	2.1E5		4.7E4	
2	101A	Cabinet	Metal	Sponge	3	2.3E5		9.2E4	
2	101A	Desk	Smooth	Wipe	5	1.5E5		5.8E4	
2	101A	Desk	Smooth	Sponge	5	1.1E5		1.4E4	
2	101A	UVAPS	Plastic	Wipe	2	7.1E4	1.6E1	3.5E4	6.0E0
2	101A	UVAPS	Plastic	Sponge	1	4.8E4		--	
2	101A	Floor	Carpet	Vacuum	2	1.6E4		9.0E3	
2	**101A**	**All Surfaces and Sample Types**			21	1.3E5		1.3E5	
2	102	Cabinet	Metal	Wipe	4	2.6E5		2.0E4	
2	102	Cabinet	Metal	Sponge	4	2.5E5		5.9E4	
2	102	Desk	Smooth	Wipe	3	2.5E5		2.1E4	
2	102	Desk	Smooth	Sponge	2	1.7E5		2.5E4	
2	102	Desk Drawer	Smooth	Sponge	1	9.8E4	1.4E1	--	4.0E0
2	102	UVAPS	Plastic	Wipe	1	8.1E4		--	
2	102	UVAPS	Plastic	Sponge	2	1.9E5		6.5E4	
2	102	Floor	Carpet	Vacuum	2	1.3E4		2.9E3	
2	102	**All Surfaces and Sample Types**			19	1.9E5		1.9E5	
3	101A	Cabinet	Metal	Wipe	2	1.7E5		3.5E4	
3	101A	Cabinet	Metal	Sponge	3	5.8E5		5.6E4	
3	101A	Desk	Smooth	Wipe	6	1.1E5		7.6E4	
3	101A	Desk	Smooth	Sponge	5	5.5E5		7.8E4	
3	101A	UVAPS	Plastic	Wipe	2	4.0E4	2.4E1	2.7E4	8.0E0
3	101A	UVAPS	Plastic	Sponge	1	1.2E5		--	
3	101A	Chair	Cloth	Vacuum	1	2.3E4		--	
3	101A	Floor	Carpet	Vacuum	2	2.2E3		1.8E1	
3	101A	**All Surfaces and Sample**			22	2.6E5		2.6E5	

Round†	Room	Surface	Surface Type	Sample Type	N‡	Arithmetic Mean		Standard Deviation	
						Surface (CFU/ft^2)	Air§ (CFU/ft^3)	Surface (CFU/ft^2)	Air§ (CFU/ft^3)
		Types							
3	102	Cabinet	Metal	Wipe	4	3.1E5	9.0E0	5.5E4	2.0E0
3	102	Cabinet	Metal	Sponge	4	2.9E5		1.0E5	
3	102	Desk	Smooth	Wipe	3	2.7E5		3.2E4	
3	102	Desk	Smooth	Sponge	2	2.6E5		1.7E5	
3	102	Desk Drawer	Smooth	Sponge	1	1.3E5		--	
3	102	UVAPS	Plastic	Wipe	1	1.6E5		--	
3	102	UVAPS	Plastic	Sponge	2	1.0E5		1.3E4	
3	102	Floor	Carpet	Vacuum	3	4.6E3		2.3E3	
3	102	**All Surfaces and Sample Types**			20	2.1E5		2.1E5	

† Round 1=VHP®, Round 2=pH-Adjusted bleach, Round 3=ClO_2.
‡ N corresponds to the number of samples with results entered into the calculation of the surface sample arithmetic mean.
§ 9 air sample results were used per each round and room to calculate the air sample arithmetic mean.
-- not applicable given only one sample.

3.2.3.2.2.2. Indoor Surface Sampling Data for Reaerosolization Study Rooms – Stage 5

All post-decontamination surface samples (Stage 5) based on the spread plate analysis were NDs (i.e., mean spread plate counts were <30 CFU and thus were considered nonquantifiable). Detectable spores were identified using the filter plate analysis for a few Stage 5 samples, although all of the samples for Round 2 (pH-adjusted bleach) were ND. One Round 3 (ClO_2) sample, which was taken from Room 101A, was positive for *Bg* based on the filter plate (3 CFU/ft^2). Sixteen Round 1 (VHP®) samples were positive for *Bg* in Stage 5 based on filter plate results. Two of the samples resulting in detectable *Bg* were from Room 101A (a sponge sample at 10 CFU/ft^2 and a wipe sample at 29 CFU/ft^2). Fourteen Round 1 samples from Room 102 were detectable for *Bg* including one vacuum sample (16 CFU/ft^2), six sponge samples (ranging from 3.0E0 to 1.9E2 CFU/ft^2), and seven wipe samples (ranging from 2.9E1 to 2.3E2 CFU/ft^2).

When considering the filter plate results, the Stage 5 arithmetic mean concentration by room and round is 0 CFU/ft^2 for each room and round, with the exception of Round 3 (ClO_2) Room 101A (<1 CFU/ft^2) and Round 1 (VHP®) Room 101A (3 CFU/ft^2) and Room 102 (57 CFU/ft^2) (see Table 3-43). While all three methods resulted in substantial reduction in the number of viable and culturable spores recovered, in this experiment only the pH-adjusted bleach treatment achieved the historic clearance requirement of "no detected spores." With <1 CFU/ft^2 detected after ClO_2 treatment, additional decontamination might be required. An important gap is the extent to which 0 CFU/ft^2 detected and <1 CFU/ft^2 detected reflect a significant difference in human health risk.

Table 3-43. Arithmetic means of surface and air concentrations of *Bg* spores collected and analyzed by filter plate method in Stage 5 (post-decontamination), by round, room, surface, surface type, and sample type*.

Round[†]	Room	Surface	Surface Type	Sample Type	N[‡]	Arithmetic Mean		Standard Deviation	
						Surface (CFU/ft^2)	Air[§] (CFU/ft^3)	Surface (CFU/ft^2)	Air[§] (CFU/ft^3)
1	101A	Cabinet	Metal	Wipe	3	1.0E1	4.0E0	1.7E1	2.0E0
1	101A	Desk	Plastic	Wipe	5	0.0E0		0.0E0	
1	101A	Desk	Smooth	Sponge	3	3.0E0		6.0E0	
1	101A	UVAPS	Plastic	Sponge	1	0.0E0		--	
1	101A	Workbench	Plastic	Wipe	2	0.0E0		0.0E0	
1	**101A**	**All Surfaces and Sample Types**			**14**	3.0E0		3.0E0	
1	102	Cabinet	Metal	Sponge	4	1.0E1	2.0E0	1.6E1	1.0E0
1	102	Cabinet	Metal	Wipe	4	7.9E1		8.9E1	
1	102	Desk	Metal	Sponge	1	6.0E0		--	
1	102	Desk	Plastic	Wipe	3	1.4E2		1.0E2	
1	102	Desk	Smooth	Sponge	3	6.6E1		1.1E2	
1	102	UVAPS	Plastic	Sponge	2	2.5E1		3.5E1	
1	102	Floor	Carpet	Vacuum	1	1.6E1		--	
1	102	Workbench	Plastic	Wipe	1	2.9E1		--	
1	**102**	**All Surfaces and Sample Types**			**19**	5.7E1		5.7E1	
2	101A	Desk	Plastic	Wipe	2	0.0E0	0.0E0	0.0E0	0.0E0
2	101A	Desk	Smooth	Sponge	5	0.0E0		0.0E0	
2	101A	Desk	Smooth	Wipe	5	0.0E0		0.0E0	
2	101A	UVAPS	Plastic	Sponge	1	0.0E0		--	
2	101A	Cabinet	Metal	Sponge	2	0.0E0		0.0E0	
2	101A	Cabinet	Smooth	Wipe	3	0.0E0		0.0E0	
2	101A	Floor	Smooth	Sponge	3	0.0E0		0.0E0	
2	**101A**	**All Surfaces and Sample Types**			**21**	0.0E0		0.0E0	
2	102	Desk	Plastic	Wipe	1	0.0E0	0.0E0	--	0.0E0
2	102	Desk	Smooth	Sponge	2	0.0E0		0.0E0	
2	102	Desk	Smooth	Wipe	3	0.0E0		0.0E0	
2	102	Cabinet	Metal	Sponge	3	0.0E0		0.0E0	
2	102	Cabinet	Smooth	Wipe	4	0.0E0		0.0E0	
2	102	Floor	Smooth	Sponge	3	0.0E0		0.0E0	
2	102	**All Surfaces and Sample Types**			**16**	0.0E0		0.0E0	
3	101A	Desk	Plastic	Wipe	3	0.0E0	0.0E0	0.0E0	0.0E0
3	101A	Desk	Smooth	Sponge	5	0.0E0		0.0E0	
3	101A	Desk	Smooth	Wipe	4	0.0E0		0.0E0	
3	101A	UVAPS	Plastic	Sponge	1	0.0E0		--	
3	101A	Cabinet	Metal	Sponge	3	1.0E0		2.0E0	
3	101A	Cabinet	Smooth	Wipe	3	0.0E0		0.0E0	
3	101A	Floor	Carpet	Vacuum	1	0.0E0		--	

Round†	Room	Surface	Surface Type	Sample Type	N‡	Arithmetic Mean		Standard Deviation	
						Surface (CFU/ft^2)	Air§ (CFU/ft^3)	Surface (CFU/ft^2)	Air§ (CFU/ft^3)
3	101A	**All Surfaces and Sample Types**			**20**	<1.0E0		<1.0E0	
3	102	Desk	Plastic	Wipe	1	0.0E0	0.0E0		0.0E0
3	102	Desk	Smooth	Sponge	4	0.0E0			
3	102	Desk	Smooth	Wipe	3	0.0E0			
3	102	UVAPS	Plastic	Sponge	2	0.0E0			
3	102	Cabinet	Metal	Sponge	4	0.0E0			
3	102	Cabinet	Smooth	Wipe	4	0.0E0			
3	102	**All Surfaces and Sample Types**			18	0.0E0			

* The samples presented in this table reflect only the samples with filter plate results; in some cases, additional samples were collected and analyzed by spread plate only. All spread plate results post-decontamination in Rooms 101A and 102 were considered non-quantifiable.
† Round 1=VHP®, Round 2=pH-Adjusted bleach, Round 3=ClO_2.
‡ N corresponds to the number of samples with results entered into the calculation of the surface sample arithmetic mean.
§ 9 air sample results were used per each round and room to calculate the air sample arithmetic mean.
-- not applicable given only one sample.

3.2.3.2.3. Particle Measurements

Along with the SKC BioSampler® measurements, the UVAPS and IBAC took continuous real-time airborne particle measurements in Rooms 101A and 102. Figure 3-25 through Figure 3-30 provides summary plots for each of the two rooms (101A and 102) for each test round (Round 1 through Round 3). UV-APS particle concentrations for individual bins between the particle sizes of 0.5 µm and 5.0 µm are provided on the plots as well as the total counts. Periods during which there are no UV-APS data are identifiable on the plots as straight lines connecting the last value collected in a sampling interval to the first value of the next interval. The IBAC data are indicated in the legend of each chart as “IBAC-” with the name of the room in which the device was located. There was no IBAC monitor in Room 102 during the three rounds. On each plot, important points in time are indicated by vertical dashed gray lines. These time periods are also listed in Table 3-44. “Building Entered” refers to the time at which sampling personnel entered the building, and “Sampling Period” refers to the times during which the sampling personnel entered the two rooms used for detailed sampling (Rooms 101A and 102). These are the periods when reaerosolization was likely to occur. These plots indicate that the total counts of the UV-APS appear to match the IBAC results fairly well and that aerosol concentration appears to be increasing over the period during which the sampling personnel were sampling in the rooms. However, these data do not indicate whether or not the particles measured with these two devices were the target spores (or other particles brought in with the samplers) and further, whether the particles are viable or not.

The release periods were also further analyzed to provide a better understanding of the particle sizes of interest. An example of a plot showing the particle size distribution prior to the release and a few time intervals leading up to the peak of the release on the April 16 test is provided in Figure 3-31. Each line of data in this plot represents a period in time prior to release and leading up to the peak concentration. This plot can help establish the difference between background and release levels for the given particle sizes. The plot indicates that particle releases include the particles in ranges from 0.723 µm up to approximately 5 µm. The dominant size was approximately 1 µm.

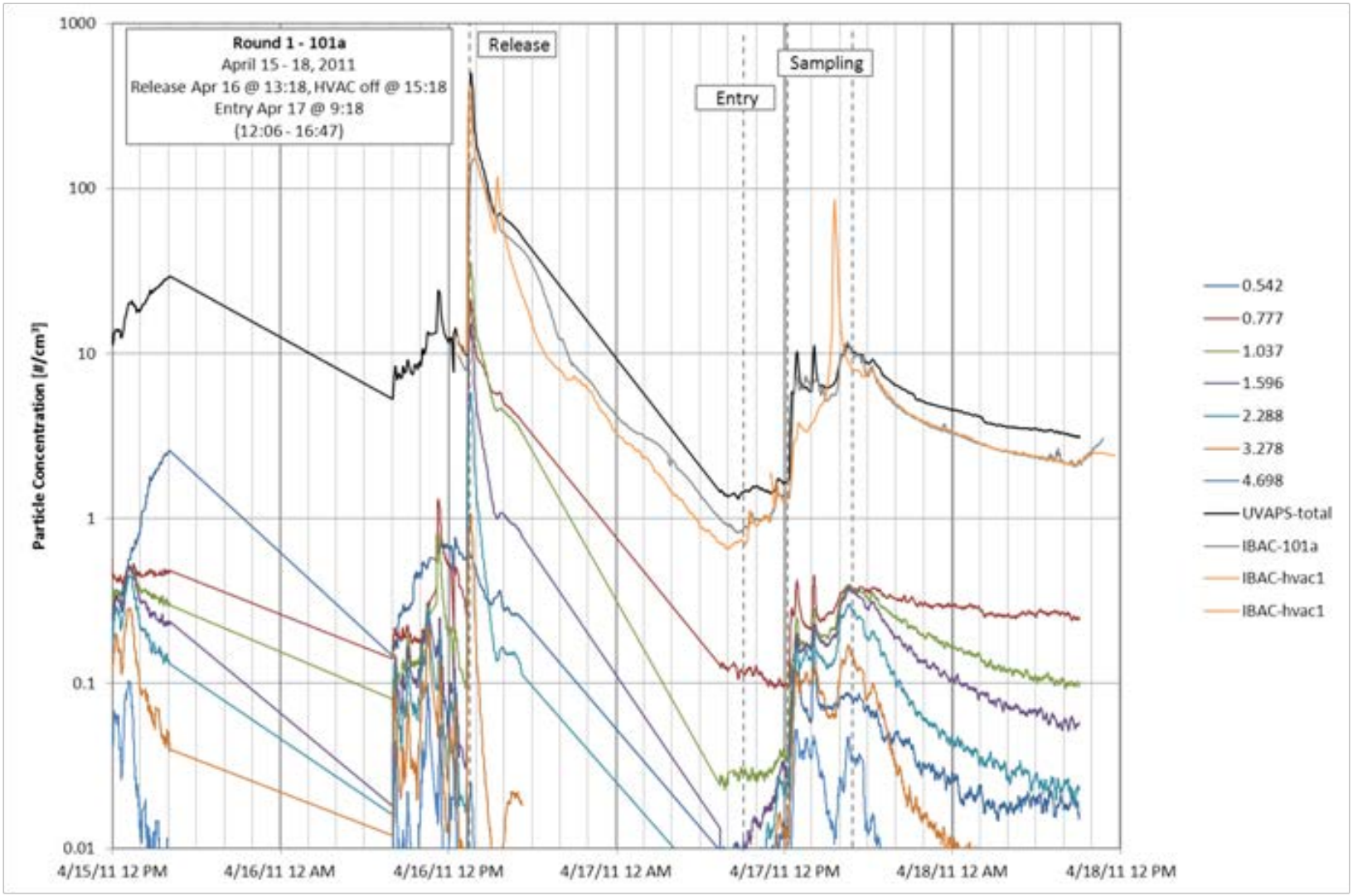

Figure 3-25. Plot of particle concentrations collected real time from the UV-APS and IBACs for Round 1, Room 101A.

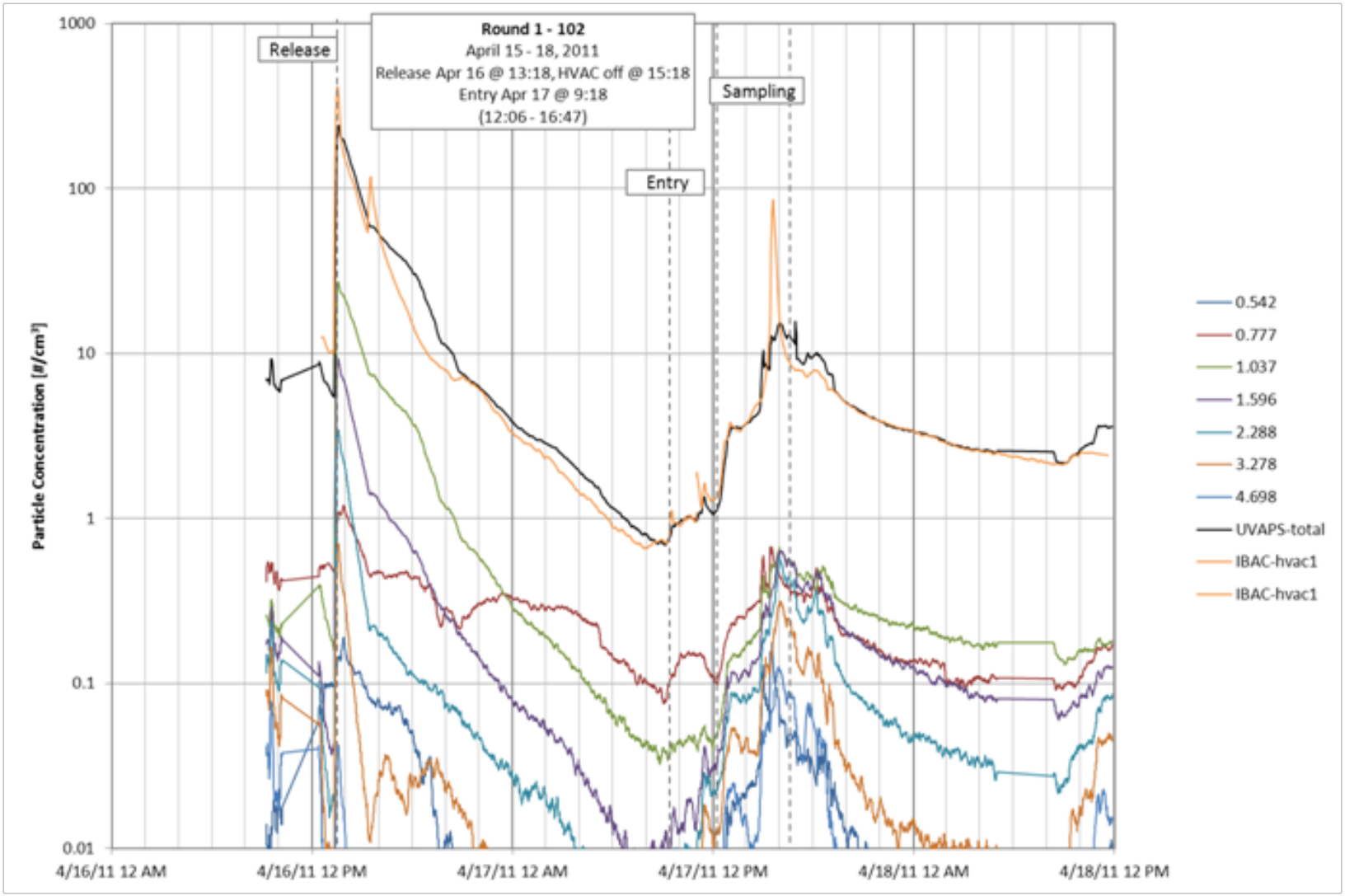

Figure 3-26. Plot of particle concentrations collected real time from the UV-APS and IBACs for Round 1, Room 102.

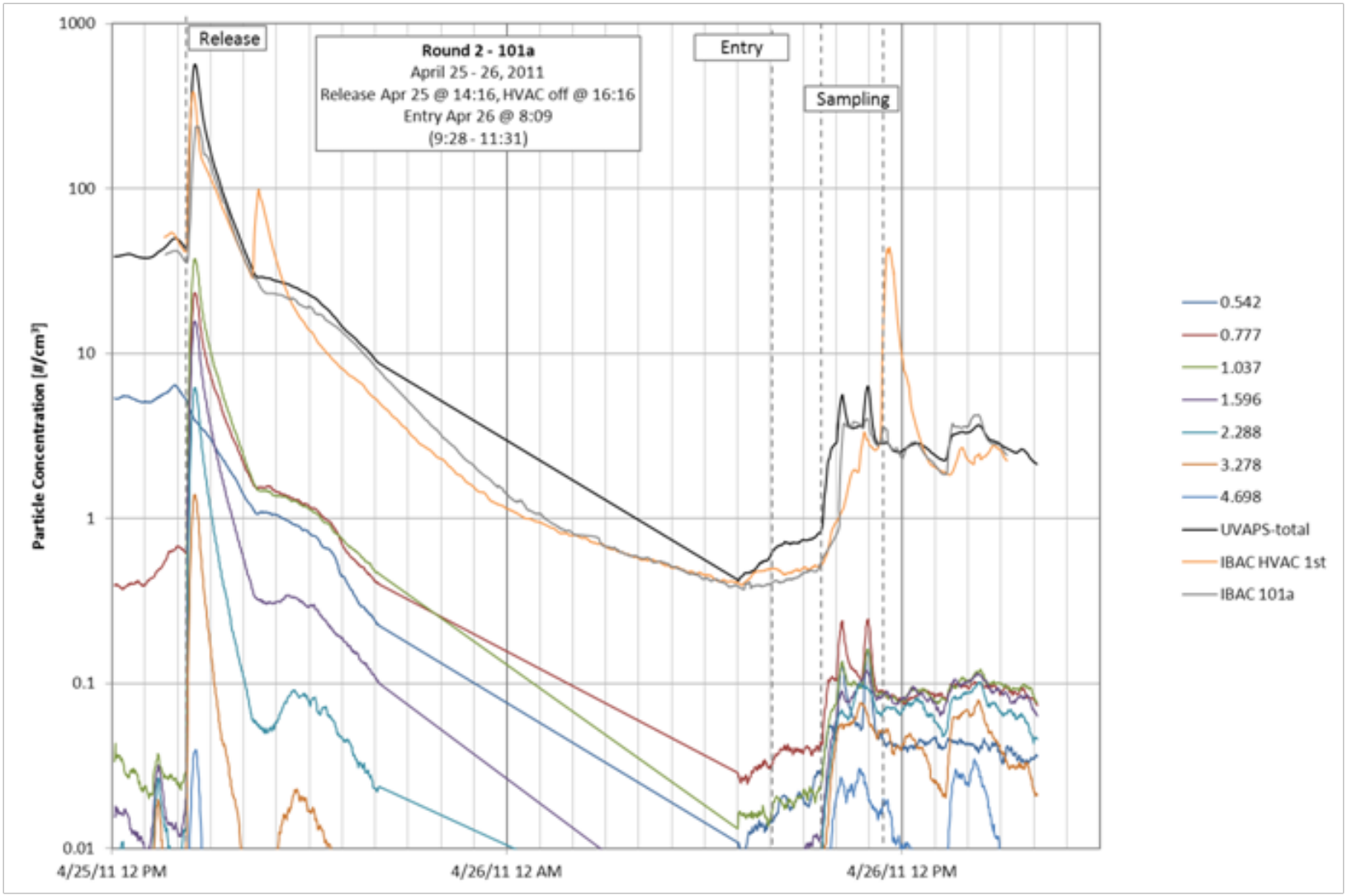

Figure 3-27. Plot of particle concentrations collected real time from the UV-APS and IBACs for Round 2, Room 101A.

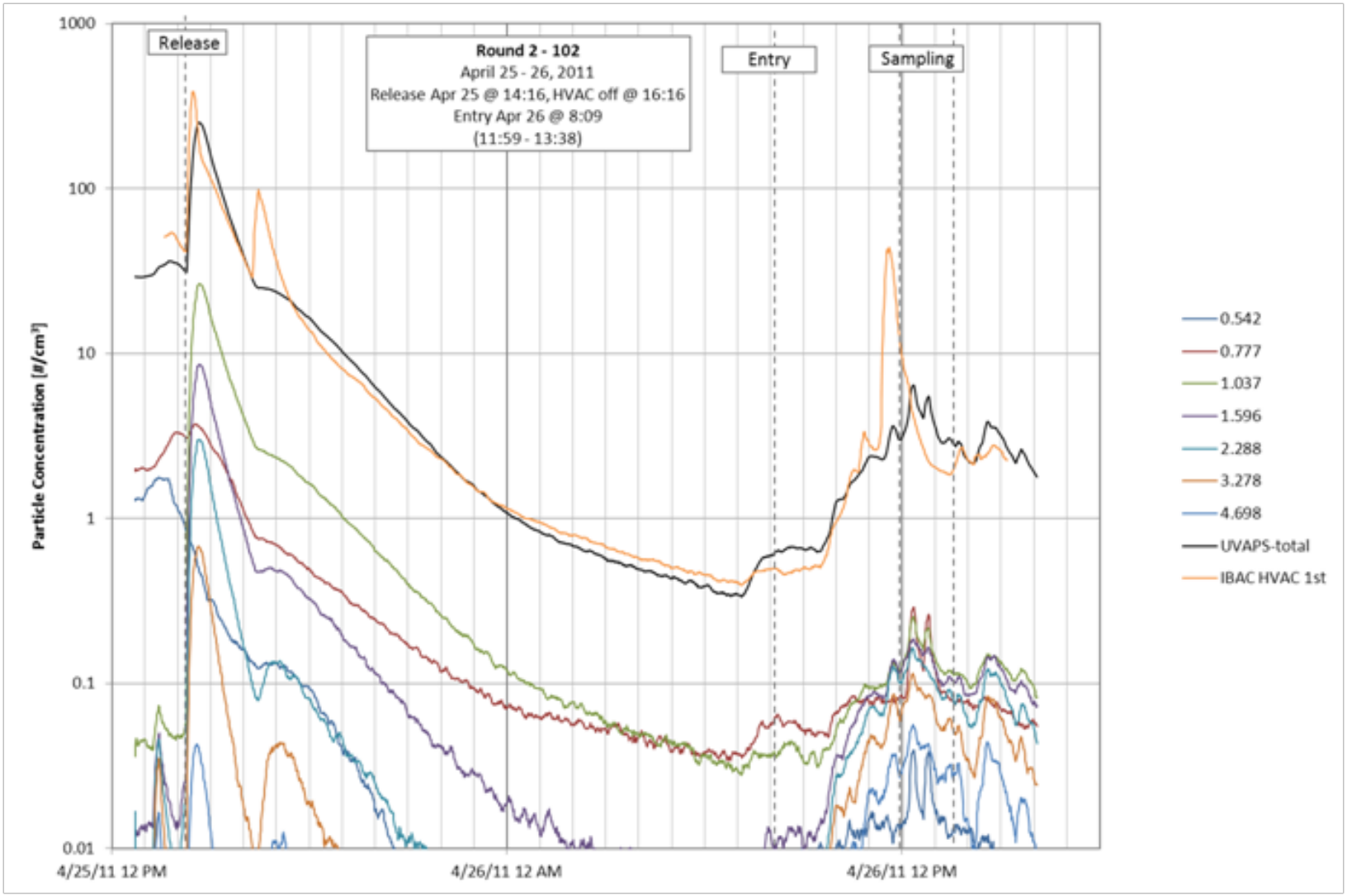

Figure 3-28. Plot of particle concentrations collected real time from the UV-APS and IBACs for Round 2, Room 102.

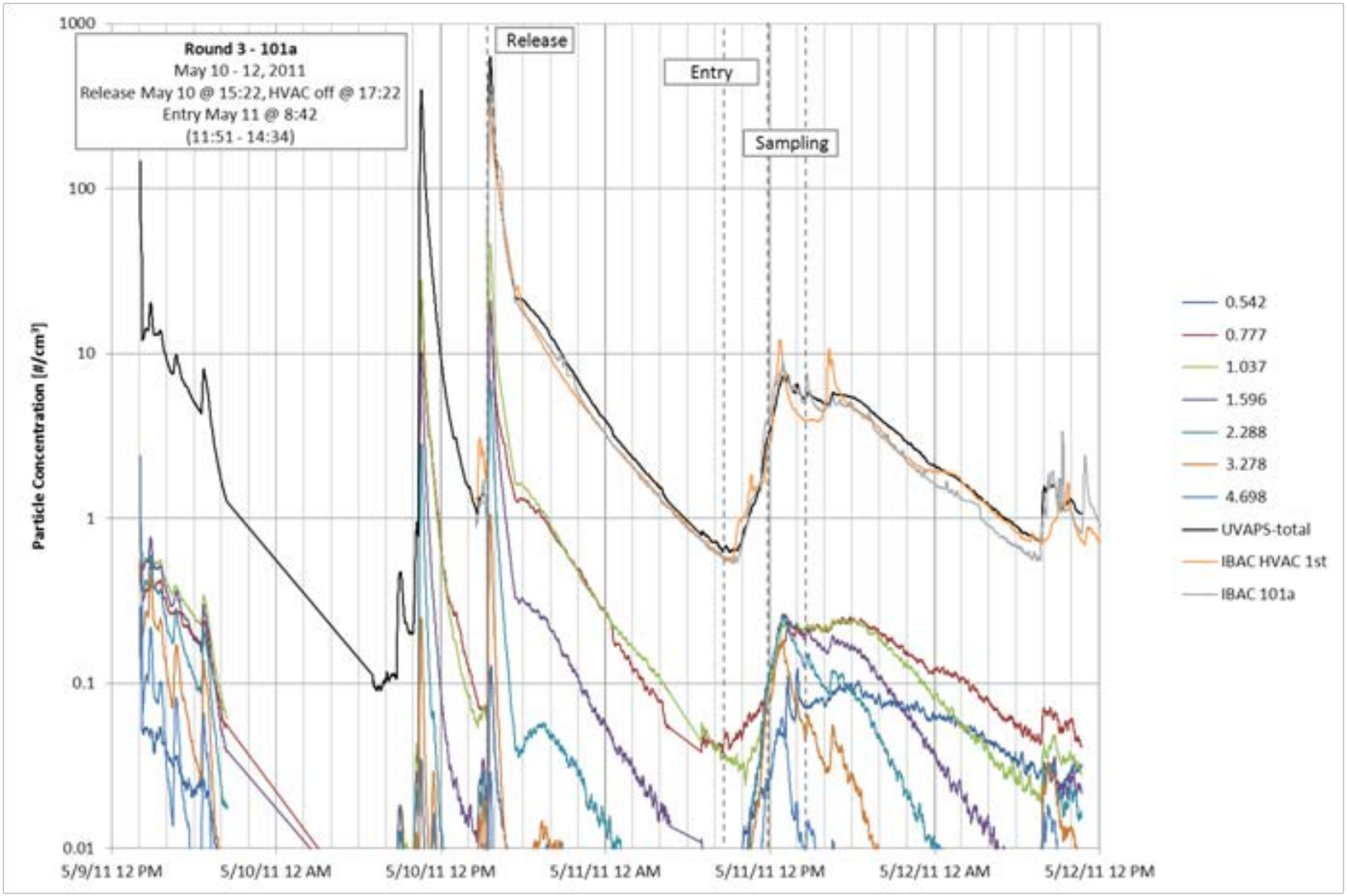

Figure 3-29. Plot of particle concentrations collected real time from the UV-APS and IBACs for Round 3, Room 101A.

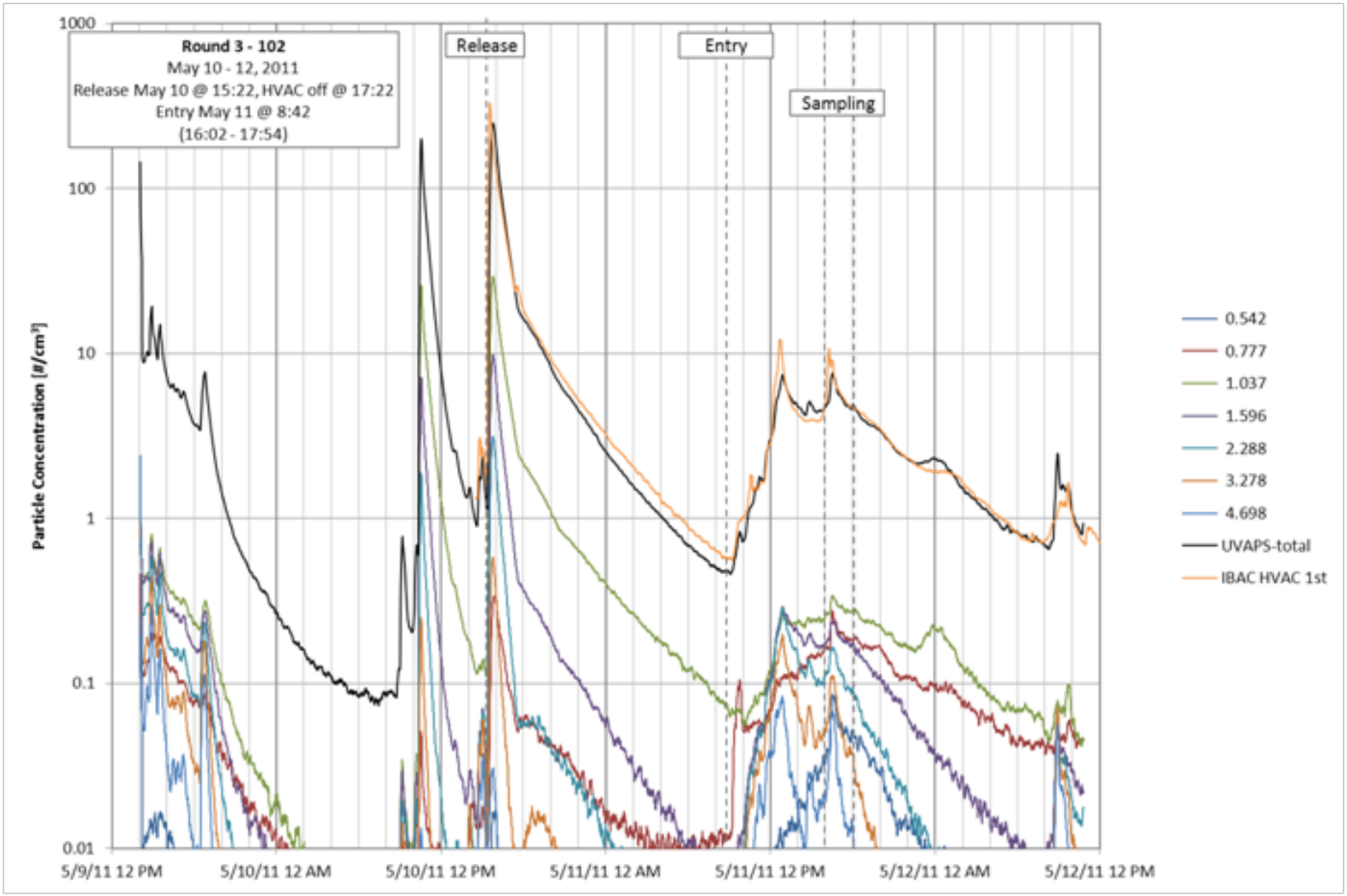

Figure 3-30. Plot of particle concentrations collected real-time from the UV-APS and IBACs for Round 3, Room 102.

Table 3-44. Summary of UV-APS event information.

Round	Date	Release Time	Release Info	Building Entered	Sampling Period
1	April 16-17, 2011	April 16, 13:18	1st floor HVAC, 200 mg 2nd floor HVAC, 0.5 mg	April 17, 09:18	12:06 – 16:47
2	April 25-26, 2011	April 25, 14:16		April 16, 08:09	101a, 09:28 –11:31 102, 11:59 – 13:38
3	May 10-12, 2011	May 10, 15:22		May 11, 08:42	101a, 11:51 – 14:34 102, 16:02 – 17:54

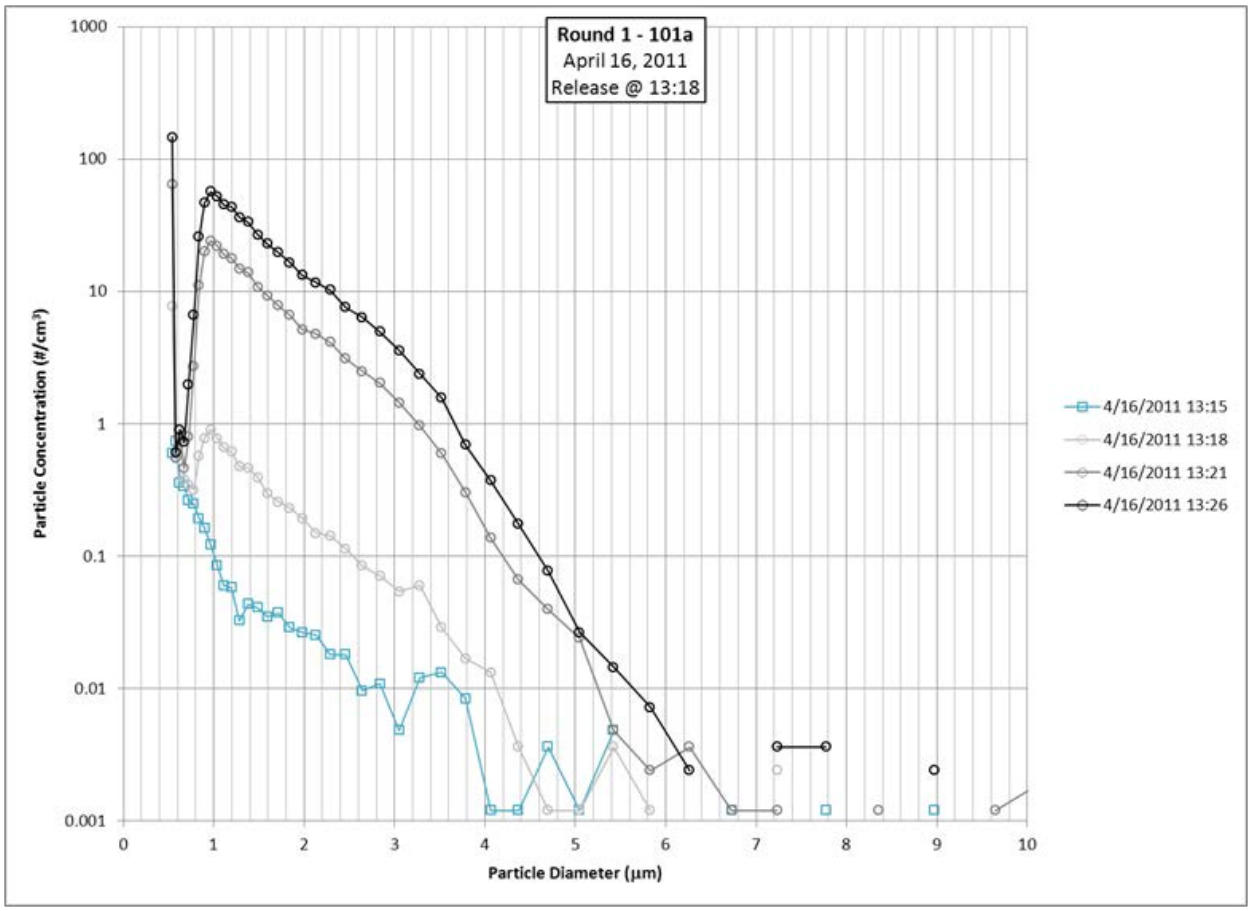

Figure 3-31. UV-APS release distribution.

3.2.4. *Bacillus* Spore Migration from Inside the Building to Outside Results

Laboratory and statistical analysis results on the transport of nonpathogenic spores initially disseminated inside the BOTE Project test facility to the outer perimeter of the building are summarized in the sections below.

3.2.4.1. Limits of Detection

Instrument LOD and the LOD within the matrix were assessed by both the EPA and USGS laboratories conducting the analyses. Instrument LODs were determined based upon analysis of an aqueous solution of pure *Bg* genomic DNA, while the matrix LODs were determined by

analyzing sterile sand samples spiked with known concentrations of *Bg* spores followed by sample extraction, purification, and qPCR detection. The matrix LOD may also be considered the matrix effect or environmental LOD[82].

3.2.4.1.1. EPA Instrument Limit of Detection

The EPA instrument standard curve for this analysis was determined after the sand sample analyses. The standard curve was therefore used retroactively to determine the LOD based on the acquired cycle threshold values. While the LOD curve was not established until after the study, controls analyzed throughout the laboratory work were consistent, indicating that the instrument was stable. The standard curve was obtained by analyzing a concentrated stock solution of *Bg* DNA that was diluted eightfold. The DNA concentrations measured in GEq (the mass of the *Bg* genome within a spore) ranged from 1.0E5 to 1.0E-2 GEq. Triplicate qPCR analyses of each dilution ran for 45 cycles. Detectable results were attained down to the 1.02 GEq/reaction at an average cycle threshold time of 38.29 (standard deviation (SD) = 0.08; n=3). Lower than ~1 GEq, the instrument registered as "undetected". The instrument lower limit of detection was therefore determined to be a cycle threshold value of 38.3, or 1.02 GEq/reaction. For the BOTE Project analyses, all averaged cycle threshold values greater than 38.3 were considered NDs based on the instrument LOD. The standard curve for this analysis fit an exponential trend line with good accuracy (see Table 3-45). The standard curve in Figure 3-32 demonstrates the effect on the EPA qPCR analytical procedure under ideal laboratory conditions. A separate analysis was conducted to determine the matrix LOD for the entire analysis process from extraction through qPCR detection (see Section 3.2.4.1.2).

Table 3-45. Average results from EPA instrument LOD.

GEq/ PCD Reaction	Cycle Threshold[1]
10,176	23.43 (0.07)
1,018	26.83 (0.13)
101.8	30.44 (0.16)
10.18	33.89 (0.43)
1.02	38.29 (0.08)
0.1	ND
0.01	ND

[1]n=3 for these analyses with SDs given within the brackets.

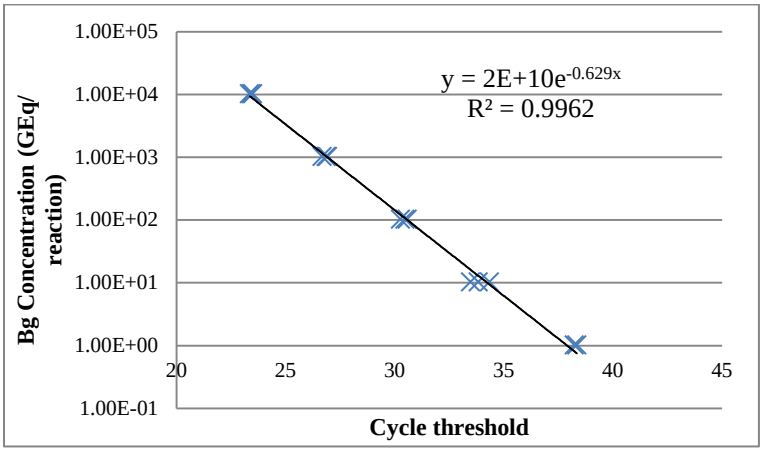

Figure 3-32. EPA instrument LOD including standard curve and exponential fit trend line.

3.2.4.1.2. EPA Environmental Limit of Detection

The overall recovery for the EPA sand extraction and analysis method was determined with matrix spikes: 45 g aliquots of sterile sand spiked with liquid suspensions of known concentration of *Bg* spores. Blind sand samples were spiked in triplicate with *Bg* spore concentrations ranging from 1E0 to 1E6 spores per gram of sand. DNA from the spores collected from each of the 45 g aliquots of spiked sand was extracted by utilizing the same procedure as used for the actual BOTE samples. The concentration of spiked spores present within each of the sand samples was revealed to the analyst only after qPCR results had been acquired. The study determined that a minimum of 1E4 spores/g sand is required for the average cycle threshold value to be above the instrument LOD (Table 3-46). The standard curve attained from the entire method fit an exponential fit regression (Figure 3-33).

Table 3-46. Average results from EPA spiked sand samples.

[Final Spike] Spores/ g Sand	Cycle threshold time[1]
1.7E6	30.1 (0.26)
1.8E5	33.8 (0.76
1.9E4	36.2 (0.86)
1.8E3	ND
1.9E2	ND
1.8E1	ND
1.7E0	ND
0.0E0	ND

[1] n = 9 for these analyses with SDs given within the brackets.

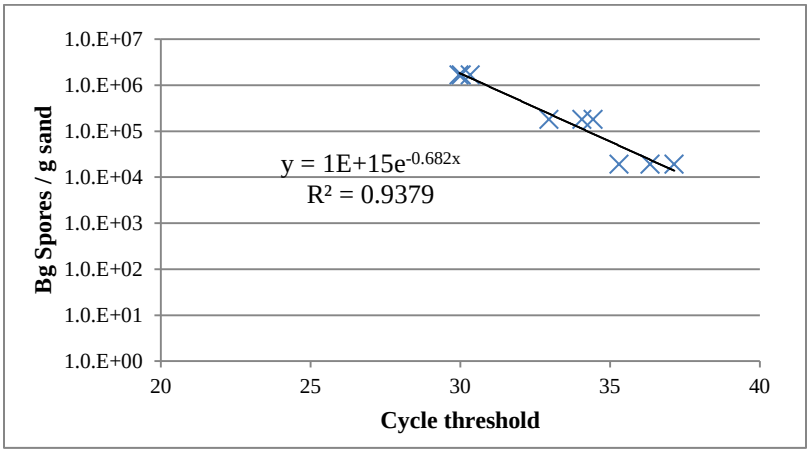

Figure 3-33. EPA LOD in sterile sand including standard curve and exponential fit trend line.

3.2.4.1.3. USGS Instrument Limit of Detection

The instrument LOD was determined by USGS using a fivefold dilution of a solution of purified *Bg* DNA prior to the start of the BOTE exercise. The DNA concentrations (measured in GEq, the mass of the *Bg* genome within a spore) ranged from 1.5E1 to 1.5E5 GEq. All standards were analyzed in duplicate with three negative controls consisting of PCR-grade water. Detectable results were attained down to the 15 GEq dilutions at an average cycle threshold time of 32.88 (SD = 0.64). Lower than ~15 GEq, the instrument registered “undetected”. Therefore, the lower limit of detection was determined to be a cycle threshold time value of 32.9 (see Table 3-49). All

Ct values greater than 32.9 were considered NDs based on the instrument LOD. The standard curve fit an exponential trend line with good accuracy (Figure 3-34).

The standard curve in Figure 3-34 demonstrates the LOD for the USGS qPCR analytical procedures under ideal conditions. A separate analysis was conducted to determine the LOD for the entire analysis process from extraction through qPCR detection (see Section 3.2.4.1.4).

Table 3-47. Average results from USGS instrument LOD.

GEq/ PCD Reaction	Cycle Threshold[1]
$1.5x10^5$	19.23 (0.14)
$1.5x10^4$	22.20 (0.08)
$1.5x10^3$	25.61 (0.04)
$1.5x10^2$	29.99 (0.01)
$1.5x10^1$	32.89 (0.64)
$1.5x10^0$	Not Conducted
$0.0x10^0$	ND

[1]n=2 for these analyses with SDs given within the brackets.

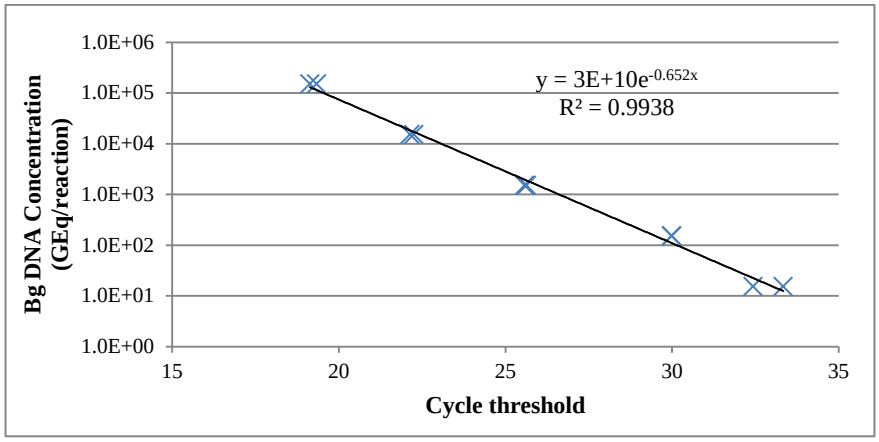

Figure 3-34. USGS instrument LOD standard curve.

3.2.4.1.4. USGS Environmental Limit of Detection

Similar to EPA, USGS analyzed sand samples (the samples were analyzed blind) spiked with liquid suspensions of *Bg* spores ranging from 1E0 to 1E6 spores/g sand. In total, 17 seeded/unseeded building sand samples (samples marked 1 through 16 and sterile sand) were

sent to USGS, and these samples were analyzed for the presence of *Bg* using direct DNA extraction and qPCR.

The MO BIO protocol (see Appendix F) using 2 µL of eluent as template was able to detect *Bg* DNA only at the highest seed concentration (see Table 3-51). This analysis was run concurrently with the BOTE Project samples. There was therefore no knowledge that the sand matrix would have such a detrimental effect on the outcome of the study. Following these tests, the USGS laboratory extracted a spiked sand sample under four other conditions. Even with only a few replicates, it was apparent that the extraction method utilized impacts the final qPCR outcome.

Table 3-48. Results from USGS spiked sand samples expressed as average genomic equivalents in the 100 µL of eluent from the MO BIO PowerSoil® Kit.

Bg Spores/ g sand	GEq/ 100 µL eluent (n=4)
1.8 E6	20
1.6 E5	ND
1.7 E4	ND
1.6 E3	ND
2.0 E2	ND
1.7 E1	ND
1.7 E0	ND
0.0 E0	ND

3.2.4.2. Sand Analysis Results for Spore Migration Study

The EPA and USGS data are better suited as qualitative rather than quantitative data due to the limited standard curve data obtained from each laboratory. The EPA standard curve was determined after the BOTE Project sand sample analyses and retroactively fit to all acquired data. USGS ran concurrent standards within each qPCR run; however, the narrow range of the standard curve limited its utility. Because the standard curve data from both organizations were somewhat uncertain for the stated reason, *Bg* results detected for the samples were treated qualitatively and were assigned a relative degree of positive detection (a qualitative assessment). Results for only those samples collected from the ten locations within the secondary enclosure and outside the building were included in the data analysis. In addition, results for the samples collected within the building are also presented, but were not included within the overall statistical analysis.

3.2.4.2.1. EPA Data Transformation

The raw cycle threshold values for each triplicate reaction were exported to a file from the EPA instrument. Samples that yielded two or more “undetected” values were considered ND by the

instrument. The remaining averaged results for each sample were codified as degrees of positive (0-5) using the designations listed in Table 3-49.

The analysis code was based upon the instrument LOD (cycle threshold of 38.3) as the lower bound and the calculated GEq/reaction for the cutoff points; see Table 3-50 for all EPA coded data results.

Table 3-49. EPA laboratory analysis code descriptions for the BOTE sand samples based on mean cycle threshold value.

Mean Cycle Threshold Value	Description	Code	GEq/PCR Reaction
Undetected	Not detected by the instrument	ND	ND
≥38.3 to < 45.0	Below the level of detection	0	<1
≥36 to <38.3	Very weak positive	1+	1-3
≥34 to <36	Weak positive	2+	3-10
≥32 to <34	Positive	3+	10-40
≥30 to <32	Strong positive	4+	40-150
<30	Very strong positive	5+	>150

Table 3-50. All EPA coded data: Round, Stage, Location, and Replicates.

	Round 1						Round 2						Round 3					
	Pre-Dissem*		Post-Dissem		Post-Decon**		Pre-Dissem		Post-Dissem		Post-Decon		Pre-Dissem		Post-Dissem		Post-Decon	
Location	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
1	4	2	4	2	2	1	4	ND	2	1	ND	1	ND	ND	1	1	1	2
2	2	1	2	1	3	2	ND	ND	1	2	ND	ND	0	ND	1	1	ND	ND
3	2	3	2	3	2	3	ND	ND	ND	ND	ND	ND	ND	ND	1	1	ND	ND
4	ND	5	ND	1	ND	ND	1	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	1	2	1	2	2	2	2	ND	1	1	ND	1	ND	ND	ND	1	ND	ND
6	3	ND	2	2	3	2	ND	ND	ND	1	ND	ND	ND	1	ND	ND	1	ND
7	3	3	1	2	ND	2	2	ND	1	1	ND	ND	1	ND	1	ND	ND	ND
8	4	2	1	1	1	1	1	ND	1	1	ND	ND	ND	ND	ND	1	ND	1
9	1	ND	ND	1	1	2	ND	ND	2	2	ND	ND	ND	ND	ND	1	1	1
10	ND	ND	ND	0	4	3	2	1	1	ND	ND	ND	ND	ND	ND	ND	ND	1
B1			4	5	3	4			3	4	ND	ND			3	3	1	ND
B2			4	2	1	1			1	1	ND	ND			1	ND	ND	ND
Site Blank	2								ND		ND		ND				ND	
Trip Blank	2								ND				ND		ND		ND	

*Dissemination. **Decontamination.

3.2.4.2.2. USGS Data

Standard curve analyses were conducted by USGS during each PCR run. The instrument LOD was determined to be a cycle threshold value of 32.9 based upon the averaged results for a DNA concentration of 32.48 GEq. However, a similar code was not developed for the USGS data due to a lack of data points generated by the PCR instrument itself.

No detectable cycle threshold values were obtained by the USGS for any of the collected BOTE Project sand samples. Even the samples collected from within the building from the first floor with the highest dissemination concentration were below the LOD through the USGS analysis. USGS extracted 216 sand samples collected during the BOTE Project exercise. A total of 432 qPCR reactions were processed from those extracts. Of those reactions, only 15 yielded results from the thermocycler, yet none of the averaged cycle threshold values were found to exceed the instrument LOD (cycle threshold 32.9). The cycle threshold values obtained from the USGS results are listed in Table 3-51. Only the PCR positive controls (Table 2-19) gave consistent results.

Table 3-51. USGS cycle threshold values obtained from the instrument.

Sample Description Round/ Stage/ Sample Location - Replicate	Reaction 1	Reaction 2
Round 1 / Post-Dissemination / B1-B	ND	40.77
Round 1 / Post-Dissemination / 5-A	ND	40.86
Round 1 / Post-Dissemination / 6-A	41.35	ND
Round 1 / Post-Decontamination / B1-B	41.84	ND
Round 1 / Post-Decontamination / 5-B	ND	40.53
Round 2 / Post-Dissemination / B1-A	40.47	ND
Round 2 / Post-Dissemination / B1-B	41.88	40.36
Round 2 / Post-Dissemination / 4-A	ND	38.45
Round 2 / Post-Dissemination / 5-B	38.89	ND
Round 2 / Post-Dissemination / 6-A	ND	39.95
Round 2 / Post-Dissemination / 7-B	ND	43.24
Round 3 / Pre-Dissemination / 2-B	ND	38.66
Round 3 / Post-Dissemination / B1-A	37.59	ND
Round 3 / Post-Dissemination / B2-B	38.48	ND
Round 3 / Post-Decontamination / B2-B	ND	37.99

3.2.4.2.3. Collected Blank Samples

Site blank and trip blank QA samples were collected during each round of the BOTE Project. The purpose of the site blanks was to determine the potential for background contamination of sampling media at the site. The site blank sample containers were opened on site and then immediately closed and re-bagged for shipment to the laboratory for analysis. The purpose of the trip blanks was to determine the potential for sample contamination over the course of an entire sampling round. Trip blanks were shipped out to the site with the sampling media, held in sample kit boxes during sample collection (but never opened) and then shipped with the samples to the laboratory for analysis. All site and trip negative controls were reported as ND with the exception of two collected during Round 1 for which corrective action was taken.

During the placement and collection process for Round 1, sampling personnel noted that the sample dishes were not individually bagged. Additionally, notes were made regarding breakage of sampling dishes following collection during shipment to the laboratory. These notes by the sampling personnel and the detected signal from the blank samples were the basis for considering all Round 1 samples as contaminated through sampler handling. Therefore, all Round 1 sample results were eliminated from the data analysis conducted for this report. Sample dishes for all other rounds were individually bagged to prevent contamination and all other trip and site blanks collected during the project were ND.

In addition to the blank samples collected on site, positive (seeded) and negative (blank) control samples were analyzed within each of the 16 EPA qPCR runs to ensure QC. Criteria for acceptance of negative qPCR controls were that all replicate samples be ND. Two types of negative controls were utilized in this study: NTC and *Escherichia coli* DNA. Likewise, two types of positive controls were used: BOTE *Bg* DNA and an additional strain of *Bg* DNA previously stored at the EPA laboratory. Acceptance of analytical results for positive controls required the observed cycle threshold time to be within 5% of the prior determined cycle threshold value. As shown in Table 3-52, all qPCR quality assurance (QA) results met the acceptance criteria.

Table 3-52. Summary of the BOTE Project EPA qPCR QA results

Control	EPA Mean Cycle threshold time (SD)	EPA Code	No. Positive/ No. Analyzed*
NTC	Undetected (0.00)	ND	0 / 51
E. coli DNA	Undetected (0.00)	ND	0 / 51
Bg BOTE DNA	27.6 (0.37)	5+	57 / 57
Bg EPA DNA	28.1 (0.18)	5+	51 / 51

*Number of Positive PCR Reactions per number analyzed, for sixteen individual 96 well PCR runs.

3.2.4.2.4. Results for Inside the Secondary Enclosure, External to the Building

The codified results for all 120 samples analyzed by the EPA (i.e., across samples “A” and “B” taken at each of ten locations, three collection stages, and two decontamination treatment rounds) are summarized in Table 3-53. In total, 63% (76/120) of the samples were classified as

ND by the instrument. The lowest cycle threshold value found in the EPA analysis was a cycle threshold value of 30.4, which indicates that no sample was classified as strong or very strong detection. In addition, 70% of the collocated samples ("A" and "B") yielded consistent results.

Table 3-53. Codified EPA results within the secondary enclosure (and outside the building.

Code	All Samples	"A" samples	"B" samples	"A" and "B" samples
	n=3	n=3	n=3	n=6
ND	76	38	38	29
0	1	1	0	1
1+	33	15	18	23
2+	8	5	3	6
3+	1	0	1	0
4+	1	1	0	1
5+	0	0	0	0
Total	**120**	**60**	**60**	**60**

3.2.4.2.5. Results for Samples from Inside the Building and Associated Inhibition Testing

Sample containers were placed inside the building before spore dissemination and collected after *Bg* dissemination and after building decontamination for each round of the BOTE Project. These samples were analyzed to assess whether analytical interference occurred due to the decontamination agents used. However, none of the sand samples were targeted for decontamination. Any decontaminant they received was due to overspray or general presence, not because the sample trays were specifically targeted for decontamination. One sample location was on the first floor, and another location was on the second floor. The analytical results for each sample collected inside the building on the two floors are detailed in

Table 3-54. Spores were detected by the EPA analysis in all but one of the samples collected post-dissemination, and all but one of the post-decontamination samples were classified as ND.

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Table 3-54. Number of sand samples collected within the building (first and second floors) according to their codified EPA results.

	1st Floor		2nd Floor	
Code	**Post-Dissemination**	**Post-Decontamination**	**Post-Dissemination**	**Post-Decontamination**
ND	0	3	1	4
0	0	0	0	0
1+	0	1	3	0
2+	0	0	0	0
3+	3	0	0	0
4+	1	0	0	0
Total	**4**	**4**	**4**	**4**

Note: Results represent samples "A" and "B" collected during Rounds 2 and 3.

Inhibition tests were conducted with the samples collected within the building to determine if residual decontamination chemical used during the BOTE Project interfered with the PCR reactions, as discussed in Section 2.9.4.5. Eight "building during BOTE" sample extracts, one sand sample from each floor (1 and 2) and each decontamination treatment round (VHP®, pH-adjusted bleach, and ClO_2 fumigation) collected post-decontamination were selected for inhibition testing. In addition, one sand extract collected post-dissemination for Round 2 (pH-adjusted bleach process) and Round 3 (ClO_2 fumigation) was assessed. Triplicate reactions using extracted template DNA from the original selected sand samples were run alongside triplicate reactions of the sample extract spiked with 10 GEq of the standard *Bg* DNA (Table 3-55). The addition of *Bg* DNA allowed for a low but reliable concentration of target DNA to be present within each spiked reaction tube; the target DNA averaged at a Ct of 33.9 (SD = 0.43) or a 3+ coded response.

Based on these analyses, none of the three decontamination agents apparently caused qPCR inhibition in the sand samples assessed during this study. In each qPCR reaction, the resulting cycle threshold value decreased when compared to the sample extracts alone, or a previously ND sample became detectable to the expected spiked concentration. While this simplistic analysis shows that the qPCR analysis was not inhibited in these samples, this analysis cannot be used to determine if the reagents may have affected the study results due to DNA degradation or other effects.

Table 3-55. Summary of qPCR decontamination agent inhibition tests of selected indoor sand samples.

BOTE Sample	Mean Cycle Threshold Time of Sample (SD)	Sample Code	Mean Cycle Threshold Time with Inhibition Spike (SD)	Spike Code
Round 1/decontamination/B1b	31.7 (0.08)	4+	31.4 (0.13)	4+
Round 1/decontamination/B2a	38.5 (2.94)	0	33.3 (0.25)	3+
Round 2/dissemination/B1a	33.0 (0.16)	3+	32.3 (0.18)	3+
Round 2/decontamination/B1a	Undetected (0.00)	ND	33.8 (0.12)	3+
Round 2/decontamination/B2a	Undetected (0.00)	ND	34.0 (0.18)	3+
Round 3/dissemination/B1a	33.0 (0.22)	3+	32.0 (0.49)	4+
Round 3/decontamination/B1b	39.9 (4.60)	0	33.8 (0.51)	2+
Round 3/decontamination/B2a	Undetected (0.00)	ND	34.0 (0.13)	3+

3.2.4.2.6. USGS Inhibition Testing

To date, no inhibition studies have been conducted by USGS.

3.2.4.2.7. EPA Sample Deviation

The EPA analytical results indicated the presence of low concentrations of *Bg* DNA in the collected sand samples, many of which were near the instrument LOD. The SDs between sample replicates ranged from a maximum of 2.18 to a minimum of 1.76 for the study as a whole (Table 3-56).

Table 3-56. EPA mean, maxima, and minima for all collected sand samples

	Cycle Threshold Time	SD	Code
Round 2			
Mean	36.2	2.18	1+
Maximum	41.3		0
Minimum	30.4		4+
Round 3			
Mean	37.0	1.76	1+
Maximum	43.3		0
Minimum	32.8		3+
Combined Averages			
Mean	36.5	2.03	1+
Maximum	43.3		0
Minimum	30.4		4+

3.2.4.2.8. USGS Sample Deviation

Due to the limited data set, no intra-sample deviations for the USGS data could be tabulated.

3.2.4.3. Statistical Analysis of Sand Sample Results

For the codified data associated with samples collected within the secondary enclosure (and outside the building), categorical data analyses were conducted to assess differences in the distribution of sand sample classifications (detected/ND) that occurred between the analytical laboratories (EPA, USGS), the study decontamination round, the stage of each round, and the sample location. The strength of the data was limited due to a lack of standard curves concurrently used within the EPA analyses and the overall lack of data from the USGS analyses. Therefore, the resulting EPA and USGS data are best suited as qualitative rather than quantitative data. The statistical analysis considered only data for the second and third treatment rounds, due to concern about sample contamination that may have occurred in the first treatment round.

3.2.4.3.1. Statistical Comparison of EPA vs. USGS Methods

Assessing the presence of statistically significant discordance between the EPA and USGS approaches was affected by the lack of detectable outcomes by the USGS analysis. using Fisher's Exact test[83], binomial tests were performed to assess the extent to which the classifications made by EPA and USGS analysis for a given sample were independent of each other (i.e., no statistical relationship is apparent in the outcome of a given sample). Because all USGS results were ND, this analysis took the form of a test of whether the percentage of ND outcomes within the EPA analysis (i.e., outcomes classified as "ND" or "0") differed significantly from 50%, or, stated otherwise, was there a significant deviation from a 50:50 split between the EPA samples being detected or non-detected? The following conclusions can be drawn from

the binomial analysis performed on the classification outcomes for all 120 samples from Round 2 and Round 3:

- The percentage of ND outcomes from the EPA analysis was 60% in Round 2, not significantly different from 50% at the 95% confidence level (p=0.155), and 68% in Round 3 which was significantly different from 50% at the 95% confidence level (p=0.006).
- From the EPA analysis, the percentage of non-detected outcomes was 75% during the pre-dissemination collection period (Stage 1), 40% during post-dissemination (Stage 2), and 78% during post-decontamination (Stage 3). These percentages were significantly different from 50% at the 95% confidence level at pre-dissemination (p=0.002) and post-decontamination (p=0.0007); the percentage at post-dissemination did not differ significantly from 50% (p=0.268).

The results of this statistical analysis imply that the EPA and USGS analysis results cannot be considered statistically independent in the third treatment round nor in Stages 1 and 3. In the second treatment round and in the sampling that follows post-dissemination (Stage 2), insufficient evidence existed to reject the null hypothesis that the two sets of outcomes were independent of each other, given the lower non-detection rate under the EPA analysis in both Round 2 and Stage 2 compared to the other treatment rounds and stages. Across all samples, the EPA analysis determined that approximately 64% of the samples were ND, compared to 100% of the samples according to the USGS analysis. This difference may be due to the large discrepancy between initial sample amount (45 g for EPA vs. 0.25 g for USGS) and the difference in replicate numbers (three replicates for EPA, two replicates for USGS). Because the EPA analysis yielded some detectable results, only the EPA results were used for further analysis in this report.

3.2.4.3.2. Statistical Analysis Comparing Decontamination Treatment Rounds

Statistical analyses to test for significant differences in the proportion of ND results (i.e., outcomes classified as “ND” or “0”) between Round 1 and Round 2 were performed using Fisher’s Exact test[83]. Table 3-57 summarizes the classification data entering into this analysis. According to this table, and as noted in the conclusions, 60 and 68 percent of samples in Round 2 and Round 3, respectively, were classified as ND. The association between the percentage of ND and the testing round was not significant at the 95% confidence level (p=0.447).

A logistic regression analysis was fitted to the detected/ND outcome data from Round 2 and Round 3 to assess the extent to which testing round and sampling stage were statistically significant predictors for the proportion of NDs. This analysis allows the effect of one of these factors to be assessed while taking account of the other effects in the logistic regression model. The logistic regression model also included a random effect for the sample location; this effect accounted for possible correlation in the outcomes among samples collected at the same location over the course of the study (i.e., among treatment rounds and collection stages). Like the outcome of Fisher’s Exact Test, the logistic regression analysis found no significant effect of testing round (i.e., no significant difference between the second and third decontamination

technologies in the proportion of NDs in the sand samples at the 95% confidence level (p=0.306)).

Table 3-57. Summary of the number of samples within each of the positive and non-detected classifications according to EPA analysis, by treatment round (considering all samples).

Code	Round 2	Round 3	Total
ND	36	40	**76**
0	0	1	**1**
1+	15	18	**33**
2+	7	1	**8**
3+	1	0	**1**
4+	1	0	**1**
5+	0	0	**0**
Total	**60**	**60**	**120**

Note: Codes of ND and 0 represent “non-detected” outcomes

3.2.4.3.3. Statistical Analysis of Stages

Fisher’s Exact test[83] was used to test for significant association between the proportion of ND results and the sampling stages (Pre-Dissemination, Post-Dissemination of *Bg* in the building, Post-Decontamination of the building; Table 3-58) for samples collected in Rounds 2 and 3. When the test was performed separately for each decontamination technology (i.e., each round), the difference in the proportion of ND samples among the testing stages was significant for Round 2 ($p<0.001$) and Round 3 ($p=0.019$). The primary contributor to significance in both decontamination rounds was the difference between post-dissemination (Stage 2) and the other two stages. As noted in Table 3-58, the ND rate is lowest during post-dissemination, especially in the second treatment, with the difference due primarily to a larger number of samples being classified as weakly detected (1+) in post-dissemination.

When Fisher’s Exact test was used to compare the percentages of NDs between the two rounds independently for each testing stage, no significant differences were observed between the rounds at the 95% confidence level for any testing stage. Hence, the proportion of ND results was not significantly different between the Round 2 Pre-Dissemination and the Round 3 Pre-Dissemination ($p=0.065$). Similar conclusions can be reached for the post-dissemination ($p=0.333$) and post-decontamination ($p=0.127$) stages.

When the analysis was conducted across both (Round 2 and 3) testing rounds (i.e., the data from both decontamination technologies were lumped together for each testing stage), the association between the three stages was found to be highly significant ($p=0.002$). This outcome was due primarily to the higher detection rates observed in post-dissemination compared to the other two stages. The ND rate during post-dissemination is about half the rate

observed during post-decontamination (Table 3-58), with the difference due primarily to a larger number of samples being classified as weakly detected (1+) in post-dissemination.

The effect of sampling stage was further assessed using the same logistic regression analysis model described in section 3.2.3.3.2, focusing this time on the significance of the sampling stage effect in the model. The overall sampling stage effect was highly significant (p=0.0009). As a result, pairwise comparisons among the three stages were performed within the model fitting. The p-value of the logistic regression analysis comparing pre-dissemination to post-dissemination was 0.020, while the p-value for comparing pre-dissemination to post-decontamination was 0.79, and the p-value for comparing post-dissemination to post-decontamination was 0.001. Because significance was determined here at the 0.05/3=0.0167 level (the three pair-wise comparisons were performed at this significance level to ensure that the overall error rate among all three pairs was no higher than 0.05), only the post-dissemination vs. post-decontamination comparison was determined to be significant at an overall 95% confidence level. This difference was therefore the primary contributor to the overall differences among stages.

Table 3-58. Summary of the number of samples within positive and ND classifications according to EPA analysis, by collection stage (considering all samples).

Code	Round 2			Round 3		
	Pre-Dissem*	Post-Dissem	Post-Decon**	Pre-Dissem	Post-Dissem	Post-Decon
ND	12	6	18	17	10	13
0	0	0	0	1	0	0
1+	3	10	2	2	10	6
2+	3	4	0	0	0	1
3+	1	0	0	0	0	0
4+	1	0	0	0	0	0
5+	0	0	0	0	0	0
Total	**20**	**20**	**20**	**20**	**20**	**20**

*Dissemination. **Decontamination.

3.2.4.3.4. Statistical Analysis of Sample Placement

Table 3-59 summarizes the average EPA results from each decontamination technology round, collection stage, and sampling location, based upon whether or not the *Bg* concentration was within the detectable limits (i.e., was classified as 1+ through 5+). As each round progressed, the rate of detection increased from the samples collected during pre-dissemination to those collected post-dissemination of spores. While a decrease in the number of samples with detectable *Bg* was seen post-decontamination, care must be taken before attributing this observed decrease to the decontamination technologies alone, as the sand samples within the

secondary enclosure were not directly decontaminated during this study. As stated previously, when an analysis was conducted looking at the detected results from both decontamination technology rounds together, the association of detects to NDs between stages was significant (p=0.001). However, no significant association was observed between the proportion of NDs and location at the 95% confidence level, based on Fisher's Exact test (p=0.360).

Figure 3-35 shows where the sand sample locations were positioned along the outside of the building within the secondary enclosure. Table 3-59 shows that the largest proportion of detected results occurred at Location 1, near the secondary enclosure personnel entrance. Here, five of the six sampling events led to detected outcomes.

Table 3-59. Number of samples with detected *Bg* by location, round, stage and detection status based on averaged EPA analysis of individual samples.

Secondary Enclosure Location		Round 2 Detected Samples			Round 3 Detected Samples			Total
		Pre-Dissem* N=2	Post-Dissem N=2	Post-Decon** N=2	Pre-Dissem N=2	Post-Dissem N=2	Post-Decon N=2	
1		1	2	1	0	2	2	**8**
2		0	2	0	0	2	0	**4**
3		0	0	0	0	2	0	**2**
4		2	0	0	0	0	0	**2**
5		1	2	1	0	1	0	**5**
6		0	1	0	1	0	1	**3**
7		1	2	0	1	1	0	**5**
8		1	2	0	0	1	1	**5**
9		0	2	0	0	1	2	**5**
10		2	1	0	0	0	1	**4**
Total	**Detected**	**8**	**14**	**2**	**2**	**10**	**7**	**43**
	ND	**12**	**6**	**18**	**18**	**10**	**13**	**77**

*Dissemination. **Decontamination.

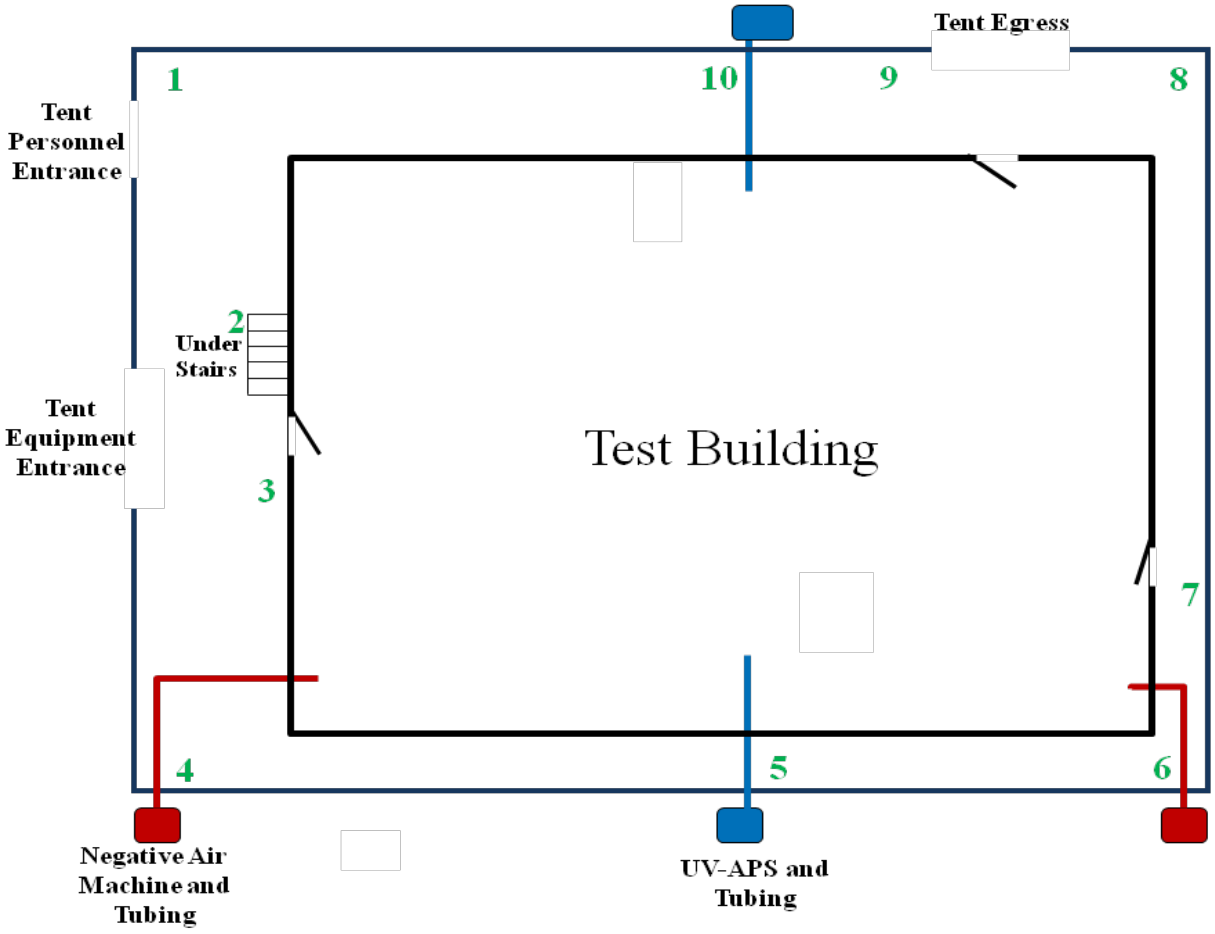


Figure 3-35. Schematic of the building and secondary enclosure layout for the BOTE Project Phase 1.

3.2.4.3.5. Statistical Analysis of Possible Carryover Contamination between Rounds

A few surface samples collected post-decontamination for Round 1 resulted in detectable *Bg* spores at very significant levels. All surface samples collected post-decontamination for Rounds 2 and 3 were below the limit of detection. Because the Round 2 sand pre-dissemination sampling occurred directly following the Round 1 decontamination treatment without any additional decontamination, the number of detectable sand samples collected during the pre-dissemination sampling of the bleach might be due to inefficient decontamination by VHP® within the building. The prevalence of detected samples in Round 2 pre-dissemination was therefore assessed to see how detected samples in Round 2 pre-dissemination compared to detected samples present in Round 1 post-decontamination. Among the 20 different sampling locations (two samples at each of the ten locations), five locations had samples showing detected results in both sampling periods, 12 locations had samples showing detected results in the Round 1 post-decontamination period but not detected in the Round 2 pre-dissemination period, and three locations had samples showing not detected in the Round 1 post-decontamination period and detected in the Round 2 pre-dissemination period. Results of

applying a nonparametric sign test concluded that the median difference in average cycle threshold response between the two periods was significantly negative (p=0.012), meaning that the average cycle threshold response in Round 1 post-decontamination tended to be lower than the response in Round 2 pre-dissemination. This result is consistent with saying that the prevalence of detected results in Round 2 pre-dissemination was significantly higher than in Round 1 post-decontamination at a given location. (A similar conclusion was not reached between Round 2 post-decontamination and Round 3 pre-dissemination: the median difference in average cycle threshold time was not significantly different from zero at the 95% confidence level). There is statistical evidence that most sampling locations had an increase in detectable spore counts between the end of Round 1 and the start of Round 2, and this increase of spores may have been building spores redistributed during the building reset.

3.2.5. Decontamination Line Wash Water Treatment Assessment Results

Water quality results for all the sampling events are summarized in Table 3-60 through Table 3-64. Spore concentration results (before and after wash water chlorination) were NDs for the first four sampling events; therefore, Bg spore log reduction (per Equation 2-1) was not possible for these samples. This result is not surprising because personnel removed outer gloves and booties, which would be expected to have the best likelihood of having attached spores, before the PPE wash down procedure was performed. Given the preliminary results from the first four decontamination runs, *Bg* spores were spiked into the collected wash water for the final sampling event prior to sampling and analysis (0.15 mL of an estimated 1.5E8 CFU/mL suspension). An initial level titer of 3 log CFU/mL resulted in a greater than 3-log reduction at approximately 60 ° F (15 °C) and a pH of approximately 11 at the 15-minute contact time. The estimated simple CT was 45,000 mg-min/L. Due to a cross- contamination problem, the results from the concentrated sample analysis were not used to calculate log reduction. Only results from grab sample analyses were used for these calculations.

The inactivation results are similar to EPA bench scale results, which show for similar conditions a greater than 7 log reduction of *Bg* spores at a temperature of 23 °C and a 4.5 log to a greater than 7 log reduction at a temperature of 4 °C[66]. For the BOTE Project, wash water temperatures ranged from 4 to 15 °C.

Table 3-60. Results for wash water collected in Round 1 after dissemination and pre-decontamination.

Measurement	Pre-chlorine	Time Zero*	15-min Chlorination*	Quench	Post-Chlorine
Temperature (°C)	NA				
Free Chlorine (mg/L)	0.01, ND ,0.05	3.32	3.13	0.02	ND
pH		9.59	9.76	11.69	
Turbidity (NTU)**	111.4 ,116.2 ,108.3				97.7, 90.55, 117.7
Total Suspended Solids (mg/L)	117, 114, 114				95, 87, 87
Chemical Oxygen Demand (mg/L)	NA				

*1 x 10^3 dilution **Nephelometric turbidity unit

Table 3-61. Results for wash water collected in Round 2 after dissemination and pre-decontamination.

Measurement	Pre-chlorine	Time Zero*	15-min chlorination*	Quench	Post-chlorine
Temperature (°C)	3.8	10.3			10.3
Free Chlorine (mg/L)	0.12, 0.09, 0.07	3.94, 4.15	4.33, 4.44	0.08, ND, ND	0.24, ND, ND
pH	8.43	10.05		11.85	11.18
Turbidity (NTU)**	241.6, 239.7				243.2, 225.3
Total Suspended Solids (mg/L)	181, 180, 174				166, 164, 167
Chemical Oxygen Demand (mg/L)	0.51, 0.58, 0.58				5.00, 4.99, 5.01

*1 x 10^3 dilution **Nephelometric turbidity unit.

Table 3-62. Results for wash water collected in Round 2 during pH-adjusted bleach decontamination.

Measurement	Pre-chlorine	Time Zero*	15-min chlorination*	Quench	Post-chlorine
Temperature (°C)	5.4	7.8	8.3	11.3	
Free Chlorine (mg/L)	2.47	3.84	3.24	0.1, ND	ND, 0.03
pH	8.45	10.03	9.5	11.77	11.7
Turbidity (NTU)**	197.5, 196.4, 193.3				172.1, 167.3, 169.8
Total Suspended Solids (mg/L)	122, 123, 121				103, 100, 99
Chemical Oxygen Demand (mg/L)	ND, ND				5.17, 5.18

*1 x 10^3 dilution **Nephelometric turbidity unit.

Table 3-63. Results for wash water collected in Round 2 after pH-adjusted bleach decontamination.

Measurement	Pre-chlorine	Time Zero*	15-min chlorination*	Quench	Post-chlorine
Temperature (°C)	13.3	14.7	15.0		
Free Chlorine (mg/L)	0.01, ND, ND				0.02, ND, ND
pH	8.4, 8.4, 8.4				10.37, 10.46, 10.46
Turbidity (NTU)**	277.3, 279.7, 270.7				237.0, 252.8, 223.1
Total Suspended Solids (mg/L)	183, 181, 181				127, 126, 125
Chemical Oxygen Demand (mg/L)	0.77, 0.91				5.12, 4.77

*1 x 10^3 dilution **Nephelometric turbidity unit.

Table 3-64. Results for wash water collected in Round 3 after dissemination and pre-decontamination.

Measurement	Pre-chlorine	Time Zero*	15-min chlorination*	Quench	Post-chlorine
Temperature (°C)	14.9	16.7			
Free Chlorine (mg/L)	0.17, 0.09, 0.08	2.94, 2.93	3.01, 3.00, 2.98	ND/ND	0.06, 0.02, ND
pH	8.4				11.2
Turbidity (NTU)**	294.9, 309.4, 301.9				325.7, 324.2, 322.6
Total Suspended Solids (mg/L)	207, 208, 208				184, 183, 183
Chemical Oxygen Demand (mg/L)	0.05, 0.06, 0.05				5.71, 5.71, 5.71

*1 x 10^3 dilution **Nephelometric turbidity unit.

4. DATA ASSESSMENT AND DISCUSSION

4.1. Decontamination Methods Assessment

One of the primary objectives of the BOTE Project was to operationally assess the effectiveness of pre-selected decontamination processes. The methods were selected based upon subject matter expert workgroup discussions, assessing the potential of the processes from existing laboratory data and/or past field performance. The BOTE Project facility configuration and *Bg* surface loadings were designed to assess the decontamination process effectiveness under several scenarios, for future use in extrapolating results to incident and site-specific needs.

Based upon the subject matter expert workgroup discussions, three decontamination methods were chosen for assessment in the BOTE Project. As discussed in Section 2.10, the following decontamination processes were selected:

- fumigation with H_2O_2 using STERIS VHP®;
- surface decontamination using pH-adjusted bleach (amended bleach); and
- fumigation with ClO_2.

Each decontamination process was assessed independently, used in three different test rounds. As discussed in detail in Section 2, each round involved the setup (or reset) of the facility, dissemination of *Bg* spores, pre-decontamination (characterization) sampling, application of the decontamination process, post-decontamination (clearance) sampling, and facility assessment (and re-set). In the first round, STERIS Corporation (Mentor, OH) was subcontracted by INL under the EPA agreement to fumigate the facility with hydrogen peroxide using their VHP® process. The EPA Region 10 START contractor was used to decontaminate the facility using pH-adjusted bleach. This process was directed by EPA Region 1 and ten On-scene Coordinators, supported by technical experts from EPA's Chemical, Biological, Radiological, and Nuclear (CBRN) Consequence Management Advisory Team (CMAT, formerly the National Decontamination Team) and EPA's National Homeland Security Research Center within the Office of Research and Development. The third round decontamination process was a full facility fumigation with ClO_2, performed by Sabre Technical Services, LLC (Slingerland, NY), as a subcontractor to INL under the EPA agreement.

Discussion of each process and the sampling results with respect to the assessment of effectiveness is provided in the subsections that follow.

4.1.1. STERIS VHP® Fumigation

For the first round of Phase I, STERIS Corporation's VHP® technology was selected for the decontamination process.

4.1.1.1. Process Description

During the VHP® process, an aqueous solution of hydrogen peroxide is flash-vaporized into a stream of dehumidified heated air. This stream of hydrogen peroxide vapor is then injected into the space to be decontaminated. In general, the process can be operated in a closed- or open-

loop mode. In the closed-loop mode, process air is withdrawn from the enclosure, passed through a catalyst to decompose any residual hydrogen peroxide and dehumidified before being re-enriched with hydrogen peroxide vapor and returned to the enclosure. In the open-loop mode, process air is drawn from outside the space to be decontaminated, dehumidified and enriched with hydrogen peroxide vapor before being injected into the enclosure. Excess air in the enclosure passes through a catalyst to decompose the hydrogen peroxide to safe levels before being vented to the environment. In either mode, the injection process proceeds continuously until a sufficient exposure of the VHP® to the contaminated space in terms of time and concentration has been achieved. After the decontamination has been completed, the concentration of VHP® remaining in the space is reduced by the use of a decomposition catalyst, natural decomposition and the introduction of fresh air.

The target H_2O_2 concentration was 250 ppm for 90 minutes or a cumulative exposure of 400 ppm-hr at a temperature of 65 °F or higher. The selection of these fumigation criteria was determined by STERIS, in accordance with their EPA registration label (EPA Reg. No. 58779-4) for Vaprox® use as a sterilant. For fumigation of PBF-632, STERIS chose to use a separate generator unit for each floor located externally to the building with the vapor injected into the building air handler units. For each floor, the generation equipment consisted of one VHP® M1000-T4 Biodecontamination System (STERIS, Mentor, OH) and one Munters HC-300 dehumidifier (Amesbury, MA). The T4 generator operates in an open-loop configuration, where fresh air is dehumidified by the Munters HC-300 units before being injected with hydrogen peroxide vapor and delivered into the building. The T4 generator operates in an injection rate range of 4-96 g/min of hydrogen peroxide solution and airflow rates of 40-100 standard cubic feet per minute (SCFM). Actual injection and air flow rates will be described in the following section. The T4 is designed to inject either 35% or 59% solutions of hydrogen peroxide (Durox LR®). The 59% solution was utilized by the vendor for this process. Use of the 59% solution effectively increases the generation capacity of the unit and reduces the risk of condensation of the injected vapor due to less concurrent water injection. To offset the air introduced into the building by the fumigant generation process, an “exhaust skid” consisting of a HEPA filter, catalyst, and fan was used.

The building HVAC fans (one for each floor) were operational and were used to facilitate distribution of the fumigant throughout the building. To provide further air movement and to ensure that the fumigant would penetrate into rooms not containing supply registers, 74 16-in pedestal fans were used (see Figure 4-1and Figure 4-2). Five high-volume catalyst units (~1,200 CFM each) were activated during the aeration phase to increase the rate of hydrogen peroxide decomposition and decrease the aeration time. Two Patron 30,000 British thermal unit (Btu)/hr electric heaters (Cheektowaga, NY) were deployed in the building (first floor hallway) to maintain the desired operational temperature of 65 °F.

To monitor environmental conditions within the building during fumigation, six sensor pods were used. Each pod contained an electrochemical hydrogen peroxide sensor, a humidity sensor and temperature sensor. Data were monitored and logged at a computer terminal outside the building. EPA also had HOBO® U10 data loggers (Onset Computer Corp., Bourne, MA) installed in each room to monitor the temperature and RH. To further measure the distribution of the

fumigant and its efficacy, a number of biological indicators (BIs) and color-changing chemical indicators (CIs) were placed in the building. The BIs were Tri-Scale Biological Indicators (part # LOG-456) from Apex Laboratories, Inc. (Apex, NC). Each BI consisted of three stainless steel discs inoculated with *G. stearothermophilus* (#12980) at the 1E6, 1E5, and 1E4 levels, respectively. The CIs used were STERIS, Inc. (Mentor, OH) model numbers NB305 and PCC036.

A description of PBF-632 can be found in Section 2.1**.** This same configuration was used in all three rounds.

4.1.1.2. Facility Contamination

Bg spores were disseminated on April 16, 2011, following the procedure described in Section 2.3. The target surface loading of 1E4 to 1E6 CFU/ft^2 was desired on the first floor, and a surface loading of 1E2 to 2E2 CFU/ft^2 was desired on the second floor. The actual surface loading was characterized by surface sampling as described in Section 2.5.4.

4.1.1.3. Setup and Preparation

On April 17, 2011, STERIS equipment was delivered to the test bed site via common carrier. The T4 units were placed outside the outer membrane near the furnace room and the exhaust skid was placed just outside the furnace room on Floor 1 as shown in Figure 4-1. The T4 units, dehumidifier and the monitoring equipment were covered with a secondary enclosure to protect them from the elements. The STERIS team consisted of four personnel who assisted with the setup, fumigation and teardown of the equipment.

Before each round, each vendor was given the opportunity to walk through the facility to determine if any items in the facility would absorb or consume the fumigant. The items that were identified were then removed from the facility before fumigation to be treated in a different manner. STERIS elected to leave all materials inside the facility during fumigation, so no materials or furniture were removed from the building during this round. STERIS also elected not to encapsulate (tent) the facility directly (i.e., on the building directly, underneath the secondary enclosure).

On April 18, 2011, following characterization sampling, the placement of fans, sensors, and aerators (also referred to as catalyst units) inside the facility was completed. Four personnel staged equipment in the staging area at the west end of the building. All entries into PBF-632 following spore dissemination were in Level C PPE, which included a full-face air purifying respirator with HEPA filters, Tyvek® suit, and nitrile gloves. The respirator, gloves and boots were each taped to the suit using liquid chemical resistant tape to form a complete barrier. Three STERIS personnel and two EPA personal entered the facility to stage equipment and distribute BIs and CIs throughout the facility. One STERIS employee remained outside to pass equipment into the facility. Equipment was then passed through the doorways on the first and second levels to prevent contamination of the staging area. The second floor was set up first, with a total of 36 pedestal fans placed throughout the floor to facilitate dispersion of the vaporized H_2O_2. Two aerators were deployed in the hallway. The power cords for the aerators were run outside the secondary enclosure through an access hole near the furnace room. Three

sensor pods were deployed on this floor. The wiring for the sensor pods was also run to the outside to allow for monitoring during fumigation. Before any equipment was placed on the floor, the footprint in which it was to be placed was sprayed with Spor-Klenz® Ready to Use (STERIS, Mentor, OH) to inactivate any spores that would be under the equipment and would hence not be exposed to the hydrogen peroxide vapor. As the equipment was being set up, the BIs and CIs were placed in the rooms and hallways of the second floor. Locations of the BIs/CIs were recorded and are discussed in a later section. After all equipment and BIs/CIs were placed, personnel moved down to the first floor. The airlock between the floors was left open during the fumigation so that excess air from the second floor could flow to the exhaust skid connected to the first floor. Equipment on the first floor was set up in a manner similar to the second floor, deploying 38 fans, three aerators, and three sensor pods. In addition, two space heaters were placed in the hallway of the first floor in order to provide heat to achieve the desired temperature during fumigation. The position of all equipment on the first and second floors is shown in Figure 4-1 and Figure 4-2.

The distribution of hydrogen peroxide throughout the facility was accomplished by connecting the flow from the T4 generators to the building HVAC systems (on each floor) using a 3-in insulated plastic flexible duct. A separate line was installed for each floor. A hole was cut into the side of the HVAC supply air plenum and a bulkhead fitting was installed to connect the hose to the plenum. On the bottom floor, the hole was cut into one side of a dual plenum. On the top floor, the hole was centered between the dual plenum supply sides.

A photo of one of the T4 generators is shown in Figure 4-3. The black lines coming off the top and going to the center of the photograph are the insulated delivery lines that went into PBF-632. The yellow flexible duct was connected to a dehumidifier and supplied dry air to the generator.

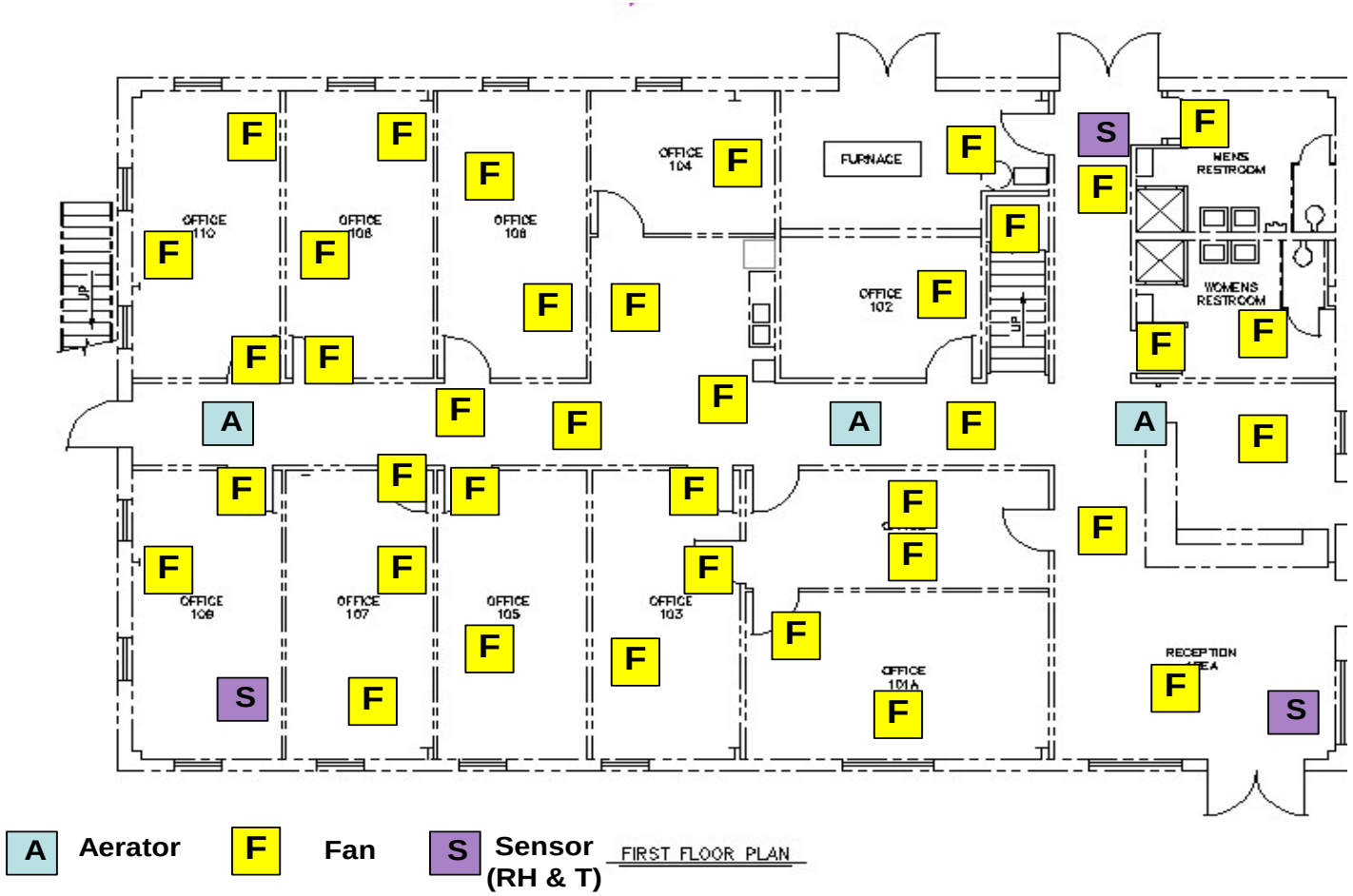


Figure 4-1. Schematic of first floor showing location of fans, sensors, and aerators.

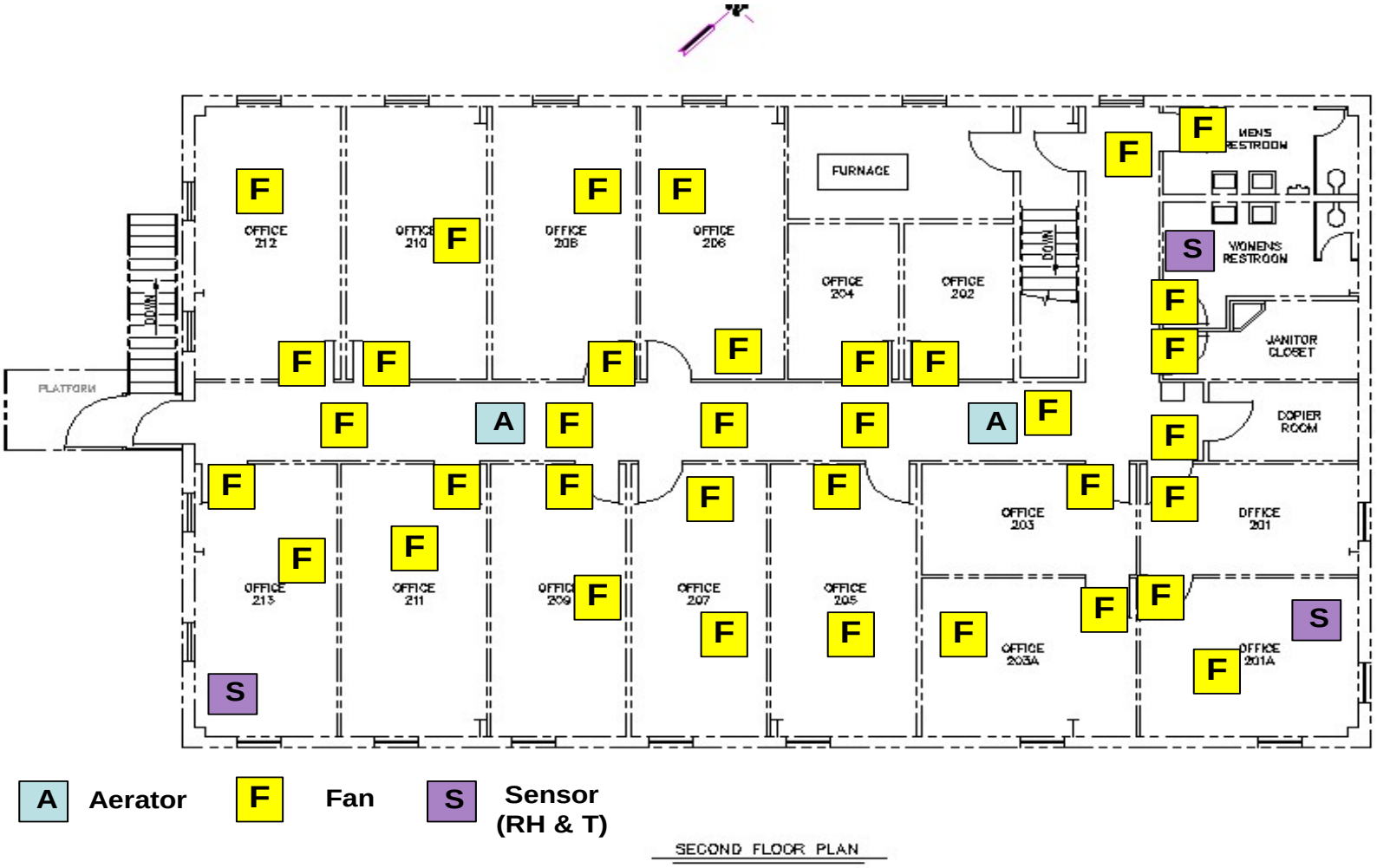


Figure 4-2. Schematic of second floor showing location of fans, sensors, and aerators.

Figure 4-3. Photo of T4 generator with gas delivery lines going into PBF-632.

4.1.1.4. Fumigation Conditions

The facility was turned over to STERIS on the morning of Tuesday, April 19, to begin fumigation. At 1130 hrs, safety personnel swept the building to ensure no one was inside prior to commencement of fumigation. Immediately following the safety sweep, STERIS personnel determined that one of the T4 units was experiencing a short circuit. Plans were made to fumigate one floor at a time with the one remaining T4 unit. Fortunately, a technician was able to determine the cause of the short circuit and was able to repair the malfunctioning unit. Fumigation of both floors proceeded shortly thereafter at 1150 hr. A timeline of events that took place during the fumigation is shown below in Table 4-1. The amount of hydrogen peroxide injected was incrementally increased to prevent condensation in the lines. The concentration on the first floor had not reached the target concentration of at least 250 ppm, so at 1700 hrs the delivery lines to each floor were swapped to see if this exchange might help. The swap of delivery lines did increase the concentration so a decision was made to plumb both delivery lines into the first floor to increase the concentration of hydrogen peroxide on that floor. At 1950 hr, both supply lines were connected to the first floor for the next hour prior to shutting down the generators. The natural degradation of hydrogen peroxide was observed for 30 minutes prior to turning on the aerators to run overnight. Personnel departed the site at approximately 2200 hrs, and a night watchman was left on site to ensure that no personnel entered the building.

During the fumigation, monitoring was conducted around the perimeter of PBF-632 approximately 15 ft from the outer membrane. The frequency was initially 15-min intervals for the first hour and then hourly after that to ensure that the concentration of hydrogen peroxide remained below the permissible exposure limit (PEL) of 1 ppm. There was one instance where the concentration exceeded the PEL, and this was near the exhaust ductwork for the UV-APS systems located on the south side of the building. The ductwork was sealed with duct tape and the hydrogen peroxide concentration around the perimeter returned to 0 ppm.

Table 4-1. Chronology of fumigation events with VHP® on April 19, 2011.

Time	Action
1150	VHP® generator started at 50 g/min on first floor Second floor VHP® generator delayed by equipment problem
1218	T4 generator repaired, and VHP® generator started at 50 g/min on second floor
1230	Injection rate increased to 65 g/min on both floors
1235	First floor injection stopped due to equipment problem
1240	T4 generator repaired and VHP® generation resumed on first floor at 65 g/min
1424	Injection rate increased to 75 g/min on both floors
1442	Injection rate increased to 80 g/min on both floors
1705	VHP® generation stopped to swap floors supplied by each generator
1715	VHP® generators resumed at 80 g/min
1952	Both T4s plumbed to supply first floor at combined 140 g/min
2102	VHP® generation terminated
2131	Aerators turned on
2200	Personnel depart site

4.1.1.5. Scrubbing and Aeration

Once the fumigation was terminated on the evening of April 19, the aerators were turned on at 2130 hr. The aerators were allowed to operate overnight, and the concentration of H_2O_2 in the building was monitored remotely on the following day. Once the hydrogen peroxide concentration had dropped sufficiently, a number of entries with appropriate respirators were made into the building to measure the H_2O_2 concentration using more sensitive handheld monitors (Dräger PAC III, Draeger Safety, Pittsburgh, PA). On the morning of Thursday, April 20, hydrogen peroxide concentrations in some rooms still measured up to 6 ppm around some materials measured using the handheld monitors. Four Novatek Novair 2000 NAMs (Novatek, Exton, PA) were then connected to ducts that had been pre-installed to aid in aeration of the building by bringing in fresh air (Figure 4-4). One NAM for each floor was connected on the west side of the facility, set to supply 2,000 CFM. Likewise, one NAM for each floor was connected on the east side of the facility and set to pull 1,000 CFM from the facility. The building was pressurized slightly to prevent sucking in any spores that might be present outside the building. H_2O_2 concentrations in the facility had dropped below the OSHA PELof 1 ppm, and two EPA

and three STERIS personnel entered the building in Level C PPE at approximately 1600 hr to remove the equipment and recover the BIs/CIs. The removal of the fans and aerating equipment inside PBF-632 required approximately two hours. All internal lines were disconnected and pushed outside the outer secondary enclosure.

Figure 4-4. Inlet NAMs on left side of figure and outlet NAMs on right side of figure.

4.1.1.6. Demobilization

PBF-632 was turned back over to the BOTE Project team on Thursday, April 21. By the afternoon of April 21, all equipment that had been placed inside the building had been removed by three STERIS personnel in Level C PPE in the interior of the building and one STERIS personnel on the exterior. STERIS personnel remained on site for Friday, April 22, and disassembled and packaged the equipment that was located under a small protective secondary enclosure. The equipment had been packaged and was shipped out at approximately 1600 hr on the afternoon of April 22. Approximately half of one 15 gal container of Durox LR (FMC Corporation, Philadelphia, PA) H_2O_2 solution remained, and approximately 5.5 gal remained of the other 15 gal container. The remaining H_2O_2 solution was returned with the equipment to the STERIS facility.

4.1.1.7. Temperature and Relative Humidity

The heating system in PBF-632 was not functional, and the project required the use of supplemental heating to raise the temperature in the facility to the desired temperature above 65 °F. Two Patron® 30,000 Btu/hr heaters were utilized to heat the facility in conjunction with operation of the blower on the building HVAC system to distribute the heat. A diesel-powered heater was used to heat the outer envelope (area between the building and the secondary enclosure). The interior heaters were started on April 18, 2011, and allowed to operate throughout the fumigation. The envelope heater was turned off at 1300 hr on April 19. The

temperature throughout the fumigation was maintained above the 65 °F threshold; there was no requirement on RH.

In addition to the three temperature and RH sensors that STERIS used, the EPA also collected temperature and RH data in each room using HOBO® U10 data loggers. These data loggers recorded temperature and RH every two minutes. Once the clearance sampling was completed, the data loggers were removed and the data were recovered.

Temperature and RH measurements inside the facility were recorded both by STERIS and by the EPA. The temperatures that STERIS recorded are shown in Figure 4-5 and Figure 4-6. The RH values are shown in Figure 4-7and Figure 4-8. The start time of zero in the figures corresponds to 1150 hr on April 19, 2011.

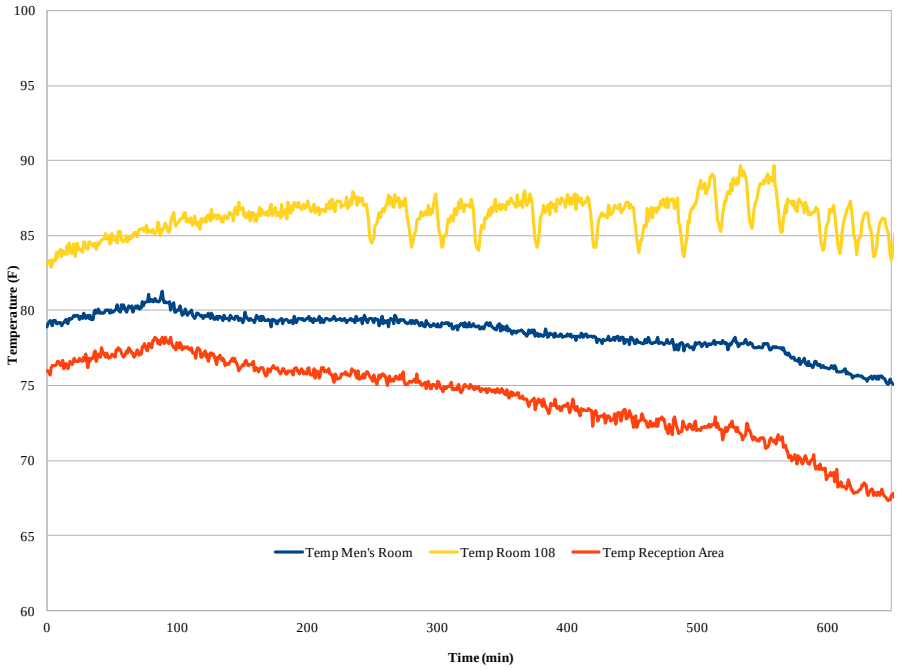


Figure 4-5. Temperature profile for the first floor.

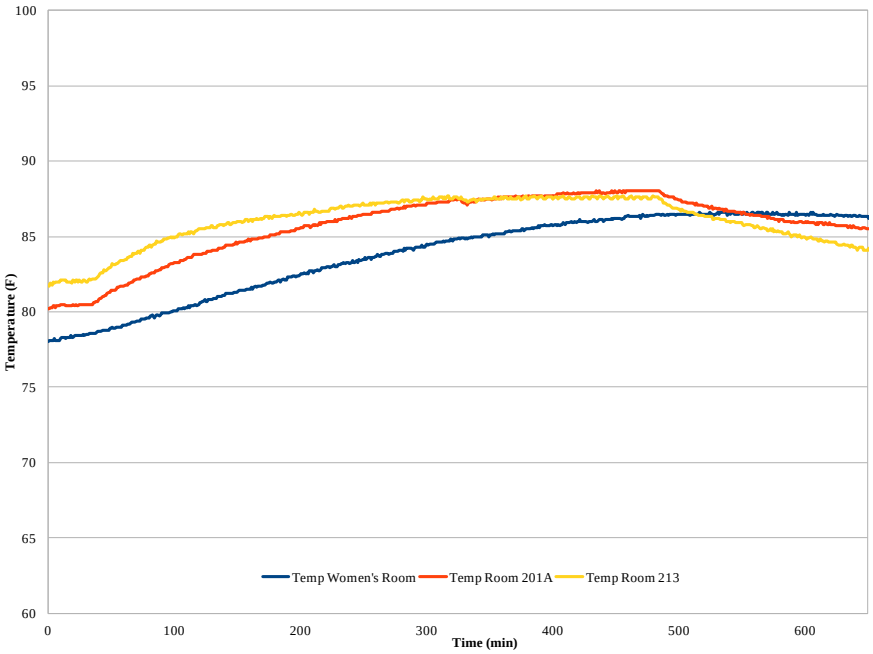


Figure 4-6. Temperature profile for the second floor.

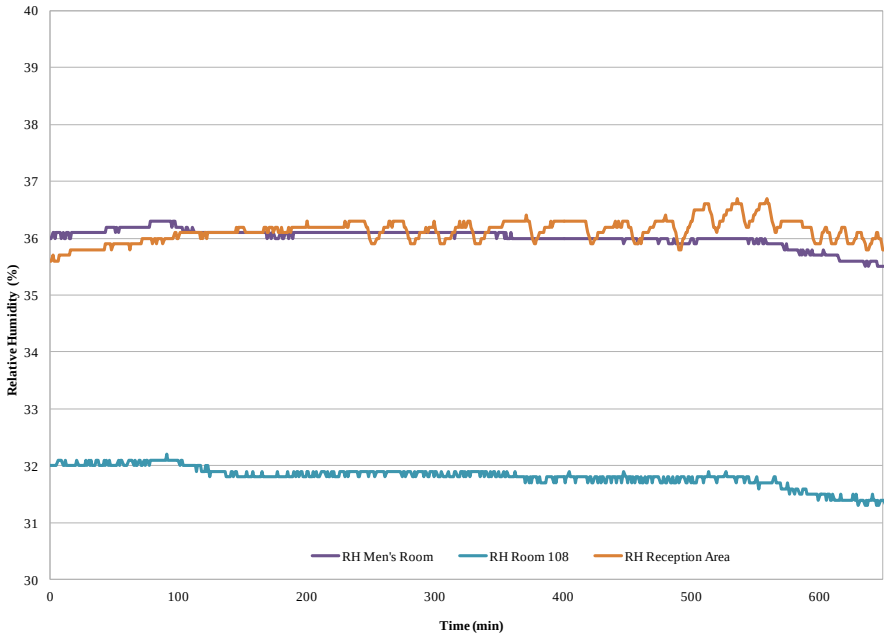


Figure 4-7. RH on the first floor.

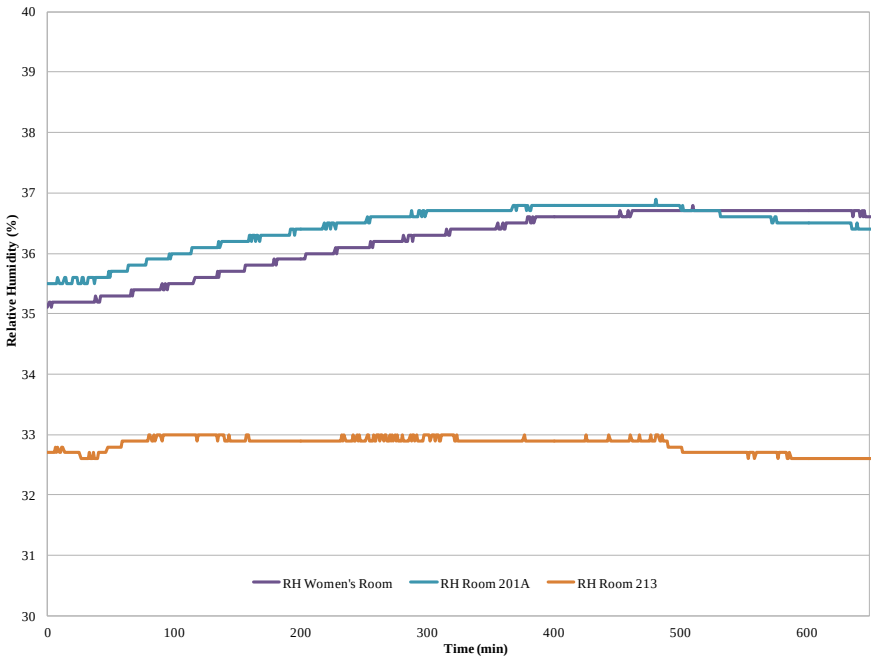


Figure 4-8. RH on the second floor.

4.1.1.8. H_2O_2 Measurements

The concentration of H_2O_2 was measured using three sensors on each floor as shown in Figure 4-9 and Figure 4-10. The sensors were hard-wired to a data acquisition system located near the generator systems outside the building. The H_2O_2 concentration on the first floor never reached the target (FIFRA registration) conditions (250 ppm for 90 minutes) for this product. The target was 250 ppm for 90 minutes or a cumulative exposure of 400 ppm-hrs. It was not until after 500 minutes, when both T4 generators were plumbed into the first floor HVAC system, that the concentration in Room 109 went over 250 ppm. Two of the sensors on the second floor measured an H_2O_2 concentration of 250 ppm for several hours. The third sensor in the women's room never measured higher than 200 ppm. The bathrooms did not have an HVAC register, so getting H_2O_2 vapor distribution into these rooms was difficult.

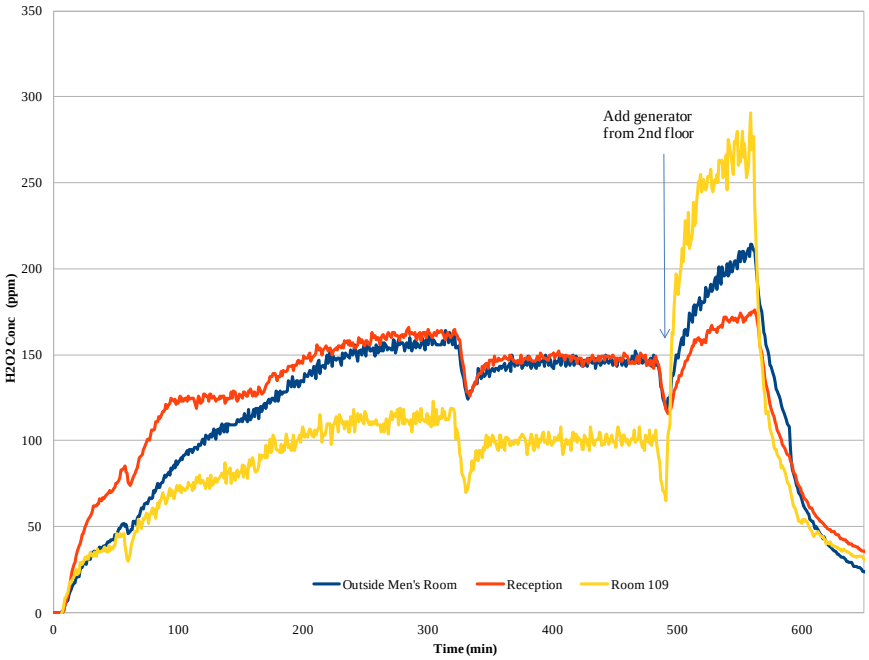


Figure 4-9. Hydrogen peroxide concentration on the first floor.

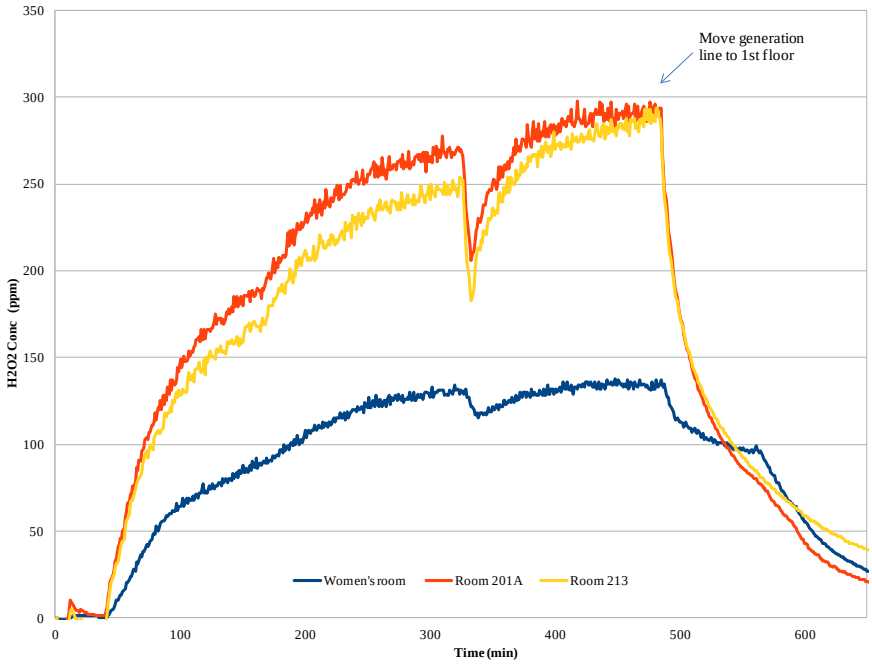


Figure 4-10. Hydrogen peroxide concentration on the second floor.

4.1.1.9. VHP® Decontamination Results

A variety of methods were used to evaluate the decontamination efficacy. These methods included the BI and CI results as well as the process monitoring (H_2O_2 concentration, temperature, RH) data. Surface samples were collected prior to and following decontamination for the ultimate determination of decontamination efficacy. This section presents the results of the VHP® fumigation.

4.1.1.10. BI Results

A total of 90 biological indicators from Apex Laboratories were set out, 44 on the first floor and 46 on the second floor. Each BI consisted of three stainless steel discs inoculated with *G. stearothermophilus* at the 1E6, 1E5, and 1E4 levels, respectively. The BIs were recovered by two EPA personnel in Level C PPE and were analyzed by the INL Microbiology Laboratory.

The BI locations are shown by the colored circles in Figure 4-11 and Figure 4-12. The 6 log BIs were analyzed first to see if they had been inactivated ("no growth"). The BIs shown in green were 6 log BIs that were inactivated by the hydrogen peroxide. If the 6 log BI showed growth, then the 5 log BI was processed to see if it had been inactivated by the hydrogen peroxide. A solid yellow circle denotes a 5 log BI that had no growth after being exposed to hydrogen peroxide. Likewise, if the 5 log BI showed growth, then the 4 log BI was processed. A solid red circle denotes a 4-log BI that had been inactivated. For the first floor, 27 of the 6 log BIs were inactivated, followed by 16 of the 5 log and 1 of the 4 log BIs. For the second floor, 30 of the 6 log BIs were inactivated, followed by 15 of the 5 log and 1 of the 4 log BIs. Both of the 6 log BIs in the women's restroom were inactivated even though the H_2O_2 concentration remained below 150 ppm throughout the test. For the rooms in which H_2O_2 was monitored, the women's restroom and other rooms on the second floor (having < 150 ppm H_2O_2 for the majority of the fumigation) had effectiveness just as good as or better than indicated by the BIs compared to rooms on the first floor that had higher H_2O_2 concentrations.

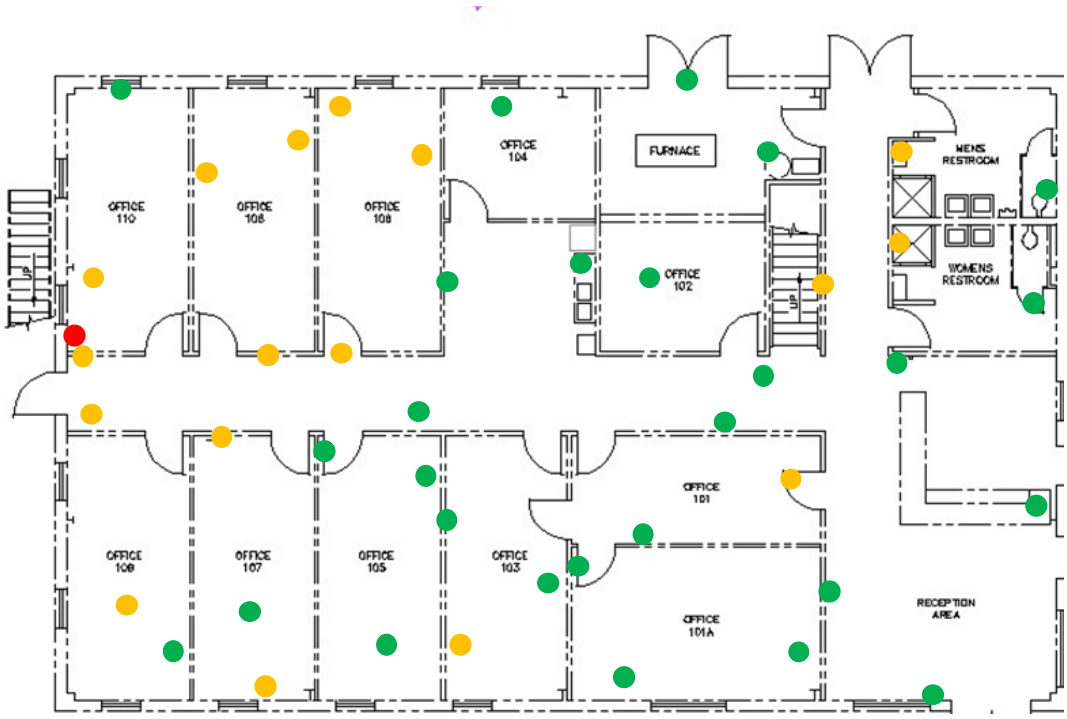


Figure 4-11. Results for BIs on the first floor.

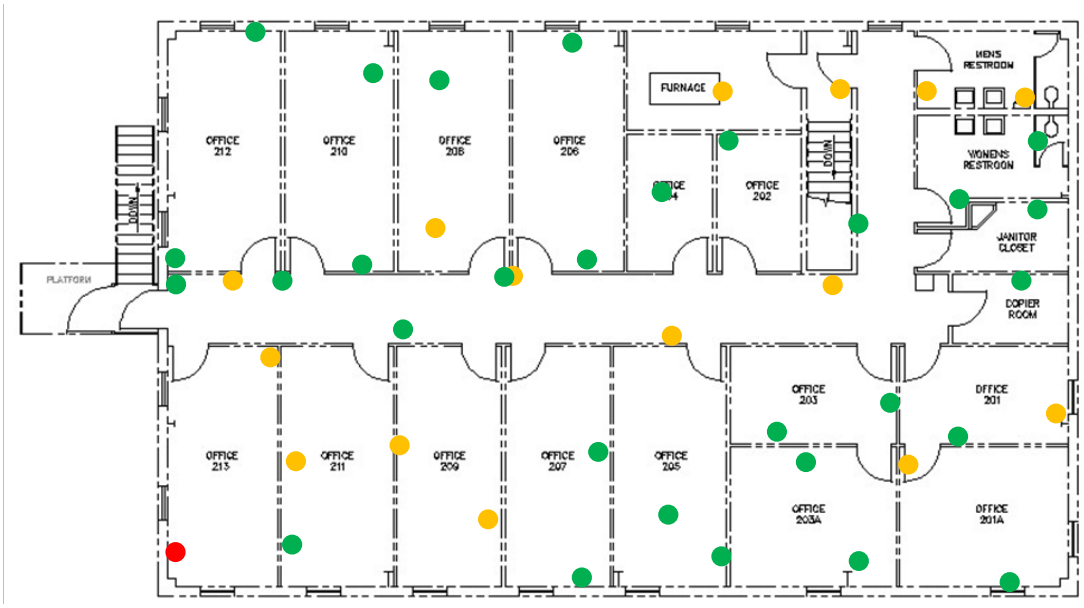


Figure 4-12. Results for BIs on the second floor.

4.1.1.10.1. Chemical Indicators

The CIs were collected at the same time as the BIs. All CIs on both floors had changed color and matched the end point standard, indicating that they had been exposed to H_2O_2 vapor. These indicators are more of a qualitative endpoint to indicate that the area was exposed to a sufficient amount of H_2O_2. No conclusions can be drawn from the CIs except that H_2O_2 had reached the location of each CI.

4.1.1.10.2. Surface Sampling Results

Characterization sampling was conducted on April 17 and 18, 2011. Post- decontamination sampling commenced on April 22-23, 2011. Swabs, sponge-sticks, and vacuum sock samples were collected from various surfaces and structures not removed from the building during the decontamination procedures. This section contains the results of the pre- and post-decontamination sampling that occurred during Round 1, fumigation with VHP®.

4.1.1.10.2.1. Field Blanks

Field blank samples were collected during each sampling campaign to determine the potential for background contamination of sampling media. Contamination could occur during sample handling in the field or in the laboratory during sample processing. Field blanks (62) were collected during the characterization sampling. Of the field blanks collected, four samples from the second floor came back with detectable *Bg* counts of 4.1E3, 7E0, 3.4E1, and 1.4E3 CFU.

Field blank samples (43) were collected during post-decontamination sampling for Round 1; two samples were found to have detectable *Bg* counts at 2 and 17 CFU.

4.1.1.10.2.2. Pre-decontamination Sampling

Bg spores were disseminated on April 16, 2011 following the procedure described in Section 2.3. A target surface loading of 1E4 to 1E6 CFU/ft^2 was desired on the first floor, and a surface loading of 1E2 to 2E2 CFU/ft^2 was desired on the second floor. The actual surface loading was characterized by surface sampling as described in Section 2.5.4. Surface sampling results are shown in Figure 4-13 and Figure 4-14.

Pre-decontamination samples (399) were collected, a total of thirteen were ND (no viable spores recovered). Ten of the 13 were from the less-contaminated second floor. A more detailed description of the pre-decontamination sampling results is presented in Section 3.2.1.2.

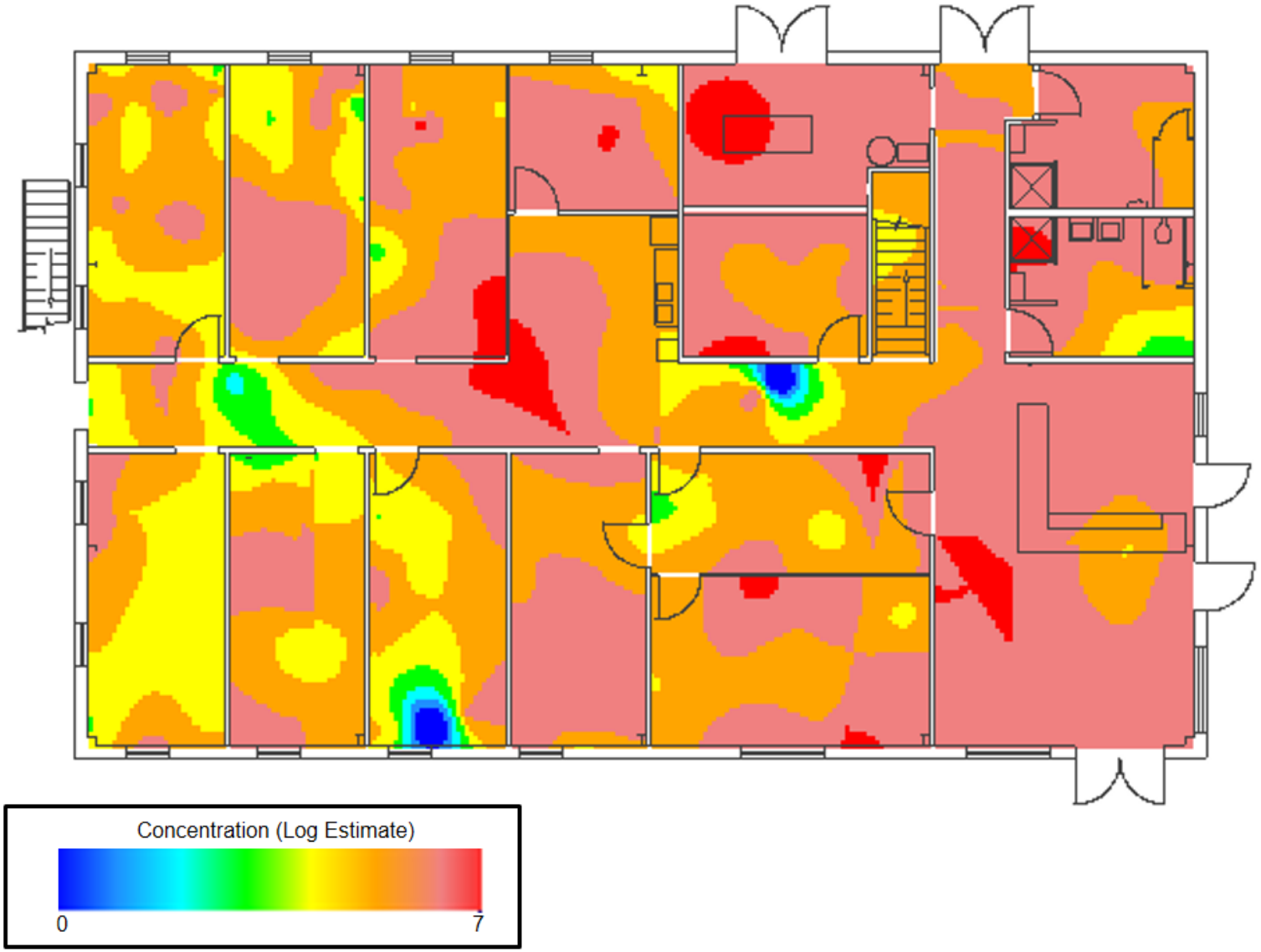


Figure 4-13. Spatial distribution of first floor pre-decontamination characterization sample results.

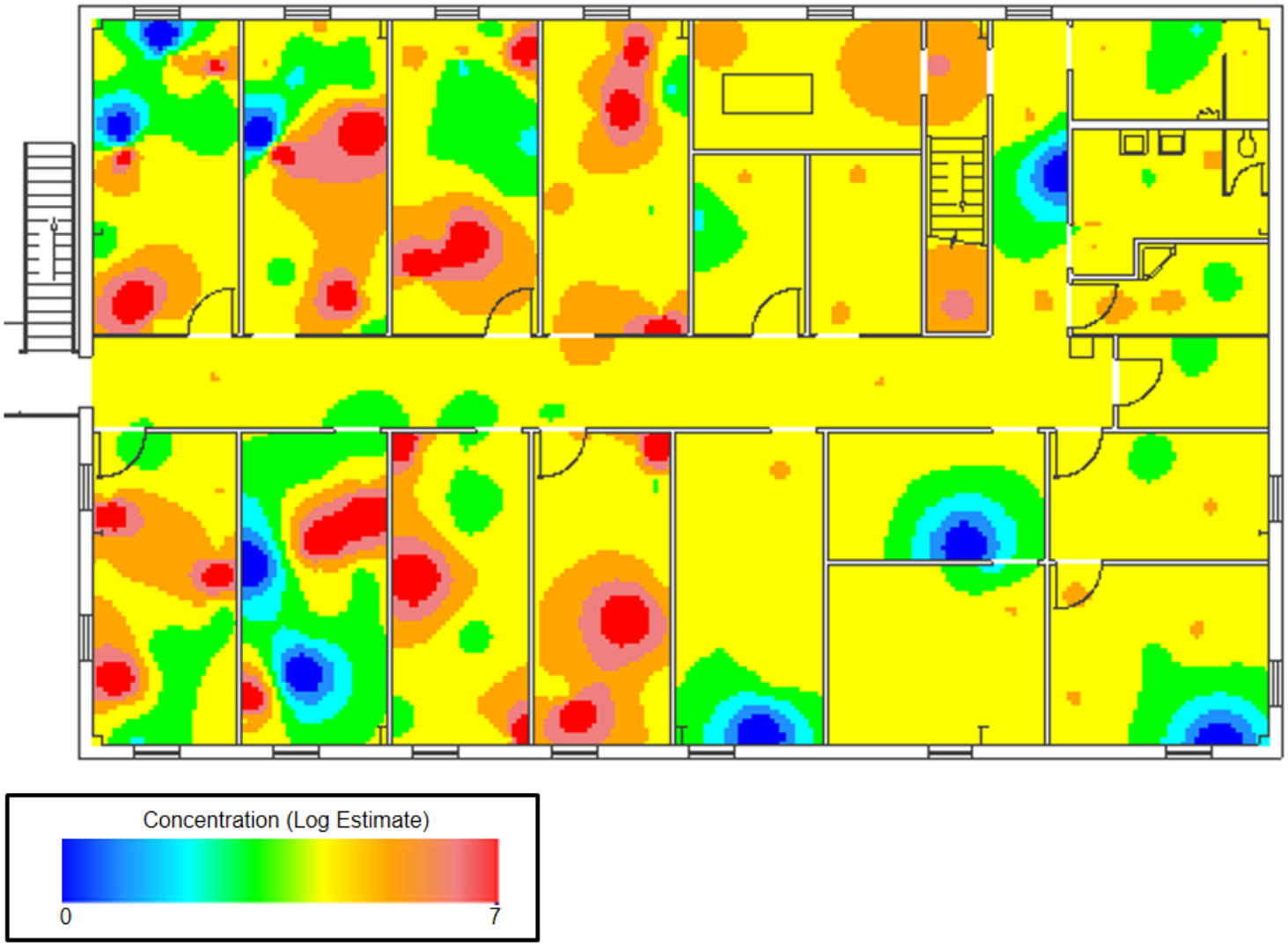


Figure 4-14. Spatial distribution of second floor pre-decontamination characterization sample results.

4.1.1.10.2.3. Post- Decontamination Samples

A total of 288 samples were collected following decontamination with VHP®. The results with detectable *Bg* are shown in Table 4-2 and Table 4-3 and shown in Figure 3-7 and Figure 3-8 for Floors 1 and 2, respectively. A total of 78 samples from the first floor and 16 from the second floor came back with detectable *Bg* either from spread and/or filter plating. All sample results are reported in Appendix G.

Table 4-2. Results from first floor following decontamination with VHP®.

Sample ID#	Room	Sample Method	Sampled Surface	Spread Plate Result (CFU/ft^2)	Filter Plate Result (CFU/ft^2)
3568	Bathroom-Men	Vacuum Sock	Ceiling	1.0E2	5.8E1
2233	Bathroom-Men	Sponge-Stick	Floor	9.2E2	2.0E2
2236	Bathroom-Men	Sponge-Stick	Floor	ND	1.9E1
2916	Bathroom-Women	Sponge-Stick	Floor	ND	4.0E0
3594	Corridor+Lobby	Vacuum Sock	Ceiling	8.0E0	ND
3629	Corridor+Lobby	Vacuum Sock	Ceiling	1.7E1	ND
3585	Corridor+Lobby	Vacuum Sock	Ceiling	1.3E1	1.0E0
3644	Corridor+Lobby	Vacuum Sock	Ceiling	4.2E1	ND
2072	Corridor+Lobby	Sponge Wipe	Floor	2.9E1	5.3E1
2722	Corridor+Lobby	Sponge Wipe	Floor	5.7E1	3.2E1
2566	Corridor+Lobby	Sponge-Stick	Floor	2.2E1	ND
2653	Corridor+Lobby	Sponge-Stick	Floor	8.2E1	3.8E1
3670	Mechanical Room	Vacuum Sock	Supply Vent	4.0E2	TNTC
2679	Mechanical Room	Sponge-Stick	Floor	3.5E2	ND
2231	Mechanical Room	Sponge-Stick	Floor	5.0E2	ND
3621	Room 101	Vacuum Sock	Ceiling	3.7E2	1.2E2
4157	Room 101A	Vacuum Sock	Floor-carpet	2.8E1	NA
4064	Room 101A	Vacuum Sock	Floor-carpet	1.6E2	NA
2942	Room 101A	Sponge-Stick	Desk	ND	4.0E0
2900	Room 101A	Sponge-Stick	Workbench	ND	3.0E0
3248	Room 101A	Sponge-Stick	Cabinet	ND	1.9E1
2734	Room 101A	Sponge-Stick	Desk	1.8E1	1.2E1
2957	Room 101A	Sponge-Stick	Desk	ND	1.0E1
1973	Room 101A	Sponge-Stick	Cabinet	ND	4.0E0
3660	Room 102	Vacuum Sock	Floor	2.9E1	1.4E1
3608	Room 102	Vacuum Sock	Floor	2.8E1	NA
3243	Room 102	Sponge-Stick	Workbench	1.4E2	4.6E1
3238	Room 102	Sponge-Stick	Cabinet	2.8E1	4.0E0
3509	Room 102	Sponge-Stick	Cabinet	6.5E1	ND
3506	Room 102	Sponge-Stick	Desk	ND	5.0E0
3273	Room 102	Sponge-Stick	Desk	1.1E2	1.8E2
3242	Room 102	Sponge-Stick	Desk	ND	2.0E0
3239	Room 102	Sponge-Stick	Cabinet	2.6E1	3.2E1
3676	Room 103	Vacuum Sock	Ceiling	4.0E0	ND
3077	Room 103	Sponge-Stick	Table	ND	1.5E1
3013	Room 103	Sponge-Stick	Table	ND	3.6E1

Sample ID#	Room	Sample Method	Sampled Surface	Spread Plate Result (CFU/ft^2)	Filter Plate Result (CFU/ft^2)
3513	Room 103	Sponge-Stick	Floor	1.2E2	1.3E1
3529	Room 103	Sponge-Stick	Floor	ND	3.8E1
3528	Room 103	Sponge-Stick	Floor	ND	2.0E1
3076	Room 103	Sponge-Stick	Mail slot	ND	8.0E0
1597	Room 103	Swab	Supply Vent	6.0E3	2.7E2
3714	Room 104	Vacuum Sock	Ceiling	ND	2.0E0
3495	Room 104	Sponge-Stick	Wall	ND	5.0E0
3287	Room 104	Sponge-Stick	Table	ND	7.0E0
3283	Room 104	Sponge-Stick	Table	ND	3.0E0
3686	Room 105	Vacuum Sock	Floor-carpet	ND	2.0E0
3718	Room 105	Vacuum Sock	Floor-carpet	4.0E0	2.0E0
3569	Room 105	Vacuum Sock	Ceiling	4.0E0	2.0E0
3981	Room 105	Vacuum Sock	Floor	ND	1.0E0
3595	Room 105	Vacuum Sock	Floor	ND	1.0E0
3066	Room 105	Sponge-Stick	Table	1.4E2	1.4E2
1676	Room 105	Swab	Supply Vent	3.6E3	3.0E3
3631	Room 106	Vacuum Sock	Shelves	8.0E0	1.0E0
3616	Room 106	Vacuum Sock	Floor	1.3E1	3.0E0
3725	Room 106	Vacuum Sock	Ceiling	1.7E1	9.0E0
2840	Room 106	Sponge-Stick	File cabinet	2.4E1	2.6E1
2839	Room 106	Sponge-Stick	Desk	9.1E1	5.1E1
3246	Room 106	Sponge-Stick	Floor	ND	1.8E1
1682	Room 106	Swab	Supply Vent	ND	1.8E2
3599	Room 107	Vacuum Sock	Ceiling	4.2E1	2.0E1
3067	Room 107	Sponge-Stick	Table	2.0E6	NA
3719	Room 108	Vacuum Sock	Shelves	1.3E1	2.0E0
3978	Room 108	Vacuum Sock	Chair	ND	1.0E0
3520	Room 108	Sponge-Stick	Shelves	2.8E1	NA
3522	Room 108	Sponge-Stick	Wall	1.9E1	NA
3065	Room 108	Sponge-Stick	Floor	ND	2.0E0
3627	Room 109	Vacuum Sock	Bed	ND	1.0E0
3669	Room 109	Vacuum Sock	Bed	ND	1.0E0
3563	Room 109	Vacuum Sock	Floor	ND	1.0E0
3689	Room 109	Vacuum Sock	Ceiling	ND	1.0E0
2658	Room 109	Sponge-Stick	Countertop	1.5E2	ND
2429	Room 109	Sponge-Stick	Countertop	1.9E1	ND
3655	Room 110	Vacuum Sock	Chair	ND	1.0E0
3612	Room 110	Vacuum Sock	Ceiling	ND	4.0E0
3648	Room 110	Vacuum Sock	Wall	4.0E0	1.0E0
3584	Room 110	Vacuum Sock	File cabinet	ND	1.0E0
3868	Room 110	Vacuum Sock	File cabinet	ND	1.0E0
3284	Room 110	Sponge-Stick	File cabinet	ND	5.0E0

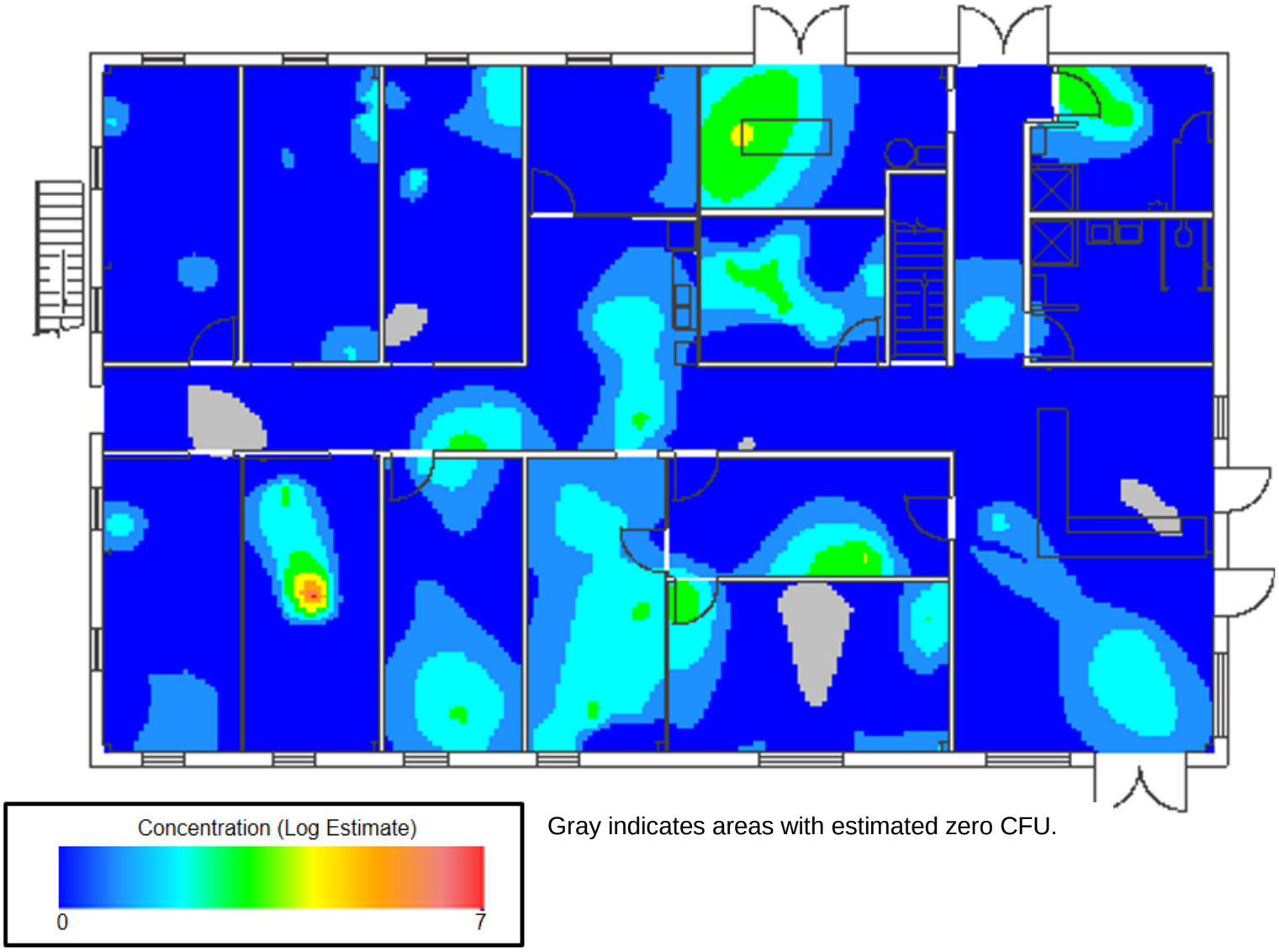
NA=Sample was not filter plated.
ND=Non-detect.
TNTC=Too numerous to count.

Table 4-3. Results from second floor post-decontamination sampling.

Sample ID#	Room	Sample Method	Sampled Surface	Spread Plate Result (CFU/ft^2)	Filter Plate Result (CFU/ft^2)
3640	Mechanical Room	Vacuum Sock	Return Vent	ND	1.0E0
2049	Mechanical Room	Sponge-Stick	Floor	ND	2.2E1
3551	Room 201	Vacuum Sock	Ceiling	ND	1.0E0
2047	Room 202	Sponge-Stick	Floor	ND	3.0E0
2709	Room 203	Sponge-Stick	Floor	ND	3.0E0
1628	Room 206	Swab	Supply Vent	ND	9.0E1
3552	Room 208	Vacuum Sock	Floor	ND	1.0E0
2600	Room 209	Sponge-Stick	Table	ND	6.0E0
3606	Room 210	Vacuum Sock	Chair	2.9E1	1.1E1
1696	Room 210	Swab	Ceiling	3.5E5	ND
3643	Room 211	Vacuum Sock	Ceiling	2.8E1	NA
3702	Room 211	Vacuum Sock	Chair	4.0E0	ND
3546	Room 213	Vacuum Sock	Bed	9.3E1	NA
3547	Room 213	Vacuum Sock	Floor-carpet	ND	1.0E0
2602	Room 213	Sponge-Stick	Cabinet	3.3E2	NA
2347	Room 213	Sponge-Stick	Sink	4.2E2	NA

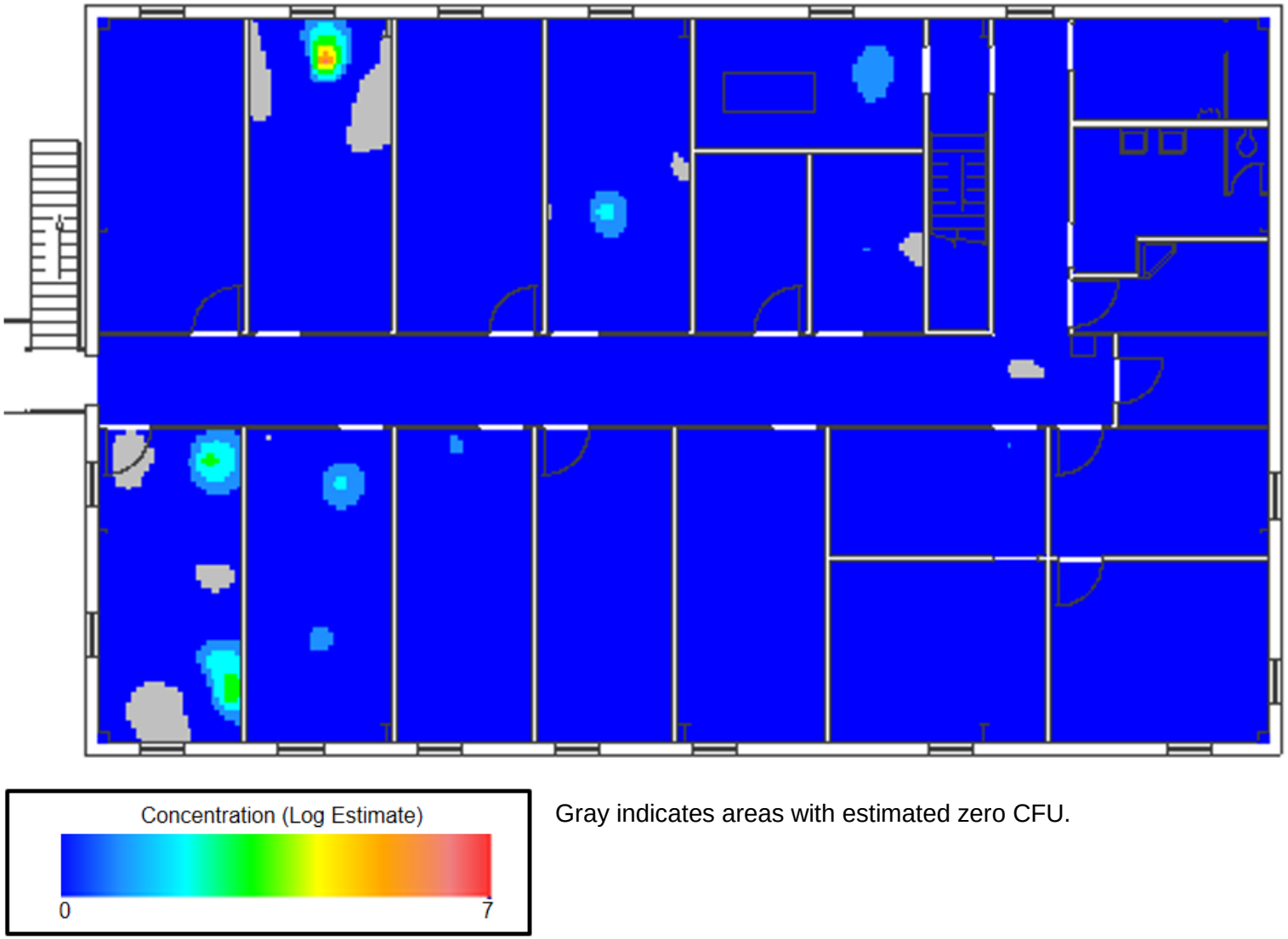
NA=Sample was not filter plated.

ND=Non-detect.



Gray indicates areas with estimated zero CFU.

Figure 4-15. Spatial distribution of first floor post-decontamination in Round 1.



Gray indicates areas with estimated zero CFU.

Figure 4-16. Spatial distribution of second floor post-decontamination in Round 1.

4.1.1.10.3. Decontamination Efficacy

Roughly a third of the samples on the first and second floor resulted in detectable *Bg* after decontamination. The temperature was maintained above the desired set-point throughout the testing. The main condition that was not achieved was the H_2O_2 concentration throughout the facility for the specified amount of time, possibly a result of breakdown or adsorption of the H_2O_2 that was being injected into the facility, poor circulation of the H_2O_2, or simply not enough H_2O_2 was injected. These results indicate that the H_2O_2 exposure was not sufficient to inactivate all the spores at either challenge level (surface loading). One improvement would have been to increase the amount of H_2O_2 that was introduced on each floor by doubling the number of T4 generators or using a larger generator.

4.1.1.11. Materials Effects

A post-test inspection of the building was completed after clearance sampling. Materials that had been placed in the building were inspected for damage. All surfaces and materials retained their original condition and color. Based on this inspection, there did not appear to be any damage to the building contents from exposure to the VHP® process.

4.1.1.12. Summary of Fumigation with VHP®

Fumigation of materials in the laboratory with H_2O_2 has shown the process to be efficacious for inactivation of *Bacillus* spores. There are several advantages with this process because this process does not require the removal of the porous materials from the facility prior to fumigation. Experimental evidence has shown that porous materials can adsorb H_2O_2, thus creating a demand and lowering the immediate concentration of H_2O_2 in a facility. Removal of porous materials like mattresses and thick cushions may have reduced the adsorption of H_2O_2 and resulted in a higher H_2O_2 concentration which could have resulted in a higher efficacy. The aeration time could also have been reduced by the removal of heavy foam products, but leaving the materials in the building would just require a longer aeration phase, as indicated by higher H_2O_2 readings over the mattresses and cushions during the aeration phase. The building did not need to be tarped or modified prior to decontamination. The crew from STERIS was able to complete the project in three days. Another advantage is that after fumigation, the H_2O_2 is broken down into water and oxygen, so there is no need for sorbents or neutralization following fumigation.

The system that was used was not a field-deployable system, but a system designed to be installed more permanently in a facility for routine fumigations. Specialized equipment and experience is necessary to conduct the fumigation with H_2O_2.

A site visit by the STERIS crew would have allowed the crew to familiarize themselves with the facility layout and HVAC design. The HVAC on each floor was used to distribute H_2O_2 throughout the facility (each floor independently). The connection on the bottom floor was not optimized and resulted in a lower H_2O_2 concentration than expected. A higher H_2O_2 concentration may have resulted in a higher degree of inactivation of the *Bg* spores. Another improvement would have been to increase the amount of H_2O_2 that was introduced on each floor by doubling the number of T4 generators or using a higher capacity generator.

Specialized equipment and training is required for the fumigation process using hydrogen peroxide vapor. There are only a couple of companies that have the equipment necessary to carry out the fumigation of a facility. The procurement process time may be an important factor when considering response and recovery preparedness, as well as incident-specific options. There may be large quantities of chemicals that would need to be transported and stored on site; secondary containment measures must be taken to prevent any spills. Any materials in the facility that will confound the decontamination may need to be removed prior to decontamination for the process to be successful. Removal of materials from the facility may require additional personnel and entries in PPE for material removal and treatment of removed material, adding to the labor and waste management costs compared to what was done in this project.

4.1.2. Surface Decontamination Approach using pH-Adjusted Bleach

For the second round of Phase I, a surface decontamination process was utilized.

4.1.2.1. Decontamination Process

The EPA Region 10 START contractor was used to decontaminate the facility using pH-adjusted bleach. This process was directed by EPA Region 1 and ten On-Scene Coordinators, supported by technical experts from EPA's CMAT, formerly the National Decontamination Team and EPA's National Homeland Security Research Center within the Office of Research and Development. The process involved the removal of porous materials for subsequent treatment with pH-adjusted bleach and disposal, followed by spraying all remaining surfaces in the facility with a pH-adjusted bleach solution (amended bleach). During both the removal and spraying, NAMs were used to assist in mitigating airborne *Bg*. This process and the subsequent results are discussed in the following subsections.

4.1.2.1.1. Background and Purpose

In addition to the use of fumigation approaches for facilities contaminated with biological agents, additional readily-available and approved methods are needed to improve the EPA's and the Nation's preparedness for wide area remediation scenarios. Such available methods could include a wide range of technologies (e.g., gases, liquids, foams, gels, ozone, etc.) and would be effective against minimally contaminated to heavily contaminated surfaces.

Decontamination methods other than fumigation have been used previously and included combinations of disposal of contaminated items, vacuuming, and the use of liquid sporicides such as a pH-adjusted bleach solution. For example, a combined set of mechanical and chemical procedures (vacuum, scrub/wash and pH-adjusted bleach) was used successfully in the decontamination of a small wooden shed contaminated with "natural" *B. anthracis* spores originating from animal hides during a drum-making process[1]. Based upon these field results, an effort was undertaken in the EPA laboratory to assess the effectiveness of specific process steps[19]. Understanding the effectiveness and assessing the capability on a field scale would significantly increase EPA's readiness to respond to a wide area release.

4.1.2.1.2. Process Description

The procedures discussed in this chapter are considered the "low-tech" approach. The general strategy of this approach was to bag and remove porous waste materials (i.e., ceiling tile,

mattresses, couches, etc.) and then decontaminate the remaining items and surfaces by spraying with liquid sporicidal chemicals (pH-adjusted bleach) using gas-powered chemical sprayers. Following application of the sporicidal liquid, squeegees and wet-dry shop vacuums were used to collect the excess liquids.

The US EPA Region 10 On-Scene Coordinator was the Incident Commander during the decontamination procedures and directed the EPA START contractors to implement this pH-adjusted bleach decontamination protocol in a manner consistent with what would be undertaken during an actual "anthrax" removal action.

The facility, dissemination, sampling, and sample analysis will be discussed briefly here and are discussed in more detail in Sections 2.1, 2.3, and 2.4, respectively.

4.1.2.1.3. Facility Contamination

On April 25th, 2011, *Bg* spores were disseminated as described in Section 2.3. The dissemination team contaminated both floors of PBF-632 with *Bg* spores. A predetermined amount of *Bg* was disseminated so that a high concentration (approximately 1E4 to 1E6 CFU/ft^2) was dispersed and settled on the first floor, and a lower concentration (approximately 1E2 to 2E2 CFU/ft^2) was dispersed and settled on the second floor. The amount of surface loading was determined from pre-decontamination (characterization) samples collected April 26th and 27th before remediating the building.

4.1.2.1.4. Decontamination Personnel

The crew size was eight individuals consisting of six entry personnel and two support personnel. The crew was part of the EPA Region 10 START. In addition, three support personnel (from EPA's CMAT, the EPA Region 4 On-Scene Coordinator, the EPA Region 1 On-Scene Coordinator) entered the facility and assisted in the decontamination. At a minimum, each crew member had taken a site-specific training program ensuring that workers received the site-specific hazard awareness training they needed to work safely at this site. Training was based on the job hazard analysis in the Health and Safety Plan and other applicable standards. At a minimum the crew members had initial 40-hr (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) and current annual 8-hr refresher training. A minimum of one team member had current first aid and cardiopulmonary resuscitation training. Each crew member had a successful respiratory fit test in the model of mask worn.

4.1.2.1.5. Safety, Health, and Facility Preparation

On April 28 and 29, 2011, during facility preparation, workers wore Level C personal protection which included a full-face air purifying respirator with HEPA filters, liquid chemical resistant gloves, boots, and suit with hood (see Figure 4-17). The respirator, gloves and boots were each taped to the suit using liquid chemical-resistant tape to form a complete barrier. Workers entered from one end of the building and exited through a Decontamination Line, described in Section 2.8, at the other end of the building.

Figure 4-17. Photograph of decontamination personnel suited in Level C PPE.

A roll-off dumpster for the first floor wastes was positioned just outside the personnel Decontamination Line from the building. All the solid waste exiting the first floor was passed through the personnel Decontamination Line, identified as to its source and characteristics, weighed, and then placed in a dumpster. For the second floor, a dumpster was located on the ground just beyond the outdoor stairs at the building entrance so that waste could be ejected from the second floor stair landing directly into the dumpster (see Figure 4-18). Second-floor waste was not weighed and was assumed to be equal to the weighed first-floor waste. Waste handling receptacles were positioned to minimize handling costs and to reduce ergonomic stress.

Figure 4-18. Photograph of dumpster located near the outside stairs, used for second floor waste.

Electrical power to the facility outlets, HVAC and lights was turned off to reduce the risk of electrical shock. The power was locked out according to INL's safety procedure. Auxiliary low-voltage lighting was placed in each room along with cameras and sampling equipment as described in Section 2.1.

NAMs were used to control the flow of air in the facility to manage particulates (spores) that may be reaerosolized during the process and to reduce chlorine gas concentration generated from the pH-adjusted bleach spraying. Each NAM was equipped with HEPA filters (H1990 horsepower (hp) models, Novatek Novair 2000 and Abatement Technologies (Fort Erie, CA)) and each NAM had a low and high setting that corresponded to a nominal 1,000 and 2,000 CFM air flow rate. The NAMs were turned on as soon as the characterization sampling was completed and stayed on throughout the pH-adjusted bleach remediation process, including drying. The NAMs were located outside the structure, including outside the secondary enclosure structure, and a duct was attached from the NAMs to the secondary enclosure structure, then from the secondary enclosure structure to the building using 12-in duct and duct fittings (see Figure 4-19 and Figure 4-20). Flow was directed in one side of the building and out the opposite side of the building for each floor. The layout of the NAM connections to the facility is shown in Figure 4-21 and described in Table 4-4. For each floor and each side of the building, NAMs were connected to the building through one window fitted with a plywood adaptor that replaced the window pane. All air entering the building through the NAMs passed through HEPA filtration to reduce transport of spores into the building, and all air exiting the building through the NAMs passed through HEPA filtration to reduce transport of spores from the building.

Flow rate settings on the NAMs were adjusted to obtain relative negative pressure on the first (high spore contamination) floor, as compared to the second (low spore concentration) floor,

and both floors at negative pressure compared to the outside ambient pressure to reduce the transport of spores from the high concentration areas. The first floor was set to 6,000 CFM (all three NAMs on high) flowing out and 4,000 CFM (one NAM on high and two on low) flowing in. The second floor was set to 6,000 CFM (all three NAMs on high) flowing out and 5,000 CFM (two NAMs on high and one on low) flowing in (all flows are nominal). NAM air inlets on the first floor were on the personnel entry side of the building. NAM air outlets on the first floor were on the exit, Decontamination Line side of the building. Originally the second floor air flow was to be in the same direction as the first floor air flow; however, for logistical reasons the dumpster was located on the entry side of the building so the air flow on the second floor was oriented in the same direction as the waste material flow, out the entry side of the building. NAM air inlets on the second floor were on the personnel exit, Decontamination Line side of the building. NAM air outlets on the second floor were on the entry side of the building. A total of 12 NAMs were used during decontamination, and an additional two NAMs were available as backups. A total of four NAMs were used during the drying phase, all pushing air flow into the facility. This orientation during drying positively pressured the facility to minimize the potential for infiltration of any environmental contamination into the building prior to post-decontamination (clearance) sampling.

The NAM inlets on each floor all entered the building at one location. To distribute the inlet air flow and accompanying pressure, one of the NAMs was allowed to flow into this room while the other two NAM inlets were connected to 12-in ducts, one positioned approximately 1/3 of the way to the other side of the building and the other approximately 2/3 of the way to the other side of the building.

The final orientation of the NAMs during the drying phase is listed in Table 4-4, with corresponding port locations shown in the schematic in Figure 4-21. Three of the NAMs used to pull air during the decontamination phase were reversed to push air into the building for the drying phase. Initially during the drying phase, three ports (LU1, LU2, RD3 and connecting ducts) used for pulling air from the facility during the decontamination phase were then used to push air into the facility during the drying phase. This change in air flow raised the concern that viable spores might have been deposited in the duct during the decontamination phase and subsequently re-contaminated the facility during drying. This orientation was maintained for several minutes until the connections were revised to those shown in Table 4-4. After this correction, only ducts that were previously used for air flow into the facility were used in the drying phase to minimize the risk of recontamination of the facility. Wipe samples were taken from the exhaust flow ducts (LU3 and RD3); both samples came back ND for viable spores. These results and the low probability for deposited spores (if any) in the ducts to suddenly be re-entrained lessened the concern about any potential cross-contamination that may have occurred prior to going to the final NAM orientation used during the drying phase.

Figure 4-19. Photographs of the NAMs during decontamination. Left photo shows the entry side of the facility; right photo shows the far end of the facility (adjacent to the Decontamination Line).

Figure 4-20. Photographs of the NAMs during drying. Left photo shows the entry side of the facility; right photo shows the northeast side of the facility.)

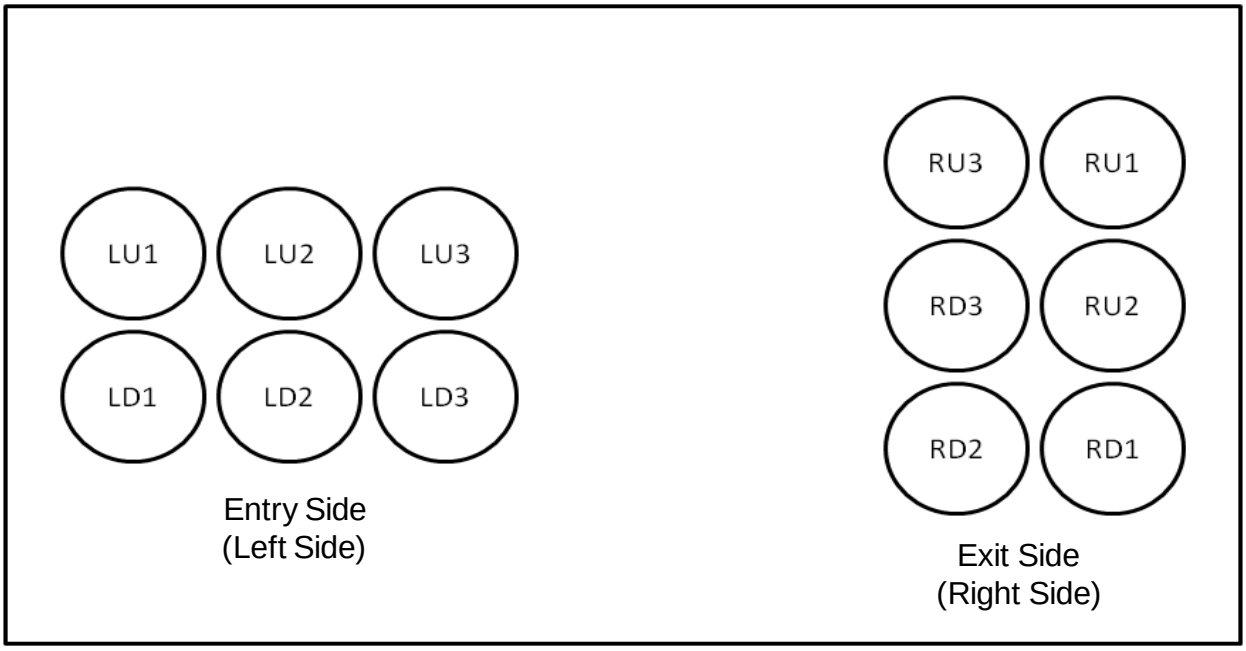


Figure 4-21. Schematic of NAM connections to the facility. Left drawing shows the entry side of the facility; right drawing shows the exit side of the facility. See Table 4-4 for legend.

Table 4-4. NAM ports and direction of flow during decontamination and drying phases.

Entry Side	During Decontamination	During Drying	Exit Side	During Decontamination	During Drying
Upstairs 1 (LU1)	Out	Not Used	Upstairs 1 (RU1)	In	In
Upstairs 2 (LU2)	Out	Not Used	Upstairs 2 (RU2)	In	Not Used
Upstairs 3 (LU3)	Out	Not Used	Upstairs 3 (RU3)	In	In
Downstairs 1 (LD1)	In	In	Downstairs 1 (RD1)	Out	Not Used
Downstairs 2 (LD2)	In	Not Used	Downstairs 2 (RD2)	Out	Not Used
Downstairs 3 (LD3)	In	In	Downstairs 3 (RD3)	Out	Not Used

The pH-adjusted bleach solution consisted of 1 part bleach, 1 part white vinegar, and 8 parts water. The solution was prepared in 50-gal batches and mixed, stored and used in polyethylene 55-gal drums (see Figure 4-22). The solution was monitored using pH paper (Whatman™, Type CF - pH indicator paper, GE Healthcare, Waukesha, WI) to maintain the pH between 6 and 7 (adding bleach or vinegar as needed to obtain desired pH). New batches were mixed as needed. A record of when solutions were mixed was kept to ensure that batches were used within three hours.

Bleach and vinegar were not combined directly together. Water was first added to the bleach (Ultra Clorox® Germicidal, Item# 44600, purchased from The Home Depot, Idaho Falls, ID) blend (2 parts water to 1 part bleach), then vinegar was added (Brand: Oasis Foods White Vinegar, 4% acidity Bar Code: 7-3214611442-5, Item# FVW40HOA). Lastly, the remaining water was added. The mixture was initially found to be too acidic so the formula was adjusted slightly as follows: 5 gal bleach, 4.5 gal white vinegar, and 40.5 gal tap water to make a 50-gal solution of pH-adjusted bleach.

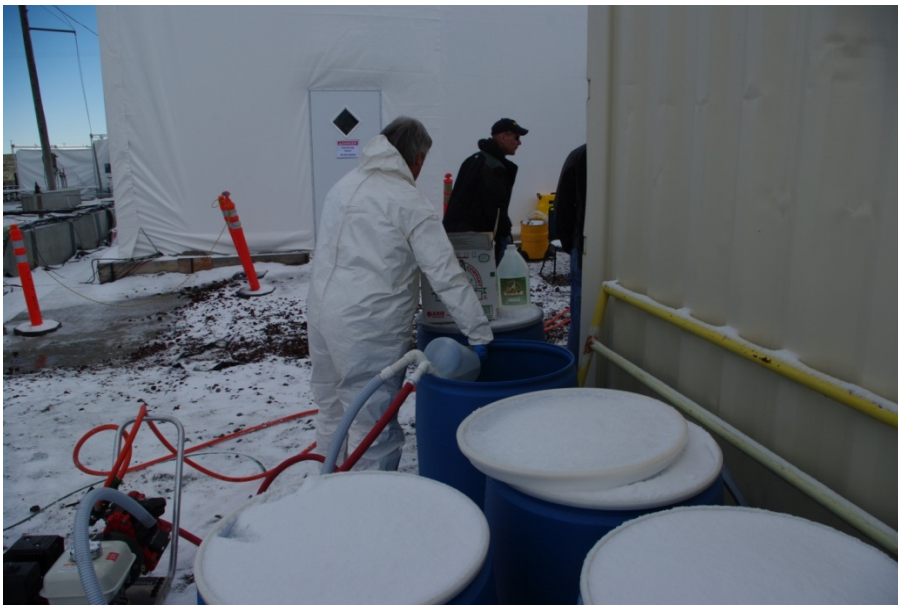


Figure 4-22. Mixing of the pH-adjusted bleach solution in 55-gal drums.

Personal chlorine monitors (Dräger Pac-7000, Pittsburgh, PA) were used to evaluate worker exposure. A monitor was used at the pH-adjusted bleach mixing area to spot test during mixing. Monitors were also worn when workers used sprayers (backpack sprayers, 1 Lpm, Solo® 425 Piston Pump Sprayer, such as from Home Depot, Idaho Falls, ID; and gas powered sprayer, Ultimate Washer, Inc., Jupiter, FL, Pro-Chem Sprayer, 300 psi, maximum 40 Lpm, 6.5-hp Honda engine) (see Figure 4-23 and Figure 4-24) inside the building.

Figure 4-23. Photograph of the Pro-Chem sprayer.

On initial building entry, outer booties were removed to reduce the potential for tracking contamination into the building. A light spray of water with backpack sprayers was used around entryways, doors and door frames. On initial entry into each room or hallway, a light spray of water was also used. This light spray was used only to contain the spores in an attempt to reduce their reaerosolization. The light spray of water was not used as a surface decontamination process.

Upon initial building entry, a walkthrough of the rooms was conducted to ensure that the floor plan was correct, furniture was located in the rooms roughly in the locations noted on the diagrams and to make a video record of the inside of the building. Deviations from diagrams were specifically noted as well as the initial condition of building materials or property. The building and furniture were found as indicated in the diagrams and no adverse material or building conditions were noted.

Figure 4-24. Photographs of the backpack sprayer.

A waste staging area was set up on each floor to handle waste items removed from rooms on that floor. To capture generated particles or chlorine that evolved from the pH-adjusted bleach during the bagging and spraying of waste items, the waste staging area was located near the NAMs outlet for that floor which was also adjacent to the dumpster exit. The waste staging area was sprayed with pH-adjusted bleach using backpack sprayers in preparation for receiving and processing waste items.

To help track time spent in each room and to help track waste handling, one team completed the removal of items, books, papers, computers, printers, lamps, rugs, hand tools, etc., from one room before moving to the next room. A separate team of two was in charge of removing ceiling tiles. Radio frequency identification (RFID) chips (see Section 4.6.2 for more details) specific to certain rooms on the first floor were inserted into each waste bag for waste weight tracking. Items within cabinets and drawers were removed, bagged and handled just as the other items within the room were handled. Upon entering a room, surfaces were lightly sprayed with water using the backpack sprayer, including furniture and all items. After a light spray of all surfaces, most items were bagged (some items needed to be cut into smaller sizes before bagging and some large items were covered in plastic and taped closed) and moved to the waste staging area (see Figure 4-25 as an example). Other nonporous items such as desks, book cases and appliances were left in the room and decontaminated in place when the room was sprayed. At the waste staging area, the bags were opened and items were sprayed using the chemical sprayer, moved within the bags and sprayed to cover all exposed surfaces (see Figure 4-26 for reference). However, the goal was to cover only the surfaces and not leave pools of liquid in the bottoms of bags (the requirement to “not leave pools of liquid” in bags was instituted by INL so that liquid waste limits were not exceeded and may or may not be required in an actual incident. However, in an actual incident the volume of bleach sprayed into waste bags may be much greater, as risks of reinfection will be weighted more heavily than liquid waste minimization). The bags were closed, double-bagged, sprayed between bags before closing the outer bag, and

finally the outside of the second bag was sprayed with pH-adjusted bleach before moving the bag to the dumpster.

Figure 4-25. Photograph of decontamination personnel cutting items into smaller sizes to fit into waste bags for removal prior to spraying the facility.

Figure 4-26. Photograph of decontamination personnel placing porous items into waste bags prior to spraying the facility.

4.1.2.1.6. Special Items

In addition to the other preparatory work, portable steps with wheels and hand rails were placed on each floor to allow easy access for sealing HVAC supply registers and for ceiling tile removal. Ceiling tiles from each room were removed, placed in bags, and moved to the waste staging area. One exception: the men's restroom on the second floor was accessed through a special door in the air lock at the top of the stairs. This room was originally overlooked and had to be decontaminated, including the removal of ceiling tiles, at the very end of the decontamination process. Similarly to the other items that were bagged, some space was left in the ceiling tile bags so that tiles could be separated while they were being sprayed within the bag during processing in the waste staging area. The bags of tiles were double-bagged, sprayed between the inner and outer bag, outer bag sealed and the outside of the bag was sprayed with pH-adjusted bleach before being moved out of the building to the dumpster.

All soft-surfaced items were removed, bagged and moved to the waste staging area. Waste staging area personnel sprayed all surfaces of the items while in their bags, double-bagged, sprayed between bags, sealed the outer bag and then sprayed the outside of the bag before moving the bags to the roll-off dumpster.

A reciprocating saw was used to reduce the size of large soft-surfaced items for easier bagging and handling. Fabrics on furniture were sprayed and bagged, moved to the waste staging area and handled like other items. Sawdust and wood shavings were treated as soft-surfaced items. Carpeting and other contaminated floor coverings (rugs) were sprayed to reduce

reaerosolization, cut into three-ft sections, bagged, moved to the waste staging area where they were sprayed again, double-bagged and disposed of in the roll-off dumpster. Bedding and other fabrics not attached to furniture were treated as soft-surfaced items.

By the end of April 28, all ceiling tiles from both floors had been removed from the ceiling and bagged (with the exception of the ceiling tiles on the second floor men's room), and approximately 80% of the waste material from the second floor had been removed from the building. Removal of waste material from the second floor was completed by mid-morning April 29, and then work began to remove waste materials from the bottom floor. Removal of waste materials from the bottom floor was completed on April 30 at approximately 1015 hr. All waste material removed from first floor was weighed, and the total amount of material removed from the first floor was 3,550 lb (see Section 4.5 for more information). Waste material from the second floor was not weighed, with the assumption that the mass of waste from each floor would be equivalent. Based on this assumption, the total weight of material removed prior to the pH-adjusted bleach decontamination was ~ 7,100 lb. The total volume of waste removed from the building was estimated to be 68 cubic yards, based on having 3.25 dumpsters of material (21 cubic yards per dumpster).

Power to the lights was turned off and lights were treated as hard-surfaced items. Attached light fixtures were swung open as when bulbs are changed and sprayed with a10-min contact time as part of the room decontamination (see Section 4.1.2.1.7). Hard surface furniture was decontaminated in place similarly to the light fixtures. The exterior surfaces were sprayed with pH-adjusted bleach and kept wet for a 10-min contact time. If there was too much furniture in a room, some was removed to another area while decontaminating the room and the remaining furniture. The moved furniture was decontaminated before it was moved back into that room.

Gross decontamination of dirt, grease and grime was not needed for this facility other than the removal of wood shavings and saw dust.

On the morning of April 30th, the decontamination of the return air ducts was conducted using a modified spray nozzle attached to the pH-adjusted bleach chemical sprayer line. This nozzle was constructed of stainless steel and had a 0.048-in diameter orifice and a 90 degree spray pattern in a hollow cone configuration (BETE® nozzle number L48, Greenfield, MA). To prevent snagging and damage to the nozzle, it was suspended off the bottom of the duct by housing it within a 6-in cage made of ½-in polyvinyl chloride pipe. The register duct openings were used as sprayer entry ports for this process. A fifty-ft steel wire pulling tool was used to insert a nylon cord the length of the duct through the duct register openings. On the second floor an additional access point was cut into the duct using an 18-volt reciprocating saw (DeWalt DC385, DEWALT Industrial Tool Co., Baltimore, MD) to aid in inserting the nylon cord in the duct (on the first floor this procedure was not necessary). The nylon cord was tied to the nozzle cage and hand-pulled through the duct while spraying pH-adjusted bleach inside the return duct. To insure a 10-min wetted contact time, the duct was first sprayed while pulling in one direction and then sprayed a second time after 5 min, pulling the nozzle in the opposite direction. A mist was observed escaping from the ends of the duct and liquid was observed dripping from several seams in the duct during the decontamination process.

Supply registers were sealed because the supply side duct contained fiberboard insulation and decontamination using pH-adjusted bleach was assumed to be problematic without first testing in the laboratory. All supply side ducting to the rooms was notionally removed and treated as a waste because the ducts were internally insulated. At the time of testing, a suitable method for decontamination of such ducting had not yet been developed; removal of this ducting was considered more cost-effective than attempting to decontaminate it in place with pH-adjusted bleach. The supply registers remained sealed for the remainder of Round 2.

4.1.2.1.7. pH-Adjusted Bleach Building Decontamination Procedure

On the afternoon of April 30th, PPE was upgraded to Level B by replacing the Powered Air Purifying Respirators with self-contained breathing apparatus and supplied airline respirators (see Figure 4-27). Air was supplied to the air-line respirators by an EPA Region 10 Level A support truck. The truck was outfitted with a cascade air system consisting of four 6,000 psi air tanks connected in series. The system was designed to be able to support four personnel working for eight hours, as well as refilling self-contained breathing apparatus tanks in preparation for the expected high chlorine air concentrations during facility decontamination (spraying with pH-adjusted bleach). All other PPE was kept the same.

On each floor, the pH-adjusted bleach decontamination process started on the side of the building where the fresh air entered and moved from room to room until the last rooms were sprayed with pH-adjusted bleach on the side of the building where the air exited the building. The building HVAC system was off during the entire time of the pH-adjusted bleach spraying process. The chemical sprayer was used for this task and all the spraying tasks that followed from this point. The chemical sprayers produced 40 times more flow rate than the backpack sprayers and increased productivity proportionally.

On this date, a very light spray of pH-adjusted bleach was used down the hall floor prior to entering the rooms and then sprayed on surfaces on entering a room to keep reaerosolization to a minimum. Upon entering a room, checks were made to ensure that the ceiling tiles had been removed, the HVAC supply register had been sealed, all waste items had been removed, and excess furniture had been removed before starting the decontamination of the room.

Many surfaces may have been sprayed during the entry into the room and when processing items; however, this spray during room entry was not part of the building decontamination process.

The goal of the decontamination process was to spray all surfaces (using the gas powered chemical sprayer) with pH-adjusted bleach to achieve a 10-min contact time on all surfaces. The flowrate from the Pro-Chem sprayer was approximately 3 gallons per minute (gpm). The flowrate from the Solo backpack sprayer was approximately 1.3 Lpm. The initial plan was to spray all surface areas completely (building structure ceiling, walls and floor, lights, and remaining furniture including internal spaces such as desk drawers) in 5 min. Then those same surfaces were to be re-sprayed, again taking approximately 5 min to complete the reapplication, keeping the surfaces wetted for 10 continuous min. Each room was thoroughly wetted after just one application and remained wetted for 10 min, so a second spraying was not administered in

every room. (The time required to spray each room was typically 10-20 min). The spraying process went room by room until every surface in the entire floor had received a 10-min wet pH-adjusted bleach contact time. A sample photograph of the pH-adjusted bleach spraying using the chemical sprayer can be seen in Figure 4-28.

Figure 4-27. Photograph of decontamination personnel ready to enter building with self-contained breathing apparatus and supply air line respirators

Figure 4-28. Photograph of pH-adjusted bleach spraying using the chemical sprayer.

For each floor, two personnel (equipped with supplied air line respirators) each operated a separate hose from the chemical sprayer to apply the pH-adjusted bleach so that four hoses were operated from the two chemical sprayers. There were instances where the pressure was too low and adjustments had to be made to the pressure regulators of the sprayers. Each floor also had a “leader” (equipped with self-contained breathing apparatus, which provided air for about an hour) to assist with any issues.

When the spraying of the rooms was completed, the hallway and exit area used for removing waste and moving hoses was sprayed with pH-adjusted bleach similarly to the rooms. The building was left overnight in this wet condition. A total of 505 gal of pH-adjusted bleach was sprayed that afternoon, and approximately 70 gal of prepared pH-adjusted bleach went unused.

Workers exited the building through the Decontamination Line as discussed in Section 2.8. Several instances of skin irritation were reported by workers conducting the pH-adjusted bleach spraying. The affected individual was immediately checked out by on-site paramedics, treated and released from the aid station. There were no reports of inhalational exposures to chlorine, but the skin irritation reports indicate that breaches in the PPE ensemble may have caused exposure to liquid pH-adjusted bleach. Better quality taping of the ensemble, better selection of suit size, the addition of a splash protection hood, or changes in the spraying process to reduce the stress on ensemble seams may be indicated by these skin exposures.

At the end of April 30, one room (the men’s bathroom) on the second floor, a room that could be accessed only through the air lock system, had not been processed as the other rooms had been processed. The ceiling tiles in this area had not been removed; there were no other “soft” items in that room. Plans were adjusted to address decontaminating this room on the following morning with several other final decontamination tasks. To save time and not delay the drying

process, the decision was made to spray this room with ceiling tiles in place. In this room, several ceiling tiles were removed so that the space above the drop ceiling could be sprayed from below. In addition, this space was sprayed from the adjacent room.

The next morning, May 1st, the furnace room, men's bathroom, air lock, and space between the building and secondary enclosure were sprayed with pH-adjusted bleach using the chemical sprayer. A total of 65 gal of pH-adjusted bleach was sprayed that morning (with ~35 gal left unused). Following the spraying process, wet/dry shop vacuums fitted with HEPA filters were used to pick up all standing water from floors and other horizontal surfaces. Areas inside furniture, such as drawers and shelves, were emptied or wet-vacuumed as needed to remove standing liquids. As needed, the wet vacuums were emptied into 55-gal lined drums. Waste liquids inside the building were transferred to drums outside the building using a sump pump (see Figure 4-29). A total of 105 gal of waste liquid was collected from the building (see Figure 4-30). In a response where clearance sampling is not required immediately following decontamination, natural drying may be used and the need for and associated costs for wet vacuuming, fans, heaters and additional ventilation may be modified.

Figure 4-29. Photograph of decontamination personnel operating the sump pump to transfer pH-adjusted bleach runoff collected inside the facility to the exterior of the structure.

Figure 4-30. Photograph of the pH-adjusted bleach runoff collected by wet vacuuming one day after the spray procedure.

The NAMs remained on during the decontamination and drying processes. During the drying process, two NAMs on each floor were used to push air into the facility to maintain positive pressure in the facility and promote air exchange (exfiltration) to enhance the drying process.

In addition to having the NAMs move air through the building, in the afternoon of May 1, 16 small household box fans and four Patron® 30,000 Btu/hr heaters (see Figure 4-31) were placed in the building and turned on at 1730 hr. The box fans were distributed evenly, eight on each floor to help circulate air in the rooms to help the drying process which was scheduled for three days. All four heaters were placed on the first floor. Box fans and heaters were turned off May 4 at 1000 hr. Temperature and RH data were collected during the drying process and data are plotted in Figure 4-32 though Figure 4-35. Ambient RH for May 1, 3, 4, and 5 was 48, 44, 26, and 48%, respectively. From the RH data (Figure 4-34 and Figure 4-35) after the initial high reading on the afternoon/evening of May 1, the RH data were evidently below the ambient RH readings. These data showed the effectiveness of the drying process and higher temperatures on indoor RH.

After drying and upon re-entry, the laminated and wood flooring demonstrated noticeable swelling (sufficient to require replacement if it were in an actual residence). Bleach residue was noticeable on horizontal surfaces but no appreciable damage was caused by the residue.

Figure 4-31. Photograph of the four heaters used to heat the facility during the pH-adjusted bleach post-decontamination drying phase.

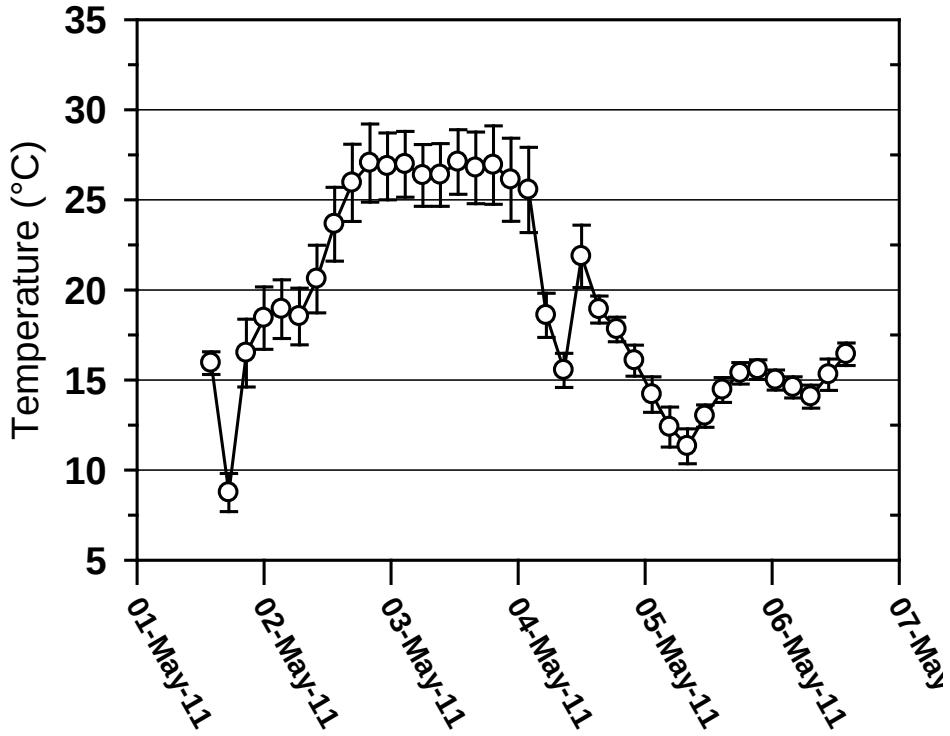


Figure 4-32. Average first floor temperatures recorded by 17 HOBO® data loggers dispersed throughout the rooms during the post-decontamination drying phase of the pH-adjusted bleach round. Facility drying began on May 1, 2011, with the activation of internal heaters and circulation fans. Fans and heaters were deactivated on May 4, 2011. Post-decontamination surface sampling commenced on May 5, 2011.

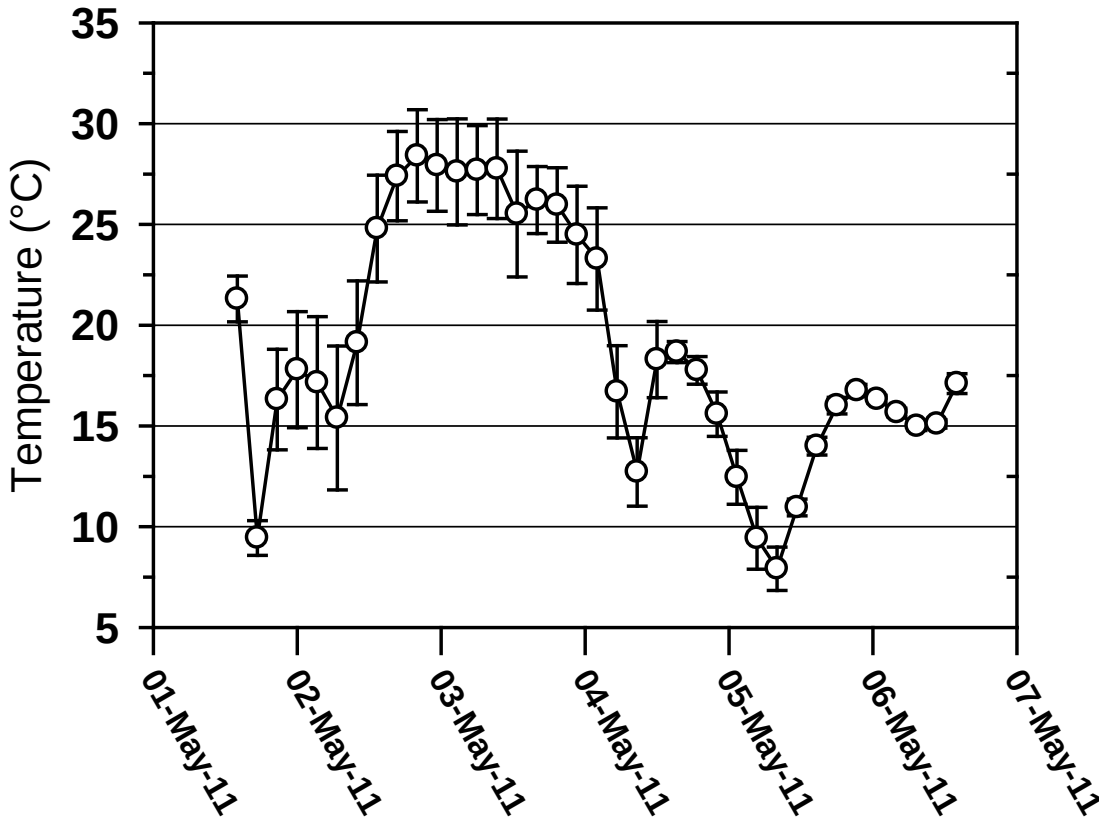


Figure 4-33. Average second floor temperatures recorded by 18 HOBO® data loggers dispersed throughout the rooms during the post-decontamination drying phase of the pH-adjusted bleach round. Facility drying began on May 1, 2011, with the activation of internal heaters and circulation fans. Fans and heaters were deactivated on May 4, 2011. Post-decontamination surface sampling commenced on May 5, 2011.

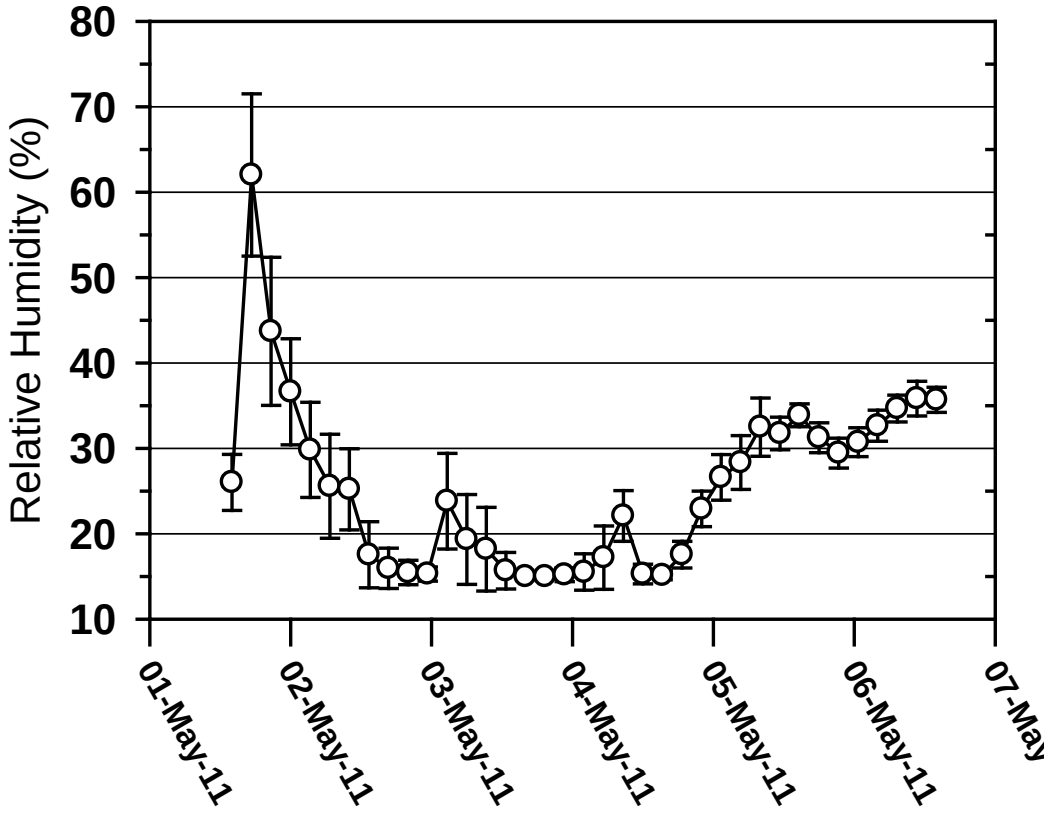


Figure 4-34. Average first floor RH recorded by 17 HOBO® data loggers dispersed throughout the rooms during the post-decontamination drying phase of the pH-adjusted bleach round. Facility drying began on May 1, 2011, with the activation of internal heaters and circulation fans. Fans and heaters were deactivated on May 4, 2011. Post-decontamination surface sampling commenced on May 5, 2011.

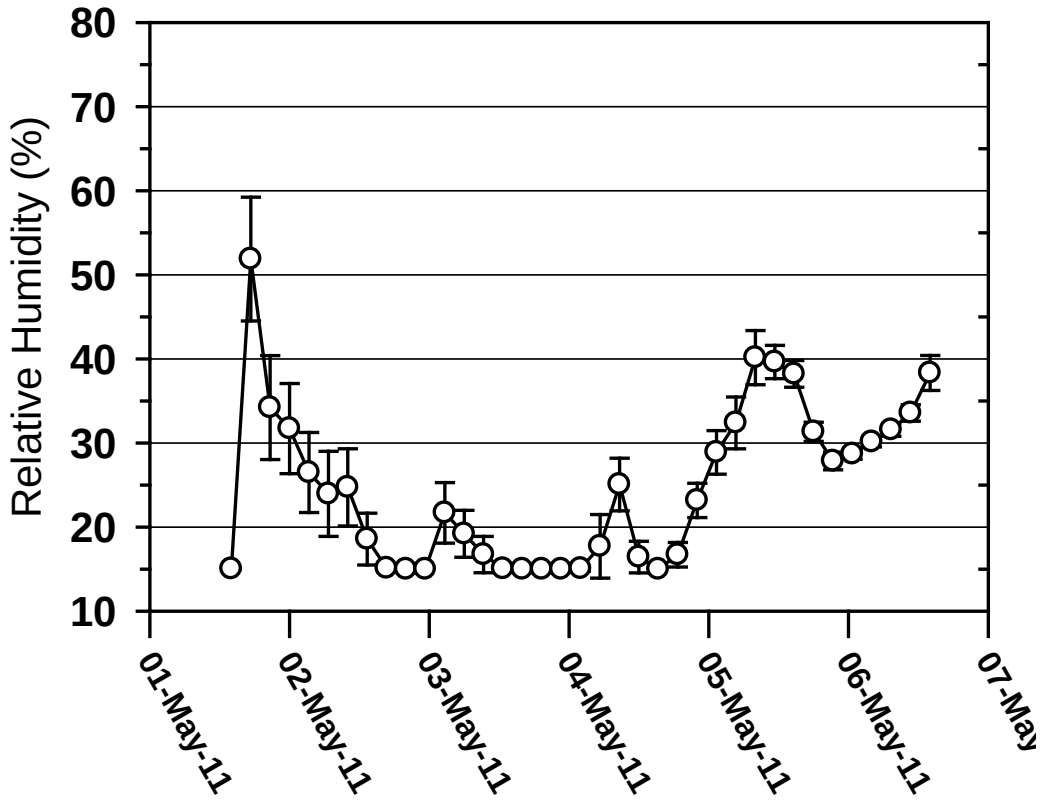


Figure 4-35. Average second floor RH recorded by 18 HOBO® data loggers dispersed throughout the rooms during the post-decontamination drying phase of the pH-adjusted bleach round. Facility drying began on May 1, 2011, with the activation of internal heaters and circulation fans. Fans and heaters were deactivated on May 4, 2011. Post-decontamination surface sampling commenced on May 5, 2011.

4.1.2.1.8. pH-Adjusted Bleach Building Decontamination Procedure Logistics

After completion of the pH-adjusted bleach facility decontamination, several logistical advantages and disadvantages of this procedure were apparent. This method requires no major facility modifications prior to decontamination. No tenting or temperature/humidity control is required during the procedure, although low temperature and high humidity may delay drying of the facility and therefore its return to service. Bleach and vinegar are readily available from multiple sources, so it is unlikely that decontaminant procurement would delay a response. Sprayers, whether back-pack or electric/gas powered chemical sprayers, are also readily available at typical local stores. In addition, highly specialized laborers are not required to perform the procedure. However, HAZMAT-trained personnel with minimal on-site training may be required due to the chlorine off-gassing. This procedure is labor-intensive and does require numerous personnel. It is also difficult to ensure complete wetting of all surfaces in complex

spaces, such as the space above the ceilings which contains a multitude of support beams, electrical conduits, HVAC ductwork, and other structures. Person-to-person technique may vary, resulting in differences in surface spray coverage. The spraying procedures required by the pH-adjusted bleach method were physically taxing on personnel due to the strenuous activities being performed in PPE. This strenuous activity places additional stress on PPE, particularly on the seams where respirators, gloves, and boots were attached to the suit. Additional care in taping PPE seams should be exercised and monitored. The need for Level B PPE to protect from inhalation hazards associated with chlorine gas introduces additional logistical requirements. In addition, some of the components of this procedure were difficult to complete. For instance, some of the furniture was challenging to section with the reciprocating saw, especially while in PPE. Springs within couches and chairs were difficult to cut as they moved freely with the reciprocating blade, and the foam padding in these items frequently jammed the teeth of the saw blades, rendering them ineffective. Bagging large items such as a mattress and cubicle walls was also challenging. The procedure also required significant amounts of planning and coordination prior to deployment. Numerous pieces of specialized equipment were required for this procedure (i.e., compressed air for respirators, NAMs, gas-powered sprayers, backpack sprayers, heaters, sump pump, large drums for mixing bleach, etc.). Overall, the procedure was feasible and was administered in the allotted time.

4.1.2.2. pH-Adjusted Bleach Decontamination Results

Surface samples were collected prior to and following decontamination so that full-facility surface inactivation efficacy could be evaluated. This section presents the results of the pH-adjusted bleach decontamination evaluation.

4.1.2.2.1. Collection and Analysis Procedures for Surface Samples

Characterization sampling prior to decontamination included 312 surface samples (222 sponge-sticks, 58 vacuum socks, 32 swabs) sent to eight LRN labs for processing and analysis. Surface sampling following decontamination included 269 samples (253 sponge-sticks, 14 vacuum socks, and two swabs). Of the pre-decontamination samples, 41 were field blanks and 271 were test samples. Twenty-five of the post-decontamination samples were field blanks and 244 were test samples. More information on the surface sampling and analysis methods can be found in Section 2.5.3 (sampling methods), Section 2.9.1 (sample analysis), and Section 3.2.1 (surface sampling results).

4.1.2.2.2. Sampling Results

Characterization (pre-decontamination) sampling was conducted April 26 and 27, 2011. Decontamination of the facility was conducted on April 30 and May 1, 2011. Following a three-day drying period, post-decontamination sampling commenced on May 5, 2011. Swabs, sponge-sticks, and vacuum sock samples were collected from various surfaces and structures not removed from the building during the decontamination procedures. Details of sample locations are described in Section 3.2.1. This section describes the results of the pre- and post-decontamination sampling that occurred during the pH-adjusted bleach decontamination.

4.1.2.2.2.1. Field Blanks

Field blank samples were collected during each sampling campaign to determine the potential for background contamination of sampling media. Contamination could occur during sample handling in the field or in the laboratory during sample processing. Of the 66 field blank samples collected during Round 2, two (one pre-decontamination and one post-decontamination) samples resulted in detectable *Bg*. These results do demonstrate the ability of samples to become contaminated with the test organism during sample handling or manipulation. Overall, because a small portion (3%, this round) of the field blanks resulted in detectable *Bg*, erroneous contamination is not expected to affect the interpretation of the test results negatively.

4.1.2.2.2.2. Pre-Decontamination Sampling

Of the 271 pre-decontamination test samples collected, nine were ND (no viable spores recovered for either spread plate or filter plate analyses) (). One of these nine (Sample ID# 2830) was from the highly contaminated first floor (Room 107), while the remaining eight samples were from the less contaminated second floor. The remaining 262 samples indicated that the building contamination level varied widely as recoveries ranged from 1 CFU to “TNTC”. Overall, contamination levels were higher than the target levels of 1E2 CFU/ft^2 on the second floor, and consistent with the target of 1E6 CFU/ft^2 on the first floor (Figure 4-36 and Figure 4-37). A more detailed description of the pre-decontamination sampling results is presented in Section 3.2.1. The complete set of pre- and post-decontamination sampling data is presented in Appendix G.

Table 4-5. Negative surface samples collected after spore dissemination, yet prior to decontamination with pH-adjusted bleach.

Sample ID#	Floor	Room	Sample Method	Blank	Sampled Surface	Spread Plate Result (CFU)	Filter Plate Result (CFU)
1564	2	208	Swab	No	Monitor	ND	ND
1644	2	212	Swab	No	Monitor	ND	ND
2122	2	Hallway	Sponge-Stick	No	HVAC Supply Vent	ND	ND
2224	2	212	Sponge-Stick	No	Wall	ND	ND
2309	2	208	Sponge-Stick	No	Wall	ND	ND
2588	2	206	Sponge-Stick	No	Table	ND	NA
2598	2	205	Sponge-Stick	No	Wall	ND	NA
2830	1	107	Sponge-Stick	No	Table	ND	ND
2837	2	210	Sponge-Stick	No	Wall	ND	NA

NA= sample was not analyzed via this analysis method.
ND = not detected.

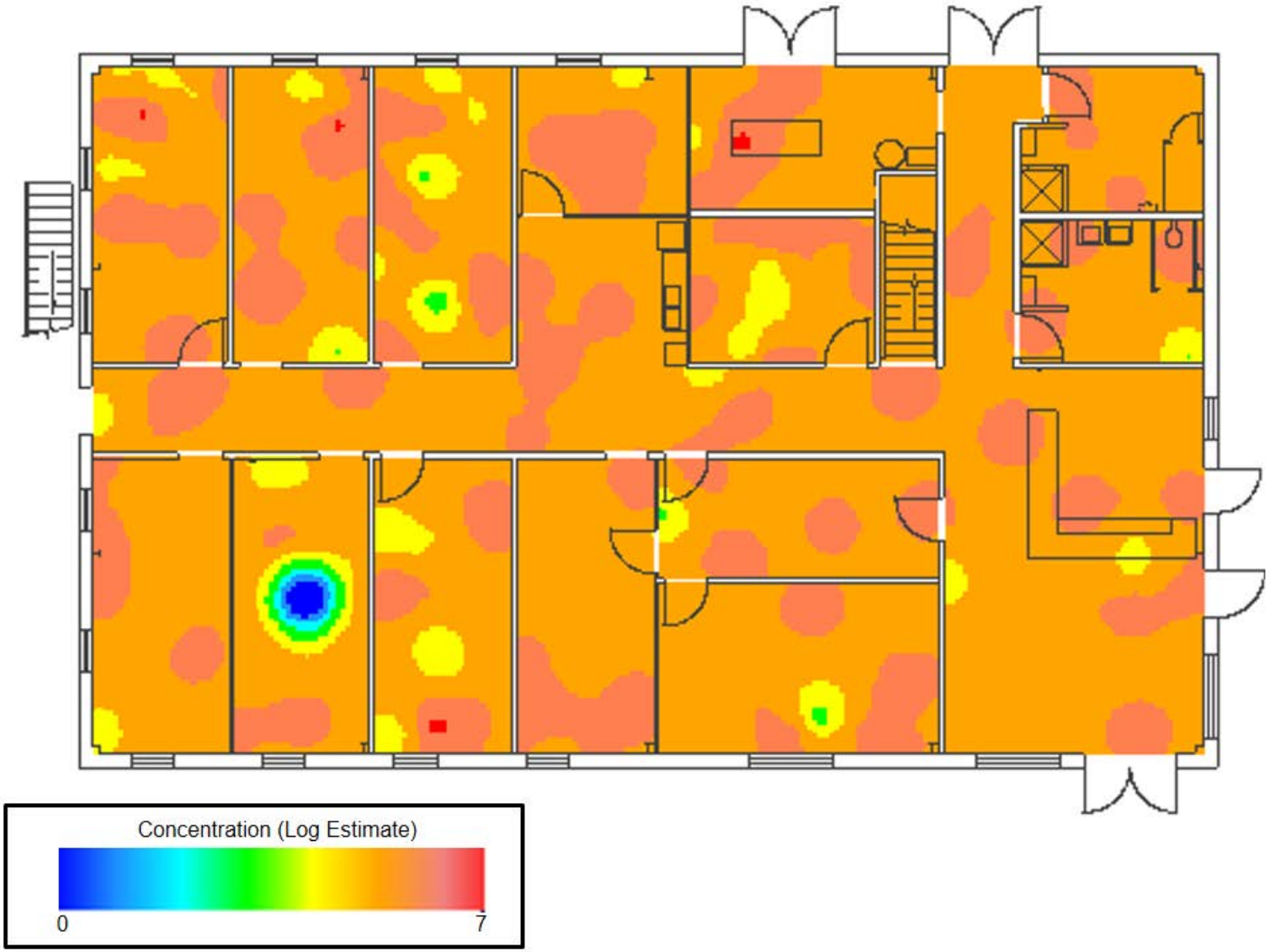


Figure 4-36. Spatial distribution of first floor pre-decontamination characterization sample results.

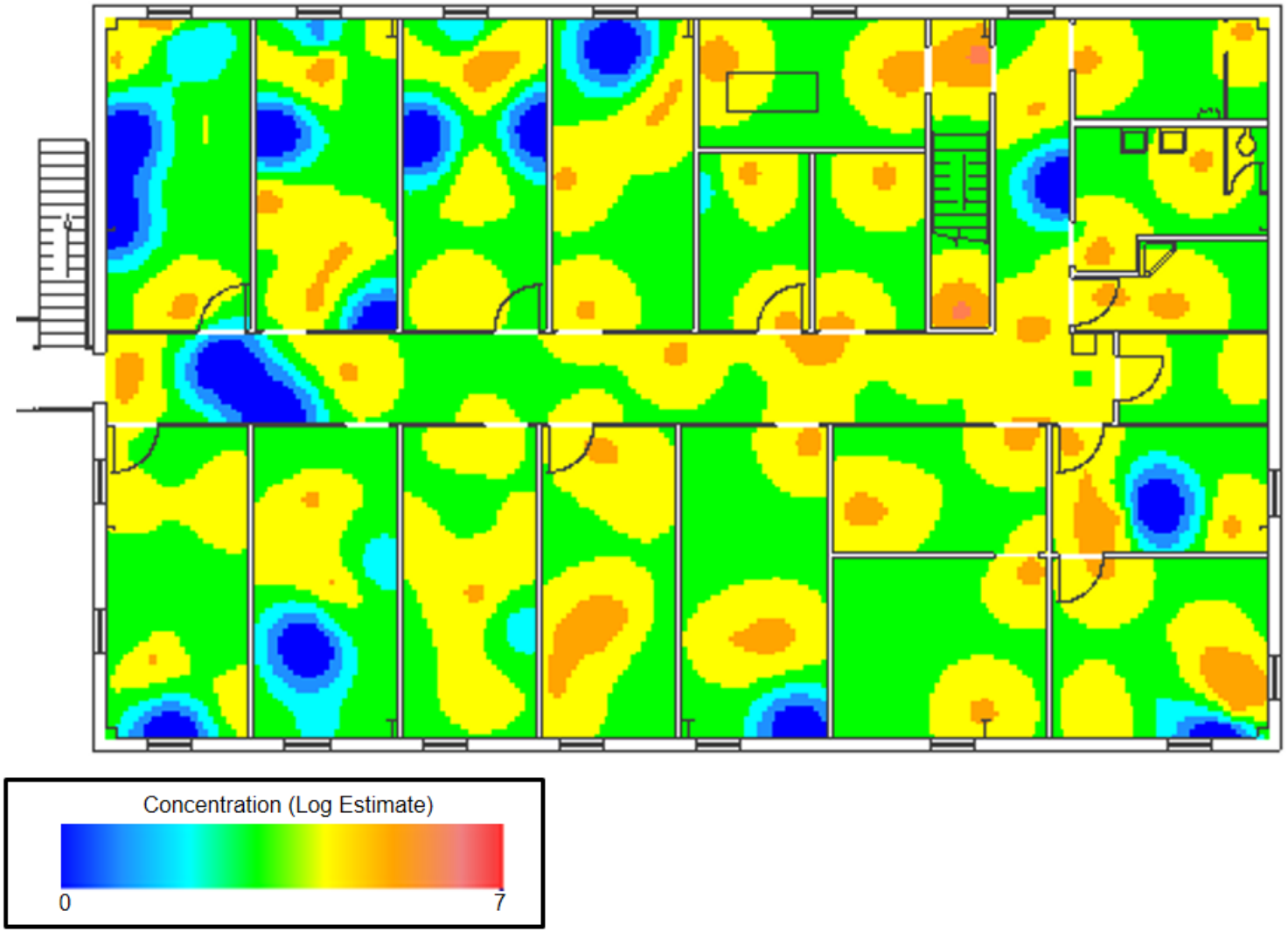


Figure 4-37. Spatial distribution of second floor pre-decontamination characterization sample results.

4.1.2.2.3. Decontamination Efficacy

Surface samples were collected prior to and following decontamination so that full-facility surface inactivation efficacy could be evaluated. This section contains the results from the decontamination of PBF-632 using a pH-adjusted bleach process.

4.1.2.2.4. Surface Decontamination Results

Of the 244 post-decontamination samples, only eight resulted in detectable *Bg* (viable spores detected by either spread plate or filter plate analysis) (Table 4-6). All eight of these samples were collected from floor surfaces; seven were collected by sponge-stick, one was collected by vacuum sock. Seven of the eight samples with detectable *Bg* were collected from the second floor, which received the lower initial spore contamination level (~1E2/ft^2).

The results suggest that decontamination of surfaces with pH-adjusted bleach was highly efficacious on the first floor and moderately efficacious on the second floor (despite the lower spore load on the second floor, see below). Overall, only 3.2% of samples collected following decontamination resulted in the recovery of viable spores. This percentage is comparable to the field blank detection rate for Round 2 (two of 66 samples, 3.0%). Recovery of viable agent from these eight samples was low, suggesting that, even in these areas with detectable *Bg*, contamination was significantly reduced by the complete decontamination process.

Seven of the eight samples showing detectable *Bg* from non-blank samples were collected from the second floor, which received the lower initial spore contamination level (1E2 to 2E2 per ft^2). Individual sampling results are shown in Figure 3-13 and Figure 3-14; spatial distribtions are shown in Figure 4-38 and Figure 4-39. All eight post-decontamination samples showing detectable *Bg* were collected from the floor, not surprising as horizontal surfaces were expected to receive a higher contamination level than vertical surfaces, and floors constituted a majority of the horizontal surface area sampled. The only sample from the first floor with detectable *Bg* (#3085) collected after decontamination yielded 16 CFU from the spread plate method, yet zero CFU from the filter plate method. This result is unexpected because the filter plate method theoretically provides a lower limit of detection. We are unsure of the cause of this anomaly. The locations of the eight post-decontamination second floor samples with detectable *Bg* appear to be random. We were unable to attribute the cause of their location to proximity to in-room supply ducts, to the amount of pH-adjusted bleach used on the second floor compared to the amount used on the first floor, nor to proximity to exterior walls, electrical outlets, halls or walkways, nor to furniture remaining in the rooms (Figure 4-38 and Figure 4-39). One hypothesis for the second floor results is related to the men's restroom being decontaminated a day after all the rest of the building was decontaminated. The original decontamination plan called for starting the spraying at the fresh air end of the building (where the NAMs supplied fresh air into the building) and decontaminating each room in sequence moving from the fresh air inlet side of the building to the air outlet side so that any spores resuspended in the process would travel to the exit side of the building, which had not yet been decontaminated. However, the men's restroom on the second floor was on the air inlet side of the building. If any spores were resuspended during the men's room decontamination, they would be pulled toward the air exit and potentially re-contaminate the second floor in a random pattern.

Table 4-6. Surface samples with detectable *Bg* collected following decontamination with pH-adjusted bleach.

Sample ID	Floor	Room	Sample Method	Blank	Sampled Surface	Spread Plate Result (CFU)	Filter Plate Result (CFU)
3085	1	Men's Bathroom	Sponge-Stick	No	Floor	1.6E1	ND
2751	2	207	Sponge-Stick	No	Floor	ND	6.0E0
2305	2	201A	Sponge-Stick	No	Floor	ND	3.0E0
2529	2	206	Sponge-Stick	No	Floor	ND	3.0E0
3949	2	212	Vacuum Sock	No	Floor	ND	3.0E0
2733	2	203	Sponge-Stick	No	Floor	ND	3.0E0
2525	2	209	Sponge-Stick	No	Floor	ND	2.0E0
2611	2	210	Sponge-Stick	No	Floor	ND	2.0E0

ND = not detected.

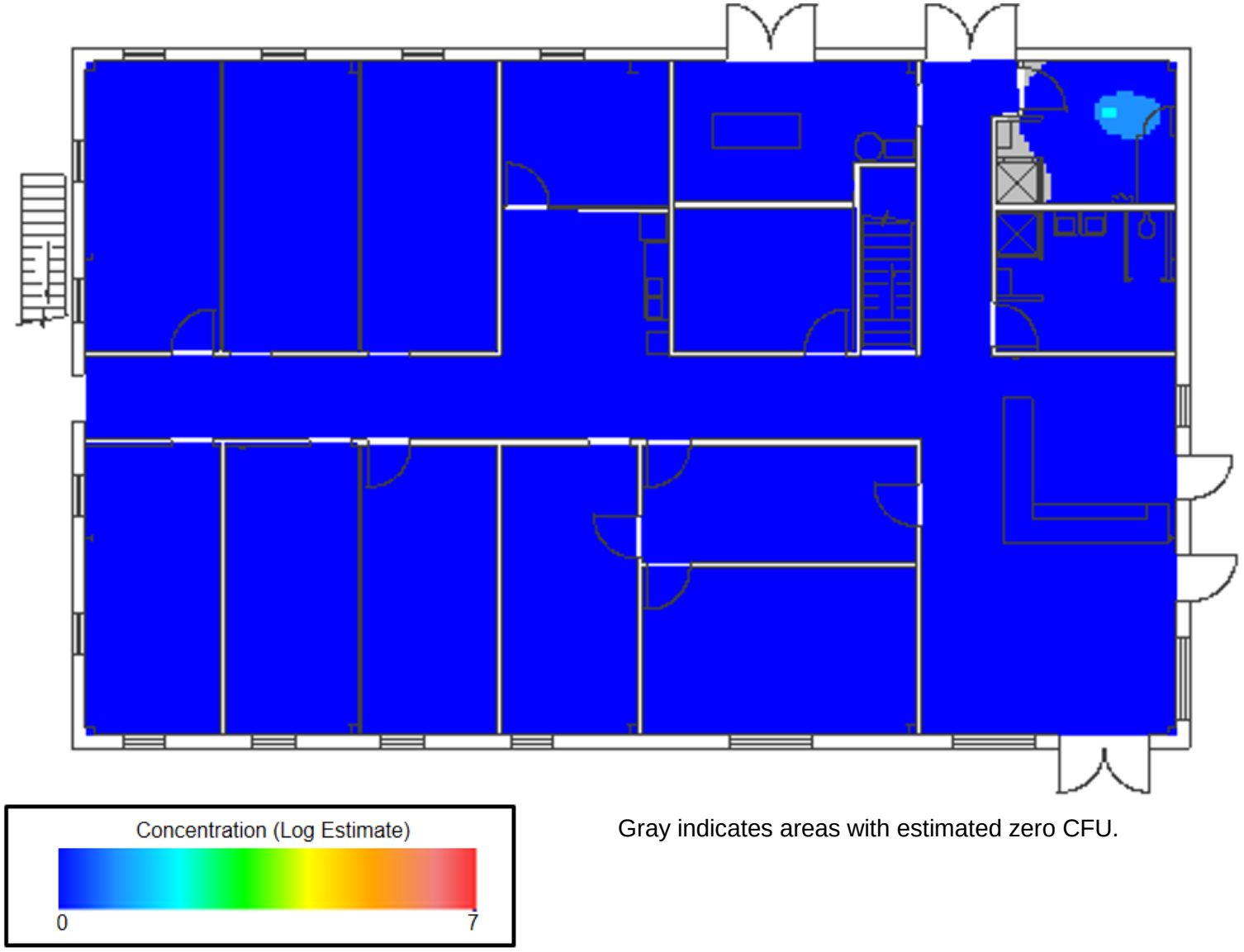
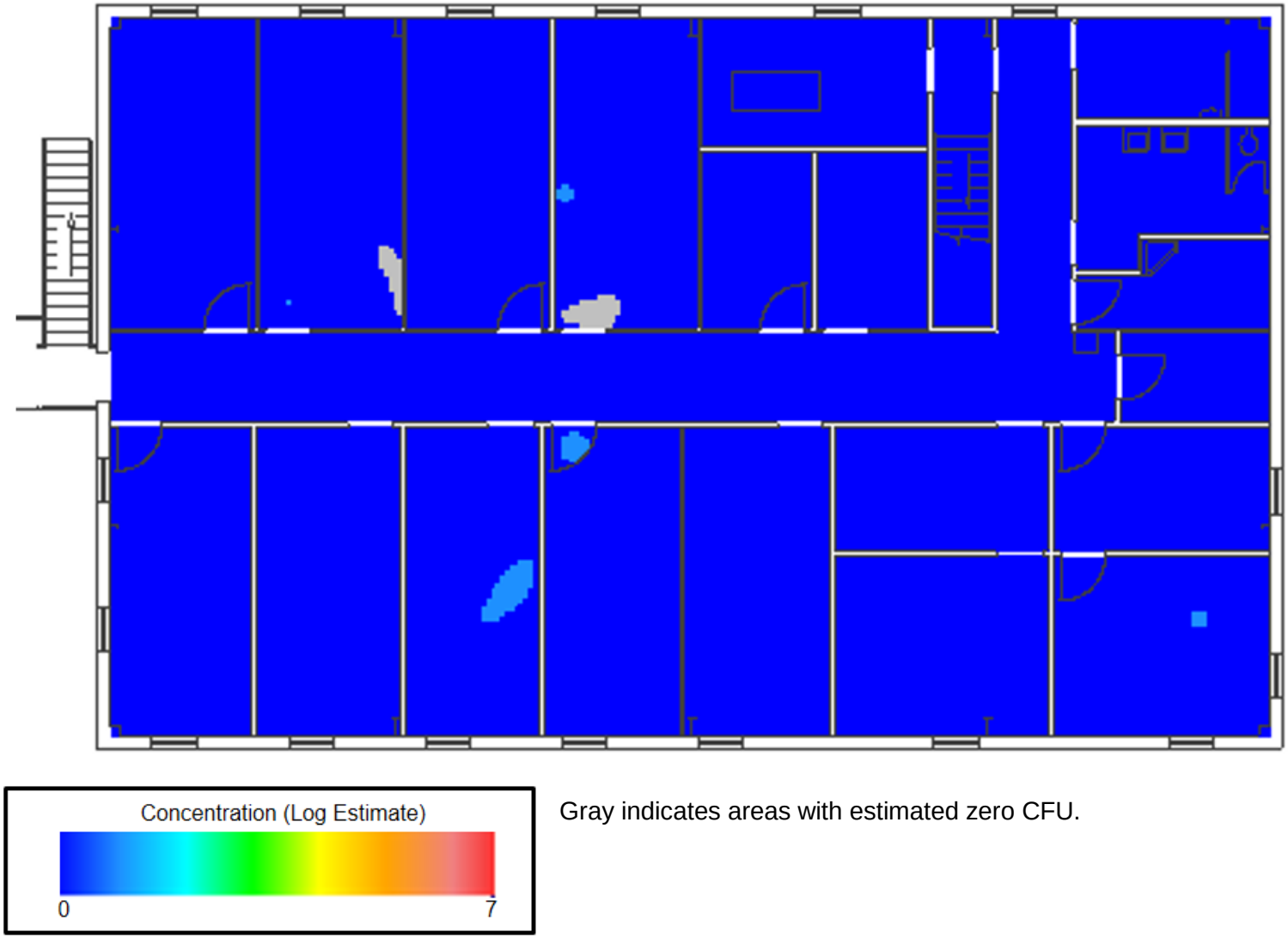


Figure 4-38. Spatial distribution of first floor post-decontamination in Round 2.



Gray indicates areas with estimated zero CFU.

Figure 4-39. Spatial distribution of second floor post-decontamination in Round 2.

4.1.2.2.5. HVAC Decontamination Results

Fifteen of the 17 samples collected from the HVAC system surfaces prior to decontamination resulted in detectable *Bg* (Table 4-7). Surface samples collected post-decontamination from areas determined to be highly contaminated before decontamination (furnace filter and return duct) suggested that no viable spores were recovered. These data suggest that the interior decontamination procedure for the HVAC system was highly effective. Consistent with other surface samples, no viable spores were recovered from any supply air vents at the termini of each supply line. These surfaces were covered with plastic, and the exterior surfaces of this plastic were decontaminated by the general spray procedure and not subjected to the targeted HVAC system decontamination procedure.

Five post-decontamination samples were collected from HVAC components, three on the first floor and two on the second floor. All five samples resulted in no viable spores recovered from the HVAC surfaces (see Table 4-8). Post-decontamination sampling was not conducted inside the HVAC supply duct. The supply duct was sealed prior to the pH-adjusted bleach decontamination procedure. The removal and disposal of the supply duct was notionalized, so the supply duct was not sampled following decontamination.

Table 4-7. HVAC surface samples collected after dissemination, yet prior to decontamination with pH-adjusted bleach.

Sample ID#	Floor	Room	Sample Method	Sampled Surface	Spread Plate Result (CFU)	Filter Plate Result (CFU)
1631	1	Hallway near Building Entry	Swab	Inside Return Duct	4.0E4	TNTC
2378	2	Hallway near Building Entry	Sponge-Stick	Inside Return Duct	4.0E3	ND
2490	1	Hallway near Building Exit	Sponge-Stick	Inside Return Duct	3.2E5	NA
2668	2	Hallway near Building Exit	Sponge-Stick	Inside Return Duct	1.3E4	ND
3683	1	Mechanical Room	Vacuum Sock	Furnace Filter	7.8E6	TNTC
3946	2	Mechanical Room	Vacuum Sock	Furnace Filter	3.2E4	NA
1495	1	Room 105	Swab	Supply Vent	4.4E4	TNTC
1526	2	Room 210	Swab	Supply Vent	1.9E3	TNTC
1528	2	Room 206	Swab	Supply Vent	NA	NA
1553	1	Room 110	Swab	Supply Vent	3.3E4	TNTC
1593	2	Room 207	Swab	Supply Vent	2.4E3	TNTC
1599	2	Room 212	Swab	Supply Vent	5.5E2	3.8E2
1625	2	Room 208	Swab	Supply Vent	1.8E3	ND
1645	1	Room 106	Swab	Supply Vent	7.2E3	TNTC
1665	1	Room 107	Swab	Supply Vent	6.0E3	NA
2270	1	Corridor + Lobby	Sponge-Stick	Inside Return Duct	2.0E5	NA
2122	2	Hallway	Sponge-Stick	Supply Vent	ND	ND

NA= sample was not analyzed via this analysis method; Sample 1528 was not shipped for analysis (reason unknown).
ND = not detected.
TNTC = too numerous to count.

Table 4-8. HVAC surface samples collected following decontamination with pH-adjusted bleach.

Sample ID	Floor	Room	Sample Method	Sampled Surface	Spread Plate Result (CFU)	Filter Plate Result (CFU)
4032	1	Mechanical Room	Vacuum Sock	Furnace Filter	ND	ND
3166	1	Hallway near Building Entry	Sponge-Stick	Inside Return Duct	ND	ND
2732	1	Hallway near Building Exit	Sponge-Stick	Inside Return Duct	ND	ND
2785	2	Hallway near Building Entry	Sponge-Stick	Inside Return Duct	ND	ND
2666	2	Hallway near Building Exit	Sponge-Stick	Inside Return Duct	ND	ND

ND = not detected.

4.1.2.2.6. Data Limitations

Forty-eight samples resulting in less than 30 CFU during the spread plate procedures were not subjected to the prescribed filter plating, a method with a lower limit of detection. While it is unlikely that obtaining the filter plate data from these samples would greatly change the efficacy results, more post-decontamination samples detectable for *Bg* may have been discovered if the additional analysis had been conducted.

Consistent with the other decontamination rounds, sampling was not conducted in the space above the drop ceiling before or after decontamination. Samples were collected from the top of ceiling tiles prior to decontamination and on top of the light fixtures and drop ceiling support frame after decontamination. None of the samples collected from the ceiling (support frame or light fixture) resulted in detectable *Bg* following decontamination. The space above the drop ceiling contains numerous wires, ducts, conduits, metal and wood framing, and other structures that are difficult to wet completely by spraying, and therefore these structures may pose challenges to liquid-based spray decontamination approaches.

In addition, four bags of the waste removed from the facility at the beginning of the decontamination procedure were sampled by vacuum sock after being shipped to US EPA at RTP, NC. Two replicate vacuum sock samples were collected from each bag. Samples collected from two of the four bags (both replicates) indicated viable *Bg* remained within the waste. In an actual incident, the volume of bleach sprayed into waste bags may have been greater, as risks of re-infection would be weighted more heavily against liquid waste minimization. Regardless, highly contaminated waste would have significant consequences with regard to cost, logistics, and ease of waste disposal.

4.1.2.3. Summary of the pH-adjusted Bleach Decontamination Process

Laboratory research has demonstrated the effectiveness of pH-adjusted bleach on a multitude of materials. Commonly, however, pH-adjusted bleach demonstrates attenuated efficacy on materials with a high organic content such as bare wood. During the current study, all porous items were removed from the facility prior to the spray treatment. This approach reduced the amount of difficult-to-decontaminate materials remaining in the facility during the spray treatment procedures.

Overall, the results suggest that decontamination of surfaces with pH-adjusted bleach was highly efficacious on the first floor and moderately efficacious on the second floor. Only eight of 244 post-decontamination samples resulted in detectable *Bg* and at very low surface loading concentrations (requiring filter plating analysis for detection). HVAC return-side decontamination procedures were also effective at removing contamination, as all HVAC samples post-decontamination were ND.

With regards to logistics, the liquid-based decontamination procedure affords several advantages over the fumigation methods, yet several disadvantages. Advantages of this methods include: no major facility modifications (i.e., tenting) prior to decontamination, and thus a remediation response can initiate rapidly following an incident; sprayers, bleach and vinegar are readily available at retail stores; and highly specialized laborers are not required for this procedure (although HAZMAT training is needed). Disadvantages of this method include the fact that person-to-person technique may vary and result in differences in effectiveness; wetting all surfaces thoroughly in a large facility is challenging; the procedure is physically demanding; Level B PPE is required during spray procedures to protect workers from chlorine gas, removal of disposable items is logistically challenging (especially for large items), time consuming, and results in significant amounts of waste, and lastly, some specialized equipment (NAMs, heaters, sump pumps, compressed air, supplied air respirators, etc.) was needed to complete the procedure effectively. Overall, the procedure was feasible and was administered in the allotted time.

4.1.3. Fumigation by Sabre Technical Services, LLC, with ClO_2

The third and final round of Phase 1 utilized fumigation with ClO_2 as the decontamination method.

4.1.3.1. Process Description

Sabre Technical Services LLC (“Sabre”) was selected to fumigate the facility with ClO_2. The same facility configuration as the previous two rounds was used (as described in Section 2.1) and contained a mixture of porous and nonporous surfaces throughout the building. This chapter describes the process that was used for Round 3.

As part of the process, Sabre worked with EPA and INL to determine the requirements of the project, including a site visit by two Sabre engineers three weeks prior to the scheduled fumigation. Sabre worked with BOTE Project management to define necessary project resources and plan required fumigation resources. The goal was to fumigate the facility at a ClO_2 target concentration of 3,000 parts per million by volume (ppmv) for three hours resulting in

a minimum CT of at least 9,000 ppmv-hr. After fumigation, the aeration phase would continue until the concentration in the building was lower than the OSHA PE L of 0.1 ppmv. Once the concentration in the facility was lower than this value, the facility would be turned back over to the BOTE Project management team for post-decontamination (clearance) sampling.

Sabre utilizes a wet generation system by mixing water, sodium hypochlorite, hydrochloric acid, and sodium chlorite to generate ClO_2 in the liquid phase. A proprietary liquid-air stripper is then used to transfer the ClO_2 from the liquid phase to the vapor phase. The vapor phase ClO_2 is then blown into a facility using a 7,000 CFM fan. More information on the Sabre generation process is described in US Patent # 7807101[84].

4.1.3.2. Facility Contamination

Bg spores were disseminated on May 10, 2011, following the procedure described in Section 2.3. The target surface loading of 1E4 to 1E6 CFU/ft^2 was desired on the first floor and a surface loading of 1E2 to 2E2 CFU/ft^2 was desired on the second floor. The actual surface loading was characterized by surface sampling as described in Section 2.5.4.

4.1.3.3. Planning and Design

The two-story fabricated steel building was covered with an external secondary enclosure, as in the previous two rounds, to reduce wind shear on the building. The external secondary enclosure allowed access to the building through a standard entryway as well as through a rollup door. Both doors were located on the west side of the building. Egress was made through the Decontamination Line door located on the north side of the building.

Sabre was provided three full days (May 13-15) to complete their process, which included fumigating and aerating the facility prior to turning the facility back to the INL/EPA project team by the end of the third day. This time did not include time to set up their equipment or to apply an exterior tent to PBF-632. Sabre was allowed access to the exterior of the building for three days prior to the scheduled fumigation to stage their equipment and to apply an exterior tent to PBF-632. Sabre also elected to cover the entire building with a polyethylene tent system that had direct contact with the building and was intended as primary containment for ClO_2 (i.e., Sabre's tent was located between the building shell and the secondary enclosure). The primary containment tent was installed on May 10-12, 2011, using five Sabre personnel and two additional sub-contractors. This process required the use of a forklift and a scissor (manlift) lift to position the materials on top of PBF-632. Personnel then draped the building and clipped the seams using metal spring clips. A photo of the primary containment tent is shown in Figure 4-40. The secondary enclosure is shown draped over the lattice tubing.

Sabre's equipment and trucks were positioned on spill pads adjacent to the west end of the PBF-632 (see Figure 4-41). The ClO_2 generation system consisted of a 20 ft box truck with a trailer that contained the air-liquid separation unit.

Figure 4-40 Photo showing the inner tent membrane (primary tent) on the right side of the manlift and the secondary tent over the metal lattice structure.

Figure 4-41. Photo showing the location of Sabre's equipment.

Each decontamination vendor or lead in each round was given the opportunity to walk through the facility to determine if any items in the facility would absorb or consume the fumigant or hinder the decontamination process. Any items that were identified were then removed from the facility before fumigation, to be treated by an alternative method. Sabre elected to have the heavier foam items removed because the foam would absorb the ClO_2 and extend the time required for aeration. Had the total time allotted for fumigation and aeration been longer, these items would have been left in the building. Because a total of three days was scheduled, the following items were removed: two queen-size mattresses and the thicker foam cushions from the couches and chairs. The total amount of material that was removed from the building weighed 452 lbs and took two personnel 30 min to remove. These items were notionally decontaminated with liquid ClO_2 and treated as waste.

Two 3/8-in gas sampling lines were installed on each floor at the locations shown in Figure 4-42 and Figure 4-43. The temperature and RH were monitored constantly using two HOBO® U12 data loggers (Onset Corp, Bourne, MA) that were positioned adjacent to the gas sampling lines. The target temperature inside the facility was 65 °F or higher with a humidity of 65% or higher. The EPA also collected temperature and RH data using HOBO® U10 data loggers positioned in each room. The ClO_2 concentration in the building was measured using a modified method SM-4500-E[85]. EPA also measured the ClO_2 concentration in the building using SensorWeb (prototype) pods manufactured by SensorWare (Arcadia, CA).

4.1.3.4. Fumigation Conditions

As mentioned previously, the goal was to fumigate the facility at a ClO_2 target concentration of 3,000 ppmv for three hours resulting in a minimum CT of at least 9,000 ppmv-hr at a minimum temperature of 65 °F and RH of 65%.

Sabre also began preparation of their generation system during the day on May 13 with the goal of beginning the fumigation during the evening on that day. The facility was cleared by safety personnel and locked out to prevent anyone from entering the building. Fumigation of the facility began at 0000 hr on May 14. Once fumigation began, the number of personnel on site was reduced to three Sabre personnel and three government employees to monitor the fumigation. Fumigation continued until 0430 hr, at which time the process changed to the aeration phase.

During the fumigation monitoring was conducted around the perimeter of PBF-632 approximately 15 ft from the outer membrane. The frequency was initially 15-min intervals for the first hour and then hourly thereafter to ensure that the concentration of chlorine dioxide remained below the PEL of 0.1 ppm. There was one instance where the concentration exceeded the PEL, and this exceedance was near the opening on the west side of the building where the 36-in injection duct passed under the door. The height of the door was lowered and the concentration returned to 0 ppm.

4.1.3.5. Scrubbing and Aeration

Once the desired concentration-time value of 9,000 ppmv-hr was achieved, the chlorine dioxide generation process was terminated and the scrubbing phase began at 0430 hr. Caustic (sodium hydroxide) was mixed into the sparger to neutralize the ClO_2 in the liquid and to neutralize the vapor-phase ClO_2. At 0630 hr, the ClO_2 concentration in the facility was below 12 ppmv on the first floor and 30 ppmv on the second floor. At 1330 hr, HEPA-filtered air was pushed into the facility and the gas from the building was pulled through a TIGG model N2500PDB activated carbon scrubber (Oakdale, PA), which contained approximately 2,500 lb of activated carbon (TIGG, Oakdale, PA). The flow rate through the carbon was 3,000 CFM. This polishing step was designed to reduce the ClO_2 concentration in the building below the OSHA PEL of 0.1 ppmv. The ClO_2 concentration in the building had dropped below 0.1 ppmv at approximately 1330 hr on May 14. However, the aeration continued until the following day when Sabre personnel and the project safety officer verified that the concentration of ClO_2 throughout the facility was below the 0.1 ppmv level. The facility was cleared on the morning of May 15, and the facility was turned over to the EPA at approximately 1000 hr.

4.1.3.6. Demobilization

Once the facility was turned over to the EPA on May 15, Sabre personnel remained on site on the afternoon of May 15 and May 16 to break down their equipment, including removal of the generation lines and moving their trucks and equipment away from the building. The inner membrane tent was not removed from PBF-632 during this stage, but remained on the facility throughout the remainder of this round.

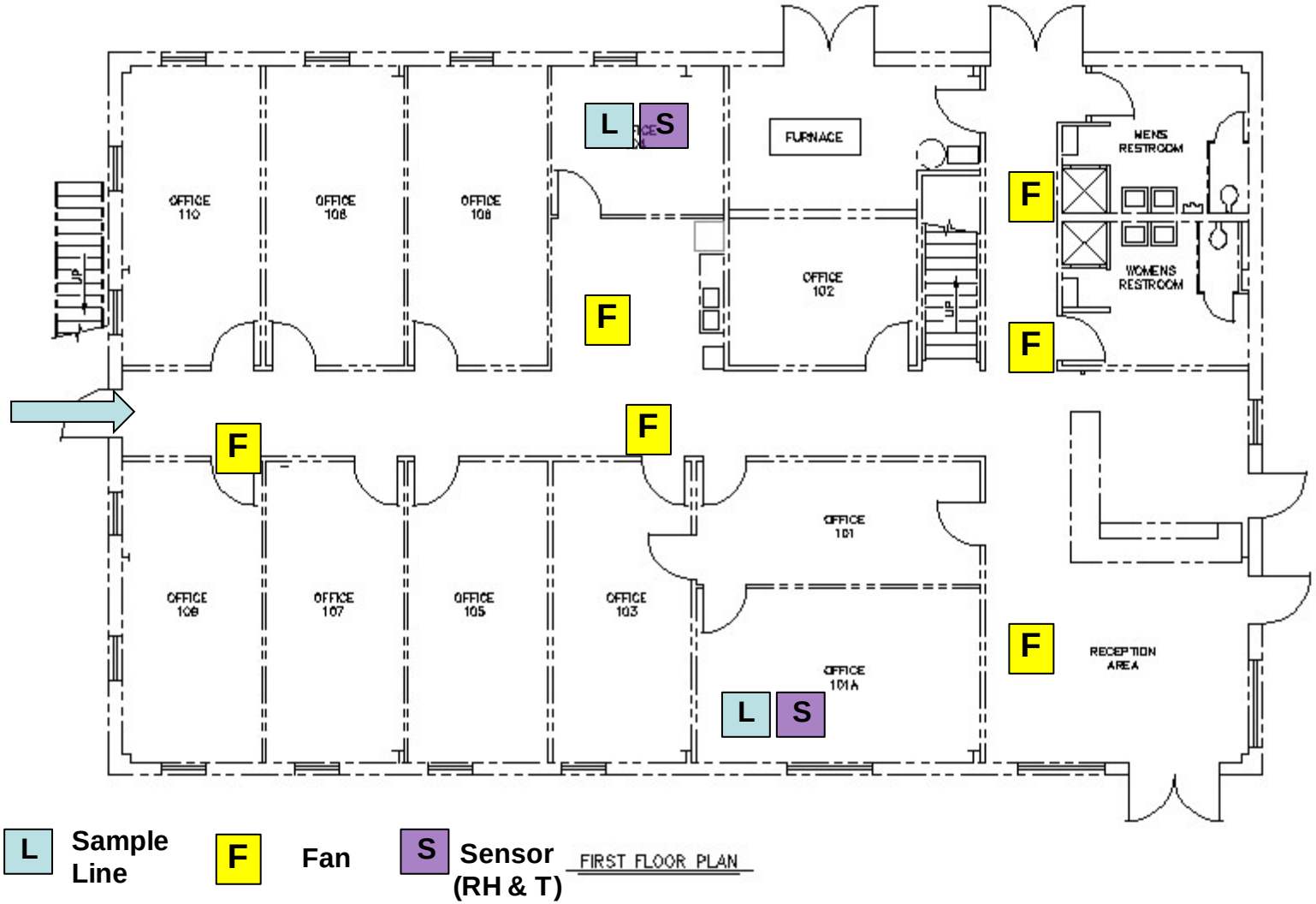


Figure 4-42. Schematic of first floor of PBF-632 showing location of fumigant sampling lines, fans, and sensors.

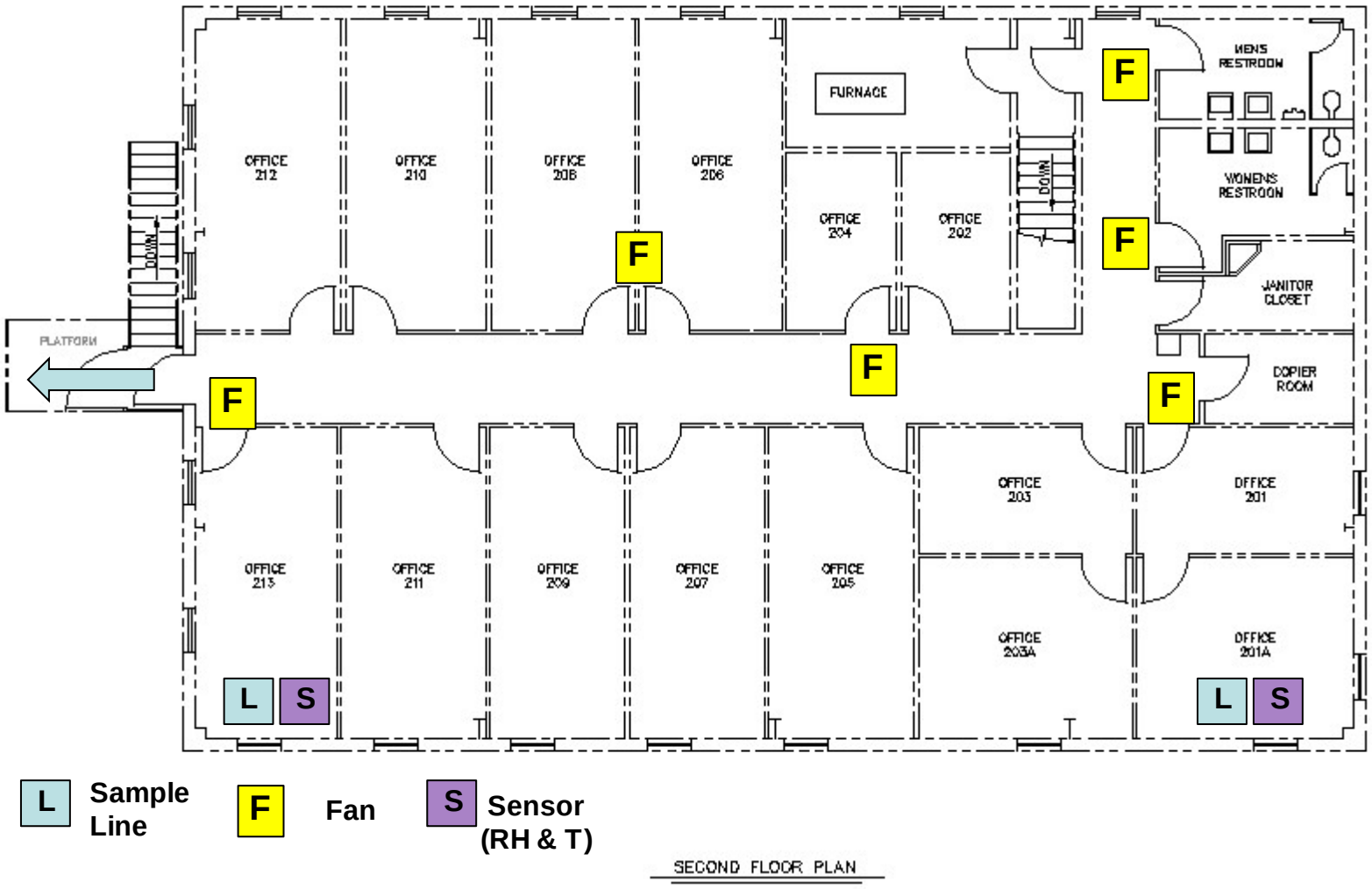


Figure 4-43. Schematic of second floor of PBF-632 showing location of fumigant sampling lines, fans, and sensors.

4.1.3.7. Temperature and Relative Humidity

The heating system in PBF-632 was not functional, and the project required the use of supplemental heating to raise the temperature in the facility to the desired temperature above 65 °F. Four (three bottom floor and one top floor) Patron® 30,000 Btu/hr heaters (Cheektowaga, NY) were utilized to heat the facility in conjunction with operation of the blower on the building HVAC systems (each floor) to distribute the heat. The heaters were activated on May 12 and allowed to operate through 1600 hr on May 13. At this time, the heaters were turned off and wrapped in plastic in preparation for the fumigation.

In addition to the two HOBO® data loggers that Sabre used, the EPA also collected temperature and RH data in each room using HOBO® U10 data loggers. These data loggers recorded temperature and humidity every two min. Once the post-decontamination (clearance) sampling was completed, the data loggers were removed and the data were recovered.

The temperatures that Sabre recorded are shown in Table 4-9, and the average temperature for each floor from EPA measurements is shown in Table 4-10. From these measurements, the following time periods were used for the average measurements:

Preparation: May 13, 2300 – 2400;

Fumigation: May 14, 0000 – 0430;

Scrubbing: May 14, 0430 – 1330; and

Aeration: May 14, 1330 – 0945 (05/15).

Table 4-9. Average facility temperature measurements from Sabre.

Phase	Room 101A		Room 104		Room 201A		Room 213	
	Temp, °F	RH, %	Temp, °F	RH, %	Temp, °F	RH, %	Temp, °F	RH, %
Preparation	77.9	73.5	78.6	72.7	80.4	64.4	85.2	57.4
Fumigation	77.2	75.3	77.3	75.3	77.5	70.3	82.5	62.0
Scrubbing	76.1	81.0	76.0	81.7	77.9	75.8	80.4	69.3
Aeration	66.6	67.3	67.1	66.3	67.6	68.8	72.4	60.0

Table 4-10. Average facility temperature measurements from EPA.

Phase	First Floor		Second Floor	
	Temp, °F	RH, %	Temp, °F	RH, %
Preparation	77.1 ± 1.1	82.3 ± 3.7	83.8 ± 2.1	62.0 ± 5.9
Fumigation	76.2 ± 1.2	79.6 ± 3.2	81.0 ± 2.1	63.7 ± 5.9
Scrubbing	75.0 ± 2.0	81.8 ± 3.4	79.0 ± 1.3	68.0 ± 5.1
Aeration	66.8 ± 1.1	59.9 ± 4.2	71.4 ± 1.4	54.6 ± 3.6

4.1.3.8. ClO_2 Measurements

Two types of measurements were performed to measure the concentration of ClO_2 in the building. Sensor Web pods and sensors were placed at eight different locations throughout the test building. Four of eight pods and sensors were collocated with Sabre's gas sampling lines. Each pod was paired with a specific sensor. This information is shown as pod number + sensor number under the Sensor Web Measurements heading in

Table 4-11. The sampling locations are also described in

Table 4-11. The Sensor Web sensors and pods, hereafter referred to as pods, were set to collect ClO_2 concentration, RH, and temperature data every 30 sec. The pod from sampling Location 1 malfunctioned and RH and temperature data were not collected. However, the ClO_2 concentration was monitored and recorded. The pod in Location 4 malfunctioned and stopped transmitting data; hence, no data were collected from Location 4.

Table 4-11. ClO_2 sampling locations.

Sampling Location	Description	SABRE Sampling	Sensor Web Measurements	Comments
1	104 Office	Yes	P13 + S6	Pod malfunctioned (No RH and Temperature data)
2	101A Office	Yes	P12 + S9	
3	First Floor Men's Restroom	No	P1 + S4	
4	First Floor Hallway	No	P11 + S8	Pod malfunctioned (No RH, Temperature, and ClO_2 data)
5	213 Office	Yes	P9 + S7	
6	201A Office	Yes	P4 + S3	
7	Second Floor Men's Restroom	No	P8 + S5	
8	Second Floor Hallway	No	P3 + S1	

Sensor Web pods and sensors were calibrated in the EPA's Research Triangle Park laboratory after the field test. Eight of the pods and sensors were placed into an environmentally controlled exposure chamber (55 in x 30 in x 48 in) to allow them to be calibrated with the modified SM 4500-E titration[85]. The temperature and RH were controlled and monitored in the exposure chamber throughout the calibration experiments using a HMP50 combination temperature/RH probe (Vaisala, Woburn, MA), water-cooled fans, and a steam injection system. The chamber temperature was maintained at 75 ± 4 °F and 75 ± 2 % RH throughout the calibration. After placing the pods and sensors in the exposure chamber, various concentrations of ClO_2 were introduced. Target concentrations in the exposure chamber were achieved using a ClO_2 generator from ClorDiSys Solutions, Inc. (Lebanon, NJ). The ClO_2 generator maintained a constant target ClO_2 concentration in the exposure chamber and injected fumigant when the concentration inside the chamber fell below a pre-set condition. Once the targeted concentration was reached, the pods and sensors were allowed to equilibrate for 20 min. Three modified SM-4500-E titrations were then pulled from the exposure chamber at each targeted concentration, and the Sensor Web sensor data taken during the titration sampling period were averaged.

Sabre monitored the ClO_2 level throughout the fumigation and scrubbing phases using modified method SM-4500-E[85]. This method is an amperometric titration to analyze chlorine, ClO_2, chlorite, and chlorate as a single value. A gas phase sample was collected in the 5% potassium iodide buffered phosphate solution in an impinger at a flow rate of 1 L min^{-1}. The phosphate buffer solution (pH 7.2) was prepared with 25 g of potassium iodide and 500 mL of buffer phosphate. After ClO_2 gas was sampled, the buffer solution in the impinger was mixed with 150 mL of deionized water, and then 5 mL of a 6 N hydrochloric acid solution was added to the solution. The solution was titrated with 0.1 N sodium thiosulfate. The titration volume was

converted to calculate ClO_2 concentration. The sampling duration varied from 1 min to 25 min, depending on the previous ClO_2 concentration level.

The ClO_2 fumigation started at 2355 hr on May 13 and ended at 0430 hr on May 14. The ClO_2 gas in the air was scrubbed from 0430 hr till 1330 hr on May 14th. The building was cleared after 1330 hr on May 14. The temperature and RH conditions during fumigation are shown in Figure 4-44 and Figure 4-45, respectively. Due to malfunctions of two pod systems, the figures show the data from five sampling locations. The temperature was maintained between 75 to 85 °F and an RH of 60 to 85% throughout the fumigation.

The ClO_2 measurements were compared for two different methods (titration method and Sensor Web sensors). The results are shown in Figure 4-46 through Figure 4-49 for Locations 1, 2, 5, and 6, respectively, corresponding to the rooms listed in

Table 4-11. The figures contain the ClO_2 concentration change as a function of time and also CT (ppmv-hr) as a function of time. The results from both measurements showed that the fumigation met an accumulated minimum 9,000 ppmv-hr CT clock value. The initial ClO_2 concentration was well matched for both methods, but the sensor reading was always higher than the titration method after one to two hours of ClO_2 fumigation. The measurements from sample Location 6 showed good agreement of both methods throughout the fumigation compared to the other three sampling locations. In the field study setup, it is difficult to identify why there is a measurement difference between the two methods; the difference between the two methods needs further investigation.

Figure 4-50 shows the CT from all sampling locations monitored by Sensor Web sensors. The results confirm that all seven locations met the accumulated minimum requirement of 9,000 ppm-hr ClO_2 CT value.

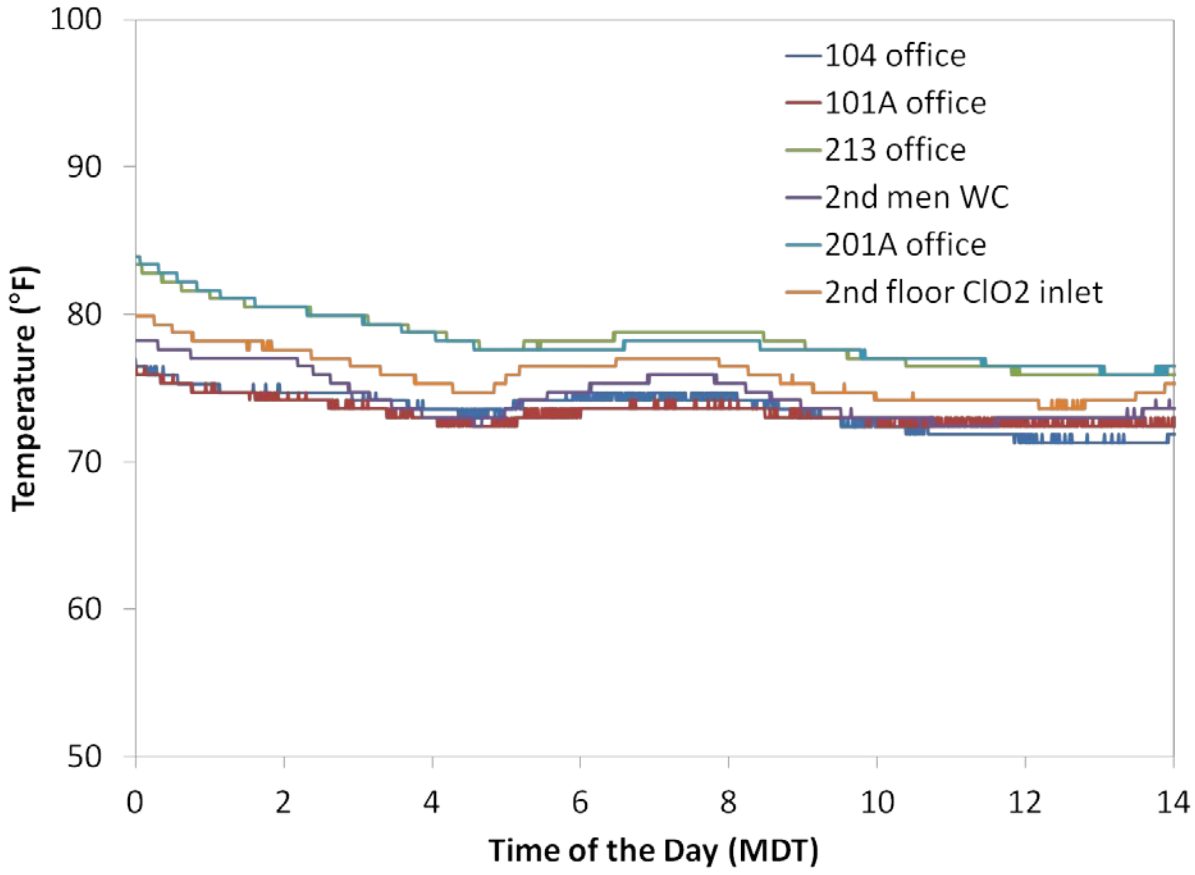


Figure 4-44. Temperature profile during ClO_2 fumigation on May 14, 2011.

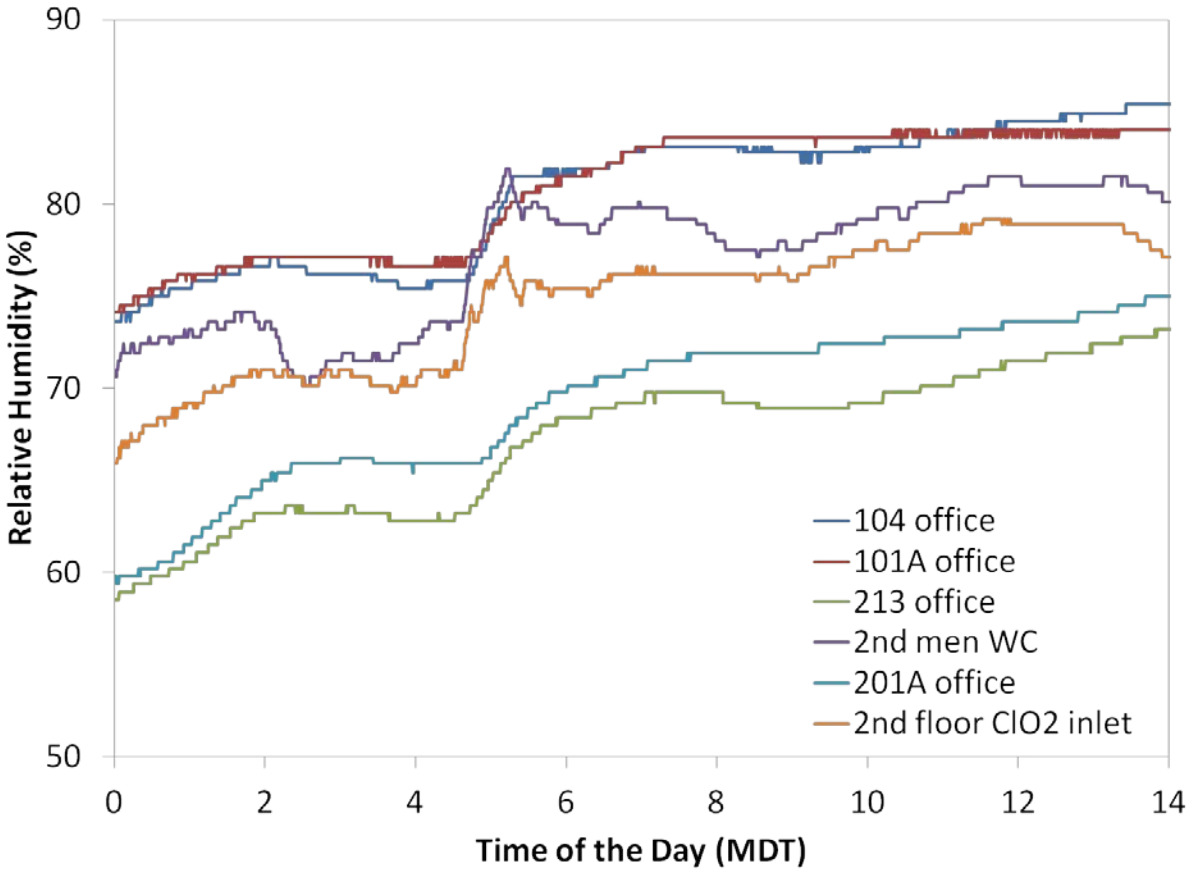


Figure 4-45. RH profile during ClO_2 fumigation on May 14, 2011.

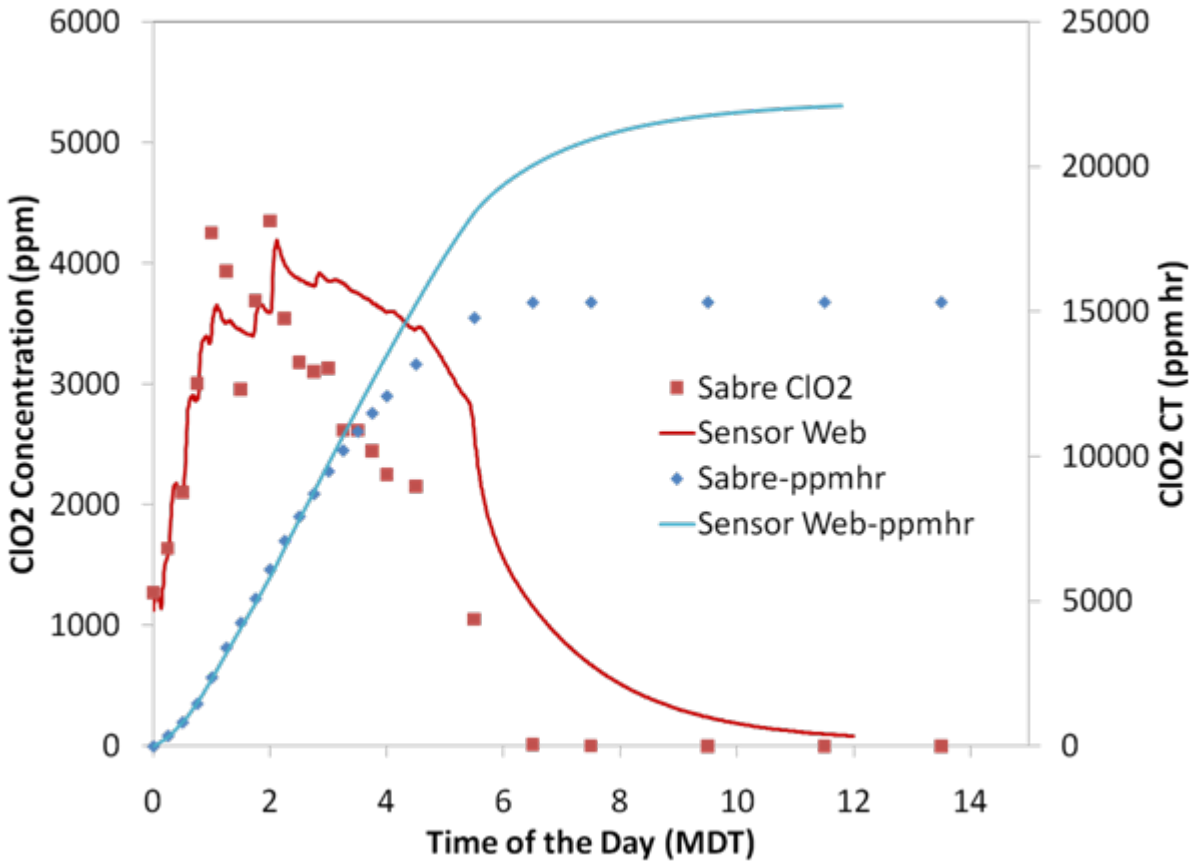


Figure 4-46. ClO_2 concentration (red) and CT (blue) profiles at sample Location 1: Sensor Web (solid line) and titration by Sabre (markers).

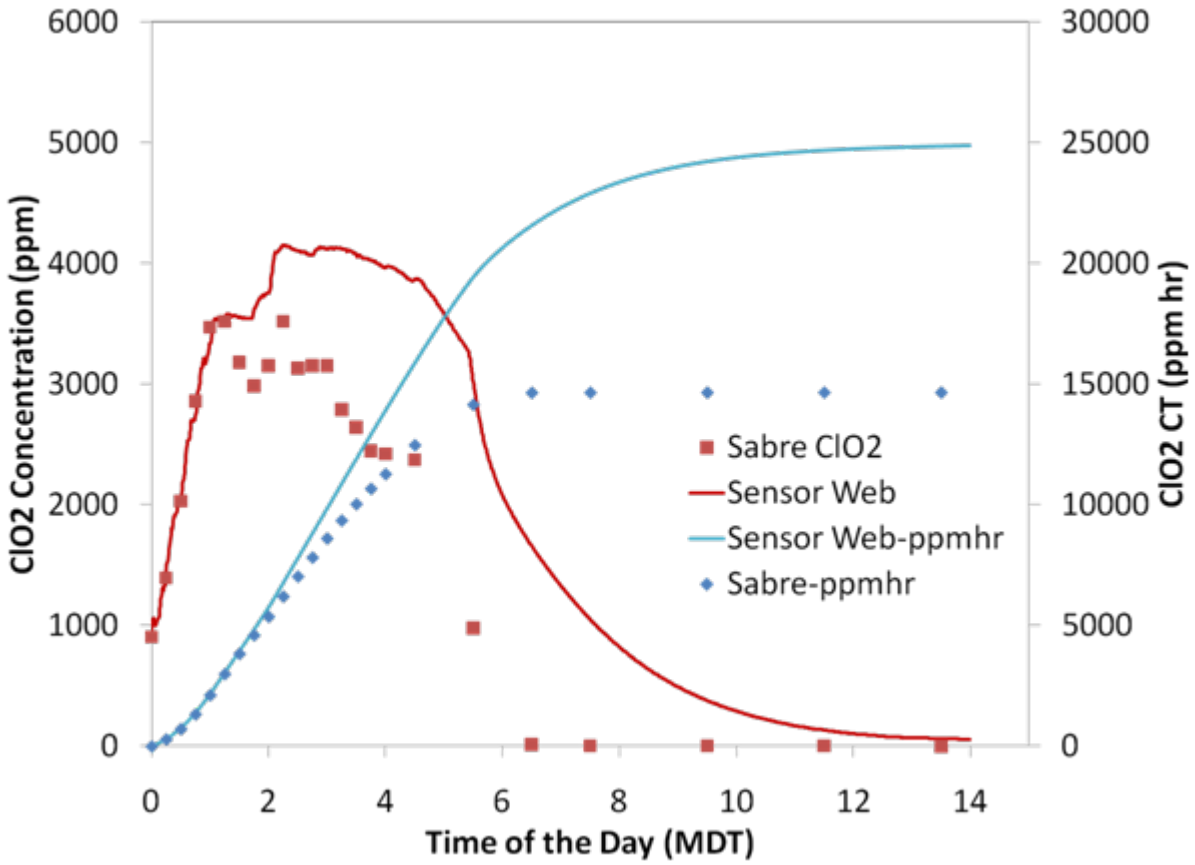


Figure 4-47. ClO_2 concentration (red) and CT (blue) profiles at sample Location 2: Sensor Web (solid line) and titration by Sabre (markers).

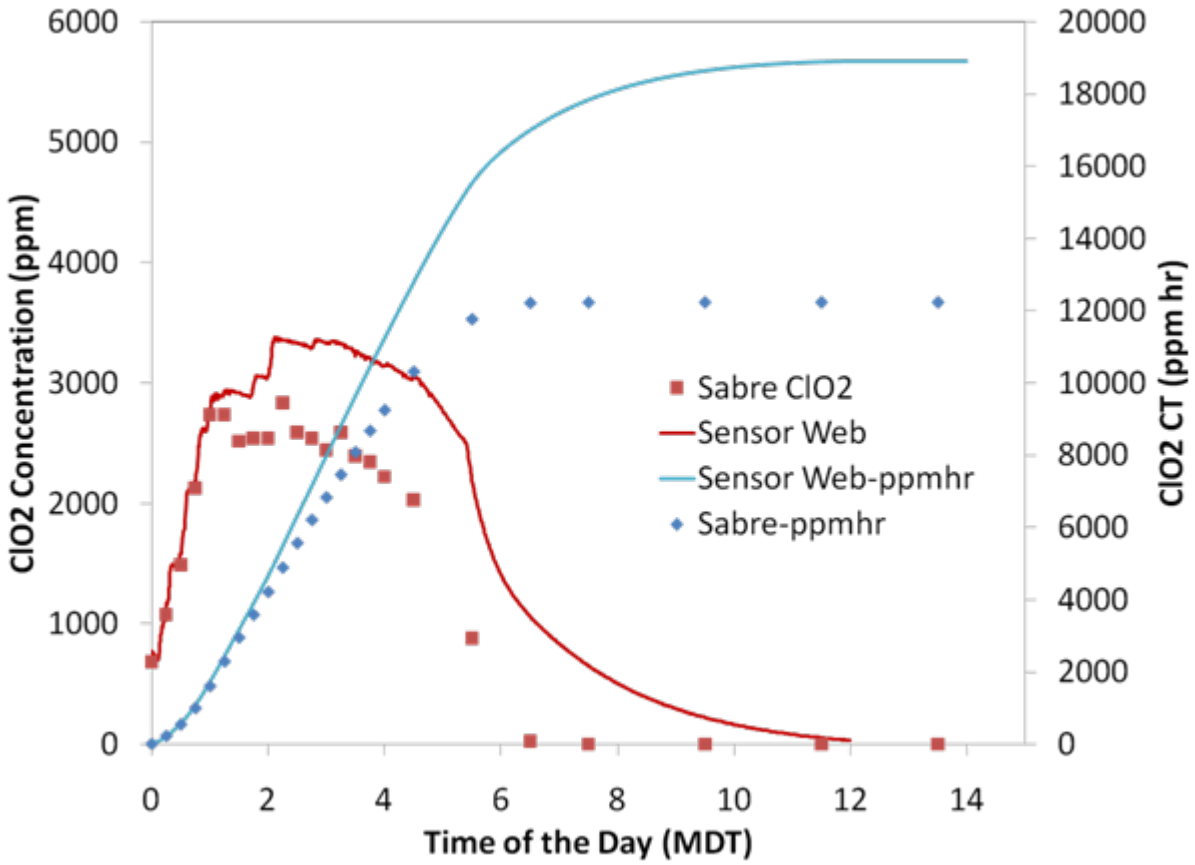


Figure 4-48. ClO_2 concentration (red) and CT (blue) profiles at sample Location 5: Sensor Web (solid line) and titration by Sabre (markers).

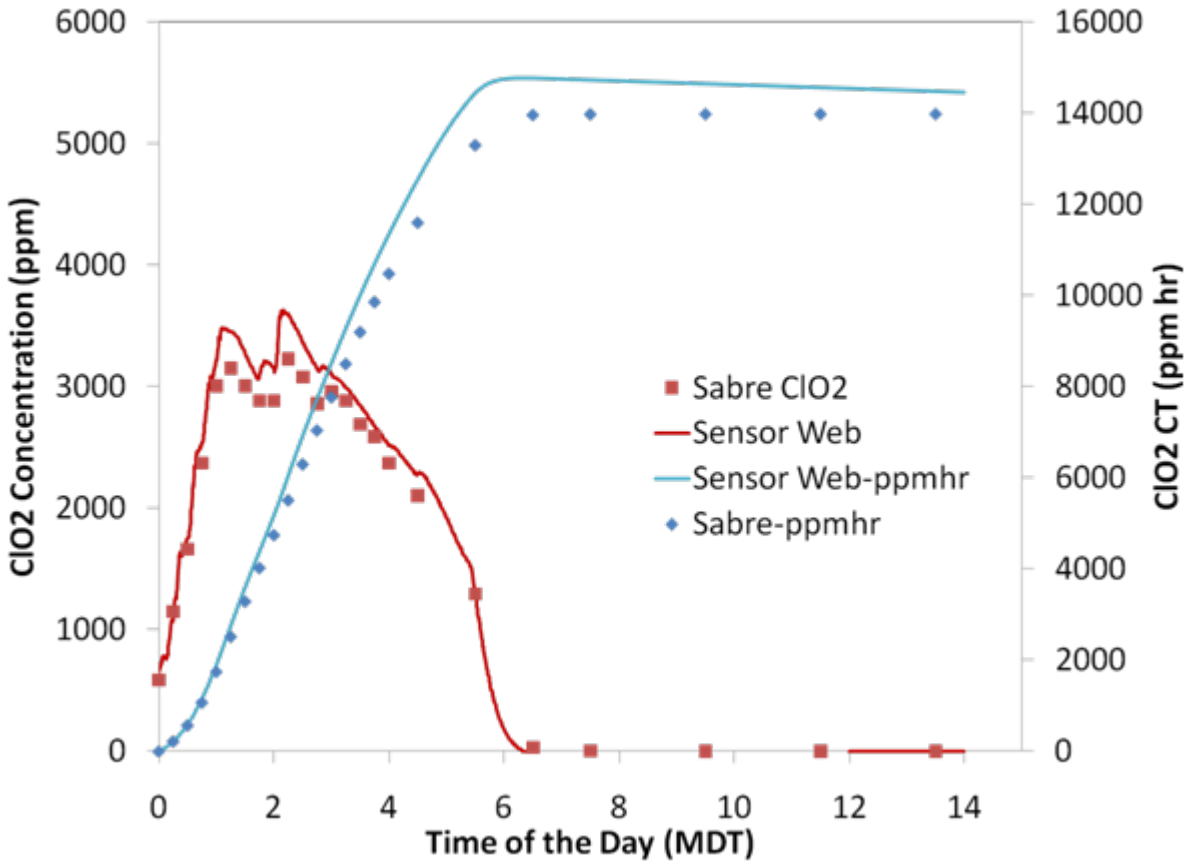


Figure 4-49. ClO_2 concentration (red) and CT (blue) profiles at sample Location 6: Sensor Web (solid line) and titration by Sabre (markers).

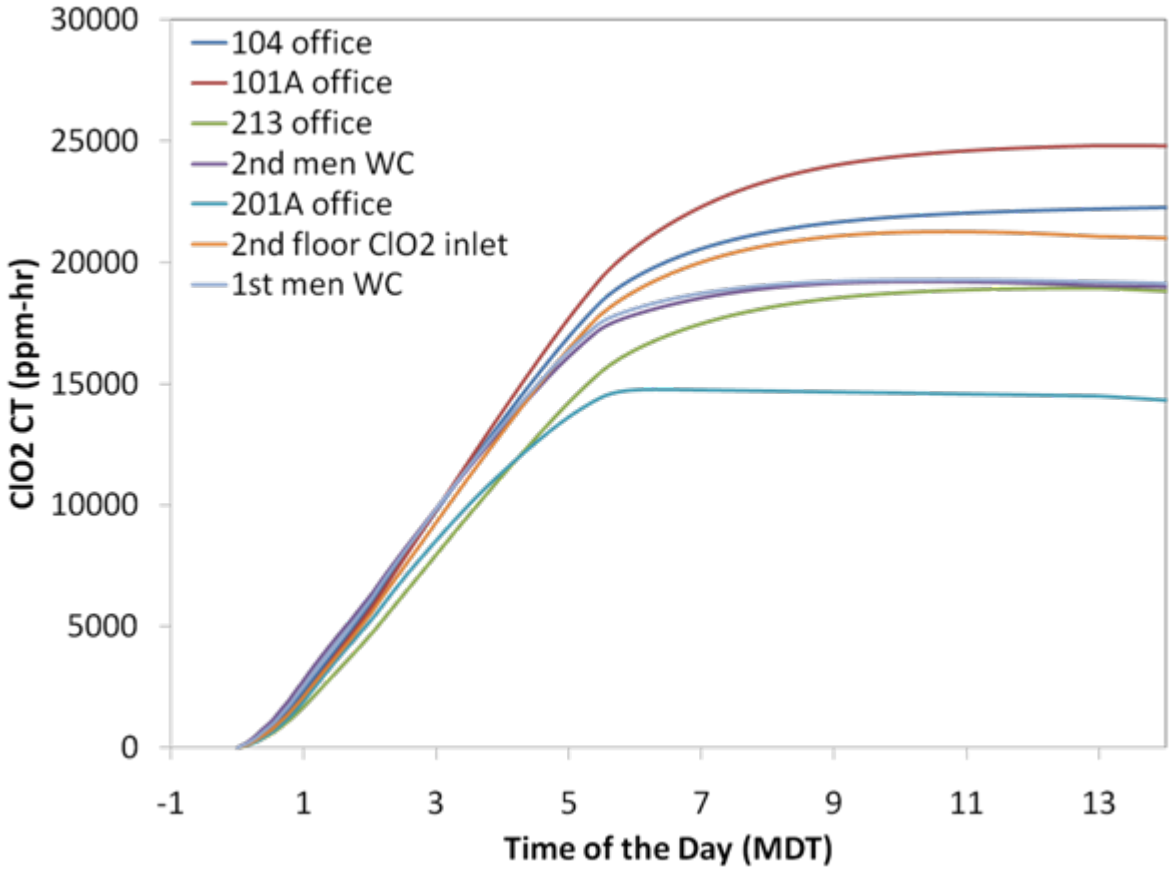


Figure 4-50. ClO_2 CT profile at seven different locations measured by the Sensor Web sensors.

4.1.3.9. ClO_2 Decontamination Results

Surface samples were collected prior to and following decontamination so that full-facility surface inactivation efficacy could be evaluated. Additional efficacy measurements included the use of BIs. This section contains the results from the fumigation of PBF-632 with chlorine dioxide.

4.1.3.9.1. Biological Indicator Results

Forty-five 1E6 *B. atrophaeus* on stainless steel BIs were set out by EPA on each floor prior to fumigation. The BIs were obtained from Apex Laboratories (item number GRS-090; Lot # G3190; Apex, NC). The BIs were recovered by EPA and were analyzed by the INL Microbiology Laboratory.

The BI locations are shown by the circles in Figure 4-51 and Figure 4-52. A solid black circle shows a BI that had no-growth after being exposed to ClO_2, and the solid red circles show BIs that showed growth following fumigation. For the BIs placed on the first floor, all of the BIs except for one were inactivated by the fumigation. For the second floor, thirty-one of the forty-five were not inactivated by the ClO_2. The average temperature and RH during fumigation were

81 °F and 61.7%, respectively. The only condition that differs between the first and second floors is the slight drop in RH. Inactivation of *Bacillus* spores is significantly dependent upon RH. As RH drops below 75%, the time or CT required for a six log inactivation (or log reduction) (such as indicated by the BIs) increases drastically[86]. This drop in RH is consistent with such an impact, i.e., requiring greater than 9,000 ppmv-hr for complete inactivation of six-log BIs.

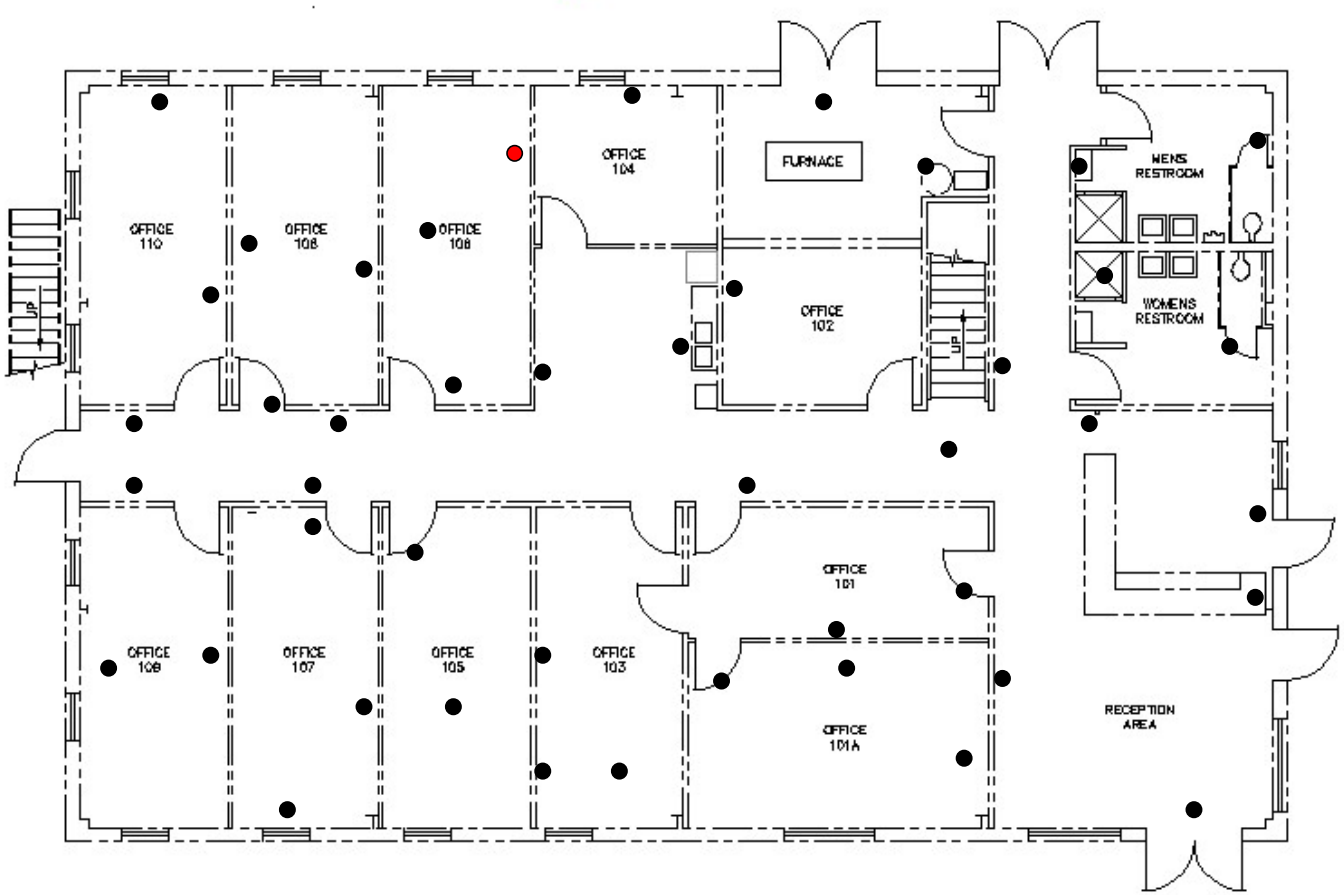


Figure 4-51. Results for BIs on the first floor (black circles indicate BIs that were negative for growth; red circles indicate BIs that were positive for growth).

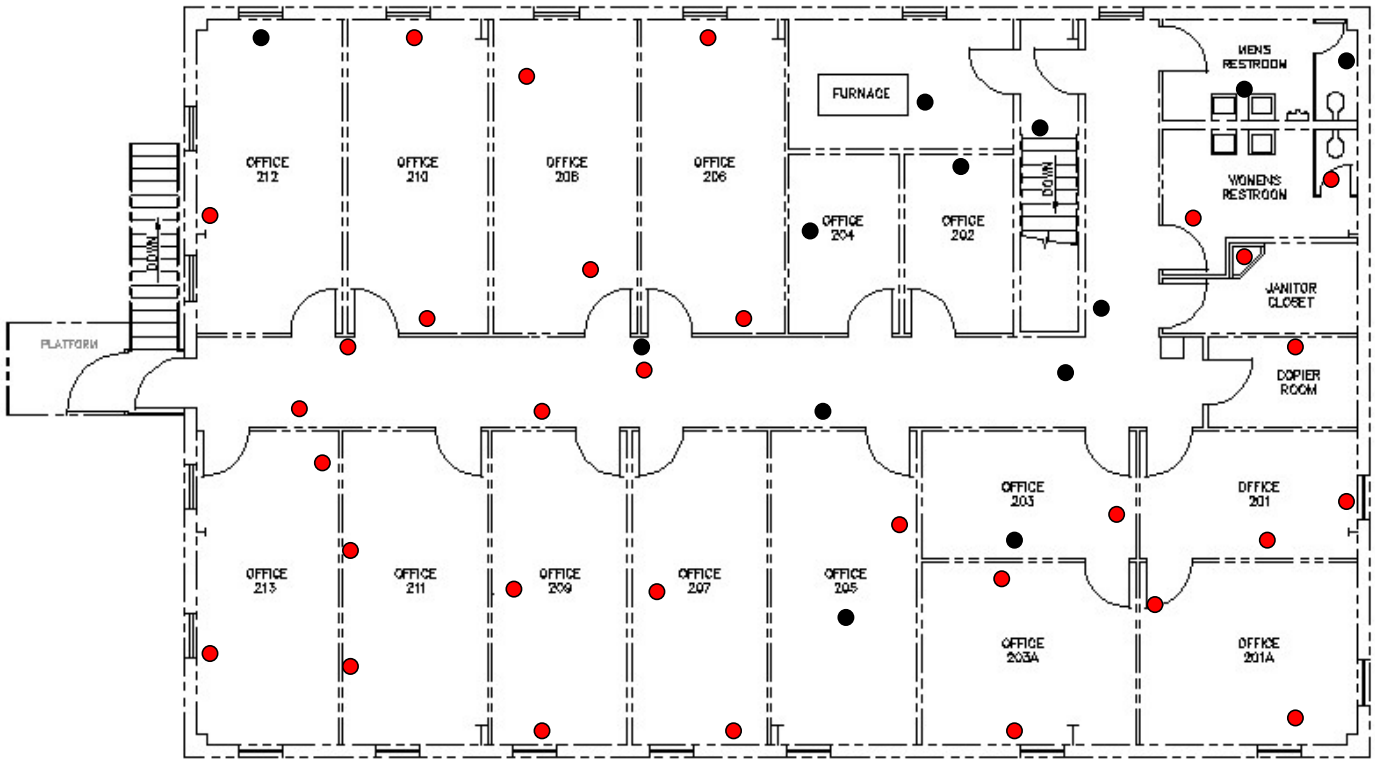


Figure 4-52. Results for BIs on the second floor (black circles indicate BIs that were negative for growth; red circles indicate BIs that were positive for growth)

4.1.3.9.2. Surface Sampling Results

Characterization sampling was conducted on May 11, 2011. Post-decontamination sampling commenced on May 16-17, 2011. Swabs, sponge-stick wipes, and vacuum sock samples were collected from various surfaces and structures not removed from the building during the decontamination procedures. This section contains the results of the pre- and post-decontamination sampling that occurred during Round 3, fumigation with ClO_2.

4.1.3.9.2.1. Field Blanks

Field blank samples were collected during each sampling campaign to determine the potential for background contamination of sampling media. Contamination could occur during sample handling in the field or in the laboratory during sample processing. There were 85 field blanks collected during the characterization sampling; three samples from the first floor resulted in detectable *Bg* (with counts of 1.4E1, 4.1E1 and 1.7E4 CFU).

Of the 57 field blank samples collected during post-decontamination sampling for Round 3, all 57 samples came back ND for spores.

4.1.3.9.2.2. Pre-decontamination Sampling

Bg spores were disseminated on May 10, 2011, following the procedure described in Section 2.3. The target surface loading of 1E4 to 1E6 CFU/ft^2 was desired on the first floor, and a surface loading of 1E2 to 2E2 CFU/ft^2 was desired on the second floor. The actual surface loading was characterized by surface sampling as described in Section 2.5.4. Surface sampling results are shown in Figure 4-53 and Figure 4-54.

Of the 399 pre-decontamination samples collected, a total of thirteen were ND (no viable spores recovered). Ten of the 13 were from the less contaminated second floor. A more detailed description of the pre-decontamination sampling results is presented in Section 3.2.1.4.1.

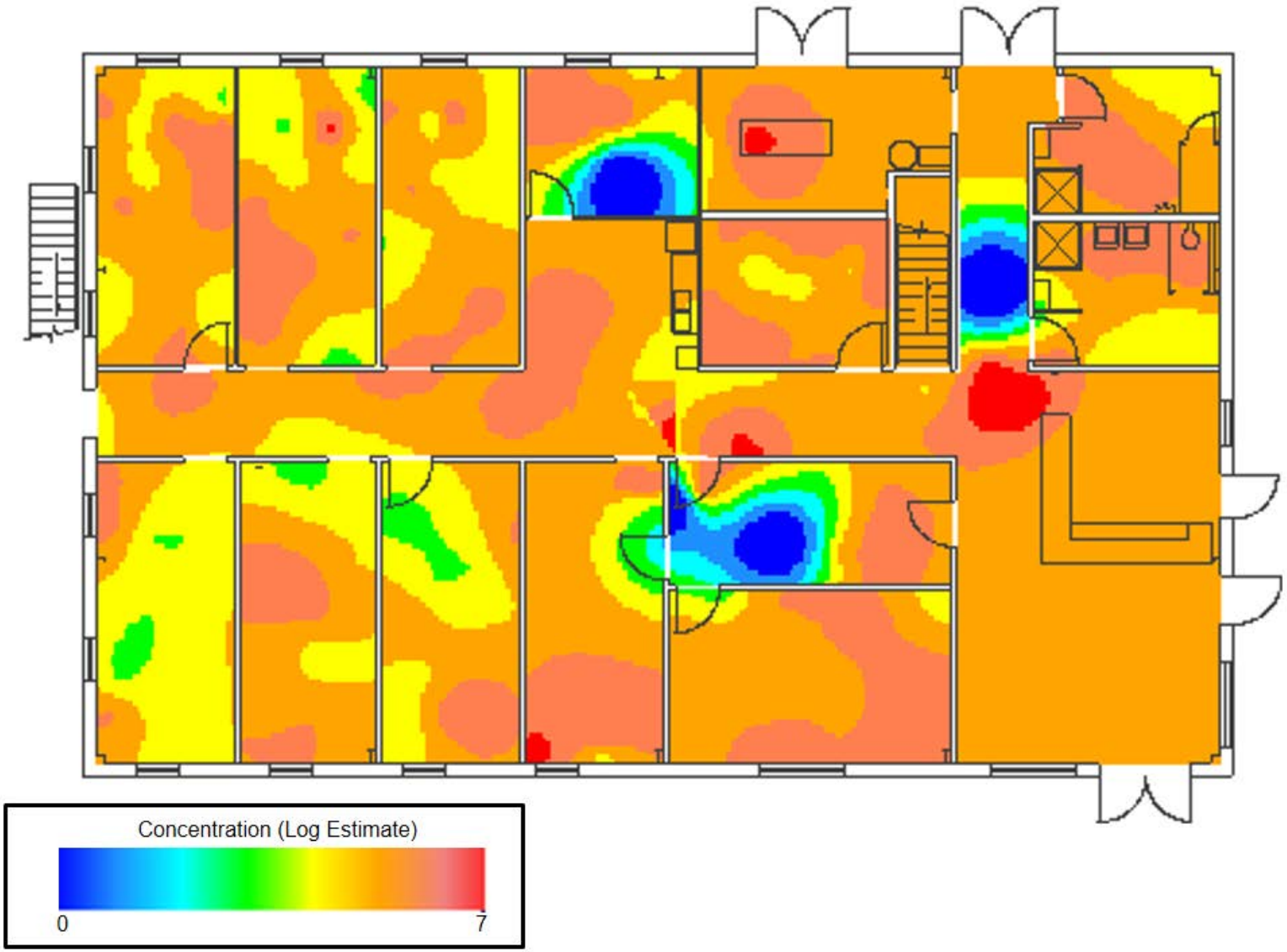


Figure 4-53. Spatial distribution of first floor pre-decontamination characterization sample results.

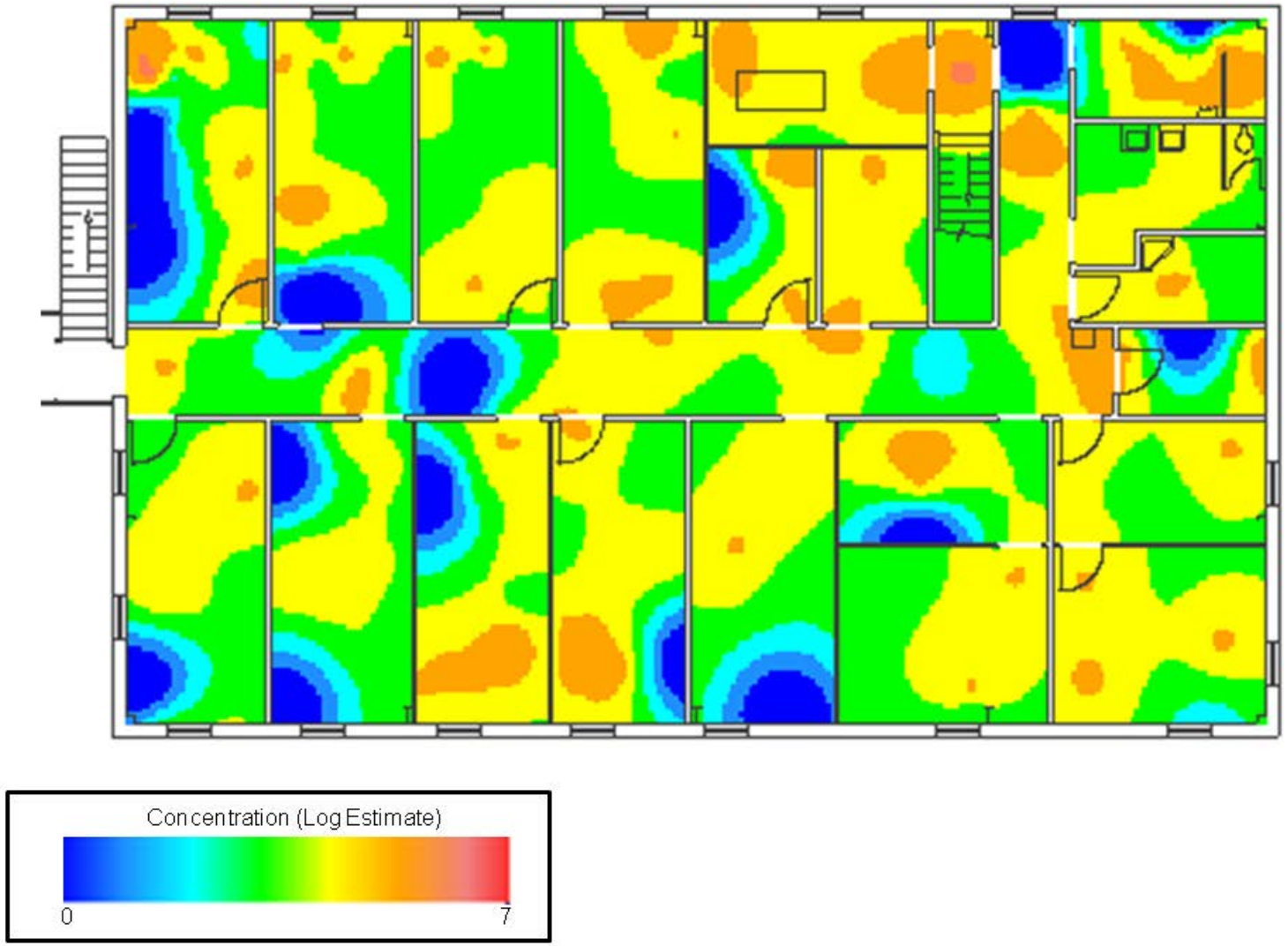


Figure 4-54. Spatial distribution of second floor pre-decontamination characterization sample results.

4.1.3.9.2.3. Post-decontamination Sampling

A total of 344 surface samples were collected after fumigation with chlorine dioxide. Of the total samples collected, only one sample, from Room 213, resulted in detectable *Bg* (17 CFU or 4 CFU/ft^2) using spread plating. An additional five samples that had ND using spread plating had detectable *Bg* with filter plating. The results for the post-decontamination sample in which *Bg* was detected are shown in Table 4-12. The individual sample plots are shown in Figure 3-19 and Figure 3-20; the spatial distributions are shown in Figure 4-55 and Figure 4-56.

Table 4-12. Results from first and second floor following decontamination with ClO_2.

Sample ID#	Floor	Room	Sample Method	Sampled Surface	Spread Plate Result (CFU/ft^2)	Filter Plate Result (CFU/ft^2)
3432	1	101A	Sponge-Stick	File Cabinet	ND	3.0E0
3619	1	105	Vacuum Sock	Floor-Carpet	ND	1.0E0
3336	1	110	Sponge-Stick	File Cabinet	ND	3.0E0
2758	2	207	Sponge-Stick	Wall	ND	5.0E0
4285	2	213	Vacuum Sock	Bed	4.0E0	ND
3357	2	Stairwell	Sponge-Stick	Floor-Smooth	ND	9.0E0

ND=non-detect.

The discrepancy between the BI inactivation and surface sampling results for the second floor is noteworthy. BIs have been used as indicators of effectiveness in past fumigations[87, 88]. However, laboratory-based fumigation studies suggest that BIs can severely underestimate the effectiveness of decontamination for inactivation of spores in indoor environments[86, 89, 90]. This statement is true for similar challenge levels between the BIs and contaminated environmental surfaces (e.g., each containing six-log of viable spores per swatch of material or BI). This difference (underestimation of the required CT for effective decontamination of most facility surfaces) is likely because standard BIs (such as the BIs used in the BOTE Project) are typically spores inoculated onto uniform materials with lower demand for the decontaminant (e.g., stainless steel). Spores deposited on typical environmental surfaces require a significantly higher CT value to achieve the same degree of reduction in viable spore numbers[15].

The BIs used on both floors were at the six-log challenge level (containing ~1E6 spores per BI). The lower RH on the second floor presented conditions that were not suitable to achieve a six-log reduction on the BIs at the CT value achieved. These results are consistent with laboratory research[15]. The *Bg* surface loadings on the second floor for Round 3 were, on average, 1.4E4 CFU/ft^2. While the second floor fumigation conditions were not sufficient to achieve the six-log reduction on the BIs required to achieve “no growth”, the fumigation conditions were sufficient to achieve the lesser log reduction required to reduce the *Bg* spores below detectable levels on the facility surfaces.

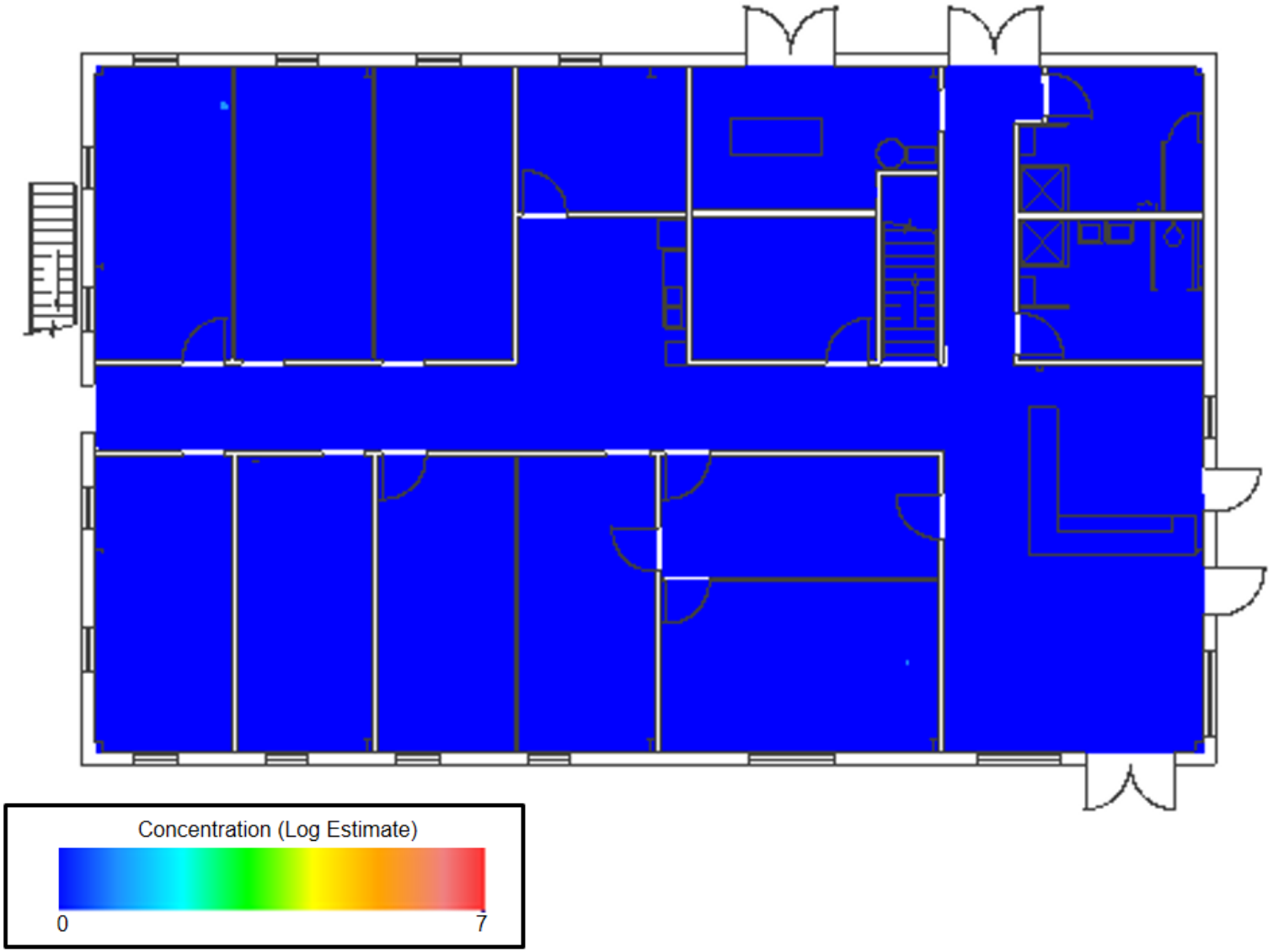


Figure 4-55. Spatial distribution of first floor post-decontamination in Round 3.

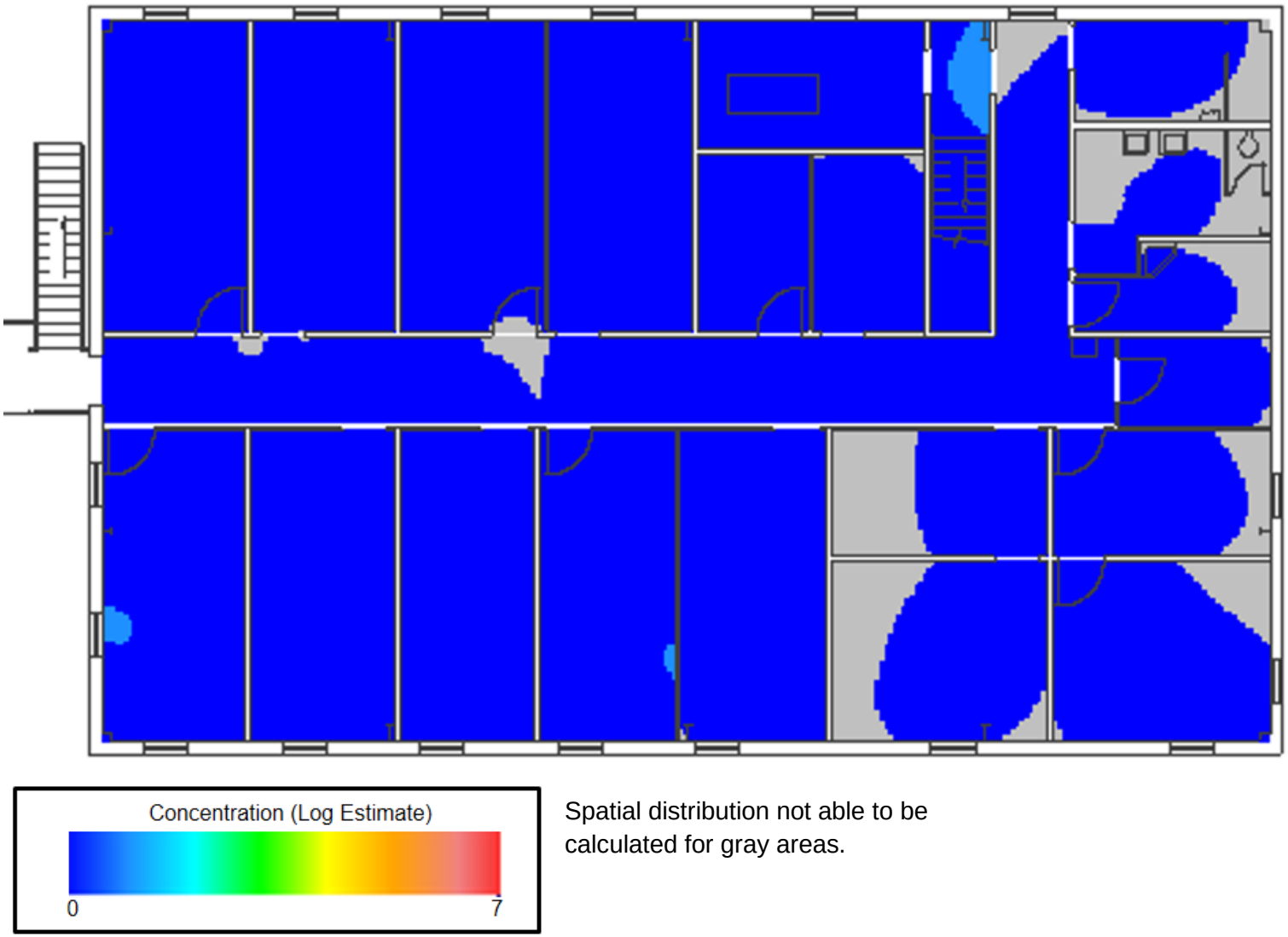


Figure 4-56. Spatial distribution of second floor post-decontamination in Round 3.

4.1.3.9.3. Material Effects

A post-test inspection of the building was completed after clearance sampling. Because this building had been used in previous studies, it was difficult to assess whether any new oxidation had occurred as a result of these tests. Materials that were placed in the building for these tests were inspected for damage. The only objects that showed any damage were ring stand clamps and quick connects on gas sample lines as shown in Figure 4-57. All other surfaces and materials retained their original condition and color.

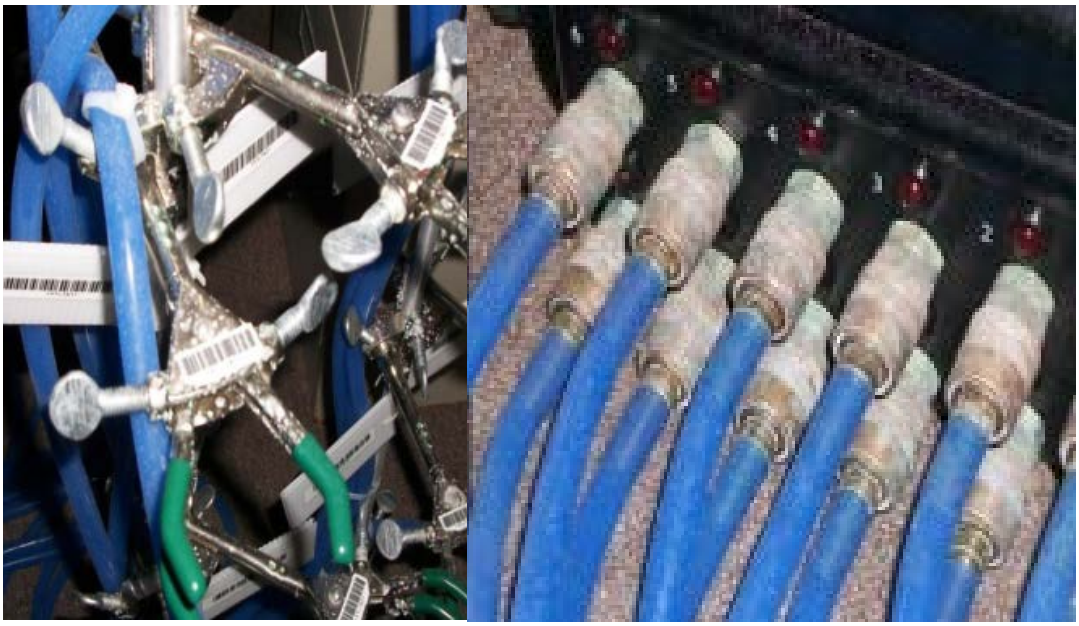


Figure 4-57. Photos of ring stand clamps and quick connects showing some signs of oxidation.

4.1.3.10. Summary of Fumigation with ClO_2

Fumigation of materials in the laboratory with ClO_2 has shown the process to be efficacious for inactivation of *Bacillus* spores. The Sabre process was shown to be able to effectively achieve conditions necessary for spore inactivation throughout the facility. This process has the advantage that it does not require the removal of any materials from the facility prior to fumigation (although some materials were chosen to be removed to reduce the aeration time).

Overall, this process was successful in the decontamination of this facility. The efficacy results from fumigation with ClO_2 show that this process was effective for decontamination with only one sample of 344 coming back positive with spread plating and an additional five with filter plating. The BIs on the bottom floor were inactivated, with the exception of one that was located inside a filing cabinet. Despite a 4 log reduction in detectable spores on the second floor, 31 of

the 45 BIs came back positive. The RH in this case was insufficient to inactivate the 6 log BIs. In future fumigations, the target RH should be raised to a minimum of 70% to ensure efficacy.

Specialized equipment and training is required to generate ClO_2, and there are only a couple of companies that have the equipment necessary to carry out the fumigation of a facility. Further, only one company (Sabre) has shown the capability to generate conditions with a facility (ClO_2 concentration, temperature, and RH) that are sufficient to inactivate *Ba* (and surrogate) spores on relevant building materials (i.e., not just BIs). The procurement process time may be an important factor when considering response and recovery preparedness, as well as incident-specific options. This process used tarpaulins to contain the ClO_2. The logistics of tenting larger facilities would likely add additional time for facility preparation. There maybe large quantities of chemicals that would need to be transported and stored on site; secondary containment measures must be taken to prevent any spills. Any materials in the facility that are constructed of mild (low carbon) steel would be expected to show signs of corrosion following exposure to ClO_2.

4.2. Decontamination Line Wash Water Treatment

Due to the small number of spores present in the personnel Decontamination Line wash water, evaluation of the efficacy of the bleach treatment procedure for the collected waters was not possible. The removal of outer gloves and booties before entering the washdown area may have affected inactivation study results by reducing the number of spores contained in the wash water. However, a greater than three log inactivation (i.e., log reduction) was achieved using the proposed protocol when the wash water was spiked with the *Bg* spores.

Results from the spiked wash water were similar to the results obtained from laboratory experiments using artificially generated wash water with similar water quality characteristics. These findings suggest that the proposed inactivation procedure would be applicable for wash water derived from similar PPE decontamination activities.

The physical and chemical characterization of the generated personnel Decontamination line wash water provided valuable data regarding the water quality parameters representative of this sample type. This information will be helpful in generating a typical wash water to be used in laboratory experiments for evaluating various treatment procedures.

Use of the ultrafiltration concentrator allowed collection of concentrated samples. However, the high turbidity of the wash water under the conditions experienced made operation of the concentrator difficult due to filter clogging. For future wash water studies using the ultrafiltration concentrator, improvements should be made so that turbid water is concentrated more effectively.

4.3. Discussion of Rapid Viability-Polymerase Chain Reaction Results

From the LLNL analysis, culture results for pre-decontamination samples typically showed 1E4-1E5 CFU per sample; lower values (1E1 to 1E2 CFU) were occasionally observed, possibly representing QC (field blanks) samples rather than actual surface samples, although the sample

type was not made known. For MFP (or background) samples, five samples had 1E1 to 1E2 CFU per sample. For Round 1 post-decontamination samples, 11 samples showed 1E1 to 1E3 CFU per sample. Only one Round 2 post-decontamination sample showed CFU at 10 per sample, whereas no Round 3 post-decontamination samples led to any CFU or culture-positives by PCR analysis.

Overall, the RV-PCR method provided rapid results that were 97.6% consistent (209/214 samples) with results from culture analysis. The results are summarized in Table 4-13 including calculation of false positive and false negative percentages for RV-PCR based on differences with culture results. The overall false positive percentage for samples was 0.5% and overall false negative percentage was 1.9%. As discussed above, each sample was split into two equal parts (concentrated to the same extent), and most of the samples showing discrepancies in results between methods represented samples with low spore levels that did not generate CFU on culture plates. There were several samples that did not give any CFU on culture plates while the RV-PCR gave positive results. Among those samples, there were 12 samples for which the culture result was positive by real-time PCR analysis of the enrichment culture, and there were 13 samples for which the culture result was positive by real-time PCR analysis of the concentrated enrichment culture. In a couple of cases, discrepancies were due to technical issues while performing sample processing that later were addressed through protocol changes to prevent issue reccurrence. These results indicated that the RV-PCR could be more sensitive than the traditional plate culture methods, due mainly to the fact that RV-PCR allows the use of the whole sample for the analysis.

In Table 4-13, data from Round 2 and 3 pre- and post-decontamination samples were generated with some minor changes to the protocol including washing aliquots in buffer prior to conducting DNA extraction (either by magnetic bead-based or heat lysis protocols), using cold buffers and cold medium to prevent spore germination in T0 aliquots and allowing coarser particles to settle out prior to performing liquid transfers. While changes improved the data quality, in some cases the additional handling steps added to the risk of cross-contamination between samples that was manifested by some of the negative control samples showing positive results for culture analysis (Table 4-13). To address the risk of additional handling steps, a more frequent glove change procedure was instituted as well as changes in the final protocol to reduce the number of steps involving mixing of sample contents and settling. The mitigation measures appeared to be successful, given that contamination was not evident in the subsequent sample processing efforts.

Overall, the high percent agreement is significant, given that the method had not previously been tested with post-decontamination field samples containing relevant levels of debris. For the post-decontamination samples, the percent agreement was slightly higher, 98% (156/159). The BOTE Project samples contained a wide range of spore levels (< 1E1 to > 1E5 CFU/sample), with real-world debris loadings that were accurately detected by the RV-PCR method. The agreement of the two methods is quite noteworthy given that two-thirds of the samples contained low (<10 CFU/sample) to ND levels of viable spores from either background, pre-release (MFP) sampling (8% of the total sample number) or from post-decontamination sampling (74% of total sample number). Because the intended use of the method is for post-

decontamination clearance analysis, the high accuracy observed with the gold-standard culture method under relevant decontaminant scenarios provides a solid foundation for continued optimization and application of the method for virulent *Ba* spores.

Furthermore, results from the EPA MLB Laboratory showed 86% agreement between culture and RV-PCR analysis for 50 samples (see Table 4-14). The discrepancy in results was largely attributed to limited practice with the RV-PCR protocol, and the BOTE Project was intended to provide such an opportunity for the MLB Laboratory. Another likely contributing factor involved inexperience and, thus, technical issues with the magnetic bead-based DNA extraction procedure. Additional experience with the method and ongoing research will resolve the problems with the interlaboratory reproducibility of performance of the DNA extraction and purification protocol.

For low spore levels, more variability between culture and RV-PCR results was expected due to factors such as spore clumping and pipetting variations. A hypothetical spore distribution in different sample sub-sections is shown in Figure 4-58. In the BOTE Project protocol, the extract was split so that ~38% went to culture (13 mL), ~38% went to RV-PCR (13 mL) and 24% remained unprocessed or archived (8 mL). At T0, 1 mL was removed for processing, a volume that represented 28% of the total volume in the filter cup.

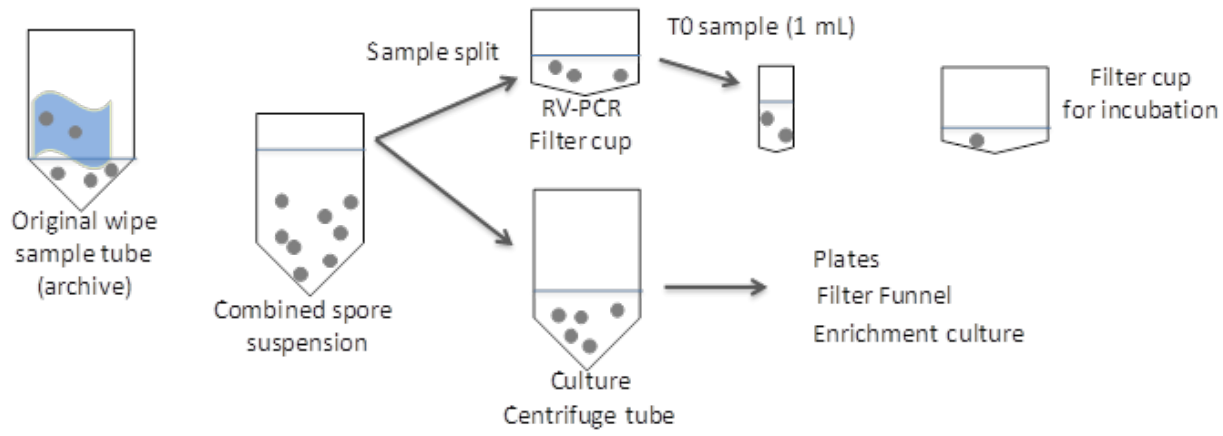


Figure 4-58. Schematic diagram showing one possible distribution of spores during sample processing of a wipe sample with a low spore level. The archive sample tube represents spores remaining with the wipe sample after the two spore extraction steps are completed. Spores associated with the wipe and in the remaining extraction buffer are shown.

Table 4-13. Summary of LLNL BOTE Project data by event type including blanks and controls.

BOTE Project Event	Total Sample No.[1]	Samples							True Blanks	Negative Controls	Positive Controls
		RV-PCR and Culture Pos.	RV-PCR and Culture Neg.	RV-PCR Pos. and Culture Neg.	RV-PCR Neg. and Culture Pos.[2]	Total Agreement[3] (%)	False Pos.[3] (%)	False Neg.[3] (%)	RV-PCR and Culture Neg.	RV-PCR and Culture Neg.[4]	RV-PCR and Culture Pos.
MFP	17	14	3	0	0	17/17 (100%)	0/17 (0%)	0/17 (0%)	3/3	1/1	1/1
Round 1 pre-decon	2	1	0	0	1	1/2 (50%)	0/2 (0%)	1/2 (50%)	0/0	1/1	1/1
Round 1 post-decon	44	30	11	1	2	41/44 (93.2%)	1/44 (2.3%)	2/44 (4.5%)	5/5	3/3	3/3
Round 2 pre-decon	20	13	6	0	1	19/20 (95%)	0/20 (0%)	1/20 (5%)	2/2	1/1	1/1
Round 2 post-decon	47	3	44	0	0	47/47 (100%)	0/47 (0%)	0/47 (0%)	3/3	1/2	2/2
Round 3 pre-decon	16	11	5	0	0	16/16 (100%)	0/16 (0%)	2/16 (0%)	2/2	1/2	2/2
Round 3 post-decon	68	0	68	0	0	68/68 (100%)	0/68 (0%)	0/68 (0%)	4/4	3/4	4/4
Total	214	72	137	1	4	209/214 (97.6%)	1/214 (0.5%)	4/214 (1.9%)	20/20	11/14	14/14

[1]Total sample number includes surface and QC samples and does not include True Blanks or laboratory negative and positive controls.
[2]Summary of culture positive samples: One Pre-VHP RV-PCR sample leaked, therefore the result is not reliable—the protocol was modified to correct the issue for additional sample analysis. Two Post-VHP samples, the culture portion required PCR analysis of the concentrated enrichment culture to obtain positive results; One Pre-Bleach sample (the culture portion) showed no plate CFU and was positive by real-time PCR analysis of the enrichment culture only (RV-PCR showed T9 Ct values, but did not meet the criteria for a positive result).
[3]Note that each sample was divided into two equal parts for parallel RV-PCR and culture analyses. As a result, variability could have been observed for the samples with low spore levels. Percentages were based on surface and QC samples and did not include True Blanks or laboratory negative and positive controls.
[4]For three of 14 negative controls, culture results were positive but RV-PCR results were negative, suggesting cross-contamination occurred for the culture portion.
Abbreviations: Pos, Positive; Neg, Negative; decon, decontamination.

Table 4-14. Summary of EPA-OPP-MLB BOTE Project data by event type, including blanks and controls.

BOTE Project Event	Total Sample No.[1]	Samples							True Blanks	Negative Controls	Positive Controls
		RV-PCR and Culture Pos.	RV-PCR and Culture Neg.	RV-PCR Pos. and Culture Neg.	RV-PCR Neg. and Culture Pos.[2]	Total Agreement[3] (%)	False Pos.[3] (%)	False Neg.[3] (%)	RV-PCR and Culture Neg.	RV-PCR and Culture Neg.[4]	RV-PCR and Culture Pos.
MFP	2	0	1	1	0	1/2 (50%)	1/2 (50%)	0/2 (0%)	1/1	1/1	1/1
Round 1 pre-decon	16	12	3	0	1	15/16 (93.8%)	0/16 (0%)	1/16 (6.2%)	1/1	1/1	1/1
Round 1 post-decon	23	1	19	0	3	20/23 (87%)	0/23 (0%)	3/23 (13%)	1/1	1/1	1/1
Round 2 pre-decon	9	5	2	0	2	7/9 (77.8%)	0/9 (0%)	2/9 (22.2%)	1/1	1/1	1/1
Total	50	18	25	1	6	43/50 (86%)	1/50 (2%)	6/50 (12%)	4/4	4/4	4/4

[1]Total sample number includes surface and QC samples and does not include True Blanks or laboratory negative and positive controls.
[2]Summary of culture positive samples: One Pre-VHP RV-PCR sample leaked, so the result is not reliable—the protocol was modified to correct the issue for additional sample analysis. Two Post-VHP samples, the culture portion required PCR analysis of the concentrated enrichment culture to obtain positive results; One Pre-Bleach sample, the culture portion showed no plate CFU and was positive by real-time PCR analysis of the enrichment culture only (RV-PCR showed T9 Ct values, but did not meet the criteria for a positive result).
[3]Note that each sample was divided into two equal parts for parallel RV-PCR and culture analyses. As a result, variability could have been observed for the samples with low spore levels. Percentages were based on surface and QC samples and did not include True Blanks or laboratory negative and positive controls.
[4]For three of 14 negative controls, culture results were positive but RV-PCR results were negative, suggesting cross-contamination occurred for the culture portion.
Abbreviations: Pos, Positive; Neg, Negative; decon, decontamination.

As mentioned, samples also often contained high debris levels that provided a challenge for PCR-based analysis. However, RV-PCR protocols were shown to be robust for environmental samples and, in most cases, the standard protocol gave consistent results with culture analysis. Occasionally, additional sample dilution (1 to 20 rather than 1 to 10 dilution) was required to obtain accurate RV-PCR results. In addition, the heat lysis DNA extraction protocol applied to a few samples showed greater ΔCt values than the protocol based on magnetic bead-based DNA extraction (see Table 3-29). Further optimization of the DNA extraction and purification portion of the protocol is expected to address the observed PCR inhibition as well as the higher apparent limit of detection for some post-decontamination samples. Protocol modifications introduced after the Round 1 post-decontamination sample testing (used for subsequent Round 2 and 3 testing) also appeared to improve the magnetic bead-based method, but the protocol modifications need to be evaluated systematically to ensure the accuracy of the RV-PCR approach across all sample types and relevant decontamination scenarios.

The method was shown to work well for the surrogate *B. atrophaeus* (*Bg*) spores exposed to decontaminants at real-world application levels and with wipe samples containing background debris and indigenous microbial populations. The > 97% agreement between methods was remarkable for a field test that included samples with low spore levels (at or below the detection limit of the plating method) after treatment with fumigants and surface disinfectants. The T9 endpoint appeared to be sufficient to detect any spores that might have been delayed in germination due to decontaminant exposure. Additional research has been planned for RV-PCR analysis applied to *B. anthracis* spores exposed to decontaminants to confirm the robustness of the method for post-decontamination scenarios.

4.4. Aggressive Air Sampling

In past decontamination activities for *Ba*, AAS augmented surface sampling for making clearance decisions. In the BOTE Project, AAS was incorporated to assess the determination of effectiveness using a decontamination method as compared to surface sampling. AAS used two different air samplers for comparison, as no standard air sampling methodology currently exists for use of AAS for *Ba* spores. The operation was conducted successfully for all three events and sample results closely paralleled surface sample results (see Table 4-15). AAS after Round 1 (fumigation with VHP®) had the highest concentrations of spores detected in the air and surface samples. AAS after Round 3 (fumigation with ClO_2) had the lowest concentrations of spores detected in the air and surface samples. Sampling after the ClO_2 fumigation produced only one sample (Room 105, XMX) resulting in detectable *Bg*, and the concentration was at the detection limit. The XMX field blank for Room 105 also had one CFU. Notably, none of the surface samples from Rooms 105 or 106 resulted in detectable *Bg* after fumigation with ClO_2; likewise, only one surface sample of a total of 273 surface samples resulted in detectable *Bg* anywhere in facility.

During the first AAS sampling event in Round 1 (H+0), the concentrations achieved in Room 105 during the first two hours could have resulted in an exposure to over 90 *Bg* CFU to unprotected individuals in the room during that time, based on breathing an average of 15 Lpm (0.53 ft^3/min) (90 CFU/ft^3 x 0.53 ft^3/min x 120 min).

The first two AAS sampling events (after Round 1 [VHP®] and Round 2 [pH-adjusted bleach] post-decontamination sampling) resulted in detectable *Bg* in the hallway where there were no leaf blowing operations. Because the rooms were not under negative pressure, *Bg* spores could have migrated outside the rooms into the hallway during the leaf blowing operations.

The XMX sample result concentrations were always higher than the corresponding STA samples possibly due to the higher flow rates for the XMX samplers (530 Lpm) versus the STA samplers (28.3 Lpm) causing higher XMX capture velocities coupled with the low concentrations of *Bg*.

Table 4-15. Summary of AAS and surface sampling results.

Round	Location	Aggressive Air Sampling Results (CFU/ft^3)						Post-Decontamination Surface Sampling Results	
		XMX			STA			# Samples with Detectable *Bg*/Total Samples	Average Concentration (CFU/ft^2) (SD)
		H+0	H+60	H+120	H+0	H+60	H+120		
1	Room 105	1.4, 1.4	0.24, 0.18	ND, 0.054	ND	ND	ND	7/10	3.8E2 (1.1E3)
1	Room 106	0.12, 0.54	0.18, 0.18	ND, ND	0.034	ND	ND	7/13	2.5E1 (5.5E1)
1	Hallway	0.65	0.24	ND	ND	-	-	0/14	-
2	Room 105	0.054, 0.054	ND, ND	ND, 0.018	ND	ND	ND	0/9	-
2	Room 106	ND, 0.037	ND, 0.018	0.018, ND	ND	ND	ND	0/8	-
2	Hallway	0.054	ND	ND	ND	ND	ND	0/10	-
3	Room 105	0.018, ND	ND, ND	ND, ND	ND	ND	ND	1/10	5.8E-2 (1.8E-1)
3	Room 106	ND, ND	ND, ND	ND, ND	ND	ND	ND	0/12	-
3	Hallway	ND	ND	ND	ND	ND	ND	0/13	-

4.5. Assessment of Reaerosolization

4.5.1. Reaerosolization Assessment Discussion

The purpose of this analysis was to provide a preliminary view into the surface and airborne *Bg* spore sample data and how reaerosolization may be characterized. Aerosolized *Bg* spores were detected a day after dissemination, both before Stage 3 and after Stage 4 re-entry of personnel. The mean *Bg* spore concentrations in air during Stages 3 and 4 (approximately 1.0E1 to 1.E2 CFU/ft^3) are higher than background concentrations (Stage 1).

Baron et al.[91] reported on the development of a system for aerosol deposition of *B. anthracis* and *Bg* spores (dried spores with a silica-based flow enhancer added) on surfaces and noted that most spores settled within a few hours. More specifically, more than 99% of 1 to 2 µm particles would settle within 10 hr[91]. With a dissemination of about 2.5E5 CFU/ft^3, 2.5E4 CFU/ft^3 would be expected to be left in the air after 10 hr. The residual aerosolized spores detected in Stage 3 may reflect a continued settling of approximately 99% of the spores remaining at 10 hr during the subsequent approximately 14 hr. However, the spores detected in Stage 3 could also arise from settling and subsequent reaerosolization. Furthermore, the comparison between this study and the Baron study might not be directly valid as the Baron et al. study used dried spores whereas the *Bg* spores for the BOTE project were disseminated as a wet suspension. Which of these alternative explanations (or a combination) is correct cannot be determined from the collected data.

Stage 4 arithmetic mean *Bg* spore surface concentrations by room and round (see Table 3-42, all surface and sample types) ranged from 1.3E5 CFU/ft^2 (Round 2, Room 101A) to 6.6E5 CFU/ft^2 (Round 1, Room 101A). As shown in Table 3-42, mean *Bg* spore surface concentrations can vary considerably by surface and sample type. Certain materials (i.e., plastics) appear to attract spores under certain conditions, hypothetically, when there is an electrostatic charge. A relatively small portion of the disseminated *Bg* spores remained aerosolized or were reaerosolized during Stage 4 (see Figure 4-59). The arithmetic mean *Bg* spore concentrations in air ranged from 9 to 32 CFU/ft^3 during Stage 4. Interestingly, during Stage 3 (an apparently more quiescent period; collected approximately a day after *Bg* spore dissemination and before surface sampling personnel entered), the arithmetic mean *Bg* spore concentrations in air ranged from 4 to 72 CFU/ft^3. Increasing air concentrations associated with increased activity (i.e., surface sampling) were apparent only during Round 1 as arithmetic mean spore concentration in Stage 3 (4 to 8 CFU/ft^3) increased in Stage 4 (20 to 32 CFU/ft^3). However, no clear relationship has been observed between spores recovered from surfaces and spores recovered from air. The type/level of sampling activity during Round 1 may have been especially effective at reaerosolization of the deposited spores. Variability among sampling teams may be a contributing factor to the apparent differences observed with regard to reaerosolization. Disseminated spores may remain airborne during the later stages, complicating the interpretation of potential reaerosolization. In addition, the indications of reaerosolization are rather limited temporally, and the extent and length of time that reaerosolization would continue at this level is uncertain. Spore loadings and reaerosolization levels could change via natural spore migration outside the building[50] or possible enhanced binding with surface materials[92]. Extrapolation of these settling/reaerosolization characteristics beyond the sampling time frame

would be rather uncertain. Likewise, application of these settling/reaerosolization trends to different sized buildings, with different materials and disturbance activities/levels, would be uncertain as well.

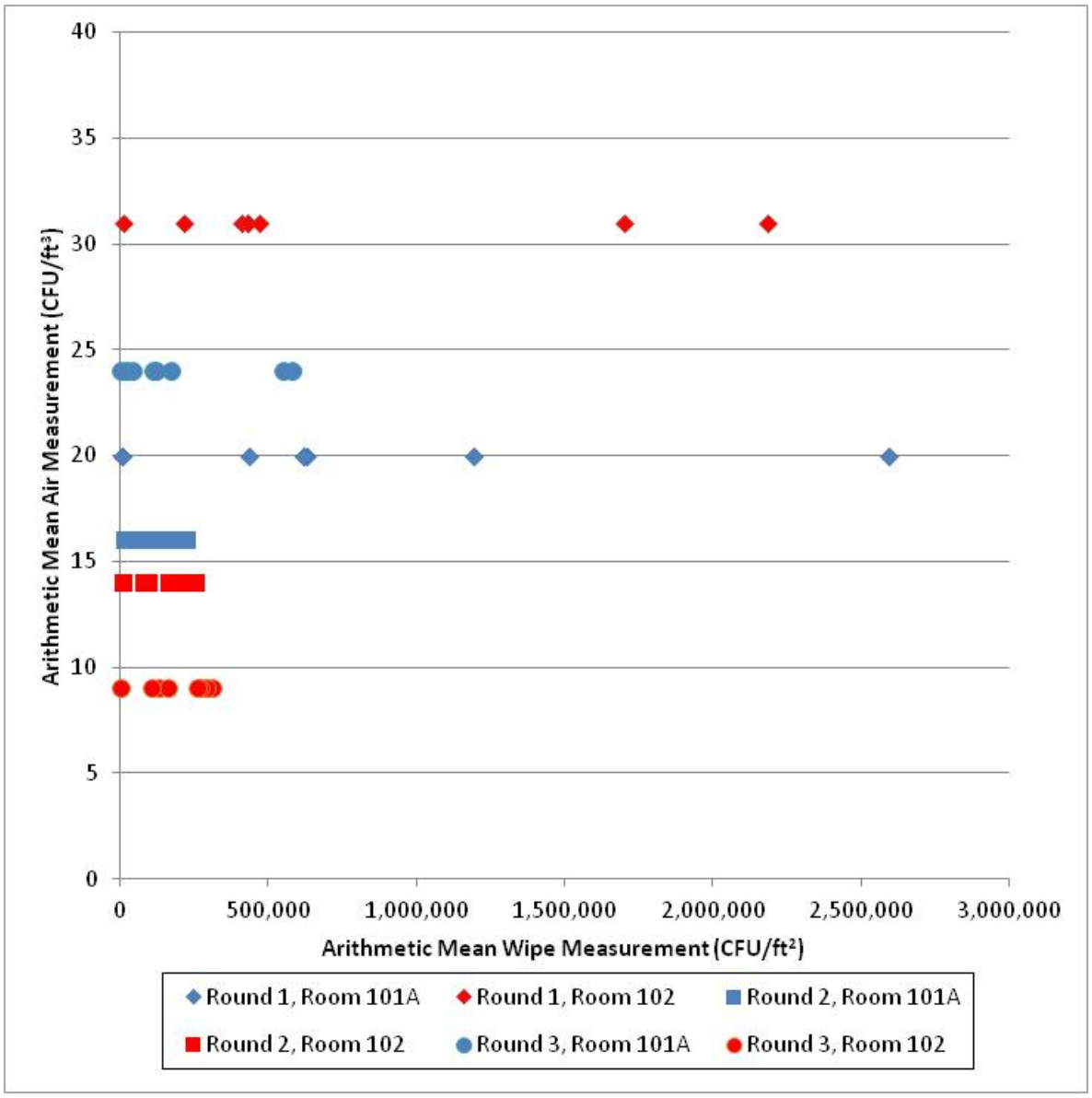


Figure 4-59. Arithmetic means of air versus surface sample measurements from Stage 4 (different points correspond to different surfaces, surface types, and sample types).

Some spores may not have settled or may have reaerosolized during Stage 5 of Round 1 (post-decontamination with VHP®). Arithmetic mean spore concentrations in air were 4 CFU/ft^3 in Room 101A and 2 CFU/ft^3 in Room 102. These airborne concentrations were detected even with very low concentrations of *Bg* spores detected on surfaces. All Stage 5 Round 1 surface samples based on spread plate analyses were NDs (i.e., mean spread plate counts were <30 CFU), but there were detects based on the filter plate results (3 CFU/ft^2 in Room 101A and 57 CFU/ft^2 in Room 102).

4.5.2. Reaerosolization Assessment Summary

Air and surface samples were collected from Rooms 101A and 102 during the BOTE Project to better characterize the potential for reaerosolization of spores released in a real-world indoor environment. Airborne *Bg* spores were detected the day after dissemination and, in some cases, even after decontamination of the rooms.

Airborne *Bg* spores appeared to reaerosolize (or otherwise remain aerosolized for a period of time) and mix readily throughout the rooms. There were no significant differences in *Bg* spore concentrations associated with sampling heights or locations within the rooms.

Residual aerosolized or reaerosolized *Bg* spore concentrations were a fraction of the *Bg* spore concentrations measured in air during active dissemination. Arithmetic mean *Bg* airborne spore concentrations exceeded 2.0E5 CFU/ft^3 during spore dissemination, but fell below 1.0E2 CFU/ft^3 during the post-dissemination stages (after one day of settling).

Aerosolized spores were observed at both high (pre-decontamination) and low (post-decontamination) levels of *Bg* spore surface contamination. The proportion of *Bg* spores that apparently reaerosolize from surfaces appears to be lower at high levels of contamination than at low levels of surface contamination. For example, during Stage 4 (all rounds), the arithmetic mean *Bg* spore surface loadings (by room and round for all surfaces and sample types combined) were >1.0E5 CFU/ft^2, and the arithmetic mean air concentrations were ≤31 CFU/ft^3. During Stage 5 (Round 1), the arithmetic mean *Bg* spore concentration on surfaces was 57 CFU/ft^2 in Room 102, while the arithmetic mean air concentration was 2 CFU/ft^3. These results can not rule out that residual aerosolized and viable spores also contribute to the air sampling data.

As noted in the introduction, estimating airborne spore concentrations from the reaerosolization of deposited spores is probably influenced by many factors including residual aerosolized spores, surface loading, surface material type, activity levels, etc. Consideration of settling and reaerosolization of spores should be included as part of future decontamination studies and activities.

4.6. Waste Management

The proper management of waste from the cleanup after a biological event is a key element of the remediation process. Different decontamination strategies result in different waste quantities and characteristics, and the management of those wastes can significantly affect the overall remediation timeline, resource requirements, and costs.

One of the waste management challenges that the BOTE Project presented was that there was a need to address waste issues (costs, quantities, logistics, etc.) for the project as if the waste that was generated had been contaminated with *Ba*, even though the waste that was generated was not contaminated with *Ba* ("notional" waste). In addition, as a constraint of the tests, the waste that was generated needed to be handled in accordance with INL waste management practices ("real" waste). This effort manifested itself mainly as a need to keep any biohazard-labeled bags (supplied to the sampling teams in the sampling kits) out of the trash. Putting biohazard bags into the trash would not be consistent with waste handling procedures in a real *Ba* incident. The waste management practices from a real *Ba* contamination incident would be determined by the State in which the incident occurred, and how that State characterizes the waste. The disposal of the waste (and criteria for defining/classifying the waste) must also be considered prior to selecting the decontamination technology. Ease of waste management for a given technology must be balanced with factors of time, availability, and cost (e.g., if there is only one suitable fumigation contractor and they are unavailable for six months but the facility needs to be cleaned in one month, a different technology would need to be selected).

4.6.1. General Waste Management Approach

To estimate the cost of and issues related to management of the different "notional" waste streams generated during the BOTE Project, while still appropriately addressing INL requirements for the "real" waste streams, the waste management concept shown in Figure 4-60 was developed. "Initial Disposition" refers to what happened to the "notional" waste immediately upon generation at the site. "Measurements" refers to the different measurements (e.g., weight, point of origin) that were taken on the "notional" waste after its initial disposition. "Temporary Management" refers to the near-term management of the "real" waste such as temporary storage, mingling with or separation from other waste streams, etc. "Final Disposition" refers to the waste management activities related to introducing the "real" waste into INL's waste management processes. In other words, the waste was treated as *Ba*-contaminated waste up until the point at which the waste entered its temporary waste management stage in preparation for final disposition in the INL waste management process.

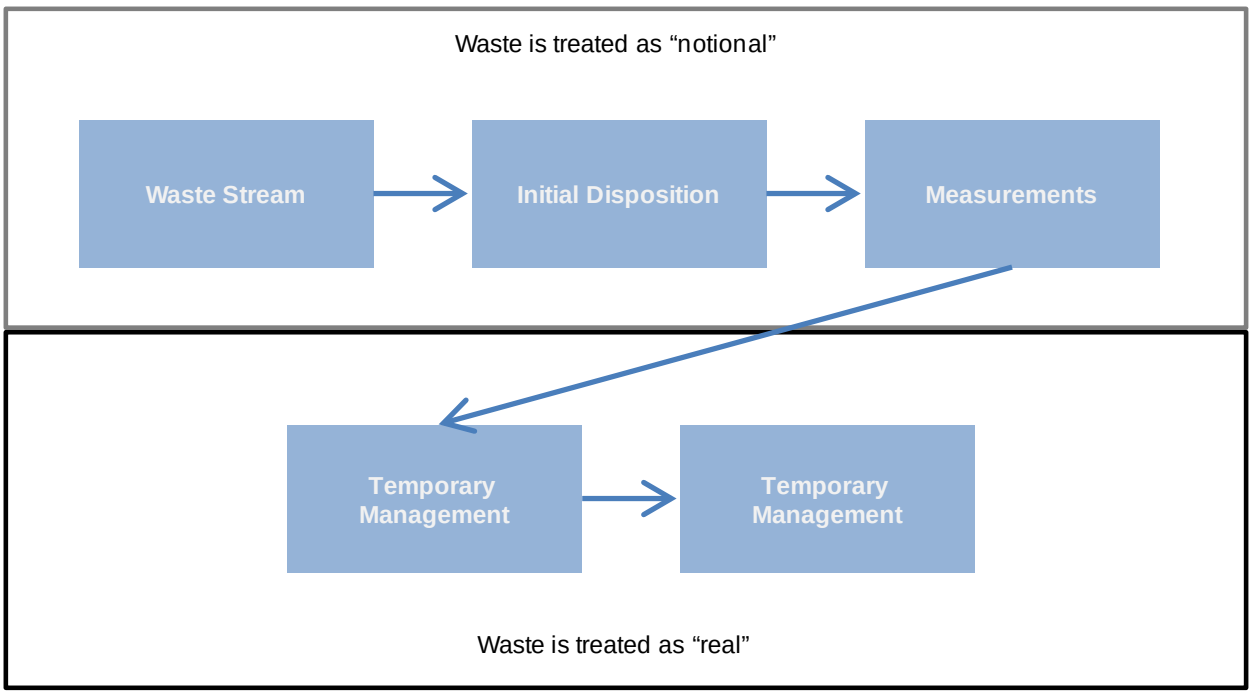


Figure 4-60. Waste management concept.

4.6.2. On-Site Activities

The operational implementation of the above waste management concept was put into practice at the BOTE Project for all three rounds of Phase 1 testing.

Waste that originated in the Sampling Prep Trailer was periodically brought to the Sampling and Decontamination Support Trailer in bags and weighed on a platform scale (My Weigh, Inc., Phoenix, AZ, PN VHD). Weights were recorded either directly into a laboratory notebook or into an iPad device and transferred to the laboratory notebook as a backup. (More information on the use of the iPad can be found in Appendix M.) Once weighed, the waste was transferred into a nearby dumpster for eventual processing through the INL waste management process.

Solid waste that originated in the personnel Decontamination Line was bagged by the Decontamination Line operations personnel and placed outside the personnel Decontamination Line structure. The bags were weighed on the platform scale, the weights and point of origin logged, and then the bags were put into the dumpster. Liquid waste that was collected from the personnel Decontamination Line was accumulated in a 55 gal drum; when the drum was full, the quantity was logged and the drum was replaced with an empty drum.

For the Round 2 (pH-adjusted bleach) decontamination, a significant amount of material was bagged and removed from the building prior to the bleach spraying process. Tracking the point of origin of the solid waste generated during the pH-adjusted bleach decontamination process to the individual room that the materials came from was desirable. To implement the tracking process, RFID chips, each with a unique serial number (Metalcraft, Inc., Mason City, IA, PN 40375-0001) were placed into the bags prior to closing. Bags were accumulated on a room-by-

room basis so that their originating location could be tracked. The bags were then brought to a staging area (one on each floor of the building), opened, and sprayed with pH-adjusted bleach, then closed and double-bagged. Due to the contaminant control procedures put in place to minimize cross-contamination of the less-contaminated parts of the building (Floor 2) and the more contaminated parts of the building (Floor 1), the waste bags were directly thrown into a dumpster from the second floor and not weighed. Waste from the second floor was assumed to be equal to that from the first floor. All bags from the first floor were brought outside the personnel Decontamination Line, the bags were weighed, waved in front of the RFID reader device (Motorola, Inc., Libertyville, IL, PN RD5000); the room of origin was logged; then the bags were placed in a dumpster separate from the waste generated at the personnel Decontamination Line.

The soapy water generated in the personnel Decontamination Line was kept separate from the wastewater that contained bleach from the pH-adjusted bleach decontamination process.

4.6.3. Waste Categorization

For the purposes of separating the waste streams into potential pathways for waste treatment and disposal, the various “real” waste streams were categorized according to the categories listed in Table 4-16, based on whether they had ever been contaminated by the *Bg*, whether they were liquid or solid, and whether they had been subjected to the decontamination processes from the various rounds. In addition, categories were created for waste generated as a result of decontamination operations, such as PPE waste from the Decontamination Line, or liquid bleach residues vacuumed up from the floor following the pH-adjusted bleach decontamination process from Round 2. In a real biological contamination incident, once a stream has been determined to be a waste, the next step is to characterize the waste in accordance with the procedures established by the State in which the waste was generated. These procedures are especially important for biological agents because biological agents are not addressed as part of the Federal Hazardous Waste Framework within the RCRA[93]. As a result, individual State waste management officials must be consulted regarding how these agents are characterized/classified within their respective states. In addition, while the State has a lot of say in the categorization of the waste, it is the owner/operators of waste management facilities that ultimately have to accept the waste. A combination of the identification of state waste management requirements of these waste streams and the waste acceptance criteria and the willingness of owner/operators of waste management facilities to accept the waste determines the final disposition of these waste streams. Pre-incident waste management planning is therefore a real need, so that these issues can be identified and resolved prior to an incident. In addition, the comparison of a single building approach does not address the overwhelming complexities associated with a wide area anthrax release. Facilities outside the State of the release may also be needed to support the response, therefore it becomes a more accurate statement to discuss waste management in terms of the acceptance of the State and owner/operators regardless of where the release occurs. The complexity of multi-state response also further supports the need for pre-incident waste management planning.

Table 4-16. Waste categories.

Number	Name	Description
1S	Uncontaminated Solids	Solid materials that have never been contaminated. An example is the PPE packaging waste from the Sampling Prep Trailer.
2S	Contaminated Solids	Solid materials that are contaminated and have never been decontaminated. None of this type of waste was generated during the BOTE Project Phase 1.
3S	Decontaminated Solids	Solid materials that were once contaminated but have undergone decontamination processes. There may be residual contamination, but sampling and analysis would be required to determine whether residual contamination still exists. A decision would still have to be rendered because this material constitutes a waste. The waste would have to be characterized to determine how it will be handled, labeled, transported, treated and/or disposed of. An example is the material removed prior to the Amended Bleach decontamination that was sprayed with bleach prior to packaging.
4S	Decontamination Solid Waste	Solid materials that were generated through the decontamination process. This waste would still require a waste characterization prior to disposal. An example is the used PPE that came from the Decontamination Line, or fans used in the VHP® fumigation process.
1L	Uncontaminated Liquids	Liquids that have never been contaminated. None of this type of waste was generated during the BOTE Project Phase 1 although some was generated during the dissemination activities of Round 1 that involved collecting water during the timeframe prior to the building being contaminated.
2L	Contaminated Liquids	Liquids that are contaminated and have never been decontaminated. None of this type of waste was generated during the BOTE Project Phase 1.
3L	Decontaminated (treated) Liquids	Liquids that were once contaminated but have undergone the treatment processes. Residual contamination may exist, but sampling and analysis would be required to determine whether residual contamination still exists. A decision would still have to be rendered because this material constitutes a waste. The waste would have to be characterized to determine how it will be handled, labeled, transported, treated and/or disposed of. The waste that fell into category 3L was the liquids generated during the drying operation after the Amended Bleach decontamination.
4L	Decontamination Liquid Waste	Liquids that were generated through the decontamination process. An example is the recovered rinsate from the Decontamination Line or the spent bleach solution vacuumed from the floor during the amended bleach decontamination.

Table 4-17 lists the various waste streams and describes the initial disposition, measurements, frequency of measurements, temporary management/storage, and final disposition of the waste materials. The final disposition of this waste is based on INL waste management procedures with State input; however, if this were an actual incident involving a release of *Ba*, waste management procedures would be developed in accordance with State requirements with collaborative technical support from appropriate Federal agencies as requested.

Table 4-17. BOTE Project waste management measurements and frequency.

Waste Stream	Waste Category (see Table 4-16)	Initial Disposition	Measurements	Frequency
PPE and Other Solid Decontamination and Sampling Residues	2S, 3S, or 4S	Collect in bag at end of Decontamination Line	Item Description Weight	As bags were filled, Decontamination Line Ops personnel put bag outside Decontamination Line
Personnel Decontamination Rinsate and Collected Liquid Residues from Amended Bleach Decontamination	2L, 3L, or 4L	Collect in barrel at end of DecontaminationLline; soapy water from Decontamination Line and bleach from Decontamination Line were collected separately; liquid residues from amended bleach decontamination was collected separately	Volume	When barrel is full
Items Removed Prior To/During Amended Bleach Decontamination	3S	Package prior to removal (Bag, Add RFID Tag, Move to Staging Area Inside Bldg., Add Bleach, Close Bag, Double Bag); place outside Decontamination Line	Item Description Item Weight Item Room	As bags were filled
Sampling Waste from Donning Trailer	1S	Place in plastic bag	Description Weight	As bags were filled

ASSUMPTIONS:
No residues are either listed or characteristically hazardous per RCRA. However, if the residues are either listed or characteristically hazardous, then disposal must be in accordance with RCRA Subtitle C requirements defined by the State and the waste acceptance criteria of the waste management facility where the waste will be managed. If the waste management facility is not in the same State where the incident occurred, then both State solid waste regulatory offices must be consulted. Any pathogenic agent has been “rendered non-viable” through autoclaving or similar process, and no free liquids are present. Liquid waste likewise is “rendered non-viable” and meets PLN-8104. Most of the liquid (assuming non-RCRA), if not all, in the past went to the sanitary waste system via a pumper truck. Any additional solid waste regulations of the State have been followed.

4.6.4. Results

The waste generation data are subject to the caveat that, to the extent possible, generated waste was assigned to the activities that resulted in the generation of that particular batch of waste. However, due to the duration of some of the workdays during the BOTE Project Phase 1 testing, some activities were deferred until the following day, and this deferral may have resulted in some waste being assigned to the activities associated with the following day. These minor discrepancies may change the activity that the waste was assigned to but would have a negligible effect on the overall cost analysis associated with the waste management.

Due to logistical issues with handling the removed materials that were collected from the second floor of the building during Round 2 (pH-adjusted bleach decontamination process) while maintaining the contaminant control procedures, the weights of the removed materials from the second floor were not measured directly. Rather, the quantities of materials removed from the first floor were doubled. In addition, although the laminate floors were not removed prior to the pH-adjusted bleach decontamination process, the laminated floors were severely warped by the pH-adjusted bleach spray and, in a normal decontamination situation, would have required replacement. Also, the supply-side HVAC ductwork would have been removed as part of the pH-adjusted bleach decontamination process and later replaced (see Section 4.1.2.1.6). The laminate floors and HVAC duct were therefore notionally added to the waste stream for the pH-adjusted bleach decontamination process, as well as to the refit cost in the cost analysis. These issues all combined to result in the pH-adjusted bleach decontamination process generating significant quantities of waste relative to the fumigation rounds. Table 4-18 lists the amount of solid and liquid waste generated during each test activity, categorized as per Table 4-16. Note that waste related to dissemination of the spores represents a total for all three rounds.

Table 4-18. Waste data from BOTE Project Phase 1.

Activity	Category 1S Uncontaminated Solid (lb)	Category 3S Decontaminated Solid (lb)	Category 4S Decontamination Waste Solid (lb)	Total Solid Waste (lb)	Category 1L Uncontaminated Liquid (gal)	Category 3L Decontaminated Liquid (gal)	Category 4L Decontamination Waste Liquid (gal)	Total Liquid Waste (gal)
Breakdown by Detailed Activity								
Dissemination	70	0	0	70	66	0	0	66
VHP® - Characterization Sampling	17	0	210	227	0	0	211	211
VHP® - Decontamination	7	0	447	455	0	0	55	55
VHP® - Clearance Sampling	20	0	188	208	0	0	74	74
AB- Characterization Sampling	21	0	247	268	0	0	177	177
AB Decontamination - Removal	6	10,142	154	10,302	0	0	26	26
AB Decontamination - Spray	4	2,157	178	2,339	0	105	528	633
AB Decontamination - Dry	0	0	0	0	0	0	0	0
AB - Clearance Sampling	16	704	325	1,045	0	0	101	101
ClO_2 - Characterization Sampling	11	0	101	112	0	0	137	137
ClO_2 - Decontamination	0	0	0	0	0	0	0	0
ClO_2 - Clearance Sampling	0	0	315	315	0	0	38	38
AB - Building Reset	0	0	0	0	0	0	0	0
Breakdown by Round								
VHP®	114	0	846	960	66	0	340	406
AB	46	13,003	905	13,954	0	105	831	936
ClO_2	11	315	101	427	0	0	175	175
Total	171	13,318	1,852	15,341	66	105	1,345	1,516
Breakdown by Aggregated Activity								
VHP® Sampling	37	0	398	436	0	0	285	285
VHP® Decontamination	7	0	447	455	0	0	55	55
AB Sampling	37	704	572	1,313	0	0	278	278
AB Decontamination	10	12,299	332	12,641	0	105	554	659
ClO_2 Sampling	11	315	101	427	0	0	175	175
ClO_2 Decontamination	0	0	0	0	0	0	0	0
Other	70	0	0	70	66	0	0	66

AB = pH-adjusted bleach decontamination process; Other = collected during other activities (e.g., dissemination)

Summarizing the daily solid waste data on the basis of total amount collected and plotting the results yields Figure 4-61. The materials removed from the pH-adjusted bleach decontamination process in Round 2 contributed significantly to the overall waste stream, as well as requiring much more support for handling and packaging than the other days of the testing. Coordination of waste management procedures with the State waste management officials is critical. For example, in the recent naturally-occurring *Ba* response in Durham, NH[1], the State indicated that if the pH-adjusted bleach decontamination process were properly followed, the waste could be disposed of as solid waste in a RCRA Subtitle D facility without any additional waste characterization sampling. In a real *Ba* response, it is advantageous to ensure that the decontamination process (and sampling, if required) results in the least restrictive (e.g., Subtitle D) waste designation, thus reducing remediation costs.

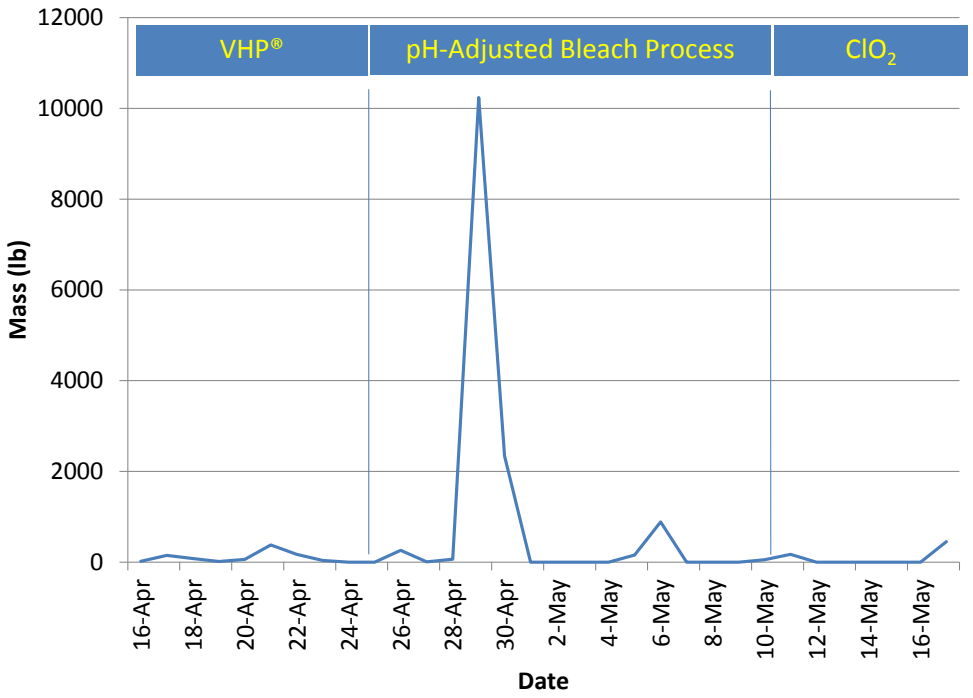


Figure 4-61. Daily solid waste generation.

4.6.5. Discussion

Figure 4-62 shows the distribution of waste by activity (sampling and decontamination and other) for liquid and solid waste. The vast majority of the waste from Round 2 with the pH-adjusted bleach decontamination process was generated during the decontamination itself, whereas for Round 1 and Round 3, a significant fraction of the waste was generated during sampling operations. Note that any differences in quantities of waste generated during sampling operations represent the variability of sampling waste generation (i.e., sampling activities for the three rounds of the BOTE Project were virtually identical).

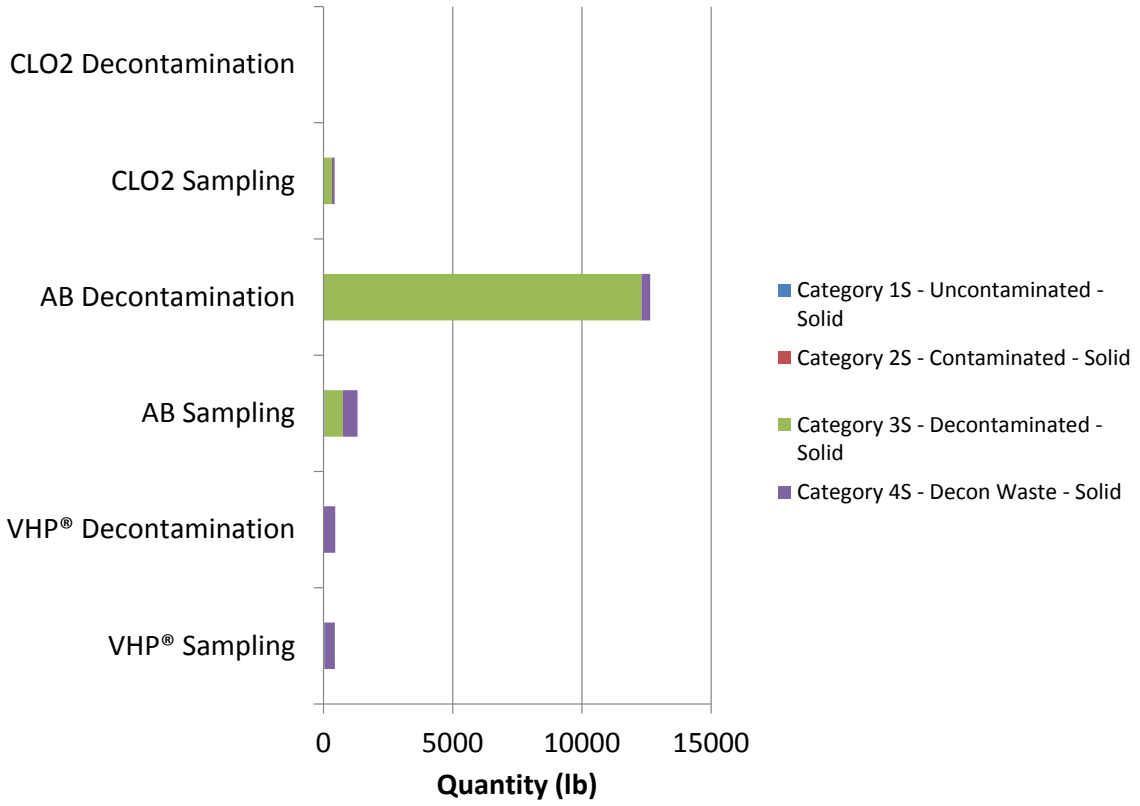


Figure 4-63 shows the quantities of solid waste as a function of waste category. The largest amount of solid waste generated occurred during Round 2 (pH-adjusted bleach decontamination process) in which porous surfaces were removed, bagged, decontaminated *ex situ*, and treated as waste (Category 3S). Waste generated during Round 1 (fumigation with VHP®) included only category 4S waste such as PPE and sampling waste (e.g., packaging) for both building decontamination and sampling. A small amount of decontaminated solid material was also generated during the post-decontamination sampling in Round 2. No solid waste was generated during building decontamination using ClO_2, but a small amount of solid waste (Category 4S) from PPE and sample kit packaging was generated during ClO_2 sampling. Foam materials (452 lbs) were removed after the ClO_2 fumigation (chairs, chair cushions, and mattresses), but these materials were not included in the waste tally because they were not damaged and would not have been replaced had there been an additional round following ClO_2 fumigation.

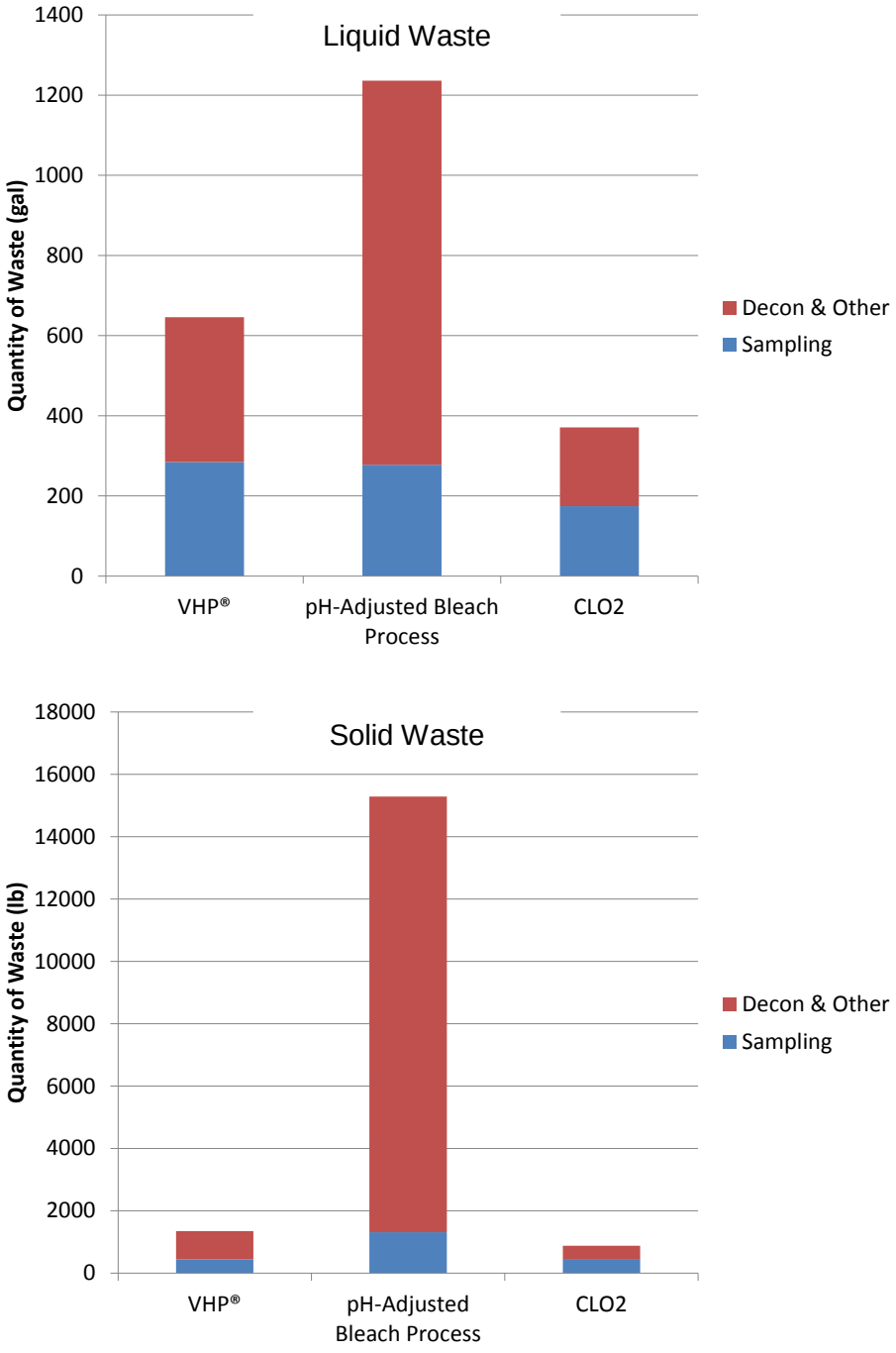


Figure 4-62. Distribution of waste by activity (normalized to 100%). The top plot is liquid and the bottom plot is solid waste.

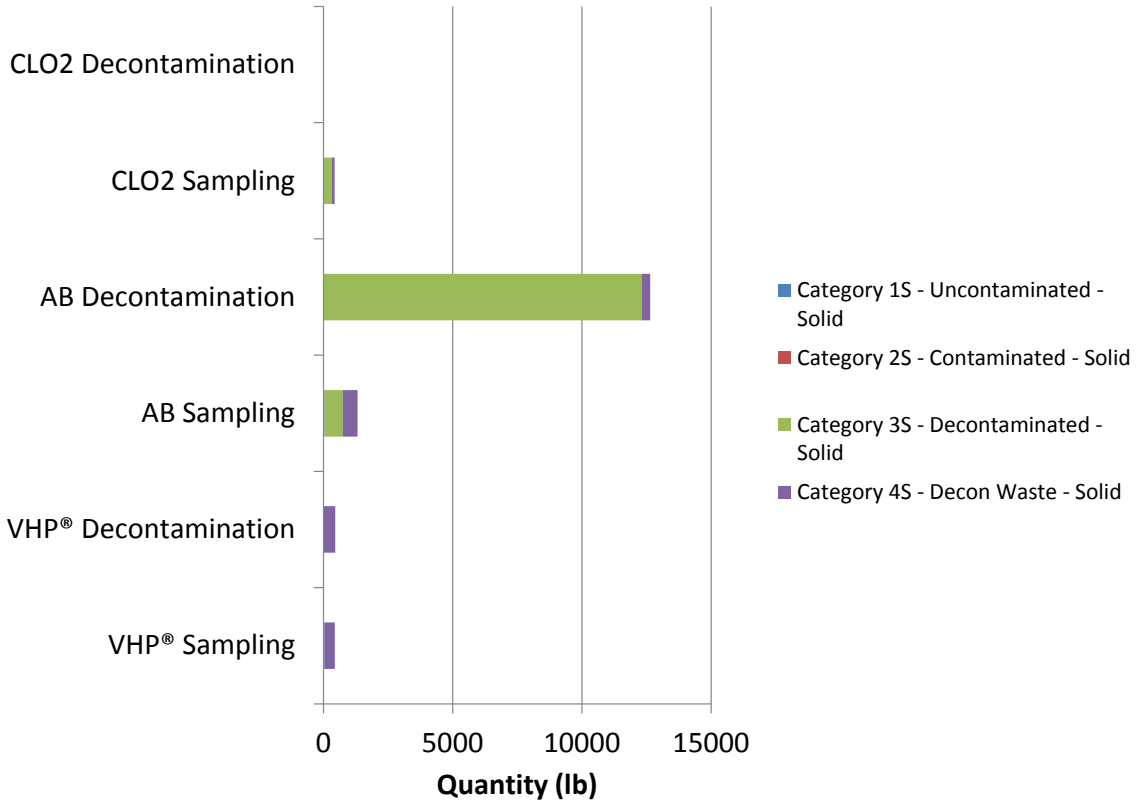


Figure 4-63. Solid waste by category.

Figure 4-64 shows the quantities of liquid waste as a function of waste category. The largest amount of liquid waste was generated during Round 2 (pH-adjusted bleach decontamination process) due to decontamination of the building using pH-adjusted bleach (Category 4L). Decontamination liquid waste was also generated during all three rounds during sampling; this waste consisted of the rinsate recovered from the Decontamination Line.

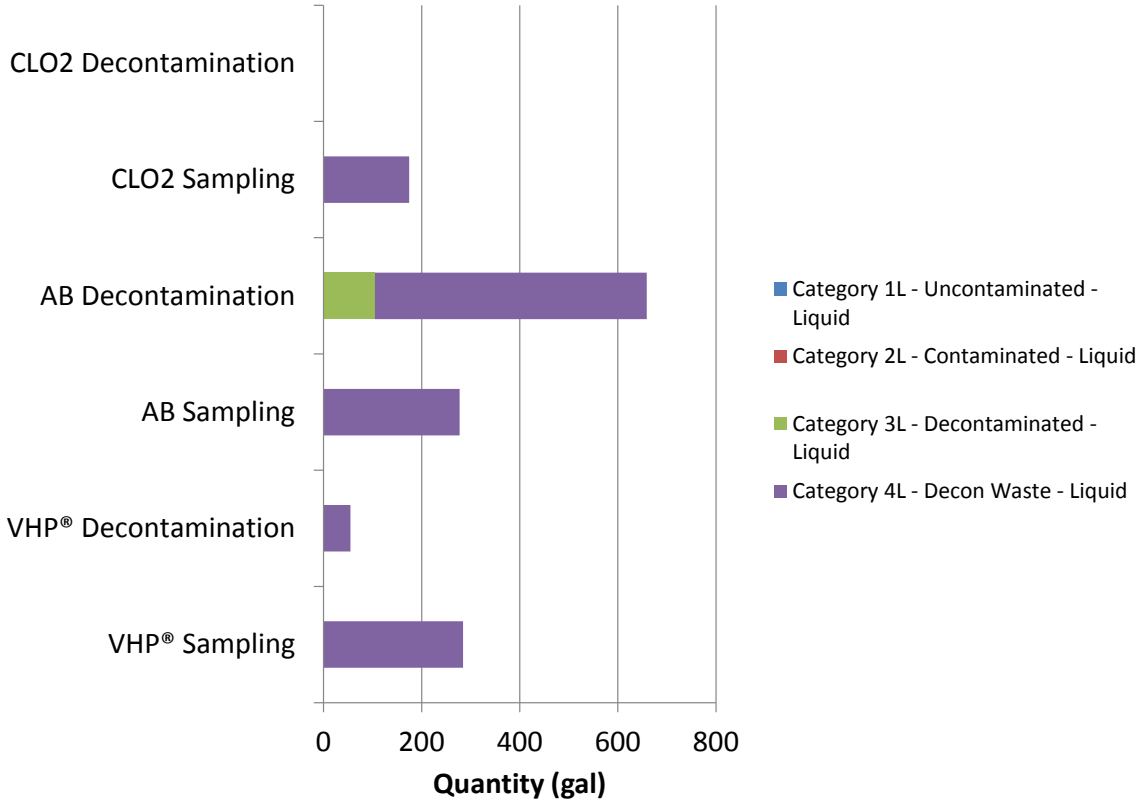


Figure 4-64. Liquid Waste by Category

4.6.6. Conclusions

The management of the waste from the BOTE Project presented several challenges, including:

- Difficulty weighing the waste from the second floor of the building during the pH-adjusted bleach decontamination process while maintaining the contaminant control measures necessary to prevent cross-contamination of samples;
- Difficulty extrapolating waste management practices from waste containing a nonpathogenic organism to waste management of wastes containing *Ba*; and
- Difficulty specifying appropriate waste characterization strategies (i.e., sampling procedures for bagged waste are not well-defined; bagging waste is logistically difficult, and the effectiveness of using a surface sampling technique on bags of wetted building materials is questionable).

The following observations and conclusions can be made:

- Waste management is an integral part of the decontamination process and must be included as a specific function when response planning is done;
- Overall, the pH-adjusted bleach decontamination process generated the most waste for both building decontamination and sampling efforts;

- The use of RFID chips to track the source of the waste worked very well in spite of fears that the presence of the pH-adjusted bleach in the bags might interfere with reading the RFID chip information properly; and
- If the State agrees to accept liquid wastes in a POTW facility and the solid waste in a RCRA Subtitle D facility, the waste management is greatly simplified.

4.7. Cost Analysis

A major objective of the BOTE Project was to estimate the cost of the application of various decontamination technologies as a function of materials and labor effort. This estimation was done by achieving the following objectives:

- Primary Objective: To conduct an analysis of the cost of the application of cleanup technologies;
- Secondary Objective: To develop a tool or methodology that can be used to help guide decision making for future events; and
- Secondary Objective: To provide input to a risk assessment to estimate residual exposure potential as a function of remediation costs and decontamination technologies.

4.7.1. Cost Analysis Approach

The cost analysis approach makes the general assumption that although certain pieces of information derived from the BOTE Project are incident- and site-specific, the information can still be extrapolated to other incidents, using appropriate scaling factors based on labor hours, numbers of samples, size of affected areas, and quantities of waste that are generated. Although it would be desirable to be able to extrapolate the BOTE Project cost analysis to a wide area incident, the goal of this analysis was to be able to extrapolate the analysis to other single building incidents. The parameters examined in this cost analysis include costs related to sampling activities, application of decontamination technologies for the building and personnel entering and leaving the building, and costs related to equipment rentals and consumables. Some costs that are critical to an analysis (e.g., waste management) were not able to be assessed purely based on the BOTE Project; i.e., some BOTE Project-derived costs may be unrealistic because the BOTE Project used a *Ba* surrogate and not actual *Ba* spores. Some cost issues are highly dependent on the waste designation that is determined by the State, because the initial presence of *Ba* in the materials may not preclude disposal of liquid waste in a POTW facility or solid waste in a RCRA Subtitle D landfill provided that the State approves these disposal pathways for waste that has undergone a decontamination or treatment process. In the BOTE Project Phase 1, there was an underlying operational assessment that influenced many decisions that impact costs. Costs that could not be assessed either by using data directly from the BOTE study or from estimates based on best engineering judgment were not included in the cost analysis.

4.7.1.1. Costs that were included

Costs estimated from the BOTE Project Phase 1 activities were assumed to be applicable to the extrapolation of costs for another single building incident. Extrapolation of this cost analysis to a wide area event was not within the scope of this effort, although future analyses may attempt to make this extrapolation. The goal of this effort was to assess costs (labor + materials)

associated with cleaning up a single building to a given level of residual number of viable spores remaining on the surfaces and/or in the air based on a per application basis, if possible. If possible, labor costs were based on an approximate loaded hourly labor rate and accounted for both Federal and non-Federal workforce (i.e., contractor) efforts (labor costs associated with Federal workers are frequently ignored because they are sometimes paid by funding sources not normally associated with the response). This consideration is particularly important for cost elements that are more easily scaled such as decontamination personnel, where the effect of adding additional decontamination personnel could be examined. Costs for waste management were based on type, quantity, and level of residual contamination, coupled with hypothetical transportation, treatment, and disposal considerations. Some of the waste management cost elements were notional rather than based on data from the BOTE Project because a surrogate for *Ba* spores was used. Statistical analysis was performed to assign confidence intervals to the cost estimates when compared to residual spores remaining after decontamination. Costs that are considered in the analysis are discussed in the subsections below.

4.7.1.2. Sampling

Due to the research study nature of the BOTE Project, the sampling effort for the BOTE Project was significantly greater than the sampling effort that would have been performed at a real *Ba* incident. Cost analysis of the sampling effort broke the costs down so that future cost estimates could be scaled as appropriate for an incident, but the overall sampling cost from BOTE should not be construed to reflect the total sampling cost for a similar sized building. The BOTE building had unique aspects (e.g., diversity of rooms) that would influence the sampling effort; the cost analysis attempted to account for these unique aspects where possible.

- Travel costs for sampling teams (including lodging and per diem);
- Training time for sampling teams (it is assumed that even for a real *Ba* incident, there would be site-specific training for sampling teams);
- Labor costs associated with planning sampling activities;
- Labor costs for sampling teams to don PPE and prepare for building entry;
- Labor costs for sampling teams entering the building and performing sampling activities;
- Labor costs for sampling teams exiting the building through the personnel Decontamination Line and associated labor costs of Decontamination Line personnel;
- Labor costs associated with preparing the sampling kits that were used for sampling;
- Labor costs associated with supporting the sampling activities (e.g., BROOM, Incident Command, Safety);
- Material costs associated with sampling, including the cost of PPE;
- Material costs associated with sampling teams entering the building; and
- Waste management costs associated with sampling.

4.7.1.3. Laboratory Analysis

- Costs associated with preparing and shipping samples to the laboratory;
- Labor costs for laboratory analysis;
- Material costs for laboratory analysis; and
- Labor costs associated with statistical analysis of the laboratory data.

4.7.1.4. Decontamination

- Travel costs for decontamination and/or removal teams (including lodging and per diem);
- Labor costs for training of decontamination and/or removal teams (it was assumed that even for a real *Ba* incident with experienced decontamination teams, there would be some site-specific training required);
- Labor costs for decontamination and/or removal teams donning PPE and preparing for building entry (PPE costs were separately tracked);
- Labor costs for decontamination and/or removal teams entering the building and performing decontamination operations;
- Labor costs for decontamination and/or removal teams exiting the building through the personnel Decontamination Line and associated labor costs of Decontamination Line personnel;
- Labor costs associated with maintaining entry teams (e.g., Level B PPE support);
- Material costs associated with decontamination and/or removal teams entering the building;
- Material costs for decontamination;
- Equipment rental costs;
- Fixed contractor costs for decontamination (e.g., contracts with fumigation vendors); and
- Waste management costs due to decontamination and removal teams entering the building.

4.7.1.5. Waste Management

- Labor costs associated with development of plans for waste management, transportation, health and safety, and communications (notional);
- Labor costs associated with coordination with regulatory authorities (notional);
- Waste transportation costs (notional but based on measurements of waste quantities);
- Waste disposal fees (notional but based on measurements of waste quantities);
- Waste handling, packaging, and labeling costs (notional, but based on measurements of waste quantities); and
- Waste sampling and analysis costs (notional, but based on measurements of waste quantities).

4.7.1.6. Building Refit

The costs of replacing the items in the building have a high degree of uncertainty. In this cost analysis, no consideration was made as to who would actually be paying the costs for replacement of items. The building owner would probably be responsible for refit costs, and their insurance coverage would likely significantly impact what items get replaced. In addition, the numbers of items and amount of material in the contaminated rooms will have a profound impact on refit costs. For the BOTE Project, the rooms were relatively sparsely fitted with representative items, but the numbers of items and amount of materials in the BOTE rooms was likely to be significantly less than in a real residence or office. The cost estimate that was performed assumed that all items in the rooms would be replaced. No assumptions were made as to who would bear these costs.

- Labor costs for replacing items removed from building either before or after decontamination;
- Replacement costs for items in building that were removed either before or after decontamination; and
- Replacement costs for items in building that were not removed but would have been removed in a real situation (notional).

4.7.1.7. Incident Command

The costs of the IC covered in this section include costs not directly accounted for in other cost categories (e.g., sampling, decontamination).

- Travel costs of minimal IC personnel (e.g., Safety, Incident Commander), including lodging and per diem;
- Labor costs associated with maintaining minimal IC through duration of each round; and
- Labor costs for health and safety monitoring of decontamination reagent levels inside the building to determine when the building can safely be entered for clearance sampling.

4.7.1.8. Costs not included

A number of cost elements, although important, were not assessed in the cost analysis from the BOTE Project. In general, these costs were either impossible to assess accurately due to their site- and incident-specific nature, or were not likely to be a strong function of the decontamination strategy. These costs included:

- Costs due to denial of access to facilities that have not been cleared;
- Costs associated with delays in reaching final decontamination or waste disposal decisions;
- Costs associated with delay in cleanup due to limited availability of cleanup contractors;
- Costs associated with the closest waste management facilities being unwilling to accept the incident-generated wastes for whatever reason (i.e., public, political, shareholder, or other concerns);
- Most IC costs;
- Costs associated with public panic (e.g., the types of costs reported in news media after incidents);
- Costs associated with denial of access due to the public's refusal to reoccupy buildings that have been cleared;
- Costs of items not directly related to the decontamination and building remediation; and
- Costs due to the extension of response/recovery timelines due to political considerations.

4.7.2. Conceptual Description of Cost Analysis

The equations in this section represent a mathematical approach to collecting the various cost elements and combining them into an overall cost. The cost estimate is broken down into several main components: 1) sampling and analysis costs; 2) decontamination costs; and 3) restoration costs.

4.7.2.1. Sampling and Analysis Costs

Equation 4-1 describes the total costs for sampling:

$$C_s = \sum_{i=0}^{Nes} (C_{PS} + C_{PDS} + C_{PDWS}) + \sum_{j=0}^{Ns} (C_{SLi} + C_{SMi} + C_{SAi} + C_{SWi})$$

Equation 4-1

where C_S represents the sampling costs, C_{PS} is the cost of sample team preparation (labor + PPE) for each entry *(i*) into the contaminated building up to N_{es} that is the total number of sample team entries, C_{PDS} is the cost of post-entry personnel decontamination of the sampling team (labor + materiel) for each entry, C_{PDWS} is the cost of waste management for the personnel decontamination waste for each entry into the contaminated zone, and, for each type of sample (*j*) up to the total number of samples (*Ns*), C_{SLi} is the cost of labor, C_{SMi} is cost of materials, C_{SAi} is the cost of sample analysis (including packaging and shipping), and C_{SWi} is associated waste management costs. Sampling costs were calculated for both the pre-decontamination (characterization) and post-decontamination (clearance) sampling for each round of the BOTE Project.

4.7.2.2. Decontamination Costs

Equation 4-2 describes the costs for decontamination:

$$C_D = \sum_{i=0}^{Ned} (C_{PD} + C_{PDD} + C_{PDWD}) + C_{DC} + C_{RLB} + C_{RW} + C_{DL} + C_{DM} + C_{DW}$$

Equation 4-2

where C_D represents the cost for decontamination, C_{PD} is the cost of decontamination/removal team preparation (labor + PPE) for each entry *j* into the contaminated building up to N_{ed} that is the total number of decontamination/removal team entries into the building, C_{PDD} is the cost of post-entry personnel decontamination of the decontamination/removal team (labor + materiel), C_{PDWD} is the cost of waste management for the personnel decontamination waste for each entry into the contaminated zone, C_{DC} is the fixed cost of any third party decontamination contractors, C_{RLB} is the cost of labor for pre-decontamination item removal, C_{RW} is the cost of waste management for the removed items, C_{DL} is the cost of decontamination team labor, C_{DM} is the cost of decontamination materials, including purchase and/or lease of equipment such as backpack sprayers or NAMs, C_{DW} is the cost of managing decontamination waste. Some of these terms were zero for certain decontamination technology selections, and some of these terms were notionalized (e.g., waste) because this effort used a simulant and not a real

biological warfare agent. Where possible, a detailed assessment of cost was performed, including such factors as electricity for NAMs, water, and shipment for supplies.

4.7.2.3. Restoration Costs

Equation 4-3 conceptually describes the costs for restoration of the facility and addresses costs incurred after the decontamination until the building has been refitted with new or decontaminated items. Some of these cost elements were notionalized, e.g., laminate flooring was not replaced after the pH-adjusted bleach decontamination process but would have been replaced in a real situation due to warping that occurred from the laminate becoming wet and saturated from the decontamination process.

$$C_R = C_{RLA} + C_{RW} + C_U$$

Equation 4-3

In Equation 4-3, C_R represents the cost for restoring the facility to normal operation after the decontamination, C_{RLA} is the labor cost of removing materials post-decontamination, C_{RW} is the cost of managing those removed materials as waste, and C_U is the cost of refitting the facility with new items (labor + materials).

4.7.2.4. Total Cost Per Round

Using these equations, the total cost per Round (*C*) was estimated using Equation 4-4:

$$C = C_S + C_D + C_R$$

Equation 4-4

There are several ways to normalize these data, including:

- Cost Per Room Type;
- Cost Per Unit Area; or
- Cost Per Unit Volume.

4.7.3. Sources of Data

The raw data were acquired from several sources. Table 4-19 lists the data acquired, the source of the data, and how the data were QC-checked. The cost data were collected in an MS Excel workbook (i.e., the Cost Analysis workbook) that contained multiple worksheets. These worksheets can be found in Appendix H and are available if additional detail is desired on how costs were estimated. Table 4-20 lists the worksheets and what data they contain.

Table 4-19. Sources of data.

Measurement	Primary Source	QC Method
Entry team personnel Decontamination Line data	Notes from radio broadcasts	Compared with Test Group Director notes and Emergency Medical Team notes
Entry team preparation time	Radio broadcasts	Occasional observations
Entry team times inside building	Radio broadcasts	Compare with Test Group Director notes
Material costs	Copies of purchase orders, emails	Spot check random entries for accuracy
Personnel Decontamination Line operations data	Test Group Director Notes	Compared with notes
Times to perform decontamination operations	Radio broadcasts	Compare with notes, Test Group Director notes
Times to take samples	Observer inside building watching sampling teams	Compare with notes, Test Group Director notes
Waste origination point	RFID chips inserted into bags of waste prior to removing bags from rooms; later tracked as bags of waste left building using RFIDreader	N/A
Waste quantity estimates	Platform scale near personnel Decontamination Line; volumetric estimate on full barrels	Scale periodically checked for drift and zero with full bottle of bleach

Table 4-20. Worksheets from the cost analysis workbook.

Worksheet Name	Information in the Worksheet
AB Building Refit	Calculations for the Round 2 building refit [Equation 4-3]
Activities	The list of the activities that occurred throughout the BOTE Project Phase 1
Analytical Costs	Calculations for estimating analytical costs [Equation 4-1]
Cost Equations	The main cost calculation sheet that estimated values for the terms in Equation 4-1, Equation 4-2, Equation 4-3, and Equation 4-4
Daily Activity List	A lookup table assigning the activities in the “Activities” worksheet to a given date
Daily Waste Generation	Calculations of the amount of waste generated each day
Decontamination line Ops	Raw data – observations of the labor due to personnel Decontamination Line operations
Entry Team Decontamination Line Time	Raw data – observations of the amount of time each building entry team spent in the personnel Decontamination Line
Entry Team Prep Time	Raw data – observations of the amount of time each building entry team spent donning their PPE and preparing for entry
Knobs	The worksheet with the adjustable parameters for the cost analysis
Lumped Costs	Raw data – observations and calculations of various lumped costs that were

Worksheet Name	Information in the Worksheet
	not scalable based on labor hours or entries (e.g., travel, BROOM support)
Notes and Assumptions	A list of notes and assumptions
Numbers of Samples	Calculations related to numbers of samples
Purchase Orders	Raw data – observations and calculations of various items purchased for the BOTE Project
Resource Tracker Sampling Data	Raw data – observations taken by the observer inside the building during sampling operations
Revisions	A list of revisions to the Cost Analysis Workbook as the calculations were developed
Room Sample Box Prep Time	Raw data – observations of how long it took to prepare the sample boxes for use in the different rooms in the building
Room Sample Time	Raw data – how long it took to sample each room
Salary Table	A table of salaries that were used to estimate labor rates of various efforts
Summary	Intermediate calculations of various terms used in the Cost Equations worksheet
Team Entries	Calculations of numbers and duration of entries by various teams
Team Makeup	This worksheet defined the makeup of each team and calculated the team's loaded hourly labor rate based on the team makeup and the Salary Table worksheet
Time Per Sample	Calculations of how long each type of sample took to acquire
Waste	Raw data – quantities of waste generated
Waste Cost	Calculations of waste management costs
Waste Summary	Calculations of amount of waste generated in each room and amount of waste broken down by category

4.7.3.1. Labor Cost Approach

Labor costs were estimated using a loaded hourly labor rate approach that used designated teams for various activities. Contractor hourly labor estimates[94] were based on values for the labor categories shown in Table 4-21, and the Incident Commander or On-Scene Coordinator was based on a GS-13 Step 5 rate found in the 2011 General Schedule Locality Pay Tables for Raleigh-Durham-Cary, NC[95]. A multiplication factor of three was used to estimate total loaded hourly rates from the base hourly salary values. This multiplier accounted for benefits and management overhead associated with the employee. The personnel mix of teams that comprised the efforts for various aspects of the response was based on mixtures of the previously mentioned labor categories, deployed for varying numbers of hours. The teams that were used are listed in Table 4-22.

Table 4-21. Labor categories and loaded hourly labor rates.

Labor Category	Job Classification	Loaded Hourly Rate ($)
PL1	Engineer I	86
PL2	Engineer II	102
PL3	Engineer III	124
PL4	Engineer V	170
TL1	Engineering Aide I	66
TL2	Engineering Aide II	79
TL3	Engineering Aide III	88
EMT	Paramedic	58
On-Site Coordinator/Commander	GS-13 Step 5	147

Table 4-22. Labor mix of teams of personnel.

Team Type	OSC/ Commander	EMT	PL1	PL2	PL3	PL4	TL1	TL2	TL3	# of Teams
AAS Team	1			3						1
BROOM Team			1			1				1
Building Upfit Team			1				3	3	3	1
Command Team	1									1
Data Analysis Team					2	2				1
Decontamination Line Ops Team	1	1						3		1
Decontamination Line Setup Team									2	1
Decontamination Team (PPE Level B)	0.33				3.33	0.67				3
Decontamination Team (PPE Level C)	0.33				2.33	0.67				3
Documentation/Plan Writing Team			0.5		0.25		1			1
EPA Purchasing Team						1			0.25	1
Health and Safety Team	1									1
INL Equipment Purchase Team						0.25	1			1
Laboratory Analyst Team	0.25			0.25					1	1
On-Scene Coordinator	1									1
Regulatory Coordination Team	1					2				1
Removal Team	0.33				3.33	0.67				3
Room Sample Box Prep Team									3	1
Sample Kit Prep Team				1						1
Sample Packaging Team			1			1			1	1
Sample Planning Team						1				1
Sampling Team	0.33				3					6
Statistical Analysis Team						1				1
Waste Handling Team	1							3		1
Waste Sampling Team			3							1
Water Sampling Team			3							1

4.7.3.2. Sampling/Analysis Cost Approach

The following costs were calculated based on the number of entries:

- Building entry costs;
- Team preparation costs; and
- Personnel decontamination costs.

The following costs were calculated based on the number of samples:

- Team labor for sampling;
- Materials for sampling, including PPE;
- Labor for analysis; and
- Materials for analysis.

The following costs were calculated based on totaling purchase order values or by estimation of time coupled with loaded labor hours:

- Preparing sampling kits;
- Travel for sampling teams;
- Purchase of temperature/RH monitoring devices (e.g., HOBOs®);
- BROOM support; and
- Analysis and QA of data.

The waste management costs from sampling were estimated based on the amounts of different types of waste generated and notional waste management decisions and costs that would arise based on those decisions.

4.7.3.3. Facility Decontamination Cost Approach

The following costs were calculated based on the number of decontamination and/or removal team entries (the majority of the items below pertain only to Round 2 [when the pH-adjusted bleach decontamination process was used]):

- Team preparation; and
- Team labor during personnel decontamination.

The following costs are calculated based on the time that the entry teams spend inside the building performing decontamination and removal activities:

- Labor for decontamination; and
- Labor for removal.

The following costs are calculated based on totaling the value of purchase orders and other such expenses:

- Materials;
- Equipment purchase and rental;
- Travel for decontamination/removal teams;

- Fixed (lumped sum) contractor costs (e.g., contracts with fumigation vendors in Rounds 1 and 3 included labor, materials, travel, etc., and were not broken down);
- IC support (e.g., safety); and
- Purchase of temperature/RH sensors (e.g., HOBOs®) and other instrumentation.

The waste management costs from decontamination are estimated based on the amounts of different types of waste generated and notional waste management decisions and costs that would arise based on those decisions.

4.7.3.4. Refurbishment Cost Approach

Costs changed based on what was removed, decontaminated or treated, and disposed. In the BOTE Project, some materials were removed prior to decontamination, and some were removed after decontamination. Those activities generated waste that had characteristics based on when the waste was removed and where in the facility or surrounding areas the waste originated. Materials removed from the building were replaced prior to initiation of the subsequent round. Costs associated with replacing those materials were estimated based on average costs of materials in the different types of rooms and labor hours by INL personnel. There were some materials (e.g., laminate flooring, electrical components) that were not removed between rounds that most likely would have been removed in a real situation (e.g., the pH-adjusted bleach warped the laminate floors; the ClO_2 corroded many electrical components). Costs associated with replacing those materials were calculated based on manufacturer estimates for labor and materials. It was not possible to assess the corrosion damage that ClO_2 did to electrical components and various other metal parts of the building completely because the building had been fumigated with ClO_2 repeatedly in earlier studies. This inability to assess damage due to ClO_2 fumigation completely may result in an underestimate of the replacement cost of materials after ClO_2 fumigation.

4.7.3.5. Assumptions and Caveats

Many assumptions and caveats must be noted in this cost analysis. Table 4-23 lists these assumptions and caveats. The “Worksheet” column refers to the worksheet tabs in the MS Excel Cost Analysis workbook that is found in Appendix H.

Table 4-23. Caveats and assumptions in cost analysis.

Worksheet	Caveat/Assumption
All	Used a single average time per entry based on Test Group Director data for all entries by all teams, with the exception of incidental entries. This average takes into account the attempt to have teams inside the building for nominally three hours, but, due to various issues, the teams could not remain for the full three hours.
AB Building Refit	Damage to building structure and wiring could not be assessed partially due to lack of access and partially due to inability to determine whether damage was incurred during the BOTE Project or during previous ClO_2 fumigations.
AB Building Refit	Laminate floor cost: \$3.70/ft^2 installed[96]
AB Building Refit	Notional cost to install HVAC duct on both floors: from http://www.homewyse.com/services/cost_to_install_duct.html[97]
Analytical Costs	There is a parameter on the "Knobs" worksheet that has the multiplier for Bio-safety Level 3 (BSL-3) analysis versus BSL-2 Analysis
Analytical Costs	The laboratory analytical labor was based only on the responses from the Utah laboratory - no additional laboratories responded with tracking data
Analytical Costs	Analytical Cost of A AS Samples = average of analytical costs of HEPA vacuum, sponge-stick, swab, and EPA wipes
Analytical Costs	Analytical Cost of Waste Samples = average of analytical costs of HEPA vacuum, sponge-stick, swab, and EPA wipes
Cost Equations	Sampling cost does not include BIs, RMCs, TSA settling plates, sand, or SKC BioSampler® samples
Cost Equations	Average material cost per sample type = total materials for that sample type + total lumped costs for that sample type + general sample costs distributed among number of HEPA, wipe, swab, air, sponge samples
Cost Equations	Decontamination contractor fixed costs = the sum of all lumped costs + purchase order costs for each Round, plus one-third of the general decontamination costs that are not attributed to any given Round
Cost Equations	Purchase orders for sampling supplies and HOBOs® are equally distributed among all samples of all main types (wipes, swabs, sponge-sticks, aggressive air)
Cost Equations	Cost of Safety Team is included in IC costs. Cost of decontamination from safety team entering building is in decontamination cost.
Lumped Costs	505 gal of pH-adjusted bleach used; Remaining Stock - Vinegar 72 cases, 4-1 gal bottles per case (\$2.37 ea WalMart)
Lumped Costs	505 gal of pH-adjusted bleach used; Remaining Stock - Bleach 62 cases, 6 3-qt bottles per case (\$1.98 ea WalMart)
Lumped Costs	Assume for travel cost estimates that sampling and BROOM teams fly in, rent one car per team, stay duration of sampling (including lodging, meals, and incidental expenses), fly out; one day travel each way
Lumped Costs	Assume for travel cost estimates that decontamination teams fly in, rent one car per team, stay duration of decontamination (including lodging, meals, and incidental expenses), fly out; one day travel each way
Lumped Costs	Assume that only travel being paid for samplers, decontamination, safety, On-Scene Coordinator, command. Other travel (e.g., Decontamination line ops,

Worksheet	Caveat/Assumption
	sample kit box prep, other helpers, from local labor)
Numbers of Samples	Total number of samples for each Round was estimated by dividing the total number of each type of sample by three to account for minor differences in sample counts between nominally identical sampling in each round
QC	Recuperation time after entries was estimated by adjusting to minimize the difference between calculating the Decontamination Line time and the decontamination team time using either total days or based on entries
Room Sample Time	Assumed 15 AAS samples per entry; three hours per team
Summary	To calculate waste distribution between sampling and decontamination, liquid and solid were combined
Time Per Sample	Assumed 30 AAS samples per Round; three hours per team
Waste	Laminate Flooring = 21 ft^2/carton; 35 lb/carton = 1.67 lb/ft^2
Waste	Did not include porous materials removed after ClO_2 clearance sampling because it didn't have anything to do with the decontamination or clearance process, and wouldn't have applied to reset
Waste	HVAC material = 24 gauge; 7.71 lb/linear foot[98];
Waste Summary	Laminate Flooring was notionally added to Removal Operations

4.7.4. Results

4.7.4.1. Sampling and Analysis Costs

Due to the operational testing and evaluation nature of the BOTE Project Phase 1, the overall costs of sampling and analysis were much higher than would be observed from a real incident. One benefit from this large number of samples, however, is that statistical data for variability could be extracted from the observations of the time and effort needed to acquire samples. To account for the fact that the BOTE Project laboratory analytical efforts were done under BSL-2 conditions, whereas in an incident involving real anthrax, the laboratory analyses would be done under BSL-3 conditions, a multiplier factor of 1.5 was applied to analytical cost estimates. Table 4-24 lists the mean and standard deviations from sampling and analysis activities. Table 4-25 summarizes the sampling and analytical results for Rounds 1 through 3. Figure 4-65 pictorially shows a breakdown of the cost results for sampling and analysis. Standard deviations could not be calculated for costs that did not have multiple values. The differences between the costs associated with management of waste from the three Rounds probably reflects the variability of the sampling operations overall and gives an indication of the precision of the cost estimation for this activity.

Table 4-24. Mean and standard deviation of sampling activities.

Sampling and Analysis Costs	Mean ($/sample)	Std Deviation ($/sample)
Cost of Sample Team Preparation per Entry	252	121
Cost of Sample Team Personnel Decontamination per Entry	697	78
Cost of Sample Team per Entry	720	328
Cost of AAS Team Prep per Entry	273	130
Cost of AAS Team Decontamination per Entry	725	82
Cost of AAS Team per Entry	779	355
Labor Cost Per HEPA Sample Analysis	53	18
Material Cost Per HEPA Sample Analysis	29	
Analysis Cost Per HEPA Sample Analysis	288	
Labor Cost Per Sponge-Stick Sample Analysis	34	10
Material Cost Per Sponge-Stick Sample Analysis	20	
Laboratory Analysis Cost Per Sponge-Stick Sample Analysis	239	
Labor Cost Per Wipe (EPA) Sample Analysis	30	9
Material Cost Per Wipe (EPA) Sample Analysis	19	
Laboratory Analysis Cost Per Wipe (EPA) Sample Analysis	231	
Labor Cost Per Wipe (LLNL) Sample Analysis	30	9
Material Cost Per Wipe (LLNL) Sample Analysis	19	
Laboratory Analysis Cost Per Wipe (LLNL) Sample Analysis	640	
Labor Cost Per Swab Sample Analysis	29	9
Material Cost Per Swab Sample Analysis	21	
Laboratory Analysis Cost Per Swab Sample Analysis	219	
Labor Cost Per Aggressive Air Sample Analysis*	57	
Material Cost Per Aggressive Air Sample Analysis*	18	
Laboratory Analysis Cost Per Aggressive Air Sample Analysis*	245	

* -- average of HEPA, sponge-stick, wipe (EPA), wipe (LLNL), and swab analysis

Table 4-25. Summary of sampling and analytical cost analysis.

Cost Description	Round 1 ($)	Round 2 ($)	Round 3 ($)	Average ($)
Attributable Other Sampling/Analytical Costs (e.g., materials purchased for a specific type of sample, such as HEPA socks)	148,513	148,513	148,513	148,513
Non-Attributable Other Sampling/Analytical Related Costs (e.g., materials purchased for sampling and analysis but not able to be attributed to a specific type of sample, such as growth media, data management and data analysis costs)	95,138	95,138	95,138	95,138
Decontamination Line Labor	10,020	10,736	10,736	10,497
Sampling Labor	37,049	39,564	39,673	38,762
Material	23,894	23,894	23,961	23,916
Laboratory Analysis	313,490	313,490	314,649	313,877
Management of waste associated with taking samples	42,166	25,725	67,053	44,981
Total Sampling Cost	**660,251**	**646,324**	**688,987**	**665,188**
Sampling Cost Std Dev	**27,398**	**28,412**	**28,489**	**28,099**

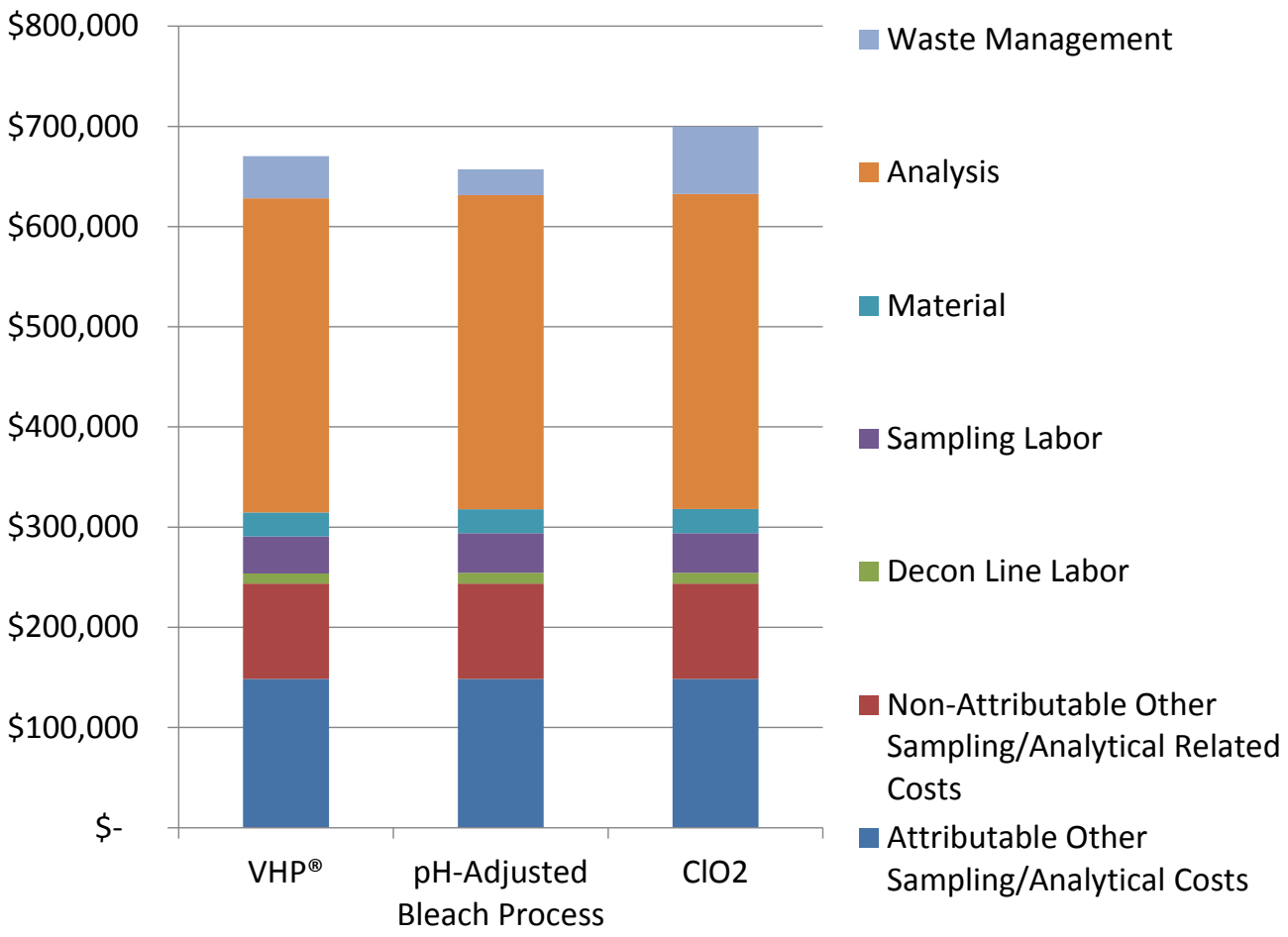


Figure 4-65. Breakdown of sampling and analytical costs.

4.7.4.2. Facility Decontamination Costs

4.7.4.2.1. Cost of Labor for Decontamination and Removal

The labor costs for decontamination and removal for the fumigation technologies (Rounds 1 and 3) are largely rolled into the cost estimate for the fumigation contractors. The numbers of sources of data for these portions of the activities were very limited (i.e., N=1 for each decontamination Round). For example, the EPA START contractors were used for the pH-Adjusted Bleach Process, but they are a rapid-response team which may be more expensive than response contractors that might be used in a real incident. In addition, it is not known how representative the fumigation contractor bids were, given the nature of the BOTE Project. The fumigation contractors did enter the facility on occasion in preparation for the fumigations, however, so there was effort expended by the on-site test group to facilitate their entries. Costs for all three decontamination technologies including the fumigations therefore included estimates for IC, Safety, and Personnel Decontamination Line Operations. The pH-adjusted bleach decontamination process (Round 2) required entries in Level B PPE which necessitated additional support personnel outside the building. Table 4-26 lists the estimated costs per entry for the various teams entering the facility.

Table 4-26. Estimated cost per entry for facility decontamination.

Labor Description	Round 1		Round 2		Round 3	
	Mean ($/entry)	Standard Deviation ($/entry)	Mean ($/entry)	Standard Deviation ($/entry)	Mean ($/entry)	Standard Deviation ($/entry)
Decontamination Team Prep	271	129	345	165	271	129
Removal Team Prep			345	165		
Decontamination Team Personnel Decontamination	722	81	822	92	722	81
Removal Team Personnel Decontamination			822	92		
Decontamination Team Per Entry	773	352	985	449	773	352
Removal Team Per Entry			985	449		

4.7.4.2.2. Fixed Cost and Material Costs of Decontamination Contractors

The fixed costs and material costs for the decontamination contractors included the fixed price contracts that were made with the fumigation contractors, setting up and disassembling the personnel Decontamination Line, travel for the EPA Region 10 START contractors, labor associated with the notional removal of the HVAC ductwork, and post-deployment documentation performed by the START contractors. Table 4-27 summarizes these costs.

Table 4-27. Decontamination contractor fixed costs and material costs.

Cost Description	Round 1 ($)	Round 2 ($)	Round 3 ($)
Decontamination Contractor Fixed Cost ($)	105,493	66,831	169,093
Material Cost for Decontamination Team ($)	1,587	31,976	1,587

4.7.4.3. Waste Management Costs

Waste management cost estimates were based on observed quantities of waste from various parts of the BOTE Project facility. Liquid wastes and solid wastes were tracked separately, and the source of the waste was identified. The waste was characterized as being from one of the following sources:

- Building;
- PPE Donning Trailer; and
- Decontamination Line.

Due to logistical limitations, it was not possible to weigh the waste removed from the second floor of the building during the pH-adjusted bleach decontamination process (Round 2). The weighed quantities from the first floor were therefore doubled. This estimation was a reasonable approach because the rooms on both floors were configured similarly. In addition to these three sources, waste from the pH- amended bleach decontamination process (Round 2) that originated in the building first floor was additionally attributed to a given room (if it originated from one of the commercial, residential, mailroom, or shop spaces), or designated as “other”. See Section 4.6.2 for a description of how RFID tags were used during the pH-adjusted bleach decontamination process to track the originating point of bags of waste.

Once the source and quantity of the waste were identified, the waste was assigned to different categories (see Section 4.6.3) based on the activity that was occurring on a given day. The categories that the waste was segregated into consisted of:

- Category 1S - Uncontaminated – Solid;
- Category 2S - Contaminated – Solid;
- Category 3S - Decontaminated – Solid;
- Category 4S - Decontamination Waste – Solid;
- Category 1L - Uncontaminated – Liquid;
- Category 2L - Contaminated – Liquid;
- Category 3L - Decontaminated – Liquid; and
- Category 4L - Decontamination Waste – Liquid.

Although Categories 2S and 2L were defined, after the sources of the waste were identified and the quantity measured, there was no waste generated during any of the BOTE Rounds that fell into those categories. Table 4-28 lists the quantities and categories for the wastes that were collected.

Table 4-28. Quantities and categories of waste collected.

Waste Category	Round 1	Round 2	Round 3
Category 1S - Uncontaminated – Solid (lb)	114	46	11
Category 3S - Decontaminated – Solid (lb)		13,003	315
Category 4S - Decontamination Waste – Solid (lb)	846	905	101
Category 1L - Uncontaminated – Liquid (gal)	66		
Category 3L - Decontaminated – Liquid (gal)		105	
Category 4L - Decontamination Waste – Liquid (gal)	340	831	175
Total Solid (lb)	960	13,954	427
Total Liquid (gal)	406	936	175

Estimating the total costs of waste management from the various rounds required notionalizing many of the waste management activities. None of the waste generated during the BOTE Project was actually contaminated with *Ba*; therefore, as is described in Section 4.5, the waste was characterized as if it were *Ba*-contaminated or had been treated/decontaminated *Ba*-contaminated materials prior to placing the waste into the dumpster and entering the waste into the INL waste management process.

Three hypothetical waste management scenarios were examined based on the difficulty of managing the waste that affected estimated costs of transportation and disposal. This approach was supported by process knowledge and experience from real responses to both intentional and naturally-occurring anthrax incidents since 2001. All scenarios assumed that solid waste that was never contaminated could be brought to a RCRA Subtitle D landfill ten miles away, and that all liquid waste regardless of initial level of contamination could be brought to a local POTW facility 10 miles away. Any solid waste that was initially contaminated but through either the decontamination processes or later on-site treatment was decontaminated was assumed to be brought to a RCRA Subtitle D landfill 200 miles away. The first scenario, “Low Difficulty”, assumed that all solid waste that was initially contaminated was disposed of as municipal solid waste (MSW) in a RCRA Subtitle D landfill 200 miles away from the incident and assumed that all liquid waste was brought to a local POTW facility 10 miles away for no increased charges above and beyond what normal MSW or sanitary sewage would require. The second scenario, “Medium Difficulty”, assumed that decontaminated waste was indeed decontaminated but a 10x multiplier surcharge was imposed on transportation and disposal. The third scenario, “High Difficulty”, assumed that decontaminated waste was assumed still to be contaminated, resulting in a 100x multiplier surcharge on transportation and disposal. These waste management scenarios are summarized in Table 4-29.

Table 4-29. Summary of waste management scenarios.

Degree of Disposal Difficulty	Decontaminated Waste Classification	Disposal Pathway			Surcharge on Transportation / Disposal
		Uncontaminated Solids Disposal	Decontaminated Solids Disposal	Uncontaminated and Decontaminated Liquids	
Low	MSW	Local Landfill (10 miles away)	Remote Landfill (200 miles away)	Local POTW facility (10 miles away)	
Medium	MSW with surcharge	Local Landfill (10 miles away)	Remote Landfill (200 miles away)	Local POTW facility (10 miles away)	10x
High	Contaminated Waste	Local Landfill (10 miles away)	Remote Landfill (200 miles away)	Local POTW facility (10 miles away)	100x

The notional waste management costs were defined as:

$$C_{waste} = C_{waste\text{-}fixed} + C_{waste\text{-}transportation} + C_{waste\text{-}handling} + C_{waste\text{-}characterization} + C_{waste\text{-}disposal}$$

Equation 4-5

where $C_{waste\text{-}fixed}$ is the fixed cost associated with waste management regardless of how much waste is generated, $C_{waste\text{-}transportation}$ is the cost associated with transporting the waste to its ultimate disposal site, $C_{waste\text{-}handling}$ is the cost associated with handling, labeling, tracking, and packaging the waste, $C_{waste\text{-}characterization}$ is the cost associated with sampling and analyzing the waste, and $C_{waste\text{-}disposal}$ is the tipping fee at the disposal facility (in this case the disposal facility was assumed to be either a landfill or a POTW wastewater treatment facility).

The components of $C_{waste\text{-}fixed}$ include such elements as:

- Development of Waste Management Plan (estimated 40 hr);
- Development of Transportation Plan (estimated 40 hr);
- Development of Tracking and Reporting Plan (estimated 40 hr);
- Health and Safety Plan and Oversight Costs (estimated 40 hr);
- Contract Oversight Costs (estimated 40 hours);
- Development of Communications and Community Outreach Plan (estimated 40 hr); and
- Coordination with Regulatory Agencies and Facilities (estimated 40 hr).

Based on those estimates of levels of effort to perform these tasks, $C_{waste\text{-}fixed}$ was approximately $53,353. Based on experience during exercises as well as real response situations, the development of the Waste Management Plan has a high probability to take much more time

than this proposed number, particularly for a complicated incident involving a weaponized biological contaminant or a wide-area incident.

The components of $C_{waste\text{-}transportation}$ included an estimate of $5/mile charges for waste disposal trucking, based on a 2001 estimate of $3/mile[99] adjusted for inflation, with an additional multiplier of 1 (for "Low" difficulty waste management), 10 (for "Medium" difficulty waste management), or 100 (for "High" difficulty waste management). Table 4-30 lists the estimated transportation costs for the three Rounds and the three disposal difficulty scenarios. Although transportation costs for a wide-area incident would be expected to be proportional to the amount of waste, for a smaller incident that would involve only a single large truck to carry all waste that was generated, this proportionality is not going to be observed.

Table 4-30. Estimated transportation costs.

Waste Disposal Difficulty	Round 1 ($)	Round 2 ($)	Round 3($)
Low	1,150	1,100	1,100
Medium	10,600	10,550	10,550
High	105,100	105,050	105,050

$C_{waste\text{-}handling}$ was estimated assuming a waste packaging rate of 100 lb/hr or 100 gal/hr by the waste packaging team. This number was scaled with the relative amount of waste. $C_{waste\text{-}characterization}$ was estimated based on an assumed 10-minute timeframe for the waste sampling team to open the container, collect a waste sample, and close the container again. One sample was assumed to be taken from every bag of waste (approximately 33.3 lb), and one sample was taken from every barrel of wastewater (55 gal). This approach was the waste sampling strategy that was used in the BOTE Project Phase 2[3]. Analytical costs were assumed to be the average of HEPA vacuum, sponge-sticks, swabs, and wipe samples. Table 4-31 lists the estimates of costs for handling, packaging, and characterizing the waste.

Table 4-31. Estimated costs of waste handling, packaging, labeling, and characterization.

Cost Description	Round 1 ($)	Round 2 ($)	Round 3 ($)
Handling, Packaging, Labeling Costs	5,260	61,122	2,316
Sampling and Analytical Costs	10,192	124,218	5,096

$C_{waste\text{-}disposal}$ was estimated assuming a tipping fee of $100/ton of solid waste (based on a series of Internet searches that yielded a wide range of estimated costs ranging from approximately $50/ton to approximately $150/ton and $50/10,000 gal of liquid waste (based on assuming 50% of the cost of Cary, NC, residential sewer rates), with an additional multiplier of 1 (for “Low” difficulty waste management), 10 (for “Medium” difficulty waste management), or 100 (for “High” difficulty waste management). Table 4-32 lists the estimated waste disposal costs for the three rounds and the three disposal difficulty scenarios.

Table 4-32. Estimated waste disposal costs.

Waste Disposal Difficulty	Round 1 ($)	Round 2 ($)	Round 3 ($)
Low	50	702	22
Medium	446	7,003	217
High	4,405	70,006	2,169

Combining all of these waste management cost elements together and pictorially representing them results in the charts shown in

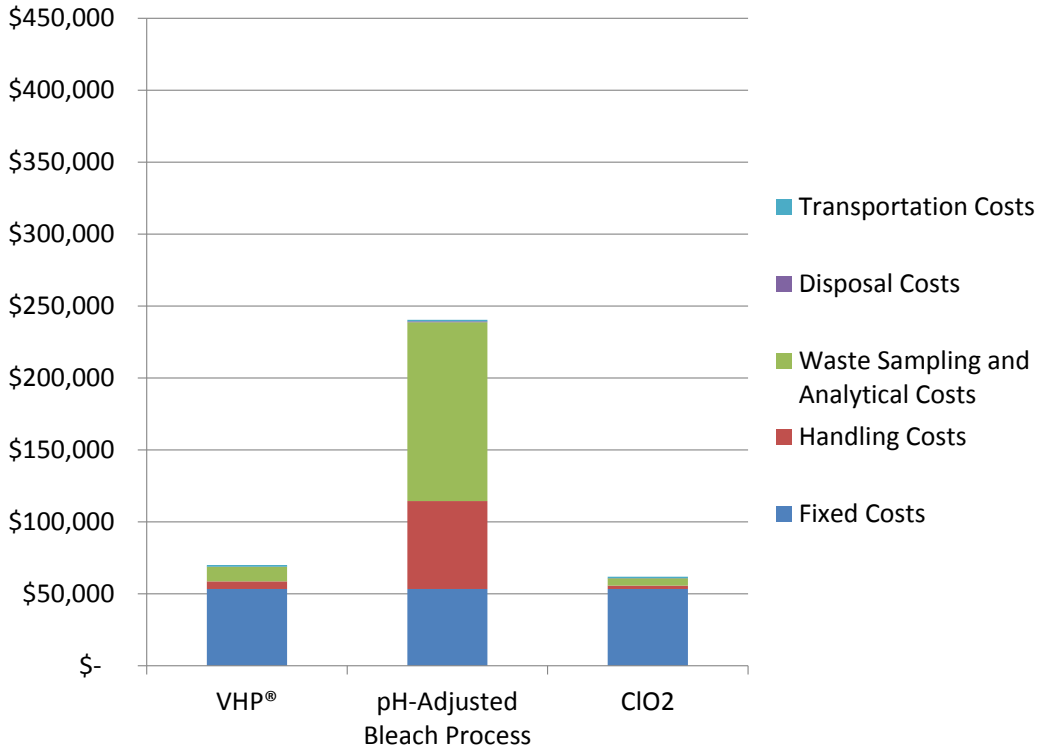


Figure 4-66 through Figure 4-68 which represent the “Low”, “Medium”, and “High” disposal difficulty scenarios. Some observations arise from these figures. First, for the “Low” and “Medium” disposal levels of difficulty, the transportation and disposal fees do not contribute significantly to the overall waste management costs, even with the 10x surcharge on transportation and disposal in the “Medium” case. Even with the 100x surcharge on transportation and disposal from the “High” disposal difficulty case, overall waste management costs increase only approximately 30% from the “Low” case. Although transportation costs for a wide-area incident would be expected to be proportional to the amount of waste, for a smaller incident that would involve only a single large truck to carry all waste that was generated, this proportionality will not be observed. Rather, the costs associated with handling the waste and characterizing the waste are the most significant contributions across all waste management scenarios. These added analytical requirements may overwhelm the capacity of the laboratory available to support the response, especially for a wide area release or for a building with the normal amount of contents. These costs escalate solely based on the amount of waste that is generated, regardless of what disposal pathways are selected. These results also suggest that developing a better strategy for characterizing the waste from events such as this with many fewer samples could result in a significant cost savings, provided that the State regulatory agencies concur with using some sort of reduced sampling scheme for the waste. Choosing to dispose of the waste as contaminated material and foregoing waste characterization sampling may not be significantly more expensive than doing extensive characterization to prove the waste is not contaminated.

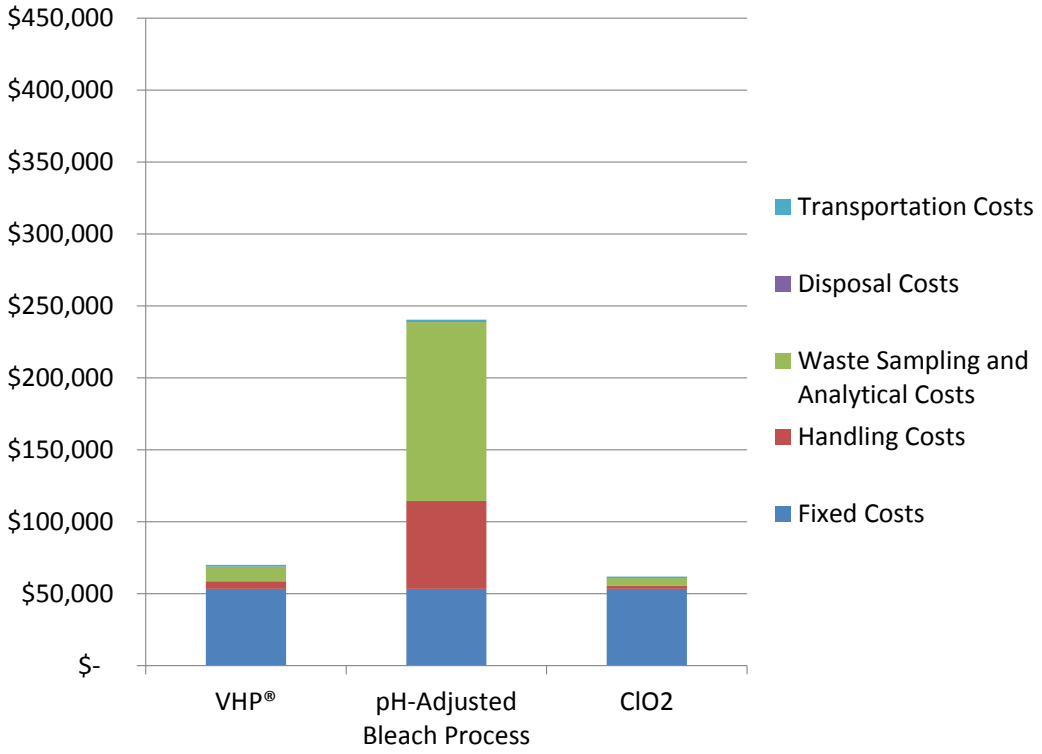


Figure 4-66. Breakdown of waste management costs ("low" disposal difficulty scenario).

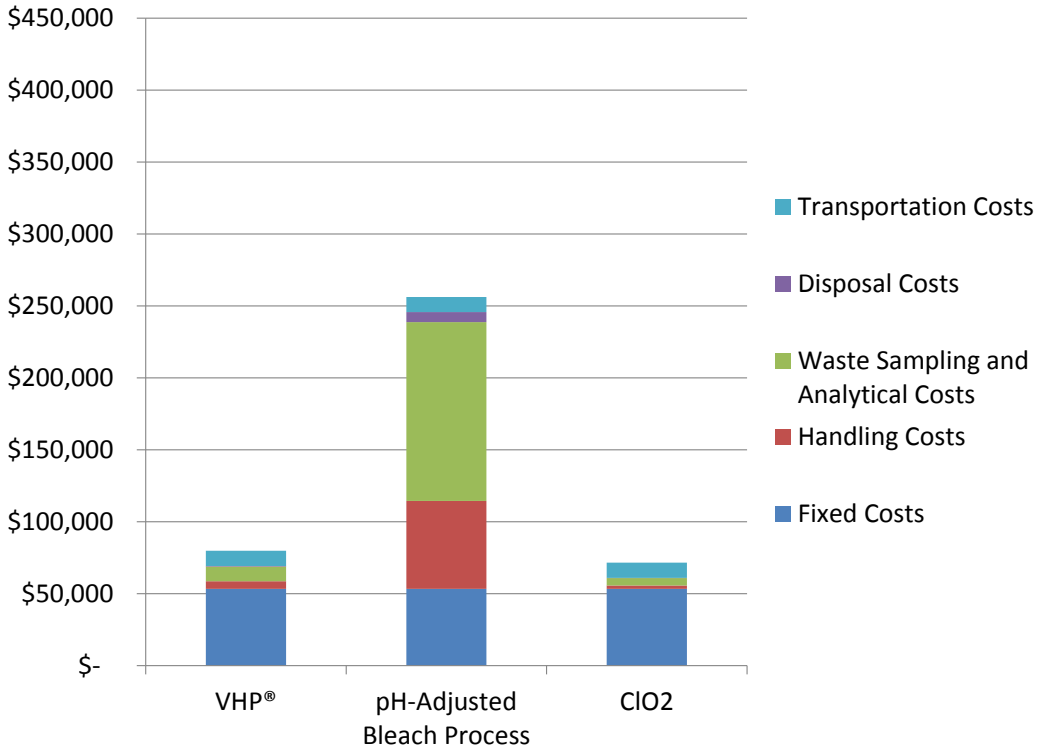


Figure 4-67. Breakdown of waste management costs ("medium" disposal difficulty scenario).

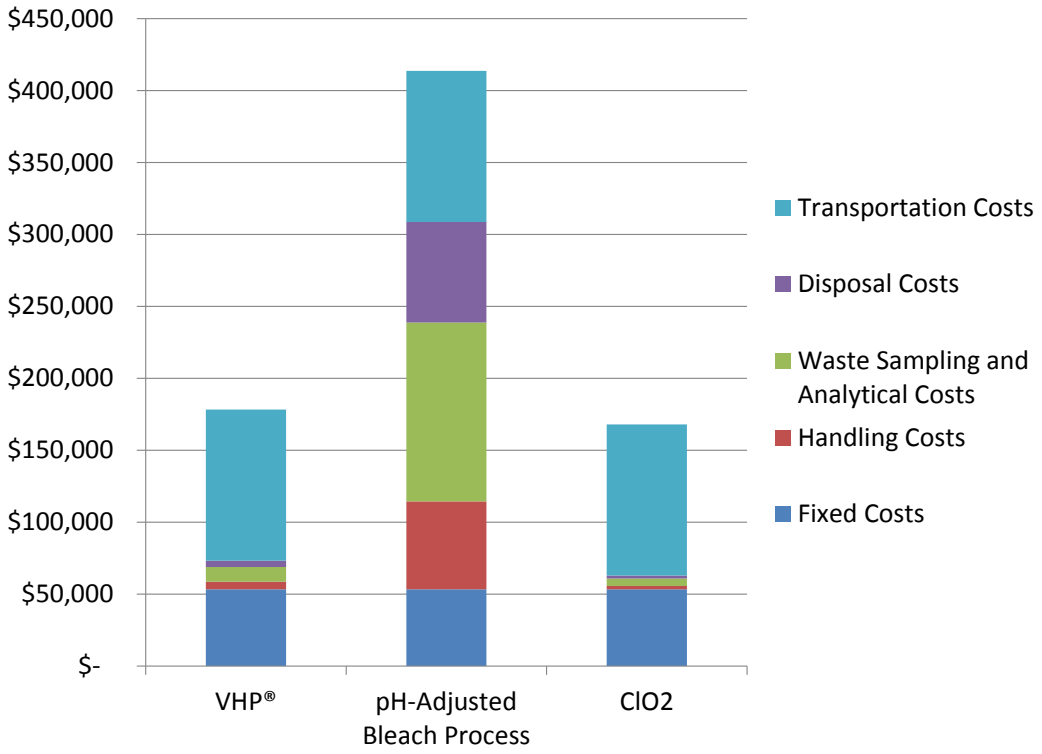


Figure 4-68. Breakdown of waste management costs ("high" disposal difficulty scenario).

4.7.4.3.1. Overall Cost of Decontamination

Combining all the costs associated with the application of the three different decontamination technologies and using the "Medium" difficulty waste management scenario results in the chart shown in Figure 4-69. The overall decontamination cost is largely driven by waste management considerations.

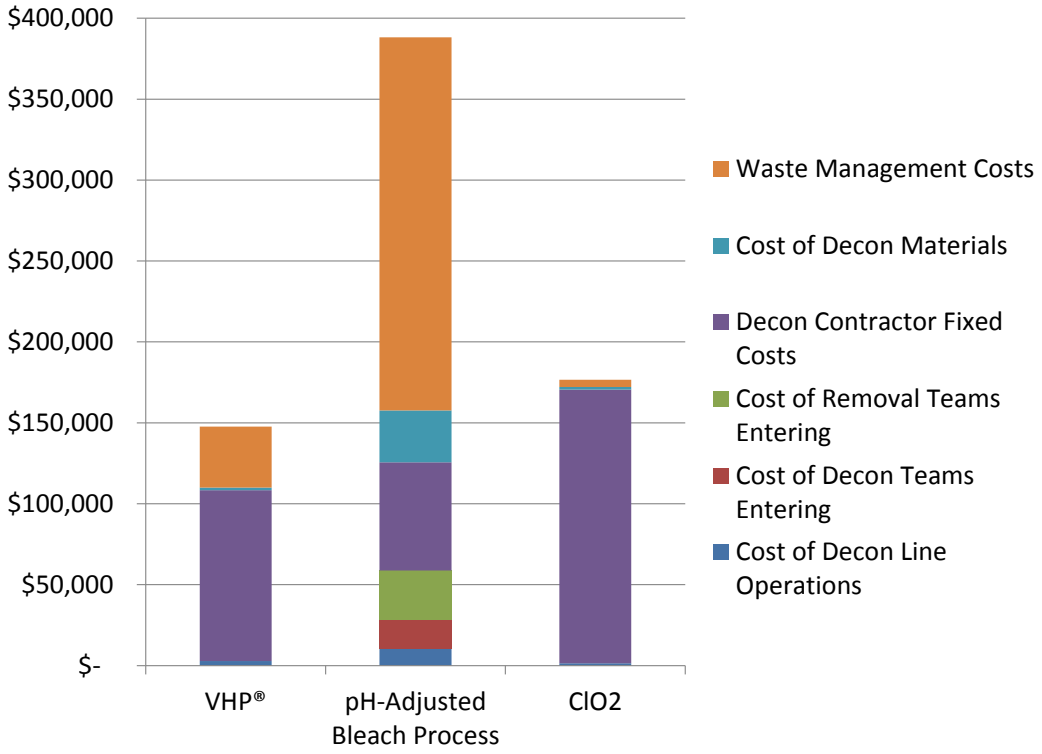


Figure 4-69. Breakdown of decontamination costs (using "medium" disposal difficulty scenario).

4.7.4.3.2. Refurbishment Costs

The materials pre-populated into the various rooms in the building, as well as the approximate size of the rooms, are listed in Table 4-33. The amount of materials pre-populated into the rooms was much less than would be found in a normal office or residential setting. No unique or valuable items that would result in an underestimation of the refurbishment costs were populated into the rooms. The costs of removal of materials and related costs such as waste management and refurbishment may be artificially low. This underestimation is especially true for Round 2 (pH-adjusted bleach decontamination process), which involved material removal (and, consequently, waste management and refurbishment) as a significant part of the decontamination process. The pH-adjusted bleach decontamination process costs would be expected to be even higher had the building been furnished in a more realistic fashion. The replacement of some items (e.g., laminate floor and HVAC ductwork) was handled notionally. The ClO_2 fumigation corroded electrical components and some of the building structural steel, but the extent of this corrosion could not be attributed exclusively to the BOTE testing because the building had been subjected to ClO_2 fumigations prior to the BOTE Project. The replacement of wiring and electrical components could potentially add a significant cost to the ClO_2 fumigation. Several rooms on each floor were not pre-populated with materials and are not listed here.

Based on estimates for the cost of these various items and labor cost estimates from INL for the level of effort to replace the items removed, coupled with manufacturer estimates of time and materials to replace the laminate floor and HVAC ductwork, the refurbishment cost was calculated. The results are shown in Table 4-34.

The fumigation decontamination technologies did not result in any refurbishment cost, which is somewhat artificial. The VHP® fumigation contractor did not remove any materials prior to their fumigation, in spite of the fact that there is evidence of material demand for H_2O_2 that may impact the ability to achieve the required concentration for effective decontamination if the VHP® generation system does not have sufficient capacity[100]. Possibly due to the building's previous experiences with ClO_2 fumigation in the INL-1 and INL-2 studies[13, 14], there was already a significant amount of rust and oxidation on some of the building surfaces that made it impossible to fully assess potential damage due to any or all of the decontamination methods.

Table 4-33. Materials pre-populated into building prior to spore dissemination.

Room	Configuration	Length (ft)	Width (ft)	Area (ft^2)	Laminate Floor	Carpet	Ceiling Tiles* (ea)	Books (ea)	Binders (ea)	Mail (pieces)	Bed (ea)	Sofa (ea)	Chair (ea)	Monitor (ea)	TV (ea)	Printer (ea)	Wall Divider (ea)
110	Office	21	10	210	1		1	20	10				2	1		1	1
109	Residential	21	10	210		1	1				1						
108	Office	21	10	210	1		1	20	10				2	1		1	1
107	Residential	21	10	210		1	1					1	1		1		
106	Office	21	10	210	1		1	20	10				4	1		1	1
105	Residential	21	10	210		1	1						4				
104	Shop	10	12	120			1	20									
103	Mail room	21	10	210			1	20		20							
213	Residential	21	10	210		1	1				1						
212	Office	21	10	210	1		1	20	10				2	1		1	1
211	Residential	21	10	210		1	1					1	1		1		
210	Office	21	10	210	1		1	20	10				2	1		1	1
209	Residential	21	10	210		1	1						4				
208	Office	21	10	210	1		1	20	10				4	1		1	1
207	Mail room	21	10	210			1			20							
206	Shop	21	10	210			1	20									
Floor 1	HVAC Duct	200															
Floor 2	HVAC Duct	200															

* - indicates that the entire ceiling of that room was populated with ceiling tiles

Table 4-34. Summary of restoration costs.

Restoration Costs	Round 1 ($)	Round 2 ($)	Round 3 ($)
Labor Cost of Post-Decontamination Material Removal	0	7,854	0
Cost of Replacing Removed Items	0	46,934	0
Restoration Cost	0	54,788	0

4.7.4.3.3. Summary of Total Costs

Combining all of the above cost elements with a component to account for the presence of a minimal IC structure (command, safety) during the duration of the decontamination processes results in the chart shown in Figure 4-70, using the "Medium" waste disposal difficulty scenario. For Figure 4-70, the sampling costs for all three rounds were averaged into a single number because there was an apparent reduction in sampling cost as the BOTE Project progressed, likely due to improved efficiency of the sampling personnel. This minor reduction was judged to be a bias, because the sampling efforts for the three rounds were identical; the total sampling costs for the three rounds were therefore averaged. Overall, the cost of the pH-adjusted bleach decontamination process was significantly higher than the cost of ClO_2 fumigation, which was slightly higher than the cost of the VHP® fumigation. The sampling effort for the BOTE Project was significantly higher than what would be done in a real incident, so the contribution to the overall cost of BOTE due to sampling is much higher than in a real situation.

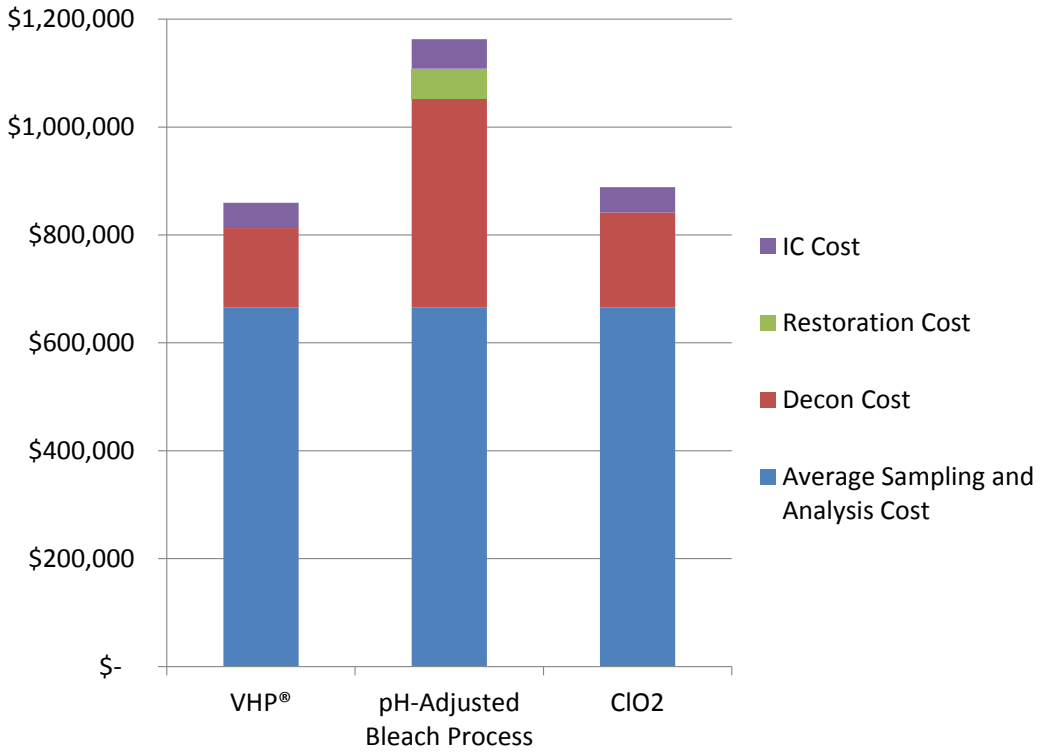


Figure 4-70. Breakdown of overall cost contributions.

4.7.5. Summary and Discussion

A detailed cost analysis was performed on the use of three different decontamination technologies on an in-building release of *Bg* spores (although cost estimates are based on assuming an actual *Ba* incident). The following activities were performed:

- Cost data were acquired on time and materials required to perform a wide variety of sampling activities including AAS and surface sampling;
- Cost data were acquired on time and materials required to perform sampling preparatory activities, training of sampling personnel, sample chain of custody activities; sample packaging and shipping activities; and laboratory analytical activities;
- Cost data were acquired on time and materials required to prepare building entry teams and perform personnel decontamination operations after the teams left the building;
- Cost data were acquired on time and materials required to use three different decontamination technologies on a contaminated building and restore the building to its condition prior to contamination;
- Cost data were acquired on quantities and characteristics of waste that was generated during sampling and decontamination operations; and
- Some elements of the cost analysis were notional in nature, including: extrapolation of analytical costs to account for increased effort of performing analyses in a BSL-3 environment as opposed to the BSL-2 environment that the BOTE Project samples were analyzed in; estimation of fixed costs associated with management of waste potentially contaminated with *Ba*; estimation of waste characterization sampling and analytical costs; estimation of replacement costs for building items such as the HVAC ductwork and laminate floors; and estimation of waste transportation costs and waste disposal tipping fees.

Based on subsequent analysis of the cost data, the following major cost-related observations are noted:

- Sampling and analysis are huge contributors to the overall cost. This statement must add the caveat that this was a research operational testing and evaluation project. In a real incident for a building this size, fewer samples would most likely be taken. In addition, analytical costs are somewhat uncertain because they were based only on tracking of labor efforts from one LRN laboratory;
- Fumigation with VHP® was the least expensive decontamination technology, with ClO_2 fumigation being only slightly more expensive than VHP®. The pH-adjusted bleach decontamination process was significantly more expensive to apply than either of the fumigation technologies, largely due to waste management costs, which could potentially be reduced by being able to use RCRA Subtitle D landfills and POTWs for disposal;
- Building refitting cost estimates have a significant amount of uncertainty. The rooms were not populated with a large number of items, so assessing the amount of damage due to the three decontamination technologies was not always possible. It is very likely that the decision of whether or not items are replaced after decontamination will be based on who is paying for the replacement;
- Waste management costs were a significant component of all three technologies, particularly for the pH-adjusted bleach decontamination process. Waste characterization sampling was the largest single component of waste management costs. In addition, waste management costs could be reduced significantly if the State allows disposal of

treated and/or decontaminated items in a RCRA Subtitle D landfill or allows the wastewater to be sent to a POTW facility;
- The cost of personnel decontamination was a significant contribution due to the need for the Decontamination Line personnel being on site during any time when entries into the building are considered, whether or not those Decontamination Line operations staff are actually performing any personnel decontaminations; and
- Almost all of the waste generated during the fumigations was a result of personnel decontamination operations.

Based on the cost analysis, the following recommendations are noted:

- Identifying ways to reduce the sampling labor burden could result in significant cost savings;
- Identifying ways to minimize waste could result in significant cost savings;
- Identifying ways to accomplish personnel decontamination in such a way as to minimize the amount of waste generated could result in significant cost savings;
- Pre-incident waste management planning will be a critical aspect of achieving cost savings for the remediation;
- Identifying ways to perform the remediation while minimizing the number of entries into the contaminated facility in PPE will enable the personnel Decontamination Line operations personnel not to be on site, resulting in significant cost savings; and
- Identifying alternate strategies for minimizing the number of waste characterization samples could result in significant cost savings.

The following important caveats must also be noted:

- The cost analysis was performed based on the assumption that only a single decontamination method would be used on a given building, which may not be the case (i.e., different parts of a building may be decontaminated in different ways, such as combining a fumigation with a pH-adjusted bleach process);
- The materials that were populated into the rooms were meant to be representative of the types of materials that would be found in a residential, commercial, or shop setting; the quantities that were present were probably on the low end of the quantities that would be found in a real setting;
- Receiving permission from the appropriate regulatory authorities to landfill some or all of the waste directly to a local RCRA Subtitle D facility without additional waste characterization sampling could have a profound impact on reducing the waste management costs. A key provision of this permission will hinge upon whether the waste is considered to be hazardous, infectious, biohazardous, or solid waste. The classification of the waste will greatly impact disposal costs.

4.8. Potential Spore Migration outside a Contaminated Building

Although this analysis was preliminary, spores evidently have the potential to migrate out of a contaminated building and settle into the surrounding soil. These results are for primary release within the HVAC system, and the design of the study did not allow for direct determination of

when and how the spores escaped the building (i.e., whether samples with detectable *Bg* were due to escape of spores from the building during the initial release or disturbance of the spores due to sampling activity within the building). Additional studies would be needed to determine the point of release from the building. The detection of *Bg* genetic material in outdoor soil indicates another exposure medium (outdoor soil) that could lead to other potential exposure routes for human receptors (e.g., dermal contact with contaminated soil, incidental ingestion of contaminated soil, and inhalation associated with the reaerosolization of contaminated soil). However, with the limited dataset, estimation of the quantity of spores that migrate is difficult. Key findings and limitations are of the spore migration study are discussed below.

Key Findings

- **The LOD of the method limited overall spore recovery.**

The matrix LOD analyses showed poor spore recovery and large variations in detection. EPA demonstrated a matrix LOD of 1E4 spores/g of sand when all 45 g of sand were utilized, while USGS, using the standard protocol for the MO BIO Soil extraction kit with 0.25 g of sand, had a matrix LOD of 1E6 spores/g of sand. At these detection limits, EPA was able to detect the spore concentration disseminated on the first floor (target concentration 1E6 spores/ft^2) of the building, but not the second floor (target concentration 1E2). The results show that the matrix LOD for the USGS was higher than the highest disseminated concentration of spores during the study. The two-order of magnitude difference in matrix LODs could be attributed to a number of factors. Undoubtedly, the large variation in sample amount contributed to the observed differences. EPA utilized the entire 45 g sand aliquot, 180x more sand than USGS utilized, increasing the total amount of DNA and potential PCR inhibitors present within the sand samples.

The differences in sand quantities would also have affected the variability in samples. For over 30% of the sample locations, the classification of the “A” sample among the categories listed in Table 3-53 disagreed with the classification of the “B” sample. There were only 13 sample sets in both decontamination technology rounds where both “A” and “B” samples yielded detectable quantities of *Bg* DNA. As a result, deposition variability is assumed to be a major component to total variability in the collected data. This sample variability may have been introduced in the field or in the laboratory during processing. In the field, samples were placed in very near proximity. However, an exact duplicate of a sample was not possible. Air flow and sample placement, in addition to laboratory analysis variability, may therefore have led to the observed differences.

While both laboratories used the same extraction kit, qPCR primers, and thermocycler program, differences in thermocycler instruments may also have had a small impact on the outcomes. The literature demonstrates that extractions (e.g., for DNA) from soil can be difficult and can often result in low yields and/or low concentrations of microbial DNA. EPA’s method of extracting the total aliquot of sand produced results comparable to the results reported by Ryu et al.[101], who detected 1E4 CFU/g of *Ba* spores in soil samples. Similarly, in an assessment of eight soil studies, Herzog et al.[82] found the mean matrix LOD for *Ba* to be 1.2E4 CFU/g of soil with a wide variation in detection limits for spiked soils, ranging from 1E-1 to 1E8 CFU/g of soil.

- **Decontamination agents were not qPCR inhibitors.**

Samples placed within the building were collected post-decontamination to determine if analytical interference occurred in the qPCR analysis due to the decontamination agents. Because these samples were placed in the second floor hallway and on the first floor reception area where decontamination took place, they were exposed to the decontamination agent. The qPCR reactions using extracted template DNA from the original samples collected within the building following decontamination were spiked with a known concentration of *Bg* DNA. These results did not show significant qPCR inhibition. However, to more fully demonstrate the lack of inhibition and help to understand the true nature of the apparent decreases noted after decontamination, a laboratory-based exposure and analysis study would need to be done.

- **Duration of exposure was not an indicative factor for the overall detection rate.**

Though the samples were in place for differing amounts of time (Table 2-11), for this analysis the same types and amounts of activities were assumed to occur during the exposure periods. While this assumption is not strictly factual, this assumption allowed for the data collected over the course of the BOTE Project as a whole to be compiled. One known deviation from this assumption occurred during the pH-adjusted bleach decontamination process during Round 2. As part of the pH-adjusted bleach decontamination process, all upholstered items (office chairs, cubicle partitions, couches, carpet, etc.), and ceiling tiles were removed from the building and replaced. This removal and replacement accounts for the substantial amount of time required for the pH-adjusted bleach decontamination process, including drying (~11 days). During this process, the large equipment door was left open for ease of access for the decontamination personnel, and a large dumpster was positioned inside the secondary enclosure in front of the building entry door (near trays 2 and 3). Removing and replacing these items from within the building also increased the amount and duration of human activity occurring around the pH-adjusted bleach post-decontamination samples. More spores were expected to be within the sand samples following the pH-adjusted bleach decontamination due to the increased human movement during that activity; however, the results herein did not show a significant difference in the proportion of the sand samples with detectable *Bg* collected post-pH-adjusted bleach or post-ClO_2 decontamination. Therefore, the *Bg* concentration within the collected sand samples was either not significantly impacted by human movement into and out of the building, or the added openings in the secondary enclosure prevented spore sedimentation.

- **Limitations to VHP® decontamination may have impacted the pH-adjusted bleach pre-dissemination sampling.**

A few surface samples collected post-VHP® decontamination resulted in detectable *Bg*, and two of these surface samples were greater than 1E6 CFU/m^2. However, the samples collected from the same surfaces post-pH-adjusted bleach and post-ClO_2 decontamination were below the limit of detection (See Section 4.9). Because the pH-adjusted bleach background sampling occurred directly following the decontamination with VHP®, the number of detectable sand samples collected during the pre-dissemination sampling of the pH-adjusted bleach may therefore be due to insufficient decontamination by VHP® within the building. The spores seen within the pre-dissemination sand samples may be building spores re-distributed during the building reset.

- **A clear spore migration pathway could not be identified from the collected data.**

Sterile sand samples were placed outside the test building within the secondary enclosure. Though these samples were placed in strategic locations near the building doorways, no statistical conclusions could be made regarding the migration pathway of the *Bg* spores. In a recent study conducted by Van Cuyk et al. (2012)[102], *B. thuringiensis* spores released outside the building as an organic pesticide migrated into nearby buildings with the highest concentrations near the entrances and the HVAC filters. The lack of statistical conclusions in the BOTE Project study may have been due to the facility setup. A roof vent was unintentionally left open during most of the project. This vent was sealed shut just prior to Round 3 decontamination, but after spore dissemination in Round 3 and all stages of the Round 1 and 2 were concluded. During an actual event, any open door, window, or vent would be a point of exit for airborne spores. In addition, in a real scenario, a secondary barrier would probably not be in place during the initial release, and spores could thus be carried much greater distances than were studied here. Finally, the test area had been used during previous events and was contaminated with significant levels of *Bg* spores. Every effort was made to mitigate the influence of contaminated *in situ* soil; sterile sand samples were placed within large sampling trays for this study. The sterility of the sand was checked before the exercise, and trip controls opened briefly on site ensured sampler handling did not contaminate the collected sand samples within the previously contaminated environment. The large trays protected the exterior of the Petri dishes from direct contact with the ground, and their bright orange color made personnel aware of their presence and reduced activity in their proximity. Regardless of these efforts, nothing could be done to prevent spores within the *in situ* soil from being reaerosolized by personnel elsewhere within the secondary enclosure.

- **The reason for the decrease in measured viable spores in the sand samples removed after dissemination compared to those removed post-decontamination is currently unknown.**

Though an overall increase and decrease was noted between dissemination and post-decontamination sampling, no specific efforts were conducted to decontaminate the sand samples. The reason for this finding is unknown. Unless the DNA was damaged by the decontamination chemicals, the DNA should have been detected via the qPCR. One possible explanation is the presence of physical processes. Weis et al. (2002)[49] demonstrated the potential for secondary aerosolization of *B. anthracis* spores from minimal movement, leading to a hypothesis that spores were carried out of the building by physical processes including people, air movement, or electrostatic forces leading to a decrease in spores. However, the actual reason for the decrease in spore concentration seen in the sand samples is still unknown.

4.8.1. Conclusions

The contaminated building was inside a secondary enclosure with controlled areas of entrance and egress, so care must be taken when interpreting the results. The secondary enclosure may reduce infiltration and exfiltration effects, which in turn reduces migration from the building. The secondary enclosure interfered with the natural dissemination of spores to the surrounding areas, causing any escaped spores to be deposited between the exterior building walls and the interior secondary enclosure walls. Sampling was limited to within the secondary enclosure. In

addition, unlike *in situ* soils, laboratory-prepared sand samples consisting of Petri dishes filled with sterile sand were set out of the way of direct foot traffic to avoid disturbance of the trays during the exercise and, consequently, direct foot tracking might not be adequately captured within the collected sand samples. However, the sample trays were within the vicinity of human movement and were therefore exposed to activity-related resuspension. Regardless of these design limitations, this study clearly showed that spores can be carried outdoors following an indoor release.

- **Spores potentially migrate out from a contaminated building into the surrounding area.**

Though the data included in this report are preliminary, there is evidence that spores have the potential to migrate out of a contaminated building and settle into the surrounding area. The test area had previously been contaminated with *Bg* spores, so sterile sand samples were utilized during this analysis to reduce contamination by *in situ* soil. While EPA data cannot be used to give a quantitative estimate of spores that migrate and it should be noted that disturbances of natural soil surrounding the area could have also contributed to detections in the samples, the data suggest that spores have the potential to migrate from a contaminated building. Van Cuyk et al.[102] came to a similar but opposite conclusion in their study of the capabilities of spores to migrate into a building following an outdoor release. During future exercises, the potential for soil contamination exterior to the building must be considered.

- **The current data set can give only qualitative information.**

The degree to which residual soil contamination may be a significant exposure pathway will require further evaluation. One standard curve was assessed post-analysis and used for all EPA data rather than standards within each qPCR analysis. The resulting data are therefore not suitable for quantitative comparisons. The LOD gleaned from this analysis was used as the cut-off value for all averaged Ct results, which were then categorized according to the degree of positive value. Due to the lack of standard curve data within each PCR run, detected samples can be assigned only a degree positive (a qualitative assessment) and cannot be quantified. Furthermore, the PCR assay detects DNA regardless of spore viability. Spores may be present in “NDs” at levels below the LOD, so an ND result does not indicate the absence of viable *Bg* spores.

- **This study did not address a method for soil decontamination.**

While a decrease in the number of samples with detectable *Bg* post-decontamination was seen, care must be taken before attributing this observed decrease to the decontamination technologies alone, as none of the sand samples were directly decontaminated during this experiment. Only the interior of the building was decontaminated, and, therefore, no significant decrease in detectable *Bg* DNA outside the building within the places sampled was expected prior to the study. The decrease in samples with detectable *Bg* post-decontamination could have been caused by chemical DNA degradation due to decontamination overspray or vapors flowing out into the secondary enclosure. Regardless of mechanism, the qPCR results show that there was a decrease in DNA concentration coming from either viable or non-viable spores

within the assessed sand samples. Follow-on work would be required to determine the efficacy of the decontamination technologies in a soil matrix.

- **Alternative processing methods could be studied to improve detection of *Bg* DNA.**

USGS directly extracted a smaller quantity of sand to achieve a matrix LOD of 1E6 spores/g sand, while EPA indirectly washed the spores from a large amount of sand prior to DNA extraction to achieve a 1E4 spores/g sand matrix LOD. Using an extraction and analysis method with a lower matrix LOD could greatly improve results.

4.8.2. Future Considerations

The following considerations should be taken into account when planning similar or follow-on projects.

4.8.2.1. Sampling Considerations

- Ensure that all samples are individually bagged before placement to prevent cross-contamination;
- Research sturdier Petri dishes to prevent breakage;
- Consider shipping methods with increased padding to help prevent breakage; and
- Ensure that each stage has at least one trip blank and site blank.

4.8.2.2. Analysis Considerations

- This study points out a need for extension of contamination testing to the exterior of a building of concern. Following an actual release within a building, human activity and airflow can cause the agent of concern to be released to a wide area and potentially affect a significant number of bystanders. Future studies could help determine the probability and extent of contamination.
- One of the significant limitations of qPCR analysis is its inability to determine the viability of the organism from which the DNA is extracted. RV-PCR is a recently developed analysis tool for determining spore viability in minimal time[35]. RV-PCR combines culture with PCR detection to determine both the viability and DNA specificity of a targeted microorganism. To our knowledge, a method for analyzing DNA in soil samples using RV-PCR has not been described in the literature. The feasibility of analyzing soils for DNA content using RV-PCR should be explored because this technique may yield pertinent information regarding the concentration and viability of assessed samples.
- Matrix LODs in sand and soil are a limiting factor to determining soil contamination. A more efficacious method for extracting DNA from soil samples is needed. Future work utilizing various extraction kits and eluent concentrations might help identify a more appropriate methodology. While this study utilized sand as the soil medium, future work using other soil media would be of significant interest as each medium could have different DNA extraction efficiencies. As an example, carrier DNA during the extraction process has been found to increase the total DNA yield during low-concentration extractions (<10,000 genomes/mL).[103]
- Inhibition caused by results from the decontamination chemicals/process needs to be more fully demonstrated. To help understand the true nature of the apparent decreases noted after decontamination, a laboratory-based exposure and analysis study should be done. This essential experiment could be accomplished by spiking sand with *Bg* DNA and spores (separate experiments), then exposing each in a chamber (with limited air movement) to various decontamination agents, then re-analyzing. The idea would be to

prove that the decontamination chemicals had no effect and/or destroyed/impacted the spore/DNA, yielding the lowered amounts seen after decontamination.
- The possibility of physical processes within the secondary enclosure that decrease spore presence needs to be addressed. In particular, if spores bind to surfaces such as the secondary enclosure walls, the exterior of the secondary enclosure, or personnel clothing, other areas of concern could be implicated during an actual event.

4.9. Development of an Exposure Assessment Plan

Following the Amerithrax events of 2001, there has been much interest in better addressing the risk of inhalational anthrax from incidents involving the release of *Ba* spores into the environment. However, no standard methodology exists for estimating the risk of exposure to *B a* spores or to estimate exposure concentrations based on site-specific sampling data. The BOTE Project Phase 1 provided a rich dataset of sampling data to assess usability of collected data at a contaminated site for developing a methodology for conducting an exposure assessment. Because inhalational exposure to *Ba* spores is a significant health risk, this exposure pathway will be the primary focus for the development of a site-specific inhalation exposure assessment plan which could be used to perform a qualitative assessment of exposure using semi-quantitative/qualitative data generated in a field setting. The intent is to conduct an exposure assessment, only a part of the risk analysis process which generally consists of hazard identification/problem formulation, dose assessment, exposure assessment, and risk characterization. A preliminary methodology is being developed to characterize potential exposure for re-entry into a building contaminated with *Bg* spores, before and after decontamination. Key assumptions for handling the analytical data and exposure calculation are being derived from chemical risk assessment guidelines and standard microbiological analytical practices. Semi-quantitative/qualitative data on indoor surface and air samples that were collected during the BOTE Project will be used for the inhalation exposure assessment.

One of the greatest challenges of risk assessment is addressing the uncertainties associated with the process from sample collection to interpreting the analytical results combined with the physical site characteristics and the variability of the exposed population(s). Analysis of the BOTE Project dataset is the first attempt to identify the uncertainties associated with the calculation of exposure (lack of knowledge of recovery efficiencies of sampling methods; handling of ND data; use of reaerosolization factors from the literature; and choice of surrogate agent used for the BOTE Project). Thus, the analysis of this dataset will provide a qualitative assessment of inhalation exposure, but it is still critical to moving the science forward and to determine gaps/needs for quantitative exposure assessments. While exposures calculated using this derived exposure assessment methodology are limited by uncertainties, the use of the data to address analytical method limitations and run sensitivity analyses is very beneficial. This initial exposure assessment will also allow the objective evaluation of the assumptions and decisions that were made during the planning process.

4.9.1 Exposure Assessment Methodology

The exposure assessment methodology is being developed to assess the exposures of adult receptors to *Bg* spores via inhalation of *Bg* spores in indoor air including the potential

reaerosolization of spores from indoor surfaces. The methodology will include considerations for qualitative determination of intake doses of *Bg* spores via inhalation associated with re-entry into the BOTE Project facility following *Bg* spore dissemination both before and after decontamination for various exposure settings:

- Residential; and
- Office, mailroom, and industrial.

The exposure assessment will utilize analytical data (viable and culturable *Bg* spores as measured by CFU) for air and surface samples collected before and after the application of each decontamination technology (i.e., pH-adjusted bleach, fumigation with ClO_2 gas, and fumigation with VHP®).

The initial exposure assessment will also allow the objective evaluation of the assumptions and decisions that were made during the planning process. Many of the exposure assessment assumptions and decisions were based on typical chemical risk assessment approaches and standard microbiological analytical practices. Key assumptions and decisions guiding the exposure assessment methodology include:

- Using "0" for values below the historic "quantitation limit" and assessing sensitivity around the "0";
- Using ProUCL software[104] (that assumes continuous data) rather than models that assume discrete data, e.g., exponential or beta-Poisson, to analyze discrete (CFU) data;
- Using the 95% upper confidence level of the mean as the exposure point concentration;
- Performing analyses with spread plate data alone, in the absence of available filter plate data;
- Using *Bg* as a surrogate for *Ba*, rather than the more closely related *B. thuringiensis;*
- Using reaerosolization factors calculated for non-*Bg* organisms or particles; and
- Using CFU results "as is"; adjustments were not made to reflect potential recovery inefficiencies of the sampling methods

The inhalation exposure pathways identified for evaluation in the BOTE Project are illustrated in the conceptual site model (Figure 4-71). Briefly, the two complete exposure pathways that will be evaluated for the assessment include: 1) *Bg* spores are released in the BOTE Project facility via aerosolization, contaminating the indoor air through which adult receptors are potentially exposed via inhalation; and 2) *Bg* spores are released in the BOTE Project facility via aerosolization and then become deposited onto indoor surfaces and subsequently reaerosolized (via disturbance of the contaminated surface), re-contaminating the indoor air through which adult receptors are potentially exposed via inhalation. Additional information on potential exposure pathways is provided in the following paragraphs.

The source of contamination was *Bg* spores released as an aerosol within the BOTE Project facility. Post-dissemination (pre-decontamination) sampling took place the day after *Bg* spore dissemination (approximately 17 to 24 hr after dissemination). With the exception of rooms 101A and 102, this assessment will not focus on inhalational exposure that might occur during the actual dissemination of *Bg* spores, but rather, inhalational intake doses will be estimated

after the *Bg* spores had a chance to settle. Baron et al.[91] reported on the development of an aerosol system for depositing *Ba* spore particles on surfaces, noting that most spores settled within a few hours inside a chamber set up with a HEPA filter ventilation system . More specifically, more than 99% of 1- to 2-µm particles would settle within 10 hr. Inhalation exposures will be determined on a limited basis (i.e., Rooms 101A and 102) during each dissemination event.

Following the initial introduction of aerosolized *Bg* spores, the release mechanisms included deposition and reaerosolization (e.g., disturbing the settled spores by walking across the contaminated floor or wiping a contaminated desk surface). A portion of the *Bg* spores possibly remained airborne following dissemination. Indoor air was the identified exposure medium and was sampled directly for *Bg* spores in rooms 101A and 102. Indoor surfaces throughout the building were also sampled for deposited *Bg* spores, and these data will be used to quantify spores that might reaerosolize into indoor air.

The scope of this exposure assessment will be limited to the inhalation route of exposure in adults and will not address children or pet receptors. Deposition of *Bg* spores on indoor surfaces and the associated potential routes of exposure via dermal contact and incidental ingestion will not be evaluated in this exposure assessment. Outdoor air concentrations of *Bg* spores were not measured during this exercise. The assessment will focus only on *Bg* spores; post-decontamination exposures to potential decontamination technology-related chemicals or chemical by-products will not be evaluated.

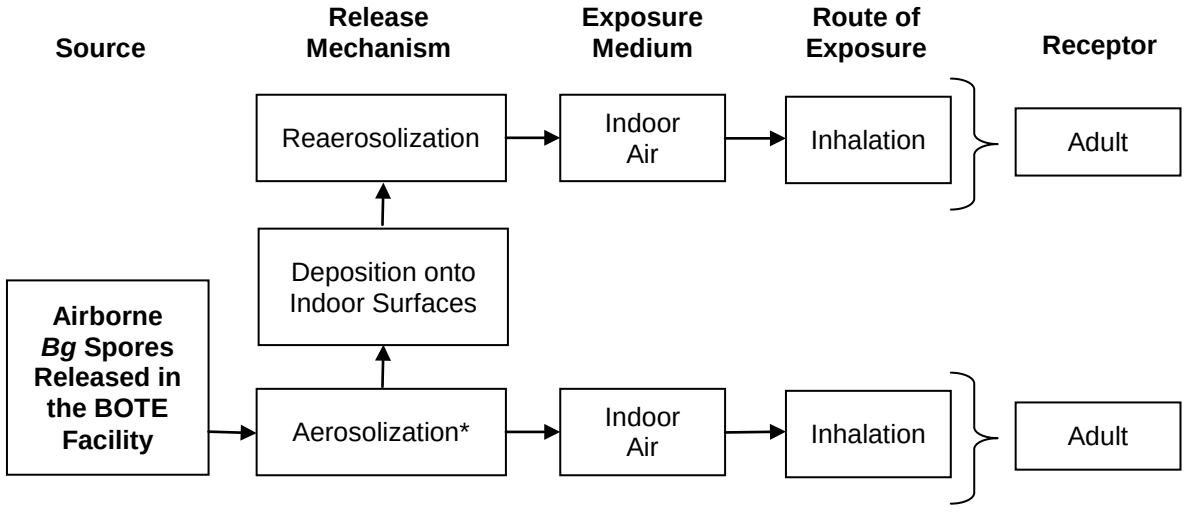


Figure 4-71. Conceptual site model.

* Inhalation exposures during *Bg* spore dissemination (aerosolization) will be assessed only in Rooms 101A and 102.

A summary of available data differentiated by exposure unit that will be used to calculate inhalational intake doses is shown in Table 4-35. Each exposure unit is a room or group of rooms to which an adult receptor is exposed and for which an exposure point concentration (EPC) is calculated and applied over the exposure time (ET). Table 4-35 also notes the exposure setting (e.g., residential or office) associated with each exposure unit. Indoor air spore concentration measurements were available only for two rooms representing an office exposure setting. Spore concentration measurements from surfaces were available from many rooms representing a variety of exposure settings and acquired using a variety of sampling methods.

4.9.2 Future Steps

The selected approaches represent an initial look at a methodology which could be used for a qualitative inhalation exposure assessment and should only be considered preliminary. The approaches selected for this initial methodology were documented in the associated exposure assessment plan and the exposure assessment QAPP. The exposure assessment plan will guide the future evaluation of calculation of EPCs using the BOTE Project data. The evaluation will also look at sensitivity around the assumptions that were selected, and alternative approaches will be considered to revise the exposure assessment plan. Potentially “better” decisions and alternatives may be identified for use in future studies or real world events.

Table 4-35. Data availability by medium and exposure unit per decontamination round.

Medium	Exposure Unit	Exposure Setting	Data Availability	
			Pre-Decontamination	Post-Decontamination
Indoor Air	Rooms 101A; 102; and 101A and 102 combined	Office	Concentration of viable *Bg* spores (CFU) measured by culture, collected by SKC at 4 time points*	Concentration of viable *Bg* spores (CFU) measured by culture, as collected by SKC at one time point
Indoor Surfaces	Rooms 105; 107; 109; 209; 211; 213; and all residential settings combined; all first floor rooms combined; and all second floor rooms combined	Residential	Quantity of viable *Bg* spores (CFU) measured by culture, as collected by sponge, swab, vacuum, and wipe (rooms 101A and 102 only) Quantity of viable *Bg* spores (CFU) recovered from RMC and settling plate (second floor rooms only) samples and measured by culture, which served as quality control samples confirming *Bg* spore dissemination	Quantity of viable *Bg* spores (CFU) measured by culture, as collected by sponge, swab, vacuum, and wipe (rooms 101A and 102 only)
Indoor Surfaces	Rooms 101; 101A; 102; 103; 104; 106; 108; 110; 201; 201A; 202; 203; 203A; 204; 205; 206; 207; 208; 210; 212; copier room (floor 2); corridor + lobby (floor 1); hallway (floor 2); janitor closet (floor 2); mechanical room (floor 1); mechanical room (floor 2); men's bathroom (floor 1); men's bathroom (floor 2); stairwell (floor 2); women's bathroom (floor 1); women's bathroom (floor 2); and all office, mailroom, industrial settings combined	Office, mailroom, or industrial	Quantity of viable *Bg* spores (CFU) measured by culture, as collected by sponge, swab, vacuum, and wipe (rooms 101A and 102 only) Quantity of viable *Bg* spores (CFU) recovered from RMC and settling plate (second floor rooms only) samples and measured by culture, which served as quality control samples confirming *Bg* spore dissemination	Quantity of viable *Bg* spores (CFU) measured by culture, as collected by sponge, swab, vacuum, and wipe (rooms 101A and 102 only)

* Pre-decontamination air sampling was conducted at four different times including: before *Bg* spore dissemination, during *Bg* spore dissemination, before pre-decontamination surface sampling, and during pre-decontamination surface sampling (intended to capture reaerosolization of *Bg* spores associated with human activity).

5. STATISTICAL ANALYSIS OF PRE- AND POST-DECONTAMINATION SAMPLING RESULTS, DECONTAMINATION EFFICACY, AND COST ASSESSMENT

5.1. Introduction and scope

The purpose of this analysis was to evaluate different decontamination methods and to assess the relationship between these decontamination methods and other variables, like sampling method and room type.

Statistical analyses were performed and visual representations created to provide insight into these key issues. Pre-decontamination analyses were also performed to study how well contamination was distributed across the building for each of the three events. The other test factors, like sampling method, were also investigated to look for significant effects in the recovery of the contamination. Post-decontamination analyses were performed to study the effectiveness of the three decontamination methods, as well as how the other factors affected the decontamination and recovery process. The effectiveness results will be contrasted with the cost analysis results to help explain the overall differences between the three decontamination methods.

5.2. Summary of Key Findings

The key results found within the statistical analyses are listed in this summary.

- Spatial analyses showed that there was no significant spatial correlation after the contamination occurred (pre-decontamination). Usually sample results taken close to one another were no more alike than samples that were taken far apart, suggesting that the dissemination technique effectively dispersed the spores within the building.
- For the post-decontamination VHP® results, the spatial analyses did indicate some correlation between sample results that were closely located (within 5 to 20 in), possibly due to small areas that were not decontaminated as effectively as other areas.
- The statistical analysis confirmed that the contamination was applied so that the first floor was significantly more contaminated than the second floor for each of the three events (Figure 5-4).
- Sampling of the contamination prior to decontamination showed that the vacuum socks reported much less contaminant than swabs and sponge-sticks (Figure 5-5). There were also differences in the amount of contaminant found on the sampled objects (floor, desk, vent, etc.) (Figure 5-7); however, these differences may be due in part to the different sampling methods (see Appendix C for the details on the surface sampling protocols).
- There were no significant differences found in contamination for the different room types (Figure 5-6). The amount of contaminant sampled in each room type was not always consistent across the three rounds. The amount of contaminant sampled prior to the VHP® decontamination was higher than the amount of contaminant sampled prior to the

other two decontamination methods for each of the room types except for the residential rooms, in which the amount of contaminant sampled prior to the VHP® decontamination was the lowest amount.

- After decontamination, VHP® had significantly fewer ND (clean) samples (83.8% clean) than pH-adjusted bleach and ClO_2 (both just over 99.6% clean) (Table 5-2).
- After the VHP® decontamination, the clearance samples showed that the residential room decontamination efficacy was significantly lower than the other room types (Table 5-6).
- After the VHP® decontamination, the clearance samples showed that the decontamination efficacy according to the swab samples was significantly lower than for vacuum socks and sponge-sticks.
- The VHP® and ClO_2 methods were very similar in cost (between $800,000 and $900,000), while the cost of the pH-adjusted bleach was nearly $1,200,000. The cost differential between the VHP® and ClO_2 methods was due mostly to the difference in the fumigation contractor costs; the cost differential between the fumigations and the pH-adjusted bleach method was largely due to waste management costs.
- ClO_2 was the least expensive of the most effective decontamination methods (Figure 5-10).

5.3. Spatial Distribution Analyses

To evaluate whether the general spatial dissemination and post-decontamination residuals were similar between the three events, a normalized spatial modeling analysis was performed. Because the sample results are so dependent on the sampling technology used and on other factors, the data were normalized to allow all results to be used in this spatial distribution analysis. Further detail concerning how the data were normalized can be found in Appendix L. Although building structures (walls, hallways, doorways) and contaminant dissemination pathways (primarily via vents and open doorways) affect the spatial correlation of sample results, kriging was used to explore the gross spatial nature of the contamination for each of the three events. Further detail about how kriging was applied to the data can be found in Appendix L. The spatial kriging estimates are graphically displayed in plots produced using VSP (Visual Sample Plan)[105]. These plots were produced for each of the three events, as well as each floor, for a total of six plots. Figure 5-1 shows the spatial kriged estimates for the first floor prior to the pH-adjusted bleach decontamination. The full set of six plots showing the spatial nature prior to each of the three contaminations on the first and second floors is found in Appendix L (Figures L.1 – L.6).

Each spatial distribution plot is accompanied by a plot showing the variation associated with those estimates, called a variogram plot. A variogram plot shows the variability (y-axis) of sample values that are a certain distance apart (plus/minus a tolerance). This distance is shown as increasing on the x-axis. The points on the plot show the lag distances that were selected to make empirical measurements of the variability. The line represents the modeled relationship between distance and variability. Figure 5-2 shows the accompanying variogram plot for the first floor contamination prior to the Round 2 (pH-adjusted bleach) decontamination. This plot shows that there is no spatial correlation. In other words, sample results taken close to one another are

no more alike than samples that are taken very far apart. These results are very similar for the second floor and the other decontamination events. The full set of six plots showing the variogram plots for the data prior to each of the three contaminations on the first and second floors is found in Appendix L (Figures L.7 – L.12). For *Ba, Bg* and similar contaminants, these results are not unexpected, suggesting that any hotspot-like deposition model would not be appropriate for a biological release.

Spatial distribution analyses were also performed for the VHP® post-decontamination data. Figures L.13 and L.14 in Appendix L show the spatial nature of the remaining contamination on the first and second floors. Figures L.15 and L.16 in Appendix L show the variogram plots for each floor. For the post-decontamination VHP® results, there may be some spatial correlation between sample results located very close to one another (within 5-20 in of each other). This correlation could be feasible if the decontamination efficacy is somewhat patchy over the building, or certain small patches were not decontaminated as effectively as others.

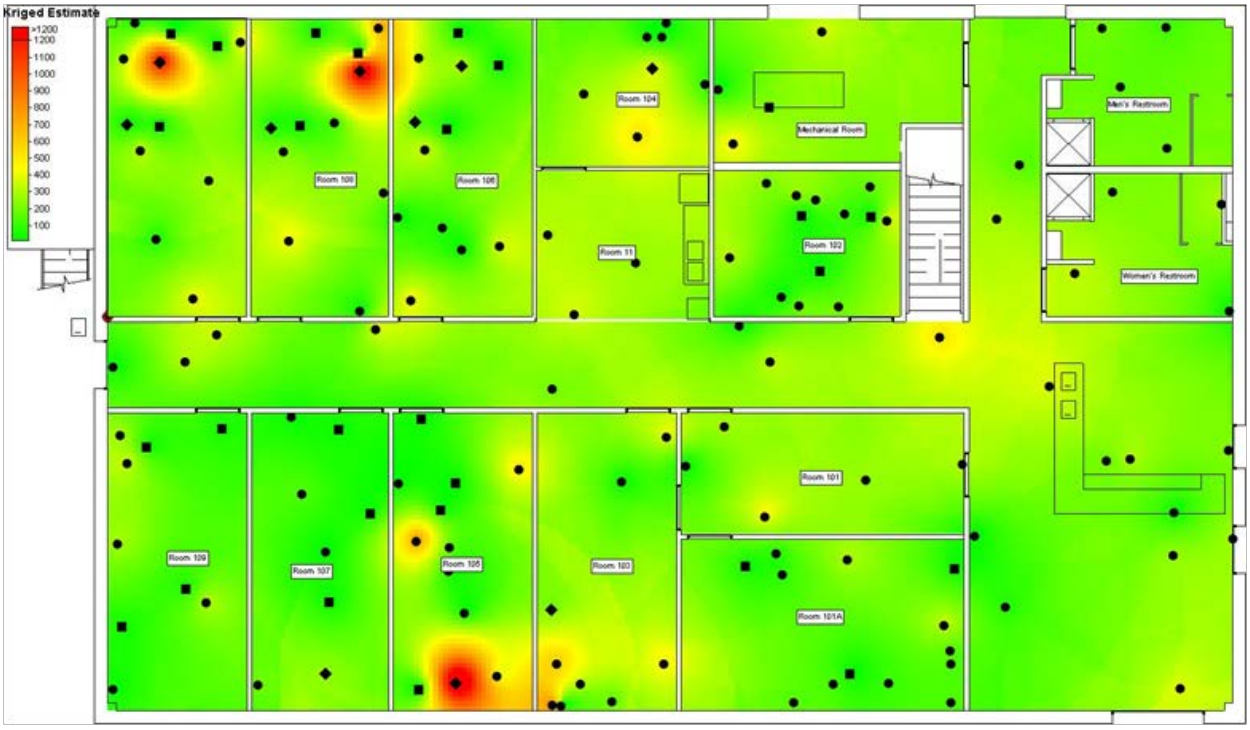


Figure 5-1. Kriged estimates (scale explained in Appendix L) of the contamination on the first floor prior to the pH-adjusted bleach decontamination (square = vacuum sock, diamond = swab, circle = sponge-stick).

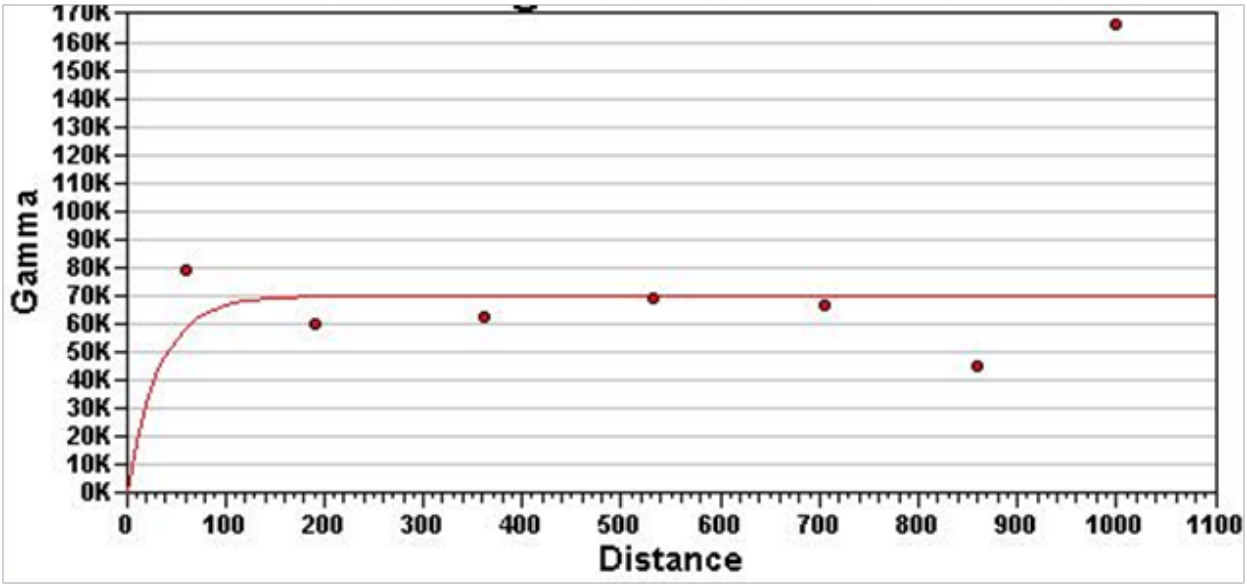


Figure 5-2. Variogram for the first floor contamination prior to the pH-adjusted bleach decontamination.

5.3.1. Pre-Decontamination Analyses

The pre-decontamination data were analyzed to determine which factors had a significant effect on the amount of contamination that was recovered and analyzed. The factors investigated included:

- Sampling round with a particular decontamination method (VHP®, pH-adjusted bleach, and ClO_2);
- Floor (1st Floor and 2nd Floor);
- Room type (commercial, mailroom, residential, shop, and not assigned);
- Sampling method (vacuum sock, swab, and sponge-stick);
- Sampled object (bed, cabinet, ceiling, chair, couch, countertop, desk, file cabinet, floor, mail slot, monitor, nightstand, return vent, shelves, sink, stove, supply vent, table, wall, and workbench); and
- Laboratory (eight unidentified laboratories were used).

ANOVA was performed to determine if there were significant differences between the levels of each of the listed factors and any possible interactions between them. A key assumption with ANOVA is that the data are symmetrically distributed; however, contamination values, measured in CFU/cm^2, were positively skewed. Two different transformations were made to the data so that analyses would be performed on more symmetrically distributed data. Analyses were performed on the ranks of the data (a non-parametric approach) and the log (CFU/cm^2). As expected, results were generally similar between the two analysis methods. When performing ANOVA, p-values less than 0.05 indicate that there are significant differences in sample results between the levels of the factor (with 95% confidence). In the case of interactions, p-values less than 0.05 indicate that the sampled contamination level changes inconsistently when looking at two of the factors (with 95% confidence). Only factors that were significant, nearly significant, or

in a significant interaction are included in the reported analyses, below. Plots will be used to show the differences in the levels of each factor, as well as the interactions between factors.

The ANOVA results are found in Table 5-1. Analyses performed on the ranks and on the log(CFU/cm^2) showed similar results. The p-values from the ranks analysis are reported here. The following conclusions were drawn:

- There were no significant differences in the sampled contamination levels between the sampling events (p-value = 0.5721). The box plots in Figure 5-3 show that the means and medians between the three sampling events were similar.
- As expected, the first floor was significantly more contaminated than the second floor (p-value < 0.0001). Figure 5-4 confirms the differences between the floors.
- There was a significant difference in the amount of contamination found in the five different room types (p-value < 0.0001). Figure 5-6 shows that the amount of contamination found in the residential room type was smaller than the others.
- There was a significant difference in the amount of contamination observed by each of the three sampling methods (p-value < 0.0001). The vacuum sock reported much less contaminant than the other two methods, as shown in Figure 5-5.
- The amount of contaminant observed on each of the objects was significantly different (p-value < 0.0001). The box plots in Figure 5-7 show how the many objects differed. Objects were usually sampled using the method that was most appropriate, so only a few objects were sampled using more than one sampling method. This difference in sampling can confound the object effect, meaning that some, or possibly even most, of these differences may be due more to the differences observed in sampling method results. The sampling was performed to be similar to an actual event, so it was not feasible to design an experiment that would separate this confounded effect.
- The interaction between sampling event and sampling method was significant (p-value = 0.0144). An interaction plot of the means is shown in Figure 5-8. The vacuum sock results were consistent across the three events; however, the sponge-stick results were much higher for the VHP® pre-decontamination event, while the swab results were much higher for the ClO_2 pre-decontamination event.

Table 5-1. ANOVA results for the pre-decontamination data. Due to non-normality of the data, analyses were performed on ranks and log (CFU/cm^2). (Only factors that were significant or in a significant interaction were included in the final analysis.)

Factor / Interaction	p-Value Based on Ranks	p-Value Based on log (CFU/cm^2)
Sampling Event	0.5721	0.4024
Floor	< 0.0001	< 0.0001
Room Type	< 0.0001	0.0350
Method	< 0.0001	< 0.0001
Object	< 0.0001	< 0.0001
Sampling Event x Method	0.0144	0.0042

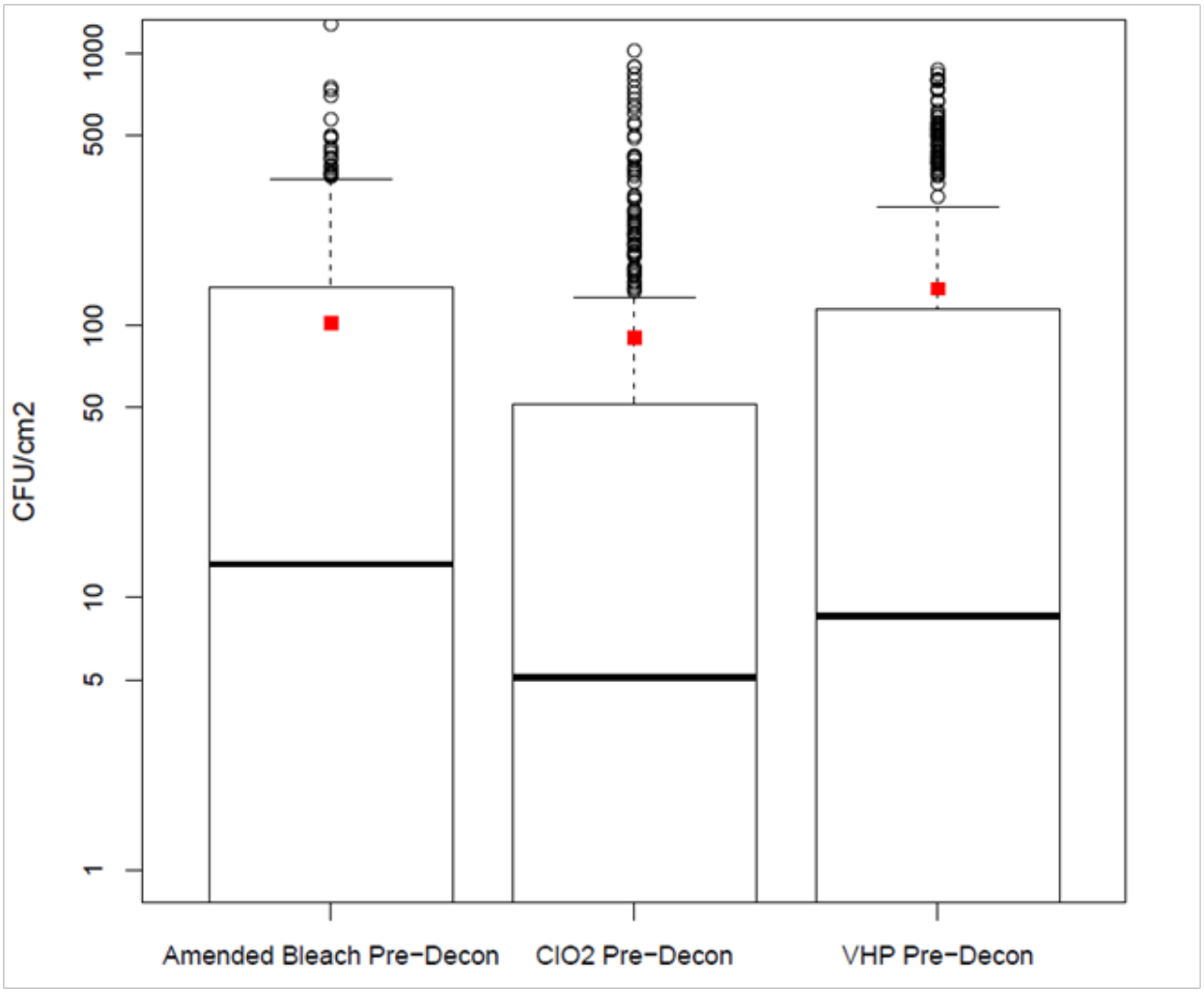


Figure 5-3. Box plots of extracted contamination (CFU/cm^2 in log scale) for each pre-decontamination round (middle box represents middle 50% of data, middle line in box represents median, red square represents mean).

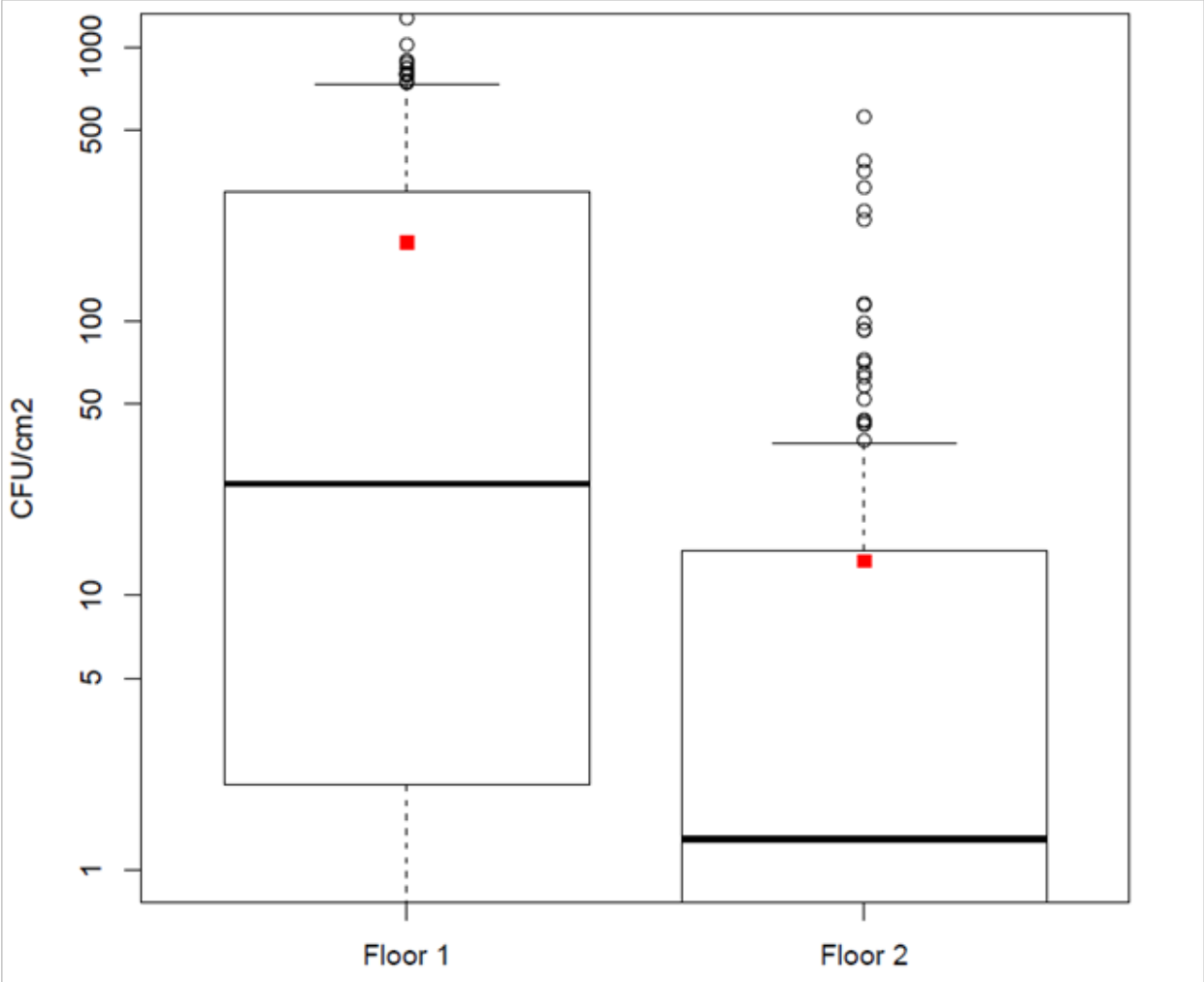


Figure 5-4. Box plots of extracted contamination (CFU/cm^2 in log scale) for each floor across all three pre-decontamination rounds (boxes represent middle 50% of data, middle line in box represents median, red square represents mean).

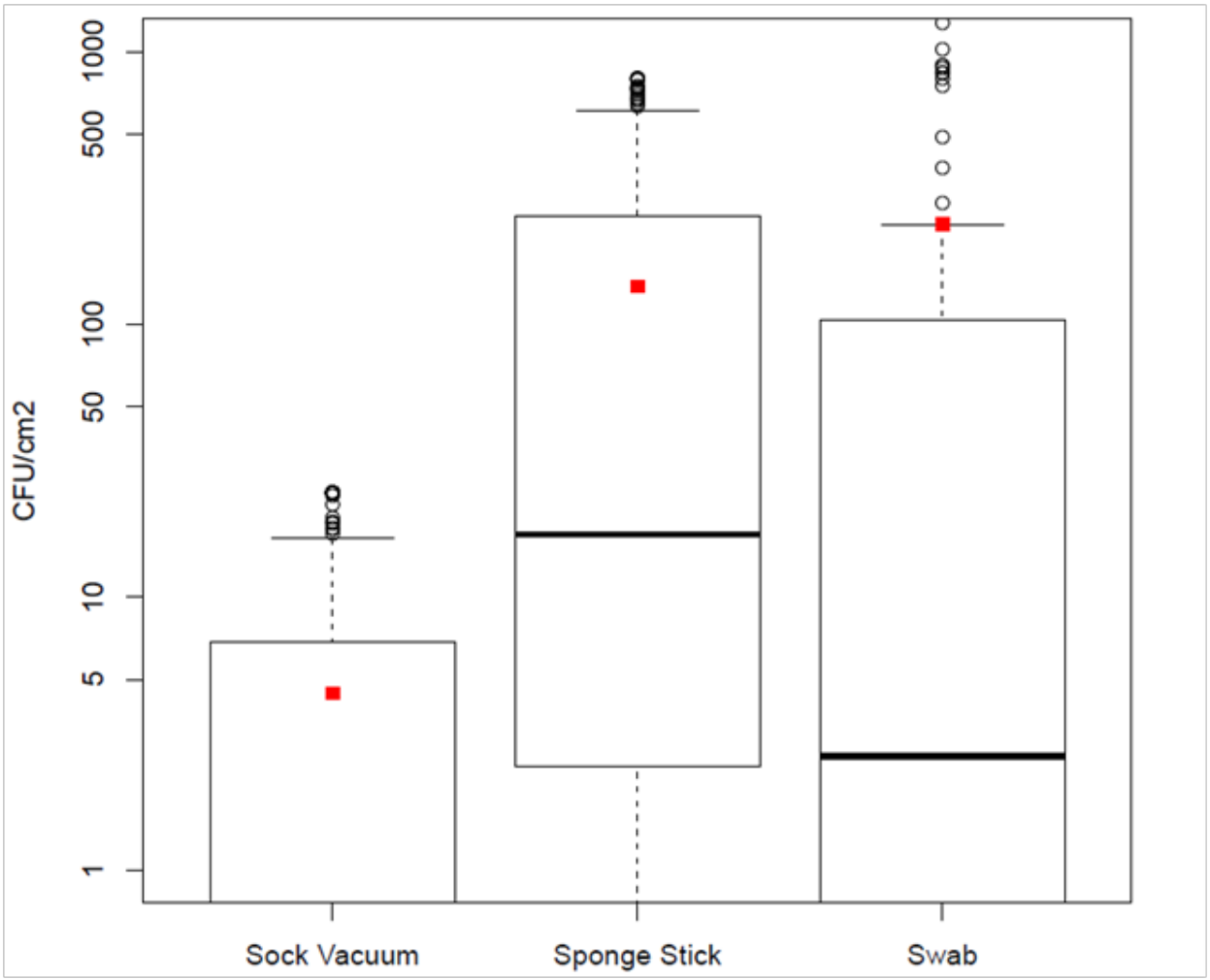


Figure 5-5. Box plots of extracted contamination (CFU/cm^2 in log scale) for each sampling method across all three pre-decontamination rounds (boxes represent middle 50% of data, middle line in box represents median, red square represents mean).

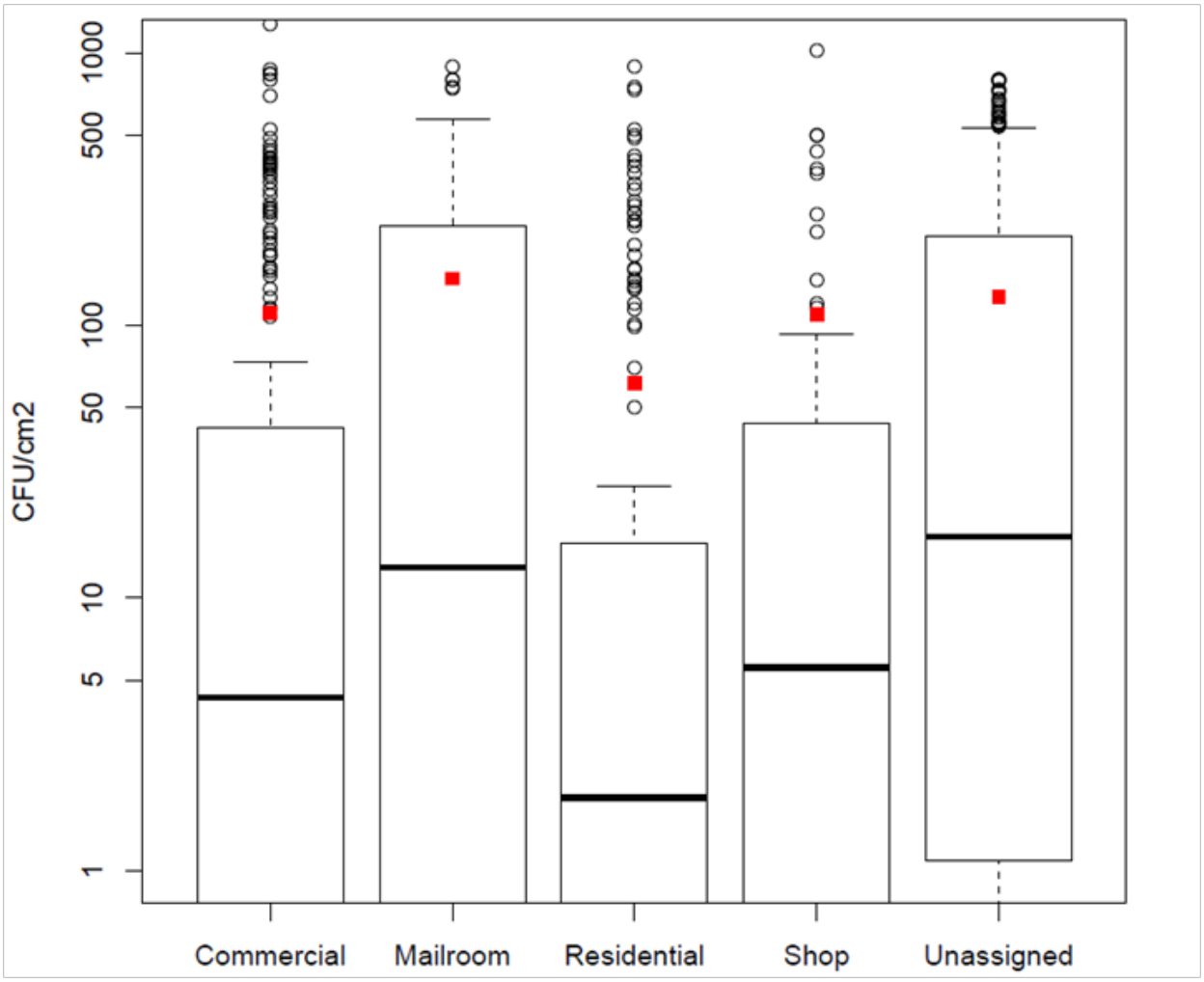


Figure 5-6. Box plots of extracted contamination (CFU/cm^2 in log scale) for each room type across all three pre-decontamination rounds (boxes represent middle 50% of data, middle line in box represents median, red square represents mean).

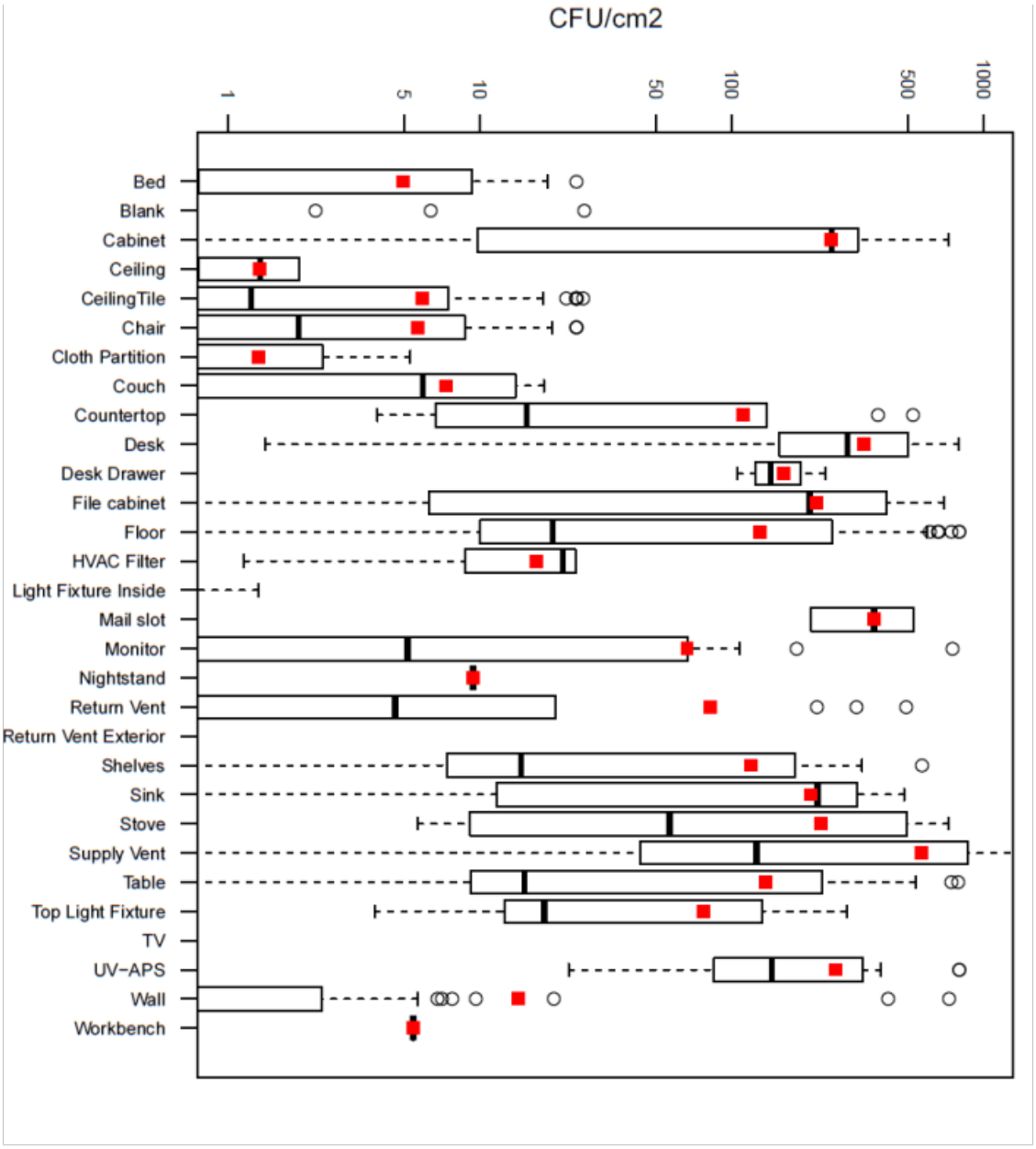


Figure 5-7. Box plots of extracted contamination (CFU/cm^2 in log scale) for each sampled object across all three pre-decontamination rounds (boxes represent middle 50% of data, middle line in box represents median, red square represents mean).

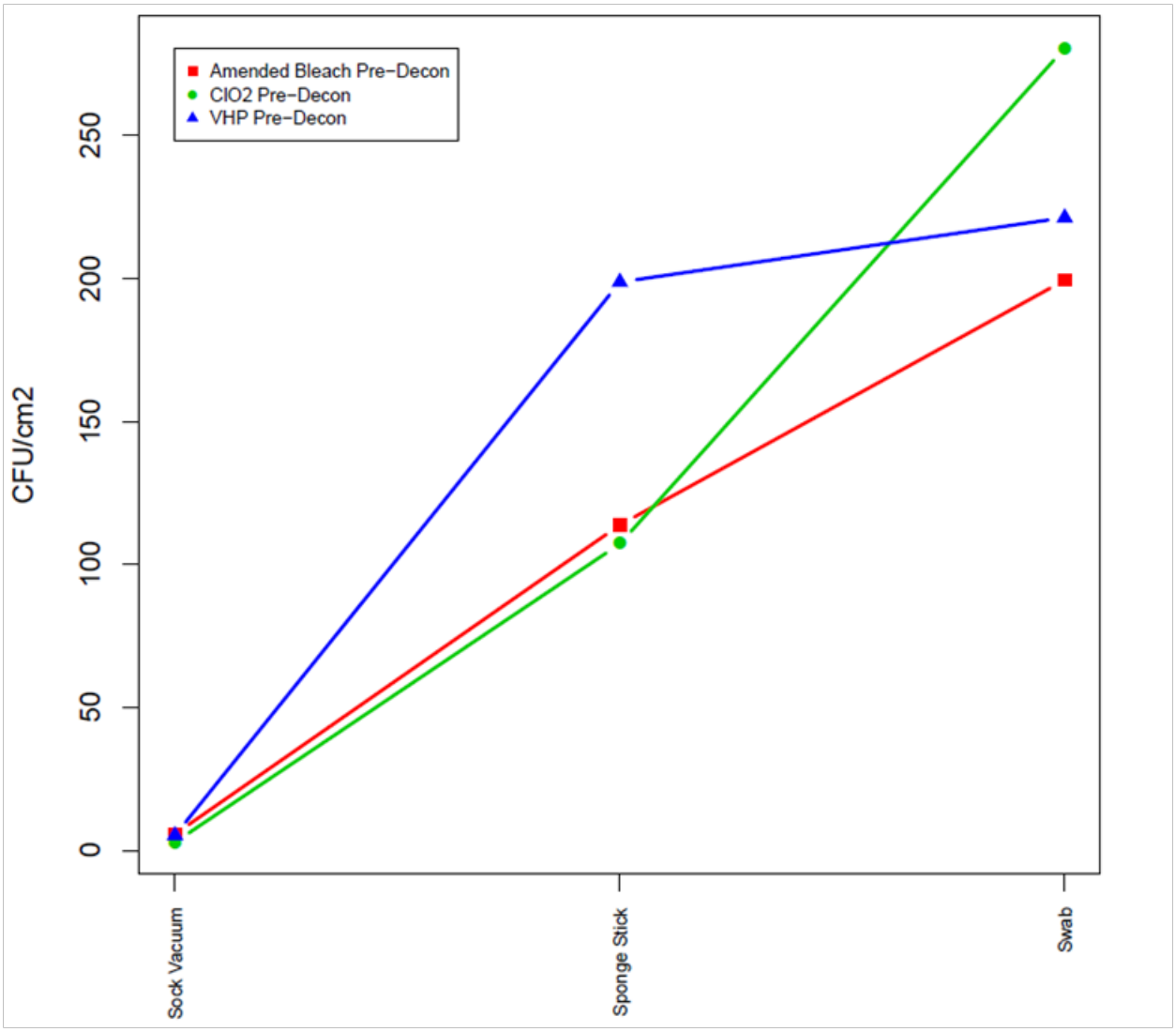


Figure 5-8. Interaction Plot of Sampling Method and Pre-Decontamination Rounds Measured in CFU/cm^2.

5.4. Post-Decontamination Analyses

Based on sample results after decontamination, the pH-adjusted bleach and ClO_2 decontamination methods were obviously more effective than the VHP® method. No formal statistical tests were required or performed to support this conclusion. A simple data summary is provided in Table 5-2 to summarize the effectiveness of the three decontamination methods. However, several statistical analyses were performed on the VHP® test results to explore the effects of various factors on the VHP® decontamination effectiveness.

Table 5-2 summarizes the effectiveness of each decontamination method by listing the number of samples that reported contamination (positive) and the number of samples that reported no contamination (ND). VHP® had significantly more positive samples, with 83.8% of the samples coming back clean (ND), compared to over 99.6% for pH-adjusted bleach and ClO_2. Samples taken during the pH-adjusted bleach and ClO_2 decontamination methods were ND in all cases, except for one positive sample each. Table 5-3 lists the information about each of the positive samples for pH-adjusted and ClO_2.

Table 5-2. The decontamination effectiveness for each decontamination method.

Decontamination Method	# of Samples Not Clean (Positive)	# of Samples Clean (ND)	% of Clean Samples	Decontamination Efficiency
Amended Bleach	1	268	99.63%	0.999998
ClO_2	1	311	99.68%	0.999972
VHP®	52	269	83.80%	0.982778

Table 5-3. The sample characteristics of the pH-adjusted bleach and ClO_2 samples that showed positive growth.

Decon Method	Barcode	Floor	Room	Method	CFU
pH-Adjusted Bleach	3085	1st	Men's Bathroom	Sponge Stick	16
ClO_2	4285	2nd	Room 213	Vacuum Sock	17

The VHP® post-decontamination data were analyzed further to study the effects of the other factors during the testing. Three different response measures of decontamination efficacy were analyzed. These response measures are defined as follows:

- **DE = Decontamination efficiency** = $\frac{pre-post}{pre}$ where the ***post*** values (measured in CFU/cm^2) are the post-VHP® decontamination values matched to the mean of those **pre** values taken during the pre-VHP® decontamination event that were within 1 ft of the ***post*** sample location using the same sampling method. In the rare occurrence that the ***post*** value was higher than the ***pre*** value, the resulting negative value was set to zero. Only those ***post*** values with a nearby ***pre*** value were included in this part of the analysis. The decontamination efficiency measures the proportion of contamination in a sampling location that was removed during decontamination.
- **Log(DE) = Log(decontamination efficiency)** = $log\left(\frac{pre-post}{pre}\right)$. In the few cases where the $\frac{pre-post}{pre}$ value was zero, the value 0.0001 was substituted so that the logarithm could be calculated.
- **Percentage clean** = $\frac{c}{n}$ where ***c*** is the number of samples that were clean (ND) and ***n*** is the total number of samples.

The first two response measures, DE and log (DE), are measured on a continuous scale, so ANOVA was used to evaluate the effects of various factors. Each factor, previously listed in the pre-decontamination analysis section, was included in the analyses, as well as interactions between factors. Only those factors and interactions that were significant or nearly significant are included in the reported results below. The decontamination efficiency data were not normally distributed. Non-normality can have an adverse effect on the results using ANOVA. For this reason, the log decontamination efficiency values were also analyzed and the results reported. Taking the logarithm of skewed data is a common way of removing skewness from the data distribution, resulting in a more symmetrically distributed data set.

During the analysis of DE, it became apparent that there was a single outlying sample that was having a heavy influence on the analyses. This sample was a swab, taken on the 2nd floor, in a room configured as a commercial facility. The value for this outlying sample was 9.7E3 CFU with the next largest swab sample at 1.7E2 CFU. ANOVA was performed on the data with and without this outlying value. Both sets of results are shown in Table 5-4.

The third response measure, percentage clean, was formed by the binomial response of whether or not the samples returned clean (ND). Fisher's Exact Tests were performed to look for significant differences in the percent of samples that returned clean for each of the factors of interest. Interactions were not studied for this response measure.

The analyses were performed to determine which factors and interactions between factors had a significant effect on decontamination. The p-values from these analyses are shown in Table 5-5. p-Values less than 0.05 indicate that the factor or interaction has a significant effect on decontamination with 95% confidence. The following conclusions were made about each of the factors:

- **Floor**
  - *Fisher's Exact Test* – These results showed a strong difference between floors when looking at percentage of samples clean (ND) (p-value < 0.0001). Table 5-5 shows that the 1st floor had only 75% samples clean after the VHP® decontamination, while the 2nd floor had 95% clean.
  - *ANOVA (including outlier)* – These tests showed a significant difference between floors when looking at DE (p-values of 0.0094 from the DE ANOVA and 0.0125 when analyzing the log(DE)). Table 5-5 shows DE was actually higher for the 1st floor, which had received a much larger amount of contamination.
  - *ANOVA (excluding outlier)* – When the outlier on the 2nd floor is removed, the DE becomes a little higher for the 2nd floor, as should be expected, and the difference between floors becomes non-significant (p-values of 0.7993 and 0.4211).
- **Room Type**
  - *Fisher's Exact Test* – No statistically significant differences were found in the percentage of samples clean among the different room types (p-value = 0.1166).
  - *ANOVA (including outlier)* – The ANOVA tests showed no statistically significant differences between the different room types with a significance level of 0.05 (p-values of 0.0956 and 0.1869 when analyzing the logarithm). Some of the room types did not have a lot of samples (mailroom and shop) and, therefore, the statistical power to find differences was lower.

- *ANOVA (excluding outlier)* – When the outlier was removed, the ANOVA on DE showed a significant difference (p-value=0.0228), while the ANOVA of the log(DE) showed a nearly significant difference (p-value=0.0547). Table 5-6 displays the mean DE and percent of samples clean for each room when VHP® decontamination was used. The mean DE for the commercial rooms increased from 0.979 to 0.995 when the outlier was removed. The residential rooms had the lowest DE mean (0.944) and percent clean value (76.67%), while the other four room types had very similar DE means near 1.000 (with the outlier removed).

- **Method**
  - *Fisher's Exact Test* – When analyzing the percent clean, Table 5-7 shows that the vacuum sock (78.57% clean) was lower than sponge-sticks (86.59% clean) and swabs (86.67% clean), but this difference was not statistically significant according to the Fisher's Exact Test (p-value=0.1851).
  - *ANOVA (including outlier)* – The ANOVA tests showed a highly significant difference between the sampling methods with respect to DE (p-value < 0.0001). Table 5-7 shows that the vacuum socks and sponge-sticks were very similar, while the mean DE for the swabs was significantly lower.
  - *ANOVA (excluding outlier)* – The swab mean DE increased from 0.874 to 0.932 when the outlier was removed. This difference was still significant when analyzing the log (DE) (p-value=0.0226).
- **Floor x Method Interaction**
  - *ANOVA (including outlier)* – The ANOVA tests showed a significant interaction between floor and method (p-values of 0.0182 and 0.0117). Figure 5-9 shows a plot of this interaction. The plot shows that the Swab-2nd floor mean DE was heavily influenced by the outlier (it is much lower than the others).
  - *ANOVA (excluding outlier)* – When the outlier was removed, this interaction was no longer significant (p-values of 0.3697 and 0.5143). The outlier was solely responsible for the significant interaction that had been revealed. The dotted line on Figure 5-9 represents the swab means for both floors without the outlier, showing how much influence the single outlier has.

As can be seen from the results, the swab-second floor outlier data point is highly influential. There were no explanations for this data point and the data around it did not confirm this point as a hotspot of contamination. With this data point included, the mean DE for swabs on the second floor was unusually low. This result was counter-intuitive. The expectation was that decontamination efficiency should be lower (or at least similar) for the first floor, because the first floor was more heavily contaminated. This pattern was also observed for the vacuum socks and sponge-stick samples. Also, analyses including this data point did not conclude that there were significant differences between the room types, although the mean DE values seemed to show that the mean residential DE value was lower than the others. Once the outlying data point was removed, this difference was determined to be significant. For these reasons, the analyses were performed with and without this data point, and the conclusions mentioned refer only to the analyses without this data point.

Table 5-4. ANOVA and Fisher's Exact Test results of the VHP® post-decontamination data. (Only factors that were significant or close to significant were included in the final model.)

Factor / Interaction	DE (Decontamination Efficiency) ANOVA p-value	DE (outlier removed) ANOVA p-value	Log (DE) ANOVA p-value	Log (DE) (outlier removed) ANOVA p-value	% Clean Fisher's Exact p-value
Floor	0.0094	0.7993[1]	0.0125	0.4211[1]	<0.0001
Room Type	0.0956	0.0228	0.1869	0.0547	0.1166
Method	<0.0001	0.0947	<0.0001	0.0226	0.1851
Floor x Method	0.0182	0.3697[1]	0.0117	0.5143[1]	_

1 This factor or interaction was highly nonsignificant for this analysis, so therefore this factor was not included in the final model.

Table 5-5. VHP® post-decontamination results for each floor.

Floor	Mean Decontamination Efficiency	Mean Decontamination Efficiency (outlier removed)	# of Samples Not Clean	# of Samples Clean	% of Clean Samples
1st Floor	0.985	0.985	45	132	74.58%
2nd Floor	0.979	0.990	7	137	95.14%

Table 5-6. VHP® post-decontamination results for each room type.

Room Type	Mean Decontamination Efficiency	Mean Decontamination Efficiency (outlier removed)	# of Samples Not Clean	# of Samples Clean	% of Clean Samples
Commercial	0.979	0.995	11	70	86.42%
Mailroom	0.999	0.999	3	21	87.50%
Residential	0.944	0.944	14	46	76.67%
Shop	1.000	1.000	0	20	100%
Unassigned	0.998	0.998	24	112	82.35%

Table 5-7. VHP® post-decontamination results for each sample method.

Sample Method	Mean Decontamination Efficiency	Mean Decontamination Efficiency (outlier removed)	# of Samples Not Clean	# of Samples Clean	% of Clean Samples
Vacuum Sock	0.987	0.987	24	88	78.57%
Sponge-Stick	0.992	0.992	24	155	86.59%
Swab	0.874	0.932	4	26	86.67%

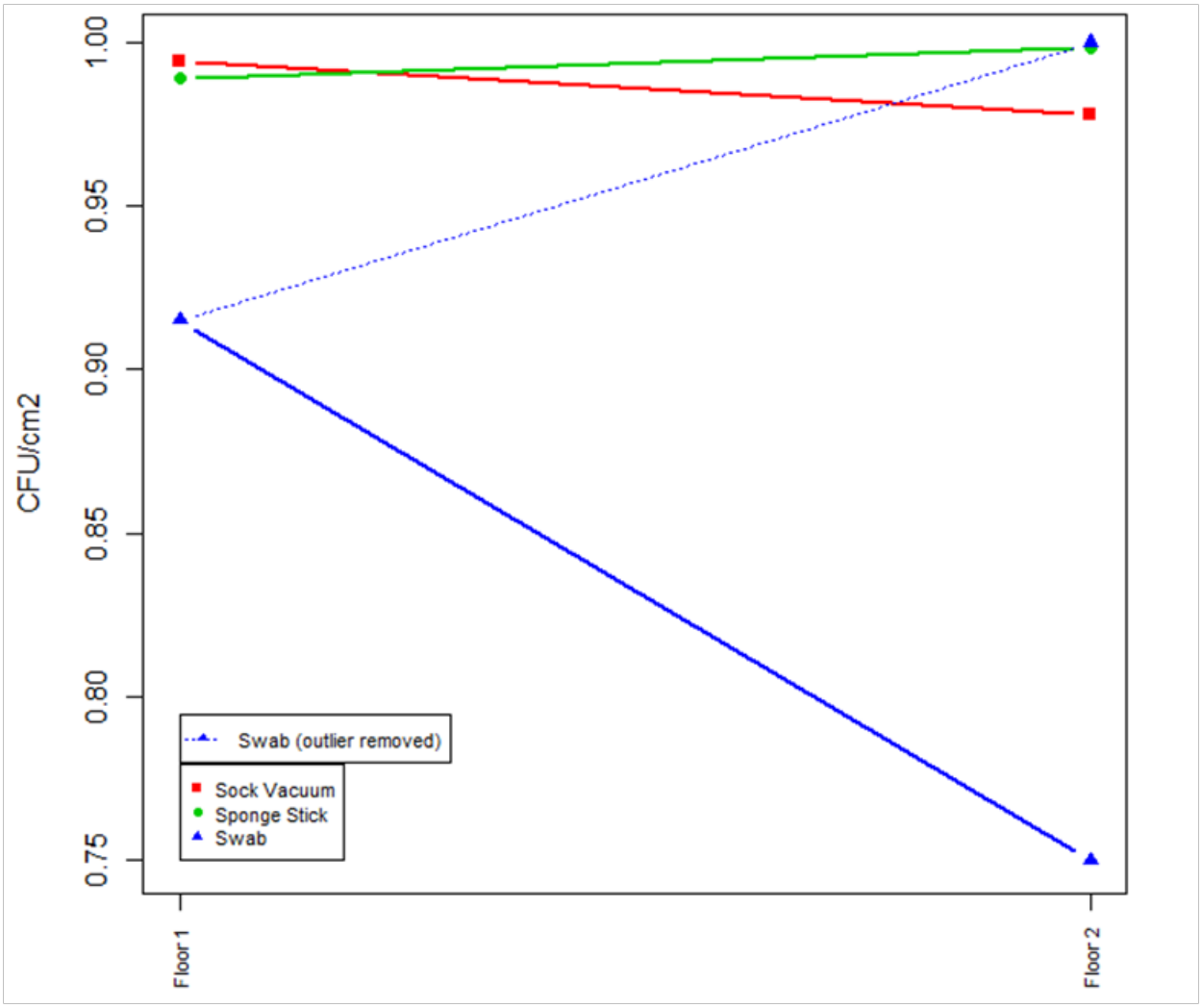


Figure 5-9. Interaction plot of sampling method and floor for the VHP® events (y-axis is the mean DE for each combination of the factors).

5.5. Conclusions from Statistical Analysis

The post decontamination data showed a clear difference between the three decontamination methods. Both pH-adjusted bleach and ClO_2 performed well, with only one sample each showing positive growth (percent clean rates above 99.6%). VHP® had 52 samples showing positive growth (83.8% clean rate), resulting in a much lower percent clean rate than the other two methods. Figure 5-10 shows a summary of the estimated overall costs for each of the decontamination methods (note that the y-axes in Figure 5-10 have been truncated). The VHP® and ClO_2 methods were very similar in cost (between $800,000 and $900,000), while pH-adjusted bleach cost nearly $1,200,000. However, these overall cost estimates include an unrealistically significant amount of characterization and clearance sampling due to the research nature of BOTE Phase 1 study. Figure 5-10 also summarizes the performance of each decontamination method using percentage of samples clean (ND) and decontamination efficiency. With respect to performance, ClO_2 and pH-adjusted bleach performed well in both measured aspects, while VHP® performed significantly worse.

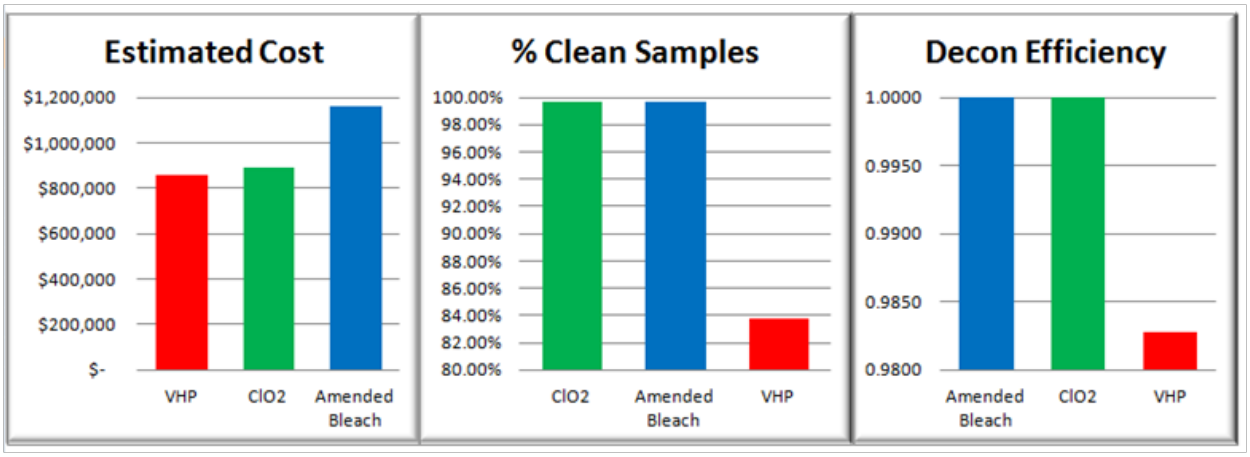


Figure 5-10. Overall decontamination method cost and performance.

6. QUALITY ASSURANCE AND QUALITY CONTROL

The purpose of this section is to describe QA and QC activities that were implemented during the BOTE Project, Phase 1 (the subject of this report). Specifically, the research areas that were EPA's responsibility were carried out in accordance with a series of QAPPs approved by EPA prior to the start of testing. In addition, EPA QA personnel conducted an assessment of various research components that were to have been conducted in accordance with a specific QAPP.

6.1. Background

As previously discussed, the BOTE Project was a field-level decontamination assessment managed by the EPA and DHS with the DOD/DTRA serving as the interagency coordinating study directorate. Three decontamination methods were assessed: (1) fumigation with VHP®, (2) a treatment process including the use of pH-adjusted bleach, and (3) fumigation with ClO_2.

The four principal objectives of the BOTE Project Phase 1 decontamination assessment were:

- Conduct and evaluate field-level studies of three decontamination technologies/protocols from initial discovery to final environmental remediation.
- Demonstrate that biological sampling and analysis methods from previous studies provide accurate characterization of *Ba* simulant concentration challenges for detection/identification purposes.
- Collect and analyze the results from the decontamination study and perform a cost analysis of all aspects of the remediation approaches.
- Determine the exposures associated with reentry into a building that has been contaminated with surrogate *Ba* spores and subsequently decontaminated.

6.2. Quality Assurance Objectives

To ensure that data produced were defensible and reproducible, the EPA approved QAPPs prior to the commencement of data collection and conducted assessments during the various stages of data collection.

During the course of a project, the three types of audits that may be performed include: (1) technical systems audits; (2) performance evaluation audits; and (3) data quality audits.

Technical systems audits are generally conducted prior to or during the early stages of a project. The Technical Systems Audit is a qualitative on-site evaluation that determines whether or not a project or analysis is being performed as described in existing test plans, QAPPs, or standard methods.

Quantitative evaluations are made using performance evaluation audits. A performance evaluation audit is an evaluation of a measurement system using a reference material with a known value or composition. EPA often provides performance evaluation audit samples to contractors so that those contractors can demonstrate their ability to perform a specific analysis adequately.

Data quality audits evaluate methods used to collect, interpret, and report project results. Selected samples are tracked through laboratory analysis, data processing, and statistical analysis procedures to determine whether all data modifications, and the reasons for those modifications, were adequately documented.

These assessments are an integral part of any quality assurance program.

6.3. Key QA and QC Activities and Reporting

Through systematic checking, audits confirm that appropriate QA procedures are being followed and that project performance meets specified standards. The on-site QA-related activities pertinent to the BOTE Project included the following: a confirmation and evaluation of the test organism, spore dissemination and reference testing, sample collection, tracking and handling, cross-contamination reduction, field blanks, and sample analysis methods. The results of these QA activities are discussed in this section.

6.3.1. Test Organism

To meet the objectives of the project, a non-pathogenic surrogate (*Bg*, ATCC 9372; also known as *B. atrophaeus* and *B. subtilis* var. *niger)* was used. The *Bg* spore preparation was obtained from DOD's Critical Reagents Program Antigen Repository.

Prior to its use, the *Bg* spore preparation was evaluated by EPA at the EPA's Aerosol Testing Facility in Research Triangle Park, NC, and the EPA's BSL-2 Biocontaminant Suite at AWBERC in Cincinnati, OH.

A technical systems audit was conducted during the evaluation of the spore preparation. There were no audit findings that would impact the outcome of the project.

6.3.2. Spore Dissemination and Reference Testing

Three reference methods were used to indicate that the dissemination process was successful at meeting the target surface loading criteria for the first and second floors of the test facility. The reference methods were as follows: real-time particle measurements were taken at 20 locations throughout the facility during dissemination using the FLIR Systems, Inc. IBACs, and surface loading (CFU per ft^2) indications were provided for by using stainless steel reference material coupons (RMCs) and TSA settling plates. Each of the reference methods is shown in Table 2-4.

In Round 2, the majority of the RMCs were reported as being ND for viable Bg spores after dissemination. Only four of 28 samples had non-zero CFU values reported. The mean of these non-zero samples was consistent with the Round 1 results for Floor RMCs. It is unknown why *Bg* was not detected on the majority of the RMCs in this round. The measured surface loading on Floor 1 was within the target criteria of 1E4 to 1E6 CFU/ft^2. This measured loading was consistent with that estimated from the four Floor 1 RMCs with *Bg* detected (see Section 3.2.1.1); there was no statistically significant difference between the surface sampling and RMC average values (t-test, two-tailed p-value = 0.4838). Because the surface sampling was the ultimate method for determination of the pre- and post-decontamination *Bg* spore loading, these

Floor 1 RMC values were not investigated further. No corrective action was deemed necessary or taken.

Also in Round 2, all quantified RMC samples associated with the second floor rooms were higher than the target spore loading of 1E2 to 2E2 CFU/ft^2. One RMC on the second floor was ND for *Bg*. Excluding the inclusion of this value as 0 CFU, the mean loading for second floor RMCs was 7.3E3 (±4.7E3) CFU/ft^2. When the unexplained NDs are included, the results did not indicate a significant difference (*t*-test, p =0.3722)[81] between first and second floor surface loadings. Excluding the NDs, the results did indicate a significant difference (*t*-test, p <0.0001)[81] between first and second floor surface loadings. These results were meant to provide an indication of surface loading; the surface sampling results were the critical criteria for the decontamination assessment. The Floor 2 loadings determined by surface sampling were within the target criteria and well indicated by the RMCs. No corrective action was deemed necessary or taken.

6.3.3. Sample Collection, Tracking and Handling

The BROOM[60] PDA was used by sample collection teams to track sample location, sample types, sample matrices, date, time, samplers, and other pertinent data. Chain of custody forms generated by the BROOM system were included with each shipment and verified by a second person.

The sampling methods used in the BOTE Project are listed in Table 2-5. For surface sampling, these methods were: cellulose sponge-stick wipes, macrofoam swabs, vacuum socks, and Versalon wipes®. For air sampling, the methods were: SKC BioSamplers®, UV-APS, Dycor XMX/2L-MIL Aerosol Collection System, and Mattson-Garvin Model 220 slit-to-agar. Sand and water samples were also analyzed. Petri plates filled with sand were used as the sand samples. The EPA water pathogen concentration was used for water sampling.

For the RV-PCR testing, sampling was done using the Versalon® wipes, with samples shipped to either LLNL or EPA-OPP-MLB (Ft. Meade) for the prescribed analyses. As mentioned in Section 3.2.2.1, due to the complexity and difficulties with the sample shipment, the desired sample distribution plan as recommended by the statisticians could not be followed for some events. No corrective action was possible on-site to improve sample shipping procedures. The result was a reduced number of samples, hence, lower statistical power. However, no significant impact on the results and conclusions is noted.

For the sand samples, during the placement and collection process for Round 1, sampling personnel noted that the sample dishes were not individually bagged. Additionally, notes were made regarding breakage of sampling dishes following collection during shipment to the laboratory. These notes by the sampling personnel and the detected signal from the blank samples were the basis for considering all Round 1 samples as contaminated through sampler handling. Therefore, all Round 1 sample results were eliminated from the data analysis conducted for this report. Corrective action for Rounds 2 and 3 were to ensure that all sample dishes were individually bagged to prevent contamination. All other trip and site blanks collected during the project were ND.

During AAS, three one-hour samples were collected by each XMX and STA sampler during each sampling event. However, in Round 1, the STA sampler located in the Hallway did not function due to equipment failure. This equipment failure was corrected prior to AAS in subsequent rounds.

6.3.4. Cross-Contamination Reduction Methods

During the on-site technical systems audit, the methods used to prevent cross-contamination were observed by the QA team. The team observed the secondary enclosure of the facility, personnel entry methods, and decontamination of both the samples and the personnel leaving the building.

6.3.5. Sample Analysis Methods

Surface samples were analyzed for viable *Bg* by either the LRN or INL, in accordance with standardized procedures. All surface samples intended for use in the assessment of decontamination effectiveness were analyzed via the LRN. Surface samples (Versalon® wipes) used for assessment of RV-PCR analyzed by LLNL and EPA-OPP-MLB (Ft. Meade). Surface and air samples for the reaerosolization study were analyzed by INL. Water samples were also analyzed by INL, as were all reference samples (RMCs and settling plates). All samples were analyzed for quantifiable, viable *Bg* using dilution plating methods. Surface samples with less than 30 CFU present at the lowest dilution were to be filter plated to attain lower detection limits.

Sand samples were sent to EPA AWBERC for further processing. The, samples were split for analysis at that facility and for shipment to USGS for analysis.

6.3.5.1. Analysis of Samples by the LRN

The LRN is a network of federal, state, and local laboratories. A total of eight LRN laboratories participated in the BOTE Project Phase 1, analyzing 1,937 samples. LRN analyzed samples by culture method only (no PCR), because previous contamination events conducted at the INL facility (PBF-632) used in the BOTE Project result in residual *Bg* DNA in the environment.

All samples on Floor 2 or with less than 30 CFU present from the lowest dilution plate were to be filter plated to attain lower detection limits and more accurate data at the lower range.

In Round 2, one surface sample collected from the first floor with detectable *Bg* (#3085) collected after decontamination yielded 16 CFU from the spread plate method, yet ND CFU from the filter plate method. This result was unexpected because the filter plate method theoretically provides a lower limit of detection. We are unsure of the cause of this anomaly. Since the value of 16 CFU was below the quantitation limit of 30 CFU, this result was not expected to impact the analysis or conclusions.

Additionally for Round 2, forty-eight samples resulting in less than 30 CFU during the spread plate procedures were not subjected to the prescribed filter plating, a method with a lower limit of detection. While it is unlikely that obtaining the filter plate data from these samples would greatly change the efficacy results, more post-decontamination samples detectable for *Bg* may have been discovered if the additional analysis had been conducted.

6.3.5.2. Analysis of Samples by INL

The EPA QA staff conducted an audit of the INL laboratory procedures included the analysis for the TSA settling plates and RMCs collected during pre-decontamination surface sampling. In addition, the INL also analyzed wipes from the reaerosolization study, taken in Rooms 101A and 102.

All CFU counts and calculations were recorded in the appropriate laboratory notebook and the viable count worksheet and archived. All quantitative results were recorded in Excel spreadsheets according to sample identification number and sent to the EPA project officer after analysis and quality control checks.

6.3.5.3. Analysis of Samples for the Rapid Viability-Polymerase Chain Reaction Study

Only two Round 1 pre-decontamination samples were received and analyzed. These samples represented QC (field blank) samples rather than wipe samples from surface sampling. For these samples, only one of two (50%) showed agreement between methods due to a technical issue with one of the RV-PCR samples (the filter cup leaked during incubation so spore outgrowth and subsequent cell growth were compromised in this sample). Based on this issue, a change was instituted in the protocol to cap the filter cup bottom before adding growth medium, rather than after. Because capping is performed in the BSC, there is little risk for the additional handling of the filter cups containing dry spores. After the protocol change was made, no filter cup leakage was observed.

In Round 3, some negative control samples were positive by culture analysis possibly due to cross-contamination (see Table 3-33). Protocol modifications including extra glove changes were incorporated to prevent this error in the culture sample analysis that followed.

For samples analyzed by the EPA-OPP-MLB Laboratory, seven samples were determined to show a difference between the culture and RV-PCR analysis methods. A likely contributing factor to RV-PCR performance involved inexperience with the magnetic bead-based DNA extraction procedure. Additional experience and ongoing research on this method will address the problems with the reproducibility of performance of the DNA extraction and purification protocol.

6.3.5.4. Analysis of Samples for the Sand Study

Sand samples were analyzed by EPA and USGS. One deviation to the QAPP should be noted: the processing protocol incorporated an additional suspension and centrifugation of the pellet. No QA issues were noted with the analysis. However, due to sample collection issues noted in Section 6.3.3, data from Round 1 were not considered in the statistical analysis.

6.3.6. Collected Blank Samples

Contamination could occur during sample handling in the field or in the laboratory during sample processing. Field blank samples were collected during each sampling campaign to determine the potential for background contamination of sampling media.

Surface sampling field blanks submitted for LRN analysis (swabs, sponge-stick wipes, and vacuum socks) were included in the samples taken for each round of testing in the facility. Blank samples were submitted from sampling teams designated for sampling on the first and second floors. For Round 1, a total of 52 field blanks were taken pre-decontamination. Of the field blanks collected, four samples from the second floor came back with detectable *Bg* counts from the spread plate analysis. All four samples with detectable viable *Bg* were from the second floor. Quantified CFU were 7.0E0, 3.4E1, 1.43E3, and 4.1E3. An additional six samples had detectable viable *Bg*, via filter plate analysis (with non-detects from the spread plate analysis). Four of these samples were from sample teams on the first floor and two were from teams sampling on the second floor. Detected values ranged from 1 to 13 CFU. A total of 45 field blank samples were collected during post-decontamination sampling for Round 1; one sample was found to have detectable *Bg* counts via spread plating with a value of 17 CFU. Three additional samples had *Bg* detected via filter plate analysis (with no detectable *Bg* via spread plating); values ranges from 2 to 5 CFU. All blank samples with detectable *Bg* were from the first floor sampling teams.

A total of 41 field blank samples were collected during pre-decontamination sampling in Round 2. Two samples had detectable *Bg*, one via spread plate analysis (67 CFU) and one via filter plate analysis (3 CFU). Both samples were from Floor 1 sample teams. A total of 25 field blank samples were collected in Round 2 during post-decontamination sampling. One sample from a Floor 2 sample team had detectable *Bg* via filter plate analysis (6 CFU).

In Round 3, 52 field blank samples were collected during pre-decontamination sampling. Four samples had detectable *Bg*, two via spread plate analysis (3.3E1 and 1.7E4 CFU) and two via filter plate analysis (3 and 74 CFU). All four samples were from Floor 1 sample teams. A total of 47 field blank samples were collected during post-decontamination sampling. No samples had detectable *Bg* either by spread or filter plate analysis.

For the sand samples, site blank and trip blank QA samples were collected during each round of the BOTE Project. The purpose of the site blanks was to determine the potential for background contamination of sampling media at the site. The site blanks were opened on site and then immediately closed and re-bagged for shipment to the laboratory for analysis. The purpose of the trip blanks was to determine the potential for sample contamination over the course of an entire sampling round. Trip blanks were shipped out to the site with the sampling media, held in sample kit boxes during sample collection (but never opened) and then shipped with the samples to the laboratory for analysis. All site and trip negative controls were reported as ND with the exception of two collected during Round 1 for which corrective action was taken.

Prior to use in AAS testing, XMX and STA samplers were tested for background contamination. Sampling of the STA samplers revealed that four of the nine were contaminated with *Bg* prior to sampling. All STA samplers were decontaminated with pH-adjusted bleach and placed in the facility during the VHP® fumigation in Round 1 to further sterilize the STA samplers.

During the reaerosolization study, 54 background samples were collected prior to *Bg* dissemination. Of these samples, three yielded detectable *Bg*. This was possibly due to residual

contamination in this facility form prior use as a test bed. These results were determined to have no impact on the testing, since they were very low levels compared to the amount of *Bg* that would be released during dissemination. No corrective action was warranted, in accordance with prior planning for the BOTE Project based upon MFP results.

6.4. Technical Systems Audit

The on-site technical systems audit lasted for approximately three weeks during the BOTE Project testing. This audit was initiated at the start of the MFP (April 14, 2011) and went into Round 2 (April 29, 2011). The first day was spent preparing and conducting quality control checks of the sampling kits and observing the second part of the sampler training. The samplers performed sampling exercises using the prepared sampling kits. During the mock run, observation of the samplers via the closed-circuit camera system was conducted. In addition, at the end of the sampling period, the removal of air samples was observed via the closed-circuit camera system.

6.4.1. Summary of Observation and Findings

No significant findings were noted.

6.4.1.1. Sample Handling

Initially, the sample handling process was very cumbersome. The issue was resolved during a discussion with the on-site EPA Project (Program) Manager, INL sample handler and EPA QA personnel.

6.4.1.2. Sample Storage

The EPA water samples were not stored under refrigeration. Samples were left out on the laboratory bench in the microbiology laboratory and table in the sample trailer, respectively. The SOP stipulates that samples should be stored in a refrigerator.

6.4.1.3. Water Concentrator

One of the two pipettors used for the water analysis was out of calibration The P20 was scheduled to be calibrated in September 2009.

6.4.1.4. Waste Removal Process

There was a deviation from the SOP for preparing the building prior to low tech decontamination procedures using pH amended bleach. Some of the deviations noted in handling the waste might have created possible safety hazards and cross-contamination issues. These issues included the incomplete bagging of some materials, e.g., mattress, and not spraying some materials prior to cutting.

6.5. Performance Evaluation Audit

Performance evaluation audit samples were prepared at EPA and were shipped via UPS overnight to the receiving laboratories. The purpose of the performance evaluation audit samples was to evaluate the efficiency and repeatability of sample processing across the laboratories and sample types.

An aliquot of the Critical Reagents Program *Bg* utilized in the BOTE Project was subjected to dilution plating to determine the starting titer. Working solutions with *Bg* concentrations of 5E3

and 5E6 CFU/mL were prepared in PBST. For all performance evaluation audit samples, 0.2 mL of the working solution was used to inoculate sampling media. Samples were inoculated with a micropipette, taking care to dispense the liquid slowly so that the liquid soaked completely into the sample. Targeted final spike concentrations were 1E3 and 1E6 total CFU per sample.

Two replicate spike samples were randomly chosen and sent to each laboratory for each spike concentration (blank, 1E3, and 1E6 CFU), and each sample type (swab, vacuum sock, sponge stick). Seven of the eight LRN labs that participated in BOTE Project sample processing agreed to receive, process, and report data from samples spiked with a known amount of *Bg* spores. Samples were shipped to the laboratories in collection kits exactly as they would be received from the BOTE Project field exercise. Sample identification was achieved through barcodes. The sample type, inoculum amount, and laboratory used for analysis were all tracked by EPA, but these data were not available to the LRN labs. During the performance evaluation audit, each laboratory received only those types of samples that it received during actual BOTE Project sample analysis.

Chains of custody were maintained for each change in sample possession.

Each laboratory received, processed, and analyzed samples using the exact protocols and procedures used for actual BOTE Project samples. All titer determinations indicated that the working solutions were within the acceptable range outlined by the QAPP (± 0.5 $\log_{10}$ of the target concentration). Results from the titer determinations are presented in Table 6-1.

Results obtained from the LRN laboratories upon processing the performance evaluation audit samples indicated that extraction of spores from sponge wipes and vacuum socks was more efficient than extraction from swabs, especially for the samples spiked with 1E6 CFU (Table 6-2 through Table 6-6). The mean recovery from swabs spiked with 1E6 CFU was no different than recoveries from swabs spiked with 1E3 CFU ($p = 0.68$, t-test). These data suggest that recovery from swabs may demonstrate a negative bias as the concentration of spores on the swab increases. Spores collected by swabs from surfaces may not demonstrate the same bias observed from swabs spiked with a liquid inoculum.

Recoveries from sponge sticks were typically higher than the other two sample types, and best approximated spike concentrations. Mean recoveries for sponge samples were of the same order of magnitude (± ≤1 log) as the spiked amount and were within 50% of the target concentration for both 1E3 and 1E5 CFU spiked samples (Table 6-5 and Table 6-6)

Considering only swabs and vacuum socks, swabs were better at approximating contamination at the 1E3 CFU level, while vacuum socks more accurately predicted spike concentrations for the 1E6 CFU spiked samples.

Nearly all blank samples (spiked with buffer only) were reported as no growth (zero CFU) following analysis. The exceptions included two sponge wipe samples (3057, Lab #5 and 3235, Lab #5) and one vacuum sock sample (5039, Lab #6).

Recovery of no detectable viable spores was reported for several samples spiked with 1E3 and 1E6 CFU (Table 6-2 through Table 6-4). Laboratory #3 reported zero recovered CFU from all 1E3 spiked samples and reported recoveries 1 log lower than all other laboratories for 1E6 spiked vacuum socks. These data suggest that laboratory technique and proficiency can be a source of bias.

In summary, the results of the performance evaluation audit indicate that extraction efficiencies may vary between sampling devices. Sponge sticks demonstrated the closest approximation of spike concentrations. Swabs demonstrated the worst approximation of spike concentration when spiked with 1E6 CFU. Variability between laboratories can evidently be high. Further, one laboratory systematically reported results lower than the known spike amount and lower than all the other laboratories. Performance evaluation audits are an important tool for assessing the quality of data received in a multi-laboratory study such as the BOTE Project.

Table 6-1. Aliquots of the stock spore solution used to spike performance evaluation audit samples were subjected to tenfold dilution plating to determine the actual number of spores in the inoculum.

Titer Check	Target CFU/mL	Achieved CFU/mL	Inoculum Volume (mL)	Target Inoculum (CFU)	Actual Inoculum (CFU)
1	5E6	4.6E6	0.2	1E6	9.3E5
2	5E6	3.8E6	0.2	1E6	7.7E5
3	5E3	4.4E3	0.2	1E3	8.7E2
4	5E3	4.8E3	0.2	1E3	9.7E2
5	5E3	5.9E3	0.2	1E3	1.2E3
6	0E0	0E0	0.2	0E0	0E0

Table 6-2. Recovery results from LRN performance evaluation audit swab samples sent to seven of the eight participating LRN laboratories.

Sample ID	Spike (CFU)	Laboratory Result (CFU)	Percent of Spike Recovered	Lab
4822	0E0	0E0		2
4815	0E0	0E0		2
4829	0E0	0E0		3
4825	0E0	0E0		3
4832	0E0	0E0		5
4835	0E0	0E0		5
4818	0E0	0E0		6
4821	0E0	0E0		6
4827	1E3	4.6E2	45.8	2
4830	1E3	6.6E2	66.3	2
4831	1E3	0E0	0.0	3
4834	1E3	0E0	0.0	3
4819	1E3	4.7E2	47.0	5
4820	1E3	4.2E2	41.8	5
4826	1E3	5.8E2	58.3	6
4828	1E3	6.3E2	63.3	6
4833	1E6	4.6E2	0.0	2
4837	1E6	7.3E2	0.1	2
4824	1E6	0E0	0.0	3
4836	1E6	0E0	0.0	3
4817	1E6	5.2E2	0.1	5
4816	1E6	6.1E2	0.1	5
4838	1E6	7.1E2	0.1	6
4823	1E6	6.6E2	0.1	6

Table 6-3. Recovery results from LRN performance evaluation audit vacuum sock samples sent to seven of the eight participating LRN laboratories.

Sample ID	Spike (CFU)	Laboratory Result (CFU)	Percent of Spike Recovered	Lab
5044	0E0	0E0		1
5048	0E0	0E0		1
5041	0E0	0E0		2
5043	0E0	0E0		2
5036	0E0	0E0		3
5047	0E0	0E0		3
5046	0E0	0E0		4
5038	0E0	0E0		4
5035	0E0	0E0		5
5045	0E0	0E0		5
5039	0E0	5.0E0		6
5040	0E0	0E0		6
5042	0E0	0E0		7
5037	0E0	0E0		7
5020	1E3	4.7E1	4.7	1
5029	1E3	3.9E1	3.9	1
5027	1E3	1.0E2	10.0	2
5028	1E3	2.0E2	19.5	2
5032	1E3	0E0	0.0	3
5034	1E3	0E0	0.0	3
5026	1E3	2.3E2	23.0	4
5033	1E3	5.7E2	57.0	4
5023	1E3	1.0E2	10.0	5
5030	1E3	2.7E2	26.8	5
5019	1E3	3.2E2	32.3	6
5031	1E3	2.8E2	27.5	6
5025	1E3	3.8E2	38.3	7
5024	1E3	3.0E2	29.8	7
5005	1E6	2.8E5	28.8	1
5004	1E6	2.8E5	27.7	1
5003	1E6	1.7E5	16.8	2
5016	1E6	2.1E5	21.0	2
5006	1E6	1.6E4	1.6	3
5011	1E6	1.1E4	1.1	3
5017	1E6	2.9E5	29.0	4
5009	1E6	6.0E5	60.2	4
5012	1E6	2.6E5	25.5	5
5018	1E6	1.8E5	18.0	5
5007	1E6	2.1E5	21.2	6
5015	1E6	3.7E5	37.0	6
5014	1E6	3.5E5	35.0	7
5013	1E6	3.4E5	33.8	7

Table 6-4. Recovery results from LRN performance evaluation audit sponge-stick wipe samples sent to seven of the eight participating LRN laboratories.

Sample ID	Spike (CFU)	Laboratory Result (CFU)	Percent of Spike Recovered	Lab
3264	0E0	0E0		1
3046	0E0	0E0		1
3071	0E0	0E0		2
2050	0E0	0E0		2
3075	0E0	0E0		3
3267	0E0	0E0		3
3000	0E0	0E0		4
3081	0E0	0E0		4
3057	0E0	3.2E0		5
3235	0E0	5.9E0		5
2937	0E0	0E0		6
3266	0E0	0E0		6
2106	0E0	0E0		7
2100	0E0	0E0		7
3272	1E3	1.5E2	14.5	1
3270	1E3	1.5E2	15.0	1
3224	1E3	8.2E2	82.4	2
3225	1E3	1.2E3	116.4	2
2132	1E3	0E0	0.0	3
2911	1E3	0E0	0.0	3
3053	1E3	2.5E3	248.2	4
3037	1E3	6.1E2	60.6	4
2897	1E3	5.3E2	53.4	5
3040	1E3	8.2E2	81.9	5
2695	1E3	1.2E3	120.2	6
3033	1E3	4.0E3	402.0	6
3032	1E3	8.2E2	81.5	7
2451	1E3	1.8E3	179.2	7
2866	1E6	1.5E6	148.9	1
2912	1E6	8.9E5	89.4	1
2894	1E6	1.6E6	163.3	2
2393	1E6	1.2E6	122.7	2
2450	1E6	1.3E6	124.7	3
2874	1E6	1.5E5	14.6	3
2694	1E6	1.8E6	178.5	4
3034	1E6	1.5E6	146.0	4
2495	1E6	1.1E6	111.8	5
3257	1E6	1.0E6	103.8	5
3222	1E6	1.6E6	161.2	6
3036	1E6	1.9E6	193.6	6
3269	1E6	1.4E6	141.5	7
2891	1E6	1.4E6	141.1	7

Table 6-5. Mean and percent recovery values (all data) by sample type pooled across laboratories.

Sample Type	Recovered CFU (% of spike)		
	Blank	1E3	1E6
Swab	0	4.0E2 (40%)	4.6E2 (0.05%)
Vacuum Sock	3.6E-1	2.0E2 (20%)	2.6E5 (26%)
Sponge Wipe	6.5E-1	1.0E3 (100%)	1.3E5 (130%)

Table 6-6. Mean and percent recovery values (outliers excluded) by sample type pooled across laboratories.

Sample Type	Recovered CFU (% of spike)		
	Blank	1E3	1E6
Swab	0E0	5.4E2 (54%)	6.2E2 (0.06%)
Vacuum Sock	0E0	3.1E2 (31%)	3.0E5 (30%)
Sponge Wipe	0E0	1.4E3 (140%)	1.4E6 (140%)

Samples considered outliers include sample numbers: 4831, 4834, 4824, 4836, 5039, 5020, 5029, 5032, 5034, 5006, 5011, 3057, 3235, 3272, 3270, 2132, 2911, and 2874.

6.6. Data Quality Assessment

All LRN data from BROOM spreadsheets were checked and verified by EPA researchers. The process included matching up the sample number, sample type and laboratory results from the LRN Excel sheets to the BROOM spreadsheet. All discrepancies were corrected, based upon investigation into the sample. Most issues dealt with incorrect manual barcode reading at the laboratories. Future use of the labeling systems compatible with BROOM should consider larger labels with longer barcodes.

A total of 1,972 samples were logged into the BROOM database during collection, targeted for analysis by the LRN. In total, these samples were sent to eight different LRN laboratories in accordance with the number and types of samples that they could accommodate. LRN data were then imported into the BROOM database, cross-referenced by the sample number and checked against sample type recorded in BROOM and on the LRN data sheet (MS Excel file). Some errors occurred where samples were either not able to be located in BROOM, more than one result was reported for the same sample number, or sample results were not returned. The reconciliation process included cross referencing with the COC documentation (with regard to where samples were sent) and checking with the LRN laboratories to verify sample identification numbers that were reported. In summary, 1,966 samples were reconciled and their sampling information and results verified. The loss of 0.3% of the surface sampling data analyzed by the LRN did not impact the BOTE Project results, data analysis, or conclusions.

The sample analysis protocols for all surface and air samples analyzed by the LRN or at INL were to include filter plating of a portion of the extract if spread plating results at the lowest dilution factor were below the quantitation limit (30 CFU). All samples from the second floor (lower starting load and all post-decontamination surface samples meeting these requirements)

were to be filter plated. However, not all samples analyzed by the LRN that met that criteria were indeed filter plated.

For the MFP, two samples were missing filter plate data; however, neither of these samples had non-detectable levels of spores on the spread plate (i.e., results were still available). Therefore, the results and conclusions were unaffected.

For the pre-decontamination samples for Round 1, 19 samples meeting the criteria were not filter plated. For the post-decontamination samples for Round 1, nine samples meeting the criteria were not filter plated. However, all of these samples had spread plate results with detectable CFU. Therefore, the results and conclusions were unaffected.

For the pre-decontamination samples for Round 2, ten samples meeting the criteria were not filter plated. For the post-decontamination samples for Round 2, no filter plating data were missing. The results and conclusions were unaffected by the missing pre-decontamination filter plate data.

For the pre-decontamination samples for Round 3, nine samples meeting the criteria were not filter plated. For the post-decontamination samples for Round 3, no filter plating data were missing. The results and conclusions were unaffected by the missing pre-decontamination filter plate data.

7. CONCLUSIONS

The intent of Phase 1 of the BOTE Project was to develop an improved understanding of response strategies for a single building, ultimately to extrapolate for use in wide area remediation. This project was the first field level evaluation of decontamination technologies under similar conditions outside a laboratory-controlled environment. The decontamination efficacy, cost, labor, and waste analyses provide invaluable information to decision-makers regarding time and resources required for each decontamination approach. Furthermore, the BOTE Project provided an opportunity for improving the readiness for mitigating the effects of a release of a bioagent over a wide area by allowing for:

- EPA cross-regional training and biosampling experience;
- Collaboration across regions and government agencies; and
- Real-world experience with biological agent decontamination.

Phase 1 of the project consisted primarily of a decontamination assessment (Objective 1) and included the demonstration and evaluation of sampling methods (Objective 2), the development of a remediation cost analysis (Objective 3), and the development an exposure assessment plan (Objective 4).

Three decontamination methods showing effectiveness against *Bacillus anthracis* (*Ba*) spores in laboratory and/or field use were tested under field-relevant conditions from April 11 to May 19, 2011. The three decontamination methods utilized independently, in three separate testing events (referred to as rounds) were: Round 1, fumigation with H_2O_2 using the STERIS VHP® technology; Round 2, a decontamination process incorporating the spraying of surfaces with pH-adjusted (or amended) bleach; and Round 3, fumigation with ClO_2 by Sabre Technical Services, LLC. Test parameters for each round included the decontamination method, level of contamination, and contaminated environment (e.g., office setting, residential area, HVAC system).

Outcomes of the project objectives and sub-objectives are described in the subsections that follow.

7.1. Assessment of Decontamination Methods

The decontamination contractor or performer was responsible for the development of a remediation plan. This plan included identification of materials or items to remove from the facility prior to decontamination, materials or items to decontaminate in place and then remove as waste, methods for decontaminant application, and procedures for returning the facility to the EPA for post-decontamination sampling. A requirement of three days for facility remediation was put in place for all rounds (from setup to aeration and return of the facility to the EPA); three

additional drying days were allotted for the second round (after spraying of surfaces with pH-adjusted bleach). All decontamination methods were able to function within this time constraint.

In summary, fumigation with ClO_2 resulted in the fewest positive samples, followed by the decontamination process incorporating the spraying of surfaces with pH-adjusted bleach. Fumigation with VHP® resulted in the highest number of positive samples following treatment. The pH-adjusted bleach process resulted in the highest relative cost, followed by fumigation with ClO_2, and lastly by fumigation with VHP®. Each decontamination method was performed a single time in the BOTE Project; the results and conclusions should be considered based upon the implementation as described. Potential variance in effectiveness due to differences in implementation of each method on subsequent uses was not determined in this project. The outcome of each decontamination process with respect to the assessment of effectiveness is reported below.

Fumigation by Vaporous Hydrogen Peroxide (VHP®)

The fumigation contractor, STERIS, decided to leave all materials in the facility in place during the decontamination process (i.e., *in situ* decontamination). Although fumigation of materials in the laboratory with H_2O_2 has shown the process to be efficacious for inactivation of *Bacillus* spores on some surfaces, the results from this field study indicate that the H_2O_2 exposure was not sufficient to inactivate all the spores at the high and low challenge/test levels (surface loading). Roughly a third of the samples on the first and second floor resulted in detectable *Bg* after decontamination. A significantly greater percentage of samples with detected *Bg* were from the residential room types, compared to the other room types.

The temperature was maintained above the desired setpoint throughout the testing. The main condition that was not achieved was the target H_2O_2 concentration throughout the facility for the specified amount of time, possibly a result of breakdown or adsorption of the H_2O_2 that was being injected into the facility or simply not enough H_2O_2 was injected. These results indicate that the H_2O_2 exposure was not sufficient to inactivate all the spores at either challenge level (surface loading). One improvement may have been to increase the amount of H_2O_2 that was introduced on each floor by doubling the number of T4 generators or using a higher-capacity generator. The two generators could have been connected to one floor at a time as well, but this would have required additional fumigation time. The contractor could also have removed some of the porous materials to reduce H_2O_2 adsorption into the materials.

Upon post-decontamination inspection of the building, no damage to the building contents was observed from exposure to the VHP® process.

Waste generated during fumigation with VHP® included only solid waste such as PPE and sampling waste (e.g., packaging) from both building decontamination and sampling. A total of 1,350 lb of waste was generated from the sampling and decontamination activities. Liquid waste was also generated during this round (e.g., during sampling), from rinsate recovered from the Decontamination Line.

Surface Decontamination Approach using pH-Adjusted Bleach

The Round 2 decontamination process involved creating negative pressure on the facility using NAMs, removing all porous materials and HVAC system supply-side for treatment on-site and disposal, and then spraying all remaining surfaces in the facility with pH-adjusted bleach. The results suggest that the decontamination process was highly efficacious on the first floor and moderately efficacious on the second floor. Overall, only 3.2% of samples collected following decontamination resulted in viable spores being recovered. Further, few viable *Bg* spores were recovered from these samples, suggesting that even in these areas with detectable *Bg*, contamination was significantly reduced by the complete decontamination process. HVAC system (return side) decontamination procedures were also effective at removing contamination, as all HVAC system samples post-decontamination were ND.

Because all porous materials were removed from the facility, decontamination efficacy was not likely to be impacted by the room type.

Upon post-decontamination inspection of the building after drying, the laminated and wood flooring demonstrated noticeable swelling (sufficient to require replacement if it were in an actual residence). Bleach residue was noticeable on horizontal surfaces, but no appreciable damage was indicated by the residue.

The largest amount of solid and liquid waste generated occurred during the application of the pH-adjusted bleach decontamination process. In the decontamination that was used in the BOTE Project, all porous surfaces were removed, bagged, decontaminated *ex situ*, and treated as solid waste. The total weight of material removed prior to the pH-adjusted bleach spraying of the facility was ~ 7,100 lb. The total volume of waste removed from the building was estimated to be 68 cubic yards, based on having 3.25 dumpsters of material (21 cubic yards per dumpster).

Fumigation with Chlorine Dioxide (ClO_2)

Prior to fumigation with ClO_2, the fumigation contractor (Sabre) elected to remove (treat *ex situ* and dispose) a few porous materials due to concerns with longer aeration requirements if left in place. The facility and all remaining contents were fumigated under conditions shown to be effective for the inactivation of *Ba* spores in laboratory studies and past facility remediation actions. Overall, this process was successful in the decontamination of this facility. Of 344 post-decontamination surface samples, only one sample resulted in detectable *Bg* via spread plating and an additional five with filter plating. The samples with detected Bg were from both porous and nonporous material types. The BIs on the bottom floor were inactivated, with the exception of one that was located inside a filing cabinet. Despite a 4 log reduction in detectable spores on the second floor based upon surface sampling results, 31 of the 45 BIs came back positive. The RH on the second floor was lower than the target and the RH on the first floor. In this case, the conditions were insufficient to inactivate the 6 log BIs.

A post-test inspection of the building was completed after clearance sampling. Because this building had been used in previous decontamination studies, it was difficult to assess whether any new oxidation had occurred as a result of these tests. Materials that were placed in the

building for these tests were inspected for damage. The only objects that showed any damage were ring stand clamps and quick connects on gas sample lines. All other surfaces and materials retained their original condition and color.

Sabre elected to have the heavier foam items removed because the foam would absorb the ClO_2 and extend the time required for aeration (to achieve the three-day decontamination requirement). The items removed included two queen-size mattresses and the thicker foam cushions from the couches and chairs. The total amount of material that was removed from the building was 452 lb and took two personnel 30 minutes to remove. These items were notionally decontaminated with liquid ClO_2 (i.e., included in the cost analysis as if they were treated on site, but treatment was not actually performed in this study) and treated as solid waste. Liquid waste was also generated during this round (e.g., during sampling), from rinsate recovered from the Decontamination Line. A total of 877 lb of solid waste was generated, from the sampling and decontamination activities.

Decontamination Line and Decontamination Process Wash Water Treatment

Due to the small number of spores present in the personnel Decontamination Line wash water, evaluation of the efficacy of the bleach treatment procedure for the collected waters was not possible. However, a greater than three log inactivation (i.e., log reduction) was achieved using the proposed protocol when the wash water was spiked with the *Bg* spores.

Results from the spiked wash water were similar to those obtained from laboratory experiments using artificially generated wash water with similar water quality characteristics. These findings suggest that the proposed inactivation procedure would be applicable for wash water derived from similar PPE decontamination activities.

Use of the ultrafiltration concentrator allowed collection of concentrated samples. However, the high turbidity of the wash water under the conditions experienced made the operation of the ultrafiltration concentrator difficult due to filter clogging. For future wash water studies using the ultrafiltration concentrator, improvements should be made so that turbid water is concentrated more effectively.

7.2. Demonstration and assessment of biological sampling methods

Previously evaluated biological sampling methods were evaluated. These methods included surface sampling, RV-PCR, and aggressive air sampling. The outcome of each assessment is reported below.

Surface Sampling

Surface sampling was conducted for four primary purposes: (1) assessment of decontamination efficacy, (2) reaerosolization study, (3) correlation to AAS results, and (4) RV-PCR method evaluation. For the assessment of decontamination efficacy, a total of 1,937 swab, sponge-stick wipes, and vacuum sock samples were collected and analyzed by the LRN. In addition, 138 Versalon® wipe samples were collected for analysis by INL for use in the reaerosolization

assessment. An additional 264 Versalon® wipe samples were collected for analysis by LLNL and EPA (Ft. Meade) for the assessment of RV-PCR.

For the decontamination efficacy assessment, the surface loading of viable *Bg* spores pre-decontamination was desired to be approximately 1E4 to 1E6 and 1E1 to 1E2 CFU per ft^2 in the rooms on the first and second floor, respectively.

The measured surface loading for all rounds on Floor 1 was within the target range of 1E4 to 1E6 CFU/ft^2. The measured surface loading on for all rounds on Floor 2 was an order of magnitude higher than the target range of 1E2 to 2E2 CFU/ft^2. Although the surface loading on Floor 2 was above the target range, there was still a significant difference between the measured surface loadings on the two floors. Additional statistical analysis confirmed that the contamination was applied so that the first floor was significantly more contaminated than the second floor for each of the three events.

Rapid Viability –Polymerase Chain Reaction

A total of 264 BOTE Project samples were analyzed using both the RV-PCR and the traditional microbiological culture methods to detect the presence of viable *Bg* spores (214 were processed at LLNL and 50 were processed at the Ft. Meade EPA-MLB Laboratory to practice and gain more familiarity with the method). The RV-PCR method was shown to work well for the surrogate *B. atrophaeus* spores exposed to decontaminants at real-world application levels, and with wipe samples containing background debris and indigenous microbial populations. At LLNL a > 97% agreement was observed between RV-PCR and culture results (positive/negative for *Bg*) for the field test that included samples with low spore levels (at or below the detection limit of the plating method) after treatment with fumigants and surface disinfectants. The Ft. Meade MLB Laboratory showed a lower percent agreement of 86%. The T9 endpoint appeared to be sufficient to detect any spores that might have been delayed in germination due to decontaminant exposure. Upon completion of this study, additional research has been ongoing for RV-PCR method for *Ba* spores exposed to decontaminants to confirm the robustness of the method for post-decontamination scenarios including the method endpoint (T9) for maintaining the 10-CFU level LOD. Specifically, both disinfectant exposure effects and the influence of any residual disinfectant from pH-adjusted bleach, H_2O_2 and ClO_2 treatments on performance of the RV-PCR method will be determined using *Ba* spores.

Aggressive Air Sampling

The main objective of AAS in the BOTE Project was to determine if, after application of decontamination technology, disturbing indoor surfaces resulted in the detection of re-aerosolized residual spores via air sampling. This procedure was being tested as a supplemental measurement for the determination of effectiveness of the decontamination process. The operation was conducted successfully after all three decontamination rounds and AAS sample results were similar to surface sample results. AAS results after Round 1 (fumigation with VHP®) showed the highest concentrations of spores detected in the air; the lowest were detected for Round 3 (fumigation with ClO_2). The ability to employ AAS was demonstrated successfully and it was shown that spores could be detected by this sampling

method. Additional assessment of the method is needed to develop AAS as a viable option to reduce the post-decontamination sampling burden.

7.3. Overall Cost Analysis

The main purpose of the cost analysis in the BOTE Project was to estimate the overall cost of the application of various decontamination technologies as a function of materials, time (including labor hours), and other resources.

Based on subsequent analysis of the cost data, the following major cost-related observations were noted:

- Sampling and analysis were the largest contributors to the overall cost. This statement must add the caveat that this was a research operational testing and evaluation project. In a real incident for a building this size, fewer samples would most likely be taken. However, sampling and analysis costs are still anticipated to be a major cost factor to consider.
- The costs of the decontamination processes alone (the actual fumigation or surface decontamination) were roughly equivalent for all three rounds. Overall costs for the fumigation methods (VHP® and ClO_2) were very similar (between $800,000 and $900,000), while the pH-adjusted bleach cost nearly $1,200,000. The pH-adjusted bleach decontamination process employed in this effort was more expensive to apply than either of the fumigation technologies, largely due to waste management costs. These costs are specific to the processes as they were employed in the BOTE Project.
- Waste management costs were a significant component of all three technologies, particularly for the pH-adjusted bleach decontamination process; waste characterization sampling was the largest single component of waste management costs. Almost all of the waste generated during the fumigations was a result of personnel decontamination operations. In addition, waste management costs could be reduced significantly if the State allows disposal of treated and/or decontaminated items in a RCRA Subtitle D landfill or allows the wastewater to be sent to a POTW.
- The cost of personnel decontamination was also a significant contribution, due to the need for the Decontamination Line personnel being on site during any time when entries into the building are considered, whether or not those Decontamination Line operations staff are actually performing any personnel decontaminations.

7.4. Assessment of Potential Exposure

Exposure to *Ba* spores during a release may be due to the primary release or secondary due to contact with reaerosolized spores or a contaminated surface. Spread of contamination (e.g., via reaerosolization and dispersion, inside to outside facilities [or vice versa]) may further increase the potential for exposure. The BOTE Project provided an opportunity to investigate some aspects of exposure in a field setting:

- assess *Bacillus* spore migration from inside to outside a contaminated building;

- investigate potential spore reaerosolization inside a contaminated building; and
- develop the concept of an exposure assessment plan.

7.4.1. Assessment of Reaerosolization

Reaerosolized spores were measured at both high (pre-decontamination) and low (post-decontamination) levels of *Bg* spore surface contamination. A lower concentration of reaerosolized *Bg* spores was observed at high levels of contamination than at low levels of surface contamination. There were no significant differences in *Bg* spore concentrations associated with sampling heights or locations within the rooms.

7.4.2. Assessment of *Bacillus* Spore Migration from Inside to Outside a Contaminated Building

The detection of *Bg* genetic material in previously uncontaminated sand samples outside the building suggests that spores have the potential to migrate out of a contaminated building and settle into the surrounding environment. This migration was outside the facility but within the secondary enclosure. No samples were taken outside the secondary enclosure. The study did not differentiate when *ex* filtration occurred from the facility (i.e., during dissemination or subsequent remediation activities).

7.4.3. Exposure Assessment Plan

A methodology to qualitatively characterize inhalational exposure associated with an adult's re-entry into the BOTE facility contaminated with *Bg* spores, before and after decontamination, was developed. The current methodology takes into account the specific site and the utilization of both indoor air and surface sample analytical data.

During development of the methodology, several areas of uncertainty and variability were acknowledged and included: lack of knowledge of recovery efficiencies of sampling methods; analysis of ND data; choice of statistical software and data distributions used to calculate exposure point concentrations; use of reaerosolization factors from the literature; and choice of surrogate used. These areas of uncertainty and variability need to be examined to limit the potential bias in the final exposure calculation. While the exposures calculated using this initial methodology will be limited by uncertainties and should be considered qualitative, the lessons learned from development of the methodology are critical to moving the science forward and determining gaps/needs for quantitative exposure assessments.

7.4.4. Summary

The information and experience obtained during Phase 1 was used in Phase 2, the interagency response and remediation exercise, to aid in the development of sampling, risk mitigation, decontamination, and waste management plans. Phase 2 involved the interagency response to a covert release of *Ba* (simulant); the exercise initiated with public health and federal law enforcement notification and completed through facility remediation. Information on Phase 2 can be found in the Exercise After Action Report[3]. Overall, the BOTE Project provided the opportunity to assess the interagency's current response and remediation capabilities and areas

of need for future capability enhancements. It provided the opportunity to assess current sampling and decontamination options in a standardized, field-scale test bed to understand the scalability of laboratory efficacy testing to actual field-scale application. In total, field-scale efficacy based upon the actual conditions achieved in the application of each in decontamination method within the BOTE Project facility were well indicated by prior laboratory-based efficacy testing data. However, the effort require or ability to achieve the target decontamination conditions and the impact of not achieving those conditions (e.g., with fumigation with VHP®) were captured during the BOTE Project Phase 1. Such information was also captured during BOTE Phase 2, e.g.,for fumigation with methyl bromide. The field-scale opportunity offered an assessment of the decontamination technologies, to provide added confidence to the relationship to laboratory testing and ideas for future research needs to enhance response and remediation capabilities.

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Appendix A

INL Facility PBF-632 Test Room Photos and Inventory of Contents

Commercial Setting

(Rooms 106, 108, 110, 208, 210, and 212)

Figure A-1. Room 106

Figure A-2. Room 108

Figure A-3. Room 110

Figure A-4. Room 208

Figure A-5. Room 210

Figure A-6. Room 212

Residential Setting

(Rooms 105, 107, 109, 209, 211, and 213)

Figure A-7. Room 105

Figure A-8. Room 107

Figure A-9. Room 109

Figure A-10. Room 209

Figure A-11. Room 211

Figure A-12. Room 213

Figure A-13. Room 106

Figure A-14. Room 108

Figure A-15. Room 110

Figure A-16. Room 208

Figure A-17. Room 210

Figure A-18. Room 212

Industrial Setting

(Rooms 104 and 206)

Figure A-19. Room 104

Figure A-20. Room 206

Office Building Mailroom Setting

(Rooms 103 and 207)

Figure A-21. Room 103

Figure A-22. Room 207

Reaerosolization Study Rooms

(Rooms 101A and 102)

Figure A-23. Room 101A

Figure A-24. Room 102

Table 1. Room Configuration and Inventory of Contents

Configuration	Room	Ceiling, Wall, and Floor Type					Inventory of Contents (quantity)																						
		Ceiling Tile	Latex-Painted Wallboard	Laminate Floor	Carpet	Epoxy-Covered Floor	Wall Divider	Books	Binders	Mail (inside 2 holding units)	Bed with 2 Night Stands	Sofa	Book Case	Metal Filing Cabinet	Table	Desk	Chair	Monitor	TV with Stand	printer	Oven /Range	Sink	Countertop	Refrigerator	UV-APS case	Workbench	Tools	Pine Shavings (bag)
Commercial (Office) Setting	106	✓	✓	✓			1	20	10				1	1	1	1	4	1		1								
	108	✓	✓	✓			1	20	10				1	1		1	2	1		1								
	110	✓	✓	✓			1	20	10				1	1		1	2	1		1								
	208	✓	✓	✓			1	20	10				1	1	1	1	4	1		1								
	210	✓	✓	✓			1	20	10				1	1		1	2	1		1								
	212	✓	✓	✓			1	20	10				1	1		1	2	1		1								
Commercial (Office) Setting (Reaerosolization Study Rooms)	101A	✓	✓		✓									4		3									1			
	102	✓	✓		✓								1	3		2									1			
Industrial Setting	104	✓	✓			✓		20							1											1	15	1
	206	✓	✓			✓		20							1											1	15	1
Residential (Kitchen) Setting	105	✓	✓		✓										1		4				1	1	1	1				
	209	✓	✓		✓										1		4				1	1	1	1				
Residential (Living Room) Setting	107	✓	✓		✓							1	1		1		1		1									
	211	✓	✓		✓							1	1		1		1		1									
Residential (Bed Room) Setting	109	✓	✓		✓						1											1						
	213	✓	✓		✓						1											1						
Mailroom Setting	103	✓	✓			✓		20		20					2													
	207	✓	✓			✓				20					2													

Appendix B

Bg Spore Characterization Study Results

MORPHOLOGY, TITER, AND PHYSICAL CHARACTERISTICS

Summary: All morphological characteristics were consistent with previously documented descriptions of *Bacillus globigii*. *Escherichia coli*, the negative control, did not fit any of the morphological or physical characteristics consistent with *B. globigii* spores and vegetative cells.

1.1. Gram Stain

Summary: The Gram staining procedure was used to describe the test and negative control organisms. Results indicated vegetative *B. globigii* cells were purple or Gram positive as expected, while the negative control, *E. coli*, DH5α was pink or Gram negative, as expected.

1.2. Colony Morphology

Colonies of the test organism, and controls were described according to Methods for General and Molecular Microbiology, 3rd ed.[1]. Representative photographs of these organisms on Petri plates are on page 3.

Colonial growth of Critical Reagents Program (CRP) *B. globigii* on Tryptic Soy Agar Petri plates (TSA) was characterized as:

- Orange/peach/salmon color
- Rough texture
- 1 – 3 mm diameter individual colonies
- Round form
- Undulate margin
- Flat (slightly convex) elevation

Colonial growth of *B. globigii* (positive control) on TSA was characterized as:

- Orange/peach/salmon color
- Rough texture
- 1 – 2 mm diameter individual colonies
- Round form
- Undulate margin
- Flat (slightly convex) elevation

Colonial growth of *E. coli* (negative control) on TSA was characterized as:

- Pearl white (translucent)
- Smooth texture
- 0.75 – 1 mm diameter individual colonies
- Round form
- Entire margin
- Convex elevation

[1] Reddy, C.A., Beveridge, T.J., Breznak, J.A., Marzluf, G.A., and Schmidt, T.M. 2007. Methods for General and Molecular Bacteriology, 3rd ed. ASM Press, Washington, D.C.

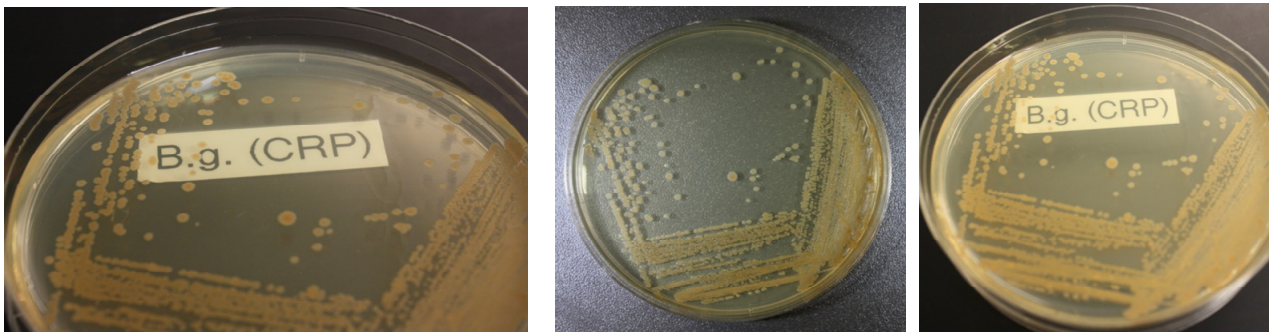
1.3. Titer Determination

Three dry aliquots (aliquots 2, 4, and 5) of *B. globigii* spores, supplied by the Critical Reagent Program, each was weighed and cultured to determine the viable number of cells per gram. Titer determinations for each of the aliquots were as follows:

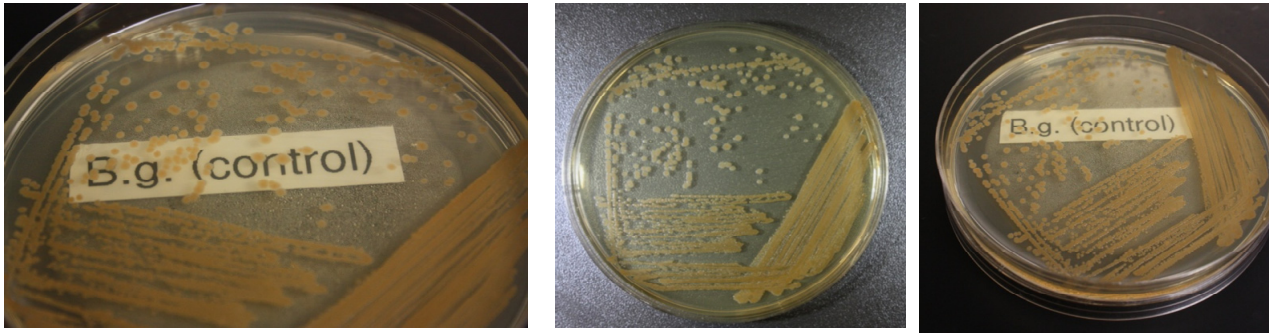
- Aliquot 2 – 1.34 X 10^{11} Colony Forming Unit (CFU) $gram^{-1}$ (11.13 Log_{10})
- Aliquot 4 – 2.68 X 10^{11} CFU $gram^{-1}$ (11.43 Log_{10})
- Aliquot 5 – 1.22 X 10^{11} CFU $gram^{-1}$ (11.09 Log_{10})
- **Average titer = 1.74 X 10^{11} CFU $gram^{-1}$ (± 8.1 X 10^{10} CFU $gram^{-1}$)**

The QA/QC requirement of having a minimum 1.0 X 10^{10} CFU $gram^{-1}$ titer was met. In addition, abundance estimates from triplicate samples were within precision criteria of 0.5 Log of one another, thus meeting the QA/QC criteria.

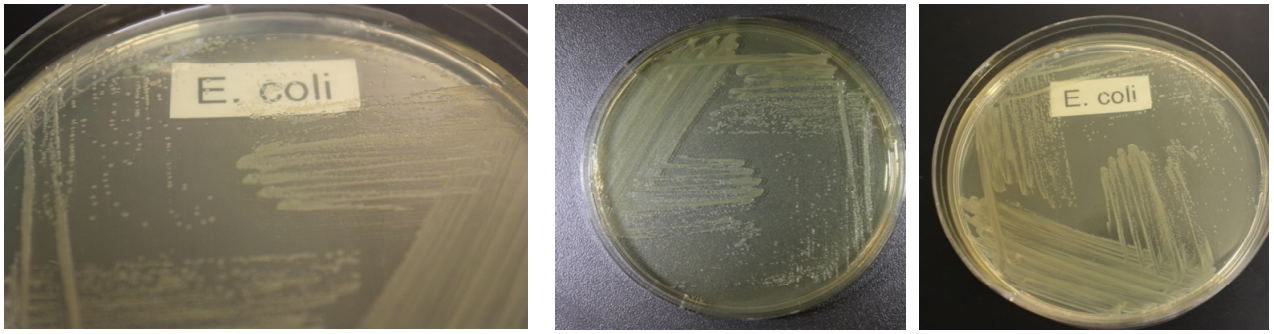
Bacillus globigii
CRP – BOTE strain



Bacillus globigii
Positive Control



Escherichia coli
Negative Control



1.4. Heat-Shock Test

Spore viability of the CRP *B. globigii* and the positive control *B. globigii* was determined for both heat-shocked spores (80°C for 20 minutes) and non-heat-shocked spores. The heat-shocked and the non-heat shocked samples were tested in triplicate and the percent survival was determined.

Results were as follows:

B. globigii Positive Control Strain

- Non-heat-shocked – 1.12 X 10^6 CFU (5.75 Log_{10})
- Heat-shocked – 9.58 X 10^5 CFU (6.11 Log_{10})
- **Log Difference = 0.07**

CRP *B. globigii* Test Strain

- Non-heat-shocked – 5.65 X 10^5 CFU (5.75 Log_{10})
- Heat-shocked – 1.28 X 10^6 CFU (6.11 Log_{10})
- **Log Difference = 0.36**

The QA/QC requirement was for the Log difference before and after heat-shock to be no greater than 0.5. This requirement was met.

1.5. Acid Resistance Test

Spore viability of the CRP *B. globigii* spores and the positive control *B. globigii* spores was determined for hydrochloric acid (HCl)-exposures of 2, 5, 10, and 20 minutes. Non-HCl-exposure control determinations were also conducted. Both the HCl exposed and the non-HCl exposed samples were tested in duplicate. Spore viability was determined by the development of turbidity in fluid thioglycollate culture tubes after 21 days incubation at 35°C. Growth in either the aerobic or anaerobic fraction of the fluid thioglycollate medium was considered a positive response for the sample. Spore growth in the fluid thioglycollate medium was confirmed or refuted by plating each positive broth tube. An aliquot of 0.1 ml was plated onto TSA and incubating overnight at 35°C. The results were as follows:

Negative control (no inoculum): No growth in any tube or on any plate

Positive control *B. globigii*: Growth in all tubes and on plates for HCl exposures of 0, 2, 5, 10 minutes, 50% of samples viable (tubes, confirmed by plating) after 20 minutes HCl exposure.

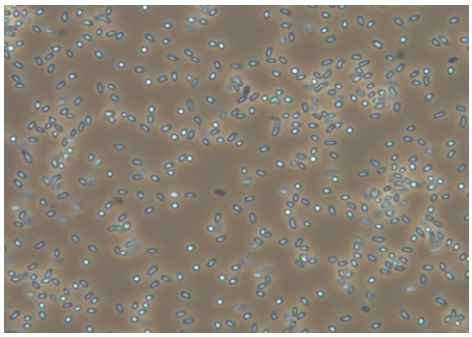
CRP *B. globigii*: Growth in all tubes HCl exposed for 0 and 2 minutes HCl. Growth in 50% of tubes exposed for 10 and 20 minutes to HCl. Only 25 % growth occurred in tubes exposed for 5 minutes to HCl. In all cases the growth in fluid thioglycollate broth tubes was confirmed by plating on TSA.

The QA/QC requirement was for the B. globigii spores to survive HCl exposure for a minimum of 2 minutes. This criterion was met by both the positive control B. globigii spores and the CRP B. globigii spores.

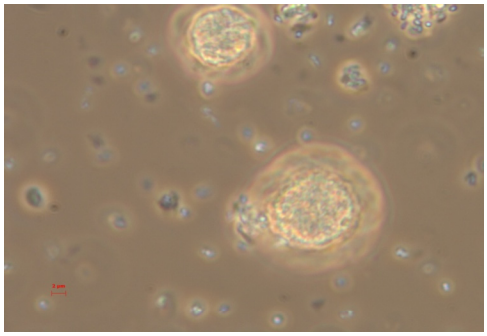
1.6. Microscopic Observation

Both the CRP *B. globigii* spore and positive control *B. globigii* spore preparations were suspended in diluent to produce a monolayer under a 22 mm^2 cover glass on a glass microscope slide. These preparations were examined at 1,000 X using phase contrast optics. Representative photographs appear below.

Bacillus globigii positive control spore preparation; phase 1,000 X oil immersion, note the preparation is mono-dispersed. (2/1/2011)



CRP *Bacillus globigii* spore preparation; phase 1,000 X oil immersion, note there are clumps to which spores appear attached. (2/14/2011)



The *B. globigii* positive control spore preparation contained numerous spores that were of consistent size and shape. The spores were mono-dispersed and showing no evidence of clumping.

The CRP *B. globigii* spore preparation exhibited clumps of various sizes. While these clumps did not appear to be composed uniformly of spores, signs of spore adherence were evident. Some of the smaller clumps appeared to be composed entirely of spores associations.

QPCR AND SEQUENCING

2.1. qPCR

Both the CRP *B. globigii* spores and the positive control *B. globigii* spores had their DNA extracted and amplified. The Surface Spore Protein (SSP) gene and the recF gene (DNA repair gene) were the target of separate qPCR amplifications. As a negative control, *E. coli* vegetative cell DNA was extracted and amplified. The results were that the negative control did not amplify, but both the CRP spores as well as the positive control spores amplified in a dose response manner producing low cycle threshold values.

The QA/QC requirement for the B. globigii spore molecular analysis was met for both the positive control B. globigii spores, and the CRP B. globigii spores. The negative control reacted as expected.

2.2. DNA Sequencing

For DNA sequencing analysis, PCR product from multiple *B. globigii* SSP gene and 16S ribosomal gene were prepared and combined by ethanol precipitation. This material was submitted to the CORE Molecular Genetics Laboratory at Cincinnati Children's Hospital Medical Center for DNA sequence analysis. The results of the SSP gene sequence analysis were inconclusive due to the small size of the amplified PCR product[2]. On the other hand, the 16S sequencing results confirmed both the CRP spores and the positive control spores were greater than 99% similar to known *B. atrophaeus* (syn. for *B. globigii*) strains in the NIH-BLAST Database. The negative control *E. coli* DNA was 99% similar to known *E. coli* strains in the NIH-BLAST Database.

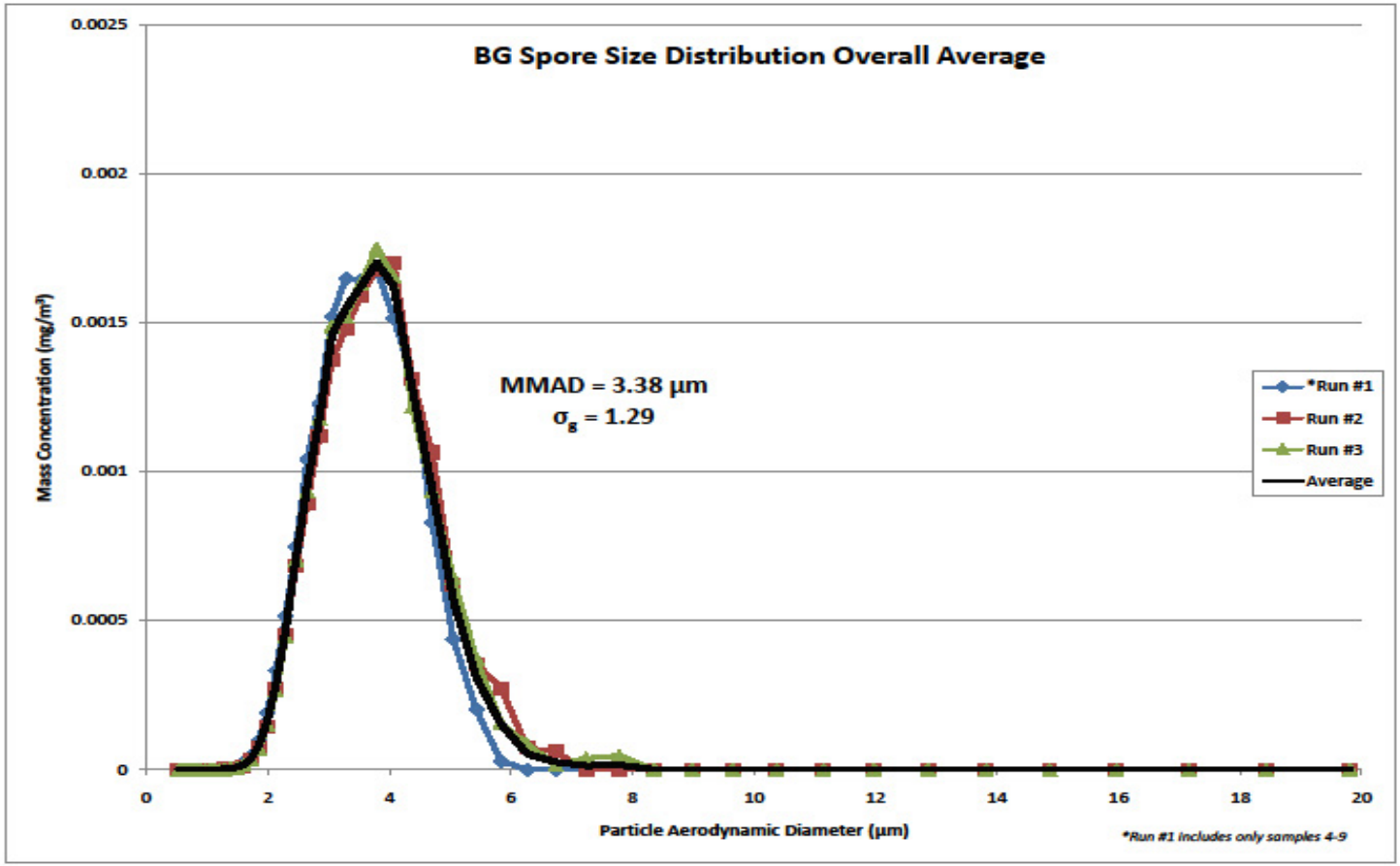
The QA/QC requirement for the B. globigii spore sequence analysis was met for both the positive control B. globigii prep, and the CRP B. globigii strain. The negative control reacted as expected.

[2] personal communication, David Fletcher, CORE Laboratory Manager

AEROSOL PARTICLE SIZE

Aerosol particle size distribution analysis indicated an overall particle size of 3.38 µm, when the CRP spore preparation was suspended in ethanol. The table and figure below indicate that there was great agreement between the various determinations. When, however, the CRP spore preparation was suspended in water, the determinations (data not shown) were not tight and suggested a great deal of clumping. Rather than having one distinct peak as in the case of the ethanol suspension, a number of broad based peaks were observed.

Section III: Aerosol Particle Sizer Determination



BG Spore Size Distribution Testing
approx. 1 mg BG spores in 100 mL of 200 proof ethyl alcohol
Aerosolized with a 3-jet Collison nebulizer
Tests performed at 25 ± 3 °C and 40% ± 10% RH
Particle size distribution measured with UV-APS
9 consecutive 60-s samples in each of 3 runs
Spore density used = 1.39 "= 0.25*ρ_{wet}+0.75*ρ_{dry}"
Wet spore ρ= 1.201
Dry spore ρ= 1.45
*Run #1 includes only samples 4-9

Overall Average

Particle aerodynamic diameter	Mass concentration w/ fluorescence >1 Average of			**Average**
	*Run #1	Run #2	Run #3	
(μm)	(mg/m3)	(mg/m3)	(mg/m3)	(mg/m3)
0.523	0	0	0	0
0.542	0	0	0	0
0.583	0	0	0	0
0.626	0	0	0	0
0.673	0	0	1.50527E-08	5.02E-09
0.723	0	0	0	0
0.777	0	2.31801E-08	0	7.73E-09
0.835	0	0	5.753E-08	1.92E-08
0.898	5.35435E-08	3.56957E-08	3.56957E-08	4.16E-08
0.965	6.6444E-08	0	4.4296E-08	3.69E-08
1.037	8.2453E-08	5.49687E-08	0	4.58E-08
1.114	3.06957E-07	1.36425E-07	1.36425E-07	1.93E-07
1.197	6.34858E-07	7.6183E-07	3.38591E-07	5.78E-07
1.286	2.36345E-06	1.89076E-06	1.57564E-06	1.94E-06
1.382	3.91053E-06	3.51948E-06	1.95527E-06	3.13E-06
1.486	9.46283E-06	7.76437E-06	6.95558E-06	8.06E-06
1.596	2.61954E-05	1.18431E-05	1.44526E-05	1.75E-05
1.715	4.5958E-05	3.1386E-05	3.56206E-05	3.77E-05
1.843	9.73701E-05	7.29502E-05	6.86227E-05	7.96E-05
1.981	0.000191027	0.000146531	0.000148065	0.000162
2.129	0.000334158	0.000269421	0.000263233	0.000289
2.288	0.000515678	0.000454246	0.000444204	0.000471
2.458	0.00074548	0.000682441	0.000702232	0.00071
2.642	0.001041072	0.000892347	0.000932371	0.000955
2.839	0.001227565	0.001116378	0.001178462	0.001174
3.051	0.001521229	0.001374149	0.00148621	0.001461
3.278	0.001647871	0.00147926	0.001519239	0.001549
3.523	0.001640455	0.001589764	0.001628591	0.00162
3.786	0.00167835	0.001675673	0.001747946	0.001701
4.068	0.00151471	0.001697406	0.001650901	0.001621
4.371	0.001317	0.001310817	0.00121601	0.001281
4.698	0.000828666	0.001063967	0.000930971	0.000941
5.048	0.00043799	0.000622072	0.000641115	0.000567
5.425	0.000200865	0.000354468	0.000370223	0.000309
5.829	2.93249E-05	0.000273699	0.000156399	0.000153
6.264	0	7.27807E-05	8.49108E-05	5.26E-05
6.732	0	6.02107E-05	1.50527E-05	2.51E-05
7.234	0	0	3.73589E-05	1.25E-05
7.774	0	0	4.63602E-05	1.55E-05
8.354	0	0	0	0
8.977	0	0	0	0
9.647	0	0	0	0
10.37	0	0	0	0
11.14	0	0	0	0
11.97	0	0	0	0
12.86	0	0	0	0
13.82	0	0	0	0
14.86	0	0	0	0
15.96	0	0	0	0
17.15	0	0	0	0
18.43	0	0	0	0
19.81	0	0	0	0

Appendix C

Surface Sampling Protocols

Entry Procedures

Entering the Building:

1) Persons A, B, and C: Don proper personal protection equipment (PPE) as stated in the Sample Collection Plan in designated sample staging area.
    i) Tyvek suit
    ii) Tyvek booties
    iii) M40 Pro-Mask or equivalent full face air purifying respirator
    iv) Nitrile gloves
        (1) Put on one pair of nitrile gloves and tape to suit
        (2) Place four pairs of XX-large gloves onto gloved hands.
2) Person A (BROOM Operator): Obtain a BROOM PDA from table in designated sample staging area and turn it on.
3) Person B (Supplier): Retrieve cart, sample collection supply bin and sample collection bin in designated sample staging area. Clearly mark in large identifiable letters on the backs of the team member's Tyvek® suits either an A, B or C to designate their assignment.
4) Person C (Collector): Open door to enter building.
5) Person B (Supplier): Move cart and supplies into building and position outside of designated room for sample collection.
6) Person A (BROOM Operator): Carry BROOM PDA into building and direct team to appropriate sample collection rooms in the order outlined by Sampling Lead, and direct the samplers on the type and the location of samples to be collected as indicated on the PDA and in the Sample Plan. Direct sample collection team to collect either an environmental or negative (field blank) control sample and track on the PDA.

IMPORTANT NOTE: DO NOT TOUCH ANYTHING ELSE OTHER THAN WHAT IS STATED WITHIN THIS PROCEDURE BEFORE SAMPLING WITHOUT CHANGING GLOVES

Sample Collection Protocols

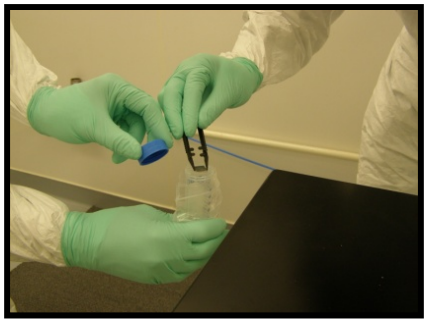
Collecting Reference Material Coupon (RMC):

1) Persons A, B and C: Discard existing top pair of gloves.
   Note: After each person has discarded 4 pairs of gloves, open a new Ziploc® bag with clean gloves and place another set of 4 gloves over last pair on your hands, while inside Ziploc® bag.

2) Person B (Supplier):
   a) Open sample collection bin.
   b) Remove RMC specimen kit from bin.
   c) Hold specimen kit barcode label out for Person A to scan.

3) Person A (BROOM Operator): Scan sample barcode label located on outside of sample Ziploc® bag into BROOM and enter in required fields.

4) Person B (Supplier):
   a) Open Ziploc® bag and remove package of disposable forceps.
   b) Open package of disposable forceps without touching them for Person C to remove from packaging.
   c) Discard forceps packaging into waste.
   d) Move 50 mL conical tube to end of Ziploc® bag, and loosen cap. Once sample has been collected, remove cap so Person C call place sample in tube.



5) Person C (Collector):
   a) Remove disposable forceps from packaging and transfer RMC into 50 mL conical tube that Person B is holding, being careful not to touch surface of RMC, the 50 mL conical tube or the plastic Ziploc® bag.
   b) Discard disposable forceps into waste.

6) Person B (Supplier):
   a) Immediately close and tighten cap to 50 mL conical tube and slide tube back into sample collection Ziploc® bag.
   b) Place sample into larger, clean Ziploc® bag.
7) Persons B and C: Remove gloves and discard in waste.

8) Repeat Steps 1-5 as necessary.

Collecting Settle Plates:

1) Persons A, B and C: Discard existing top pair of gloves.
   Note: After each person has discarded 4 pairs of gloves, open a new Ziploc® bag with clean gloves and place another set of 4 gloves over last pair on your hands, while inside Ziploc® bag.

2) Person B (Supplier):
   a. Open sample collection bin.
   b. Remove a settle plate kit.
   c. Hold settle plate barcode label out for Person A to scan.

3) Person A (BROOM Operator): Scan sample barcode label located on outside sample Ziploc® bag into BROOM and enter in required fields.

4) Person B (Supplier): Open bag and maneuver lid towards top of bag without touching it.

5) Person C (Collector):
   a. Take lid out of Ziploc bag and place on agar plate.
   b. Hold agar plate out for Person B to wrap in Parafilm and then place back in Ziploc® bag.

6) Person B (Supplier): Once collected, wrap the covered agar dish with Parafilm, and open Ziploc® bag. Once Person C places plate into bag, seal it.

7) Persons B and C: Remove gloves and discard in waste.

8) Repeat steps 1 through 6, as necessary.

Collecting Swab Samples:

1) Persons A, B and C: Discard existing top pair of gloves. **Note:** After each person has discarded 4 pairs of gloves, open a new Ziploc® bag with clean gloves and place another set of 4 gloves over last pair on your hands, while inside Ziploc® bag.

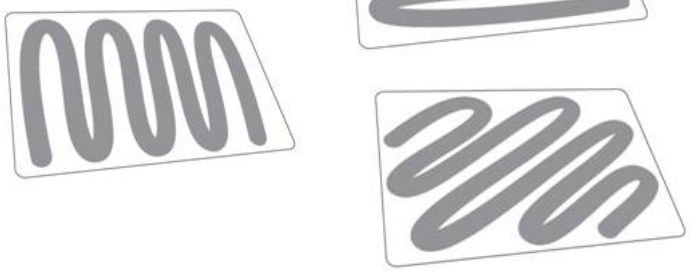
2) Person B (Supplier):
   a) Open sample collection bin.
   b) Remove swab specimen kit from bin.
   c) Hold specimen kit barcode label out for Person A to scan.

3) Person A (BROOM Operator): Scan sample barcode label located on outside of sample Ziploc® bag into BROOM and enter in required fields.

4) Person B (Supplier):
   a) Open outer Ziploc® bag containing prepackaged swab.
   b) Open package of swab without touching it for Person C to remove from packaging.
   c) Discard packaging in waste once Person C has removed swab.
   d) Move 2 ml vial containing neutralizing buffer to top of bag for Person C.
   e) After Person C removes swab and vial from bag, open template packaging in bin and remove a 2” x 2” in template.
   f) Hand template to Person C.

5) Person C (Collector):
   a) Carefully remove swab from bag without touching bag or tip of swab.
   b) Remove 2 ml vial and open with thumb.
   c) Place tip of swab into vial to wet swab. Gently press swab on inside of vial to remove excess solution from swab. Discard remaining solution and vial in waste.
   d) Gently place sampling template in proper sampling location to minimize disruption of settled aerosol.

e) Wipe sample surface horizontally using S-strokes to cover entire sample area within template using a consistent amount of pressure.
f) Turn swab over and wipe entire sample surface area using vertical S-strokes within template using a consistent amount of pressure.
g) Turn swab over and wipe entire sample surface area using diagonal S-strokes within template using a consistent amount of pressure.



6) Person B (Supplier)
   a) Open inner Ziploc®, move sterile 15 mL centrifuge tube to end of bag and unscrew cap. Once sample has been collected, remove cap so Person C call place sample in tube.

7) Person C (Collector)
   a) Carefully place swab head into sterile centrifuge tube.
   b) Break off head of swab by bending handle. The end of swab handle, touched by Person C (Collector), should not touch or enter inside of tube.
   c) Dispose of sampling template and remaining stick from swab in waste.

8) Person B (Supplier):
   a) Immediately close and tighten cap to centrifuge tube, place tube in inner Ziploc® bag.
   b) Seal inner and outer Ziploc® bag.
   c) Place sample into larger, clean Ziploc® bag.

9) Persons B and C: Remove gloves and discard in waste.

10) Repeat Steps 1-5 as necessary.

Collecting Wipe Samples (both sponge-stick and Versalon® wipes):

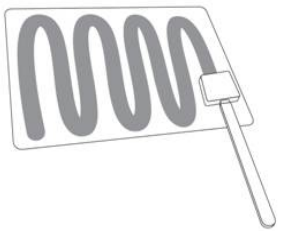
1) Persons A, B & C: Discard existing top pair of gloves. **Note:** After each person has discarded 4 pairs of gloves, open a new Ziploc® bag with clean gloves and place another set of 4 gloves over last pair on your hands, while inside Ziploc® bag.

2) Person B (Supplier):
   a) Open sample collection bin.
   b) Open template packaging in bin and remove a 10”x 10” template.
   c) Hand template to Person C.
   d) Remove one wipe specimen kit from bin.
   e) Hold specimen kit barcode label out for Person A to scan.

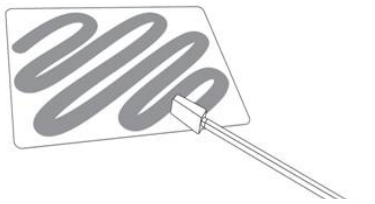
3) Person A (BROOM Operator): Scan sample barcode label located on outside sample Ziploc® bag into BROOM and enter in required fields.

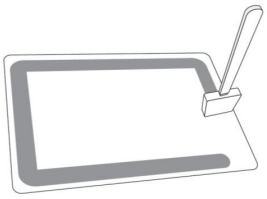
4) Person B (Supplier):
   a) Open outer Ziploc® bag containing prepackaged sponge-stick (or moistened Versalon® wipes).
   b) Open package without touching sponge-stick for Person C to remove from packaging.
      i) For **Versalon®** wipe open Ziploc® bag containing pre-moistened wipe in a 50 mL tube.
      ii) Hold tube in bag and flick downward so wipe slides to cap.
      iii) Carefully open cap which wipe should be stuck to. Be careful not to drop wipe.
      iv) Once Person C removed Versalon® wipe, place cap back on tube.
   c) Discard packaging into waste.
   d) After sample is collected move inner Ziploc® bag to end of outer Ziploc® bag and open.
      i) For wipe move 50 mL tube to end of Ziploc® bag and unscrew cap.

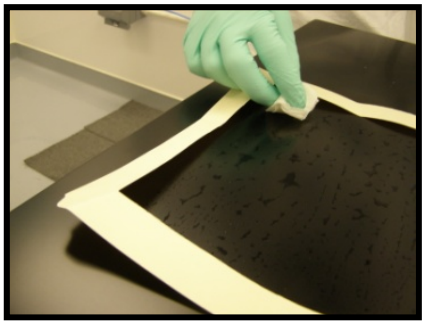
5) Person C (Collector):
   a) Carefully remove sponge-stick from bag without touching bag.



b) Gently place sampling template in proper sampling area to minimize disruption of settled aerosol.
c) Wipe sample surface horizontally using S-strokes to cover entire sample area within template using a consistent amount of pressure.
d) Turn sponge-stick over and wipe same surface vertically using the same technique within template
    i) For Versalon® wipes fold exposed side in.
e) Turn sponge-stick on edge (narrow side) and wipe same surface diagonally using the same technique within the template
    i) For Versalon® wipes fold exposed side in.
f) With sponge-stick tip wipe perimeter of sampling area once.
g) Carefully place sponge-stick into inner Ziploc® bag that Person B is holding being careful not to touch surface of bag.
    i) For Versalon® wipes place wipe into 50 mL tube.
h) Break handle of sponge-stick off only allowing sampled sponge portion to remain in bag.
i) Dispose of sampling template and remainder of sponge-stick in waste.







6) Person B (Supplier):
    a) Immediately seal inner Ziploc® bag containing sponge-stick sample and slide back into outer Ziploc® bag and seal.
        i) For wipe immediately close and tighten cap of 50 mL tube and slide back into Ziploc® bag and seal.
    b) Place sample into larger, clean Ziploc® bag.

7) Persons B and C: Remove gloves and discard in waste.

8) Repeat Steps 1-5 as necessary.

Collecting HEPA Vacuum Sock Samples:

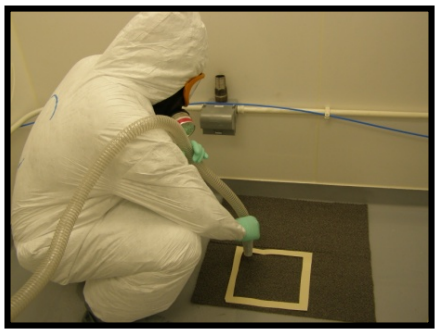
1) Persons A, B, and C: Discard existing top pair of gloves. **Note:** After each person has discarded 4 pairs of gloves, open a new Ziploc® bag with clean gloves and place another set of 4 gloves over last pair on your hands, while inside Ziploc® bag.

2) Person C (Collector):
   a) Plug in HEPA vacuum power cord, place HEPA vacuum hose over shoulder, and be sure not touch anything or drag on floor.
   b) Remove plastic cover from nozzle without touching it in preparation for Person B to place vacuum sock assembly onto nozzle.

3) Person B (Supplier):
   a) Open sample supply bin.
   b) Remove vacuum sock specimen kit from bin.
   c) Hold specimen kit barcode label out for Person A to scan.

4) Person A (BROOM Operator): Scan sample barcode label located on outside sample Ziploc® bag into BROOM and enter in required fields.

5) Person B (Supplier):
   a) Open outer Ziploc® bag containing inner Ziploc® bag with vacuum sock assembly.
   b) Open inner Ziploc® bag within outer Ziploc bag and push vacuum sock assembly from bottom to expose cardboard applicator tube opening.
   c) Using Ziploc® bag to handle vacuum sock assembly, place vacuum sock assembly onto nozzle of vacuum tube while Person C holds vacuum nozzle. Once assembly is on, grasp nozzle with Ziploc® so Person C can change gloves.



6) Person C (Collector): Dispose of top layer gloves into waste.

7) Person B (Supplier)
   a) Open template packaging in bin and remove a 24”x 24” template
   b) Hand template to Person C.
   c) Turn on vacuum.

8) Person C (Collector)
   a) Gently place sampling template in proper sampling area to minimize disruption of settled aerosol.
   b) With vacuum nozzle perpendicular to sample surface, vacuum horizontally using S-strokes to cover sample area within sampling template.
   c) Vacuum same area vertically using same technique within template.

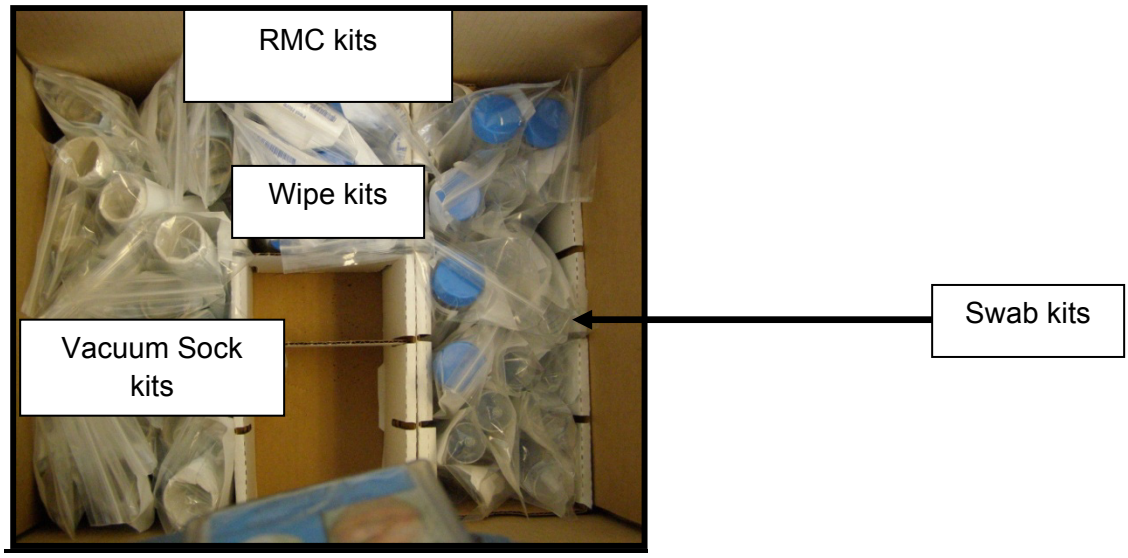
9) Person B (Supplier)
   a) Turn off vacuum when sampling is completed.
   b) Using inner Ziploc® bag, remove vacuum sock assembly from vacuum nozzle.
   c) Seal inner Ziploc® bag and slide back into outer Ziploc® bag and seal.
   d) Place sample into larger, clean Ziploc® bag.

10) Person C (Collector): Wipe down nozzle (in and out) and end of tubing with alcohol wipe and place dirty wipe in waste. Allow nozzle to air dry and wrap nozzle with a clean Ziploc® bag.

11) Persons B & C: Remove gloves and discard in waste.

12) Repeat Steps 1-5 as necessary.

Example of sampling kits. A kit will be made for each room of study rooms and another kit will be made for remaining rooms. I will provide the breakdown of rooms.



QC Sample Collection Protocols

QC FIELD NEGATIVE CONTROL (Field Blanks) – are to be performed when sampling teams approximately reach **center of each room** following normal procedures for swab, wipe, vacuum sock sample collection without actually sampling a surface.

Collecting QC Swab Field Negative Control:

1) Persons A, B and C: Discard existing top pair of gloves. **Note:** After each person has discarded 4 pairs of gloves, open a new Ziploc® bag with clean gloves and place another set of 4 gloves over last pair on your hands, while inside Ziploc® bag.

2) Person B (Supplier):
   a) Open sample supply bin.
   b) Remove swab specimen kit from bin.
   c) Hold specimen kit barcode label out for Person A to scan.

3) Person A (BROOM Operator): Scan sample barcode label located on outside sample Ziploc® bag into BROOM and enter in required fields.

4) Person B (Supplier):
   a) Open outer Ziploc® bag containing prepackaged swab.
   b) Open package of swab without touching it for Person C to remove from packaging.
   c) Discard packaging in waste once Person C has removed swab.
   d) Move 2 ml vial containing neutralizing buffer to top of bag for Person C.

5) Person C (Collector):
   a) Carefully remove swab from bag without touching bag or tip of swab.
   b) Remove 2 ml vial and open with thumb.
   c) Place tip of swab into vial to wet swab. Gently press swab on inside of vial to remove excess solution from swab. Discard remaining solution and vial in waste.
   d) DO NOT TOUCH ANYTHING WITH SAMPLE, ESPECIALLY A CONTAMINATED SURFACE.

6) Person B (Supplier)
   a) Open inner Ziploc®, move sterile 15 mL centrifuge tube to end of bag and unscrew cap. Remove cap so Person C call place sample in tube.

7) Person C (Collector)

a) Carefully place swab head into centrifuge tube.
b) Break off head of swab by bending handle. The end of swab handle, touched by Person C, should not touch or enter inside of tube.

8) Person B (Supplier):
   a) Once swab sample is placed in conical tube, replace screw cap and keep conical tube in Ziploc® bag.
   b) Seal Ziploc® bag.
   c) Place sample into larger, clean Ziploc® bag.

9) Persons B and C: Remove gloves and discard in waste.

10) Persons A, B and C: Continue with normal sampling operations.

Collecting QC Wipe Field Negative Control:

1) Persons A, B & C: Discard existing top pair of gloves. **Note:** After each person has discarded 4 pairs of gloves, open a new Ziploc® bag with clean gloves and place another set of 4 gloves over last pair on your hands, while inside Ziploc® bag.

2) Person B (Supplier):
   a) Open sample supply bin.
   b) Remove wipe specimen kit from bin.
   c) Hold specimen kit barcode label out for Person A to scan.

3) Person A (BROOM Operator): Scan sample barcode label located on outside sample Ziploc® bag into BROOM and enter in required fields.

4) Person B (Supplier):
   a) Open outer Ziploc® bag containing prepackaged sponge-stick (or moistened Versalon® wipes).
   b) Open package without touching sponge-stick for Person C to remove from packaging.
      i) For **Versalon®** wipe open Ziploc® bag containing pre-moistened wipe in a 50 mL tube.
      ii) Hold tube in bag and flick downward so wipe slides to cap.
      iii) Carefully open cap which wipe should be stuck to. Be careful not to drop wipe.
      iv) Once Person C removed wipe, place cap back on tube.
   c) Discard packaging into waste.

5) Person C (Collector):
   a) Carefully remove sponge-stick without touching bag.

b) **DO NOT TOUCH ANYTHING WITH SAMPLE, ESPECIALLY A CONTAMINATED SURFACE.**

6) Person B (Supplier):
   a) Move inner Ziploc® bag to end of outer Ziploc® bag and open.
      i) For wipe move 50 mL tube to end of Ziploc® bag and unscrew cap.

7) Person C (Collector):
   a) Carefully place sponge-stick into inner Ziploc® bag Person B is holding being careful not to touch surface of bag.
      i) For wipes place wipe into 50 mL tube.
   b) Break handle of sponge-stick off only allowing sampled sponge portion to remain in bag. Dispose of sampling template and remainder of sponge-stick in waste.

8) Person B (Supplier):
   a) Immediately seal inner Ziploc® bag containing sponge-stick sample and slide back into outer Ziploc® bag and seal.
      i) For wipe immediately close and tighten cap of 50 mL tube and slide back into Ziploc® bag and seal.
   b) Place sample into larger, clean Ziploc® bag.

9) Persons B and C: Remove gloves and discard in waste.

10) Persons A, B and C: Continue with normal sampling operations.

Collecting QC Vacuum Sock Field Negative Control:

1) Persons A, B, and C: Discard existing top pair of gloves. **Note:** After each person has discarded 4 pairs of gloves, open a new Ziploc® bag with clean gloves and place another set of 4 gloves over last pair on your hands, while inside Ziploc® bag.

2) Person C (Collector):
   a) Place HEPA vacuum hose over shoulder, and be sure not touch anything or drag on floor.
   b) Remove plastic cover from nozzle without touching it in preparation for Person B to place vacuum sock assembly onto nozzle.

3) Person B (Supplier):
   a) Open sample supply bin.
   b) Remove vacuum sock specimen kit from bin.
   c) Hold specimen kit barcode label out for Person A to scan.

Person A (BROOM Operator): Scan sample barcode label located on the outside of the Ziploc® bag containing the vacuum sock specimen kit into BROOM and enter in required fields.

4) Person B (Supplier):
   a) Open outer Ziploc® bag containing inner Ziploc® bag with vacuum sock assembly.
   b) Open inner Ziploc® bag within outer Ziploc bag and push vacuum sock assembly from bottom to expose cardboard applicator tube opening.
   c) Using Ziploc® bag to handle vacuum sock assembly, place vacuum sock assembly onto nozzle of vacuum tube while Person C holds vacuum nozzle. Once assembly is on, grasp nozzle with Ziploc® so Person C can change gloves.

5) Person C (Collector)
   a) Remove vacuum nozzle from Ziploc® bag.
   b) DO NOT TURN ON VACUUM.

6) Person B (Supplier)
   a) Using inner Ziploc® bag, remove vacuum sock assembly from vacuum nozzle.
   b) Seal inner Ziploc® bag and slide back into outer Ziploc® bag and seal.
   c) Place sample into larger, clean Ziploc® bag.

7) Person C (Collector): Wipe down nozzle (in and out) and end of tubing with alcohol wipe. Allow nozzle to air dry and wrap nozzle with a clean Ziploc® bag.

8) Persons B and C: Remove gloves and discard in waste.

9) Persons A, B and C: Continue with normal sampling operations.

Exit Procedures

Procedures for Exiting Rooms:

Upon Exiting:

1. Persons A, B and C: Remove gloves and discard before leaving a room.

Exiting Building and Decontamination Procedures:

1) Persons A, B, and C: At exit door remove booties and place in trash container.

2) Person C (Collector):
   a) Open door to exit building.
   b) Take cart from Person B and proceed to cart and HEPA vacuum decon table.
   c) Remove HEPA vacuum hose and place in amended bleach bucket.
   d) Extensively wipe down HEPA vacuum with Hype-Wipe bleach towelette.
   e) Dispose of Hype-Wipe bleach towelette.
   f) Tie up trash bag from cart and wipe down outside with Hype-Wipe bleach towelette.
   g) Take decontaminated HEPA vacuum and trash bag to decon wash line tent and hand to decon line personnel.
   h) Wipe down flashlight and marker with Hype-Wipe bleach towelette left on cart.
   i) Place flashlight and marker inside a clean Ziploc® bag and place back onto cart.
   j) Proceed with cart to decon wash line tent.
   k) Place cart on right side of tent.
   l) Extensively wipe down and wash all parts of cart and Ziploc® bag containing flashlight and marker.
   m) Leave cart and Ziploc® bag behind and proceed to left side of decon line tent.
   n) Follow normal SOP for self-decon.
   o) Exit left side of decon wash line tent.
   p) Retrieve cart from right side of decon wash line tent.
   q) Perform any additional decon of personal masks.
   r) Leave Ziploc® bag containing flashlight and marker on cart.
   s) Decon line personnel will place decontaminated cart into appropriate conex box.
   t) Disrobe and dispose of PPE into trash container.
   u) Proceed to temper tent for medical checks, rest and rehydration.
   v) Stay in localized designated area until leaving the INL Testing Site.

3) Person B (Supplier):
   a) Push cart out of building.
   b) Leave cart and HEPA vacuum for Person C to decon.
   c) Take sample collection Ziploc® bags to designated sample decon table.
   d) Open large Ziploc® bag and remove smaller double-bagged Ziploc® containing samples.
   e) Dispose of large Ziploc® in trash container.

f) Wipe down outside Ziploc® with Hype-Wipe bleach towelette.
g) Dispose of Hype-Wipe bleach towelette in trash container.
h) Change gloves.

i) Place all decontaminated double-bagged Ziploc® bags into new pre-labeled large Ziploc® bags.
j) Take decontaminated sampling bags to decon wash line tent, rinse of bags, and hand to designated sample shipment personnel.
k) Follow normal SOP for self-decon.
l) Exit left side of decon wash line tent.
m) Perform any additional decontamination of personal masks.
n) Disrobe and dispose of PPE into trash container.
o) Proceed to temper tent for medical checks, rest and rehydration.
p) Stay in localized designated area until leaving INL Testing Site.

4) Person A (BROOM Operator):
   a) Upload data from PDA as described in training.
   b) Carry BROOM PDA out of building.
   c) Take sample supply bins to designated BROOM PDA decon table and bin remnant (unused specimen kits and supplies) disposal area.

d) Place remnants of sample supply bin (e.g. unused samples, gloves, trash bags) into trash container.
e) Break down cardboard bins and dispose of in trash container.
f) Proceed to left side of decon wash line tent.
g) Follow normal SOP for self-decon.
h) Exit left side of decon wash line tent.
i) Perform any additional decon of personal masks.
j) Proceed to temper tent for medical checks, rest and rehydration.
k) Stay in localized designated area until leaving the INL Testing Site.

Appendix D

Aggressive Air Sampling (AAS) Protocol

A-1. Sample Collection Materials

1. U.S. EPA pre-labeled and barcoded sample kits:
    a. Gloves, nitrile
    b. 150 mm x 15 mm, disposable petri plate containing 70 mL trypticase soy agar with lid and sealed with paraffin tape
    c. Dry filter cartridges (37 mm, 3-piece cassettes with 0.8 μm pore mixed cellulose ester filter)
    d. Paraffin tape
    e. Sample labels
    f. Re-sealable plastic bags, 1-quart (individual sample bag)
    g. Re-sealable plastic bags, 1-gallon or larger (sample transport bag)
2. Checklist and sampling map
3. Slot screwdriver
4. Hand-held PDA with BROOM software
5. Wet test meter (air flow calibrator)
6. Mattson-Garvin STA samplers with 60-min drive motors
7. Dycor XMX samplers with the dry impingement modules
8. Forced air equipment (such as a one-horse power mechanical leaf blower)
9. Oscillating floor fan (at least 20 inches in diameter)
10. ICx IBAC™ Sensors
11. Isopropyl alcohol
12. Soft cloth
13. STA sampler lubricant

Note: Prepare STA sample media (if petri plates were procured without media):

1. Place the 150 mm disposable petri plates on a level surface and pour the media (70 ml) hot.
2. Media should be approximately 5.75mm deep in the plate.

A-2. Sample Collection Procedures

1. Ensure all sampler flow rates have current (within one year of sampling date) factory or professional calibration certificates.
    a. Ensure that the Mattson-Garvin STA sampler states the sampling rate as 1.00 cubic feet per minute on the Certificate of Calibration furnished with the unit.
2. Designate the two rooms to perform aggressive air sampling on the first floor, from areas known to be previously least contaminated, and move to those known to be more contaminated.
3. Isolate the room being sampled to the degree feasible by closing doors, hanging plastic sheeting, etc., in order to prevent air from within the room from moving into other parts of the facility during sampling.
4. Establish and maintain a negative pressure environment in the room or area being sampled relative to outside air.
    a. Place two HEPA-filtered portable ventilation unit (negative air unit) at one end of the room enclosure. Note: Only one negative air unit will be operated and the other kept as backup. NOTE: Only during the low-tech decontamination event

will the entire BOTE Testing Facility be placed under negative pressure using negative air units.
    b. Seal the negative air units into the plastic barrier of the containment.
    c. Exhaust filtered air outside of the enclosure through flexible duct hoses.
    d. Determine the actual flow rate through each unit by measuring the average velocity of the air entering the unit duct with a velometer and multiplying by the duct area.
    e. Ensure the air handling unit (AHU) system is operating for the entire aggressive air sampling procedure.
    f. Seal any AHU system vents that supply air into the room or area being sampled.
    g. Ensure HEPA-filtered "make-up air" comes mainly from an airlock at the opposite end of the room enclosure.
    h. Measure and record pressure differences.
        i. Ensure the pressure differential is at least 0.02 inches (0.5 mm) of water and room air exchanges are kept at a minimum.
5. Ensure that the Dycor XMX sampler liquid impingement modules (LIM) are switched out with the dry impingement modules (DIM) for each sampler.
    a. If DIM is not installed, follow instructions in Dycor XMX/2L-MIL Operator's Manual, Version 1.8, Section 3.3.
6. Perform functional test on each XMX by following instructions in Dycor XMX/2L-MIL Operator's Manual, Version 1.8, Section 3.4.
7. Verify that the STA samplers have the correct drive motors (60-min) installed.
8. Prior to use, field calibrate each XMX sampler flow rate with a 37 mm, 3-piece cassette with a 0.8 μm pore mixed cellulose ester (MCE) filter designated for calibration prior to use.
9. Calibrate and adjust the airflow of the STA sampler:
    a. Carefully inspect the air intake and the calibrated slit in the dome assembly to assure that they are free of particulate matter.
    b. Inspect the gasket. Wipe clean with damp cloth if necessary.
    c. Place the dome assembly in position on the gasket and tighten down.
    d. Turn the air control valve above the flowmeter, which is located on top of the housing, to the "OFF" position (to the right until it no longer moves).
    e. Set the desired revolution time on the Artisan Timer to 60 minutes.
    f. Caution: Do not place your hand (or any object) over the throat of the air intake while the vacuum pump is on.
    g. Start the STA sampler by turning on the main power switch and then push the START button on the Artisan timer.
    h. Adjust the airflow to 60 cubic feet/hour by means of the airflow control valve on the top of the flowmeter so the ball is centered at the red line (approx. 60 SCFH).
    i. Attach a wet test meter and run three (3), one-minute checks.
        i. If all three tests are between 59.70 and 60.30, place red line flag in position.
        ii. If not, adjust and repeat.
    j. Shut off the sampler by turning off the main power switch.
    k. Remove the dome assembly and wipe the air intake, calibrated slit and the brass slit-to-agar distance gauge with a cloth, dampened with isopropyl alcohol.
10. Provide the Aggressive Air Sampling Team with a checklist and a map that outlines where to place sampling equipment and fans.
11. Place ICx IBAC™ Sensors in close proximity to aerosol samplers and exhaust vents that keep the rooms under negative pressure.

a. Monitor and control the sensors remotely within the Admin Trailer.
b. Beginning 10 minutes prior to the entry that commences the forced air on surfaces event, and throughout the aggressive air sampling procedure, measure aerosol concentrations using the sensors.

12. Place one oscillating floor fan (at least 20 inches in diameter) near the center of the room.
    a. Position fan strategically to both direct airflow towards the ceiling and create turbulence that will keep particulate matter in suspension.
    b. The fan shall remain operational throughout the period of sample collection.
13. Place one XMX sampler and one STA sampler outside of the room or floor containment in an adjacent zone.
    a. Ensure that samplers are not in corners or near obstructions.
    b. Ensure that one sampler is not placed within the air movement influence of another sampler.
    c. Collect samples using pre-labeled and barcoded sample kits provided by U.S. EPA.
    d. Note: Each kit will include all supplies needed to collect, label and package each sample.
14. Collect field blanks.
    a. Collect field blanks in the same areas as the corresponding air samples.
    b. Do not let the field blanks come in contact with potentially contaminated surfaces.
    c. Don a clean pair of disposable nitrile gloves over existing gloves and collect one field blank for the XMX sampler.
        i. While the XMX sampler is in the OFF position, open re-sealable plastic bag containing the dry filter cartridge.
        ii. Secure the dry filter cartridge into the XMX sampler.
        iii. Remove the dry filter cartridge from the XMX sampler.
        iv. Place the dry filter cartridge in a re-sealable 1-quart plastic bag and securely seal the bag and label it as “field blank.”
        v. Note: Remove excessive air from the re-sealable plastic bags to increase the number of samples that can be shipped in one container.
    d. Don a clean pair of disposable nitrile gloves over existing gloves and collect one field blank for the STA sampler.
        i. While the STA sampler is in the OFF position, open re-sealable plastic bag containing the petri plate.
        ii. Remove the lid and load the bottom plate (containing the agar) into the STA sampler.
        iii. Remove the petri plate from the STA sampler and seal the with paraffin tape.
        iv. Place each petri plate in a re-sealable 1-quart plastic bag and securely seal the bag and label it as “field blank.”
        v. Note: Remove excessive air from the re-sealable plastic bags to increase the number of samples that can be shipped in one container.
    e. Process the samples along with the other air samples.
15. Collect three, one-hour air samples with each sampler during the entire time aggressive air sampling is conducted inside containment.
    a. Don a clean pair of disposable nitrile gloves over existing gloves, for each sample collected.
    b. Place each sample in a re-sealable 1-quart plastic bag and securely seal the bag.

c. Note: Remove excessive air from the re-sealable plastic bags to increase the number of samples that can be shipped in one container.
d. Enter all the data into the hand-held PDA and scan the bar code on the sample bag for each sample (to include blanks).
e. Decontaminate and package sample bags appropriately prior to being transported to INL laboratories.

16. Place the three aerosol samplers (2 XMX/2L-MIL and 1 slit-to-agar) at central points within each room or area to be sampled.
    a. Ensure that samplers are not in corners or near obstructions.
    b. Ensure that one sampler is not placed within the air movement influence of another sampler.
    c. Close all doors and keep closed until vacating the room.
    d. Collect samples using pre-labeled and barcoded sample kits provided by U.S. EPA.
    e. Note: Each kit will include all supplies needed to collect, label and package each sample.
    f. Collect field blanks as described in step 14.
17. Prepare the XMX for sampling:
    a. Plug the XMX into an outlet using the supplied power cord.
        i. Check that power is on by turning the power dial and checking that the timer display is lit and set at zero.
    b. Remove the red filter cap from the dry filter cartridge.
        i. Use a screwdriver to help take the dry filter cartridge apart into two pieces.
        ii. Be careful not the touch the filter.
    c. Unscrew the dry impingement module (DIM) nut and push the open end of the dry filter cartridge (bottom half) onto the DIM.
        i. Screw the DIM nut back on securely.
        ii. Attach the quick connect fitting onto the bottom of the DIM nut.
    d. Check all fittings and connects and close the DIM door.
    e. Set the sampler for manual control.
        i. Set the mode of the timer in the first dial to “H”.
        ii. Set the last dial on the timer (unit of time) to minutes.
        iii. Set the middle dials to 060, the length of time to sample for in minutes.
        iv. Note: The dials should read “H 0 6 0 m”
    f. Collect a total of 19 samples (15 one-hour samples and 4 blanks) for each sampling event
        i. 11 XMX samples; 6 inside room, 3 outside room, 2 blanks
        ii. 8 slit-to-agar samples; 3 inside room, 3 outside room, 2 blanks
        iii. Don a clean pair of disposable nitrile gloves over existing gloves, for each sample collected.
        iv. Place each sample in a re-sealable 1-quart plastic bag and securely seal the bag.
        v. Note: Remove excessive air from the re-sealable plastic bags to increase the number of samples that can be shipped in one container.
    g. Enter all the data into the hand-held PDA and scan the bar code on the sample bag for each sample (to include blanks).
    h. Decontaminate and package sample bags appropriately prior to being transported to INL laboratories.
18. Prepare the STA for sampling:

a. Don a clean pair of disposable nitrile gloves over existing gloves and remove the petri plate lid and place the bottom plate (containing the agar) on the petri plate holder.
b. Replace dome assembly.
c. Adjust the height of the petri plate by fully depressing the slit-to-agar distance gauge at the top of the dome assembly and then adjusting the elevation on the right side of the unit so that the media surface touches the gauge.
d. Lock the elevation arm and release the distance gauge. The STA sampler is now ready to operate.
e. Set the timer to the 60-minute interval (corresponds to the 60-minute installed drive motor).

19. The sampling process will begin with the simultaneous activation of the five aerosol samplers (three in the room or area being sampled and two outside the enclosure).
    a. Start the XMX sampler by pressing the sampling button. Sampling will continue for the time selected on the timer (60 minutes).
    b. Start the STA sampler by turning on the main power switch and pressing the START button on the timer. The unit will shut off after one revolution of the petri dish (60 minutes).
    c. Replace the 37 mm, 0.8 μm pore MCE filters in the three XMX samplers and agar plates in the two STA samplers after the first 60 minutes of sampling.
        i. Don a clean pair of disposable nitrile gloves over existing gloves, for each sample collected.
    d. Replace the filters and agar plates after the second 60 minutes of sampling.
        i. Don a clean pair of disposable nitrile gloves over existing gloves, for each sample collected.
    e. Note: Sample for a total of 180 minutes (3 hours) for each sampler, resulting in three air samples from each of the five samplers.
    f. Note: Replace filter sample media as needed in the event that dust and debris from the rooms cause the filters to become sufficiently plugged as to reduce the sampler's volumetric sample collection flow rate to a level that is 20 percent below its initial value.
20. Activate the oscillating floor fans at their lowest speed setting.
21. Use forced air equipment (such as a one-horse power mechanical leaf blower) to direct a jet of air towards all surfaces in the room to dislodge and re-suspend any surviving spores that might be present following the decontamination.
    a. Ensure the tip of the leaf blower is at a less than 45-degree angle from the surface.
    b. Ensure that the tip of the leaf blower is as close to the surface as possible.
    c. Ensure that a sweeping motion from side to side across the surface is maintained as the leaf blower moves forward.
    d. Agitate all such surfaces (walls, ceilings, floors, ledges, etc.).
        i. Conduct forced air agitation for at least 20 minutes in the room.
            1. Conduct forced air agitation for at least 15 minutes on all horizontal surfaces, re-doing surfaces as time permits.
            2. Conduct forced air agitation for at least 5 minutes on all vertical surfaces and the ceiling, re-doing surfaces as time permits.
    e. Vacate the room being sampled once the surface agitation phase has been completed.
    f. Close all doors and keep closed until reentry to collect samples.

Figure A-1. An example of a 1 hp leaf blower.

22. Reenter the room when the aerosol samplers have run for a total of 60 minutes, and deactivate each aerosol sampler and collect and replace the sampling media from each.
    a. Don a clean pair of disposable nitrile gloves over existing gloves, for each sample collected.
    b. Ensure that the XMX/2L-MIL aerosol samplers collect three times the volume of each area (room) onto the filters (approximately 150 minutes sampling with two XMX/2L-MIL samplers should provide acceptable volumes).
    c. Un-connect the filter cartridge from the XMX.
    d. Re-connect the two halves of the filter (DIM).
    e. Note: If extended sampling is recommended, deactivate the aerosol samplers, replace the sampling media with new media and activate the aerosol samplers and allow them to run for the specified period of time.
    f. Place each sample in a re-sealable 1-quart plastic bag and securely seal the bag.
    g. Note: Remove excessive air from the re-sealable plastic bags to increase the number of samples that can be shipped in one container.
23. Deactivate the XMX and STA samplers outside the room being sampled, and collect and replace the sampling media as described in step 19 above.
24. Prepare media blanks:
    a. Provide one unopened dry filter cassette per lot used, as a media blank to the processing laboratory.
    b. Provide one unopened trypticase soy ager plate per lot used, as a media blank to the processing laboratory.
    c. Place each media blank in a re-sealable 1-quart plastic bag and securely seal the bag.
    d. Note: Remove excessive air from the re-sealable plastic bags to increase the number of samples that can be shipped in one container.
    e. Enter all the data into the hand-held PDA and scan the bar code on the sample bag for each sample.
    f. Package sample bags appropriately prior to being transported to INL laboratories.
25. Field calibrate each aerosol sampler flow rate with sampling media designated for calibration after each sampling event.
    a. Note: There are several O-rings in the XMX. These should be monitored and replaced as required.
26. Clean the XMX samplers by air purging.

a. Run the XMX samplers for 5 minutes as a precaution against cross-contamination between sampling events (not between samples within the same room).

27. Disassemble sampler components and decontaminate all parts.
    a. Partially disassemble the XMX concentrator and spray it down with bleach and water to decontaminate the internal components of the XMX.
    b. Note: If positive surface or air sample results are discovered post-decontamination, swab key parts of the XMX after decontamination to test effectiveness.
28. Perform any needed maintenance on the XMX and STA samplers:
    a. Clean the STA samplers with isopropyl alcohol and a soft cloth.
    b. Lubricate the STA samplers with the lubricant provided with the sampling units after each of the three sampling events.
        i. Lubricate the two shafts: the drive shaft above the drive motor and the elevating mechanism shaft below the drive motor.
29. Provide an equipment blank for each sampling device used during the sampling event:
    a. In an area known to be free of contamination, prepare a filter cartridge in the same manner as actual samples.
        i. Operate the each XMX sampler for 60 minutes with a filter cartridge designated as an equipment blank.
    b. In an area known to be free of contamination, prepare a in the same manner as actual samples.
        i. Operate the each STA sampler for 60 minutes with a trypticase soy ager plate designated as an equipment blank.
    c. Place each equipment blank in a re-sealable 1-quart plastic bag and securely seal the bag.
    d. Note: Remove excessive air from the re-sealable plastic bags to increase the number of samples that can be shipped in one container.
    e. Enter all the data into the hand-held PDA and scan the bar code on the sample bag for each sample.
    f. Package sample bags appropriately prior to being transported to INL laboratories.

A-3. Sample Decontamination and Shipment

1. Place multiples of the re-sealable 1-quart plastic bags into a 1-gallon re-sealable plastic bag.
2. Securely seal the 1-gallon re-sealable plastic bag and label the bag (e.g., identify samples contained in the re-sealable plastic bag, sample locations, date and time samples were collected, and name of individual collecting the samples).
3. Decontaminate the outer surface of the larger re-sealable plastic bag using a fresh pH-adjusted bleach solution (household bleach diluted 1:9; pH-adjusted to 6.8-8.0) with a 10-minute contact time before the re-sealable plastic bag leaves the contaminated area.
4. Thoroughly dry the outside of the re-sealable plastic bag.
5. Complete a chain of custody form.
6. Note: Once the outer re-sealable plastic bag is decontaminated, it should not be opened outside of appropriate containment in a laboratory.
7. Place the larger re-sealable plastic bag into an appropriate container for shipping.
8. Transport all samples to the processing laboratory on wet ice or on cold packs.

9. Note: Samples may be stored at 2°C–8°C prior to processing and should be processed within 48 hours of collection.
10. Send appropriate chain of custody forms and analytical request forms with each shipment sent to the processing laboratory.
11. Note: The shipper is responsible for ensuring adherence to the most current and appropriate regulations.
12. Note: Do not transport contaminated equipment/supplies in the same container as the samples.

Attachment B. Sample Analysis Materials and Procedures

B-1. Sample Analysis Materials

1. Slot screwdriver
2. Sterile tweezers or forceps that have flattened ends specifically for handling filters
3. 50 mL conical centrifuge tubes
4. Sterile extraction fluid, e.g. deionized water, phosphate buffer saline solution
5. Wrist action shaker
6. Trypticase soy agar plates
7. Cell spreader

B-2. Sample Procedures

1. Process the XMX samples under aseptic conditions, typically inside a Biological Safety Cabinet (BSC) or at the INL laboratory:
    a. Note: If a BSC is not available the technician can carry out the filter extraction on the bench top by first swabbing the bench top area with 10 % bleach solution, keep the working area to a minimum, that would be directly in front of the technician. It would also be advantageous to have a Bunsen burner running towards the back edge of the work area as this will provide convection currents towards the flame and reduce any possible airborne contaminants.
    b. Open the re-assembled filter cartridge again, containing the exposed filter.
    c. To separate the cartridge, select a blunt instrument such as a slot screwdriver and pry apart the lower joint between the lower and middle part of the cartridge that is holding the filter in place.
    d. Use a pair of sterile tweezers or forceps that have flattened ends specifically for handling filters to carefully lift the filter from the cartridge and off of the supporting cardboard backing.
    e. Place the filter into a 50 ml conical centrifuge tube, which contains 20ml of sterile extraction fluid, e.g. deionized water, phosphate buffer saline (PBS) solution, etc.
    f. Seal the lid of the 50 ml conical centrifuge tube securely and allow soaking for 10 minutes.
    g. Vortex the sample for 2 minutes to insure the filter is fully wetted.
    h. Place the sample tube on a wrist action shaker for 15 minutes.
    i. Perform heat shocking of the sample if it enhances the *Bg* analysis.
    j. Decant extraction fluid into a new centrifuge tube to remove filter.
        i. Leave enough of the liquid to archive for an additional sample if needed
    k. Record the amount of remaining liquid and archived liquid to the nearest μl.
    l. Aseptically dispense the remaining liquid unto a 100 mm trypticase soy agar (TSA) plate and spread with a cell spreader.
    m. Note: Only a small amount of liquid can be plated. Plate must remain agar side up until all sample fluid is absorbed by the agar. Typical sample volume applied is 100μL. This volume can be increased to 200 μL if the plates are pre-dried a bit by leaving them out at room temperature overnight. Multiple replicates are plated out depending on what total sample volume is being analyzed.
    n. Analyze via the method of filter plating and leave the XMX filter inside the extraction fluid.

2. Analyze the first sample for Bg by Realtime-PCR and culture, morphology and enumeration.
    a. Note: Since we are conducting clearance sampling, we don't anticipate any detectable concentrations. However, if we have an incomplete decontamination, then we could see concentrations.
    b. Two XMX samplers are simultaneously collecting air samples in each room sampled. Therefore, do not analyze the second filter until results of the first filter ensure we do not need to dilute.
3. Analyze the second sample for Bg by Realtime-PCR and culture, morphology and enumeration.
    a. Depending on the microbial concentration in the air, this filter sample may have to be diluted with a series of 10-fold dilutions and then the dilutions all plated out.
    b. It will be up to the end user to determine what range of dilutions are necessary and usually only 2 dilutions need to be plated to bracket the correct cell concentration such that the counts are between 30 and 300 on the plates.

Appendix E

LRN *Bg* Analysis Protocols for the BOTE Project

1.1. Materials

The following materials and supplies were necessary to complete the analysis procedures:

- Freshly prepared 10% bleach solution
- Sample extracts (from Swabs, Sponge Wipes, and Vacuum socks)
- PBST (Technova Brand, Part# P0201; Fisher Part# 50842946 or equivalent)
- Disposable polystyrene serological pipets (5 mL and 10 mL)
- Tryptic Soy Agar (TSA) culture plates (such as BD, Part# 236950)
- MicroFunnel Disposable Filter Funnels, Pall Life Sciences (VWR P/N 55095-060)
- Disposable Sterile Forceps
- Disposable sterile 10 µl loops
- Laboratory tissue wipes
- Disposable protective clothing/aprons
- Disposable gloves
- Cell spreaders (such as Lazy-L, Fisher Part# NC9417825)
- Deionized water
- Racks for 15 ml and 50 ml centrifuge tubes
- Sterile, plastic, screw-cap 50 ml centrifuge tubes (such as BD, Part# 352070)
- Sterile, plastic, screw-cap 15 ml centrifuge tubes (such as BD, Part# 352097)
- Pipette tips with aerosol filter for 1 ml & 100 µl (similar to Rainin; Part# SR-L200F and SR-L1000F)

1.2. Equipment

The following equipment was prescribed to complete the analysis procedures. (An important note is that the initially recommended Barnant Portable Air/Pressure station provided insufficient vacuum to allow the filters in conjunction with the filter manifold to operate adequately. As a result, labs were forced to find alternate vacuum equipment to complete the filter-plate analyses):

- Vortex Mixer (such as Daigger Vortex Genie 2, Daigger Part# EF3030A)
- Portable Pipet-Aid (Eppendorf Easypet Pipet, Fisher Part# 13-688-177 or Rainin equivalent)
- Pipettors for 1 ml and 100 µl volumes (similar to Rainin Light touch LT1000 and LT100 or Eppendorf equivalent)
- Vacuum tubing (Nalgene 180 Clear PVC Vacuum tubing, VWR Part# 63013-763)
- Vacuum pump or vacuum line with vacuum gauge (Cole Parmer; gauge catalog #07380-62; connector kit catalog# 07395-20; and bushing catalog# 08539-83)
- Nalgene Heavy Duty Polypropylene Vacuum Bottles (Fisher Scientific, Part# 02-923-11)
- Quick Filling Venting Closure, Two Port (Fisher Scientific, Part# 02-923-19)
- Filter Funnel Manifold (Pall Corporation, 6 place, aluminum, Part# 15403, or Fisher Part# xx2504735)
- Incubator (set to 35°C)

- Biological Safety Cabinet (BSC)
- 40 kHz Sonicator bath (such as Branson Ultrasonic Cleaner Model 1510, Process Equipment and Supply, Inc.; Part# 952-116)
- Centrifuge with rotors and sealable centrifuge buckets to hold 50 ml conical tubes
- Seward Stomacher® 400 Circulator (Seward; Part# 0400/001/AJ) with closure bags (Part# BA6141/CLR) and rack (Part# BA6090)

1.3. Procedures

1.3.1. Sponge Wipe Processing and Plating Procedure

A. Preparation

1. Personnel must be familiar with this procedure
2. Equipment preparation
   a) Assemble equipment in BSC as needed: Stomacher, vortex, filtration manifold, automatic pipettors, racks, etc.
   b) Assemble extra supplies and reagents near BSC.
3. Supply preparation
   a) Unpack shipping containers directly into a biological safety cabinet.
   b) If wipes are not in Stomacher® bags, label one 1 Stomacher® bag for each wipe and place in a bag rack.
   c) Label one specimen cup for each wipe sample.
   d) Label two sterile 50 ml centrifuge tubes for each wipe sample and place in tube rack.
   e) For each sample, label 14 TSA plates on the agar side of the plate with the sample number and the following:

      Label 3 each as follows (for spread-plates):

      - 10^{-1}
      - 10^{-2}
      - 10^{-3}
      - 10^{-4}

      Label 2 each as follows (for filter-plate):

      - 10^{0}

B. Perform sample processing, spore elution, and culture procedure

1. Dislodge spores from the sample wipes.

   a) Don gloves and disposable protective clothing. All subsequent procedures involving manipulation of wipes or spore suspensions must be carried out in a BSC.
   b) If the wipes are not in Stomacher bags, transfer each wipe to a Stomacher® bag using sterile forceps. Change forceps between samples.
   c) Add 90 ml of PBST to each bag that contains a wipe.
   d) Stomach wipes in the PBST

- Set the Stomacher® to 260 RPM.
- Place one bag containing wipe into the Stomacher® so the wipe rests evenly between the homogenizer paddles.
- Stomach each wipe for 1 min.
- Open the door of the Stomacher® and remove the bag containing the wipe. Grab the wipe on the outside of the bag with your hands. Move the wipe to the top of the bag while using your hands to squeeze excess liquid from the wipe.
- Remove and discard the wipe using sterile forceps.

e) Repeat steps (b) through (d) for all samples.
f) Allow bags to sit for 10 min to allow elution suspension foam to settle.

2. Concentrate wipe elution suspension.

a) Gently mix elution suspension up and down with a 50 ml pipette three times.
b) Split elution suspension volume equally
    - Remove half of the suspension volume (~45 ml) with a sterile 50 ml pipette and place it in a 50 ml screw capped centrifuge tube.
    - Place remaining suspension (~45 ml) into a second 50 ml tube.
c) Record suspension volumes on tubes and data sheet.
d) Repeat steps (a) through (c) for all samples.
e) Centrifuge 50 ml centrifuge tubes
    - Place tubes into sealing centrifuge buckets.
    - Decontaminate centrifuge buckets before removing from the BSC.
    - Centrifuge tubes at 3500 x g for 15 minutes. Do not use the brake option on the centrifuge to slow the rotor, as re-suspension of pellet may occur.
f) Remove supernatant with a 50 ml pipette and discard to leave approximately 3 ml in each tube. The pellet may be easily disturbed and not visible, so place pipette tip away from the tube bottom.
g) Vortex and sonicate tubes
    - Set vortexer to high intensity level and touch activation.
    - Set sonicator water bath to high and turn on.
    - Vortex tubes for 30 sec.
    - Transfer tubes to sonicator bath and sonicate for 30 sec.
    - Repeat vortex and sonication cycles two times.
h) Remove suspension from one tube with a sterile 5 ml pipette and place it in the other tube of the same sample.
i) Measure final volume of suspension with 5 ml pipette and record on tube and data sheet.
j) Repeat steps (e) through (i) for all samples.

3. Serially dilute the spore elution suspension in PBST.

a) Vortex elution suspension on high for 30 sec
b) Remove 0.1 ml of spore elution suspension (10^0) and place in one tube (0.9 ml) of PBST. This is the 10^{-1} suspension. Recap the 10^{-1} tube and vortex on high for 30 sec.
c) Open cap of the 10^{-1} suspension and remove 0.1 ml of this suspension and place in a new 0.9 ml tube of PBST. This is the 10^{-2} suspension. Recap the PBST tube and vortex on high for 30 sec.

d) Open cap of the 10^{-2} suspension and remove 0.1 ml of this suspension and place in a new 0.9 ml tube of PBST. This is the 10^{-3} suspension. Recap the PBST tube and vortex on high for 30 sec.
e) You will have four spore suspensions: the initial wipe elution suspension (no dilution=10^{0}) and three serial dilutions of this suspension in PBST (10^{-1}, 10^{-2}, and 10^{-3}).
f) Repeat steps (a) through (d) for all samples.

4. Culture diluted spore suspensions on TSA

a) After vortexing tubes well, remove 100 µl from the 10^{-3} suspension with the P100 pipette and place on to a plate of TSA labeled 10^{-4}.

> NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-3} suspension resulting in a 10^{-4} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

b) Spread the inoculum on each of the three 10^{-4}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
c) After vortexing tubes well, remove 100 µl from the 10^{-2} suspension with the P100 pipette and place on to a plate of TSA labeled 10^{-3}.

> NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-2} suspension resulting in a 10^{-3} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

d) Spread the inoculum on each of the three 10^{-3}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
e) After vortexing tubes well, remove 100 µl from the 10^{-1} suspension with the P100 pipette and place on to a plate of TSA labeled 10^{-2}.

> NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-1} suspension resulting in a 10^{-2} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

f) Spread the inoculum on each of the three 10^{-2}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
g) After vortexing tubes well, remove 100 µl from the initial wipe elution suspension (10^{0}) with the P100 pipette and place on to a plate of TSA labeled 10^{-1}.

> NOTE: the plating of 100 µl is an additional 1:10 dilution of the initial wipe elution suspension (10^{0}) resulting in a 10^{-1} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

h) Spread the inoculum on each of the three 10^{-1}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
i) Place all plates in an incubator set at 35 ± 2 ºC for a maximum of 3 days. Plates should be examined within 18-24 hours after start of incubation and within 72 hours of sample collection. Count CFU of each suspect BG colony (orange in color) and record on the viable count worksheet.

- If the CFU is <300/plate, record actual number.
- If the CFU is >300/plate, record as “too numerous to count” (TNTC)
- If no growth of suspect colonies is observed, record as “None detected”

5. Capture spores on Microfunnel membranes and culture on TSA.

   a) Place two 0.45 µm (pore-size) Microfunnels on the vacuum manifold.
   b) Moisten Microfunnel membranes with 5 ml PBST, open vacuum and vacuum through the filter. All filtering should be done with a vacuum pressure <20 cm Hg.
   c) With the vacuum valve closed, place 10 ml of PBST into each filter cup.
   d) Add 1.0 ml of 10^0 wipe elution suspension from 3(a) to each filter cup.
   e) Open valves and vacuum the suspension through the filter.
   f) Rinse the walls of each Microfunnel cup with 10 ml of PBST and vacuum through the filter.
   g) Squeeze the walls of the Microfunnel cup gently and separate the walls from the base holding the filter. Remove each filter membrane with sterile forceps and place grid-side up on a TSA plate. Make sure that the filter is in good contact with the surface of the agar. If an air pocket occurs under the filter, use the sterile forceps to lift the edge of the filter to release the air pocket for better contact with the agar.
   h) Record exact volume of the 10^0 wipe elution suspension filtered on each plate. It should be 1 ml.
   i) Repeat steps (a) through (i) for all each sample.
   j) Incubate TSA plates with filter membranes at 35 ± 2 ºC for a maximum of 3 days. Plates should be examined within 18-24 hours after start of incubation and within 72 hours of sample collection. Count CFU of each suspect BG colony (orange in color) and record on the viable count worksheet.
      - If the CFU is <300/plate, record actual number.
      - If the CFU is >300/plate, record as “too numerous to count” (TNTC)
      - If no growth of suspect colonies is observed, record as “None detected”

1.3.2. Swab Processing and Plating Procedure

A. Preparation

1. Personnel must be familiar with this procedure.
2. Equipment preparation
   a) Assemble equipment in BSC as needed: vortex, filtration manifold, automatic pipettors, racks, etc.
   b) Assemble extra supplies and reagents near BSC.
3. Supply preparation
   a) Unpack shipping containers directly into a biological safety cabinet.
   b) If swabs are not in sterile, plastic 15 ml screw cap centrifuge tubes, label one 15 ml tube for each swab and place in a tube rack.
   c) For each sample, label 14 TSA plates with the sample number.

      Label 3 each as follows (for spread-plates):

      - 10^{-1}
      - 10^{-2}

- 10^{-3}
- 10^{-4}

Label 2 each as follows (for filter-plate):

- 10^{0}

B. Perform sample processing, spore elution, and culture procedure

1. Dislodge spores from the sample swabs.

   a) Don gloves and disposable protective clothing. All subsequent procedures involving manipulation of swabs or spore suspensions must be carried out in a BSC.
   b) If the swabs are not in screw cap centrifuge tubes, transfer each swab to sterile, plastic 15 ml screw cap centrifuge tube using sterile forceps.
   If necessary, cut the handle of swab to fit into the tube using sterile scissors.
   Change forceps and scissors between samples.
   c) Add 5 ml of PBST to each tube that contains a swab.
   d) Vortex swabs in the PBST.
      - Set the vortex mixer to the highest intensity level and 'touch' activation.
      - Vortex each swab in ten sec bursts for 2 min to dislodge spores from swab.
      - Open the cap of the 15 ml centrifuge tube containing swab and spore elution suspension. Using sterile forceps, lift the swab and use the forceps to press the tip of the swab against the inside of the tube to remove extra liquid from the foam tip.
   e) Repeat steps (b) through (d) for all samples.

2. Serially dilute the spore elution suspension in PBST.

   a) Vortex elution suspension on high for 30 sec
   b) Remove 0.1 ml of spore elution suspension (10^{0}) and place in one tube (0.9 ml) of PBST. This is the 10^{-1} suspension. Recap the 10^{-1} tube and vortex on high for 30 sec.
   c) Open cap of the 10^{-1} suspension and remove 0.1 ml of this suspension and place in a new 0.9 ml tube of PBST. This is the 10^{-2} suspension. Recap the PBST tube and vortex on high for 30 sec.
   d) Open cap of the 10^{-2} suspension and remove 0.1 ml of this suspension and place in a new 0.9 ml tube of PBST. This is the 10^{-3} suspension. Recap the PBST tube and vortex on high for 30 sec.
   e) You will have four spore suspensions: the initial wipe elution suspension (no dilution=10^{0}) and three serial dilutions of this suspension in PBST (10^{-1}, 10^{-2}, and 10^{-3}).
   f) Repeat steps (a) through (d) for all samples.

3. Culture diluted spore suspensions on TSA.

   a) After vortexing tubes well, remove 100 µl from the 10^{-3} suspension with the P100 pipette and place on to a plate of TSA <u>labeled 10^{-4}</u>.

NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-3} suspension resulting in a 10^{-4} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

b) Spread the inoculum on each of the three 10^{-4}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
c) After vortexing tubes well, remove 100 µl from the 10^{-2} suspension with the P100 pipette and place on to a plate of TSA labeled 10^{-3}.

NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-2} suspension resulting in a 10^{-3} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

d) Spread the inoculum on each of the three 10^{-3}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
e) After vortexing tubes well, remove 100 µl from the 10^{-1} suspension with a P100 pipette and place on to a plate of TSA labeled 10^{-2}.

NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-1} suspension resulting in a 10^{-2} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

f) Spread the inoculum on each of the three 10^{-2}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
g) After vortexing tubes well, remove 100 µl from the initial wipe elution suspension (10^{0}) with the P100 pipette and place on to a plate of TSA labeled 10^{-1}.

NOTE: the plating of 100 µl is an additional 1:10 dilution of the initial wipe elution suspension (10^{0}) resulting in a 10^{-1} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

h) Spread the inoculum on each of the three 10^{-1}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
i) Place all plates in an incubator set at 35 ± 2 ºC for a maximum of 3 days. Plates should be examined within 18-24 hours after start of incubation and within 72 hours of sample collection. Count CFU of each suspect BG colony (orange in color) and record on the viable count worksheet.
   - If the CFU is <300/plate, record actual number.
   - If the CFU is >300/plate, record as “too numerous to count” (TNTC)
   - If no growth of suspect colonies is observed, record as “None detected”

4. Capture spores on Microfunnel membranes and culture on TSA

a) Place two 0.45 µm (pore-size) Microfunnels on the vacuum manifold.
b) Moisten Microfunnel membranes with 5 ml PBST, open vacuum and vacuum through the filter. All filtering should be done with a vacuum pressure <20 cm Hg.
c) With the vacuum valve closed, place 10 ml of PBST into each filter cup.
d) Add 1.0 ml of 10^{0} wipe elution suspension from 2(a) to each filter cup.
e) Open valves and vacuum the suspension through the filter.

f) Rinse the walls of each Microfunnel cup with 10 ml of PBST and vacuum through the filter.
g) Squeeze the walls of the Microfunnel cup gently and separate the walls from the base holding the filter. Remove each filter membrane with sterile forceps and place grid-side up on a TSA plate. Make sure that the filter is in good contact with the surface of the agar. If an air pocket occurs under the filter, use the sterile forceps to lift the edge of the filter to release the air pocket for better contact with the agar.
h) Record exact volume of the 10^0 wipe elution suspension filtered on each plate. It should be 1 ml.
i) Repeat steps (a) through (i) for all each sample.
j) Incubate TSA plates with filter membranes at 35 ± 2 ºC for a maximum of 3 days. Plates should be examined within 18-24 hours after start of incubation and within 72 hours of sample collection. Count CFU of each suspect BG colony (orange in color) and record on the worksheet titled BG Spore Environmental Sample Results Form – Manual Dilution and Filter Plating.
   - If the CFU is <300/plate, record actual number.
   - If the CFU is >300/plate, record as “too numerous to count” (TNTC)
   - If no growth of suspect colonies is observed, record as “None detected”

1.3.3. Vacuum Sock Processing and Plating Procedure

A. Preparation

1. Personnel must be familiar with this procedure.
2. Equipment preparation
   a) Assemble equipment in BSC: vortex, filtration manifold, automatic pipettors, racks, etc.
   b) Assemble extra supplies and reagents near BSC.
3. Supply preparation
   a) Unpack shipping containers directly into a biological safety cabinet.
   b) If vacuum socks are not in sterile, plastic specimen cup, label one 4 oz sterile specimen cup for each vacuum sample.
   c) For each sample, label 14 TSA plates with the sample number.

      Label 3 each as follows (for spread-plates):

      - 10^{-1}
      - 10^{-2}
      - 10^{-3}
      - 10^{-4}

      Label 2 each as follows (for filter-plate):

      - 10^0

B. Perform sample processing, spore elution, and culture procedure

1. Dislodge spores from the vacuum socks and concentrate elution suspension.

a) Place 50 ml PBST into sterile, leak-proof, screw-cap wide-mouth plastic container.
b) Remove the sock from the bag by holding onto upper blue plastic material. Wet the sock by dipping the lower 1 inch of the vacuum sock into the liquid in the container.
c) With disposable scissors or individually sterilized scissors, and while holding the sock over the cup, cut lower edge of sock as close to the lower edge seam as possible. (Flaming scissors with an alcohol lamp will not assure sterilization when *Bacillus* spores are involved)
d) Submerge the sock in the PBST so that the liquid is allowed to enter the opening and wet the contents inside.
e) When the liquid appears to have wet the sock beyond about 1 inch from the bottom, cut a 1-inch vertical slit up the center from the bottom of the sock. Then cut horizontally from side to side, about 1 inch from the bottom, allowing two pieces to fall into the cup with PBST.
f) Submerge the lower edge of the sock again to allow wetting of the contents inside. Again cut a 1-inch vertical slit up the center and horizontally from side to side to allow another two sections to fall into the container with the PBST.
g) Continue to submerge and cut the sock until all of the white filter part of the sock is in pieces in the jar.
h) Discard the upper blue portion of the vacuum sock.
i) Change gloves.
j) Tightly close the container, seal with parafilm, and place on a platform shaker/rotator with lock bars. Agitate samples at 300 rpm for 30 min.

   NOTE: If shaker/rotator is outside of the BSC, the containers should be enclosed in ziplock bags and a sealed biotransport box (Fisher Scientific; catalog #15-251-2)

k) Remove transport container from the shaker and place in the BSC. Allow settling for 1 min, then pipette off 30 ml of supernatant into 50-ml sterile, screw-cap, conical tubes.
l) Discard the settled material.
m) Place conical tubes into sealing centrifuge buckets within the BSC. Transport to centrifuge and place on swinging bucket rotor.
n) Centrifuge the supernatant at 3500 X *g* for 15 min. Do not use brake to slow the rotor, as resuspension may occur.
o) After centrifugation, move the sealed centrifuge buckets back to the BSC.
p) Carefully pipette off 25 ml of the supernatant and re-suspend the pellet in the remaining 5 ml by vortexing the 5 ml sample for 1 min with 10 sec bursts.

2. Serially dilute the spore elution suspension in PBST.

   a) Vortex elution suspension on high for 30 sec
   b) Remove 0.1 ml of spore elution suspension (10^0) and place in one tube (0.9 ml) of PBST. This is the 10^{-1} suspension. Recap the 10^{-1} tube and vortex on high for 30 sec.

c) Open cap of the 10^{-1} suspension and remove 0.1 ml of this suspension and place in a new 0.9 ml tube of PBST. This is the 10^{-2} suspension. Recap the PBST tube and vortex on high for 30 sec.
d) Open cap of the 10^{-2} suspension and remove 0.1 ml of this suspension and place in a new 0.9 ml tube of PBST. This is the 10^{-3} suspension. Recap the PBST tube and vortex on high for 30 sec.
e) You will have four spore suspensions: the initial wipe elution suspension (no dilution=10^{0}) and three serial dilutions of this suspension in PBST (10^{-1}, 10^{-2}, and 10^{-3}).
f) Repeat steps (a) through (d) for all samples.

3. Culture diluted spore suspensions on TSA.

a) After vortexing tubes well, remove 100 µl from the 10^{-3} suspension with the P100 pipette and place on to a plate of TSA labeled 10^{-4}.

> NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-3} suspension resulting in a 10^{-4} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

b) Spread the inoculum on each of the three 10^{-4}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
c) After vortexing tubes well, remove 100 µl from the 10^{-2} suspension with the P100 pipette and place on to a plate of TSA labeled 10^{-3}.

> NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-2} suspension resulting in a 10^{-3} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

d) Spread the inoculum on each of the three 10^{-3}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
e) After vortexing tubes well, remove 100 µl from the 10^{-1} suspension with the P100 pipette and place on to a plate of TSA labeled 10^{-2}.

> NOTE: the plating of 100 µl is an additional 1:10 dilution of the 10^{-1} suspension resulting in a 10^{-2} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

f) Spread the inoculum on each of the three 10^{-2}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.
g) After vortexing tubes well, remove 100 µl from the initial wipe elution suspension (10^{0}) with the P100 pipette and place on to a plate of TSA labeled 10^{-1}.

> NOTE: the plating of 100 µl is an additional 1:10 dilution of the initial wipe elution suspension (10^{0}) resulting in a 10^{-1} dilution on the plate. Repeat 2 more times for a total of three inoculated plates.

h) Spread the inoculum on each of the three 10^{-1}-labeled TSA plates with one Lazy-L cell spreader. Discard spreader.

i) Place all plates in an incubator set at 35 ± 2 ºC for a maximum of 3 days. Plates should be examined within 18-24 hours after start of incubation and within 72 hours of sample collection. Count CFU of each suspect BG colony (orange in color) and record on the worksheet titled BG Spore Environmental Sample Results Form – Manual Dilution and Filter Plating..
   - If the CFU is <300/plate, record actual number.
   - If the CFU is >300/plate, record as "too numerous to count" (TNTC)
   - If no growth of suspect colonies is observed, record as "None detected."

4. Capture spores on Microfunnel membranes and culture on TSA

a) Place two 0.45 µm (pore-size) Microfunnels on the vacuum manifold.
b) Moisten Microfunnel membranes with 5 ml PBST, open vacuum and vacuum through the filter. All filtering should be done with a vacuum pressure <20 cm Hg.
c) With the vacuum valve closed, place 10 ml of PBST into each filter cup.
d) Add 1.0 ml of 10^0 wipe elution suspension from 2(a) to each filter cup.
e) Open valves and vacuum the suspension through the filter.
f) Rinse the walls of each Microfunnel cup with 10 ml of PBST and vacuum through the filter.
g) Squeeze the walls of the Microfunnel cup gently and separate the walls from the base holding the filter. Remove each filter membrane with sterile forceps and place grid-side up on a TSA plate. Make sure that the filter is in good contact with the surface of the agar. If an air pocket occurs under the filter, use the sterile forceps to lift the edge of the filter to release the air pocket for better contact with the agar.
h) Record exact volume of the 10^0 wipe elution suspension filtered on each plate. It should be 1 ml.
i) Repeat steps (a) through (i) for all each sample.
j) Incubate TSA plates with filter membranes at 35 ± 2 ºC for a maximum of 3 days. Plates should be examined within 18-24 hours after start of incubation and within 72 hours of sample collection. Count CFU of each suspect BG colony (orange in color) and record on the worksheet titled BG Spore Environmental Sample Results Form – Manual Dilution and Filter Plating.
   - If the CFU is <300/plate, record actual number.
   - If the CFU is >300/plate, record as "too numerous to count" (TNTC)
   - If no growth of suspect colonies is observed, record as "None detected"

1.3.4. Documentation of Results

Data were manually entered into Microsoft Excel Spreadsheets.

Appendix F

Sand Sample Preparation, Collection, and Extraction/Analysis Protocols

I-1: Dry Heat Sterilizing Sand Aliquots Conducted by EPA

I-2: Placement and Collection Protocols for Sand Dish Study

I-3: Division of Samples between the EPA and USGS, and Concentration of *Bacillus atrophaeus* subsp. *globigii* (*Bg*) Spores

I-4: Vacuum Based Protocol for the PowerSoil® DNA Isolation Kit

I-5: qPCR Analysis of Isolated DNA from BOTE Samples

I-6: USGS Soil DNA Extraction Protocol for the Detection of *Bacillus atrophaeus* subsp. *globigii*

Appendix I-1: Dry Heat Sterilization of Sand Aliquots Conducted by EPA

A. Consumables and Equipment

1. Aluminum weighing boats; 75 mL, Fisher Cat # 08-732-107
2. Aluminum foil
3. Sand, silica, Ace Hardware, Cat # 4315024 or equivalent
4. Parafilm® (Pechiney Plastic Packaging Company, Chicago, IL)
5. Office tape
6. Digital top loader balance
7. Forma Quick-Dry Oven, model 3096 (Forma Scientific, Inc., Marietta, OH) or equivalent
8. Plastic sterile Petri dishes, 150 by 15 mm (BD Biosciences, San Jose, CA; Falcon Cat # 25373-187, or equivalent)

B. Procedure:

1. Tare the weight of a single aluminum weigh boat.
2. Add to 50 g of sand to each of 250 weigh boats.
3. Cover individual weigh boats with aluminum foil and place, in a Forma-Quick Dry Oven at 250 °C 10 hours. (Oven reached 250 °C after two hours and reached a high temperature of 290 °C for two hours.)
4. Remove sterilize sand aliquots from the oven and allow to cool.
5. In a biological safety cabinet, aseptically transfer a sterile sand aliquot to a sterile 150 mm Petri dish and seal with a 14 in (35.6 cm) x 2 in (5.1 cm) piece of Parafilm® and two pieces of office tape on either side of the diameter of the sealed Petri dish.
6. Place filled sand samples into secondary plastic bag and box for shipment to Idaho National Laboratory, BOTE site. Store under ambient conditions until usage.

Appendix I-2: Placement and Collection Protocols for Sand Dish Study

For placement and collection start at tent site 1 and move in sequential order 1-10. Collect all required sample blanks at site 5. Collect the two control positive building samples (B1-B2) while in the building collecting other samples.

A. Placement of Trays

1. Person A (Supplier):
   Remove pre-labeled orange painted holder from the kit and hand to Person B (Collector).

2. Person B (Collector):
   Place orange painted holder in specified site.

3. BROOM Operator:
   Pre-scan all trays to mark coordinates in BROOM.

B. Placing Sand Dish Samples

Persons A and B: Discard existing top pair of gloves. **Note:** After each person has discarded all but their base pairs of gloves, open the bag with clean gloves and place another set of 3 gloves over the last pair on hands, while inside the zip-top bag. Each sampler will have their own bag of fresh gloves.

1. Person A (Supplier):
   a) Remove a sample supply kit. Kit contains sealed sand sample in an individual bag.
   b) Open sample supply kit.
   c) Remove pre-filled sand sample and check label on the bag to ensure correct.
   d) Pass the labeled sand sample to Person B.
   e) Discard top layer of gloves before placing next sample.
   f) Repeat steps c through f until all samples are placed.

2. Person B (Collector):
   a) Double check laboratory prepared sand sample labeling to ensure correct site placement.
   b) Remove packaging material from the prepared sand sample and dispose in waste bag.
   c) Place laboratory prepared sand sample on holder in specified site.
   d) Remove lid from the sand sample and dispose in waste bag.
   e) Remove exterior gloves.
   f) Repeat steps b-f for all samples being placed.

C. Collecting Sand Dish Samples

Persons A and B: Discard existing top pair of gloves. **Note:** After each person has discarded all but their base pairs of gloves, open the bag with clean gloves and place another set of 3 gloves

over the last pair on hands, while inside the zip-top bag. Each sampler will have their own bag of fresh gloves. Person C: replace gloves as needed.

1. Person A (Supplier):
   a) Remove a sample collection kit. Kit contains clean Petri dish and pre-cut piece of Parafilm®.
   b) Slide Petri dish and Parafilm® up in bag without touching inside the bag or the clean Petri dish/ Parafilm® and allow Person B to remove items from the bag.
   c) Open bag and hold open for Person B to insert the sealed sand sample.
   d) Immediately seal zip-top bag after the sand sample has been inserted.
   e) Place into sample collection box.
   f) Remove exterior layer of gloves and repeat steps a-e for duplicate samples.

2. Person B (Collector):
   a) Take clean Petri dish from Person A.
   b) Throw base into the waste bag and place lid on sand sample.
   c) Take a piece of Parafilm® from Person A.
   d) Wrap sand sample dish with Parafilm®.
   e) Place two pieces of office tape on either side of the sand sample.
   f) Double check sand sample label and hold for Person C to scan.
   g) Place in sample collection zip-top bag.
   h) Remove outer pair of gloves and collect duplicate sample following steps a-g.
   i) After all samples are collected, transport samples to decontamination line.
   j) Wipe exterior of zip-top sample bags with bleach wipe.
   k) Discard wipe into waste bag.
   l) Hand samples off to INL for packaging and shipping.

3. Person C (BROOM Operator)
   a) Scan barcode on exterior of collected sand sample, record collection time, and location.
   b) Scan tray barcode with BROOM tool.
   c) Record extra observations in Notes dialog box.

Appendix I-3: Division of Samples Between the EPA and USGS, and Concentration of *Bacillus atrophaeus* subspecies *globigii* (*Bg*) Spores

Introduction

This document describes a method for storing and processing sand samples presumed to contain *Bg* spores and extracting DNA from them. The sample processing consists of:

- dividing the sand samples between the EPA and USGS (D. 1-12, below)
- concentrating the spores from the remaining sand (D. 13-35, below)
- extracting DNA from the sand concentrate (D. 36, below).
- shipping samples to USGS (D. 37, below)
- cleanup is also described (D. 38-40, below).

Approximately 5 g aliquots from each of the BOTE sand samples will be sent to Dale Griffin (USGS) by overnight delivery for analysis for the presence of *Bg* spores. Aliquots will be placed aseptically in individual labeled, sterile 50 mL conical screw cap centrifuge tubes. The caps of each tube will be sealed with Parafilm® for added security. The tubes will be placed in a large bag before being boxed for shipment to the USGS.

The remaining sand sample (approximately 45 g) will be accurately weighted before spore isolation. The sand matrix will be washed with phosphate buffered saline supplemented with TWEEN®-20 (TWEEN®, Sigma-Aldrich, St. Louis, MO). After vigorous shaking, the sand will be allowed to settle and the supernatant will be transferred to a centrifuge bottle. On completion of centrifugation, the supernatant will be aspirated and discarded. DNA will be extracted from the pellet using the MO BIO PowerSoil® DNA Isolation Kit. Extracted DNA will be assayed using the qPCR Analysis of Isolated DNA, Appendix I-5.

A. Sample Storage:

Upon arrival of the samples from the field operation to EPA will be stored at 4 ˚C in the 150 mm Petri dishes in which they were shipped until they are processed.

B. Sample Processing, Consumables:

1. 50 mL sterile conical centrifuge tubes in racks; Fisher Brand Cat #430043, or equivalent
2. 250 mL centrifuge tubes; Corning Cat # 430776, or equivalent
3. Sterile scoopulas, Fisher Brand Cat # 14-357Q, or equivalent
4. Sterile powder funnels, Fisher Brand Cat 10-371D, or equivalent
5. Aluminum foil and assorted autoclave bags
6. Parafilm®
7. Paper towels
8. Permanent marker
9. Shipping box and XL zip-top bag, GSA Cat GS07F9232S, or equivalent
10. Dispatch® towels, 7” x 8”, 50/box, Cat # 69101, or equivalent
11. 70 % Ethanol
12. Nitrile gloves, assorted sizes
13. Phosphate Buffered Saline supplemented with TWEEN® 20 (PBST) (Table I3-1 and I3-2)

Table I3- 1: Components of 10X Phosphate Buffered Saline

Component	To make 1,000 mL	To make 2,000 mL
NaCl	80 g	160 g
KH_2PO_4	2 g	4 g
$Na_2HPO_4 \cdot 12H_2O$	29 g	58 g
KCl	2 g	4 g
Reagent water	to 1,000 mL	to 2,000 mL
Adjust pH to 7.4 with 0.1 N HCl or 0.1 N NaOH, as necessary. Autoclave or positive pressure filter sterilize.		

Table I3- 2: Phosphate Buffered Saline with 1% Tween® 20

Component	To make 1,000 mL
Tween® 20 (Polyoxyethylene (20) sorbitan monolaurate)	10 mL
Reagent water	to 1,000 mL
Autoclave or positive pressure filter sterilize.	

To make working PBST (0.01% Tween® 20): Mix 100 mL 10X PBS, 10 mL Tween® 20 with 800 mL reagent water; adjust the pH to 7.4 with 0.1 N HCl or 0.1 N NaOH, as necessary. Adjust the volume to 1,000 mL with reagent water. Autoclave or positive pressure filter sterilize.

Sterile Pasteur, 10 mL and 25 mL serological pipettes

C. Sample Processing, Equipment:

1. Single pan top loader balance
2. Sterile scoopulas, Fisher Cat # 14-357Q, or equivalent
3. Sterile powder funnels, Fisher Cat # 10-37D, or equivalent
4. Pipette aid
5. Sorvall® Evolution RC centrifuge (Fisher Scientific, Pittsburg, PA)
6. Sorvall®, SLA fixed angle rotor
7. Sorvall®, 250 mL polypropylene Oak Ridge Centrifuge Bottles, centrifuge bottles, sterile, Cat # 03937
8. Sorvall®, HS-4 swinging bucket rotor
9. Sorvall® 50 mL conical centrifuge insert, Cat # 03072, for use in Sorvall® HS-4 swinging bucket rotor

D. Sample Processing, Procedure:

Safety: Minimal personal protective equipment to be worn by the operator(s) includes a laboratory coat, double gloves, and safety glasses. All sample handling will be conducted in a biological safety cabinet.

Divide the sand samples between EPA and USGS

1. The 50 mL and 250 mL tubes will be labeled with pre-printed labels.
2. After transferring the top loader balance to the biosafety cabinet, Check to make sure it is level.
3. A 50 mL tube will be weighed and the weight recorded on the data log provided at the end of this SOP.
4. Sterile scoopulas and powder funnels will be autoclaved prior to work and placed in the biological safety cabinet along with precut pieces of Parafilm®.

5. An individual paper towel will be laid out in the biosafety cabinet to serve as a work surface for each sample division.
6. The paper towel will be sprayed with 70% ethanol to keep down dust and debris.
7. The appropriate 150 mm Petri dish and pre-labeled tubes will be set in the work area.
8. The contents of the 150 mm Petri dish will be mixed by a gentle shaking back and forth. Then the Petri dish will be tapped upside down on the bench top to get the contents deposited to the lid side of the Petri dish.
9. The sample container weight will be recorded on the sample log.
10. After opening the 150 mm Petri dish, using a sterile scoopula, aseptically transfer approximately 5 g of the sand to a sterile 50 mL conical centrifuge tube.
11. Screw the cap on the centrifuge tube and seal the cap with a piece Parafilm® wrapped around the cap.
12. Set the sample aside for shipment to the USGS. For shipment instructions skip to step 37.

Concentrate Spores from the Remaining Sand

13. Determine the weight of the sample remaining in the lid and record the result on sample log.
14. Open and place a pre-labeled 250 mL centrifuge tube within a holder on a paper towel sprayed with 70% ethanol.
15. Holding a sterile powder funnel in the neck of the centrifuge tube, aseptically transfer the remaining sand from the Petri dish lid to 250 mL centrifuge tube.
16. Determine the weight of the empty Petri dish lid and record the result on sample log.
17. Using a pipette or wash bottle, aseptically transfer 25 mL of PBST into the lid of the 150 mm Petri dish, gently swirl it around the lid and pour it through funnel into the 250 mL centrifuge tube.
18. Using a pipette or wash bottle, aseptically transfer 25 mL of PBST into the bottom of the 150 mm Petri dish, gently swirled it around, and pour it through funnel into the 250 mL centrifuge tube.
19. Using a pipette or wash bottle, aseptically transfer another 25 mL of PBST to rinse the funnel.
20. Adjust the volume in 250 mL centrifuge tube with PBST to 125 mL and recap it.
21. Appropriately dispose of the empty 150 mm Petri dish, scoopula, pipettes, and filter funnel.
22. Shake the 250 mL centrifuge tube containing 125 mL PBST and sample back and forth vigorously for 3 minutes.
23. Allow sand particles to sediment for 5 minutes
24. Using a sterile 25 mL pipette, transfer the supernatant to a sterile, pre-labeled 250mL Sorvall centrifuge bottle.
25. Repeat steps 1 through 24 six times. This is the number of samples that can be processed in the Sorvall Evolution Refrigerated Centrifuge using a SLA fixed angle rotor.
26. Carefully dispose of the paper towel ensuring that any lost sand remains in the towel.
27. Wipe the work surface of the biosafety cabinet with a Dispatch® towel and then with 70% ethanol.
28. Remove the outer pair of gloves and discard them. Put on a fresh pair of outer gloves before processing the next sample
29. After balancing the bottles, centrifuge them at 5,900 *x g* for 20 minutes using a Sorvall Evolution Refrigerated Centrifuge equipped with a SLA fixed angle rotor. The Sorvall

Evolution Refrigerated Centrifuge brake should be set to 1 and the temperature should be set to 4ºC.

30. Aseptically aspirate the supernatant from the centrifuge bottle, using a sterile Pasteur pipette connected to a suction flask and discard it.
31. Aseptically resuspend the pellet in the 250 mL centrifuge bottle in 25 mL PBST and transfer the pellet resuspension to a sterile 50 mL conical centrifuge bottle.
32. Repeat step 31 for each of the 250 mL centrifuge bottles.
33. Transfer up to 4 of the 50 mL conical centrifuge tubes to the Sorvall HS-4 rotor equipped with a Sorvall 50 mL insert in each cup.
34. Centrifuge the tubes at 5,900 *x g* for 20 minutes using a Sorvall Evolution Refrigerated Centrifuge equipped with the HS-4 swinging bucket rotor. The Sorvall Evolution Refrigerated Centrifuge brake should be set to 1 and the temperature should be set to 4ºC.
35. Aseptically aspirate the supernatant carefully from the 50 mL centrifuge tube, using a sterile Pasteur pipette connected to a suction flask and discard it. Save the pellet for DNA extraction.

DNA Extraction

36. Extract the DNA from the individual pellets following the vacuum based manufacturer's protocol from the PowerSoil® DNA Isolation Kit (MO BIO Laboratories, Inc., Carlsbad, CA).

Shipment of the USGS Samples

37. Wipe the outsides of the USGS aliquots (samples) with a Dispatch towel. Then place the USGS aliquots in a XL Ziploc® bag, wipe the outside of the Ziploc® bag with a Dispatch® towel , and load it into a box for overnight shipment at ambient conditions. Seal and label the box following the Safety, Health, and Environmental Management (SHEM) guidance. If shipment will occur on a future date, store the samples in 4 °C. The shipping address is as follows:

    Dr. Dale Griffin
    United States Geological Survey
    2639 North Monroe Street, Suite A-200
    Tallahassee, FL 32303
    Office phone # 850-553-3675

Clean Up

38. Clean the biosafety cabinet according to the laboratory's SOP.
39. Sterilize, clean and re-autoclave the reusable scoopulas and powder funnels.
40. Fill out a request for shipping form and get it authorized by Mary Sullivan (U.S. Environmental Protection Agency, Cincinnati, OH). Make a copy of the request for shipping form for Mary Sullivan's records and deliver it with Pat Tapp (U.S. Environmental Protection Agency, Cincinnati, OH). Before 4:00 PM take the package(s) to the mailroom in the basement of EPA's Andrew W. Breidenbach Environmental Research Center.

Appendix I-4: Vacuum Based Protocol for the PowerSoil® DNA Isolation Kit

A. Reagents:

PowerSoil® DNA Isolation Kit (MO Bio Cat. # 12888, or equivalent)

B. Equipment:

MO BIO Vortex Adapter tube holder for the vortex (MO BIO Catalog No. 13000-V1)
PowerVAC™ vacuum manifold (MO BIO Catalog #11991, or equivalent)
PowerVAC™ Mini System (MO BIO Catalog #11992)
PowerVAC™ Mini Spin Filter Adaptors (MO BIO Catalog #11992-20)

C. Procedure:

This procedure is based on the MO BIO PowerSoil® DNA Isolation Kit # 12888 instructions. The Operator must wear gloves at all times.

1. Weigh out ~0.25 g of the sand sample. Record the weight in the lab book and place the sample in the MoBio garnet beating tube (PowerBead Tubes). Label the tube.
2. Gently vortex to mix.
3. Check Solution C1. If Solution C1 is precipitated, heat the solution to 60 °C until it dissolves before using it.
4. Add 60 µL of Solution C1 and invert the tube several times or vortex briefly.
5. Secure PowerBead Tubes horizontally using the MO BIO Vortex Adapter tube holder for the vortex (MO BIO Catalog No. 13000-V1) or secure tubes horizontally on a flat-bed vortex pad with tape. Vortex at maximum speed for 10 minutes.
6. Make sure the PowerBead Tubes rotate freely in the centrifuge without rubbing. Centrifuge tubes at 10,000 *x g* for 30 seconds at room temperature.
7. CAUTION: Be sure not to exceed 10,000 x g or the tubes could break.
8. Transfer the supernatant to a clean 2 mL Collection Tube (provided in the kit).
9. Note: Expect between 400 to 500 µL of supernatant. Supernatant could still contain some sand particles.
10. Add 250 µL of Solution C2 and vortex for 5 seconds. Incubate at 4 °C for 5 minutes.
11. Centrifuge the tubes at room temperature for 1 minute at 10,000 x g.
12. Avoiding the pellet, transfer up to, but no more than, 600 µL of supernatant to a clean 2 mL Collection Tube (provided in the kit).
13. Add 200 µL of Solution C3 and vortex briefly. Incubate at 4 °C for 5 minutes.
14. Centrifuge the tubes at room temperature for 1 minute at 10,000 x g.
15. Avoiding the pellet, transfer up to, but no more than, 750 µL of supernatant into a clean 2 mL Collection Tube (provided in the kit).
16. Add 1,200 µL of Solution C4 to the supernatant and vortex for 5 seconds.
17. For each preparation, attach one aluminum PowerVac™ Mini Spin Filter Adapter (MO BIO Catalog#11992-10 or 11992-20) into the Luer-Lok® fitting of one port in the manifold. Gently press a Spin Filter column into the PowerVac™ Mini Spin Filter Adapter until snugly in place. Ensure that all unused ports of the vacuum manifold are closed.
18. Note: Aluminum PowerVac™ Mini Spin Filter Adapters are reusable.
19. Transfer 650 µL of prepared sample lysate (from step 14) to the Spin Filter column.
20. Turn on the vacuum source and open the stopcock of the port. Hold the tube in place, when opening the stopcock, to keep the spin filter steady. Allow the lysate to pass through the Spin Filter column. After the lysate has passed through the column completely, load again with the next 650 µL of lysate. Continue until all of the lysate has

been loaded onto the Spin Filter column. Close the one-way Luer-Lok® stopcock of that port.

21. **Note**: If Spin Filter Columns are filtering slowly, close the ports to samples that have completed filtering to increase the pressure to the other columns.
22. Load 800 µL of 100% ethanol into the Spin Filter so that it completely fills the column. Open the stopcock, while holding the column steady. Allow the ethanol to pass through the column completely. Close the stopcock.
23. Add 500 µL of Solution C5 to each Spin Filter. Open the Luer-Lok® stopcock and apply a vacuum until Solution C5 has passed through the Spin Filter completely. Continue to pull a vacuum for another minute to dry the membrane. Close each port.
24. Turn off the vacuum source and open an unused port to vent the manifold. If all 20 ports are in use, break the vacuum at the source. Make certain that all vacuum pressure is released before performing the next step. It is important to turn off the vacuum at the source to prevent backflow into the columns.
25. Remove the Spin Filter column and place in the original labeled 2 mL Collection Tube. Place into the centrifuge and spin at 13,000 × *g* for 1 minute to completely dry the membrane.
26. Transfer the Spin Filter column to a new 2 mL Collection Tube and add 100 µL of Solution C6 to the center of the white filter membrane. Alternatively, sterile DNA-Free PCR Grade Water could be used for elution from the silica Spin Filter membrane at this step (MO BIO Catalog # 17000-10).
27. Centrifuge at room temperature for 30 seconds at 10,000 *x g*.
28. Discard the Spin Filter column. The DNA in the tube is now ready for any downstream application. No further steps are required. MO BIO recommends storing DNA frozen (-20 °C to -80 °C). Solution C6 contains no EDTA.
29. Store the sample at -70 °C until ready to run qPCR analysis.

Appendix I-5: qPCR Analysis of Isolated DNA from BOTE Samples

Introduction:

Quantitative PCR (qPCR) is an adaptation of the basic PCR procedure to allow specific quantification of copy numbers in original samples, rather than the plus/minus detection of conventional PCR. One of the most commonly used methods for qPCR is known as Taqman™, developed by Applied Biosystems. The method is based on the detection of fluorescence increase from an oligonucleotide probe molecule when degraded by the 5' exonuclease activity of the polymerase enzyme during the extension or elongation step of PCR. The oligonucleotide probe molecule contains a fluorescent "Reporter" moiety covalently attached to one end of the molecule, and a "Quencher" moiety attached to the other. The quencher moiety prevents emission of light by the reporter moiety, when the probe is intact. During each PCR cycle, double-stranded DNA is denatured at 95 °C, followed by specific binding of the PCR primers and Taqman oligonucleotide probe to complementary regions of the denatured DNA strands during the annealing step of PCR. During the extension or elongation step of PCR, the polymerase enzyme traverses the template from the 3' end of each primer, degrading bound probe with its 5' exonuclease activity, which separates the Reporter from the Quencher moieties. This results in a light emission increase in proportion to the exponential increase in DNA copies during PCR amplification. A threshold cycle (Ct) is then determined corresponding to the point at which fluorescence begins to increase in a linear fashion. Samples with higher target cell numbers will have a lower Ct, while those with lower target cell numbers will have a higher Ct.

A. Reagents Needed:

DNA Molecular Grade Water (AccuGENE, Cambrex # 51200, or equivalent)
qPCR Taq Polymerase (Applied Biosystems, TaqMan Universal PCR Master Mix, no Amp Erase, cat. # 4364341)
Primers and Probes specific for the *recF* gene of *Bg* DNA (Table A5-1)

Table I5-1: qPCR Primers and Probe (Sigma Aldrich, or Equivalent, HPLC Purified)

Target Organism	Primers/ Probe	Sequence (5' to 3')	Reference
B. globigii	*Bg*42F	CGC GCC CGA GGA CTT AA	Kane et. al (2009)
	*Bg*104R	ATG TCA AGA AAC CGC CGT C	
	*Bg*60FT	FAM-TCT CGT AAA GGG CAG CCC GCA AG -TAMRA	

B. Equipment Needed:

Applied Biosystems 7900HT Prism, or equivalent.

C. Procedure:

1. For each DNA sample isolated, perform two additional ten-fold dilutions[1] of the isolated DNA, (1:10 and 1:100 dilutions; 20 µL plus 180 µL molecular grade water per dilution).

[1] Between experiments, store DNA dilutions at 20 °C to prevent degradation. To avoid excessive freeze thaw cycle, which can degrade DNA, make multiple aliquots of the DNA dilutions before freezing.

Note: Analysis of multiple dilutions of isolated DNA samples should provide a dose-response with dilution, indicative of positive PCR amplification. (Background or non-specific PCR amplification would give similar Ct values for all dilutions). Comparison of undiluted DNA and 1:10 and 1:1000 dilutions could be indicative of PCR inhibitors in the DNA sample (if undiluted samples showed negative amplification, and diluted ones were positive and dose-responsive).

2. Prepare enough PCR "master mix" to analyze all samples. Enough master mix is prepared to divide equally among all samples, plus approximately 4% (v/v) extra to allow for loss due to pipetting etc. (Table I5-2).

Table I5-2: Master Mix Preparation Table

Reagent	Reaction Volume (µL)	Quantity Master Mix (µL)	Final Concentration (µM)	Quantity Master Mix + 4% (µL)
Taqman Universal PCR Master Mix, 2X	10	650		676
Probe (10 pmol/µL)	0.8	52	0.4	54.08
Forward Primer (10 pmol/µL)	1	65	0.5	67.6
Reverse Primer (10 pmol/µL)	1	65	0.5	67.6
Sample Template Volume	2	130		135.2
Water	5.2	338		351.52
Total Reaction Volume	20	1300		1352
Number of Samples	65			

3. Figure I5-1 below shows a typical setup of a 96-well PCR plate for analysis of BOTE DNA samples on the Prism 7900HT. Three dilutions (undiluted, 1:10 and 1:100) are analyzed for each DNA sample, with triplicate PCR reactions per dilution. In addition, previously prepared and characterized positive and negative DNA detection controls are analyzed with each PCR 96-well run. In this case, *Bg* DNA (BOTE strain) and *Bg* DNA (+ strain) are used as positive (pos) controls (A1-A6), and *E. coli* DNA is used as a negative (neg) detection control (A7-A9). Furthermore, no-template PCR controls (NTC) in which water is substituted for sample template are used (A10-A12).

	1	2	3	4	5	6	7	8	9	10	11	12
A	*Bg* BOTE DNA Pos Control			*Bg* + DNA Pos Control 1:10			*E. coli* DNA Neg Control			No Template Control (NTC)		
B	DNA #1 Undiluted			DNA #1 Diluted 1:10			DNA #1 Diluted 1:100			DNA #2 Undiluted		
C	DNA #2 Diluted 1:10			DNA #2 Diluted 1:100			DNA #3 Undiluted			DNA #3 Diluted 1:10		
D	DNA #3 Diluted 1:100			DNA #4 Undiluted			DNA #4 Diluted 1:10			DNA #4 Diluted 1:100		
E	DNA #5 Undiluted			DNA #5 Diluted 1:10			DNA #5 Diluted 1:100			DNA #6 Undiluted		
F	DNA #6 Diluted 1:10			DNA #6 Diluted 1:100			DNA #7 Undiluted			DNA #7 Diluted 1:10		
G	DNA #7 Diluted 1:100			DNA #8 Undiluted			DNA #8 Diluted 1:10			DNA #8 Diluted 1:100		
H	DNA #9 Undiluted			DNA #9 Diluted 1:10			DNA #9 Diluted 1:100			Empty	Empty	Empty

Figure I5-1: Typical qPCR 96 well plate set-up for analysis of triplicate BOTE extracted DNA samples.

Note: Use of an Excel® spreadsheet to enter sample information speeds up the process, as entries can be copied and pasted into the Excel® spreadsheet. Data entry into the Applied Biosystems 7900HT Prism software requires typing each entry individually.

4. Perform the PCR with a quantitative PCR unit (like Applied Biosystems 7900HT Prism), using the PCR conditions listed in Table I5-3:

Table I5- 3: Thermocycler Program Specifications

Cycle	Temperature (°C)	Time	Number of Cycles
DNA denaturation	95	10 minutes	1
PCR amplification	95 60	15 seconds 1 minute	45

D. Data Analysis: Determination of Ct values by Prism SDS Software

In order to accurately compare Ct values between qPCR experimental runs, it is necessary to consistently set Baseline and Threshold values in Prism SDS software when analyzing results for an individual run. The software will automatically calculate both Baseline (number of cycles corresponding to background noise preceding exponential signal, usually between cycles 3-15) and Threshold settings (setting that determines actual Ct value).

Normally, an automatic baseline setting of 3-15 cycles is appropriate for most runs, and does not need to be adjusted. However, the use of an automatic threshold setting can result in differential calculation of Ct values, depending upon the threshold value determined by the software. In order to accurately calculate Ct values, the threshold setting should be set manually so that it corresponds to the midpoint in the exponential region of signal increase.

Procedure for setting proper threshold:

1. After completion of PCR run, select “Analyze” under Analysis Heading of SDS software.

Note: Once a qPCR run on the Applied Biosystems 7900HT Prism is completed, the primary data is saved and stored automatically by the unit. The baseline and threshold values can be changed and adjusted at any time, without loss of the primary data.

2. Open the results tab, select all data (Ctrl-a) and examine the amplification patterns. At this point, the unit has automatically determined both the Baseline and Threshold values. Leave the baseline setting on “Automatic Baseline” corresponding to cycles 3-15.
3. Next, choose Manual Ct, and adjust the threshold (green line) so that it is approximately halfway up the exponential portion of the curve (Figure I5-2). For most primer and probe systems, this corresponds to a setting of a 0.2 threshold value. Once the threshold is properly set, resave the data (Ctrl-S).

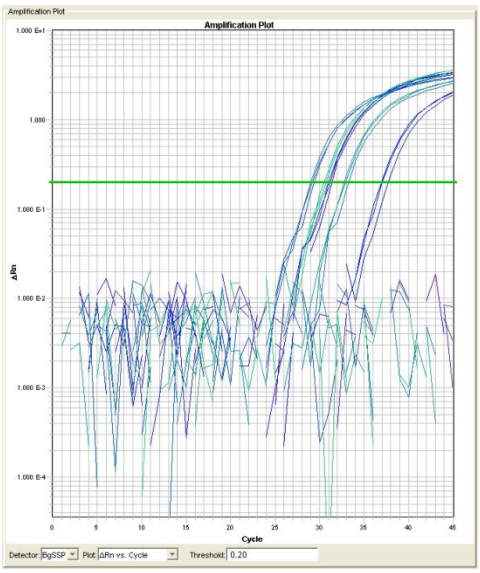


Figure I5-2: Representative qPCR amplification plot.

4. Using the Prism SDS Software, export the calculated Ct values by choosing File > Export and select location for saving the file (saved as a .txt file).
5. Open the exported txt file using the Excel program, and Sort the data by choosing Data > Sort > Sort by Well > Ascending. The Data should now be sorted so that Sample Names (column B) ascend from A1-A12, B1-B12 etc.
6. Select and copy Ct values (column F) and Paste Special (values only) into Excel spreadsheet containing sample information. Average Ct and SD values will then be calculated. Analysis of DNA samples should result in a nearly linear Ct vs. dilution plot (at least $R^2 > 0.95$). *E. coli* controls should be negative (40 or greater Ct), and prior *Bg* DNA control within 5% of prior determined Ct values.

References

ABI Prism 7900HT Sequence Detection System User Guide, Part Number 4317596 Rev. B 12/2002

AOAC (2002). Sporicidal activity of disinfectants. Official Method 966.04, AOAC International.

Brown, G. S., R. G. Betty, et al. (2007). Evaluation of a wipe surface sample method for collection of *Bacillus* spores from nonporous surfaces. App Environ Microbio **73**(3): 706-710.

Kane, S.R., Letant, S.E., Murphy, G.A., Alfaro, T.M., Krauter, P.W., Mahnke, R., Legler, T.C., and Raber, E. (2009). Rapid, high-throughput, culture-based PCR methods to analyze samples for viable spores of *Bacillus anthracis* and its surrogates. J Microbio Methods **76**(3): 278-284.

Attachment I-6: USGS Sand DNA Extraction Protocol for the Detection of *Bacillus atrophaeus* subsp. *globigii*

Introduction

This document describes a method for the qPCR detection of DNA from *Bacillus atrophaeus* subsp. *globigii* (*Bg*) spores. It consists of two primary steps: DNA isolation from spores of *Bg* and qPCR analysis of the DNA. Specificity of qPCR detection is determined by comparison of results to non-target DNA (for example *Escherichia coli*) and positive control DNA from formerly characterized *Bg* spore preparations.

Quantitative PCR (qPCR) is an adaptation of the basic PCR procedure to allow specific quantification of copy numbers in original samples, rather than the plus/minus detection of conventional PCR. One of the most commonly used methods for qPCR is known as Taqman™, developed by Applied Biosystems. The method is based on the detection of fluorescence increase from an oligonucleotide probe molecule when degraded by the 5' exonuclease activity of the polymerase enzyme during the extension or elongation step of PCR. The oligonucleotide probe molecule contains a fluorescent "Reporter" moiety covalently attached to one end of the molecule, and a "Quencher" moiety attached to the other. The quencher moiety prevents emission of light by the reporter moiety, when the probe is intact (e.g. free in solution). During each PCR cycle, double-stranded DNA is denatured at 95 °C, followed by specific binding of the PCR primers and Taqman oligonucleotide probe to complementary regions of the denatured DNA strands during the annealing step of PCR. Then during the extension or elongation step of PCR, the polymerase enzyme traverses the template from the 3' end of each primer, degrading bound probe with its 5' exonuclease activity, which separates the Reporter from the Quencher moieties. This results in a light emission increase in proportion to the exponential increase in DNA copies during PCR amplification. A threshold cycle (Ct) is then determined corresponding to the point at which fluorescence begins to increase in a linear fashion. Samples with higher target cell numbers will have a lower Ct, while those with lower target cell numbers will have a higher Ct.

A. Reagents:

PowerSoil® DNA Isolation Kit (MO Bio cat. 12888, or equivalent)
DNA Molecular Grade Water (MO BIO Catalog # 17000-10), or equivalent)
qPCR Taq Polymerase (Applied Biosystems, TaqMan Universal PCR Master Mix, no Amp Erase, catalog #4364341)
qPCR primers and probe (Eurofins MWG Operon, Table I6-1)

Table I6-1: qPCR Primers and Probe

Target Organism	Primers/ Probe	Sequence (5' to 3')	Reference
B. globigii	*Bg*42F	CGC GCC CGA GGA CTT AA	Kane et. al (2009)
	*Bg*104R	ATG TCA AGA AAC CGC CGT C	
	*Bg*60FT	FAM-TCT CGT AAA GGG CAG CCC GCA AG -TAMRA	

B. Equipment:

MO BIO Vortex Adapter tube holder for the vortex (MO BIO Catalog No. 13000-V1)
PowerVAC™ vacuum manifold (MO BIO Catalog #11991, or equivalent)
PowerVAC™ Mini System (MO BIO Catalog #11992)
PowerVAC™ Mini Spin Filter Adaptors (MO BIO Catalog #11992-20)

Applied BioSystems StepOne 48-well Real-Time PCR system (Applied Biosystems, Catalog #4376373)

C. DNA Isolation

This procedure is based on the MO BIO PowerSoil® DNA Isolation Kit #12888 instructions. The Operator must wear gloves at all times.

1. Weigh out ~0.25 gram of the sand sample. Record the weight in the lab book and place the sample in the MO BIO garnet beating tube (PowerBead Tubes). Label the tube.
2. Gently vortex to mix.
3. Check Solution C1. If Solution C1 is precipitated, heat solution to 60 °C until dissolved before use.
4. Add 60 µL of Solution C1 and invert several times or vortex briefly.
5. Secure PowerBead Tubes horizontally using the MO BIO Vortex Adapter tube holder for the vortex (MO BIO Catalog No. 13000-V1) or secure tubes horizontally on a flat-bed vortex pad with tape. Vortex at maximum speed for 10 minutes.
6. Make sure the PowerBead Tubes rotate freely in the centrifuge without rubbing. Centrifuge tubes at 10,000 x g for 30 seconds at room temperature. CAUTION: Be sure not to exceed 10,000 x g or tubes might break.
7. Transfer the supernatant to a clean 2 mL Collection Tube (provided). Note: Expect between 400 to 500 µL of supernatant. Supernatant could still contain some sand particles.
8. Add 250 µL of Solution C2 and vortex for 5 seconds. Incubate at 4 °C for 5 minutes.
9. Centrifuge the tubes at room temperature for 1 minute at 10,000 x g.
10. Avoiding the pellet, transfer up to, but no more than, 600 µL of supernatant to a clean 2 mL Collection Tube (provided).
11. Add 200 µL of Solution C3 and vortex briefly. Incubate at 4 °C for 5 minutes.
12. Centrifuge the tubes at room temperature for 1 minute at 10,000 x g.
13. Avoiding the pellet, transfer up to, but no more than, 750 µL of supernatant into a clean 2mL Collection Tube (provided).
14. Add 1200 µL of Solution C4 to the supernatant and vortex for 5 seconds.
15. For each preparation, attach one aluminum PowerVac™ Mini Spin Filter Adapter (MO BIO Catalog#11992-10 or 11992-20) into the Luer-Lok® fitting of one port in the manifold. Gently press a Spin Filter column into the PowerVac™ Mini Spin Filter Adapter until snugly in place. Ensure that all unused ports of the vacuum manifold are closed. Note: Aluminum PowerVac™ Mini Spin Filter Adapters are reusable.
16. Transfer 650 µL of prepared sample lysate (from step 14) to the Spin Filter column.
17. Turn on the vacuum source and open the stopcock of the port. Hold the tube in place when opening the stopcock to keep the spin filter steady. Allow the lysate to pass through the Spin Filter column. After the lysate has passed through the column completely, load again with the next 650 µL of lysate. Continue until all of the lysate has been loaded onto the Spin Filter column. Close the one-way Luer-Lok® stopcock of that port. Note: If Spin Filter Columns are filtering slowly, close the ports to samples that have completed filtering to increase the pressure to the other columns.
18. Load 800 µL of 100% ethanol into the Spin Filter so that it completely fills the column. Open the stopcock while holding the column steady. Allow the ethanol to pass through the column completely. Close the stopcock.
19. Add 500 µL of Solution C5 to each Spin Filter. Open the Luer-Lok® stopcock and apply a vacuum until Solution C5 has passed through the Spin Filter completely. Continue to pull a vacuum for another minute to dry the membrane. Close each port.

20. Turn off the vacuum source and open an unused port to vent the manifold. If all 20 ports are in use, break the vacuum at the source. Make certain that all vacuum pressure is released before performing the next step. It is important to turn off the vacuum at the source to prevent backflow into the columns.
21. Remove the Spin Filter column and place in the original labeled 2 mL Collection Tube. Place into the centrifuge and spin at 13,000 × g for 1 minute to completely dry the membrane.
22. Transfer the Spin Filter column to a new 2 mL Collection Tube and add 100 µL of Solution C6 to the center of the white filter membrane. Alternatively, sterile DNA-Free PCR Grade Water could be used for elution from the silica Spin Filter membrane at this step (MO BIO Catalog # 17000-10).
23. Centrifuge at room temperature for 30 seconds at 10,000 x g.
24. Discard the Spin Filter column. The DNA in the tube is now ready for any downstream application. No further steps are required. It is recommend to store DNA frozen (-20 °C to -80 °C). Solution C6 contains no EDTA.
25. Store the sample at -70 °C until ready to run qPCR analysis.

D. qPCR Analysis of Isolated DNA

1. Prepare enough PCR "master mix" to analyze all samples. Enough master mix is prepared to divide equally among all samples, plus approximately 4% extra to allow for loss due to pipetting etc. Use the embedded spreadsheet below to calculate master mix volumes.

Table I6-2: Master Mix Preparation Table

Reagent	Reaction Volume (µL)	Quantity Master Mix (µL)	Final Concentration (µM)	Quantity Master Mix + 4% (µL)
Number of Samples	10			
Taqman Universal PCR Master Mix, 2X	12.5	125		130
Probe (10 pmol/µL)	2.0	20	1.0	20.8
Forward primer (10 pmol/µL)	2.0	20	1.0	20.8
Reverse primer (10 pmol/µL)	2.0	20	1.0	20.8
Water	4.5	45		46.8
Extracted Sample Template vol (µL)	2.0			
Total Reaction Volume	25			

2. 2 µL of DNA extracts are used directly from the DNA Isolation procedure previously detailed.

3. Enter samples to be analyzed in the Applied BioSystems StepOne™ software package. 10% of the environmental sand samples will be run in duplicate.

   In addition to the environmental samples, previously prepared and characterized positive and negative DNA detection controls are analyzed, using previously prepared DNA samples. In this case, *E. coli* DNA is used as a negative detection control, and *B. globigii*

DNA is used as a positive control. Furthermore, no-template PCR controls which are water substituted for sample template are used.

4. Perform PCR with an Applied BioSystems StepOne™ 48-well Real-Time PCR system (Carlsbad, CA).

Table I6- 3: Thermocycler Program Specifications

Cycle	Temperature (°C)	Time	Number of Cycles
DNA denaturation	50	2 minutes	1
	95	10 minutes	
PCR amplification	95	15 seconds	45
	60	15 seconds	

5. Analyze data and paste Ct values into sample spreadsheet, to determine average Ct and SD values. E. coli controls should be negative (40 or greater Ct), and prior *Bg* DNA control within 5% of prior determined Ct values.

   The Applied BioSystems StepOne™ software package will give a visual representation of the collected data similar to that below (Figure I6-1).

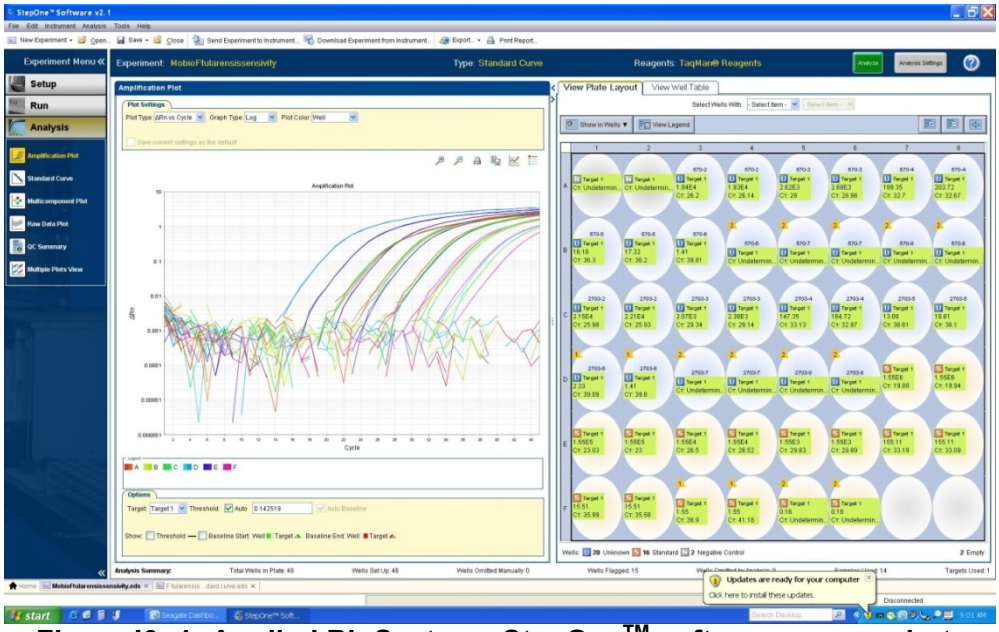


Figure I6- 1: Applied BioSystems StepOne™ software screen shot.

References

Kane, SR, Letant, SE, Murphy, GA, Alfaro, TM, Krauter, PW, Mahnke, R, Legler, TC, and Raber, E (2009). *Rapid, high-throughput, culture-based PCR methods to analyze samples for viable spores of Bacillus anthracis and its surrogates*. Journal of Microbiology Methods **76**(3): 278-284.

MO BIO Laboratories, Inc. PowerSoil® DNA Isolation Kit Instruction Manual. Version 08202010.

Appendix G

Report of Sample Results – LRN Samples

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4160	MFP	Floor 1	Corridor+Lobby	15.077	16.656	2.500	Vacuum Sock	4.000	Martinez	4/15/2011	12:13:00 PM	Ceiling	Porous	Horizontal Downward	FALSE		1	Yes	2.3	NA
2462	MFP	Floor 1	Corridor +Lobby	5.781	13.165	1.894	Sponge Wipe	0.694	Terrill	4/15/2011	10:56:00 AM	Return Vent	Metal	Horizontal Upward	FALSE		2	No	ND	ND
4211	MFP	Floor 1	Room 101A	19.523	7.327	0.500	Vacuum Sock	4.000	Oudejans	4/15/2011	11:55:00 AM	Chair	Cloth	Horizontal Upward	FALSE	chair not in correct position; chair near desk in front of window is sampled vacuum ;vertical sampled first.safety hazard on power cord	2	Yes	ND	0.6
4153	MFP	Floor 1	Room 101A	19.831	8.009	0.000	Vacuum Sock	4.000	Oudejans	4/15/2011	12:19:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank vacuum	2	No	ND	ND
2934	MFP	Floor 1	Room 101A	19.033	6.827	0.792	Sponge Wipe	0.694	Oudejans	4/15/2011	11:48:00 AM	Desk	Plastic	Horizontal Upward	FALSE	slight wet surface vertical sampled first	2	No	ND	ND
3211	MFP	Floor 1	Room 101A	19.489	8.313	0.000	Sponge Wipe	0.694	Oudejans	4/15/2011	12:16:00 PM	Floor	Carpet	Horizontal Upward	TRUE	manual position;	2	No	ND	ND
4193	MFP	Floor 1	Room 102	17.810	15.708	0.000	Vacuum Sock	4.000	Oudejans	4/15/2011	12:49:00 PM	Floor	Carpet	Horizontal Upward	FALSE	sampled closer to the outside wall than indicated.;socket came off; air sampling off before vacuum. restart sampling after reassemling unit.	3	Yes	16.7	ND
2861	MFP	Floor 1	Room 102	19.499	17.171	1.000	Sponge Wipe	0.694	Oudejans	4/15/2011	12:34:00 PM	Desk	Plastic	Horizontal Upward	FALSE	vertical first; dirty desk; carryover on template <Collector listed this sample as a swab, INL and the LRN labs noted it as a Sponge Stick. Collection Method changed to Sponge Stick. R. Knowlton>	2	No	ND	ND
4166	MFP	Floor 1	Room 103	13.493	6.414	2.500	Vacuum Sock	4.000	Martinez	4/15/2011	12:02:00 PM	Ceiling	Porous	Horizontal Downward	FALSE		2	No	ND	ND
3226	MFP	Floor 1	Room 103	15.321	8.714	0.688	Sponge Wipe	0.694	Martinez	4/15/2011	11:48:00 AM	Countertop	Smooth	Horizontal Upward	FALSE		2	No	ND	ND
3227	MFP	Floor 1	Room 103	13.093	11.021	0.280	Sponge Wipe	0.694	Martinez	4/15/2011	11:43:00 AM	Wall	Textured	Vertical	FALSE	<Collector listed this sample as a wipe, INL and the LRN labs noted it as a Sponge Stick. Collection Method changed to Sponge Stick. R. Knowlton>	2	No	ND	ND
4202	MFP	Floor 1	Room 104	13.793	18.848	0.480	Vacuum Sock	4.000	Martinez	4/15/2011	12:36:00 PM	Countertop	Metal	Horizontal Downward	TRUE	blank	2	No	ND	ND
3230	MFP	Floor 1	Room 104	15.033	20.344	0.420	Sponge Wipe	0.694	Martinez	4/15/2011	12:26:00 PM	Countertop	Porous	Horizontal Downward	FALSE		2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3231	MFP	Floor 1	Room 104	13.774	18.886	0.480	Sponge Wipe	0.694	Martinez	4/15/2011	12:34:00 PM	Countertop	Porous	Horizontal Downward	TRUE	blank	2	No	ND	ND
4161	MFP	Floor 1	Room 105	10.902	10.524	0.000	Vacuum Sock	4.000	Martinez	4/15/2011	11:27:00 AM	Floor	Carpet	Horizontal Upward	FALSE		1	Yes	2.4	NA
2935	MFP	Floor 1	Room 105	11.836	12.052	0.762	Sponge Wipe	0.694	Martinez	4/15/2011	11:19:00 AM	Countertop	Smooth	Horizontal Upward	FALSE	formica and sampled on left side	2	No	ND	ND
4196	MFP	Floor 1	Room 106	11.285	20.380	0.350	Vacuum Sock	4.000	Martinez	4/15/2011	10:59:00 AM	Chair	Cloth	Horizontal Upward	FALSE	chair under window. note fr previous swab sample, screen was on opposite side of desk.	2	Yes	8.3	12.7
4154	MFP	Floor 1	Room 106	10.994	18.447	0.400	Vacuum Sock	4.000	Martinez	4/15/2011	10:47:00 AM	Chair	Cloth	Horizontal Upward	FALSE		3	Yes	8.3	ND
2936	MFP	Floor 1	Room 106	11.581	15.620	1.000	Sponge Wipe	0.694	Martinez	4/15/2011	10:35:00 AM	Countertop	Smooth	Horizontal Upward	FALSE		2	No	ND	ND
1693	MFP	Floor 1	Room 106	10.312	18.006	0.400	Swab	0.028	Martinez	4/15/2011	10:53:00 AM	Computer	Glass	Horizontal Upward	FALSE	computer screen	4	No	ND	NA
4197	MFP	Floor 1	Room 107	8.307	10.778	1.200	Vacuum Sock	4.000	Terrill	4/15/2011	12:36:00 PM	Countertop	Plastic	Horizontal Upward	TRUE		1	No	ND	NA
4232	MFP	Floor 1	Room 107	8.426	8.328	1.300	Vacuum Sock	4.000	Terrill	4/15/2011	12:23:00 PM	Chair	Leather	Horizontal Upward	FALSE	correction to sample. 2nd entry of this sample.	2	No	ND	ND
4183	MFP	Floor 1	Room 107	8.313	11.931	2.199	Vacuum Sock	4.000	Terrill	4/15/2011	11:48:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile was taken down from ceiling before sampling for safety reasons	2	No	ND	ND
4207	MFP	Floor 1	Room 107	8.913	9.014	0.200	Vacuum Sock	4.000	Terrill	4/15/2011	11:59:00 AM	Chair	Porous	Horizontal Downward	FALSE	sample was taken from couch. sample object menu didn't have that description.	2	Yes	4.2	ND
2418	MFP	Floor 1	Room 107	8.021	11.087	1.200	Sponge Wipe	0.694	Terrill	4/15/2011	12:30:00 PM	Countertop	Plastic	Horizontal Upward	TRUE	need option for blanks in drop down menu for sample object	2	No	ND	ND
2931	MFP	Floor 1	Room 107	7.094	6.901	1.300	Sponge Wipe	0.694	Terrill	4/15/2011	12:24:00 PM	Shelves	Smooth	Horizontal Upward	FALSE	2nd entry of sample	2	No	ND	ND
1582	MFP	Floor 1	Room 107	8.378	11.373	1.200	Swab	0.028	Terrill	4/15/2011	12:31:00 PM	Countertop	Plastic	Horizontal Upward	TRUE		4	No	ND	NA
1513	MFP	Floor 1	Room 107	7.236	9.732	0.800	Swab	0.028	Terrill	4/15/2011	12:26:00 PM	Desk	Smooth	Horizontal Upward	FALSE	2nd of this sample	4	No	ND	NA
4150	MFP	Floor 1	Room 108	8.000	18.439	0.486	Vacuum Sock	4.000	Anaya	4/15/2011	12:28:00 PM	Chair	Porous	Horizontal Upward	FALSE		2	Yes	8.3	ND
2855	MFP	Floor 1	Room 108	7.326	18.010	0.814	Sponge Wipe	0.694	Anaya	4/15/2011	12:22:00 PM	Desk	Smooth	Horizontal Upward	FALSE		2	No	ND	ND
1590	MFP	Floor 1	Room 108	8.716	19.910	2.325	Swab	0.028	Anaya	4/15/2011	12:45:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	Swab of the diffuser on the ceiling	4	No	ND	NA
1592	MFP	Floor 1	Room 108	7.201	18.978	0.811	Swab	0.028	Anaya	4/15/2011	12:39:00 PM	Computer	Smooth	Vertical	FALSE	Lower right hand corner of the computer monitor	4	No	ND	NA
4224	MFP	Floor 1	Room 109	5.673	8.714	0.381	Vacuum Sock	4.000	Terrill	4/15/2011	11:24:00 AM	Chair	Cloth	Horizontal Upward	FALSE	sample taken from bed. bed was not an option in drop down menu for sample object.	3	Yes	12.5	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4140	MFP	Floor 1	Room 109	5.873	12.014	0.000	Vacuum Sock	4.000	Terrill	4/15/2011	11:09:00 AM	Floor	Carpet	Horizontal Upward	FALSE		7	No	ND	ND
2093	MFP	Floor 1	Room 109	5.680	6.290	0.200	Sponge Wipe	0.694	Terrill	4/15/2011	11:30:00 AM	Wall	Textured	Vertical	FALSE		2	No	ND	ND
2417	MFP	Floor 1	Room 109	6.221	10.431	1.743	Sponge Wipe	0.694	Terrill	4/15/2011	11:12:00 AM	Shelves	Metal	Horizontal Upward	FALSE		2	Yes	268.8	ND
4209	MFP	Floor 1	Room 110	5.212	20.467	0.496	Vacuum Sock	4.000	Anaya	4/15/2011	12:00:00 PM	Chair	Porous	Horizontal Upward	FALSE		2	Yes	4.2	ND
3213	MFP	Floor 1	Room 110	4.373	19.996	0.697	Sponge Wipe	0.694	Anaya	4/15/2011	11:54:00 AM	Shelves	Smooth	Horizontal Upward	FALSE	Sample was on the front of the top of the filing cabinet. Sample was put in the wrong bag that bag was placed in the correct one.	2	No	ND	ND
2859	MFP	Floor 1	Room 110	4.917	14.457	0.000	Sponge Wipe	0.694	Anaya	4/15/2011	11:38:00 AM	Wall	Smooth	Vertical	FALSE		2	No	ND	ND
1688	MFP	Floor 1	Room 110	4.211	18.851	0.892	Swab	0.028	Anaya	4/15/2011	11:44:00 AM	Computer	Smooth	Vertical	FALSE	sample was taken on bottom right corner of the computer monitor	4	No	ND	NA
3233	MFP	Floor 2	Hallway	6.493	12.668	3.000	Sponge Wipe	0.694	Inman	4/15/2011	10:54:00 AM	Return Vent	Smooth	Horizontal Upward	FALSE	horizontal vent 10x10 surface area left side as viewed by sampler	2	No	ND	ND
3201	MFP	Floor 2	Room 206	16.142	20.154	3.789	Sponge Wipe	0.694	Stephanie	4/15/2011	12:07:00 PM	Countertop	Textured	Horizontal Upward	FALSE	spongestick on wood table top.	5	No	ND	ND
3200	MFP	Floor 2	Room 206	17.385	14.420	3.395	Sponge Wipe	0.694	Stephanie	4/15/2011	11:57:00 AM	Wall	Textured	Vertical	FALSE	vertical spongestick on wall	5	No	ND	ND
1691	MFP	Floor 2	Room 206	17.321	20.254	3.000	Swab	0.028	Stephanie	4/15/2011	12:13:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE	swab sample from diffuser on ceiling.	4	No	ND	ND
3207	MFP	Floor 2	Room 207	16.200	6.250	5.291	Sponge Wipe	0.694	Stephanie	4/15/2011	12:19:00 PM	Countertop	Smooth	Horizontal Upward	FALSE	spongestick on tabletop. left upper corner when facing table.	5	Yes	83.5	7.8
4181	MFP	Floor 2	Room 208	13.571	18.427	3.000	Vacuum Sock	4.000	Stephanie	4/15/2011	11:37:00 AM	Chair	Porous	Horizontal Upward	FALSE	vacuum sample from seat of desk chair. no template used due to size of area.	5	Yes	12.5	ND
3205	MFP	Floor 2	Room 208	13.302	15.079	3.000	Sponge Wipe	0.694	Stephanie	4/15/2011	11:22:00 AM	Desk	Smooth	Horizontal Upward	FALSE	spongestick on table.	5	Yes	66.2	18.1
1692	MFP	Floor 2	Room 208	12.849	18.469	3.000	Swab	0.028	Stephanie	4/15/2011	11:32:00 AM	Computer	Smooth	Vertical	FALSE	swab sample from computer monitor upper left corner.	4	No	ND	ND
3975	MFP	Floor 2	Room 209	14.356	8.540	3.000	Vacuum Sock	4.000	Stephanie	4/15/2011	11:13:00 AM	Floor	Carpet	Horizontal Upward	FALSE	vacuum floor near stove.	5	Yes	ND	2.9
4138	MFP	Floor 2	Room 209	13.371	10.869	5.266	Vacuum Sock	4.000	Stephanie	4/15/2011	11:03:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	vac ceiling tile	5	No	ND	ND
3902	MFP	Floor 2	Room 209	14.371	12.140	3.000	Vacuum Sock	4.000	Stephanie	4/15/2011	10:43:00 AM	Floor	Carpet	Horizontal Upward	FALSE	sample of threshold carpet.	5	Yes	ND	17.3
3210	MFP	Floor 2	Room 209	13.271	11.869	3.000	Sponge Wipe	0.694	Stephanie	4/15/2011	10:55:00 AM	Countertop	Smooth	Horizontal Upward	FALSE	spongestick on countertop.	5	Yes	208.3	292.3

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4174	MFP	Floor 2	Room 210	10.637	20.379	3.000	Vacuum Sock	4.000	Inman	4/15/2011	11:46:00 AM	Chair	Cloth	Vertical	FALSE	chair far back wall vacuum of seat cushion	2	Yes	ND	0.6
2956	MFP	Floor 2	Room 210	12.150	19.962	3.000	Sponge Wipe	0.694	Inman	4/15/2011	11:49:00 AM	Countertop	Metal	Vertical	FALSE	upper left corner of top of 4 drawer metel cabinet	5	Yes	ND	TNTC
3212	MFP	Floor 2	Room 210	12.102	16.945	3.000	Sponge Wipe	0.694	Inman	4/15/2011	11:53:00 AM	Wall	Textured	Vertical	FALSE	10in x 10in sample above electrical outlet on right wall	5	Yes	ND	2.7
1694	MFP	Floor 2	Room 210	9.799	18.845	3.000	Swab	0.028	Inman	4/15/2011	11:42:00 AM	Computer	Glass	Vertical	FALSE	upper left corner of computer monitor	4	No	ND	ND
4213	MFP	Floor 2	Room 211	10.302	10.940	3.000	Vacuum Sock	4.000	Cavada	4/15/2011	11:37:00 AM	Floor	Carpet	Horizontal Upward	TRUE		7	No	ND	ND
4186	MFP	Floor 2	Room 211	11.611	12.224	3.000	Vacuum Sock	4.000	Cavada	4/15/2011	11:27:00 AM	Floor	Carpet	Horizontal Upward	FALSE		5	Yes	ND	21.9
4185	MFP	Floor 2	Room 211	11.599	9.440	4.000	Vacuum Sock	4.000	Cavada	4/15/2011	12:06:00 PM	Chair	Cloth	Horizontal Upward	FALSE	couch	5	Yes	25.0	14.4
4128	MFP	Floor 2	Room 211	10.850	8.276	3.396	Vacuum Sock	4.000	Cavada	4/15/2011	12:12:00 PM	Chair	Cloth	Horizontal Upward	FALSE		5	Yes	12.5	0.6
4177	MFP	Floor 2	Room 211	10.850	10.630	3.000	Vacuum Sock	4.000	Cavada	4/15/2011	11:49:00 AM	Floor	Carpet	Horizontal Upward	FALSE		5	Yes	12.5	ND
3206	MFP	Floor 2	Room 211	10.326	11.701	3.000	Sponge Wipe	0.694	Cavada	4/15/2011	11:39:00 AM	Floor	Carpet	Horizontal Upward	TRUE		5	Yes	ND	2.9
3234	MFP	Floor 2	Room 211	9.600	6.940	4.500	Sponge Wipe	0.694	Cavada	4/15/2011	12:25:00 PM	Shelves	Smooth	Horizontal Upward	FALSE		5	Yes	74.9	ND
1686	MFP	Floor 2	Room 211	10.540	11.463	3.000	Swab	0.028	Cavada	4/15/2011	11:44:00 AM	Floor	Carpet	Horizontal Upward	TRUE		4	No	ND	ND
1522	MFP	Floor 2	Room 211	9.600	9.459	3.494	Swab	0.028	Cavada	4/15/2011	12:20:00 PM	Shelves	Smooth	Horizontal Upward	FALSE		4	No	ND	ND
4141	MFP	Floor 2	Room 212	7.279	18.455	3.000	Vacuum Sock	4.000	Inman	4/15/2011	11:28:00 AM	Chair	Carpet	Horizontal Upward	FALSE	vacuum sample off chair 2ft x 2ft area	2	Yes	66.7	31.6
4201	MFP	Floor 2	Room 212	6.879	14.555	3.000	Vacuum Sock	4.000	Inman	4/15/2011	11:24:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank vacuum	2	No	ND	ND
4203	MFP	Floor 2	Room 212	7.179	16.120	3.000	Vacuum Sock	4.000	Inman	4/15/2011	11:11:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	sample taken left corner 2ft x 2ft area	2	No	ND	ND
2320	MFP	Floor 2	Room 212	6.890	19.871	3.000	Sponge Wipe	0.694	Inman	4/15/2011	11:36:00 AM	Countertop	Metal	Vertical	FALSE	upper half closest to wall	5	No	ND	ND
3214	MFP	Floor 2	Room 212	7.179	15.555	3.000	Sponge Wipe	0.694	Inman	4/15/2011	11:16:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank air	2	No	ND	ND
1577	MFP	Floor 2	Room 212	6.779	18.955	3.000	Swab	0.028	Inman	4/15/2011	11:31:00 AM	Computer	Glass	Vertical	FALSE	upper left corner screen	4	No	ND	ND
1587	MFP	Floor 2	Room 212	6.879	15.355	3.000	Swab	0.028	Inman	4/15/2011	11:19:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank wipe	4	No	ND	ND
4170	MFP	Floor 2	Room 213	8.118	8.740	3.489	Vacuum Sock	4.000	Cavada	4/15/2011	11:02:00 AM	Countertop	Cloth	Horizontal Downward	FALSE	on bed	5	Yes	ND	5.2
4167	MFP	Floor 2	Room 213	7.998	11.696	3.000	Vacuum Sock	4.000	Cavada	4/15/2011	10:43:00 AM	Floor	Carpet	Horizontal Upward	FALSE		5	Yes	ND	27.9
3496	MFP	Floor 2	Room 213	6.735	10.416	4.768	Sponge Wipe	0.694	Cavada	4/15/2011	11:21:00 AM	Shelves	Smooth	Vertical	FALSE	on wall locker	5	Yes	306.0	35.0
3209	MFP	Floor 2	Room 213	7.710	6.373	3.296	Sponge Wipe	0.694	Cavada	4/15/2011	11:10:00 AM	Wall	Smooth	Vertical	FALSE		5	Yes	ND	6.9
3109	VHP Pre-Decon	Floor 1		0.247	3.131	0.000	Sponge Wipe	0.694		4/17/2011	3:26:00 PM	Prep table	Smooth	Horizontal Upward	FALSE		4	No	ND	NA
2569	VHP Pre-Decon	Floor 1		1.339	3.131	0.000	Sponge Wipe	0.694		4/17/2011	4:36:00 PM	Floor	Smooth	Horizontal Upward	TRUE	field blank air trailer	4	No	ND	NA
2073	VHP Pre-Decon	Floor 1		0.637	3.131	0.000	Sponge Wipe	0.694		4/17/2011	4:34:00 PM	Countertop	Smooth	Horizontal Upward	FALSE	counter next to slit to agar	4	Yes	1747.1	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2458	VHP Pre-Decon	Floor 1		1.027	3.053	0.000	Sponge Wipe	0.694		4/17/2011	4:35:00 PM	Countertop	Smooth	Horizontal Upward	FALSE	slit to agars air trailer	4	Yes	357490.5	NA
1738	VHP Pre-Decon	Floor 1		-0.117	3.105	0.000	Swab	0.028		4/17/2011	3:25:00 PM	Respirator	Smooth	Horizontal Upward	FALSE		4	No	ND	NA
3866	VHP Pre-Decon	Floor 1	Bathroom M	26.645	19.709	2.469	Vacuum Sock	4.000	Anaya	4/17/2011	3:17:00 PM	Ceiling	Carpet	Horizontal Upward	FALSE		6	Yes	52919.7	NA
2955	VHP Pre-Decon	Floor 1	Bathroom M	26.184	17.943	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	3:15:00 PM	Floor	Smooth	Horizontal Downward	FALSE	under where the sink was	6	Yes	203973.1	NA
2979	VHP Pre-Decon	Floor 1	Bathroom M	26.645	20.631	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	3:12:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	Yes	618024.7	NA
2977	VHP Pre-Decon	Floor 1	Bathroom M	25.839	19.479	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	3:11:00 PM	Floor	Smooth	Horizontal Downward	FALSE		6	Yes	374481.9	NA
2953	VHP Pre-Decon	Floor 1	Bathroom M	24.572	20.362	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	3:08:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	Yes	496061.3	NA
3865	VHP Pre-Decon	Floor 1	Bathroom W	25.679	16.287	2.478	Vacuum Sock	4.000	Anaya	4/17/2011	3:02:00 PM	Ceiling	Carpet	Horizontal Upward	FALSE		6	Yes	48752.8	NA
2976	VHP Pre-Decon	Floor 1	Bathroom W	24.209	15.298	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	2:43:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	Yes	542571.6	NA
2947	VHP Pre-Decon	Floor 1	Bathroom W	27.109	16.455	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	2:58:00 PM	Floor	Smooth	Horizontal Downward	FALSE	in stall	1	Yes	536235.8	NA
2940	VHP Pre-Decon	Floor 1	Bathroom W	25.189	16.782	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	2:55:00 PM	Wall	Smooth	Horizontal Downward	FALSE	under the soap dispensers	1	Yes	678454.4	NA
2952	VHP Pre-Decon	Floor 1	Bathroom W	27.068	14.535	0.498	Sponge Wipe	0.694	Anaya	4/17/2011	2:57:00 PM	Wall	Smooth	Vertical	FALSE		1	Yes	221.8	NA
3800	VHP Pre-Decon	Floor 1	Corridor+Lobby	22.820	15.384	2.478	Vacuum Sock	4.000	Anaya	4/17/2011	2:48:00 PM	Ceiling	Carpet	Horizontal Upward	FALSE		6	Yes	112923.1	NA
3888	VHP Pre-Decon	Floor 1	Corridor+Lobby	26.210	12.439	2.392	Vacuum Sock	4.000	Anaya	4/17/2011	2:29:00 PM	Ceiling	Smooth	Horizontal Upward	FALSE	ceiling tile was marked	1	Yes	99822.4	NA
4099	VHP Pre-Decon	Floor 1	Corridor+Lobby	26.212	9.027	2.365	Vacuum Sock	4.000	Anaya	4/17/2011	2:12:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	ceiling tile that is marked	1	Yes	55036.5	NA
4026	VHP Pre-Decon	Floor 1	Corridor+Lobby	24.527	8.380	0.000	Vacuum Sock	4.000	Anaya	4/17/2011	1:51:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	6	No	ND	NA
3794	VHP Pre-Decon	Floor 1	Corridor+Lobby	16.863	12.978	0.000	Vacuum Sock	4.000	Anaya	4/17/2011	12:35:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	6	No	ND	NA
3864	VHP Pre-Decon	Floor 1	Corridor+Lobby	15.612	12.954	2.374	Vacuum Sock	4.000	Anaya	4/17/2011	12:19:00 PM	Ceiling	Carpet	Horizontal Downward	FALSE	Sample was taken on left half of the ceiling tile.	6	Yes	20334.5	NA
3534	VHP Pre-Decon	Floor 1	Corridor+Lobby	9.982	13.267	2.397	Vacuum Sock	4.000	Anaya	4/17/2011	11:45:00 AM	Ceiling	Carpet	Horizontal Downward	FALSE	Sample was taken on the left half of the ceiling tile.	6	Yes	57086.6	NA
2185	VHP Pre-Decon	Floor 1	Corridor+Lobby	24.897	8.565	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	1:39:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	1	Yes	2051.9	NA
2951	VHP Pre-Decon	Floor 1	Corridor+Lobby	26.580	6.531	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	1:55:00 PM	Floor	Smooth	Horizontal Upward	FALSE	done on the floor in front of the left door	6	Yes	613608.9	NA
2975	VHP Pre-Decon	Floor 1	Corridor+Lobby	22.820	15.829	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	2:35:00 PM	Floor	Smooth	Horizontal Downward	FALSE		6	Yes	276469.6	NA
2933	VHP Pre-Decon	Floor 1	Corridor+Lobby	27.436	11.908	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	2:25:00 PM	Floor	Smooth	Horizontal Downward	FALSE	to the left when going out the door	6	Yes	517420.5	NA
2958	VHP Pre-Decon	Floor 1	Corridor+Lobby	24.985	11.418	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	2:23:00 PM	Floor	Smooth	Horizontal Downward	FALSE	taken in front of tray	1	Yes	492029.5	NA
2954	VHP Pre-Decon	Floor 1	Corridor+Lobby	23.637	13.088	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	2:18:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	Yes	568394.6	NA
2973	VHP Pre-Decon	Floor 1	Corridor+Lobby	27.315	9.635	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	2:02:00 PM	Floor	Smooth	Horizontal Upward	FALSE	left side of the floor in front of the door	1	Yes	469422.3	NA
2944	VHP Pre-Decon	Floor 1	Corridor+Lobby	22.841	9.455	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	1:33:00 PM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	842368.3	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2946	VHP Pre-Decon	Floor 1	Corridor+Lobby	26.294	10.252	0.395	Sponge Wipe	0.694	Anaya	4/17/2011	2:07:00 PM	Countertop	Smooth	Vertical	FALSE	sample was taken on the wooden side of the counntertop	6	Yes	6086.2	NA
2091	VHP Pre-Decon	Floor 1	Corridor+Lobby	18.677	13.924	2.081	Sponge Wipe	0.694	Anaya	4/17/2011	12:52:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	sample was taken on hvac	6	No	ND	NA
2690	VHP Pre-Decon	Floor 1	Corridor+Lobby	9.107	14.080	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	11:52:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sample was taken on left side of hall just before the third door on the left.	6	Yes	330707.5	NA
2667	VHP Pre-Decon	Floor 1	Corridor+Lobby	18.302	13.666	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	12:43:00 PM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	460302.7	NA
2726	VHP Pre-Decon	Floor 1	Corridor+Lobby	17.426	14.229	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	12:40:00 PM	Wall	Smooth	Vertical	FALSE	sample was taken 1 foot off the ground	1	Yes	2829.5	NA
2412	VHP Pre-Decon	Floor 1	Corridor+Lobby	17.239	13.354	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	12:32:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	6	Yes	49.0	NA
1982	VHP Pre-Decon	Floor 1	Corridor+Lobby	15.008	15.035	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	12:14:00 PM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	50758.1	NA
2948	VHP Pre-Decon	Floor 1	Corridor+Lobby	13.548	16.520	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	12:07:00 PM	Floor	Smooth	Horizontal Upward	FALSE	Sample was taken up against the left hand wall.	6	Yes	114302.9	NA
2532	VHP Pre-Decon	Floor 1	Corridor+Lobby	12.985	12.892	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	11:57:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sample was taken on the right side of the hallway in between the 3rd and 4th door.	6	Yes	450991.0	NA
2689	VHP Pre-Decon	Floor 1	Corridor+Lobby	6.980	13.955	1.967	Sponge Wipe	0.694	Anaya	4/17/2011	11:34:00 AM	Ceiling	Smooth	Horizontal Downward	FALSE	Sample was done on left side of the hvac.	6	Yes	23.5	NA
2791	VHP Pre-Decon	Floor 1	Corridor+Lobby	3.886	13.392	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	11:26:00 AM	Wall	Smooth	Vertical	FALSE	Sample was taken on the left side of the door as facing it. <Collector listed this sample as a swab, INL and the LRN labs noted it as a Sponge Stick. Collection Method changed to Sponge Stick. R. Knowlton>	6	Yes	1689.5	NA
2790	VHP Pre-Decon	Floor 1	Corridor+Lobby	5.378	13.403	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	11:19:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Pre was done on the left side of the hallway. <Collector listed this sample as a swab, INL and the LRN labs noted it as a Sponge Stick. Collection Method changed to Sponge Stick. R. Knowlton>	6	Yes	338675.2	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2797	VHP Pre-Decon	Floor 1	Corridor+Lobby	14.048	13.955	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	12:02:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken at the hallways left corner where it opens up and becomes wiider.	1	Yes	364306.3	NA
1583	VHP Pre-Decon	Floor 1	Corridor+Lobby	24.066	8.657	0.000	Swab	0.028	Anaya	4/17/2011	1:42:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	4	No	ND	NA
1689	VHP Pre-Decon	Floor 1	Corridor+Lobby	16.175	13.330	0.000	Swab	0.028	Anaya	4/17/2011	12:28:00 PM	Floor	Smooth	Horizontal Upward	TRUE	sample was a blank	4	No	ND	NA
4142	VHP Pre-Decon	Floor 1	Mechanical Room	17.623	19.364	1.298	Vacuum Sock	4.000	Anaya	4/17/2011	3:28:00 PM	Supply Vent	Porous	Inclined	FALSE	there were 4 filters we used the left side filters	1	Yes	TNTC	NA
2960	VHP Pre-Decon	Floor 1	Mechanical Room	17.162	18.365	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	3:24:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	Yes	553371.1	NA
2945	VHP Pre-Decon	Floor 1	Mechanical Room	19.274	20.285	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	3:23:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	Yes	504365.0	NA
4238	VHP Pre-Decon	Floor 1	Room 101	19.955	10.760	1.996	Vacuum Sock	4.000	Anaya	4/17/2011	1:15:00 PM	Ceiling	Carpet	Horizontal Downward	FALSE	ceiling tile sample. it was a half tile so for post they will have to take the tile next to it. the used tile was marked on the bottom	6	Yes	2412.6	NA
2702	VHP Pre-Decon	Floor 1	Room 101	16.601	11.811	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	1:00:00 PM	Floor	Smooth	Horizontal Upward	FALSE	taken in doorway of room 101	6	Yes	7727.7	NA
2949	VHP Pre-Decon	Floor 1	Room 101	21.758	11.211	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	1:11:00 PM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	441487.4	NA
2950	VHP Pre-Decon	Floor 1	Room 101	18.403	10.159	0.000	Sponge Wipe	0.694	Anaya	4/17/2011	1:08:00 PM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	426799.9	NA
2727	VHP Pre-Decon	Floor 1	Room 101	16.100	11.060	0.397	Sponge Wipe	0.694	Anaya	4/17/2011	1:03:00 PM	Wall	Smooth	Vertical	FALSE		6	Yes	360.0	NA
3701	VHP Pre-Decon	Floor 1	Room 101A	19.432	8.527	0.000	Vacuum Sock	4.000	Oudejans	4/17/2011	12:51:00 PM	Floor	Carpet	Horizontal Upward	TRUE	vac blank for	4	No	ND	NA
4175	VHP Pre-Decon	Floor 1	Room 101A	19.523	6.914	0.500	Vacuum Sock	4.000	Oudejans	4/17/2011	12:43:00 PM	Chair	Textured	Horizontal Upward	FALSE	chair moved out slighty from under desk	4	Yes	9042.2	NA
4243	VHP Pre-Decon	Floor 1	Room 101A	16.574	9.504	0.000	Vacuum Sock	4.000	Oudejans	4/17/2011	12:20:00 PM	Floor	Carpet	Horizontal Upward	FALSE	left side of doorway sampled	4	Yes	11375.6	NA
3857	VHP Pre-Decon	Floor 1	Room 101A	21.356	8.756	0.000	Vacuum Sock	4.000	Oudejans	4/17/2011	2:01:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum carpet; in between stand, cabinet , and black box	4	Yes	5042.0	NA
2832	VHP Pre-Decon	Floor 1	Room 101A	19.193	8.331	0.000	Sponge Wipe	0.694	Oudejans	4/17/2011	12:53:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank sponge	1	No	ND	NA
2090	VHP Pre-Decon	Floor 1	Room 101A	18.082	6.215	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	12:35:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	sample in back of top surface;cabinet has now been sampled across near whole surface [this and previous sample]	1	Yes	461742.6	NA
2893	VHP Pre-Decon	Floor 1	Room 101A	21.497	6.425	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	1:28:00 PM	Desk	Plastic	Horizontal Upward	FALSE	sponge;front right on desk;	4	Yes	677254.5	TNTC
2926	VHP Pre-Decon	Floor 1	Room 101A	19.214	6.551	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	1:01:00 PM	Desk	Plastic	Horizontal Upward	FALSE	front right;wet surface	4	Yes	334499.4	TNTC
2746	VHP Pre-Decon	Floor 1	Room 101A	20.177	6.509	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	1:18:00 PM	Desk	Plastic	Horizontal Upward	FALSE	left front corner of desk top;	4	Yes	948444.3	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2793	VHP Pre-Decon	Floor 1	Room 101A	18.215	9.523	1.300	Sponge Wipe	0.694	Oudejans	4/17/2011	2:31:00 PM	Workbench	Plastic	Horizontal Upward	FALSE	top surface center uv aps against back side;	1	Yes	2591902.3	NA
2054	VHP Pre-Decon	Floor 1	Room 101A	18.237	8.930	1.300	Sponge Wipe	0.694	Oudejans	4/17/2011	2:23:00 PM	Workbench	Plastic	Vertical	FALSE	vertical on uv aps system. difficult surface for sponge; sample in front and center	6	Yes	364066.3	NA
2353	VHP Pre-Decon	Floor 1	Room 101A	20.087	9.143	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	2:06:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	front of top of cabinet	4	Yes	453438.9	TNTC
2923	VHP Pre-Decon	Floor 1	Room 101A	21.539	7.870	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	1:48:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	front of cabinet top surface;	1	Yes	385905.5	NA
2877	VHP Pre-Decon	Floor 1	Room 101A	21.581	7.263	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	1:43:00 PM	Desk	Plastic	Horizontal Upward	FALSE	left front of desk surface;	1	Yes	403184.8	NA
2899	VHP Pre-Decon	Floor 1	Room 101A	21.874	6.278	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	1:34:00 PM	Desk	Plastic	Horizontal Upward	FALSE	desk back right position	1	Yes	730052.5	NA
4165	VHP Pre-Decon	Floor 1	Room 102	19.943	16.553	0.000	Vacuum Sock	4.000	Oudejans	4/17/2011	2:51:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum in front of stand	4	Yes	10125.6	NA
3859	VHP Pre-Decon	Floor 1	Room 102	19.284	16.050	0.000	Vacuum Sock	4.000	Oudejans	4/17/2011	3:36:00 PM	Floor	Carpet	Horizontal Upward	TRUE	vacuum blank	4	No	ND	NA
3862	VHP Pre-Decon	Floor 1	Room 102	18.279	16.687	0.000	Vacuum Sock	4.000	Oudejans	4/17/2011	3:30:00 PM	Floor	Carpet	Horizontal Upward	FALSE	in front of cabinet and part of desk;wobblely template	4	Yes	9333.9	NA
4192	VHP Pre-Decon	Floor 1	Room 102	18.793	15.424	0.000	Vacuum Sock	4.000	Oudejans	4/17/2011	3:24:00 PM	Floor	Carpet	Horizontal Upward	FALSE	in front of desk with uv APS	4	Yes	14000.8	NA
2180	VHP Pre-Decon	Floor 1	Room 102	19.318	14.654	1.300	Sponge Wipe	0.694	Oudejans	4/17/2011	4:45:00 PM	Workbench	Plastic	Horizontal Upward	FALSE	left back on top of uv APS;dirty sample	1	Yes	253670.4	NA
2085	VHP Pre-Decon	Floor 1	Room 102	18.234	14.609	1.300	Sponge Wipe	0.694	Oudejans	4/17/2011	4:39:00 PM	Workbench	Plastic	Horizontal Upward	FALSE	top right corner in the back of uv APS	1	Yes	4091845.8	NA
2058	VHP Pre-Decon	Floor 1	Room 102	16.905	15.670	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	4:26:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	back of top cabinet	1	Yes	679654.4	NA
2701	VHP Pre-Decon	Floor 1	Room 102	17.754	17.290	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	4:16:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	cabinet rotated 90 degrees wrt to drawing and Broom drawing. Front of top cabinet sampled	4	Yes	476910.0	NA
2081	VHP Pre-Decon	Floor 1	Room 102	18.256	16.999	0.000	Sponge Wipe	0.694	Oudejans	4/17/2011	3:54:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	top front of cabinet	4	Yes	232211.7	NA
2179	VHP Pre-Decon	Floor 1	Room 102	18.703	16.899	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	3:44:00 PM	Desk	Plastic	Horizontal Upward	FALSE	front of desk left side corner	1	Yes	509740.8	NA
2917	VHP Pre-Decon	Floor 1	Room 102	19.351	16.117	0.000	Sponge Wipe	0.694	Oudejans	4/17/2011	3:39:00 PM	Floor	Carpet	Horizontal Upward	TRUE	dropped closed sample bag before sampling; wiped clean	6	Yes	5898.0	NA
2457	VHP Pre-Decon	Floor 1	Room 102	19.887	17.223	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	3:03:00 PM	Desk	Plastic	Horizontal Upward	FALSE	front right behind the location of the rmc	1	Yes	472302.2	NA
2745	VHP Pre-Decon	Floor 1	Room 102	20.222	16.307	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	2:44:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	front / right side;	1	Yes	393105.2	NA
2071	VHP Pre-Decon	Floor 1	Room 102	18.145	15.089	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	4:32:00 PM	Desk	Plastic	Horizontal Upward	FALSE	on desk to right of uv APS; weird black substance on desk	4	Yes	430447.8	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2352	VHP Pre-Decon	Floor 1	Room 102	19.128	16.620	1.000	Sponge Wipe	0.694	Oudejans	4/17/2011	3:08:00 PM	Desk	Metal	Horizontal Upward	FALSE	sample taken on inside of drawer of desk;right side location	1	Yes	218391.8	NA
4236	VHP Pre-Decon	Floor 1	Room 103	14.842	11.307	0.000	Vacuum Sock	4.000	Pasquerella	4/18/2011	11:49:00 AM	Table	Smooth	Horizontal Upward	TRUE		4	No	ND	ND
4162	VHP Pre-Decon	Floor 1	Room 103	13.699	10.690	0.000	Vacuum Sock	4.000	Pasquerella	4/18/2011	11:45:00 AM	Ceiling	Textured	Horizontal Upward	FALSE	tile was placed on table on the left side of room for easier access to sample. left side of tile was sampled.	1	Yes	59253.4	NA
2413	VHP Pre-Decon	Floor 1	Room 103	15.586	12.194	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	11:03:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	378993.7	TNTC
2531	VHP Pre-Decon	Floor 1	Room 103	14.842	11.307	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	11:51:00 AM	Table	Smooth	Horizontal Upward	TRUE	blank sponge	5	No	ND	ND
2691	VHP Pre-Decon	Floor 1	Room 103	13.191	7.715	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	11:35:00 AM	Mail slot	Smooth	Horizontal Upward	FALSE	on top of mail slots, mid to right side.	3	Yes	491501.5	NA
2182	VHP Pre-Decon	Floor 1	Room 103	13.736	8.429	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	11:31:00 AM	Table	Smooth	Horizontal Upward	FALSE	in front of mail slots, right bottom corner.	3	Yes	501101.1	NA
2798	VHP Pre-Decon	Floor 1	Room 103	13.682	6.602	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	11:29:00 AM	Table	Smooth	Horizontal Upward	FALSE	on table in front of mail slots, left corner.	3	Yes	690406.0	NA
2553	VHP Pre-Decon	Floor 1	Room 103	13.258	6.219	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	11:23:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	417584.2	TNTC
2056	VHP Pre-Decon	Floor 1	Room 103	15.897	6.794	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	11:16:00 AM	Floor	Smooth	Horizontal Upward	FALSE	closer to corner of room than previous spongestick sample.	2	Yes	479501.9	TNTC
2107	VHP Pre-Decon	Floor 1	Room 103	14.531	6.052	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	11:21:00 AM	Wall	Textured	Vertical	FALSE	previous spongestick sample location was a horizontal sample. may have been marked vertical.	5	Yes	4079.8	ND
1510	VHP Pre-Decon	Floor 1	Room 103	14.648	6.682	0.000	Swab	0.028	Pasquerella	4/18/2011	11:38:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE		1	Yes	738201.0	ND
1690	VHP Pre-Decon	Floor 1	Room 103	14.842	11.307	0.000	Swab	0.028	Pasquerella	4/18/2011	11:54:00 AM	Table	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
4230	VHP Pre-Decon	Floor 1	Room 104	16.196	19.514	2.274	Vacuum Sock	4.000	Fetzer	4/18/2011	11:45:00 AM	Ceiling	Porous	Horizontal Downward	FALSE		4	Yes	16500.9	TNTC
4242	VHP Pre-Decon	Floor 1	Room 104	14.020	18.368	1.193	Vacuum Sock	4.000	Fetzer	4/18/2011	11:54:00 AM	Ceiling	Porous	Horizontal Downward	TRUE		4	Yes	ND	0.6
2391	VHP Pre-Decon	Floor 1	Room 104	15.611	20.661	1.298	Sponge Wipe	0.694	Fetzer	4/18/2011	11:35:00 AM	Wall	Smooth	Vertical	FALSE		5	Yes	1176.0	501.7
2088	VHP Pre-Decon	Floor 1	Room 104	15.634	20.052	0.899	Sponge Wipe	0.694	Fetzer	4/18/2011	11:24:00 AM	Table	Smooth	Horizontal Upward	FALSE	corner of bench map wrong	2	Yes	135700.5	TNTC
2648	VHP Pre-Decon	Floor 1	Room 104	14.277	20.006	0.894	Sponge Wipe	0.694	Fetzer	4/18/2011	11:20:00 AM	Table	Smooth	Horizontal Upward	FALSE	sample taken on top of bench map wrong	2	Yes	203896.3	TNTC
2390	VHP Pre-Decon	Floor 1	Room 104	15.294	18.244	0.798	Sponge Wipe	0.694	Fetzer	4/18/2011	11:08:00 AM	Table	Smooth	Horizontal Upward	FALSE		5	Yes	460302.7	TNTC
2087	VHP Pre-Decon	Floor 1	Room 104	14.699	19.444	0.000	Sponge Wipe	0.694	Fetzer	4/18/2011	11:05:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	403184.8	TNTC
2086	VHP Pre-Decon	Floor 1	Room 104	14.067	18.321	1.400	Sponge Wipe	0.694	Fetzer	4/18/2011	12:01:00 PM	Ceiling	Porous	Horizontal Downward	TRUE		2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1651	VHP Pre-Decon	Floor 1	Room 104	14.067	18.321	1.397	Swab	0.028	Fetzer	4/18/2011	11:56:00 AM	Ceiling	Porous	Horizontal Downward	TRUE		7	Yes	ND	82.8
1518	VHP Pre-Decon	Floor 1	Room 104	15.094	19.344	2.599	Swab	0.028	Fetzer	4/18/2011	11:39:00 AM	Supply Vent	Metal	Horizontal Downward	FALSE		7	Yes	1944529.5	TNTC
4250	VHP Pre-Decon	Floor 1	Room 105	11.747	10.990	0.000	Vacuum Sock	4.000	Pasquerella	4/18/2011	9:48:00 AM	Floor	Carpet	Horizontal Upward	FALSE		6	Yes	10050.6	NA
4231	VHP Pre-Decon	Floor 1	Room 105	10.513	12.137	0.000	Vacuum Sock	4.000	Pasquerella	4/18/2011	9:16:00 AM	Floor	Carpet	Horizontal Upward	FALSE		2	Yes	14750.8	TNTC
3909	VHP Pre-Decon	Floor 1	Room 105	10.864	8.923	0.000	Vacuum Sock	4.000	Pasquerella	4/18/2011	10:51:00 AM	Ceiling	Textured	Horizontal Upward	FALSE	left side of tile sampled, placed on stove for easier access to sample.	4	Yes	15250.9	TNTC
4252	VHP Pre-Decon	Floor 1	Room 105	10.446	6.405	0.000	Vacuum Sock	4.000	Pasquerella	4/18/2011	10:39:00 AM	Floor	Carpet	Horizontal Upward	FALSE	far right corner of room.	1	Yes	7012.9	NA
3533	VHP Pre-Decon	Floor 1	Room 105	10.895	9.673	0.000	Vacuum Sock	4.000	Pasquerella	4/18/2011	10:04:00 AM	Floor	Carpet	Horizontal Upward	FALSE	right of center in front of stove	1	Yes	5573.7	NA
2530	VHP Pre-Decon	Floor 1	Room 105	12.519	11.350	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	9:38:00 AM	Sink	Metal	Horizontal Upward	FALSE	left side of sink.	2	Yes	373953.9	TNTC
2444	VHP Pre-Decon	Floor 1	Room 105	12.038	6.756	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	10:27:00 AM	Table	Smooth	Horizontal Downward	FALSE	far left corner of table, closest to the wall and corner of room.	2	Yes	239415.0	TNTC
2387	VHP Pre-Decon	Floor 1	Room 105	10.141	9.575	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	10:16:00 AM	Stove	Metal	Horizontal Upward	FALSE		2	Yes	462990.6	TNTC
2057	VHP Pre-Decon	Floor 1	Room 105	9.990	11.004	0.000	Sponge Wipe	0.694	Pasquerella	4/18/2011	9:57:00 AM	Wall	Textured	Vertical	FALSE	apprx one foot from floor	2	Yes	698.9	479.2
1683	VHP Pre-Decon	Floor 1	Room 105	11.294	6.527	0.000	Swab	0.028	Pasquerella	4/18/2011	10:59:00 AM	Return Vent	Metal	Horizontal Upward	FALSE	additional sample location ceiling. previous swab sample was taken at an incorrect location. this sample location corresponds to map.	1	No	ND	ND
1594	VHP Pre-Decon	Floor 1	Room 105	10.132	8.634	0.000	Swab	0.028	Pasquerella	4/18/2011	10:21:00 AM	Supply Vent	Metal	Horizontal Downward	FALSE	diffuser on floor to the left of the stove. not in middle of room as it is placed on map.	7	Yes	46212.6	ND
4235	VHP Pre-Decon	Floor 1	Room 106	10.995	18.779	2.284	Vacuum Sock	4.000	Fetzer	4/18/2011	10:36:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	previous sample at wrong location. this sample relocated <wrong sample removed from database-R.Knowlton>	1	Yes	11310.6	NA
3858	VHP Pre-Decon	Floor 1	Room 106	10.902	19.832	0.583	Vacuum Sock	4.000	Fetzer	4/18/2011	10:20:00 AM	Wall	Textured	Vertical	FALSE	vacuum sample 2ft x 2ft area on partition	1	Yes	4900.3	ND
3851	VHP Pre-Decon	Floor 1	Room 106	11.229	20.581	0.397	Vacuum Sock	4.000	Fetzer	4/18/2011	10:10:00 AM	Chair	Textured	Horizontal Upward	FALSE		1	Yes	45302.6	NA
3852	VHP Pre-Decon	Floor 1	Room 106	12.750	19.856	1.491	Vacuum Sock	4.000	Fetzer	4/18/2011	10:01:00 AM	File cabinet	Smooth	Horizontal Upward	FALSE	books located on top of metal cabinet	1	Yes	9548.9	NA
4155	VHP Pre-Decon	Floor 1	Room 106	12.312	19.806	0.000	Vacuum Sock	4.000	Fetzer	4/18/2011	9:52:00 AM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	12042.4	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3855	VHP Pre-Decon	Floor 1	Room 106	10.878	18.429	0.394	Vacuum Sock	4.000	Fetzer	4/18/2011	9:38:00 AM	Chair	Textured	Horizontal Upward	FALSE		6	Yes	17401.0	NA
2059	VHP Pre-Decon	Floor 1	Room 106	10.481	19.926	0.692	Sponge Wipe	0.694	Fetzer	4/18/2011	10:55:00 AM	File cabinet	Metal	Horizontal Upward	FALSE	disregard last sample location in rm 108 picture of last is correct <the incorrect duplicate sample was deleted from the database-R.Knowlton>	5	Yes	486509.7	TNTC
2055	VHP Pre-Decon	Floor 1	Room 106	10.504	17.914	0.783	Sponge Wipe	0.694	Fetzer	4/18/2011	9:27:00 AM	Desk	Smooth	Horizontal Upward	FALSE		5	Yes	365314.2	TNTC
2460	VHP Pre-Decon	Floor 1	Room 106	10.574	15.107	0.000	Sponge Wipe	0.694	Fetzer	4/18/2011	9:03:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	422384.1	TNTC
2698	VHP Pre-Decon	Floor 1	Room 106	10.106	16.791	0.590	Sponge Wipe	0.694	Fetzer	4/18/2011	9:21:00 AM	Wall	Smooth	Vertical	FALSE		5	Yes	432.0	455.2
2459	VHP Pre-Decon	Floor 1	Room 106	11.912	15.920	0.597	Sponge Wipe	0.694	Fetzer	4/18/2011	9:12:00 AM	Table	Smooth	Horizontal Upward	FALSE		2	Yes	737252.2	TNTC
1699	VHP Pre-Decon	Floor 1	Room 106	11.042	19.505	2.197	Swab	0.028	Fetzer	4/18/2011	10:47:00 AM	Supply Vent	Metal	Horizontal Downward	FALSE		7	Yes	2820768.1	TNTC
1620	VHP Pre-Decon	Floor 1	Room 106	10.411	18.452	0.991	Swab	0.028	Fetzer	4/18/2011	9:33:00 AM	Monitor	Smooth	Vertical	FALSE	upper left corner of monitor	7	Yes	167445.6	TNTC
3699	VHP Pre-Decon	Floor 1	Room 107	8.431	8.314	0.293	Vacuum Sock	4.000	Perry	4/17/2011	4:45:00 PM	Chair	Leather	Horizontal Upward	FALSE		4	Yes	887.6	TNTC
4156	VHP Pre-Decon	Floor 1	Room 107	9.386	10.140	0.294	Vacuum Sock	4.000	Perry	4/17/2011	4:38:00 PM	Couch	Cloth	Horizontal Upward	FALSE		1	Yes	16684.3	ND
3854	VHP Pre-Decon	Floor 1	Room 107	9.255	12.048	0.000	Vacuum Sock	4.000	Perry	4/17/2011	4:00:00 PM	Floor	Carpet	Horizontal Upward	FALSE		1	Yes	3729.4	ND
4178	VHP Pre-Decon	Floor 1	Room 107	8.775	7.370	0.000	Vacuum Sock	4.000	Perry	4/17/2011	4:59:00 PM	Floor	Carpet	Horizontal Upward	TRUE		1	Yes	ND	0.1
4003	VHP Pre-Decon	Floor 1	Room 107	7.817	11.770	2.281	Vacuum Sock	4.000	Perry	4/17/2011	5:14:00 PM	Ceiling	Textured	Horizontal Upward	FALSE		4	Yes	2179.3	TNTC
2184	VHP Pre-Decon	Floor 1	Room 107	8.489	9.305	0.296	Sponge Wipe	0.694	Perry	4/17/2011	4:30:00 PM	Table	Smooth	Horizontal Upward	FALSE	coffee table	3	Yes	149754.4	NA
2079	VHP Pre-Decon	Floor 1	Room 107	7.713	12.331	0.691	Sponge Wipe	0.694	Perry	4/17/2011	4:06:00 PM	Wall	Paint	Vertical	FALSE		3	Yes	22.1	105.8
2080	VHP Pre-Decon	Floor 1	Room 107	7.113	6.614	1.284	Sponge Wipe	0.694	Perry	4/17/2011	4:54:00 PM	Shelves	Smooth	Horizontal Upward	FALSE		7	Yes	306804.4	TNTC
2082	VHP Pre-Decon	Floor 1	Room 107	8.326	7.125	0.000	Sponge Wipe	0.694	Perry	4/17/2011	5:02:00 PM	Floor	Carpet	Horizontal Upward	TRUE		3	No	ND	ND
1523	VHP Pre-Decon	Floor 1	Room 107	7.132	9.991	0.575	Swab	0.028	Perry	4/17/2011	4:09:00 PM	Monitor	Glass	Vertical	FALSE	TV SCREEN	7	Yes	64817.7	ND
1574	VHP Pre-Decon	Floor 1	Room 107	8.041	7.431	0.000	Swab	0.028	Perry	4/17/2011	4:57:00 PM	Floor	Carpet	Horizontal Upward	TRUE		7	No	ND	ND
1570	VHP Pre-Decon	Floor 1	Room 107	8.367	6.616	2.160	Swab	0.028	Perry	4/17/2011	5:05:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		7	Yes	106228.9	TNTC
4182	VHP Pre-Decon	Floor 1	Room 108	7.806	19.617	0.595	Vacuum Sock	4.000	Perry	4/17/2011	6:21:00 PM	Wall	Cloth	Vertical	FALSE	vacuum sample on cubicle partition	4	Yes	654.2	TNTC
4245	VHP Pre-Decon	Floor 1	Room 108	9.599	19.957	1.483	Vacuum Sock	4.000	Perry	4/17/2011	6:11:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	vacuumed around and on top of the books on the file cabinet. The book on the far left fell over.	4	Yes	179.2	92.6
4176	VHP Pre-Decon	Floor 1	Room 108	9.651	17.807	2.270	Vacuum Sock	4.000	Perry	4/17/2011	6:34:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		2	Yes	1020.9	TNTC
4172	VHP Pre-Decon	Floor 1	Room 108	8.213	20.517	0.396	Vacuum Sock	4.000	Perry	4/17/2011	6:15:00 PM	Chair	Cloth	Horizontal Upward	FALSE		4	Yes	7958.8	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4169	VHP Pre-Decon	Floor 1	Room 108	7.908	18.449	0.495	Vacuum Sock	4.000	Perry	4/17/2011	5:46:00 PM	Chair	Cloth	Horizontal Upward	FALSE		4	Yes	7417.1	TNTC
4171	VHP Pre-Decon	Floor 1	Room 108	8.621	15.414	0.000	Vacuum Sock	4.000	Perry	4/17/2011	5:36:00 PM	Floor	Smooth	Horizontal Upward	TRUE		1	Yes	ND	0.5
2472	VHP Pre-Decon	Floor 1	Room 108	9.251	17.517	0.000	Sponge Wipe	0.694	Perry	4/17/2011	5:40:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	364306.3	TNTC
2415	VHP Pre-Decon	Floor 1	Room 108	9.551	20.317	1.273	Sponge Wipe	0.694	Perry	4/17/2011	6:07:00 PM	File cabinet	Metal	Horizontal Upward	FALSE		6	Yes	398721.0	NA
2696	VHP Pre-Decon	Floor 1	Room 108	8.906	15.801	0.000	Sponge Wipe	0.694	Perry	4/17/2011	5:32:00 PM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
2700	VHP Pre-Decon	Floor 1	Room 108	9.451	14.530	0.786	Sponge Wipe	0.694	Perry	4/17/2011	5:26:00 PM	Wall	Paint	Vertical	FALSE		3	Yes	3340.7	NA
2699	VHP Pre-Decon	Floor 1	Room 108	7.459	15.006	0.000	Sponge Wipe	0.694	Perry	4/17/2011	5:21:00 PM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	368050.1	NA
2195	VHP Pre-Decon	Floor 1	Room 108	7.513	17.917	0.797	Sponge Wipe	0.694	Perry	4/17/2011	5:51:00 PM	Desk	Smooth	Horizontal Upward	FALSE		7	Yes	239991.0	TNTC
1684	VHP Pre-Decon	Floor 1	Room 108	8.987	19.672	2.141	Swab	0.028	Perry	4/17/2011	6:26:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		7	Yes	810220.6	TNTC
1586	VHP Pre-Decon	Floor 1	Room 108	7.276	18.673	1.086	Swab	0.028	Perry	4/17/2011	5:55:00 PM	Monitor	Plastic	Vertical	FALSE		7	Yes	62417.0	ND
1578	VHP Pre-Decon	Floor 1	Room 108	8.437	15.882	0.000	Swab	0.028	Perry	4/17/2011	5:34:00 PM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
4253	VHP Pre-Decon	Floor 1	Room 109	5.373	8.723	0.000	Vacuum Sock	4.000	Inman	4/17/2011	5:30:00 PM	Bed	Cloth	Horizontal Downward	FALSE	right corner edge of bed	3	Yes	2387.6	NA
3535	VHP Pre-Decon	Floor 1	Room 109	6.267	6.567	2.100	Vacuum Sock	4.000	Inman	4/17/2011	5:47:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	2ft x 2ft area vacuum of ceiling tile taken from back half of room	3	Yes	6375.4	NA
4248	VHP Pre-Decon	Floor 1	Room 109	4.119	7.914	0.000	Vacuum Sock	4.000	Inman	4/17/2011	5:32:00 PM	Bed	Cloth	Horizontal Downward	FALSE	top left corner of bed 2ft x 2ft	3	Yes	8708.8	NA
4233	VHP Pre-Decon	Floor 1	Room 109	5.621	9.614	0.000	Vacuum Sock	4.000	Inman	4/17/2011	5:06:00 PM	Floor	Carpet	Horizontal Upward	TRUE	vacuum blank	7	No	ND	ND
3850	VHP Pre-Decon	Floor 1	Room 109	4.773	11.131	0.000	Vacuum Sock	4.000	Inman	4/17/2011	4:47:00 PM	Floor	Carpet	Horizontal Downward	FALSE	2ft x 2ft area vacuum inside to right against sink edge along floor	3	Yes	9750.6	NA
3856	VHP Pre-Decon	Floor 1	Room 109	5.973	11.914	0.000	Vacuum Sock	4.000	Inman	4/17/2011	4:42:00 PM	Floor	Carpet	Horizontal Downward	FALSE	2ft x 2ft area vacuum just inside doorway	7	Yes	15834.2	TNTC
2416	VHP Pre-Decon	Floor 1	Room 109	5.153	6.053	0.000	Sponge Wipe	0.694	Inman	4/17/2011	5:42:00 PM	Wall	Textured	Horizontal Downward	FALSE	sample area along window seal of back wall horizontal swab	1	Yes	388785.4	NA
2061	VHP Pre-Decon	Floor 1	Room 109	5.421	9.497	1.197	Sponge Wipe	0.694	Inman	4/17/2011	4:59:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank sponge	6	No	ND	NA
2388	VHP Pre-Decon	Floor 1	Room 109	4.195	10.951	0.000	Sponge Wipe	0.694	Inman	4/17/2011	4:56:00 PM	Countertop	Smooth	Horizontal Downward	FALSE	10in x 10in sponge swipe along countertop left side of sink	6	Yes	354802.6	NA
2194	VHP Pre-Decon	Floor 1	Room 109	4.195	12.304	0.000	Sponge Wipe	0.694	Inman	4/17/2011	4:53:00 PM	Countertop	Smooth	Horizontal Downward	FALSE	10in x 10in sponge swipe along countertop of sink, right side of sink	1	Yes	485741.7	NA
2812	VHP Pre-Decon	Floor 1	Room 109	3.915	6.485	1.300	Sponge Wipe	0.694	Inman	4/17/2011	5:37:00 PM	Wall	Textured	Vertical	FALSE	10in x 10in sponge swipe along wall in a verticle manner map called for horizontal	1	Yes	686.4	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1484	VHP Pre-Decon	Floor 1	Room 109	5.921	9.914	0.000	Swab	0.028	Inman	4/17/2011	5:03:00 PM	Floor	Carpet	Horizontal Upward	TRUE	swab blank	4	No	ND	NA
4148	VHP Pre-Decon	Floor 1	Room 110	4.911	19.695	1.296	Vacuum Sock	4.000	Inman	4/17/2011	4:15:00 PM	Wall	Cloth	Vertical	FALSE	vacuum sample 2ft x 2ft area of partition wall opposite side wall than entrance door taken apprx 4ft from floor	3	Yes	1200.1	NA
4173	VHP Pre-Decon	Floor 1	Room 110	5.073	20.596	0.000	Vacuum Sock	4.000	Inman	4/17/2011	4:10:00 PM	Chair	Cloth	Horizontal Downward	FALSE	vacuum sample 2ft x 2ft area off chair along back wall	3	Yes	23959.7	NA
4244	VHP Pre-Decon	Floor 1	Room 110	6.673	19.896	0.000	Vacuum Sock	4.000	Inman	4/17/2011	3:58:00 PM	File cabinet	Leather	Horizontal Upward	FALSE	vacuum of books located on right side top of metal cabinet that sits on wall to right of door towards back	7	Yes	1616.8	TNTC
4210	VHP Pre-Decon	Floor 1	Room 110	4.773	18.491	0.000	Vacuum Sock	4.000	Inman	4/17/2011	3:49:00 PM	Chair	Cloth	Horizontal Downward	FALSE	vacuum of chair that sits at desk on left wall apprx area of 2 ft x 2 ft	3	Yes	8083.8	NA
4158	VHP Pre-Decon	Floor 1	Room 110	6.575	20.549	0.000	Vacuum Sock	4.000	Inman	4/17/2011	4:04:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	vacuum of metal cabinet to far left side of top sutface against 2 walls	3	Yes	733.4	NA
3849	VHP Pre-Decon	Floor 1	Room 110	4.173	17.151	0.000	Vacuum Sock	4.000	Inman	4/17/2011	3:40:00 PM	Floor	Smooth	Horizontal Downward	FALSE	vacuum of apprx 2ft x 2ft area along left wall next to desk and garbage can	3	Yes	6250.4	NA
4014	VHP Pre-Decon	Floor 1	Room 110	5.173	16.251	0.000	Vacuum Sock	4.000	Inman	4/17/2011	3:30:00 PM	Floor	Smooth	Horizontal Downward	TRUE	vacuum blank apprx 3 ft in air	7	No	ND	ND
3853	VHP Pre-Decon	Floor 1	Room 110	5.873	15.651	2.050	Vacuum Sock	4.000	Inman	4/17/2011	4:33:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	2ft x 2ft area of ceiling vacuumed, tile removed apprx 4ft from door way placed on floor immediately to left of entrance	3	Yes	1275.1	NA
3203	VHP Pre-Decon	Floor 1	Room 110	6.011	17.196	0.000	Sponge Wipe	0.694	Inman	4/17/2011	3:33:00 PM	Floor	Smooth	Horizontal Downward	FALSE	10in x 10in sponge swipe off floor apprx half way inside room	6	Yes	346354.9	NA
3208	VHP Pre-Decon	Floor 1	Room 110	4.173	19.896	0.000	Sponge Wipe	0.694	Inman	4/17/2011	4:20:00 PM	File cabinet	Metal	Horizontal Downward	FALSE	10in x 10in sponge swipe of area on top of file cabinet that sits on opposite side of partition	4	Yes	382305.6	TNTC
3202	VHP Pre-Decon	Floor 1	Room 110	6.575	20.193	0.000	Sponge Wipe	0.694	Inman	4/17/2011	4:01:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	sponge sample 10in x 10in on top surface of metal cabinet back right wall	4	Yes	347026.9	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2595	VHP Pre-Decon	Floor 1	Room 110	5.373	15.951	0.000	Sponge Wipe	0.694	Inman	4/17/2011	3:24:00 PM	Floor	Smooth	Horizontal Downward	TRUE	sponge blank	1	No	ND	NA
2872	VHP Pre-Decon	Floor 1	Room 110	5.673	14.596	0.000	Sponge Wipe	0.694	Inman	4/17/2011	3:12:00 PM	Floor	Smooth	Horizontal Upward	FALSE	10in x 10in sponge swab just inside door and to left on floor	6	Yes	327347.7	NA
3369	VHP Pre-Decon	Floor 1	Room 110	4.459	17.822	0.000	Sponge Wipe	0.694	Inman	4/17/2011	3:45:00 PM	Desk	Smooth	Horizontal Downward	FALSE	10in x 10in sponge off left corner of desk that sits along the left wall	6	Yes	231543.3	NA
3199	VHP Pre-Decon	Floor 1	Room 110	4.373	20.705	1.698	Sponge Wipe	0.694	Inman	4/17/2011	4:24:00 PM	Wall	Textured	Vertical	FALSE	sponge swipe area 10in x 10in on back wall apprx 5ft off flloor	1	Yes	4031.8	NA
1687	VHP Pre-Decon	Floor 1	Room 110	4.311	18.251	0.000	Swab	0.028	Inman	4/17/2011	3:53:00 PM	Monitor	Glass	Horizontal Downward	FALSE	swab upper left hand corner computer monitor that sits in middle of desk along left wall	7	Yes	16804.6	12506.2
1649	VHP Pre-Decon	Floor 1	Room 110	4.973	16.051	0.000	Swab	0.028	Inman	4/17/2011	3:25:00 PM	Floor	Smooth	Horizontal Downward	TRUE	swab blank apprx 3 ft in air	1	No	ND	ND
1685	VHP Pre-Decon	Floor 1	Room 110	5.411	20.008	2.080	Swab	0.028	Inman	4/17/2011	4:28:00 PM	Supply Vent	Metal	Horizontal Upward	FALSE	swab of area along vent duct in ceiling along back half of room	4	Yes	774210.8	NA
2943	VHP Pre-Decon	Floor 2		13.272	12.457	3.391	Sponge Wipe	0.694	Terrill	4/17/2011	11:13:00 AM	Wall	Smooth	Vertical	FALSE	had to back track to this sample because identifier was missed	8	Yes	ND	13.2
3698	VHP Pre-Decon	Floor 2	Bathroom M	27.919	19.558	5.317	Vacuum Sock	4.000	Terrill	4/17/2011	5:28:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile was placed on floor for easier access to sample location then placed back in original location	7	Yes	545.9	TNTC
2992	VHP Pre-Decon	Floor 2	Bathroom M	28.753	20.503	3.566	Sponge Wipe	0.694	Terrill	4/17/2011	5:22:00 PM	Wall	Textured	Vertical	FALSE		4	Yes	52.8	NA
2990	VHP Pre-Decon	Floor 2	Bathroom M	29.615	20.086	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	5:18:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	11441.8	NA
2974	VHP Pre-Decon	Floor 2	Bathroom M	26.807	20.142	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	5:12:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	10559.6	NA
4109	VHP Pre-Decon	Floor 2	Bathroom W	28.364	17.166	3.996	Vacuum Sock	4.000	Terrill	4/17/2011	5:00:00 PM	Floor	Smooth	Horizontal Upward	TRUE		6	No	ND	NA
4218	VHP Pre-Decon	Floor 2	Bathroom W	27.780	17.528	5.250	Vacuum Sock	4.000	Terrill	4/17/2011	5:03:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile was placed on floor for easier access to sample location then placed back in original location	7	Yes	558.4	TNTC
2993	VHP Pre-Decon	Floor 2	Bathroom W	26.613	16.166	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	4:44:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	11591.6	NA
2972	VHP Pre-Decon	Floor 2	Bathroom W	29.003	17.889	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	4:50:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	15095.4	NA
2970	VHP Pre-Decon	Floor 2	Bathroom W	27.808	17.166	3.985	Sponge Wipe	0.694	Terrill	4/17/2011	4:55:00 PM	Floor	Smooth	Horizontal Upward	TRUE		4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1579	VHP Pre-Decon	Floor 2	Bathroom W	28.169	16.805	3.995	Swab	0.028	Terrill	4/17/2011	4:54:00 PM	Floor	Smooth	Horizontal Upward	TRUE		4	No	ND	NA
2967	VHP Pre-Decon	Floor 2	Copier Room	29.463	13.351	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	4:18:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	5380.6	NA
2984	VHP Pre-Decon	Floor 2	Copier Room	28.768	13.962	3.295	Sponge Wipe	0.694	Terrill	4/17/2011	4:17:00 PM	Wall	Smooth	Vertical	FALSE	this is a correction entry for this sample. other sample location was placed outside building <deleted the sample referenced by the collector. R. Knowlton>	4	Yes	240.0	NA
2989	VHP Pre-Decon	Floor 2	Copier Room	27.795	13.212	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	4:07:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	2399.9	NA
3896	VHP Pre-Decon	Floor 2	Hallway	16.908	13.190	4.096	Vacuum Sock	4.000	Terrill	4/17/2011	10:26:00 AM	Ceiling	Porous	Horizontal Upward	TRUE		7	No	ND	ND
3916	VHP Pre-Decon	Floor 2	Hallway	15.727	12.749	5.233	Vacuum Sock	4.000	Terrill	4/17/2011	10:13:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile taken down from ceiling before sampling for easier access and then placed back in original position after sampling	4	Yes	370.9	NA
3915	VHP Pre-Decon	Floor 2	Hallway	8.917	12.836	5.283	Vacuum Sock	4.000	Terrill	4/17/2011	9:48:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	sample was taken from ceiling tile placed on the floor for easier access	1	Yes	1045.6	NA
3965	VHP Pre-Decon	Floor 2	Hallway	25.287	16.078	5.282	Vacuum Sock	4.000	Terrill	4/17/2011	11:48:00 AM	Wall	Porous	Vertical	FALSE	ceiling tile taken down and placed on the floor for easier access to sample location then placed back in original location	6	Yes	355.9	NA
3015	VHP Pre-Decon	Floor 2	Hallway	26.023	17.647	3.290	Sponge Wipe	0.694	Terrill	4/17/2011	11:37:00 AM	Wall	Smooth	Vertical	FALSE		8	Yes	ND	18.0
3016	VHP Pre-Decon	Floor 2	Hallway	25.532	15.097	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	11:30:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	14112.4	NA
3008	VHP Pre-Decon	Floor 2	Hallway	23.718	13.405	4.898	Sponge Wipe	0.694	Terrill	4/17/2011	11:24:00 AM	Return Vent	Metal	Horizontal Upward	FALSE	filter was taken down from vent before sampling and replaced after sampling. sample was taken from inside duct work.	3	Yes	1928.6	NA
3014	VHP Pre-Decon	Floor 2	Hallway	22.320	13.356	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	11:19:00 AM	Floor	Smooth	Horizontal Upward	FALSE		8	Yes	11271.9	TNTC
3003	VHP Pre-Decon	Floor 2	Hallway	16.399	13.144	4.096	Sponge Wipe	0.694	Terrill	4/17/2011	10:21:00 AM	Ceiling	Porous	Horizontal Upward	TRUE		3	No	ND	ND
2963	VHP Pre-Decon	Floor 2	Hallway	15.836	13.375	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	10:01:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	9004.5	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2964	VHP Pre-Decon	Floor 2	Hallway	8.775	13.772	4.889	Sponge Wipe	0.694	Terrill	4/17/2011	9:37:00 AM	Return Vent	Metal	Horizontal Upward	FALSE	filter was taken down from vent before sampling and replaced after sampling	3	Yes	4276.6	NA
2985	VHP Pre-Decon	Floor 2	Hallway	8.765	13.466	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	9:26:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	14279.5	NA
3021	VHP Pre-Decon	Floor 2	Hallway	25.394	18.662	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	11:54:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken directly outside airlock door	3	Yes	14716.2	NA
1603	VHP Pre-Decon	Floor 2	Hallway	16.700	13.445	4.096	Swab	0.028	Terrill	4/17/2011	10:23:00 AM	Ceiling	Porous	Horizontal Upward	TRUE		4	No	ND	NA
3863	VHP Pre-Decon	Floor 2	Janitor Closet	29.073	15.352	5.280	Vacuum Sock	4.000	Terrill	4/17/2011	4:42:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile was placed on floor for easier access to sample location then placed back in original location	7	Yes	287.5	173.1
2965	VHP Pre-Decon	Floor 2	Janitor Closet	27.016	14.879	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	4:25:00 PM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	14393.7	NA
2983	VHP Pre-Decon	Floor 2	Janitor Closet	28.378	15.074	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	4:32:00 PM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	15623.4	NA
3891	VHP Pre-Decon	Floor 2	Mechanical Room	19.215	19.275	3.598	Vacuum Sock	4.000	Terrill	4/17/2011	12:20:00 PM	Return Vent	Porous	Horizontal Upward	FALSE	sample was taken from filter and was placed on the floor for easier access then placed back in original location. sample location was smaller than vacuum templet.	7	Yes	1064.1	TNTC
3064	VHP Pre-Decon	Floor 2	Mechanical Room	19.019	20.084	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	12:14:00 PM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	47911.8	NA
3030	VHP Pre-Decon	Floor 2	Mechanical Room	22.255	19.741	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	12:11:00 PM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	60213.7	NA
4163	VHP Pre-Decon	Floor 2	Room 201	27.795	11.766	5.265	Vacuum Sock	4.000	Terrill	4/17/2011	3:36:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile was placed on floor for easier access to sample location then placed back in original location	6	Yes	237.5	NA
2966	VHP Pre-Decon	Floor 2	Room 201	28.990	10.849	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	3:31:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	13777.4	TNTC
2986	VHP Pre-Decon	Floor 2	Room 201	26.405	11.711	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	3:25:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	9309.2	TNTC
3860	VHP Pre-Decon	Floor 2	Room 201A	27.906	7.930	5.270	Vacuum Sock	4.000	Terrill	4/17/2011	4:01:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile was placed on floor for easier access to sample location then placed back in original location	7	Yes	562.5	ND
2994	VHP Pre-Decon	Floor 2	Room 201A	26.294	6.957	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	3:47:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	13168.3	TNTC
2962	VHP Pre-Decon	Floor 2	Room 201A	29.185	5.957	3.497	Sponge Wipe	0.694	Terrill	4/17/2011	3:50:00 PM	Wall	Smooth	Vertical	FALSE		4	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2982	VHP Pre-Decon	Floor 2	Room 201A	26.322	9.014	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	3:43:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	14917.8	TNTC
2959	VHP Pre-Decon	Floor 2	Room 201A	28.715	8.267	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	3:56:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	16199.4	NA
3009	VHP Pre-Decon	Floor 2	Room 202	21.857	17.590	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	11:06:00 AM	Floor	Smooth	Horizontal Upward	FALSE		8	Yes	12855.8	TNTC
3006	VHP Pre-Decon	Floor 2	Room 202	21.487	14.814	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	11:01:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	12745.0	ND
4025	VHP Pre-Decon	Floor 2	Room 203	23.807	12.000	5.500	Vacuum Sock	4.000	Martinez	4/17/2011	3:04:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		1	Yes	2774.5	NA
3004	VHP Pre-Decon	Floor 2	Room 203	21.802	10.734	3.000	Sponge Wipe	0.694	Martinez	4/17/2011	2:41:00 PM	Floor	Textured	Horizontal Upward	FALSE		7	Yes	10083.9	TNTC
3002	VHP Pre-Decon	Floor 2	Room 203	24.034	10.025	3.200	Sponge Wipe	0.694	Martinez	4/17/2011	2:38:00 PM	Wall	Textured	Vertical	FALSE		7	Yes	ND	30.5
3923	VHP Pre-Decon	Floor 2	Room 203A	23.727	7.377	5.500	Vacuum Sock	4.000	Martinez	4/17/2011	2:56:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		7	Yes	1469.4	TNTC
2991	VHP Pre-Decon	Floor 2	Room 203A	24.749	6.940	3.000	Sponge Wipe	0.694	Martinez	4/17/2011	2:51:00 PM	Floor	Textured	Horizontal Upward	FALSE		6	Yes	3778.4	TNTC
2971	VHP Pre-Decon	Floor 2	Room 203A	24.934	8.814	3.000	Sponge Wipe	0.694	Martinez	4/17/2011	2:46:00 PM	Floor	Textured	Horizontal Upward	FALSE		7	Yes	13415.5	ND
3910	VHP Pre-Decon	Floor 2	Room 204	19.523	16.360	5.281	Vacuum Sock	4.000	Terrill	4/17/2011	10:58:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	sample was taken from ceiling before sampling for easier access then tile was replaced after sampling	7	Yes	869.0	TNTC
3007	VHP Pre-Decon	Floor 2	Room 204	20.356	14.856	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	10:34:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE		3	Yes	9251.2	NA
3010	VHP Pre-Decon	Floor 2	Room 204	18.528	16.661	3.296	Sponge Wipe	0.694	Terrill	4/17/2011	10:42:00 AM	Wall	Smooth	Vertical	FALSE		3	Yes	25.9	ND
3012	VHP Pre-Decon	Floor 2	Room 204	19.500	17.471	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	10:45:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	14343.8	NA
3861	VHP Pre-Decon	Floor 2	Room 205	19.025	8.069	5.500	Vacuum Sock	4.000	Martinez	4/17/2011	2:24:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		7	Yes	1000.1	TNTC
3001	VHP Pre-Decon	Floor 2	Room 205	19.870	6.189	3.200	Sponge Wipe	0.694	Martinez	4/17/2011	2:20:00 PM	Wall	Textured	Vertical	FALSE		7	Yes	ND	28.8
2999	VHP Pre-Decon	Floor 2	Room 205	20.225	7.450	3.000	Sponge Wipe	0.694	Martinez	4/17/2011	2:15:00 PM	Floor	Textured	Horizontal Upward	FALSE	previous sample location was nearest to the door entrance but seemed to jump with broom to next room. it was in rm 205	7	Yes	10557.7	TNTC
2998	VHP Pre-Decon	Floor 2	Room 205	20.260	11.595	3.000	Sponge Wipe	0.694	Martinez	4/17/2011	2:09:00 PM	Floor	Textured	Horizontal Upward	FALSE	<Collector noted that she had difficulty placing this sample, that it jumped to the wrong room. Figured out that it was located in room 207 when it should have been in room 205. Adjusted the location to be in the same basic location relative to the wall	7	Yes	12930.7	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3908	VHP Pre-Decon	Floor 2	Room 206	17.321	15.445	3.000	Vacuum Sock	4.000	Wenning	4/17/2011	4:41:00 PM	Ceiling	Smooth	Horizontal Downward	TRUE	vacuum blank	1	Yes	1.8	ND
3918	VHP Pre-Decon	Floor 2	Room 206	17.621	16.845	3.000	Vacuum Sock	4.000	Wenning	4/17/2011	4:32:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	vacuum sample from ceiling tile	2	Yes	829.2	ND
3025	VHP Pre-Decon	Floor 2	Room 206	16.148	14.996	3.000	Sponge Wipe	0.694	Wenning	4/17/2011	3:21:00 PM	Floor	Smooth	Horizontal Upward	FALSE	spongestick on entrance threshold floor.	3	Yes	16597.8	NA
3024	VHP Pre-Decon	Floor 2	Room 206	17.712	18.699	3.493	Sponge Wipe	0.694	Wenning	4/17/2011	4:19:00 PM	Desk	Smooth	Horizontal Upward	FALSE		6	Yes	18239.3	NA
3023	VHP Pre-Decon	Floor 2	Room 206	17.664	15.436	3.000	Sponge Wipe	0.694	Wenning	4/17/2011	4:45:00 PM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
3018	VHP Pre-Decon	Floor 2	Room 206	16.742	20.154	3.793	Sponge Wipe	0.694	Wenning	4/17/2011	3:55:00 PM	Table	Textured	Horizontal Upward	FALSE		7	Yes	5299.0	TNTC
3022	VHP Pre-Decon	Floor 2	Room 206	17.750	20.100	3.786	Sponge Wipe	0.694	Wenning	4/17/2011	4:12:00 PM	Workbench	Textured	Horizontal Upward	FALSE	spongestick on worktable. tools covering table.	3	Yes	5032.6	NA
3020	VHP Pre-Decon	Floor 2	Room 206	18.018	19.308	3.000	Sponge Wipe	0.694	Wenning	4/17/2011	4:04:00 PM	Floor	Textured	Horizontal Upward	FALSE	spongestick on floor. woodchips present on floor, sample collected over area.	7	Yes	48.0	960.4
3017	VHP Pre-Decon	Floor 2	Room 206	15.742	17.054	3.000	Sponge Wipe	0.694	Wenning	4/17/2011	3:49:00 PM	Floor	Smooth	Horizontal Upward	FALSE	spongestick on floor in front of outlet	6	Yes	15012.9	NA
1652	VHP Pre-Decon	Floor 2	Room 206	17.872	15.417	3.000	Swab	0.028	Wenning	4/17/2011	4:49:00 PM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
1581	VHP Pre-Decon	Floor 2	Room 206	16.942	20.154	5.279	Swab	0.028	Wenning	4/17/2011	4:25:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	swab from ceiling diffuser	7	Yes	107429.3	TNTC
4114	VHP Pre-Decon	Floor 2	Room 207	17.753	11.359	5.500	Vacuum Sock	4.000	Martinez	4/17/2011	1:57:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		7	Yes	704.0	TNTC
4159	VHP Pre-Decon	Floor 2	Room 207	16.155	8.846	3.780	Vacuum Sock	4.000	Martinez	4/17/2011	1:46:00 PM	Floor	Textured	Horizontal Upward	TRUE		6	No	ND	NA
2995	VHP Pre-Decon	Floor 2	Room 207	15.665	6.904	3.780	Sponge Wipe	0.694	Martinez	4/17/2011	1:29:00 PM	Table	Smooth	Horizontal Upward	FALSE		7	Yes	12277.0	TNTC
2987	VHP Pre-Decon	Floor 2	Room 207	16.477	8.876	3.000	Sponge Wipe	0.694	Martinez	4/17/2011	1:54:00 PM	Floor	Textured	Horizontal Upward	TRUE	blank and we had no wipe sample kit/supplies so we made it a sponge blank	7	No	ND	ND
2938	VHP Pre-Decon	Floor 2	Room 207	17.753	7.150	3.200	Sponge Wipe	0.694	Martinez	4/17/2011	1:41:00 PM	Table	Textured	Vertical	FALSE		7	Yes	2087.9	ND
2997	VHP Pre-Decon	Floor 2	Room 207	15.596	7.544	3.780	Sponge Wipe	0.694	Martinez	4/17/2011	1:33:00 PM	Table	Smooth	Horizontal Upward	FALSE		7	Yes	13992.7	TNTC
2939	VHP Pre-Decon	Floor 2	Room 207	15.968	6.950	3.871	Sponge Wipe	0.694	Martinez	4/17/2011	1:25:00 PM	Table	Smooth	Horizontal Upward	FALSE		7	Yes	11047.3	TNTC
2996	VHP Pre-Decon	Floor 2	Room 207	17.753	9.250	3.780	Sponge Wipe	0.694	Martinez	4/17/2011	1:13:00 PM	Table	Smooth	Horizontal Upward	FALSE		7	Yes	10857.2	TNTC
2981	VHP Pre-Decon	Floor 2	Room 207	16.053	12.350	3.000	Sponge Wipe	0.694	Martinez	4/17/2011	12:53:00 PM	Floor	Textured	Horizontal Upward	FALSE		7	Yes	16303.1	ND
2988	VHP Pre-Decon	Floor 2	Room 207	15.544	8.029	3.780	Sponge Wipe	0.694	Martinez	4/17/2011	1:36:00 PM	Table	Smooth	Horizontal Upward	FALSE		7	Yes	12302.9	TNTC
1739	VHP Pre-Decon	Floor 2	Room 207	16.353	8.650	3.780	Swab	0.028	Martinez	4/17/2011	1:49:00 PM	Floor	Textured	Horizontal Upward	TRUE	this and last sample were blanks	4	No	ND	ND
1596	VHP Pre-Decon	Floor 2	Room 207	15.568	10.250	3.200	Swab	0.028	Martinez	4/17/2011	1:05:00 PM	Supply Vent	Metal	Horizontal Upward	FALSE		4	Yes	2400.7	NA
3917	VHP Pre-Decon	Floor 2	Room 208	13.802	19.854	3.990	Vacuum Sock	4.000	Wenning	4/17/2011	11:56:00 AM	Wall	Textured	Vertical	FALSE	vac sample from vertical partition in room. sample collected from side facing window.	1	Yes	36.0	10.9

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3914	VHP Pre-Decon	Floor 2	Room 208	13.843	20.297	3.000	Vacuum Sock	4.000	Wenning	4/17/2011	11:47:00 AM	Chair	Textured	Horizontal Upward	FALSE	DISREGARD PREVIOUS VAC SAMPLE LOCATION. This is correct location for vac sample 3914. previously placed in wrong room.<Deleted the repeat of this sample that was placed in the wrong room>	1	Yes	1620.1	ND
3889	VHP Pre-Decon	Floor 2	Room 208	14.619	20.429	3.000	Vacuum Sock	4.000	Wenning	4/17/2011	11:36:00 AM	Floor	Smooth	Horizontal Upward	FALSE	vacuum in front of file cabinet. immediately next to other vac sample. no template used due to small space. sample area approx. 1ft x 2 ft	2	Yes	362.5	ND
4168	VHP Pre-Decon	Floor 2	Room 208	14.695	19.554	3.000	Vacuum Sock	4.000	Wenning	4/17/2011	11:28:00 AM	Floor	Smooth	Horizontal Upward	FALSE	vacuum from floor in front of file cabinet.	2	Yes	275.0	138.6
4130	VHP Pre-Decon	Floor 2	Room 208	13.302	18.245	3.696	Vacuum Sock	4.000	Wenning	4/17/2011	11:17:00 AM	Chair	Textured	Horizontal Upward	FALSE	vacuum on seat of chair.	2	Yes	333.4	ND
4093	VHP Pre-Decon	Floor 2	Room 208	14.678	17.395	3.000	Vacuum Sock	4.000	Wenning	4/17/2011	12:07:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	vacuum sample taken from ceiling tile.	1	Yes	175.0	ND
3029	VHP Pre-Decon	Floor 2	Room 208	15.322	18.304	3.694	Sponge Wipe	0.694	Wenning	4/17/2011	12:27:00 PM	Wall	Textured	Vertical	FALSE		7	Yes	33.6	42.4
3027	VHP Pre-Decon	Floor 2	Room 208	12.936	19.914	3.593	Sponge Wipe	0.694	Wenning	4/17/2011	12:20:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	spongestick on file cabinet.	7	Yes	18277.7	TNTC
3028	VHP Pre-Decon	Floor 2	Room 208	13.302	15.245	3.693	Sponge Wipe	0.694	Wenning	4/17/2011	10:45:00 AM	Table	Smooth	Horizontal Upward	FALSE	spongestick on table.	7	Yes	20519.2	TNTC
1598	VHP Pre-Decon	Floor 2	Room 208	13.826	20.065	4.636	Swab	0.028	Wenning	4/17/2011	12:32:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	swab sample from ceiling diffuser.	7	Yes	105628.8	TNTC
1575	VHP Pre-Decon	Floor 2	Room 208	12.902	18.460	3.000	Swab	0.028	Wenning	4/17/2011	11:09:00 AM	Monitor	Smooth	Vertical	FALSE	computer monitor. upper left corner	7	Yes	2400.7	3064.4
3947	VHP Pre-Decon	Floor 2	Room 209	14.056	10.940	3.000	Vacuum Sock	4.000	Martinez	4/17/2011	11:33:00 AM	Floor	Carpet	Vertical	FALSE		7	Yes	104.2	94.3
3893	VHP Pre-Decon	Floor 2	Room 209	14.056	8.240	3.000	Vacuum Sock	4.000	Martinez	4/17/2011	12:06:00 PM	Floor	Carpet	Horizontal Upward	FALSE	skipped previous sample swab on coil of fridge due to no wetting agent	7	Yes	153.8	62.9
3925	VHP Pre-Decon	Floor 2	Room 209	13.856	10.440	5.500	Vacuum Sock	4.000	Martinez	4/17/2011	12:39:00 PM	Ceiling	Porous	Horizontal Downward	FALSE		6	Yes	400.0	-12.1

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2905	VHP Pre-Decon	Floor 2	Room 209	14.928	9.983	3.890	Sponge Wipe	0.694	Martinez	4/17/2011	11:49:00 AM	Stove	Metal	Horizontal Upward	FALSE	<collector indicated that this sample was collected on the stove, but the placement was near the door. The sample was moved to the stove top. R. Knowlton>	7	Yes	5260.6	TNTC
2092	VHP Pre-Decon	Floor 2	Room 209	14.370	12.069	3.894	Sponge Wipe	0.694	Martinez	4/17/2011	11:20:00 AM	Countertop	Smooth	Horizontal Upward	FALSE	<Misplaced the location, so it was moved based on where it was supposed to be collected. R. Knowlton>	7	Yes	6177.4	ND
2848	VHP Pre-Decon	Floor 2	Room 209	12.764	11.291	3.884	Sponge Wipe	0.694	Martinez	4/17/2011	11:44:00 AM	Countertop	Smooth	Horizontal Upward	FALSE	<collector indicated that this sample was on the countertop, but placed it in the middle of the room. So it was moved to the countertop. R. Knowlton>	7	Yes	13401.6	TNTC
2850	VHP Pre-Decon	Floor 2	Room 209	13.776	7.023	3.780	Sponge Wipe	0.694	Martinez	4/17/2011	12:30:00 PM	Table	Smooth	Horizontal Upward	FALSE		7	Yes	9775.8	TNTC
2875	VHP Pre-Decon	Floor 2	Room 209	12.412	6.652	3.300	Sponge Wipe	0.694	Martinez	4/17/2011	12:23:00 PM	Wall	Textured	Vertical	FALSE		7	Yes	290.4	183.6
1643	VHP Pre-Decon	Floor 2	Room 209	14.456	10.540	3.200	Swab	0.028	Martinez	4/17/2011	12:19:00 PM	Supply Vent	Metal	Horizontal Upward	FALSE	taken under the lip	4	Yes	1200.3	1656.5
3931	VHP Pre-Decon	Floor 2	Room 210	10.402	19.604	4.195	Vacuum Sock	4.000	Inman	4/17/2011	12:25:00 PM	Wall	Cloth	Vertical	FALSE	2ft x 2ft vacuum sample of cloth partition sample taken apprx 4 foot off the ground	7	Yes	33.3	29.9
3936	VHP Pre-Decon	Floor 2	Room 210	10.299	15.537	5.292	Vacuum Sock	4.000	Inman	4/17/2011	12:38:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	vacuum sample of ceiling tile removed and placed on floor immediately to right of entrance	1	Yes	277.1	NA
4112	VHP Pre-Decon	Floor 2	Room 210	10.709	20.298	3.000	Vacuum Sock	4.000	Inman	4/17/2011	12:19:00 PM	Chair	Cloth	Horizontal Downward	FALSE	vacuum of chair seat that is againstfar back wall surface area of sample apprx 2ft x 2ft	6	Yes	210.0	NA
4116	VHP Pre-Decon	Floor 2	Room 210	11.771	20.154	3.000	Vacuum Sock	4.000	Inman	4/17/2011	12:10:00 PM	Floor	Smooth	Horizontal Downward	FALSE	vacuum of floor inside room towards back against wall and against metal cabinet	1	Yes	254.3	NA
3906	VHP Pre-Decon	Floor 2	Room 210	11.782	19.516	3.000	Vacuum Sock	4.000	Inman	4/17/2011	12:05:00 PM	Floor	Smooth	Horizontal Downward	FALSE	vacuum of floor inside towards back wall against metal cadinet	1	Yes	164.7	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4094	VHP Pre-Decon	Floor 2	Room 210	11.799	17.754	3.000	Vacuum Sock	4.000	Inman	4/17/2011	11:58:00 AM	Floor	Smooth	Horizontal Downward	TRUE	blank vacuum sample air	6	No	ND	NA
2344	VHP Pre-Decon	Floor 2	Room 210	9.799	17.355	3.000	Sponge Wipe	0.694	Inman	4/17/2011	11:39:00 AM	Floor	Smooth	Horizontal Downward	FALSE	10in x 10in swab of floor inside next to wall and corner of garbage can	5	Yes	8323.8	TNTC
2343	VHP Pre-Decon	Floor 2	Room 210	9.784	19.799	4.000	Sponge Wipe	0.694	Inman	4/17/2011	12:28:00 PM	File cabinet	Metal	Horizontal Downward	FALSE	spongestick on metal cabinet top rear half against wall	5	Yes	13814.8	1319.2
2342	VHP Pre-Decon	Floor 2	Room 210	12.099	20.054	3.000	Sponge Wipe	0.694	Inman	4/17/2011	12:15:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	spongestick on surface of metal cabinet upper left corner	5	Yes	11335.3	TNTC
2846	VHP Pre-Decon	Floor 2	Room 210	11.699	17.854	3.000	Sponge Wipe	0.694	Inman	4/17/2011	11:53:00 AM	Floor	Smooth	Horizontal Downward	TRUE	blank sponge air	5	Yes	ND	19.0
2851	VHP Pre-Decon	Floor 2	Room 210	11.899	14.360	4.197	Sponge Wipe	0.694	Inman	4/17/2011	11:33:00 AM	Wall	Textured	Vertical	FALSE	10in x 10in swab on wall immediately to right of entrance apprx 4ft off ground	5	Yes	79.2	40.4
2904	VHP Pre-Decon	Floor 2	Room 210	10.402	14.826	3.000	Sponge Wipe	0.694	Inman	4/17/2011	11:24:00 AM	Floor	Smooth	Horizontal Downward	FALSE	10in x 10in swab of floor inside door immediately to right of door opening	5	Yes	10817.8	TNTC
1642	VHP Pre-Decon	Floor 2	Room 210	11.699	17.559	3.000	Swab	0.028	Inman	4/17/2011	11:52:00 AM	Floor	Smooth	Horizontal Downward	TRUE	blank swab inside air	4	No	ND	NA
1611	VHP Pre-Decon	Floor 2	Room 210	10.899	20.527	5.298	Swab	0.028	Inman	4/17/2011	12:31:00 PM	Supply Vent	Metal	Horizontal Upward	FALSE	swab of vent in ceiling towards far back wall	4	Yes	24006.5	NA
1580	VHP Pre-Decon	Floor 2	Room 210	9.799	18.332	3.000	Swab	0.028	Inman	4/17/2011	11:48:00 AM	Monitor	Glass	Vertical	FALSE	2in x 2in swab upper left corner monitor	4	Yes	ND	745.4
4098	VHP Pre-Decon	Floor 2	Room 211	10.493	7.424	3.000	Vacuum Sock	4.000	perry	4/17/2011	1:12:00 PM	Floor	Carpet	Horizontal Upward	FALSE		3	No	ND	ND
3964	VHP Pre-Decon	Floor 2	Room 211	10.769	11.577	5.271	Vacuum Sock	4.000	perry	4/17/2011	1:32:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		3	Yes	166.7	81.7
4089	VHP Pre-Decon	Floor 2	Room 211	10.833	8.276	3.392	Vacuum Sock	4.000	perry	4/17/2011	12:58:00 PM	Chair	Cloth	Horizontal Upward	FALSE		3	Yes	362.5	NA
4105	VHP Pre-Decon	Floor 2	Room 211	11.749	9.469	3.392	Vacuum Sock	4.000	perry	4/17/2011	12:52:00 PM	Couch	Cloth	Horizontal Upward	FALSE		3	Yes	312.5	NA
4115	VHP Pre-Decon	Floor 2	Room 211	10.918	12.003	3.000	Vacuum Sock	4.000	perry	4/17/2011	12:17:00 PM	Floor	Carpet	Horizontal Upward	FALSE		8	Yes	445.9	NA
3746	VHP Pre-Decon	Floor 2	Room 211	10.514	6.440	3.000	Vacuum Sock	4.000	perry	4/17/2011	1:24:00 PM	Floor	Carpet	Horizontal Upward	FALSE		8	Yes	108.3	NA
2852	VHP Pre-Decon	Floor 2	Room 211	10.514	6.913	3.000	Sponge Wipe	0.694	perry	4/17/2011	1:16:00 PM	Floor	Carpet	Horizontal Upward	TRUE		3	No	ND	ND
3258	VHP Pre-Decon	Floor 2	Room 211	9.513	6.317	4.198	Sponge Wipe	0.694	perry	4/17/2011	1:07:00 PM	Shelves	Smooth	Horizontal Upward	FALSE		3	Yes	14398.5	NA
3278	VHP Pre-Decon	Floor 2	Room 211	10.897	9.107	3.395	Sponge Wipe	0.694	perry	4/17/2011	12:45:00 PM	Table	Smooth	Horizontal Upward	FALSE		3	Yes	5850.5	NA
3271	VHP Pre-Decon	Floor 2	Room 211	9.400	10.768	3.593	Sponge Wipe	0.694	perry	4/17/2011	12:27:00 PM	Wall	Textured	Vertical	FALSE		3	Yes	19.7	ND
1635	VHP Pre-Decon	Floor 2	Room 211	10.961	7.254	3.000	Swab	0.028	perry	4/17/2011	1:11:00 PM	Floor	Carpet	Horizontal Upward	TRUE		4	No	ND	ND
1640	VHP Pre-Decon	Floor 2	Room 211	9.492	9.660	4.066	Swab	0.028	perry	4/17/2011	12:35:00 PM	Wall	Textured	Vertical	FALSE	TV	4	Yes	ND	1159.5

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3602	VHP Pre-Decon	Floor 2	Room 212	7.490	19.854	3.984	Vacuum Sock	4.000	Wenning	4/17/2011	3:07:00 PM	Wall	Textured	Vertical	FALSE	vacuum sample collected from vertical partition surface.	1	Yes	112.5	ND
3907	VHP Pre-Decon	Floor 2	Room 212	8.379	15.876	3.000	Vacuum Sock	4.000	Inman	4/17/2011	10:29:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank vacuum air	4	Yes	ND	1.2
4095	VHP Pre-Decon	Floor 2	Room 212	8.579	18.554	5.286	Vacuum Sock	4.000	Inman	4/17/2011	11:17:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	2ft x 2ft vacuum of ceiling tile removed from ceiling and placed on floor in middle of room	1	Yes	177.8	NA
4117	VHP Pre-Decon	Floor 2	Room 212	7.208	20.054	3.000	Vacuum Sock	4.000	Inman	4/17/2011	11:04:00 AM	Floor	Smooth	Horizontal Upward	FALSE	2ft x 2ft vacuum of floor in front of cabinet on back left wall	7	Yes	495.9	ND
4288	VHP Pre-Decon	Floor 2	Room 212	7.697	20.337	3.000	Vacuum Sock	4.000	Inman	4/17/2011	10:59:00 AM	Chair	Cloth	Horizontal Upward	FALSE	apprx 2ft x 2ft surface area of chair seat against back wall of room	6	No	ND	NA
4097	VHP Pre-Decon	Floor 2	Room 212	8.290	20.354	3.000	Vacuum Sock	4.000	Inman	4/17/2011	10:55:00 AM	Floor	Smooth	Horizontal Upward	FALSE	2ft x 2ft vacuum of floor against wall and edge of metal cabinet	6	Yes	163.3	NA
3934	VHP Pre-Decon	Floor 2	Room 212	8.779	19.554	3.000	Vacuum Sock	4.000	Inman	4/17/2011	10:51:00 AM	Floor	Smooth	Horizontal Upward	FALSE	2ft x 2ft vacuum of floor	1	Yes	312.7	NA
3941	VHP Pre-Decon	Floor 2	Room 212	7.379	18.378	3.000	Vacuum Sock	4.000	Inman	4/17/2011	10:37:00 AM	Chair	Cloth	Horizontal Upward	FALSE	vacuum of chair seat in front of desk left wall	1	Yes	1017.7	NA
2345	VHP Pre-Decon	Floor 2	Room 212	6.482	19.764	3.000	Sponge Wipe	0.694	Inman	4/17/2011	11:08:00 AM	Cabinet	Metal	Horizontal Upward	FALSE	10in x 10in swab back half of cabinet top closest to wall	5	Yes	4910.2	ND
2880	VHP Pre-Decon	Floor 2	Room 212	8.179	16.954	3.000	Sponge Wipe	0.694	Inman	4/17/2011	10:24:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank sponge air	5	No	ND	ND
2346	VHP Pre-Decon	Floor 2	Room 212	6.479	16.172	3.000	Sponge Wipe	0.694	Inman	4/17/2011	10:21:00 AM	Wall	Textured	Vertical	FALSE	10in x 10in swab apprx 5ft up wall surface	5	Yes	97.9	21.6
2847	VHP Pre-Decon	Floor 2	Room 212	8.090	14.576	3.000	Sponge Wipe	0.694	Inman	4/17/2011	10:11:00 AM	Floor	Smooth	Horizontal Upward	FALSE	10in x 10in apprx 6in off left door jam	8	Yes	7814.1	TNTC
1589	VHP Pre-Decon	Floor 2	Room 212	7.979	19.946	5.170	Swab	0.028	Inman	4/17/2011	11:12:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE	swab of vent shaft in ceiling	4	Yes	16804.6	NA
1681	VHP Pre-Decon	Floor 2	Room 212	8.389	16.206	3.000	Swab	0.028	Inman	4/17/2011	10:26:00 AM	Floor	Smooth	Horizontal Upward	TRUE	swab blank	4	No	ND	NA
1639	VHP Pre-Decon	Floor 2	Room 212	6.879	18.424	3.000	Swab	0.028	Inman	4/17/2011	10:42:00 AM	Monitor	Glass	Horizontal Upward	FALSE	upper left corner monitor 2in x 2in area	4	No	ND	NA
4092	VHP Pre-Decon	Floor 2	Room 213	8.194	7.676	3.387	Vacuum Sock	4.000	perry	4/17/2011	11:46:00 AM	Bed	Cloth	Horizontal Upward	FALSE	true bed sample <deleted the previous sample because the collector indicated they made a mistake and this is the correct sample- R. Knowlton>	8	Yes	325.0	NA
3966	VHP Pre-Decon	Floor 2	Room 213	7.661	7.920	3.580	Vacuum Sock	4.000	perry	4/17/2011	11:32:00 AM	Bed	Cloth	Horizontal Upward	FALSE		3	Yes	112.5	134.0

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3924	VHP Pre-Decon	Floor 2	Room 213	8.949	8.742	3.586	Vacuum Sock	4.000	perry	4/17/2011	11:21:00 AM	Bed	Cloth	Horizontal Upward	FALSE		3	Yes	420.9	NA
3905	VHP Pre-Decon	Floor 2	Room 213	7.526	10.158	3.000	Vacuum Sock	4.000	perry	4/17/2011	11:00:00 AM	Floor	Carpet	Horizontal Upward	TRUE		8	No	ND	NA
4083	VHP Pre-Decon	Floor 2	Room 213	7.927	7.032	5.288	Vacuum Sock	4.000	perry	4/17/2011	12:07:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		3	Yes	183.3	125.4
4059	VHP Pre-Decon	Floor 2	Room 213	7.433	11.920	3.000	Vacuum Sock	4.000	Perry	4/17/2011	10:15:00 AM	Floor	Carpet	Horizontal Upward	FALSE		8	Yes	191.7	NA
2738	VHP Pre-Decon	Floor 2	Room 213	6.594	11.097	4.782	Sponge Wipe	0.694	perry	4/17/2011	11:14:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		7	Yes	3019.1	ND
2878	VHP Pre-Decon	Floor 2	Room 213	7.490	9.463	3.000	Sponge Wipe	0.694	perry	4/17/2011	10:57:00 AM	Floor	Carpet	Horizontal Upward	TRUE		6	No	ND	ND
2394	VHP Pre-Decon	Floor 2	Room 213	8.867	11.225	3.489	Sponge Wipe	0.694	Perry	4/17/2011	10:22:00 AM	Sink	Smooth	Horizontal Upward	FALSE		7	Yes	10823.6	ND
2739	VHP Pre-Decon	Floor 2	Room 213	8.883	6.943	3.000	Sponge Wipe	0.694	perry	4/17/2011	11:49:00 AM	Bed	Cloth	Horizontal Upward	FALSE	lost laser, no height	3	Yes	8668.5	ND
3291	VHP Pre-Decon	Floor 2	Room 213	7.208	6.040	3.486	Sponge Wipe	0.694	perry	4/17/2011	11:55:00 AM	Wall	Smooth	Vertical	FALSE		3	Yes	46.1	3.2
1641	VHP Pre-Decon	Floor 2	Room 213	7.909	9.671	3.000	Swab	0.028	perry	4/17/2011	11:02:00 AM	Floor	Carpet	Horizontal Upward	TRUE		4	No	ND	ND
2197	VHP Pre-Decon	Floor 2	Stairwell	23.530	19.814	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	12:04:00 PM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	233156.0	NA
3031	VHP Pre-Decon	Floor 2	Stairwell	23.874	14.935	3.000	Sponge Wipe	0.694	Terrill	4/17/2011	12:25:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken on first floor at bottom of stairs	3	Yes	514348.6	NA
3568	VHP Post-Decon	Floor 1	Bathroom M	25.910	19.709	0.000	Vacuum Sock	4.000	Anaya	4/22/2011	1:26:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		5	Yes	104.2	58.1
2233	VHP Post-Decon	Floor 1	Bathroom M	24.644	20.412	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	1:10:00 PM	Floor	Smooth	Horizontal Downward	FALSE		2	Yes	921.6	203.0
2234	VHP Post-Decon	Floor 1	Bathroom M	26.297	18.056	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	1:16:00 PM	Floor	Smooth	Horizontal Downward	FALSE		2	No	ND	ND
2236	VHP Post-Decon	Floor 1	Bathroom M	24.855	19.287	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	1:12:00 PM	Floor	Smooth	Horizontal Downward	FALSE		2	Yes	ND	19.3
2235	VHP Post-Decon	Floor 1	Bathroom M	26.684	20.483	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	1:14:00 PM	Floor	Smooth	Horizontal Downward	FALSE		2	No	ND	ND
2916	VHP Post-Decon	Floor 1	Bathroom W	24.012	15.023	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	12:59:00 PM	Floor	Smooth	Horizontal Downward	FALSE		2	Yes	ND	4.0
2240	VHP Post-Decon	Floor 1	Bathroom W	27.400	14.539	0.597	Sponge Wipe	0.694	Anaya	4/22/2011	1:02:00 PM	Wall	Paint	Vertical	FALSE		2	No	ND	ND
2582	VHP Post-Decon	Floor 1	Bathroom W	26.960	16.519	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	1:05:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	No	ND	ND
2914	VHP Post-Decon	Floor 1	Bathroom W	25.156	17.179	0.794	Sponge Wipe	0.694	Anaya	4/22/2011	1:07:00 PM	Wall	Paint	Vertical	FALSE	under the sink	2	No	ND	ND
3594	VHP Post-Decon	Floor 1	Corridor+Lobby	23.055	11.002	2.459	Vacuum Sock	4.000	Anaya	4/22/2011	11:49:00 AM	Ceiling	Porous	Horizontal Upward	FALSE		2	Yes	8.3	ND
3672	VHP Post-Decon	Floor 1	Corridor+Lobby	24.537	7.784	0.000	Vacuum Sock	4.000	Anaya	4/22/2011	11:59:00 AM	Floor	Smooth	Horizontal Downward	TRUE		2	No	ND	ND
3629	VHP Post-Decon	Floor 1	Corridor+Lobby	25.992	8.428	2.436	Vacuum Sock	4.000	Anaya	4/22/2011	12:25:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile	2	Yes	16.7	ND
3558	VHP Post-Decon	Floor 1	Corridor+Lobby	25.904	12.564	2.356	Vacuum Sock	4.000	Anaya	4/22/2011	12:49:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile	3	No	ND	ND
3585	VHP Post-Decon	Floor 1	Corridor+Lobby	22.780	15.188	2.392	Vacuum Sock	4.000	Anaya	4/22/2011	12:56:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile	5	Yes	12.5	0.6
3644	VHP Post-Decon	Floor 1	Corridor+Lobby	15.461	13.157	2.392	Vacuum Sock	4.000	Anaya	4/22/2011	10:23:00 AM	Ceiling	Porous	Horizontal Upward	FALSE		5	Yes	41.7	ND
3549	VHP Post-Decon	Floor 1	Corridor+Lobby	8.383	12.854	2.387	Vacuum Sock	4.000	Anaya	4/22/2011	9:58:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE	ceiling tile sample	5	No	ND	ND
3550	VHP Post-Decon	Floor 1	Corridor+Lobby	16.536	13.891	0.000	Vacuum Sock	4.000	Anaya	4/22/2011	10:25:00 AM	Ceiling	Porous	Horizontal Upward	TRUE		2	No	ND	ND
2606	VHP Post-Decon	Floor 1	Corridor+Lobby	25.332	11.376	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	12:39:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2601	VHP Post-Decon	Floor 1	Corridor+Lobby	23.470	12.743	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	11:37:00 AM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
2266	VHP Post-Decon	Floor 1	Corridor+Lobby	22.516	9.467	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	11:43:00 AM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
2267	VHP Post-Decon	Floor 1	Corridor+Lobby	24.935	8.249	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	12:00:00 PM	Floor	Smooth	Horizontal Downward	TRUE		2	No	ND	ND
2072	VHP Post-Decon	Floor 1	Corridor+Lobby	26.608	6.616	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	12:10:00 PM	Floor	Smooth	Horizontal Downward	FALSE		2	Yes	29.3	53.3
2070	VHP Post-Decon	Floor 1	Corridor+Lobby	27.444	9.404	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	12:18:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	No	ND	ND
2749	VHP Post-Decon	Floor 1	Corridor+Lobby	27.356	11.552	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	12:44:00 PM	Floor	Smooth	Horizontal Downward	FALSE		1	No	ND	ND
2599	VHP Post-Decon	Floor 1	Corridor+Lobby	26.564	10.240	0.596	Sponge Wipe	0.694	Anaya	4/22/2011	12:23:00 PM	Wall	Smooth	Vertical	FALSE	sample was on the side of the counter	1	No	ND	ND
2741	VHP Post-Decon	Floor 1	Corridor+Lobby	5.254	13.157	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	9:39:00 AM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
2725	VHP Post-Decon	Floor 1	Corridor+Lobby	3.939	13.358	0.685	Sponge Wipe	0.694	Anaya	4/22/2011	9:44:00 AM	Wall	Smooth	Vertical	FALSE	Sample was taken on entrance door to the first floor	5	No	ND	ND
2724	VHP Post-Decon	Floor 1	Corridor+Lobby	6.574	13.988	2.068	Sponge Wipe	0.694	Anaya	4/22/2011	9:50:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE		2	No	ND	ND
2721	VHP Post-Decon	Floor 1	Corridor+Lobby	9.116	13.881	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	10:02:00 AM	Floor	Smooth	Horizontal Downward	FALSE		1	No	ND	ND
2722	VHP Post-Decon	Floor 1	Corridor+Lobby	12.636	13.294	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	10:09:00 AM	Floor	Smooth	Horizontal Downward	FALSE		2	Yes	56.6	31.7
2652	VHP Post-Decon	Floor 1	Corridor+Lobby	13.858	13.978	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	10:14:00 AM	Floor	Smooth	Horizontal Downward	FALSE		2	No	ND	ND
2566	VHP Post-Decon	Floor 1	Corridor+Lobby	22.666	15.460	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	11:26:00 AM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	21.6	ND
2653	VHP Post-Decon	Floor 1	Corridor+Lobby	14.532	15.308	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	10:17:00 AM	Floor	Smooth	Horizontal Downward	FALSE		2	Yes	82.1	38.2
2200	VHP Post-Decon	Floor 1	Corridor+Lobby	16.928	13.597	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	10:26:00 AM	Floor	Smooth	Horizontal Downward	TRUE		2	No	ND	ND
2742	VHP Post-Decon	Floor 1	Corridor+Lobby	17.514	14.331	0.397	Sponge Wipe	0.694	Anaya	4/22/2011	10:34:00 AM	Wall	Smooth	Vertical	FALSE		5	No	ND	ND
2743	VHP Post-Decon	Floor 1	Corridor+Lobby	17.905	13.695	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	10:35:00 AM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
2241	VHP Post-Decon	Floor 1	Corridor+Lobby	18.785	14.063	2.074	Sponge Wipe	0.694	Anaya	4/22/2011	10:38:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE	hvac sample	5	No	ND	ND
2577	VHP Post-Decon	Floor 1	Corridor+Lobby	13.222	16.520	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	10:16:00 AM	Floor	Smooth	Horizontal Downward	FALSE		2	No	ND	ND
2436	VHP Post-Decon	Floor 1	Corridor+Lobby	20.342	13.335	0.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:53:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
3670	VHP Post-Decon	Floor 1	Mechanical Room	17.539	19.357	1.081	Vacuum Sock	4.000	Anaya	4/22/2011	1:25:00 PM	Supply Vent	Porous	Inclined	FALSE	furnace vent	5	Yes	404.2	TNTC
2679	VHP Post-Decon	Floor 1	Mechanical Room	18.488	20.518	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	1:21:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	345.6	ND
2231	VHP Post-Decon	Floor 1	Mechanical Room	17.117	18.161	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	1:22:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	496.8	ND
3621	VHP Post-Decon	Floor 1	Room 101	20.288	10.231	2.393	Vacuum Sock	4.000	Anaya	4/22/2011	11:12:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile was labeled for post decon	5	Yes	370.9	120.8
2654	VHP Post-Decon	Floor 1	Room 101	21.445	10.834	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	11:08:00 AM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
2825	VHP Post-Decon	Floor 1	Room 101	16.546	12.281	0.000	Sponge Wipe	0.694	Anaya	4/22/2011	10:48:00 AM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
2827	VHP Post-Decon	Floor 1	Room 101	16.057	11.234	0.491	Sponge Wipe	0.694	Anaya	4/22/2011	10:52:00 AM	Wall	Paint	Vertical	FALSE		5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4157	VHP Post-Decon	Floor 1	Room 101A	21.532	8.927	0.000	Vacuum Sock	4.000	Oudejans	4/22/2011	2:19:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum to left of cabinet and to right of black box on floor; no marking on floor from pre decon sample; may have been in overlap with pre decon sample;	6	Yes	27.9	NA
3961	VHP Post-Decon	Floor 1	Room 101A	19.009	7.781	0.000	Vacuum Sock	4.000	Oudejans	4/22/2011	1:45:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank vacuum	6	No	ND	NA
3626	VHP Post-Decon	Floor 1	Room 101A	19.610	6.993	0.596	Vacuum Sock	4.000	Oudejans	4/22/2011	1:21:00 PM	Chair	Cloth	Horizontal Upward	FALSE	chair;horizontal surface; overlap with previous sample	6	No	ND	NA
4064	VHP Post-Decon	Floor 1	Room 101A	16.441	9.473	0.000	Vacuum Sock	4.000	Oudejans	4/22/2011	1:06:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample to right of previous pre decon sample; vacuum hose extension works great.	6	Yes	157.9	NA
2794	VHP Post-Decon	Floor 1	Room 101A	18.014	9.249	1.200	Sponge Wipe	0.694	Oudejans	4/22/2011	2:44:00 PM	Workbench	Plastic	Horizontal Upward	FALSE	top of uv aps system; front center; horizontal surface	7	No	ND	ND
2942	VHP Post-Decon	Floor 1	Room 101A	20.032	6.414	0.800	Sponge Wipe	0.694	Oudejans	4/22/2011	1:38:00 PM	Desk	Plastic	Horizontal Upward	FALSE	25 percent overlap with previous sample pre decon sample; left side in middle of top surface;	3	Yes	ND	3.6
2900	VHP Post-Decon	Floor 1	Room 101A	18.279	8.955	1.200	Sponge Wipe	0.694	Oudejans	4/22/2011	2:35:00 PM	Workbench	Plastic	Vertical	FALSE	vertical surface of uv aps system; right side	7	Yes	ND	2.9
2463	VHP Post-Decon	Floor 1	Room 101A	20.193	9.207	0.700	Sponge Wipe	0.694	Oudejans	4/22/2011	2:23:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	front right corner of metal cabinet ; 60 percent overlap with pre decon sample;	3	No	ND	ND
3248	VHP Post-Decon	Floor 1	Room 101A	21.604	7.886	0.694	Sponge Wipe	0.694	Oudejans	4/22/2011	2:09:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	front right corner of cabinet with 50 percentage overlap with pre decon sample;	3	Yes	ND	19.2
2723	VHP Post-Decon	Floor 1	Room 101A	21.872	7.348	0.800	Sponge Wipe	0.694	Oudejans	4/22/2011	2:04:00 PM	Desk	Plastic	Horizontal Upward	FALSE	left corner of desk in back ;no overlap with pre decon sample	7	No	ND	ND
2734	VHP Post-Decon	Floor 1	Room 101A	21.872	6.228	0.800	Sponge Wipe	0.694	Oudejans	4/22/2011	1:55:00 PM	Desk	Plastic	Horizontal Upward	FALSE	right corner of against back; no overlap with pre decon sample;	3	Yes	17.8	11.9
2957	VHP Post-Decon	Floor 1	Room 101A	21.409	6.192	0.797	Sponge Wipe	0.694	Oudejans	4/22/2011	1:52:00 PM	Desk	Plastic	Horizontal Upward	FALSE	dropped bag before sampling. no overlap with pre decon sample; front right corner of desk	7	Yes	ND	9.5

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2844	VHP Post-Decon	Floor 1	Room 101A	19.102	6.502	0.798	Sponge Wipe	0.694	Oudejans	4/22/2011	1:26:00 PM	Desk	Plastic	Horizontal Upward	FALSE	sticky surface; sample to the right of previous pre decon sample; front right corner of desk	7	No	ND	ND
1973	VHP Post-Decon	Floor 1	Room 101A	18.053	6.215	0.000	Sponge Wipe	0.694	Oudejans	4/22/2011	1:15:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	2/3 overlap with previous sample; back on top of metal cabinet;	3	Yes	ND	3.9
2354	VHP Post-Decon	Floor 1	Room 101A	19.158	7.996	0.000	Sponge Wipe	0.694	Oudejans	4/22/2011	1:48:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank sponge	3	No	ND	ND
3541	VHP Post-Decon	Floor 1	Room 102	18.194	16.030	0.000	Vacuum Sock	4.000	Oudejans	4/22/2011	3:42:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank vacuum	7	No	ND	ND
3660	VHP Post-Decon	Floor 1	Room 102	17.339	16.633	0.000	Vacuum Sock	4.000	Oudejans	4/22/2011	3:37:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum floor in front of wooden panel; some overlap with pre decon sample;	7	Yes	29.2	14.4
3608	VHP Post-Decon	Floor 1	Room 102	18.463	15.397	0.000	Vacuum Sock	4.000	Oudejans	4/22/2011	3:12:00 PM	Floor	Carpet	Horizontal Upward	FALSE	Air sampling started in preparing this vacuum sample;sample to right of pre decon sample with 25 percent overlap	6	Yes	27.9	NA
3609	VHP Post-Decon	Floor 1	Room 102	19.895	16.529	0.000	Vacuum Sock	4.000	Oudejans	4/22/2011	2:59:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum in front of stand;	6	No	ND	NA
3243	VHP Post-Decon	Floor 1	Room 102	19.225	15.049	1.200	Sponge Wipe	0.694	Oudejans	4/22/2011	4:25:00 PM	Workbench	Plastic	Horizontal Upward	FALSE	top of uv aps system; left side of top surface	7	Yes	135.4	46.4
3282	VHP Post-Decon	Floor 1	Room 102	18.440	15.039	1.200	Sponge Wipe	0.694	Oudejans	4/22/2011	4:20:00 PM	Workbench	Plastic	Horizontal Upward	FALSE	top of uv aps system; right side front	7	No	ND	ND
3238	VHP Post-Decon	Floor 1	Room 102	16.942	15.683	0.700	Sponge Wipe	0.694	Oudejans	4/22/2011	4:09:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	back side of top of metal cabinet cabinet; 80 percentage overlap with pre decon sample;	7	Yes	27.8	3.6
3509	VHP Post-Decon	Floor 1	Room 102	18.234	17.006	0.700	Sponge Wipe	0.694	Oudejans	4/22/2011	3:48:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	80 percentage overlap with pre decon sample; front of top of metal cabinet	7	Yes	64.8	ND
3240	VHP Post-Decon	Floor 1	Room 102	18.385	15.909	0.000	Sponge Wipe	0.694	Oudejans	4/22/2011	3:45:00 PM	Floor	Carpet	Horizontal Upward	TRUE	sponge blank	7	No	ND	ND
3506	VHP Post-Decon	Floor 1	Room 102	19.361	16.583	0.800	Sponge Wipe	0.694	Oudejans	4/22/2011	3:33:00 PM	Desk	Metal	Horizontal Upward	FALSE	pulled drawer out. sample inside drawer; to left of pre decon sample; no overlap. closed drawer.	7	Yes	ND	5.3
3273	VHP Post-Decon	Floor 1	Room 102	18.749	16.938	0.800	Sponge Wipe	0.694	Oudejans	4/22/2011	3:28:00 PM	Desk	Plastic	Horizontal Upward	FALSE	front; left of the middle; no overlap with pre decon sample; very dirty	7	Yes	105.6	179.9

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3242	VHP Post-Decon	Floor 1	Room 102	19.895	17.388	0.800	Sponge Wipe	0.694	Oudejans	4/22/2011	3:17:00 PM	Desk	Metal	Horizontal Upward	FALSE	right corner of desk in the back.no overlap with pre decon sample;	7	Yes	ND	2.1
3244	VHP Post-Decon	Floor 1	Room 102	18.269	14.627	0.800	Sponge Wipe	0.694	Oudejans	4/22/2011	4:12:00 PM	Desk	Plastic	Horizontal Upward	FALSE	sample on desk to right of uv aps system; no overlap with pre decon sample;	7	No	ND	ND
3239	VHP Post-Decon	Floor 1	Room 102	20.154	16.406	0.800	Sponge Wipe	0.694	Oudejans	4/22/2011	2:53:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	overlap with pre decon sample; 80 percent; cabinet front	7	Yes	25.9	32.4
3218	VHP Post-Decon	Floor 1	Room 102	17.721	17.317	0.700	Sponge Wipe	0.694	Oudejans	4/22/2011	3:59:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	front of top of metal cabinet; overlap with pre decon sample;	7	No	ND	ND
3676	VHP Post-Decon	Floor 1	Room 103	13.793	10.721	0.000	Vacuum Sock	4.000	Schuette	4/23/2011	11:19:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile plenum side	4	Yes	4.2	ND
3571	VHP Post-Decon	Floor 1	Room 103	13.793	10.021	0.000	Vacuum Sock	4.000	Schuette	4/23/2011	11:24:00 AM	Floor	Smooth	Horizontal Upward	TRUE		4	No	ND	ND
3077	VHP Post-Decon	Floor 1	Room 103	13.556	8.429	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	11:03:00 AM	Table	Smooth	Horizontal Upward	FALSE		1	Yes	ND	14.7
3013	VHP Post-Decon	Floor 1	Room 103	13.765	6.814	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	10:57:00 AM	Table	Smooth	Horizontal Upward	FALSE		1	Yes	ND	35.7
3513	VHP Post-Decon	Floor 1	Room 103	13.765	6.163	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	10:53:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	120.0	13.2
3530	VHP Post-Decon	Floor 1	Room 103	14.678	6.230	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	10:48:00 AM	Wall	Textured	Vertical	FALSE		1	No	ND	ND
3529	VHP Post-Decon	Floor 1	Room 103	15.321	6.914	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	10:39:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	ND	38.0
3528	VHP Post-Decon	Floor 1	Room 103	15.093	11.614	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	10:27:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	ND	20.2
3076	VHP Post-Decon	Floor 1	Room 103	13.234	7.320	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	11:10:00 AM	Mail slot	Metal	Horizontal Upward	FALSE	top of mail slot...previous sample taken on top of mail slot also	1	Yes	ND	8.1
3525	VHP Post-Decon	Floor 1	Room 103	13.793	10.021	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	11:26:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	Yes	ND	3.3
1597	VHP Post-Decon	Floor 1	Room 103	14.421	6.814	0.000	Swab	0.028	Schuette	4/23/2011	11:13:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE	air diffuser on ceiling	1	Yes	6001.6	270.1
1654	VHP Post-Decon	Floor 1	Room 103	13.793	10.021	0.000	Swab	0.028	Schuette	4/23/2011	11:29:00 AM	Floor	Smooth	Horizontal Upward	TRUE	interior bag ripped	1	No	ND	ND
3605	VHP Post-Decon	Floor 1	Room 104	13.823	18.783	0.000	Vacuum Sock	4.000	Patureau	4/22/2011	5:03:00 PM	Ceiling	Textured	Horizontal Downward	TRUE	vac blank	2	No	ND	ND
3714	VHP Post-Decon	Floor 1	Room 104	16.297	19.181	2.700	Vacuum Sock	4.000	Patureau	4/22/2011	5:00:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		4	Yes	ND	2.3
3245	VHP Post-Decon	Floor 1	Room 104	13.752	18.883	0.000	Sponge Wipe	0.694	Patureau	4/22/2011	5:07:00 PM	Ceiling	Textured	Horizontal Downward	TRUE	sponge blank	7	No	ND	ND
3495	VHP Post-Decon	Floor 1	Room 104	16.027	20.702	1.500	Sponge Wipe	0.694	Patureau	4/22/2011	4:54:00 PM	Wall	Textured	Vertical	FALSE	above previous sample outline	7	Yes	ND	5.2
3287	VHP Post-Decon	Floor 1	Room 104	15.629	20.063	0.900	Sponge Wipe	0.694	Patureau	4/22/2011	4:47:00 PM	Table	Textured	Horizontal Downward	FALSE	right of previous sample outline	7	Yes	ND	6.6
3277	VHP Post-Decon	Floor 1	Room 104	15.245	20.077	0.900	Sponge Wipe	0.694	Patureau	4/22/2011	4:45:00 PM	Table	Textured	Horizontal Downward	FALSE	tools on table also sampled	7	No	ND	ND
3283	VHP Post-Decon	Floor 1	Room 104	15.031	18.769	0.800	Sponge Wipe	0.694	Patureau	4/22/2011	4:38:00 PM	Table	Smooth	Horizontal Downward	FALSE	left of previous sample outline when looking from entrance	7	Yes	ND	2.6

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3252	VHP Post-Decon	Floor 1	Room 104	14.832	19.579	0.000	Sponge Wipe	0.694	Patureau	4/22/2011	4:36:00 PM	Floor	Smooth	Horizontal Downward	FALSE	left of previous sample outline	7	No	ND	ND
1519	VHP Post-Decon	Floor 1	Room 104	13.624	18.940	0.000	Swab	0.028	Patureau	4/22/2011	5:06:00 PM	Ceiling	Textured	Horizontal Downward	TRUE	swab blank	1	No	ND	ND
1481	VHP Post-Decon	Floor 1	Room 104	15.515	19.395	2.700	Swab	0.028	Patureau	4/22/2011	4:56:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		1	No	ND	ND
3686	VHP Post-Decon	Floor 1	Room 105	11.682	10.966	0.000	Vacuum Sock	4.000	Schmelzer	4/22/2011	5:08:00 PM	Floor	Carpet	Horizontal Upward	FALSE	sample was taken from in front of sink [B.Melton moved to room 105]	2	Yes	ND	1.7
3718	VHP Post-Decon	Floor 1	Room 105	10.654	12.186	0.000	Vacuum Sock	4.000	Schmelzer	4/22/2011	4:52:00 PM	Floor	Carpet	Horizontal Upward	FALSE	sample was taken from the center of doorway on carpet [B.Melton moved to room 105]	2	Yes	4.2	2.3
3569	VHP Post-Decon	Floor 1	Room 105	10.606	9.575	0.000	Vacuum Sock	4.000	Schuette	4/23/2011	10:13:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile plenum side...outside bag of sample dropped on floor...wiped outside of bag off with alcohol wipe	4	Yes	4.2	1.7
3981	VHP Post-Decon	Floor 1	Room 105	10.102	7.024	0.000	Vacuum Sock	4.000	Schuette	4/23/2011	10:00:00 AM	Floor	Carpet	Horizontal Upward	FALSE	sampler may have stepped in part of sample location	4	Yes	ND	1.2
3595	VHP Post-Decon	Floor 1	Room 105	10.831	9.415	0.000	Vacuum Sock	4.000	Schuette	4/23/2011	9:45:00 AM	Floor	Carpet	Horizontal Upward	FALSE		4	Yes	ND	1.2
3074	VHP Post-Decon	Floor 1	Room 105	9.983	11.262	0.300	Sponge Wipe	0.694	Schmelzer	4/22/2011	5:32:00 PM	Wall	Smooth	Vertical	FALSE	sample was taken from the right on the previous sample [B.Melton moved to room 105]	6	No	ND	NA
3502	VHP Post-Decon	Floor 1	Room 105	10.445	9.685	0.800	Sponge Wipe	0.694	Schmelzer	4/22/2011	5:29:00 PM	Stove	Smooth	Horizontal Upward	FALSE	sample was taken from the front top of the stove [B.Melton moved to room 105]	6	No	ND	NA
3501	VHP Post-Decon	Floor 1	Room 105	12.519	10.434	0.800	Sponge Wipe	0.694	Schmelzer	4/22/2011	5:21:00 PM	Sink	Metal	Horizontal Upward	FALSE	sample was taken from right side of sink [B.Melton moved to room 105]	6	No	ND	NA
3066	VHP Post-Decon	Floor 1	Room 105	11.731	6.667	0.000	Sponge Wipe	0.694	Schuette	4/23/2011	9:56:00 AM	Table	Smooth	Horizontal Upward	FALSE		1	Yes	144.5	143.2
1676	VHP Post-Decon	Floor 1	Room 105	11.302	6.824	0.000	Swab	0.028	Schuette	4/23/2011	10:06:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE	air diffuser on ceiling	1	Yes	3601.0	2970.8
3674	VHP Post-Decon	Floor 1	Room 106	10.195	19.661	1.200	Vacuum Sock	4.000	Patureau	4/22/2011	4:08:00 PM	Wall	Cloth	Vertical	FALSE	on backside of partition in top right. some overlap with previous sample since outline was in center of wall.	5	No	ND	ND
3631	VHP Post-Decon	Floor 1	Room 106	12.646	19.784	1.400	Vacuum Sock	4.000	Patureau	4/22/2011	4:14:00 PM	Shelves	Smooth	Horizontal Downward	FALSE	around and on books	2	Yes	8.3	0.6

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3616	VHP Post-Decon	Floor 1	Room 106	12.168	20.524	0.000	Vacuum Sock	4.000	Patureau	4/22/2011	3:57:00 PM	Floor	Smooth	Horizontal Downward	FALSE	floor adjacent to wall and shelf	4	Yes	12.5	2.9
3725	VHP Post-Decon	Floor 1	Room 106	10.763	18.418	2.700	Vacuum Sock	4.000	Patureau	4/22/2011	3:51:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	ceiling tile above desk	2	Yes	16.7	8.6
3663	VHP Post-Decon	Floor 1	Room 106	11.243	20.447	0.500	Vacuum Sock	4.000	Patureau	4/22/2011	4:03:00 PM	Chair	Cloth	Horizontal Downward	FALSE	grey chair by window	4	No	ND	ND
3668	VHP Post-Decon	Floor 1	Room 106	10.994	18.433	0.500	Vacuum Sock	4.000	Patureau	4/22/2011	3:44:00 PM	Chair	Cloth	Horizontal Downward	FALSE	red desk chair seat cushion	4	No	ND	ND
3254	VHP Post-Decon	Floor 1	Room 106	11.786	15.772	0.800	Sponge Wipe	0.694	Patureau	4/22/2011	4:28:00 PM	Table	Smooth	Horizontal Downward	FALSE	to right of previous sample if facing door	7	No	ND	ND
2840	VHP Post-Decon	Floor 1	Room 106	10.180	19.892	0.700	Sponge Wipe	0.694	Patureau	4/22/2011	4:18:00 PM	File cabinet	Metal	Horizontal Downward	FALSE	adjacent to wall	7	Yes	23.5	25.9
2839	VHP Post-Decon	Floor 1	Room 106	10.512	18.406	0.797	Sponge Wipe	0.694	Patureau	4/22/2011	3:28:00 PM	Desk	Smooth	Horizontal Downward	FALSE	right of previous sample outline	7	Yes	91.2	51.4
3247	VHP Post-Decon	Floor 1	Room 106	9.981	16.206	1.088	Sponge Wipe	0.694	Patureau	4/22/2011	3:25:00 PM	Wall	Textured	Vertical	FALSE	above previous sample outline	7	No	ND	ND
3246	VHP Post-Decon	Floor 1	Room 106	10.781	14.796	0.000	Sponge Wipe	0.694	Patureau	4/22/2011	3:16:00 PM	Floor	Smooth	Horizontal Downward	FALSE	right of previous sample outline	7	Yes	ND	17.6
1682	VHP Post-Decon	Floor 1	Room 106	11.333	19.589	2.700	Swab	0.028	Patureau	4/22/2011	3:38:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		1	Yes	ND	180.0
1482	VHP Post-Decon	Floor 1	Room 106	10.212	18.707	0.997	Swab	0.028	Patureau	4/22/2011	3:32:00 PM	Monitor	Smooth	Vertical	FALSE	taken in upper right corner as instructed, although previous sample marked in upper left corner	1	No	ND	ND
3578	VHP Post-Decon	Floor 1	Room 107	8.400	7.190	0.000	Vacuum Sock	4.000	Schmelzer	4/22/2011	3:38:00 PM	Couch	Leather	Horizontal Upward	TRUE	blank	2	Yes	ND	1.2
3720	VHP Post-Decon	Floor 1	Room 107	8.531	8.414	0.000	Vacuum Sock	4.000	Schmelzer	4/22/2011	3:23:00 PM	Chair	Leather	Horizontal Upward	FALSE	sample was taken from chair cushion	2	No	ND	ND
3598	VHP Post-Decon	Floor 1	Room 107	9.018	11.935	0.000	Vacuum Sock	4.000	Schmelzer	4/22/2011	2:53:00 PM	Floor	Carpet	Horizontal Upward	FALSE	adjacent to right by light switch [B.Melton moved to room 107, moved to door]	2	No	ND	ND
3599	VHP Post-Decon	Floor 1	Room 107	7.760	11.750	2.300	Vacuum Sock	4.000	Schmelzer	4/22/2011	4:26:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	inner bag fell on the floor [B.Melton moved to room 107, moved to correct spot]	2	Yes	41.7	20.1
3593	VHP Post-Decon	Floor 1	Room 107	9.213	9.714	0.000	Vacuum Sock	4.000	Schmelzer	4/22/2011	3:00:00 PM	Couch	Cloth	Horizontal Upward	FALSE	sample from middle cushion	2	No	ND	ND
3508	VHP Post-Decon	Floor 1	Room 107	7.111	6.730	1.100	Sponge Wipe	0.694	Schmelzer	4/22/2011	3:45:00 PM	Shelves	Smooth	Horizontal Upward	FALSE	sample was taken from center of top surface [B.Melton moved to shelves]	6	No	ND	NA
3167	VHP Post-Decon	Floor 1	Room 107	8.380	7.210	0.000	Sponge Wipe	0.694	Schmelzer	4/22/2011	3:36:00 PM	Couch	Leather	Horizontal Upward	TRUE	blank	6	No	ND	NA
3067	VHP Post-Decon	Floor 1	Room 107	8.413	9.414	0.000	Sponge Wipe	0.694	Schmelzer	4/22/2011	3:18:00 PM	Table	Smooth	Horizontal Upward	FALSE	sample was taken from adjacent sides of the previous sample	6	Yes	1970324.9	NA
3158	VHP Post-Decon	Floor 1	Room 107	7.542	12.317	0.000	Sponge Wipe	0.694	Schmelzer	4/22/2011	4:06:00 PM	Wall	Smooth	Vertical	FALSE	sample was taken from left side of the previous sample	6	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1647	VHP Post-Decon	Floor 1	Room 107	7.124	9.537	0.800	Swab	0.028	Schmelzer	4/22/2011	3:55:00 PM	Monitor	Glass	Vertical	FALSE	sample was taken from upper left of the monitor [B.Melton moved to room 107, moved across room]	1	No	ND	ND
1695	VHP Post-Decon	Floor 1	Room 107	8.380	7.190	0.000	Swab	0.028	Schmelzer	4/22/2011	3:34:00 PM	Couch	Leather	Horizontal Upward	TRUE	blank	1	Yes	600.2	90.0
1605	VHP Post-Decon	Floor 1	Room 107	8.300	6.900	2.300	Swab	0.028	Schmelzer	4/22/2011	4:13:00 PM	Supply Vent	Textured	Inclined	FALSE	vent surface is rusty [B.Melton moved to room 107]	1	No	ND	ND
3977	VHP Post-Decon	Floor 1	Room 108	8.513	16.430	1.184	Vacuum Sock	4.000	Patureau	4/22/2011	3:08:00 PM	Wall	Textured	Vertical	TRUE	vacuum blank	4	No	ND	ND
3719	VHP Post-Decon	Floor 1	Room 108	9.413	19.717	1.299	Vacuum Sock	4.000	Patureau	4/22/2011	2:41:00 PM	Shelves	Metal	Horizontal Downward	FALSE	top of bookshelf, on and around books	2	Yes	12.5	1.7
3633	VHP Post-Decon	Floor 1	Room 108	8.013	20.617	0.498	Vacuum Sock	4.000	Patureau	4/22/2011	2:36:00 PM	Chair	Cloth	Horizontal Downward	FALSE	grey chair by window	4	No	ND	ND
3592	VHP Post-Decon	Floor 1	Room 108	9.413	19.917	1.198	Vacuum Sock	4.000	Patureau	4/22/2011	2:31:00 PM	Wall	Cloth	Vertical	FALSE	above previous sample outline	4	No	ND	ND
3658	VHP Post-Decon	Floor 1	Room 108	9.413	17.230	2.700	Vacuum Sock	4.000	Patureau	4/22/2011	2:21:00 PM	Ceiling	Textured	Horizontal Downward	FALSE		4	No	ND	ND
3978	VHP Post-Decon	Floor 1	Room 108	7.713	18.917	0.495	Vacuum Sock	4.000	Patureau	4/22/2011	2:12:00 PM	Chair	Cloth	Horizontal Downward	FALSE	seat of chair	4	Yes	ND	1.2
3520	VHP Post-Decon	Floor 1	Room 108	9.451	20.017	1.298	Sponge Wipe	0.694	Patureau	4/22/2011	2:46:00 PM	Shelves	Metal	Horizontal Downward	FALSE	sample taken to right of previous sample outline. book was blocking top 2 inches of template. spine of book sponged.	6	Yes	27.9	NA
3524	VHP Post-Decon	Floor 1	Room 108	8.513	16.230	1.095	Sponge Wipe	0.694	Patureau	4/22/2011	3:05:00 PM	Wall	Textured	Vertical	TRUE	blank sponge	6	No	ND	NA
3522	VHP Post-Decon	Floor 1	Room 108	9.151	14.717	0.794	Sponge Wipe	0.694	Patureau	4/22/2011	3:00:00 PM	Wall	Textured	Vertical	FALSE	above previous sample outline	6	Yes	18.6	NA
3505	VHP Post-Decon	Floor 1	Room 108	7.151	19.317	0.798	Sponge Wipe	0.694	Patureau	4/22/2011	1:58:00 PM	Desk	Smooth	Horizontal Downward	FALSE	sample taken in far right corner of desk near wall, due to obstruction by ceiling tile	7	No	ND	ND
3065	VHP Post-Decon	Floor 1	Room 108	7.413	18.017	0.000	Sponge Wipe	0.694	Patureau	4/22/2011	1:47:00 PM	Floor	Smooth	Horizontal Downward	FALSE	above previous sample outline	7	Yes	ND	2.4
3063	VHP Post-Decon	Floor 1	Room 108	9.413	16.730	0.000	Sponge Wipe	0.694	Patureau	4/22/2011	2:57:00 PM	Floor	Smooth	Horizontal Downward	FALSE	right of previous sample outline, adjacent to wall	7	No	ND	ND
1576	VHP Post-Decon	Floor 1	Room 108	8.613	16.530	1.187	Swab	0.028	Patureau	4/22/2011	3:10:00 PM	Wall	Textured	Vertical	TRUE	swab blank	1	No	ND	ND
1637	VHP Post-Decon	Floor 1	Room 108	8.813	19.717	2.700	Swab	0.028	Patureau	4/22/2011	2:53:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		1	No	ND	ND
1520	VHP Post-Decon	Floor 1	Room 108	7.151	18.717	0.897	Swab	0.028	Patureau	4/22/2011	2:04:00 PM	Monitor	Smooth	Vertical	FALSE	sample taken to right of previous sample outline	1	No	ND	ND
3627	VHP Post-Decon	Floor 1	Room 109	4.854	7.707	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	3:51:00 PM	Bed	Porous	Horizontal Upward	FALSE		3	Yes	ND	0.6
3669	VHP Post-Decon	Floor 1	Room 109	5.674	7.723	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	3:45:00 PM	Bed	Porous	Horizontal Upward	FALSE		3	Yes	ND	0.6

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3576	VHP Post-Decon	Floor 1	Room 109	5.221	10.531	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	3:36:00 PM	Floor	Carpet	Horizontal Upward	TRUE		7	No	ND	ND
3563	VHP Post-Decon	Floor 1	Room 109	4.709	10.728	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	3:08:00 PM	Floor	Carpet	Horizontal Upward	FALSE		3	Yes	ND	0.6
3681	VHP Post-Decon	Floor 1	Room 109	5.921	11.414	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	3:01:00 PM	Floor	Carpet	Horizontal Upward	FALSE	had to move heater to hallway in order to access sample location	3	No	ND	ND
3689	VHP Post-Decon	Floor 1	Room 109	5.821	6.914	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	4:08:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	no marking as to which side was samped pre-VHP...ceiling tile already down on bed	7	Yes	ND	0.6
2604	VHP Post-Decon	Floor 1	Room 109	3.874	6.485	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	3:58:00 PM	Wall	Textured	Vertical	FALSE	pre-VHP sample marked approx 3.5 ft up...took post sample immediately below pre	3	No	ND	ND
2660	VHP Post-Decon	Floor 1	Room 109	5.221	10.531	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	3:37:00 PM	Floor	Carpet	Horizontal Upward	TRUE		3	No	ND	ND
2657	VHP Post-Decon	Floor 1	Room 109	4.227	9.539	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	3:25:00 PM	Nightstand	Smooth	Horizontal Upward	FALSE	no marking of template from pre-VHP sampling	3	No	ND	ND
2658	VHP Post-Decon	Floor 1	Room 109	4.340	10.921	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	3:21:00 PM	Countertop	Smooth	Horizontal Upward	FALSE	countertop left of sink	3	Yes	153.6	ND
2659	VHP Post-Decon	Floor 1	Room 109	4.324	12.239	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	3:18:00 PM	Countertop	Smooth	Horizontal Upward	FALSE	countertop right of sink	3	No	ND	ND
2429	VHP Post-Decon	Floor 1	Room 109	4.855	6.038	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	4:01:00 PM	Countertop	Paint	Horizontal Upward	FALSE	sample on windowsill...no marking from pre-VHP sampling	3	Yes	19.2	ND
3716	VHP Post-Decon	Floor 1	Room 110	5.711	16.651	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	1:20:00 PM	Floor	Smooth	Horizontal Upward	TRUE		7	Yes	ND	0.6
3655	VHP Post-Decon	Floor 1	Room 110	4.932	18.452	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	1:54:00 PM	Chair	Cloth	Horizontal Upward	FALSE		7	Yes	ND	0.6
3612	VHP Post-Decon	Floor 1	Room 110	5.811	16.551	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	2:51:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile on plenum side...ceiling tile already on floor	7	Yes	ND	4.0
3648	VHP Post-Decon	Floor 1	Room 110	4.145	19.576	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	2:42:00 PM	Wall	Porous	Vertical	FALSE	partition	7	Yes	4.2	1.2
3722	VHP Post-Decon	Floor 1	Room 110	4.973	19.251	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	2:34:00 PM	Chair	Cloth	Horizontal Upward	FALSE	current chair location not the same as on the map [on the map chair is under far window]...BROOM location is chair's current location	7	No	ND	ND
3584	VHP Post-Decon	Floor 1	Room 110	6.619	20.572	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	2:14:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE		3	Yes	ND	0.6
3868	VHP Post-Decon	Floor 1	Room 110	6.619	19.817	0.000	Vacuum Sock	4.000	Schuette	4/22/2011	2:10:00 PM	File cabinet	Textured	Horizontal Upward	FALSE	vacuum on and around books on top of file cabinet	7	Yes	ND	0.6
3280	VHP Post-Decon	Floor 1	Room 110	4.546	17.922	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	1:38:00 PM	Desk	Smooth	Horizontal Upward	FALSE		3	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3279	VHP Post-Decon	Floor 1	Room 110	5.711	16.651	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	1:28:00 PM	Floor	Smooth	Horizontal Upward	TRUE		3	No	ND	ND
3275	VHP Post-Decon	Floor 1	Room 110	5.373	14.751	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	1:11:00 PM	Floor	Smooth	Horizontal Upward	FALSE		3	No	ND	ND
3281	VHP Post-Decon	Floor 1	Room 110	6.011	17.496	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	1:46:00 PM	Floor	Smooth	Horizontal Upward	FALSE		3	No	ND	ND
3284	VHP Post-Decon	Floor 1	Room 110	4.386	19.865	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	2:27:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE		3	Yes	ND	4.6
3286	VHP Post-Decon	Floor 1	Room 110	4.530	20.700	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	2:22:00 PM	Wall	Textured	Vertical	FALSE	pre-VHP sample was taken approx 5 ft from ground...took post sample directly under pre sample	3	No	ND	ND
3285	VHP Post-Decon	Floor 1	Room 110	6.619	20.234	0.000	Sponge Wipe	0.694	Schuette	4/22/2011	2:17:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE		3	No	ND	ND
1633	VHP Post-Decon	Floor 1	Room 110	5.711	16.651	0.000	Swab	0.028	Schuette	4/22/2011	1:26:00 PM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	ND
1653	VHP Post-Decon	Floor 1	Room 110	5.311	19.551	0.000	Swab	0.028	Schuette	4/22/2011	2:45:00 PM	Supply Vent	Metal	Horizontal Upward	FALSE	diffuser on ceiling	1	No	ND	ND
1634	VHP Post-Decon	Floor 1	Room 110	4.177	18.517	0.000	Swab	0.028	Schuette	4/22/2011	1:41:00 PM	Monitor	Smooth	Vertical	FALSE	upper right	1	No	ND	ND
3684	VHP Post-Decon	Floor 2	Bathroom M	27.804	19.731	3.000	Vacuum Sock	4.000	Patel	4/22/2011	5:40:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	ceiling tile in center of room sampled. team could not find marked tile. tile was placed on floor outside bathroom since no electrical outlet was available. point manually picked. light is adequate.	6	No	ND	NA
2674	VHP Post-Decon	Floor 2	Bathroom M	29.782	20.193	3.000	Sponge Wipe	0.694	Patel	4/22/2011	5:33:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor or rear stall entrance.	4	No	ND	ND
2646	VHP Post-Decon	Floor 2	Bathroom M	27.050	20.108	3.000	Sponge Wipe	0.694	Patel	4/22/2011	5:31:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor of entrance to men's bathroom. template used. adequate light available.	4	No	ND	ND
2682	VHP Post-Decon	Floor 2	Bathroom M	28.728	20.452	3.700	Sponge Wipe	0.694	Patel	4/22/2011	5:36:00 PM	Wall	Textured	Vertical	FALSE	sample taken on left wall of men's bathroom near rear stall entrance.	4	No	ND	ND
3580	VHP Post-Decon	Floor 2	Bathroom W	27.734	17.404	3.000	Vacuum Sock	4.000	Patel	4/22/2011	5:28:00 PM	Ceiling	Textured	Horizontal Downward	TRUE	blank vacuum	6	No	ND	NA
3666	VHP Post-Decon	Floor 2	Bathroom W	28.146	17.777	3.000	Vacuum Sock	4.000	Patel	4/22/2011	5:24:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	sample taken of ceiling tile. ceiling tile located near bathroom mirrors on left side of room. manually picked point.	6	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2673	VHP Post-Decon	Floor 2	Bathroom W	28.739	17.740	3.000	Sponge Wipe	0.694	Patel	4/22/2011	5:19:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor near bathroom stall. no light available. manually picked point.	4	No	ND	ND
1984	VHP Post-Decon	Floor 2	Bathroom W	26.672	16.797	3.000	Sponge Wipe	0.694	Patel	4/22/2011	5:16:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor of bathroom entrance. no light available. manually picked point since laser could not read.	4	No	ND	ND
2230	VHP Post-Decon	Floor 2	Bathroom W	28.146	17.365	3.000	Sponge Wipe	0.694	Patel	4/22/2011	5:21:00 PM	Floor	Smooth	Horizontal Downward	TRUE	blank in center of room. manually picked point.	4	No	ND	ND
2678	VHP Post-Decon	Floor 2	Copier Room	30.005	13.363	3.000	Sponge Wipe	0.694	Patel	4/22/2011	5:00:00 PM	Floor	Porous	Horizontal Downward	FALSE	sample taken on floor at very end of room. no light available. no furniture in room.	4	No	ND	ND
2608	VHP Post-Decon	Floor 2	Copier Room	29.405	14.131	3.682	Sponge Wipe	0.694	Patel	4/22/2011	3:15:00 PM	Wall	Porous	Vertical	FALSE	sample on left wall taken. no light available for picture. sample taken just above an electrical outlet.	4	No	ND	ND
2237	VHP Post-Decon	Floor 2	Copier Room	27.505	13.563	3.000	Sponge Wipe	0.694	Patel	4/22/2011	3:12:00 PM	Floor	Porous	Horizontal Downward	FALSE	floor sample taken near entrance of copier room. room has no light or furniture. room is also numbered 25 on door way.	4	No	ND	ND
3607	VHP Post-Decon	Floor 2	Hallway	7.593	12.668	3.000	Vacuum Sock	4.000	Johnson	4/22/2011	12:13:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		5	No	ND	ND
3589	VHP Post-Decon	Floor 2	Hallway	8.993	13.068	3.000	Vacuum Sock	4.000	Johnson	4/22/2011	2:28:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		3	No	ND	ND
3886	VHP Post-Decon	Floor 2	Hallway	7.693	12.768	3.000	Vacuum Sock	4.000	Johnson	4/22/2011	11:00:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	previous sample taken in the middle, current taken on the left side.	3	No	ND	ND
3583	VHP Post-Decon	Floor 2	Hallway	24.537	12.768	3.000	Vacuum Sock	4.000	Johnson	4/22/2011	1:21:00 PM	Ceiling	Porous	Horizontal Downward	TRUE		3	No	ND	ND
2053	VHP Post-Decon	Floor 2	Hallway	25.013	15.730	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:16:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
3142	VHP Post-Decon	Floor 2	Hallway	26.537	13.490	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	1:54:00 PM	Floor	Smooth	Horizontal Downward	FALSE		3	No	ND	ND
2437	VHP Post-Decon	Floor 2	Hallway	26.437	13.677	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:08:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		3	No	ND	ND
2048	VHP Post-Decon	Floor 2	Hallway	25.883	18.850	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:20:00 PM	Wall	Textured	Vertical	FALSE		3	No	ND	ND
2030	VHP Post-Decon	Floor 2	Hallway	24.805	13.068	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:23:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
3170	VHP Post-Decon	Floor 2	Hallway	13.193	13.828	3.495	Sponge Wipe	0.694	Johnson	4/22/2011	12:22:00 PM	Floor	Smooth	Horizontal Upward	FALSE		3	No	ND	ND
3159	VHP Post-Decon	Floor 2	Hallway	25.437	12.968	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	12:27:00 PM	Floor	Smooth	Horizontal Upward	FALSE		5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3169	VHP Post-Decon	Floor 2	Hallway	17.027	12.768	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	1:20:00 PM	Ceiling	Porous	Horizontal Downward	TRUE		3	No	ND	ND
2046	VHP Post-Decon	Floor 2	Hallway	8.174	13.829	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	10:33:00 AM	Return Vent	Porous	Horizontal Upward	FALSE	No marking, completed far left side.	3	No	ND	ND
2045	VHP Post-Decon	Floor 2	Hallway	8.693	12.868	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	10:42:00 AM	Floor	Smooth	Horizontal Upward	FALSE	No marking, took sample under second red arrow	3	No	ND	ND
2044	VHP Post-Decon	Floor 2	Hallway	7.693	13.868	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	11:52:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	No	ND	ND
2043	VHP Post-Decon	Floor 2	Hallway	13.293	12.668	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	12:03:00 PM	Wall	Textured	Vertical	FALSE	Center wall beneath previous sample taken.	3	No	ND	ND
3713	VHP Post-Decon	Floor 2	Janitor Closet	29.164	15.978	3.000	Vacuum Sock	4.000	Patel	4/22/2011	5:12:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	sample taken on ceiling tile. tile was placed on floor for easier access. tile sampled is located towards far end of room. no light available.	6	No	ND	NA
2677	VHP Post-Decon	Floor 2	Janitor Closet	27.601	14.552	3.000	Sponge Wipe	0.694	Patel	4/22/2011	5:02:00 PM	Floor	Porous	Horizontal Downward	FALSE	sample on floor at entrance of janitorial room. room is numbered 24 on door way. no light available. no furniture in room.	4	No	ND	ND
2676	VHP Post-Decon	Floor 2	Janitor Closet	28.596	15.678	3.000	Sponge Wipe	0.694	Patel	4/22/2011	5:04:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor towards the left wall of room. no light in room.	4	No	ND	ND
3640	VHP Post-Decon	Floor 2	Mechanical Room	22.021	18.602	3.000	Vacuum Sock	4.000	Johnson	4/22/2011	2:46:00 PM	Return Vent	Porous	Horizontal Downward	FALSE	Sample taken from a filter behind the air exchange.	3	Yes	ND	1.2
2049	VHP Post-Decon	Floor 2	Mechanical Room	22.193	19.854	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:38:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	ND	22.0
2052	VHP Post-Decon	Floor 2	Mechanical Room	18.893	19.854	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:43:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
3551	VHP Post-Decon	Floor 2	Room 201	29.015	11.469	3.000	Vacuum Sock	4.000	Patel	4/22/2011	2:43:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	sample of ceiling tile taken. ceiling tile was placed on floor for easier access. right side of tile was sampled.	7	Yes	ND	0.6
2680	VHP Post-Decon	Floor 2	Room 201	26.715	12.069	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:36:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken of floor at entrance of room 201. template was used.	1	No	ND	ND
2750	VHP Post-Decon	Floor 2	Room 201	29.015	11.369	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:39:00 PM	Floor	Smooth	Horizontal Downward	FALSE	floor sample near window with duct work taken. template was used.	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3574	VHP Post-Decon	Floor 2	Room 201A	28.715	7.667	3.000	Vacuum Sock	4.000	Patel	4/22/2011	3:01:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	sample of ceiling taken. left side of tile was sampled. black particles noticeable. tile is located near left window.	6	No	ND	NA
2748	VHP Post-Decon	Floor 2	Room 201A	26.815	8.967	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:51:00 PM	Floor	Smooth	Horizontal Downward	FALSE	floor sample taken on entrance of room 201A. template was used.	4	No	ND	ND
2675	VHP Post-Decon	Floor 2	Room 201A	29.415	6.067	3.697	Sponge Wipe	0.694	Patel	4/22/2011	3:07:00 PM	Wall	Textured	Vertical	FALSE	sample taken on wall near window opposite of entrance. sample taken on lower left of window. template was used. no furniture in room.	4	No	ND	ND
2238	VHP Post-Decon	Floor 2	Room 201A	29.015	6.940	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:57:00 PM	Floor	Smooth	Horizontal Downward	FALSE	floor sample taken to right of window opposite entrance. sample is near right far corner of room opposite entrance.of room.	4	No	ND	ND
2684	VHP Post-Decon	Floor 2	Room 201A	29.015	8.940	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:53:00 PM	Floor	Smooth	Horizontal Downward	FALSE	floor sample taken on left side of room near left window. template was used.	1	No	ND	ND
2047	VHP Post-Decon	Floor 2	Room 202	22.084	16.045	4.194	Sponge Wipe	0.694	Johnson	4/22/2011	1:59:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	ND	3.2
2051	VHP Post-Decon	Floor 2	Room 202	22.178	16.045	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:02:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
3695	VHP Post-Decon	Floor 2	Room 203	24.949	10.849	3.000	Vacuum Sock	4.000	Patel	4/22/2011	2:07:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	sample taken on ceiling tile. side to right of entrance was sampled. minimal light available. ceiling tile was placed on floor for easier access. this room has no furniture.	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2712	VHP Post-Decon	Floor 2	Room 203	23.750	10.050	3.493	Sponge Wipe	0.694	Patel	4/22/2011	2:15:00 PM	Wall	Textured	Vertical	FALSE	sample taken on wall near door way of room 204A. minimal light available. <Collector wrote in subsequent sample: previous sample was in wrong room. correct room is room 203. references of 204a in previous samples should be 203a- typo. sample was on wall	4	No	ND	ND
2587	VHP Post-Decon	Floor 2	Room 203	24.949	10.149	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:12:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor on far right side from entrance near corner adjacent to room 204a. minimal light available. template was used.	1	No	ND	ND
2709	VHP Post-Decon	Floor 2	Room 203	24.949	12.049	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:01:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor near entrance of room 203. sponge used. minimal lighting in this room. template used.	4	Yes	ND	2.7
3570	VHP Post-Decon	Floor 2	Room 203A	23.449	8.240	3.000	Vacuum Sock	4.000	Patel	4/22/2011	2:29:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	sample taken of ceiling tile. sample taken on right half. tile is located near window. couple broken pieces above ceiling tile was moved away to vacuum. black particles were also noticeable.	6	No	ND	NA
2710	VHP Post-Decon	Floor 2	Room 203A	25.049	8.840	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:24:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor near window. template was used.	4	No	ND	ND
2711	VHP Post-Decon	Floor 2	Room 203A	24.008	9.540	3.000	Sponge Wipe	0.694	Patel	4/22/2011	2:22:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on entrance of room 203A. sample on floor. template was used. room has no furniture. lighting is fine.	4	No	ND	ND
4065	VHP Post-Decon	Floor 2	Room 204	20.293	17.290	3.000	Vacuum Sock	4.000	Johnson	4/22/2011	1:51:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3140	VHP Post-Decon	Floor 2	Room 204	19.293	16.214	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	1:37:00 PM	Floor	Smooth	Horizontal Upward	FALSE		5	No	ND	ND
3139	VHP Post-Decon	Floor 2	Room 204	19.693	16.214	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	1:33:00 PM	Wall	Textured	Vertical	FALSE		5	No	ND	ND
3168	VHP Post-Decon	Floor 2	Room 204	20.293	14.590	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	1:28:00 PM	Floor	Smooth	Horizontal Upward	FALSE	No lighting in room.	3	No	ND	ND
3688	VHP Post-Decon	Floor 2	Room 205	19.625	8.750	3.000	Vacuum Sock	4.000	Patel	4/22/2011	1:54:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	sample taken of ceiling tile. tile was placed on floor for easier access. sample taken on side closest to entrance.	7	No	ND	ND
2707	VHP Post-Decon	Floor 2	Room 205	19.625	7.850	3.000	Sponge Wipe	0.694	Patel	4/22/2011	1:47:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor near center of room. sample is closer to window than entrance.	1	No	ND	ND
2192	VHP Post-Decon	Floor 2	Room 205	19.625	6.269	3.594	Sponge Wipe	0.694	Patel	4/22/2011	1:49:00 PM	Wall	Textured	Vertical	FALSE	sample taken on wall. template used.	1	No	ND	ND
2814	VHP Post-Decon	Floor 2	Room 205	20.425	11.650	3.000	Sponge Wipe	0.694	Patel	4/22/2011	1:45:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sampl taken on floor next to entrance of room 205. unexpected error with broom occurred. restarted and appears to work fine. template was used .	4	No	ND	ND
3573	VHP Post-Decon	Floor 2	Room 206	17.477	16.565	3.000	Vacuum Sock	4.000	Johnson	4/22/2011	1:05:00 PM	Table	Smooth	Horizontal Upward	TRUE	[B.Melton moved from 208 to 206]	5	No	ND	ND
3545	VHP Post-Decon	Floor 2	Room 206	17.790	17.433	3.000	Vacuum Sock	4.000	Johnson	4/22/2011	1:15:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	[B.Melton moved from 208 to 206]	5	No	ND	ND
3521	VHP Post-Decon	Floor 2	Room 206	17.710	18.596	3.800	Sponge Wipe	0.694	Johnson	4/22/2011	1:00:00 PM	Table	Smooth	Horizontal Upward	FALSE	[B.Melton moved from 208 to 206]	3	No	ND	ND
3183	VHP Post-Decon	Floor 2	Room 206	17.844	19.626	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	12:55:00 PM	Floor	Porous	Horizontal Upward	FALSE	Sawdust on floor forced to tap sample taken. [B.Melton moved from 208 to 206 and moved positon per notes]	5	No	ND	ND
3138	VHP Post-Decon	Floor 2	Room 206	17.647	20.350	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	12:46:00 PM	Workbench	Porous	Horizontal Downward	FALSE	Tools moved for sampling. [B.Melton moved from 208 to 206 and moved to workbench]	5	No	ND	ND
3141	VHP Post-Decon	Floor 2	Room 206	17.065	20.368	3.296	Sponge Wipe	0.694	Johnson	4/22/2011	12:41:00 PM	Workbench	Porous	Horizontal Downward	FALSE	[B.Melton moved from 208 to 206 and moved to workbench]	5	No	ND	ND
3157	VHP Post-Decon	Floor 2	Room 206	15.830	16.807	3.997	Sponge Wipe	0.694	Johnson	4/22/2011	12:35:00 PM	Floor	Smooth	Horizontal Upward	FALSE	[B.Melton moved from 208 to 206]	5	No	ND	ND
3130	VHP Post-Decon	Floor 2	Room 206	17.396	16.744	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	1:08:00 PM	Table	Smooth	Horizontal Upward	TRUE	[B.Melton moved from 208 to 206]	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1494	VHP Post-Decon	Floor 2	Room 206	17.593	16.744	3.000	Swab	0.028	Johnson	4/22/2011	1:03:00 PM	Table	Smooth	Horizontal Upward	TRUE	[B.Melton moved from 208 to 206]	1	No	ND	ND
1628	VHP Post-Decon	Floor 2	Room 206	16.582	16.816	5.800	Swab	0.028	Johnson	4/22/2011	12:50:00 PM	Supply Vent	Smooth	Vertical	FALSE	[B.Melton moved from 208 to 206]	1	Yes	ND	89.9
3587	VHP Post-Decon	Floor 2	Room 207	17.553	10.259	3.000	Vacuum Sock	4.000	Patel	4/22/2011	1:31:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on top side of ceiling tile farthest away from entrance. black particles noticeable. no template used. tile placed on floor for easier access.	6	No	ND	NA
3556	VHP Post-Decon	Floor 2	Room 207	17.353	11.259	3.000	Vacuum Sock	4.000	Patel	4/22/2011	1:26:00 PM	Floor	Smooth	Horizontal Downward	TRUE	vacuum blank	7	No	ND	ND
2818	VHP Post-Decon	Floor 2	Room 207	17.353	11.259	3.000	Sponge Wipe	0.694	Patel	4/22/2011	1:23:00 PM	Floor	Smooth	Horizontal Downward	TRUE	blank	4	No	ND	ND
2823	VHP Post-Decon	Floor 2	Room 207	17.353	9.159	3.796	Sponge Wipe	0.694	Patel	4/22/2011	1:19:00 PM	Table	Smooth	Horizontal Downward	FALSE	sample taken on table surface with mail. sample location is near center of table. template used	4	No	ND	ND
2713	VHP Post-Decon	Floor 2	Room 207	15.653	6.550	3.697	Sponge Wipe	0.694	Patel	4/22/2011	1:09:00 PM	Table	Smooth	Horizontal Downward	FALSE	sample taken on table surface near center of table. sample is adjacent to previous sample	4	No	ND	ND
2704	VHP Post-Decon	Floor 2	Room 207	17.968	6.859	3.596	Sponge Wipe	0.694	Patel	4/22/2011	1:17:00 PM	Wall	Textured	Vertical	FALSE	sample taken on left wall in front of a table with mail.	4	No	ND	ND
2708	VHP Post-Decon	Floor 2	Room 207	15.653	8.750	3.798	Sponge Wipe	0.694	Patel	4/22/2011	1:07:00 PM	Table	Smooth	Horizontal Downward	FALSE	sample top surface of table adjacent to previous sample. template used. sample taken near center of table.	4	No	ND	ND
2829	VHP Post-Decon	Floor 2	Room 207	15.653	6.550	3.772	Sponge Wipe	0.694	Patel	4/22/2011	1:02:00 PM	Table	Smooth	Horizontal Downward	FALSE	template used. sampled left corner nearest entrance.	4	No	ND	ND
2816	VHP Post-Decon	Floor 2	Room 207	15.653	8.150	3.000	Sponge Wipe	0.694	Patel	4/22/2011	12:57:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sample taken on floor at entrance of room 207. template used.	4	No	ND	ND
2744	VHP Post-Decon	Floor 2	Room 207	15.653	8.150	3.698	Sponge Wipe	0.694	Patel	4/22/2011	1:13:00 PM	Table	Smooth	Horizontal Downward	FALSE	sample taken on table surface on edge of table nearest window-farthest point from room entrance. template used.	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1650	VHP Post-Decon	Floor 2	Room 207	16.370	7.150	3.000	Swab	0.028	Patel	4/22/2011	1:36:00 PM	Ceiling	Metal	Horizontal Upward	FALSE	ceiling vent sampled with swab. swab is noticeably brown after sampling. vent is near center of room. <Collector wrote in subsequent sample: previous sample was located in wrong room. room 207 is correct room. sample was swab of ceiling vent in center of	1	No	ND	ND
1606	VHP Post-Decon	Floor 2	Room 207	17.353	11.259	3.000	Swab	0.028	Patel	4/22/2011	1:24:00 PM	Floor	Smooth	Horizontal Downward	TRUE	blank	1	No	ND	ND
3603	VHP Post-Decon	Floor 2	Room 208	13.755	20.389	3.594	Vacuum Sock	4.000	Patel	4/22/2011	12:20:00 PM	Chair	Smooth	Horizontal Upward	FALSE	sampled chair seat. appears to be slightly less than 2ft x 2ft in size. chair located on far end of room away from entrance. chsir is next to window. template not used. [B.Melton moved position to chair]	6	No	ND	NA
3548	VHP Post-Decon	Floor 2	Room 208	13.200	16.870	5.800	Vacuum Sock	4.000	Patel	4/22/2011	12:51:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	sampled top side of ceiling tile. tile was placed on floor for easier access. sample taken on far side of tile away from entrance.	7	No	ND	ND
3717	VHP Post-Decon	Floor 2	Room 208	13.512	18.456	3.595	Vacuum Sock	4.000	Patel	4/22/2011	12:45:00 PM	Chair	Carpet	Horizontal Downward	FALSE	chair seat was sampled with vacuum. template not used. chair seat appears to be slightly. less than 2ft x 2ft. chair seat is located by desk with monitor. [B.Melton moved from round table to computer chair per notes and photo]	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3667	VHP Post-Decon	Floor 2	Room 208	13.738	19.484	4.490	Vacuum Sock	4.000	Patel	4/22/2011	12:26:00 PM	Floor	Smooth	Horizontal Upward	FALSE	when stading with back towards entrance, sample taken on far left, upper corner of partition facing window. template was not used. [B.Melton moved to partition from near doorway per photo]	7	No	ND	ND
3552	VHP Post-Decon	Floor 2	Room 208	14.726	20.390	3.000	Vacuum Sock	4.000	Patel	4/22/2011	12:17:00 PM	Floor	Smooth	Horizontal Upward	FALSE	vacuum sample on far right corner of room away from entrance and adjacent to front side of filing cabinet. template was used. [B.Melton moved from doorway per notes]	7	Yes	ND	0.6
3604	VHP Post-Decon	Floor 2	Room 208	14.936	19.303	3.000	Vacuum Sock	4.000	Patel	4/22/2011	12:03:00 PM	Floor	Smooth	Horizontal Upward	FALSE	Vacuum sample of floor adjacent to right wall and next to filing cabinet. Template was used. [B.Melton moved from same location in room 206 to 208]	6	No	ND	NA
3498	VHP Post-Decon	Floor 2	Room 208	12.876	19.961	3.698	Sponge Wipe	0.694	Patel	4/22/2011	12:38:00 PM	File cabinet	Metal	Horizontal Downward	FALSE	sample on top of filing cabinet on left side of room. template was used [B.Melton moved slightly to top of cabinet]	4	No	ND	ND
3093	VHP Post-Decon	Floor 2	Room 208	15.294	18.225	3.697	Sponge Wipe	0.694	Patel	4/22/2011	11:58:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample on right wall adjacent to filing cabinet. [B.Melton nudged through wall from room 206 to 208]	4	No	ND	ND
3126	VHP Post-Decon	Floor 2	Room 208	13.602	15.145	3.798	Sponge Wipe	0.694	Patel	4/22/2011	11:38:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on table closest to door entrance.	1	No	ND	ND
1630	VHP Post-Decon	Floor 2	Room 208	12.792	18.600	4.096	Swab	0.028	Patel	4/22/2011	12:41:00 PM	Monitor	Smooth	Vertical	FALSE	sample of computer monitor on upper right side when facing monitor. template was used [B.Melton moved to monitor from round table per notes]	1	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1624	VHP Post-Decon	Floor 2	Room 208	13.871	20.045	5.800	Swab	0.028	Patel	4/22/2011	12:32:00 PM	Ceiling	Metal	Horizontal Upward	FALSE	sample of ceiling vent on far side of room near window.	1	No	ND	ND
3636	VHP Post-Decon	Floor 2	Room 209	14.756	10.552	3.000	Vacuum Sock	4.000	Patel	4/22/2011	6:14:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	sample taken of ceiling tile near entrance of room 209. tile was placed on floor for easier access. point manually picked.	7	No	ND	ND
3708	VHP Post-Decon	Floor 2	Room 209	13.778	8.096	3.000	Vacuum Sock	4.000	Patel	4/22/2011	6:08:00 PM	Floor	Carpet	Horizontal Downward	FALSE	sample taken on floor in front of round table. point manually picked.	7	No	ND	ND
3682	VHP Post-Decon	Floor 2	Room 209	14.730	10.877	3.000	Vacuum Sock	4.000	Patel	4/22/2011	6:02:00 PM	Floor	Carpet	Horizontal Downward	FALSE	sample taken on floor near entrance of room 209. point manually picked.	6	No	ND	NA
2600	VHP Post-Decon	Floor 2	Room 209	13.573	12.017	4.000	Sponge Wipe	0.694	Patel	4/22/2011	5:48:00 PM	Table	Smooth	Horizontal Downward	FALSE	sample taken on table surface to right of entrance of room 209. point manually picked.	1	Yes	ND	5.9
1975	VHP Post-Decon	Floor 2	Room 209	12.600	6.868	3.400	Sponge Wipe	0.694	Patel	4/22/2011	5:59:00 PM	Wall	Textured	Vertical	FALSE	sample of wall taken to right of round table. adequate light available. point manually picked.	1	No	ND	ND
2655	VHP Post-Decon	Floor 2	Room 209	13.828	6.893	3.800	Sponge Wipe	0.694	Patel	4/22/2011	5:56:00 PM	Table	Smooth	Horizontal Downward	FALSE	sample taken on center of table surface located at far end of room. table located near window. <Sample integrity issue so no lab result. RK>	6	NA	NA	NA
2596	VHP Post-Decon	Floor 2	Room 209	15.021	9.373	4.000	Sponge Wipe	0.694	Patel	4/22/2011	5:53:00 PM	Table	Smooth	Horizontal Downward	FALSE	sample taken on stove top- far right corner when facing it. template used.	4	No	ND	ND
2603	VHP Post-Decon	Floor 2	Room 209	12.763	11.456	4.000	Sponge Wipe	0.694	Patel	4/22/2011	5:50:00 PM	Table	Smooth	Horizontal Downward	FALSE	sample taken on table surface to right of sink.	1	No	ND	ND
3557	VHP Post-Decon	Floor 2	Room 210	10.731	16.288	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	1:50:00 PM	Floor	Textured	Vertical	TRUE	1ST of 3	3	No	ND	ND
3712	VHP Post-Decon	Floor 2	Room 210	10.155	15.605	5.182	Vacuum Sock	4.000	McIntyre	4/22/2011	1:46:00 PM	Ceiling	Textured	Vertical	FALSE		5	No	ND	ND
4075	VHP Post-Decon	Floor 2	Room 210	10.411	19.854	4.391	Vacuum Sock	4.000	McIntyre	4/22/2011	1:25:00 PM	Wall	Cloth	Vertical	FALSE	Partisan	5	No	ND	ND
3606	VHP Post-Decon	Floor 2	Room 210	10.646	20.324	3.394	Vacuum Sock	4.000	McIntyre	4/22/2011	1:20:00 PM	Chair	Cloth	Horizontal Downward	FALSE	red	3	Yes	29.2	10.9
3613	VHP Post-Decon	Floor 2	Room 210	11.564	19.513	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	1:16:00 PM	Floor	Smooth	Horizontal Downward	FALSE	buy window	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4073	VHP Post-Decon	Floor 2	Room 210	11.399	19.054	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	1:11:00 PM	Floor	Smooth	Horizontal Downward	FALSE		3	No	ND	ND
3527	VHP Post-Decon	Floor 2	Room 210	10.924	14.922	3.000	Sponge Wipe	0.694	McIntyre	4/22/2011	1:00:00 PM	Floor	Smooth	Horizontal Downward	FALSE	On the floor as you walk in. <Sample integrity issue so no lab result. RK>	6	NA	NA	NA
3128	VHP Post-Decon	Floor 2	Room 210	11.158	16.331	3.000	Sponge Wipe	0.694	McIntyre	4/22/2011	1:51:00 PM	Floor	Textured	Vertical	TRUE	2	6	No	ND	NA
3526	VHP Post-Decon	Floor 2	Room 210	11.543	14.687	4.296	Sponge Wipe	0.694	McIntyre	4/22/2011	1:42:00 PM	Wall	Textured	Vertical	FALSE	<Sample integrity issue so no lab result. RK>	6	NA	NA	NA
3136	VHP Post-Decon	Floor 2	Room 210	11.948	20.260	4.270	Sponge Wipe	0.694	McIntyre	4/22/2011	1:34:00 PM	File cabinet	Metal	Horizontal Downward	FALSE		6	No	ND	NA
3137	VHP Post-Decon	Floor 2	Room 210	9.941	19.790	3.997	Sponge Wipe	0.694	McIntyre	4/22/2011	1:32:00 PM	Desk	Metal	Horizontal Downward	FALSE		6	No	ND	NA
3127	VHP Post-Decon	Floor 2	Room 210	9.557	17.228	3.000	Sponge Wipe	0.694	McIntyre	4/22/2011	1:05:00 PM	Floor	Smooth	Horizontal Downward	FALSE	next to trash can	6	No	ND	NA
1696	VHP Post-Decon	Floor 2	Room 210	10.902	19.875	5.238	Swab	0.028	McIntyre	4/22/2011	1:39:00 PM	Ceiling	Metal	Vertical	FALSE		1	Yes	349295.1	ND
1670	VHP Post-Decon	Floor 2	Room 210	10.134	18.338	3.991	Swab	0.028	McIntyre	4/22/2011	1:08:00 PM	Desk	Smooth	Horizontal Downward	FALSE	computer	1	No	ND	ND
1524	VHP Post-Decon	Floor 2	Room 210	11.585	16.182	3.000	Swab	0.028	McIntyre	4/22/2011	1:52:00 PM	Floor	Textured	Vertical	TRUE	3	1	No	ND	ND
3630	VHP Post-Decon	Floor 2	Room 211	10.198	10.715	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	4:51:00 PM	Floor	Porous	Horizontal Upward	TRUE		6	No	ND	NA
3643	VHP Post-Decon	Floor 2	Room 211	11.234	11.276	5.800	Vacuum Sock	4.000	McIntyre	4/22/2011	4:50:00 PM	Ceiling	Porous	Horizontal Downward	FALSE		6	Yes	27.9	NA
3540	VHP Post-Decon	Floor 2	Room 211	10.443	6.185	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	4:38:00 PM	Floor	Porous	Horizontal Downward	FALSE		3	No	ND	ND
3702	VHP Post-Decon	Floor 2	Room 211	10.817	8.075	4.000	Vacuum Sock	4.000	McIntyre	4/22/2011	4:30:00 PM	Chair	Porous	Horizontal Downward	FALSE		3	Yes	4.2	ND
3665	VHP Post-Decon	Floor 2	Room 211	11.881	9.413	4.000	Vacuum Sock	4.000	McIntyre	4/22/2011	4:21:00 PM	Couch	Porous	Horizontal Downward	FALSE		3	No	ND	ND
4076	VHP Post-Decon	Floor 2	Room 211	10.256	11.959	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	4:05:00 PM	Floor	Porous	Horizontal Downward	FALSE		5	No	ND	ND
2918	VHP Post-Decon	Floor 2	Room 211	10.888	9.470	4.000	Sponge Wipe	0.694	McIntyre	4/22/2011	4:15:00 PM	Countertop	Smooth	Horizontal Downward	FALSE	coffee table <Sample integrity issue so no lab result. RK>	6	NA	NA	NA
2207	VHP Post-Decon	Floor 2	Room 211	10.543	10.744	3.000	Sponge Wipe	0.694	McIntyre	4/22/2011	4:58:00 PM	Floor	Porous	Horizontal Upward	TRUE		6	No	ND	NA
2276	VHP Post-Decon	Floor 2	Room 211	9.551	6.717	5.000	Sponge Wipe	0.694	McIntyre	4/22/2011	4:43:00 PM	File cabinet	Smooth	Horizontal Downward	FALSE	book shelf <Sample integrity issue so no lab result. RK>	6	NA	NA	NA
2903	VHP Post-Decon	Floor 2	Room 211	9.637	11.412	4.000	Sponge Wipe	0.694	McIntyre	4/22/2011	4:13:00 PM	Wall	Textured	Vertical	FALSE		6	No	ND	NA
1609	VHP Post-Decon	Floor 2	Room 211	10.917	10.715	3.000	Swab	0.028	McIntyre	4/22/2011	5:00:00 PM	Floor	Porous	Horizontal Upward	TRUE		1	No	ND	ND
1584	VHP Post-Decon	Floor 2	Room 211	9.623	9.427	5.000	Swab	0.028	McIntyre	4/22/2011	4:19:00 PM	Table	Smooth	Vertical	FALSE	tv	1	No	ND	ND
3601	VHP Post-Decon	Floor 2	Room 212	8.379	16.054	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	12:51:00 PM	Floor	Smooth	Horizontal Downward	TRUE	blank	3	No	ND	ND
3614	VHP Post-Decon	Floor 2	Room 212	6.379	16.455	5.157	Vacuum Sock	4.000	McIntyre	4/22/2011	12:45:00 PM	Ceiling	Porous	Vertical	FALSE	celing tile	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3610	VHP Post-Decon	Floor 2	Room 212	8.879	15.155	4.189	Vacuum Sock	0.014	McIntyre	4/22/2011	12:35:00 PM	Wall	Metal	Vertical	FALSE	Partisan wasn't able to line up. There might be to exstra cordinates. <Collector logged sample as a swab, but sample receipt trailer classified it as a Sock Vacuum. Changed in database to Sock Vacuum. R. Knowlton>	5	No	ND	ND
3564	VHP Post-Decon	Floor 2	Room 212	7.352	19.926	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	12:16:00 PM	Floor	Smooth	Horizontal Downward	FALSE	Floor,next to filling cabinet .	3	No	ND	ND
3664	VHP Post-Decon	Floor 2	Room 212	8.379	19.554	3.993	Vacuum Sock	4.000	McIntyre	4/22/2011	12:10:00 PM	Floor	Smooth	Horizontal Downward	FALSE		6	No	ND	NA
3532	VHP Post-Decon	Floor 2	Room 212	8.729	18.862	3.295	Vacuum Sock	4.000	McIntyre	4/22/2011	12:01:00 PM	Floor	Smooth	Horizontal Downward	FALSE	Next to the wall.	5	No	ND	ND
3659	VHP Post-Decon	Floor 2	Room 212	8.579	15.755	3.896	Vacuum Sock	4.000	McIntyre	4/22/2011	11:56:00 AM	Chair	Cloth	Horizontal Downward	FALSE	The red chair was moved around ,so we took the sample . In the order they were laid out.	3	No	ND	ND
3590	VHP Post-Decon	Floor 2	Room 212	7.879	18.643	3.596	Vacuum Sock	4.000	McIntyre	4/22/2011	11:39:00 AM	Chair	Cloth	Horizontal Downward	FALSE		5	No	ND	ND
3026	VHP Post-Decon	Floor 2	Room 212	8.679	15.655	3.589	Sponge Wipe	0.694	McIntyre	4/22/2011	12:24:00 PM	File cabinet	Metal	Horizontal Downward	FALSE	<Sample integrity issue so no lab result. RK>	6	NA	NA	NA
3068	VHP Post-Decon	Floor 2	Room 212	7.321	15.763	4.083	Sponge Wipe	0.694	McIntyre	4/22/2011	11:21:00 AM	Floor	Smooth	Horizontal Upward	FALSE	<Sample integrity issue so no lab result. RK>	6	NA	NA	NA
3070	VHP Post-Decon	Floor 2	Room 212	7.258	18.154	4.296	Sponge Wipe	0.694	McIntyre	4/22/2011	11:29:00 AM	Wall	Textured	Vertical	FALSE	The sample was on the wall next to a desk. <Sample integrity issue so no lab result. RK>	6	NA	NA	NA
3089	VHP Post-Decon	Floor 2	Room 212	8.379	15.555	3.000	Sponge Wipe	0.694	McIntyre	4/22/2011	12:53:00 PM	Floor	Smooth	Horizontal Downward	TRUE	blank	6	No	ND	NA
1629	VHP Post-Decon	Floor 2	Room 212	8.379	20.156	5.196	Swab	0.028	McIntyre	4/22/2011	12:39:00 PM	Ceiling	Metal	Vertical	FALSE		1	No	ND	ND
1595	VHP Post-Decon	Floor 2	Room 212	6.679	15.155	3.295	Swab	0.028	McIntyre	4/22/2011	11:45:00 AM	Desk	Glass	Vertical	FALSE	computer	1	No	ND	ND
1680	VHP Post-Decon	Floor 2	Room 212	8.379	15.555	3.000	Swab	0.028	McIntyre	4/22/2011	12:54:00 PM	Floor	Smooth	Horizontal Downward	TRUE		1	No	ND	ND
3600	VHP Post-Decon	Floor 2	Room 213	7.342	10.403	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	3:54:00 PM	Floor	Porous	Vertical	TRUE		3	No	ND	ND
3645	VHP Post-Decon	Floor 2	Room 213	8.185	7.065	5.800	Vacuum Sock	4.000	McIntyre	4/22/2011	3:42:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	The last 3 samples, Z cordinates have been put in manualy	5	No	ND	ND
3546	VHP Post-Decon	Floor 2	Room 213	8.618	7.667	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	2:30:00 PM	Bed	Porous	Horizontal Downward	FALSE		6	Yes	92.9	NA
3547	VHP Post-Decon	Floor 2	Room 213	6.937	8.346	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	2:21:00 PM	Floor	Carpet	Horizontal Downward	FALSE	In front of bed	4	Yes	ND	0.6
3565	VHP Post-Decon	Floor 2	Room 213	7.718	11.841	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	1:57:00 PM	Floor	Carpet	Horizontal Downward	FALSE	when you 1st walk in.	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3696	VHP Post-Decon	Floor 2	Room 213	8.588	8.622	3.000	Vacuum Sock	4.000	McIntyre	4/22/2011	2:13:00 PM	Bed	Porous	Horizontal Downward	FALSE	bed	3	No	ND	ND
2672	VHP Post-Decon	Floor 2	Room 213	7.715	10.403	3.000	Sponge Wipe	0.694	McIntyre	4/22/2011	3:55:00 PM	Floor	Porous	Vertical	FALSE	<Sample integrity issue so no lab result. RK>	6	NA	NA	NA
2609	VHP Post-Decon	Floor 2	Room 213	6.624	10.698	5.800	Sponge Wipe	0.694	McIntyre	4/22/2011	3:50:00 PM	File cabinet	Metal	Horizontal Downward	FALSE	<Sample integrity issue so no lab result. RK>	6	NA	NA	NA
2610	VHP Post-Decon	Floor 2	Room 213	8.353	6.082	5.000	Sponge Wipe	0.694	McIntyre	4/22/2011	3:37:00 PM	Wall	Textured	Vertical	FALSE	Under window .	6	No	ND	NA
2602	VHP Post-Decon	Floor 2	Room 213	8.962	6.863	5.000	Sponge Wipe	0.694	McIntyre	4/22/2011	3:33:00 PM	Cabinet	Smooth	Horizontal Downward	FALSE		6	Yes	334.4	NA
2347	VHP Post-Decon	Floor 2	Room 213	8.528	11.727	3.798	Sponge Wipe	0.694	McIntyre	4/22/2011	2:02:00 PM	Sink	Smooth	Horizontal Downward	FALSE		6	Yes	418.0	NA
2435	VHP Post-Decon	Floor 2	Stairwell	23.777	19.425	3.000	Sponge Wipe	0.694	Johnson	4/22/2011	2:34:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	No	ND	ND
1971	Amended Bleach Pre-Decon	Floor 1	Bathroom M	26.044	20.556	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:19:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	5	Yes	91580.5	ND
2248	Amended Bleach Pre-Decon	Floor 1	Bathroom M	26.059	17.980	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:18:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	5	Yes	161561.9	TNTC
2259	Amended Bleach Pre-Decon	Floor 1	Bathroom M	25.088	19.291	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:16:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	5	Yes	131755.0	TNTC
2084	Amended Bleach Pre-Decon	Floor 1	Bathroom M	24.693	20.525	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:14:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	5	Yes	168804.8	TNTC
2279	Amended Bleach Pre-Decon	Floor 1	Bathroom W	27.373	14.559	0.100	Sponge Wipe	0.694	Thomas	4/26/2011	10:59:00 AM	Wall	Smooth	Vertical	FALSE	Vertical sponge stick.	7	Yes	710.4	261.4
2594	Amended Bleach Pre-Decon	Floor 1	Bathroom W	24.914	17.058	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:05:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	5	Yes	186641.0	TNTC
2210	Amended Bleach Pre-Decon	Floor 1	Bathroom W	24.122	15.315	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:54:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	7	Yes	290149.1	TNTC
2278	Amended Bleach Pre-Decon	Floor 1	Bathroom W	27.251	16.799	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:03:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	5	Yes	266869.9	TNTC
3581	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	25.146	8.683	0.000	Vacuum Sock	4.000	Thomas	4/26/2011	10:12:00 AM	Floor	Smooth	Horizontal Upward	TRUE	Vac blank.	5	No	ND	ND
2083	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	22.978	17.630	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:10:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE	Ceiling sponge stick of overhead light ballast. Sample taken at end furthest from door.	7	Yes	118478.7	TNTC
2494	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	5.481	13.436	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	8:29:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Horizontal floor sponge. Delay due to suit breach.	1	Yes	268309.9	ND
2930	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	3.915	13.332	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	8:33:00 AM	Wall	Smooth	Vertical	FALSE	Sponge stick wipe of inside of hall door.	7	Yes	2227.1	ND
2270	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	6.150	14.013	2.800	Sponge Wipe	0.694	Thomas	4/26/2011	8:38:00 AM	Supply Vent	Smooth	Horizontal Upward	FALSE	Sample taken on inside of air supply.	1	Yes	291589.0	NA
2271	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	9.481	14.137	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	8:49:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe. Sample collected to left.	1	Yes	333395.4	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2272	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	13.186	12.875	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	8:54:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	166649.7	NA
2273	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	13.643	14.451	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	8:57:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	319188.0	NA
2356	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	13.091	16.140	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:01:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	268789.9	NA
2906	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	16.525	13.478	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:08:00 AM	Floor	Smooth	Horizontal Upward	TRUE	Sponge stick blank.	5	No	ND	ND
2513	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	17.748	13.450	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:42:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	280789.4	NA
2512	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	17.094	14.317	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:45:00 AM	Wall	Textured	Vertical	FALSE	Vertical wall sponge wipe.	1	Yes	1679.9	NA
2490	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	21.290	13.958	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:50:00 AM	Return Vent	Smooth	Horizontal Upward	FALSE	Horizontal air duct side opposite stairwell.	1	Yes	457182.8	NA
2800	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	14.934	15.552	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:05:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	7	Yes	221175.7	TNTC
2547	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	26.337	6.501	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:21:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	329267.6	NA
2269	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	23.598	12.917	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:56:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	339347.2	NA
2209	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	22.485	16.481	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:48:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	7	Yes	244214.8	TNTC
2885	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	24.789	11.348	2.800	Sponge Wipe	0.694	Thomas	4/26/2011	10:43:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE	Sponge stick of overhead light ballast left side closest to door.	1	Yes	163193.9	NA
2902	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	27.348	11.558	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:40:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	1	Yes	198568.5	NA
2400	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	25.295	11.378	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:38:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	7	Yes	261734.1	ND
2392	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	26.188	9.326	2.800	Sponge Wipe	0.694	Thomas	4/26/2011	10:30:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE	Sponge stick of ceiling light ballast furthest from northeast door.	1	Yes	222423.6	NA
2419	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	27.438	9.685	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:23:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	235191.1	NA
3293	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	25.146	8.683	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:17:00 AM	Floor	Smooth	Horizontal Upward	TRUE	Sponge blank.	2	No	ND	ND
3294	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	22.676	8.234	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:04:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	5	Yes	47604.6	18.6
3295	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	22.200	9.749	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	10:02:00 AM	Wall	Textured	Vertical	FALSE	Wall sponge wipe.	1	Yes	2183.9	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2559	Amended Bleach Pre-Decon	Floor 1	Corridor+Lobby	26.217	10.193	0.200	Sponge Wipe	0.694	Thomas	4/26/2011	10:27:00 AM	Wall	Porous	Vertical	FALSE	Vertical sponge stick.	1	Yes	2721.5	NA
3683	Amended Bleach Pre-Decon	Floor 1	Mechanical Room	17.729	19.169	1.000	Vacuum Sock	4.000	Thomas	4/26/2011	11:34:00 AM	Return Vent	Smooth	Horizontal Upward	FALSE	Vac sample of furnace filter.	2	Yes	1950111.2	TNTC
2370	Amended Bleach Pre-Decon	Floor 1	Mechanical Room	16.742	19.230	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:25:00 AM	Wall	Smooth	Vertical	FALSE	Wall sponge stick.	5	Yes	3628.7	1690.8
2249	Amended Bleach Pre-Decon	Floor 1	Mechanical Room	16.970	18.087	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:23:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	5	Yes	398625.0	TNTC
2250	Amended Bleach Pre-Decon	Floor 1	Mechanical Room	18.837	20.465	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	11:26:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge stick.	5	Yes	318228.0	TNTC
2557	Amended Bleach Pre-Decon	Floor 1	Room 101	16.793	12.073	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:15:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	240230.9	NA
2492	Amended Bleach Pre-Decon	Floor 1	Room 101	16.064	11.230	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:18:00 AM	Wall	Textured	Vertical	FALSE	Wall sponge stick wipe.	1	Yes	571.2	453.6
2533	Amended Bleach Pre-Decon	Floor 1	Room 101	17.626	10.161	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:24:00 AM	Floor	Textured	Horizontal Upward	FALSE	Floor sponge wipe.	1	Yes	385185.5	NA
2151	Amended Bleach Pre-Decon	Floor 1	Room 101	21.766	11.269	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:31:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Floor sponge wipe.	5	Yes	258710.3	TNTC
2915	Amended Bleach Pre-Decon	Floor 1	Room 101	19.742	10.941	0.000	Sponge Wipe	0.694	Thomas	4/26/2011	9:37:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE	Sample of half of ballast closest to 101A.	5	Yes	221751.6	TNTC
3572	Amended Bleach Pre-Decon	Floor 1	Room 101A	19.314	7.834	0.000	Vacuum Sock	4.000	Nickel	4/26/2011	10:55:00 AM	Floor	Carpet	Horizontal Upward	TRUE		5	No	ND	ND
3544	Amended Bleach Pre-Decon	Floor 1	Room 101A	19.419	6.814	0.000	Vacuum Sock	4.000	Nickel	4/26/2011	10:03:00 AM	Chair	Porous	Horizontal Upward	FALSE	last samplle iincorrectly cited onn wrong desk	4	Yes	241.7	NA
3566	Amended Bleach Pre-Decon	Floor 1	Room 101A	17.232	9.114	0.000	Vacuum Sock	4.000	Nickel	4/26/2011	9:41:00 AM	Floor	Carpet	Horizontal Upward	FALSE		4	Yes	21917.9	NA
3560	Amended Bleach Pre-Decon	Floor 1	Room 101A	21.608	9.047	0.000	Vacuum Sock	4.000	Nickel	4/26/2011	10:53:00 AM	Cabinet	Metal	Horizontal Upward	FALSE		4	Yes	9083.9	NA
2334	Amended Bleach Pre-Decon	Floor 1	Room 101A	19.075	6.596	0.583	Sponge Wipe	0.694	Nickel	4/26/2011	9:58:00 AM	Desk	Smooth	Horizontal Upward	FALSE		2	Yes	103095.3	-1438.5
2333	Amended Bleach Pre-Decon	Floor 1	Room 101A	20.232	6.614	0.500	Sponge Wipe	0.694	Nickel	4/26/2011	10:19:00 AM	Desk	Smooth	Horizontal Upward	FALSE		2	Yes	87548.7	-1438.5
2421	Amended Bleach Pre-Decon	Floor 1	Room 101A	21.532	7.027	0.586	Sponge Wipe	0.694	Nickel	4/26/2011	10:28:00 AM	Desk	Smooth	Horizontal Upward	FALSE		2	Yes	114043.7	-1438.5
2280	Amended Bleach Pre-Decon	Floor 1	Room 101A	21.532	6.214	0.591	Sponge Wipe	0.694	Nickel	4/26/2011	10:31:00 AM	Desk	Smooth	Horizontal Upward	FALSE		2	Yes	117960.4	-1438.5
2202	Amended Bleach Pre-Decon	Floor 1	Room 101A	21.521	7.306	0.500	Sponge Wipe	0.694	Nickel	4/26/2011	10:36:00 AM	Desk	Smooth	Horizontal Upward	FALSE		2	Yes	124747.3	-1438.5
2505	Amended Bleach Pre-Decon	Floor 1	Room 101A	21.486	7.851	0.500	Sponge Wipe	0.694	Nickel	4/26/2011	10:41:00 AM	Cabinet	Metal	Horizontal Upward	FALSE		2	Yes	295668.9	-1438.5

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2357	Amended Bleach Pre-Decon	Floor 1	Room 101A	18.232	6.214	0.578	Sponge Wipe	0.694	Nickel	4/26/2011	9:52:00 AM	Cabinet	Metal	Horizontal Upward	FALSE		2	Yes	123326.6	-1438.5
2336	Amended Bleach Pre-Decon	Floor 1	Room 101A	19.371	9.240	0.500	Sponge Wipe	0.694	Nickel	4/26/2011	11:03:00 AM	Cabinet	Metal	Horizontal Upward	FALSE		4	Yes	262022.1	NA
2568	Amended Bleach Pre-Decon	Floor 1	Room 101A	17.879	9.363	0.750	Sponge Wipe	0.694	Nickel	4/26/2011	11:23:00 AM	Desk	Plastic	Horizontal Upward	FALSE		2	Yes	48334.2	-1438.5
2420	Amended Bleach Pre-Decon	Floor 1	Room 101A	18.001	8.924	0.000	Sponge Wipe	0.694	Nickel	4/26/2011	11:14:00 AM	Desk	Plastic	Vertical	FALSE	on uv aps	4	Yes	62776.8	NA
2534	Amended Bleach Pre-Decon	Floor 1	Room 101A	19.227	8.238	0.000	Sponge Wipe	0.694	Nickel	4/26/2011	10:59:00 AM	Floor	Smooth	Horizontal Upward	TRUE		4	No	ND	NA
3553	Amended Bleach Pre-Decon	Floor 1	Room 102	19.860	16.536	0.000	Vacuum Sock	4.000	yoder	4/26/2011	12:09:00 PM	Floor	Carpet	Horizontal Upward	FALSE		5	Yes	14625.8	TNTC
3597	Amended Bleach Pre-Decon	Floor 1	Room 102	18.783	15.381	0.000	Vacuum Sock	4.000	yoder	4/26/2011	12:15:00 PM	Floor	Carpet	Horizontal Upward	FALSE		5	Yes	10500.6	TNTC
3586	Amended Bleach Pre-Decon	Floor 1	Room 102	18.402	16.554	0.000	Vacuum Sock	4.000	yoder	4/26/2011	12:42:00 PM	Floor	Carpet	Horizontal Upward	FALSE		5	Yes	3666.9	TNTC
3697	Amended Bleach Pre-Decon	Floor 1	Room 102	19.221	16.072	0.000	Vacuum Sock	4.000	yoder	4/26/2011	12:57:00 PM	Floor	Metal	Horizontal Upward	TRUE	blank	5	No	ND	ND
2651	Amended Bleach Pre-Decon	Floor 1	Room 102	20.195	16.437	1.000	Sponge Wipe	0.694	yoder	4/26/2011	12:21:00 PM	File cabinet	Metal	Horizontal Upward	FALSE		2	Yes	327347.7	-1438.5
2340	Amended Bleach Pre-Decon	Floor 1	Room 102	19.846	17.166	1.500	Sponge Wipe	0.694	yoder	4/26/2011	12:29:00 PM	Desk	Smooth	Horizontal Upward	FALSE		2	Yes	149567.2	-1438.5
2671	Amended Bleach Pre-Decon	Floor 1	Room 102	18.698	16.896	1.500	Sponge Wipe	0.694	yoder	4/26/2011	12:38:00 PM	Desk	Smooth	Horizontal Upward	FALSE		4	Yes	184313.1	NA
2670	Amended Bleach Pre-Decon	Floor 1	Room 102	19.175	14.622	0.000	Sponge Wipe	0.694	yoder	4/26/2011	1:38:00 PM	Desk	Plastic	Horizontal Upward	FALSE	top back left of uvaps	4	Yes	145751.3	NA
2337	Amended Bleach Pre-Decon	Floor 1	Room 102	18.791	16.032	0.000	Sponge Wipe	0.694	yoder	4/26/2011	12:55:00 PM	Floor	Metal	Horizontal Upward	TRUE	blank	4	No	ND	NA
2511	Amended Bleach Pre-Decon	Floor 1	Room 102	18.299	16.989	1.000	Sponge Wipe	0.694	yoder	4/26/2011	1:01:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	sticker residue on surface	4	Yes	223191.6	NA
2489	Amended Bleach Pre-Decon	Floor 1	Room 102	17.663	17.237	1.000	Sponge Wipe	0.694	yoder	4/26/2011	1:11:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	top front of file cabinet; cabinet is rotated 90 degrees from broom diagram	4	Yes	190303.2	NA
2485	Amended Bleach Pre-Decon	Floor 1	Room 102	16.900	15.665	1.000	Sponge Wipe	0.694	yoder	4/26/2011	1:20:00 PM	File cabinet	Metal	Horizontal Upward	FALSE		4	Yes	271189.8	NA
2650	Amended Bleach Pre-Decon	Floor 1	Room 102	19.299	16.581	1.000	Sponge Wipe	0.694	yoder	4/26/2011	12:51:00 PM	Desk	Smooth	Horizontal Upward	FALSE	in center desk drawer	4	Yes	97993.1	NA
2257	Amended Bleach Pre-Decon	Floor 1	Room 102	18.356	14.630	0.000	Sponge Wipe	0.694	yoder	4/26/2011	1:31:00 PM	Desk	Plastic	Horizontal Upward	FALSE	top back right of uvaps	2	Yes	165917.7	-1438.5

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2486	Amended Bleach Pre-Decon	Floor 1	Room 102	17.990	14.822	0.500	Sponge Wipe	0.694	yoder	4/26/2011	1:23:00 PM	Desk	Metal	Vertical	FALSE	uvaps was moved - no room for sample on desk. sample taken on vertical right side of desk instead	2	Yes	2131.1	1132.9
2109	Amended Bleach Pre-Decon	Floor 1	Room 103	14.633	10.902	2.600	Sponge Wipe	0.694	McCormick	4/26/2011	1:47:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	left side nearest door	2	Yes	14284.3	1439942.9
2570	Amended Bleach Pre-Decon	Floor 1	Room 103	14.666	11.557	0.000	Sponge Wipe	0.694	McCormick	4/26/2011	1:56:00 PM	Floor	Metal	Horizontal Upward	TRUE		2	No	ND	ND
2405	Amended Bleach Pre-Decon	Floor 1	Room 103	15.568	11.841	0.000	Sponge Wipe	0.694	McCormick	4/26/2011	1:43:00 PM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	357682.5	NA
2108	Amended Bleach Pre-Decon	Floor 1	Room 103	15.510	7.035	0.000	Sponge Wipe	0.694	McCormick	4/26/2011	2:09:00 PM	Floor	Smooth	Horizontal Upward	FALSE	[B.Melton moved across room]	2	Yes	418688.2	-1438.5
2927	Amended Bleach Pre-Decon	Floor 1	Room 103	14.432	6.217	2.600	Sponge Wipe	0.694	McCormick	4/26/2011	2:13:00 PM	Ceiling	Metal	Horizontal Downward	FALSE		2	Yes	128827.1	-1438.5
2510	Amended Bleach Pre-Decon	Floor 1	Room 103	13.179	6.145	0.000	Sponge Wipe	0.694	McCormick	4/26/2011	2:16:00 PM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	692037.9	-1438.5
2535	Amended Bleach Pre-Decon	Floor 1	Room 103	13.371	6.044	0.300	Sponge Wipe	0.694	McCormick	4/26/2011	2:19:00 PM	Wall	Smooth	Vertical	FALSE		2	Yes	8927.7	TNTC
2845	Amended Bleach Pre-Decon	Floor 1	Room 103	13.766	6.591	1.000	Sponge Wipe	0.694	McCormick	4/26/2011	2:22:00 PM	Table	Smooth	Horizontal Upward	FALSE		2	Yes	282373.4	-1438.5
2841	Amended Bleach Pre-Decon	Floor 1	Room 103	13.269	7.026	2.000	Sponge Wipe	0.694	McCormick	4/26/2011	2:34:00 PM	Shelves	Smooth	Horizontal Upward	FALSE		2	Yes	530380.0	-1438.5
1675	Amended Bleach Pre-Decon	Floor 1	Room 103	14.698	11.928	0.000	Swab	0.028	McCormick	4/26/2011	1:58:00 PM	Floor	Metal	Horizontal Upward	TRUE		7	No	ND	ND
1601	Amended Bleach Pre-Decon	Floor 1	Room 103	13.165	8.186	2.000	Swab	0.028	McCormick	4/26/2011	2:38:00 PM	Shelves	Metal	Horizontal Upward	FALSE		7	Yes	163244.5	TNTC
2849	Amended Bleach Pre-Decon	Floor 1	Room 104	13.836	19.134	0.000	Sponge Wipe	0.694	McCormick	4/26/2011	12:50:00 PM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	238023.0	-1438.5
2540	Amended Bleach Pre-Decon	Floor 1	Room 104	13.660	18.564	0.000	Sponge Wipe	0.694	McCormick	4/26/2011	12:43:00 PM	Floor	Smooth	Horizontal Upward	TRUE		2	No	ND	ND
2882	Amended Bleach Pre-Decon	Floor 1	Room 104	15.159	20.354	1.000	Sponge Wipe	0.694	McCormick	4/26/2011	1:00:00 PM	Table	Porous	Horizontal Upward	FALSE	included pipecutter	1	Yes	8232.6	NA
2478	Amended Bleach Pre-Decon	Floor 1	Room 104	15.470	20.354	1.000	Sponge Wipe	0.694	McCormick	4/26/2011	1:05:00 PM	Table	Porous	Horizontal Upward	FALSE	included monkey wrench	1	Yes	7948.5	NA
2473	Amended Bleach Pre-Decon	Floor 1	Room 104	15.565	20.761	1.200	Sponge Wipe	0.694	McCormick	4/26/2011	1:20:00 PM	Wall	Paint	Vertical	FALSE		1	Yes	7159.4	NA
2772	Amended Bleach Pre-Decon	Floor 1	Room 104	16.389	19.351	2.600	Sponge Wipe	0.694	McCormick	4/26/2011	1:27:00 PM	Ceiling	Metal	Horizontal Upward	FALSE	side nearest the door opposite side of vent	1	Yes	60717.7	NA
2898	Amended Bleach Pre-Decon	Floor 1	Room 104	14.970	18.225	1.000	Sponge Wipe	0.694	McCormick	4/26/2011	1:34:00 PM	Table	Smooth	Horizontal Upward	FALSE		1	Yes	461982.6	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1533	Amended Bleach Pre-Decon	Floor 1	Room 104	15.268	19.676	2.400	Swab	0.028	McCormick	4/26/2011	12:54:00 PM	Ceiling	Metal	Horizontal Upward	FALSE		7	Yes	348695.0	TNTC
1667	Amended Bleach Pre-Decon	Floor 1	Room 104	14.038	18.836	0.000	Swab	0.028	McCormick	4/26/2011	12:37:00 PM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
3671	Amended Bleach Pre-Decon	Floor 1	Room 105	10.439	12.236	0.000	Vacuum Sock	4.000	England	4/26/2011	12:37:00 PM	Floor	Carpet	Horizontal Upward	FALSE		6	Yes	11667.3	NA
3542	Amended Bleach Pre-Decon	Floor 1	Room 105	11.150	10.871	0.000	Vacuum Sock	4.000	England	4/26/2011	12:45:00 PM	Floor	Carpet	Horizontal Upward	FALSE		1	Yes	10258.1	NA
3653	Amended Bleach Pre-Decon	Floor 1	Room 105	10.389	6.478	0.000	Vacuum Sock	4.000	England	4/26/2011	1:24:00 PM	Floor	Carpet	Horizontal Upward	FALSE		1	Yes	2392.6	NA
3691	Amended Bleach Pre-Decon	Floor 1	Room 105	10.841	10.295	0.000	Vacuum Sock	4.000	England	4/26/2011	12:57:00 PM	Floor	Carpet	Horizontal Upward	FALSE		1	Yes	10118.9	NA
2120	Amended Bleach Pre-Decon	Floor 1	Room 105	11.344	8.099	2.800	Sponge Wipe	0.694	England	4/26/2011	2:25:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	[discard BJM] sample taken from ceiling light (inside)- half completed and marked	4	Yes	1216.8	NA
2503	Amended Bleach Pre-Decon	Floor 1	Room 105	12.474	11.153	1.000	Sponge Wipe	0.694	England	4/26/2011	1:03:00 PM	Sink	Metal	Horizontal Upward	FALSE		7	Yes	450991.0	TNTC
2541	Amended Bleach Pre-Decon	Floor 1	Room 105	9.921	10.860	0.500	Sponge Wipe	0.694	England	4/26/2011	1:00:00 PM	Wall	Plastic	Vertical	FALSE		7	Yes	1857.1	ND
2544	Amended Bleach Pre-Decon	Floor 1	Room 105	10.332	9.632	1.000	Sponge Wipe	0.694	England	4/26/2011	1:07:00 PM	Stove	Metal	Horizontal Upward	FALSE		7	Yes	675622.5	TNTC
2907	Amended Bleach Pre-Decon	Floor 1	Room 105	11.003	9.003	2.800	Sponge Wipe	0.694	England	4/26/2011	1:13:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	[discard BJM] sample taken on top of ceiling tile with sponge stick-sponge loses wetness for diagonal	7	Yes	23759.1	TNTC
2341	Amended Bleach Pre-Decon	Floor 1	Room 105	12.011	6.761	1.000	Sponge Wipe	0.694	England	4/26/2011	1:20:00 PM	Table	Smooth	Horizontal Upward	FALSE		7	Yes	335987.3	TNTC
2246	Amended Bleach Pre-Decon	Floor 1	Room 105	11.018	9.493	2.200	Sponge Wipe	0.694	Steve Merritt	4/26/2011	5:18:00 PM	Ceiling	Smooth	Horizontal Upward	FALSE	replacement sample taken on top of metal ballast. sample taken from next to left side of X.	2	Yes	137913.2	-1438.5
1495	Amended Bleach Pre-Decon	Floor 1	Room 105	11.154	6.619	2.800	Swab	0.028	England	4/26/2011	1:27:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		7	Yes	1566426.6	TNTC
3652	Amended Bleach Pre-Decon	Floor 1	Room 106	10.969	18.401	0.250	Vacuum Sock	4.000	England	4/26/2011	1:55:00 PM	Chair	Cloth	Horizontal Upward	FALSE	sample taken from top of chair- dimensions are approximately 1.5 ft by 2 ft	1	Yes	570.9	NA
3588	Amended Bleach Pre-Decon	Floor 1	Room 106	12.064	19.756	0.000	Vacuum Sock	4.000	England	4/26/2011	2:00:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken from next to cabinet- overlaid on previous sample	1	Yes	6332.0	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3680	Amended Bleach Pre-Decon	Floor 1	Room 106	11.213	20.442	0.250	Vacuum Sock	4.000	England	4/26/2011	2:18:00 PM	Chair	Cloth	Horizontal Upward	FALSE	sample taken on horizontal upward facing surface- approx 1.5ft by 2 ft	1	Yes	3960.2	NA
2355	Amended Bleach Pre-Decon	Floor 1	Room 106	11.290	15.824	2.800	Sponge Wipe	0.694	England	4/26/2011	2:05:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	[discard, inside light BJM]	7	Yes	168.0	160.7
2496	Amended Bleach Pre-Decon	Floor 1	Room 106	10.374	19.899	0.250	Sponge Wipe	0.694	England	4/26/2011	2:16:00 PM	File cabinet	Metal	Horizontal Upward	FALSE		4	Yes	292117.0	NA
2268	Amended Bleach Pre-Decon	Floor 1	Room 106	9.938	16.510	0.250	Sponge Wipe	0.694	England	4/26/2011	1:41:00 PM	Wall	Plastic	Vertical	FALSE		4	Yes	3492.3	NA
2919	Amended Bleach Pre-Decon	Floor 1	Room 106	10.515	17.946	0.500	Sponge Wipe	0.694	England	4/26/2011	1:46:00 PM	Desk	Smooth	Horizontal Upward	FALSE		4	Yes	312948.2	NA
2198	Amended Bleach Pre-Decon	Floor 1	Room 106	10.209	14.748	0.000	Sponge Wipe	0.694	England	4/26/2011	1:32:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	378993.7	NA
2196	Amended Bleach Pre-Decon	Floor 1	Room 106	12.069	15.895	1.500	Sponge Wipe	0.694	England	4/26/2011	1:37:00 PM	Table	Smooth	Horizontal Upward	FALSE	sponge stick sample colocated with rmc coupon on table	4	Yes	335219.4	NA
2252	Amended Bleach Pre-Decon	Floor 1	Room 106	10.869	16.296	2.200	Sponge Wipe	0.694	Steve Merritt	4/26/2011	5:14:00 PM	Ceiling	Smooth	Horizontal Upward	FALSE	replacement sample taken on top of metal ballast. replaces sample taken inside light.	2	Yes	48046.2	-1438.5
1645	Amended Bleach Pre-Decon	Floor 1	Room 106	11.276	19.739	2.800	Swab	0.028	England	4/26/2011	2:09:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		7	Yes	257470.1	TNTC
1666	Amended Bleach Pre-Decon	Floor 1	Room 106	10.270	18.552	0.750	Swab	0.028	England	4/26/2011	1:49:00 PM	Monitor	Smooth	Inclined	FALSE	sample taken in middle of monitor	7	Yes	100227.3	TNTC
3715	Amended Bleach Pre-Decon	Floor 1	Room 107	8.713	12.014	0.000	Vacuum Sock	4.000	Pobiedzinski	4/26/2011	1:46:00 PM	Floor	Carpet	Horizontal Upward	FALSE	floor in front of door	6	Yes	11959.0	NA
3723	Amended Bleach Pre-Decon	Floor 1	Room 107	9.369	10.232	0.000	Vacuum Sock	4.000	Pobiedzinski	4/26/2011	1:52:00 PM	Couch	Cloth	Horizontal Upward	FALSE	first seat cushion	1	Yes	12867.4	NA
3654	Amended Bleach Pre-Decon	Floor 1	Room 107	8.505	8.350	0.000	Vacuum Sock	4.000	Pobiedzinski	4/26/2011	2:11:00 PM	Chair	Leather	Horizontal Upward	FALSE		6	Yes	2179.3	NA
3567	Amended Bleach Pre-Decon	Floor 1	Room 107	8.113	6.731	1.194	Vacuum Sock	4.000	Pobiedzinski	4/26/2011	2:26:00 PM	File cabinet	Metal	Horizontal Upward	TRUE	blank	6	No	ND	NA
2830	Amended Bleach Pre-Decon	Floor 1	Room 107	8.431	9.414	0.000	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	2:04:00 PM	Table	Porous	Horizontal Upward	FALSE	back table left facing tv	2	No	ND	ND
2335	Amended Bleach Pre-Decon	Floor 1	Room 107	8.731	6.414	1.189	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	2:21:00 PM	File cabinet	Metal	Horizontal Upward	TRUE	blank	2	No	ND	ND
2826	Amended Bleach Pre-Decon	Floor 1	Room 107	7.931	10.631	0.000	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	2:43:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	above light fixture	2	Yes	126715.2	-1438.5
2554	Amended Bleach Pre-Decon	Floor 1	Room 107	7.713	12.231	0.396	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	2:50:00 PM	Wall	Textured	Vertical	FALSE	wall left of door	2	Yes	1614.7	975.9

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2484	Amended Bleach Pre-Decon	Floor 1	Room 107	7.017	6.587	0.000	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	2:33:00 PM	Shelves	Smooth	Horizontal Upward	FALSE	left of shelf	2	Yes	167840.1	ND
1665	Amended Bleach Pre-Decon	Floor 1	Room 107	8.431	6.814	0.000	Swab	0.028	Pobiedzinski	4/26/2011	2:48:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		6	Yes	214858.5	NA
1527	Amended Bleach Pre-Decon	Floor 1	Room 107	8.831	6.314	1.187	Swab	0.028	Pobiedzinski	4/26/2011	2:19:00 PM	File cabinet	Metal	Horizontal Upward	TRUE	blank	6	No	ND	NA
3646	Amended Bleach Pre-Decon	Floor 1	Room 108	9.051	15.830	1.270	Vacuum Sock	4.000	Pobiedzinski	4/26/2011	1:33:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	6	No	ND	NA
3692	Amended Bleach Pre-Decon	Floor 1	Room 108	7.899	18.465	0.000	Vacuum Sock	4.000	Pobiedzinski	4/26/2011	12:39:00 PM	Chair	Cloth	Horizontal Upward	FALSE	whole chair seat	6	Yes	18042.7	NA
3721	Amended Bleach Pre-Decon	Floor 1	Room 108	8.226	20.437	0.000	Vacuum Sock	4.000	Pobiedzinski	4/26/2011	12:49:00 PM	Chair	Cloth	Horizontal Upward	FALSE	back room chair	1	Yes	5467.0	NA
3945	Amended Bleach Pre-Decon	Floor 1	Room 108	9.113	20.017	0.000	Vacuum Sock	4.000	Pobiedzinski	4/26/2011	1:10:00 PM	Floor	Smooth	Horizontal Upward	FALSE	front middle of file cabinet	1	Yes	9743.1	NA
2892	Amended Bleach Pre-Decon	Floor 1	Room 108	9.151	14.630	0.677	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	1:37:00 PM	Wall	Textured	Vertical	FALSE	wall	2	Yes	752.6	641.5
2153	Amended Bleach Pre-Decon	Floor 1	Room 108	9.651	17.030	0.000	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	1:24:00 PM	Floor	Smooth	Horizontal Upward	FALSE	floor middle of room by wall	2	Yes	205926.6	-1438.5
2152	Amended Bleach Pre-Decon	Floor 1	Room 108	7.551	17.917	0.000	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	12:28:00 PM	Desk	Smooth	Horizontal Upward	FALSE	front left	2	Yes	193874.3	-1438.5
2466	Amended Bleach Pre-Decon	Floor 1	Room 108	9.151	15.830	1.496	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	1:31:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	2	No	ND	ND
2471	Amended Bleach Pre-Decon	Floor 1	Room 108	7.651	16.017	0.000	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	12:18:00 PM	Floor	Smooth	Horizontal Upward	FALSE	floor in front of door	2	Yes	379041.7	-1438.5
2165	Amended Bleach Pre-Decon	Floor 1	Room 108	9.536	20.527	0.000	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	1:01:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	front left	2	Yes	648695.6	-1438.5
2908	Amended Bleach Pre-Decon	Floor 1	Room 108	8.613	18.517	0.000	Sponge Wipe	0.694	Pobiedzinski	4/26/2011	1:21:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	above light fixture	2	Yes	107098.4	-1438.5
1668	Amended Bleach Pre-Decon	Floor 1	Room 108	8.851	15.730	1.391	Swab	0.028	Pobiedzinski	4/26/2011	1:29:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	7	No	ND	ND
1531	Amended Bleach Pre-Decon	Floor 1	Room 108	7.363	18.435	0.000	Swab	0.028	Pobiedzinski	4/26/2011	12:31:00 PM	Monitor	Smooth	Inclined	FALSE	bottom left corner	6	Yes	33609.2	NA
1631	Amended Bleach Pre-Decon	Floor 1	Room 108	9.151	19.617	0.000	Swab	0.028	Pobiedzinski	4/26/2011	1:16:00 PM	Return Vent	Smooth	Horizontal Downward	FALSE	ventilation system;	7	Yes	1446393.9	TNTC
3634	Amended Bleach Pre-Decon	Floor 1	Room 109	5.334	10.214	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	12:45:00 PM	Floor	Cloth	Horizontal Upward	TRUE	blank vacuum sample	7	No	ND	ND
3538	Amended Bleach Pre-Decon	Floor 1	Room 109	4.160	7.817	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	1:04:00 PM	Bed	Cloth	Horizontal Upward	FALSE	vacuum sample taken on bed.	7	Yes	17292.7	TNTC
3635	Amended Bleach Pre-Decon	Floor 1	Room 109	4.673	11.631	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	1:14:00 PM	Floor	Carpet	Horizontal Upward	FALSE	sample taken on floor	4	Yes	14709.2	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3591	Amended Bleach Pre-Decon	Floor 1	Room 109	5.504	8.622	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	12:37:00 PM	Bed	Cloth	Horizontal Upward	FALSE	vacuum sample on top of bed	7	Yes	42085.7	TNTC
3703	Amended Bleach Pre-Decon	Floor 1	Room 109	6.249	12.027	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	12:18:00 PM	Floor	Carpet	Horizontal Upward	FALSE	sample taken on floor in door way of room 109	7	Yes	25834.8	TNTC
2873	Amended Bleach Pre-Decon	Floor 1	Room 109	5.576	10.080	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	12:44:00 PM	Floor	Cloth	Horizontal Upward	TRUE	blank sponge sample location	1	Yes	ND	4.3
2555	Amended Bleach Pre-Decon	Floor 1	Room 109	5.921	8.331	2.178	Sponge Wipe	0.694	Carnahan	4/26/2011	12:52:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	sample taken in ceiling tile on of light closest to entrance	4	Yes	266438.0	NA
2507	Amended Bleach Pre-Decon	Floor 1	Room 109	4.015	6.489	1.082	Sponge Wipe	0.694	Carnahan	4/26/2011	12:58:00 PM	Wall	Textured	Inclined	FALSE	sample taken on wall .	4	Yes	2350.0	NA
2502	Amended Bleach Pre-Decon	Floor 1	Room 109	4.069	9.566	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	1:10:00 PM	Table	Smooth	Horizontal Upward	FALSE	sample taken on table	1	Yes	256790.3	NA
2371	Amended Bleach Pre-Decon	Floor 1	Room 109	4.146	12.160	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	1:20:00 PM	Sink	Smooth	Horizontal Upward	FALSE	sample taken on sink counter right of sink	4	Yes	239751.0	NA
2504	Amended Bleach Pre-Decon	Floor 1	Room 109	4.175	11.013	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	1:18:00 PM	Sink	Smooth	Horizontal Upward	FALSE	sample taken on counter top next to sink on left side	1	Yes	293077.0	NA
3693	Amended Bleach Pre-Decon	Floor 1	Room 110	6.158	20.168	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	1:55:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor in front of filing cabinet	4	Yes	9625.5	NA
3948	Amended Bleach Pre-Decon	Floor 1	Room 110	5.195	20.413	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	1:57:00 PM	Chair	Cloth	Horizontal Upward	FALSE	sample taken on chair seat	4	Yes	8792.2	NA
3575	Amended Bleach Pre-Decon	Floor 1	Room 110	5.453	16.254	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	1:37:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank vacuum	7	Yes	16.7	10.4
3679	Amended Bleach Pre-Decon	Floor 1	Room 110	4.951	18.452	0.000	Vacuum Sock	4.000	Carnahan	4/26/2011	1:43:00 PM	Chair	Cloth	Horizontal Upward	FALSE	sample taken on chair seat	7	Yes	8458.8	TNTC
2539	Amended Bleach Pre-Decon	Floor 1	Room 110	6.640	20.228	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	1:59:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	sample taken on top of filing cabinet	1	Yes	410672.5	NA
2515	Amended Bleach Pre-Decon	Floor 1	Room 110	4.187	19.887	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	2:00:00 PM	File cabinet	Metal	Horizontal Upward	FALSE		1	Yes	249974.6	NA
2506	Amended Bleach Pre-Decon	Floor 1	Room 110	4.431	20.758	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	2:03:00 PM	Wall	Paint	Vertical	FALSE	sample taken on wall 5ft up from wall,	1	Yes	6277.7	NA
2556	Amended Bleach Pre-Decon	Floor 1	Room 110	4.873	16.051	2.236	Sponge Wipe	0.694	Carnahan	4/26/2011	2:08:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	sample taken on top of light in ceiling . light closest to entrance	4	Yes	39430.5	NA
2291	Amended Bleach Pre-Decon	Floor 1	Room 110	5.659	14.783	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	1:25:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor at entrance of room	4	Yes	357682.5	NA
2381	Amended Bleach Pre-Decon	Floor 1	Room 110	5.973	17.296	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	1:32:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor	1	Yes	248966.6	NA
2360	Amended Bleach Pre-Decon	Floor 1	Room 110	4.539	17.936	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	1:45:00 PM	Desk	Smooth	Horizontal Upward	FALSE	sample taken on desk	4	Yes	277189.6	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1976	Amended Bleach Pre-Decon	Floor 1	Room 110	5.338	16.086	0.000	Sponge Wipe	0.694	Carnahan	4/26/2011	1:36:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank sponge	4	No	ND	NA
1553	Amended Bleach Pre-Decon	Floor 1	Room 110	4.951	19.806	0.000	Swab	0.028	Carnahan	4/26/2011	1:52:00 PM	Supply Vent	Metal	Horizontal Upward	FALSE	sample taken from supply vent	7	Yes	1182322.0	TNTC
1636	Amended Bleach Pre-Decon	Floor 1	Room 110	5.286	16.306	0.000	Swab	0.028	Carnahan	4/26/2011	1:34:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank swab	7	No	ND	ND
1571	Amended Bleach Pre-Decon	Floor 1	Room 110	4.270	18.465	0.000	Swab	0.028	Carnahan	4/26/2011	1:50:00 PM	Monitor	Smooth	Vertical	FALSE	sample taken on upper left corner of screen	7	Yes	4201.1	3975.5
2118	Amended Bleach Pre-Decon	Floor 2	Bathroom M	29.559	20.517	3.000	Sponge Wipe	0.694	England	4/26/2011	10:18:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	21706.5	TNTC
2597	Amended Bleach Pre-Decon	Floor 2	Bathroom M	28.951	20.675	3.000	Sponge Wipe	0.694	England	4/26/2011	10:21:00 AM	Wall	Plastic	Vertical	FALSE		5	Yes	193.0	ND
2141	Amended Bleach Pre-Decon	Floor 2	Bathroom M	26.484	19.906	3.000	Sponge Wipe	0.694	England	4/26/2011	10:15:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	24594.3	TNTC
2135	Amended Bleach Pre-Decon	Floor 2	Bathroom W	28.684	17.572	3.000	Sponge Wipe	0.694	England	4/26/2011	10:10:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank	5	No	ND	ND
2379	Amended Bleach Pre-Decon	Floor 2	Bathroom W	28.835	17.810	3.000	Sponge Wipe	0.694	England	4/26/2011	10:11:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	21023.2	TNTC
2222	Amended Bleach Pre-Decon	Floor 2	Bathroom W	26.714	15.974	3.000	Sponge Wipe	0.694	England	4/26/2011	10:07:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	29374.9	TNTC
2127	Amended Bleach Pre-Decon	Floor 2	Copier Room	27.558	13.860	3.000	Sponge Wipe	0.694	England	4/26/2011	9:54:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	5955.6	167.2
2123	Amended Bleach Pre-Decon	Floor 2	Copier Room	29.735	13.781	3.000	Sponge Wipe	0.694	England	4/26/2011	9:57:00 AM	Floor	Textured	Horizontal Upward	FALSE		5	Yes	4084.2	TNTC
2125	Amended Bleach Pre-Decon	Floor 2	Copier Room	28.657	14.177	3.250	Sponge Wipe	0.694	England	4/26/2011	9:59:00 AM	Wall	Plastic	Vertical	FALSE		5	Yes	292.8	TNTC
3677	Amended Bleach Pre-Decon	Floor 2	Hallway	16.996	13.534	3.000	Vacuum Sock	4.000	England	4/26/2011	8:46:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	ND
2375	Amended Bleach Pre-Decon	Floor 2	Hallway	11.293	13.458	3.000	Sponge Wipe	0.694	England	4/26/2011	8:24:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	18555.6	ND
2122	Amended Bleach Pre-Decon	Floor 2	Hallway	8.693	13.668	5.000	Sponge Wipe	0.694	England	4/26/2011	8:20:00 AM	Supply_Vent	Metal	Horizontal Downward	FALSE	[B.Melton vent exterior]	2	No	ND	ND
2115	Amended Bleach Pre-Decon	Floor 2	Hallway	6.693	12.858	3.000	Sponge Wipe	0.694	England	4/26/2011	8:12:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	13031.5	ND
2251	Amended Bleach Pre-Decon	Floor 2	Hallway	9.837	12.558	3.250	Sponge Wipe	0.694	England	4/26/2011	8:36:00 AM	Wall	Plastic	Vertical	FALSE		2	Yes	ND	11.7
2784	Amended Bleach Pre-Decon	Floor 2	Hallway	18.027	13.858	3.000	Sponge Wipe	0.694	England	4/26/2011	8:39:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	22578.3	TNTC
2378	Amended Bleach Pre-Decon	Floor 2	Hallway	23.253	13.812	5.000	Sponge Wipe	0.694	England	4/26/2011	8:56:00 AM	Return Vent	Metal	Horizontal Upward	FALSE	sample taken from inside ductwork	2	Yes	5828.9	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2589	Amended Bleach Pre-Decon	Floor 2	Hallway	25.331	14.336	3.000	Sponge Wipe	0.694	England	4/26/2011	8:59:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	29029.3	TNTC
2453	Amended Bleach Pre-Decon	Floor 2	Hallway	26.016	17.339	3.000	Sponge Wipe	0.694	England	4/26/2011	9:03:00 AM	Wall	Plastic	Vertical	FALSE		2	Yes	ND	9.4
2614	Amended Bleach Pre-Decon	Floor 2	Hallway	25.409	18.814	3.000	Sponge Wipe	0.694	England	4/26/2011	9:06:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	16005.0	ND
2668	Amended Bleach Pre-Decon	Floor 2	Hallway	6.793	13.768	3.000	Sponge Wipe	0.694	England	4/26/2011	8:32:00 AM	Return Vent	Cloth	Horizontal Upward	FALSE	sample taken from inside ductwork- duplucating previously taken sample from exterior.	2	Yes	18604.1	ND
2374	Amended Bleach Pre-Decon	Floor 2	Hallway	16.996	13.534	3.000	Sponge Wipe	0.694	England	4/26/2011	8:43:00 AM	Floor	Smooth	Horizontal Upward	TRUE		2	No	ND	ND
2822	Amended Bleach Pre-Decon	Floor 2	Hallway	20.869	13.782	3.000	Sponge Wipe	0.694	England	4/26/2011	8:50:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	28866.1	TNTC
1486	Amended Bleach Pre-Decon	Floor 2	Hallway	16.996	13.534	3.000	Swab	0.028	England	4/26/2011	8:42:00 AM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
2124	Amended Bleach Pre-Decon	Floor 2	Janitor Closet	26.828	15.058	3.000	Sponge Wipe	0.694	England	4/26/2011	10:02:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	20932.0	TNTC
2126	Amended Bleach Pre-Decon	Floor 2	Janitor Closet	28.286	14.852	3.000	Sponge Wipe	0.694	England	4/26/2011	10:05:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	27359.0	TNTC
3946	Amended Bleach Pre-Decon	Floor 2	Mechanical Room	18.857	19.269	3.000	Vacuum Sock	4.000	England	4/26/2011	10:39:00 AM	Return Vent	Porous	Vertical	FALSE	sample taken from inside ductwork- filter	1	Yes	8083.8	NA
2644	Amended Bleach Pre-Decon	Floor 2	Mechanical Room	18.896	19.993	3.000	Sponge Wipe	0.694	England	4/26/2011	10:33:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	40558.5	TNTC
2116	Amended Bleach Pre-Decon	Floor 2	Mechanical Room	22.659	19.612	3.000	Sponge Wipe	0.694	England	4/26/2011	10:31:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	57789.8	TNTC
2428	Amended Bleach Pre-Decon	Floor 2	Room 201	26.150	11.975	3.000	Sponge Wipe	0.694	England	4/26/2011	9:27:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	20274.4	TNTC
1986	Amended Bleach Pre-Decon	Floor 2	Room 201	29.430	10.286	3.000	Sponge Wipe	0.694	England	4/26/2011	9:29:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	20628.7	TNTC
2482	Amended Bleach Pre-Decon	Floor 2	Room 201	27.804	10.661	5.500	Sponge Wipe	0.694	England	4/26/2011	9:34:00 AM	Ceiling	Metal	Horizontal Downward	FALSE	[discard BJM] sample taken from half of light fixture	2	Yes	ND	20.3
2245	Amended Bleach Pre-Decon	Floor 2	Room 201	27.140	10.507	5.200	Sponge Wipe	0.694	Steve Merritt	4/26/2011	5:03:00 PM	Ceiling	Smooth	Horizontal Upward	FALSE	Sampled top of ballast on the side marked with X. Replaces previous sample taken inside light.	2	Yes	12564.0	1266530.4
2550	Amended Bleach Pre-Decon	Floor 2	Room 201A	26.812	9.289	3.000	Sponge Wipe	0.694	England	4/26/2011	9:37:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken from inside room 201a	2	Yes	19957.6	TNTC
2361	Amended Bleach Pre-Decon	Floor 2	Room 201A	29.487	6.565	3.000	Sponge Wipe	0.694	England	4/26/2011	9:40:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	26639.0	92.9

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2640	Amended Bleach Pre-Decon	Floor 2	Room 201A	29.252	5.995	3.000	Sponge Wipe	0.694	England	4/26/2011	9:45:00 AM	Wall	Plastic	Vertical	FALSE		5	Yes	ND	185.8
2493	Amended Bleach Pre-Decon	Floor 2	Room 201A	29.015	7.788	3.000	Sponge Wipe	0.694	England	4/26/2011	9:43:00 AM	Floor	Smooth	Horizontal Upward	FALSE	previous sample-2361 incorrectly placed. belongs in corner directly across from door in room 201a	5	Yes	15666.6	TNTC
2895	Amended Bleach Pre-Decon	Floor 2	Room 201A	27.778	6.720	5.500	Sponge Wipe	0.694	England	4/26/2011	9:50:00 AM	Wall	Plastic	Vertical	FALSE	[discard BJM] sample taken from inside light fixture	5	Yes	106.6	TNTC
2521	Amended Bleach Pre-Decon	Floor 2	Room 201A	27.021	6.549	5.200	Sponge Wipe	0.694	Steve Merritt	4/26/2011	5:06:00 PM	Ceiling	Smooth	Horizontal Upward	FALSE	Replacement sample for previous sample taken inside light. Collected on top of ballast.	2	Yes	8109.8	792742.7
2605	Amended Bleach Pre-Decon	Floor 2	Room 202	22.334	17.490	3.000	Sponge Wipe	0.694	England	4/26/2011	9:23:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	24479.1	TNTC
2669	Amended Bleach Pre-Decon	Floor 2	Room 202	21.476	14.494	3.000	Sponge Wipe	0.694	England	4/26/2011	9:20:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	22213.6	TNTC
2616	Amended Bleach Pre-Decon	Floor 2	Room 203	25.083	12.169	3.000	Sponge Wipe	0.694	Philpot	4/26/2011	11:09:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	34102.7	NA
2645	Amended Bleach Pre-Decon	Floor 2	Room 203	22.849	10.549	5.500	Sponge Wipe	0.694	Philpot	4/26/2011	11:12:00 AM	Ceiling	Metal	Horizontal Downward	FALSE	light balast plenum side, removed adjacent tile to collect sample	3	Yes	6335.8	ND
2643	Amended Bleach Pre-Decon	Floor 2	Room 203	21.749	10.649	3.000	Sponge Wipe	0.694	Philpot	4/26/2011	11:14:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	30094.9	NA
2129	Amended Bleach Pre-Decon	Floor 2	Room 203	24.149	9.849	3.390	Sponge Wipe	0.694	Philpot	4/26/2011	11:16:00 AM	Wall	Textured	Vertical	FALSE		3	Yes	100.8	40.2
2130	Amended Bleach Pre-Decon	Floor 2	Room 203A	24.339	6.492	3.000	Sponge Wipe	0.694	Philpot	4/26/2011	11:21:00 AM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	25297.0	NA
2128	Amended Bleach Pre-Decon	Floor 2	Room 203A	25.282	9.380	3.000	Sponge Wipe	0.694	Philpot	4/26/2011	11:18:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	25199.1	NA
2838	Amended Bleach Pre-Decon	Floor 2	Room 204	20.234	14.605	3.000	Sponge Wipe	0.694	England	4/26/2011	9:10:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	18143.3	ND
2114	Amended Bleach Pre-Decon	Floor 2	Room 204	19.350	17.504	3.000	Sponge Wipe	0.694	England	4/26/2011	9:14:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	19799.3	TNTC
2376	Amended Bleach Pre-Decon	Floor 2	Room 204	18.615	17.285	3.000	Sponge Wipe	0.694	England	4/26/2011	9:17:00 AM	Wall	Plastic	Vertical	FALSE		2	Yes	26.9	44.9
2134	Amended Bleach Pre-Decon	Floor 2	Room 205	19.161	7.969	5.500	Sponge Wipe	0.694	Philpot	4/26/2011	11:04:00 AM	Ceiling	Metal	Horizontal Downward	FALSE	plenum side balast sample was collected by removing adjacent tile	3	Yes	10818.8	NA
2133	Amended Bleach Pre-Decon	Floor 2	Room 205	20.139	8.096	3.000	Sponge Wipe	0.694	Philpot	4/26/2011	10:59:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	33238.7	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2598	Amended Bleach Pre-Decon	Floor 2	Room 205	20.534	6.050	3.496	Sponge Wipe	0.694	Philpot	4/26/2011	11:05:00 AM	Wall	Textured	Vertical	FALSE		6	No	ND	NA
2119	Amended Bleach Pre-Decon	Floor 2	Room 205	20.783	12.036	3.000	Sponge Wipe	0.694	Philpot	4/26/2011	10:57:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	25727.0	NA
2143	Amended Bleach Pre-Decon	Floor 2	Room 206	18.001	20.123	3.778	Sponge Wipe	0.694	Schuette	4/26/2011	11:25:00 AM	Table	Smooth	Horizontal Upward	FALSE	moved tools out of way to take sample	4	Yes	1751.9	660.7
2307	Amended Bleach Pre-Decon	Floor 2	Room 206	16.169	14.739	3.000	Sponge Wipe	0.694	Schuette	4/26/2011	11:00:00 AM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	18082.8	TNTC
2137	Amended Bleach Pre-Decon	Floor 2	Room 206	15.742	17.454	3.000	Sponge Wipe	0.694	Schuette	4/26/2011	11:06:00 AM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	20387.7	TNTC
2136	Amended Bleach Pre-Decon	Floor 2	Room 206	17.464	18.636	3.694	Sponge Wipe	0.694	Schuette	4/26/2011	11:13:00 AM	Table	Smooth	Horizontal Upward	FALSE		4	Yes	13958.8	TNTC
2140	Amended Bleach Pre-Decon	Floor 2	Room 206	17.822	19.540	3.000	Sponge Wipe	0.694	Schuette	4/26/2011	11:19:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample on floor with woodchips	6	Yes	6963.6	NA
2588	Amended Bleach Pre-Decon	Floor 2	Room 206	16.794	20.123	3.784	Sponge Wipe	0.694	Schuette	4/26/2011	11:28:00 AM	Table	Smooth	Horizontal Upward	FALSE	moved tools out of way to take sample	6	No	ND	NA
2145	Amended Bleach Pre-Decon	Floor 2	Room 206	16.642	16.345	3.000	Sponge Wipe	0.694	Schuette	4/26/2011	11:40:00 AM	Floor	Smooth	Horizontal Upward	TRUE		4	No	ND	ND
2142	Amended Bleach Pre-Decon	Floor 2	Room 206	17.330	18.209	5.800	Sponge Wipe	0.694	Schuette	4/26/2011	11:36:00 AM	Ceiling	Metal	Horizontal Upward	FALSE	sponge on top of light	4	Yes	3543.7	ND
1656	Amended Bleach Pre-Decon	Floor 2	Room 206	16.642	16.345	3.000	Swab	0.028	Schuette	4/26/2011	11:39:00 AM	Floor	Smooth	Horizontal Upward	TRUE	outside barcoded sample bag dropped on floor	7	No	ND	ND
2639	Amended Bleach Pre-Decon	Floor 2	Room 207	15.571	6.897	3.700	Sponge Wipe	0.694	Philpot	4/26/2011	10:42:00 AM	Table	Smooth	Horizontal Upward	FALSE		3	Yes	13343.5	NA
2117	Amended Bleach Pre-Decon	Floor 2	Room 207	15.547	7.478	3.700	Sponge Wipe	0.694	Philpot	4/26/2011	10:44:00 AM	Table	Smooth	Horizontal Upward	FALSE		3	Yes	14639.4	NA
2131	Amended Bleach Pre-Decon	Floor 2	Room 207	15.547	8.155	3.700	Sponge Wipe	0.694	Philpot	4/26/2011	10:46:00 AM	Table	Smooth	Horizontal Upward	FALSE		3	Yes	11457.2	NA
2615	Amended Bleach Pre-Decon	Floor 2	Room 207	16.053	9.968	3.000	Sponge Wipe	0.694	Philpot	4/26/2011	10:50:00 AM	Supply Vent	Metal	Horizontal Downward	TRUE	sponge stick blank	3	No	ND	ND
2508	Amended Bleach Pre-Decon	Floor 2	Room 207	17.467	10.196	3.700	Sponge Wipe	0.694	Philpot	4/26/2011	10:54:00 AM	Desk	Smooth	Horizontal Upward	FALSE		3	Yes	1296.0	ND
2383	Amended Bleach Pre-Decon	Floor 2	Room 207	15.571	6.390	3.700	Sponge Wipe	0.694	Philpot	4/26/2011	10:40:00 AM	Table	Smooth	Horizontal Upward	FALSE		3	Yes	5207.8	ND
2369	Amended Bleach Pre-Decon	Floor 2	Room 207	16.353	11.984	3.000	Sponge Wipe	0.694	Philpot	4/26/2011	10:16:00 AM	Floor	Smooth	Horizontal Upward	FALSE		3	Yes	20879.2	NA
2623	Amended Bleach Pre-Decon	Floor 2	Room 207	17.220	11.282	5.500	Sponge Wipe	0.694	Philpot	4/26/2011	10:28:00 AM	Ceiling	Textured	Horizontal Upward	FALSE	light balast above light plenum side, removed adjacent ceiling tile to collect sample	6	Yes	9863.6	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2300	Amended Bleach Pre-Decon	Floor 2	Room 207	17.956	7.695	3.400	Sponge Wipe	0.694	Philpot	4/26/2011	10:35:00 AM	Wall	Textured	Vertical	FALSE		6	Yes	132.0	NA
1593	Amended Bleach Pre-Decon	Floor 2	Room 207	16.559	8.421	5.500	Swab	0.028	Philpot	4/26/2011	10:48:00 AM	Supply Vent	Metal	Horizontal Downward	FALSE	diffuser swab sample	7	Yes	86423.5	TNTC
1737	Amended Bleach Pre-Decon	Floor 2	Room 207	16.077	9.775	3.000	Swab	0.028	Philpot	4/26/2011	10:51:00 AM	Bed	Metal	Horizontal Downward	TRUE	swab stick blank	7	No	ND	ND
4102	Amended Bleach Pre-Decon	Floor 2	Room 208	13.485	18.403	3.490	Vacuum Sock	4.000	Schuette	4/26/2011	10:18:00 AM	Chair	Porous	Horizontal Upward	FALSE		2	Yes	25.0	1.2
3958	Amended Bleach Pre-Decon	Floor 2	Room 208	13.768	20.383	3.394	Vacuum Sock	4.000	Schuette	4/26/2011	10:42:00 AM	Chair	Porous	Horizontal Upward	FALSE		2	Yes	16.7	2.9
2146	Amended Bleach Pre-Decon	Floor 2	Room 208	12.651	19.845	3.691	Sponge Wipe	0.694	Schuette	4/26/2011	10:45:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		6	Yes	5740.6	NA
2138	Amended Bleach Pre-Decon	Floor 2	Room 208	13.560	14.934	3.689	Sponge Wipe	0.694	Schuette	4/26/2011	10:09:00 AM	Table	Smooth	Horizontal Upward	FALSE	pulled in different place than pre-VHP b/c RMC on top of previous sample	4	Yes	7737.8	TNTC
2147	Amended Bleach Pre-Decon	Floor 2	Room 208	15.168	20.562	4.292	Sponge Wipe	0.694	Schuette	4/26/2011	10:48:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		4	Yes	7479.1	ND
2311	Amended Bleach Pre-Decon	Floor 2	Room 208	13.857	17.632	5.800	Sponge Wipe	0.694	Schuette	4/26/2011	10:56:00 AM	Ceiling	Metal	Horizontal Upward	FALSE	top of light	4	Yes	9739.8	TNTC
2309	Amended Bleach Pre-Decon	Floor 2	Room 208	15.317	18.433	3.294	Sponge Wipe	0.694	Schuette	4/26/2011	10:27:00 AM	Wall	Textured	Vertical	FALSE		4	No	ND	ND
1564	Amended Bleach Pre-Decon	Floor 2	Room 208	12.726	18.284	4.275	Swab	0.028	Schuette	4/26/2011	10:22:00 AM	Monitor	Smooth	Vertical	FALSE	upper left of monitor	7	No	ND	ND
1625	Amended Bleach Pre-Decon	Floor 2	Room 208	14.006	19.964	5.800	Swab	0.028	Schuette	4/26/2011	10:51:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE	air diffuser on ceiling	7	Yes	65417.8	ND
4104	Amended Bleach Pre-Decon	Floor 2	Room 209	13.902	10.769	3.000	Vacuum Sock	4.000	Philpot	4/26/2011	9:20:00 AM	Floor	Carpet	Horizontal Upward	FALSE		1	Yes	269.9	NA
3929	Amended Bleach Pre-Decon	Floor 2	Room 209	14.756	8.240	3.000	Vacuum Sock	4.000	Philpot	4/26/2011	9:27:00 AM	Floor	Carpet	Horizontal Upward	FALSE	right of stove on floor	1	Yes	20.0	37.5
2836	Amended Bleach Pre-Decon	Floor 2	Room 209	14.456	10.640	5.474	Sponge Wipe	0.694	Philpot	4/26/2011	9:46:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	area is 2x2 feet, larger than template for the sponge	3	Yes	1267.2	NA
2833	Amended Bleach Pre-Decon	Floor 2	Room 209	15.018	9.806	3.900	Sponge Wipe	0.694	Philpot	4/26/2011	9:40:00 AM	Stove	Metal	Horizontal Upward	FALSE	burner and smooth metal surface	3	Yes	8495.7	NA
2308	Amended Bleach Pre-Decon	Floor 2	Room 209	13.967	7.114	3.700	Sponge Wipe	0.694	Philpot	4/26/2011	9:58:00 AM	Table	Smooth	Horizontal Upward	FALSE	table surface	3	Yes	7895.7	NA
2647	Amended Bleach Pre-Decon	Floor 2	Room 209	12.456	6.840	3.300	Sponge Wipe	0.694	Philpot	4/26/2011	10:01:00 AM	Wall	Textured	Vertical	FALSE		3	Yes	336.0	270.1
2144	Amended Bleach Pre-Decon	Floor 2	Room 209	12.722	10.151	3.798	Sponge Wipe	0.694	Philpot	4/26/2011	10:03:00 AM	Countertop	Smooth	Horizontal Upward	FALSE		6	Yes	3621.9	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2139	Amended Bleach Pre-Decon	Floor 2	Room 209	13.856	12.069	3.797	Sponge Wipe	0.694	Philpot	4/26/2011	10:07:00 AM	Countertop	Smooth	Horizontal Upward	FALSE		3	Yes	6971.7	NA
2253	Amended Bleach Pre-Decon	Floor 2	Room 209	13.955	8.834	3.000	Sponge Wipe	0.694	J. Murray	4/26/2011	3:24:00 PM	Ceiling	Metal	Horizontal Upward	FALSE	taken from last light ballast right side	2	Yes	16230.1	1805347.7
4054	Amended Bleach Pre-Decon	Floor 2	Room 210	11.485	17.638	3.000	Vacuum Sock	4.000	Myers	4/26/2011	11:27:00 AM	Floor	Carpet	Horizontal Upward	TRUE	vacuum blank	2	No	ND	ND
3531	Amended Bleach Pre-Decon	Floor 2	Room 210	11.402	19.554	3.000	Vacuum Sock	4.000	Myers	4/26/2011	11:04:00 AM	Floor	Smooth	Horizontal Upward	FALSE	wood/laminate floor, 210	1	Yes	182.8	89.8
4227	Amended Bleach Pre-Decon	Floor 2	Room 210	10.662	20.345	3.500	Vacuum Sock	4.000	Myers	4/26/2011	11:08:00 AM	Chair	Cloth	Horizontal Upward	FALSE	red office chair, 210	1	Yes	3.6	2.7
2104	Amended Bleach Pre-Decon	Floor 2	Room 210	11.199	16.045	5.500	Sponge Wipe	0.694	Myers	4/26/2011	11:22:00 AM	Ceiling	Metal	Horizontal Upward	FALSE	light ballast, 210	6	Yes	16499.4	NA
2113	Amended Bleach Pre-Decon	Floor 2	Room 210	11.208	17.596	3.000	Sponge Wipe	0.694	Myers	4/26/2011	11:29:00 AM	Floor	Carpet	Horizontal Upward	TRUE	sponge stick blank 210	6	No	ND	NA
2110	Amended Bleach Pre-Decon	Floor 2	Room 210	12.117	20.456	4.295	Sponge Wipe	0.694	Myers	4/26/2011	11:13:00 AM	Shelves	Metal	Horizontal Upward	FALSE		6	Yes	8344.0	NA
2112	Amended Bleach Pre-Decon	Floor 2	Room 210	9.535	19.799	3.766	Sponge Wipe	0.694	Myers	4/26/2011	11:16:00 AM	File cabinet	Metal	Horizontal Upward	FALSE	file cabinet, 210	6	Yes	5831.8	NA
2621	Amended Bleach Pre-Decon	Floor 2	Room 210	10.730	14.844	3.000	Sponge Wipe	0.694	Myers	4/26/2011	10:36:00 AM	Floor	Smooth	Horizontal Upward	FALSE	wood floor	6	Yes	12095.5	NA
2837	Amended Bleach Pre-Decon	Floor 2	Room 210	11.907	14.399	3.330	Sponge Wipe	0.694	Myers	4/26/2011	10:45:00 AM	Wall	Textured	Vertical	FALSE	wipe, wall, 210	6	No	ND	NA
2111	Amended Bleach Pre-Decon	Floor 2	Room 210	9.608	17.223	3.000	Sponge Wipe	0.694	Myers	4/26/2011	10:52:00 AM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	12339.9	NA
1534	Amended Bleach Pre-Decon	Floor 2	Room 210	11.498	17.471	3.000	Swab	0.028	Myers	4/26/2011	11:30:00 AM	Floor	Carpet	Horizontal Upward	TRUE		7	No	ND	ND
1526	Amended Bleach Pre-Decon	Floor 2	Room 210	10.823	19.827	5.500	Swab	0.028	Myers	4/26/2011	11:19:00 AM	Supply Vent	Metal	Inclined	FALSE	hvac vent, 210	7	Yes	67218.3	TNTC
1617	Amended Bleach Pre-Decon	Floor 2	Room 210	9.677	18.335	4.098	Swab	0.028	Myers	4/26/2011	10:57:00 AM	Monitor	Smooth	Vertical	FALSE	monitor swab, upper right corner	7	Yes	ND	993.9
3937	Amended Bleach Pre-Decon	Floor 2	Room 211	10.765	11.858	3.000	Vacuum Sock	4.000	Myers	4/26/2011	9:34:00 AM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample 211	2	Yes	275.0	153.5
4134	Amended Bleach Pre-Decon	Floor 2	Room 211	11.865	9.465	3.395	Vacuum Sock	4.000	Myers	4/26/2011	10:22:00 AM	Couch	Cloth	Horizontal Upward	FALSE	couch, 211	1	Yes	17.5	10.9
4061	Amended Bleach Pre-Decon	Floor 2	Room 211	10.700	6.240	3.000	Vacuum Sock	4.000	Myers	4/26/2011	10:03:00 AM	Floor	Carpet	Horizontal Upward	FALSE	vacuum, 211	2	Yes	41.7	0.6
3939	Amended Bleach Pre-Decon	Floor 2	Room 211	10.133	7.420	3.000	Vacuum Sock	4.000	Myers	4/26/2011	10:08:00 AM	Floor	Carpet	Horizontal Upward	TRUE		2	No	ND	ND
4249	Amended Bleach Pre-Decon	Floor 2	Room 211	10.895	8.172	3.397	Vacuum Sock	4.000	Myers	4/26/2011	10:15:00 AM	Chair	Porous	Horizontal Upward	FALSE	chair, 211	1	Yes	11.3	4.3

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2382	Amended Bleach Pre-Decon	Floor 2	Room 211	10.000	11.659	3.491	Sponge Wipe	0.694	Myers	4/26/2011	9:47:00 AM	Wall	Textured	Vertical	FALSE		6	Yes	230.4	NA
2824	Amended Bleach Pre-Decon	Floor 2	Room 211	9.524	6.238	4.294	Sponge Wipe	0.694	Myers	4/26/2011	10:01:00 AM	Shelves	Smooth	Horizontal Upward	FALSE	sponge wipe, shelves, 211	6	Yes	241.2	NA
1979	Amended Bleach Pre-Decon	Floor 2	Room 211	10.937	9.131	3.590	Sponge Wipe	0.694	Myers	4/26/2011	10:20:00 AM	Table	Smooth	Horizontal Upward	FALSE	sponge stick, 211	6	Yes	10549.0	NA
2380	Amended Bleach Pre-Decon	Floor 2	Room 211	10.499	10.959	5.500	Sponge Wipe	0.694	Myers	4/26/2011	10:32:00 AM	Ceiling	Metal	Horizontal Upward	FALSE	light ballast, sample area indicated by sharpie marks on ceiling grid,from door: right side on window end	6	Yes	16741.8	NA
2579	Amended Bleach Pre-Decon	Floor 2	Room 211	10.092	7.420	3.000	Sponge Wipe	0.694	Myers	4/26/2011	10:09:00 AM	Table	Smooth	Horizontal Upward	TRUE		6	No	ND	NA
1731	Amended Bleach Pre-Decon	Floor 2	Room 211	10.499	7.911	5.500	Swab	0.028	Philpot	4/26/2011	9:55:00 AM	Ceiling	Metal	Horizontal Downward	FALSE	honey comb grating patially removed before sampling, was aggressively handled and or disturbed prior too	7	Yes	ND	82.8
1663	Amended Bleach Pre-Decon	Floor 2	Room 211	9.462	9.716	3.995	Swab	0.028	Myers	4/26/2011	9:52:00 AM	Monitor	Smooth	Vertical	FALSE	swab, upper right, monitor, existing template	7	Yes	1800.5	579.8
1677	Amended Bleach Pre-Decon	Floor 2	Room 211	10.133	7.393	3.000	Swab	0.028	Myers	4/26/2011	10:12:00 AM	Table	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
3951	Amended Bleach Pre-Decon	Floor 2	Room 212	7.404	18.397	3.700	Vacuum Sock	4.000	McCormack	4/26/2011	10:11:00 AM	Chair	Porous	Horizontal Upward	FALSE		4	Yes	8.3	17.3
3989	Amended Bleach Pre-Decon	Floor 2	Room 212	7.669	20.352	3.300	Vacuum Sock	4.000	McCormack	4/26/2011	10:31:00 AM	Chair	Porous	Horizontal Upward	FALSE		4	Yes	16.7	19.6
4118	Amended Bleach Pre-Decon	Floor 2	Room 212	8.468	16.220	3.000	Vacuum Sock	4.000	McCormack	4/26/2011	10:00:00 AM	Cabinet	Paint	Horizontal Upward	TRUE		4	No	ND	ND
3938	Amended Bleach Pre-Decon	Floor 2	Room 212	8.591	20.441	3.000	Vacuum Sock	4.000	McCormack	4/26/2011	10:25:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	41.3	51.2
2312	Amended Bleach Pre-Decon	Floor 2	Room 212	6.515	19.774	3.750	Sponge Wipe	0.694	McCormack	4/26/2011	10:40:00 AM	File cabinet	Metal	Vertical	FALSE		7	Yes	11558.0	TNTC
2149	Amended Bleach Pre-Decon	Floor 2	Room 212	8.176	16.220	3.000	Sponge Wipe	0.694	McCormack	4/26/2011	9:59:00 AM	Cabinet	Paint	Horizontal Upward	TRUE		7	No	ND	ND
2224	Amended Bleach Pre-Decon	Floor 2	Room 212	6.375	16.616	4.500	Sponge Wipe	0.694	McCormack	4/26/2011	9:55:00 AM	Wall	Paint	Vertical	FALSE		7	No	ND	ND
2835	Amended Bleach Pre-Decon	Floor 2	Room 212	8.041	14.630	3.000	Sponge Wipe	0.694	McCormack	4/26/2011	9:46:00 AM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	14135.0	TNTC
1599	Amended Bleach Pre-Decon	Floor 2	Room 212	7.588	20.509	5.400	Swab	0.028	McCormack	4/26/2011	10:37:00 AM	Supply Vent	Metal	Vertical	FALSE		7	Yes	19805.4	13831.4

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1644	Amended Bleach Pre-Decon	Floor 2	Room 212	6.774	18.350	4.200	Swab	0.028	McCormack	4/26/2011	10:18:00 AM	Monitor	Plastic	Inclined	FALSE		7	No	ND	ND
1787	Amended Bleach Pre-Decon	Floor 2	Room 212	8.210	15.928	3.000	Swab	0.028	McCormack	4/26/2011	10:04:00 AM	Cabinet	Paint	Horizontal Upward	TRUE		7	No	ND	ND
3926	Amended Bleach Pre-Decon	Floor 2	Room 213	6.854	8.126	3.000	Vacuum Sock	4.000	McCormack	4/26/2011	9:16:00 AM	Floor	Carpet	Horizontal Upward	FALSE		4	Yes	145.8	142.6
3700	Amended Bleach Pre-Decon	Floor 2	Room 213	8.857	8.604	3.700	Vacuum Sock	4.000	McCormack	4/26/2011	9:09:00 AM	Bed	Porous	Horizontal Upward	FALSE		4	Yes	625.0	TNTC
3706	Amended Bleach Pre-Decon	Floor 2	Room 213	7.772	10.681	3.000	Vacuum Sock	4.000	McCormack	4/26/2011	8:55:00 AM	Floor	Metal	Horizontal Upward	TRUE		1	No	ND	ND
4111	Amended Bleach Pre-Decon	Floor 2	Room 213	8.311	7.695	3.700	Vacuum Sock	4.000	McCormack	4/26/2011	9:22:00 AM	Bed	Porous	Horizontal Upward	FALSE		1	Yes	260.0	NA
3935	Amended Bleach Pre-Decon	Floor 2	Room 213	7.239	12.075	3.000	Vacuum Sock	4.000	McCormack	4/26/2011	8:35:00 AM	Floor	Carpet	Horizontal Upward	FALSE		4	Yes	516.7	263.4
2638	Amended Bleach Pre-Decon	Floor 2	Room 213	7.264	7.640	5.700	Sponge Wipe	0.694	McCormack	4/26/2011	9:42:00 AM	Ceiling	Metal	Horizontal Upward	FALSE	sample taken on top of lighting unit closest to entrance	7	Yes	15758.8	TNTC
2402	Amended Bleach Pre-Decon	Floor 2	Room 213	7.633	5.945	3.500	Sponge Wipe	0.694	McCormack	4/26/2011	9:36:00 AM	Wall	Textured	Vertical	FALSE		7	Yes	ND	36.4
2820	Amended Bleach Pre-Decon	Floor 2	Room 213	8.941	6.744	3.750	Sponge Wipe	0.694	McCormack	4/26/2011	9:33:00 AM	Nightstand	Plastic	Horizontal Upward	FALSE		7	Yes	8725.6	TNTC
2310	Amended Bleach Pre-Decon	Floor 2	Room 213	8.899	10.843	4.000	Sponge Wipe	0.694	McCormack	4/26/2011	9:00:00 AM	Sink	Plastic	Horizontal Upward	FALSE		7	Yes	6451.0	TNTC
2618	Amended Bleach Pre-Decon	Floor 2	Room 213	7.726	11.055	3.000	Sponge Wipe	0.694	McCormack	4/26/2011	8:56:00 AM	Floor	Metal	Horizontal Upward	TRUE		7	No	ND	ND
2221	Amended Bleach Pre-Decon	Floor 2	Room 213	6.782	10.978	5.000	Sponge Wipe	0.694	McCormack	4/26/2011	8:46:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		7	Yes	2855.9	ND
2121	Amended Bleach Pre-Decon	Floor 2	Stairwell	23.867	14.722	3.000	Sponge Wipe	0.694	England	4/26/2011	10:43:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	287269.2	TNTC
2148	Amended Bleach Pre-Decon	Floor 2	Stairwell	24.262	19.974	3.000	Sponge Wipe	0.694	England	4/26/2011	10:25:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	325619.7	TNTC
3485	Amended Bleach Post-Decon	Floor 1	Bathroom M	25.574	18.678	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	3:05:00 PM	Floor	Smooth	Horizontal Upward	FALSE		2	No	ND	ND
3085	Amended Bleach Post-Decon	Floor 1	Bathroom M	26.192	19.703	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	3:02:00 PM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	23.5	ND
3087	Amended Bleach Post-Decon	Floor 1	Bathroom M	25.807	20.571	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	2:58:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken on the floor in front of the heater	2	No	ND	ND
3095	Amended Bleach Post-Decon	Floor 1	Bathroom M	24.808	20.162	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	2:48:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken at entrance of bathroom	2	No	ND	ND
2870	Amended Bleach Post-Decon	Floor 1	Bathroom W	24.467	15.055	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	2:26:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken 2ft from entrance.	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2212	Amended Bleach Post-Decon	Floor 1	Bathroom W	26.365	14.503	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	2:34:00 PM	Wall	Smooth	Vertical	FALSE	sample was taken above heater	5	No	ND	ND
2869	Amended Bleach Post-Decon	Floor 1	Bathroom W	25.281	16.970	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	2:42:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken on the floor where sinks used to be.	2	No	ND	ND
2913	Amended Bleach Post-Decon	Floor 1	Bathroom W	27.100	16.204	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	2:39:00 PM	Floor	Smooth	Horizontal Upward	FALSE		2	No	ND	ND
4133	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	25.604	8.283	0.000	Vacuum Sock	4.000	Siegmund	5/5/2011	12:39:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	2	No	ND	ND
2783	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	22.678	16.495	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	11:23:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken from the right side of the previous sample.	5	No	ND	ND
2732	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	20.813	13.984	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	11:11:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE	sample was taken in vent before stairway.	5	No	ND	ND
2636	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	17.458	13.978	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	11:02:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	No	ND	ND
2792	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	17.155	14.306	0.396	Sponge Wipe	0.694	Siegmund	5/5/2011	10:57:00 AM	Wall	Smooth	Vertical	FALSE	sample was taken on the right side of the previous sample.	5	No	ND	ND
3129	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	14.630	15.615	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	10:08:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken on the floor 3ft from sinks.	5	No	ND	ND
3132	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	15.756	14.039	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	10:14:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank	2	No	ND	ND
3307	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	26.587	10.487	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:22:00 PM	Countertop	Smooth	Vertical	FALSE		5	No	ND	ND
3135	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	13.936	16.639	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	10:05:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken in front of rm 104 doorway.	5	No	ND	ND
3147	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	13.138	13.057	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	9:45:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken 14in from right wall.	5	No	ND	ND
3146	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	13.939	14.522	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	9:52:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken taken from left side looking down at the previous sample. space heater on previous sample.	5	No	ND	ND
3366	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	26.318	9.416	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:27:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	sample was taken on the rightside of the previous sample.	5	No	ND	ND
2762	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	22.857	7.619	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:48:00 PM	Floor	Smooth	Horizontal Upward	FALSE		5	No	ND	ND
3149	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	8.977	14.179	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	9:36:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken next to the left wall before rm 106	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2842	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	24.162	11.033	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:09:00 PM	Countertop	Smooth	Horizontal Upward	FALSE	sample was taken on edge of bar.	5	No	ND	ND
3304	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	26.179	6.341	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:34:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken in center of doorway.	5	No	ND	ND
2929	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	22.975	16.898	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	11:27:00 AM	Ceiling	Smooth	Horizontal Downward	FALSE	sample was taken on light fixture	5	No	ND	ND
3303	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	27.411	9.317	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:24:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken in center before doorway.	5	No	ND	ND
3313	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	26.012	10.468	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:18:00 PM	Countertop	Smooth	Horizontal Upward	FALSE	sample was taken center of bar top.	2	No	ND	ND
2922	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	23.610	12.919	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:06:00 PM	Floor	Smooth	Horizontal Upward	FALSE		5	No	ND	ND
3316	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	27.210	12.931	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:02:00 PM	Floor	Smooth	Horizontal Upward	FALSE	bleach residue was in perimeter of the sample location.	5	No	ND	ND
3319	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	27.440	11.608	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	11:51:00 AM	Floor	Smooth	Horizontal Upward	FALSE	bleach residue was perimeter of sample location.	5	No	ND	ND
3323	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	25.753	11.493	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	11:47:00 AM	Floor	Smooth	Horizontal Upward	FALSE		5	No	ND	ND
2803	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	24.746	11.325	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	11:42:00 AM	Ceiling	Metal	Horizontal Downward	FALSE		2	No	ND	ND
3302	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	25.125	8.029	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	12:35:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	5	No	ND	ND
3156	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	3.900	13.478	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	9:14:00 AM	Wall	Smooth	Vertical	FALSE	sample was taken on door below window	5	No	ND	ND
3154	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	4.395	13.169	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	9:11:00 AM	Floor	Smooth	Horizontal Upward	FALSE	bleach residue forward of sample	5	No	ND	ND
3166	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	6.078	13.992	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	9:21:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE	sample was taken in the opening over rm 110 doorway	5	No	ND	ND
2440	Amended Bleach Post-Decon	Floor 1	Corridor+Lobby	21.406	14.289	0.000	Sponge Wipe	0.694	Bartos	5/5/2011	12:31:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample collected at bottom of stairs on floor one immediately against the riser and centered on stairwell. very dirty sample.	2	No	ND	ND
4032	Amended Bleach Post-Decon	Floor 1	Mechanical Room	17.563	19.386	0.000	Vacuum Sock	4.000	Siegmund	5/5/2011	3:29:00 PM	Supply Vent	Cloth	Inclined	FALSE	sample was taken on the filter for the furnace. looking at the furnace, it was the filter in the lower right corner.	2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3483	Amended Bleach Post-Decon	Floor 1	Mechanical Room	16.821	19.218	1.180	Sponge Wipe	0.694	Siegmund	5/5/2011	3:19:00 PM	Wall	Smooth	Vertical	FALSE		2	No	ND	ND
3487	Amended Bleach Post-Decon	Floor 1	Mechanical Room	17.492	18.764	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	3:21:00 PM	Floor	Smooth	Horizontal Upward	FALSE		5	No	ND	ND
3484	Amended Bleach Post-Decon	Floor 1	Mechanical Room	18.702	20.399	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	3:15:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken in front of double doors.	2	No	ND	ND
2633	Amended Bleach Post-Decon	Floor 1	Room 101	16.645	12.169	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	10:18:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken in center of rm 101 doorway.	5	No	ND	ND
3312	Amended Bleach Post-Decon	Floor 1	Room 101	21.380	11.154	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	10:51:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken 1ft behind previous sample when looking at the doorway.	2	No	ND	ND
2910	Amended Bleach Post-Decon	Floor 1	Room 101	19.632	10.609	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	10:43:00 AM	Ceiling	Metal	Horizontal Upward	FALSE	sample was taken right side of the previous sample on light fixture.	2	No	ND	ND
3123	Amended Bleach Post-Decon	Floor 1	Room 101	16.050	11.226	1.588	Sponge Wipe	0.694	Siegmund	5/5/2011	10:25:00 AM	Wall	Smooth	Vertical	FALSE	sample was taken 2 1/2ft above first location.	2	No	ND	ND
3118	Amended Bleach Post-Decon	Floor 1	Room 101	17.646	10.987	0.000	Sponge Wipe	0.694	Siegmund	5/5/2011	10:38:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken next to venilation equipment.	2	No	ND	ND
3078	Amended Bleach Post-Decon	Floor 1	Room 101	22.013	10.187	1.398	Sponge Wipe	0.694	Siegmund	5/5/2011	12:53:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample was taken 1 1/2ft from the left of doorway	5	No	ND	ND
3434	Amended Bleach Post-Decon	Floor 1	Room 101A	18.292	9.323	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:10:00 PM	Desk	Plastic	Horizontal Upward	FALSE	middle front of uv aps unit. white ammended bleach in sample square.	1	No	ND	ND
2613	Amended Bleach Post-Decon	Floor 1	Room 101A	19.038	6.479	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:07:00 AM	Desk	Smooth	Horizontal Upward	FALSE	previous sample should be floor sample in front of desk on opposite wall . current sample moved backwards slightly from front off desk due hobo box on front rt corners. black stuff on sample spot	1	No	ND	ND
2755	Amended Bleach Post-Decon	Floor 1	Room 101A	20.388	7.581	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:50:00 AM	Floor	Smooth	Horizontal Upward	TRUE	not actually on floor . taken where standing at 5 ft height. same goes for previous sample blank .	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2377	Amended Bleach Post-Decon	Floor 1	Room 101A	21.687	8.319	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:46:00 AM	Floor	Smooth	Horizontal Upward	FALSE	floor sample square is in somewhat debris free area. no debris on floor.	4	No	ND	ND
2277	Amended Bleach Post-Decon	Floor 1	Room 101A	21.555	7.773	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:39:00 AM	File cabinet	Smooth	Horizontal Upward	FALSE	overlap from pre-work on sample square. black debris on file cabinet .	4	No	ND	ND
2756	Amended Bleach Post-Decon	Floor 1	Room 101A	21.643	7.375	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:36:00 AM	Desk	Smooth	Horizontal Upward	FALSE	white ammended bleach residual in sample square . sticky surface in sample square.	4	No	ND	ND
2642	Amended Bleach Post-Decon	Floor 1	Room 101A	21.806	6.282	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:30:00 AM	Desk	Smooth	Horizontal Upward	FALSE	residual white ammended bleach in sample square. surface dirty. black debris...	4	No	ND	ND
2215	Amended Bleach Post-Decon	Floor 1	Room 101A	18.588	9.087	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:02:00 PM	Desk	Plastic	Vertical	FALSE	vertical upward on plastic on front rt of uv-aps unit.	4	No	ND	ND
3250	Amended Bleach Post-Decon	Floor 1	Room 101A	20.300	6.592	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:18:00 AM	Desk	Smooth	Horizontal Upward	FALSE	rust inside sample square . moved slightly backwards from front of desk..will have overlap approximately 25 percent .	1	No	ND	ND
2223	Amended Bleach Post-Decon	Floor 1	Room 101A	19.494	7.089	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:03:00 AM	Floor	Smooth	Horizontal Upward	FALSE	floor sample, ammended residual bleach. floor looks painted	1	No	ND	ND
2220	Amended Bleach Post-Decon	Floor 1	Room 101A	18.157	6.150	0.000	Sponge Wipe	0.694	Willison	5/5/2011	10:59:00 AM	File cabinet	Smooth	Horizontal Upward	FALSE	overlap from previos sample..approximately 60 percent.	6	No	ND	NA
2641	Amended Bleach Post-Decon	Floor 1	Room 101A	16.323	9.314	0.000	Sponge Wipe	0.694	Willison	5/5/2011	10:49:00 AM	Floor	Smooth	Horizontal Upward	FALSE	1ft inside door to the rt side...up next to door.	7	No	ND	ND
2218	Amended Bleach Post-Decon	Floor 1	Room 101A	21.407	6.297	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:25:00 AM	Desk	Smooth	Horizontal Upward	FALSE	white ammended bleach spots within sample square. dirty surface.	4	No	ND	ND
2747	Amended Bleach Post-Decon	Floor 1	Room 101A	20.093	9.131	0.000	Sponge Wipe	0.694	Willison	5/5/2011	11:53:00 AM	File cabinet	Smooth	Horizontal Upward	FALSE	dirt and rust in sample square. overlap from pre work as well. approximately 80 percent .	4	No	ND	ND
3306	Amended Bleach Post-Decon	Floor 1	Room 102	20.404	16.259	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:21:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	90 percent overlap from pre work. white ammended bleach in sample square.	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3478	Amended Bleach Post-Decon	Floor 1	Room 102	19.936	16.535	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:17:00 PM	Floor	Smooth	Horizontal Upward	FALSE	rust in sample square on floor.	4	No	ND	ND
3519	Amended Bleach Post-Decon	Floor 1	Room 102	18.160	16.955	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:58:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	80 percent overlap from pre work. rust in sample square too.	6	No	ND	NA
3072	Amended Bleach Post-Decon	Floor 1	Room 102	19.288	14.819	0.000	Sponge Wipe	0.694	Willison	5/5/2011	1:35:00 PM	Desk	Plastic	Horizontal Upward	FALSE	white ammended bleach in sample square on top of uv aps unit. ceiling tile debris in sample square.	6	No	ND	NA
3151	Amended Bleach Post-Decon	Floor 1	Room 102	18.628	14.831	0.000	Sponge Wipe	0.694	Willison	5/5/2011	1:31:00 PM	Desk	Plastic	Horizontal Upward	FALSE	lots of white ammended bleach in sample square. on top of uv aps unit. top rt. red cap in sample square	6	No	ND	NA
3134	Amended Bleach Post-Decon	Floor 1	Room 102	18.340	14.759	0.000	Sponge Wipe	0.694	Willison	5/5/2011	1:24:00 PM	Desk	Smooth	Horizontal Upward	FALSE	ceiling tile debris and white ammended bleach in sample square. on top of desk to the rt of uv aps unit.	6	No	ND	NA
3150	Amended Bleach Post-Decon	Floor 1	Room 102	18.088	14.807	0.000	Sponge Wipe	0.694	Willison	5/5/2011	1:19:00 PM	Desk	Metal	Vertical	FALSE	vertical sponge on side of desk.	4	No	ND	ND
3143	Amended Bleach Post-Decon	Floor 1	Room 102	17.896	17.171	0.000	Sponge Wipe	0.694	Willison	5/5/2011	1:06:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	70 percent overlap from pre work. ammended bleach in sample square. and rust.	4	No	ND	ND
3181	Amended Bleach Post-Decon	Floor 1	Room 102	19.144	16.223	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:54:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank in middle of room 5 ft height.	6	No	ND	NA
3153	Amended Bleach Post-Decon	Floor 1	Room 102	19.264	16.715	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:48:00 PM	Desk	Smooth	Horizontal Upward	FALSE	center drawer sample inside desk drawer. no visible debris present.	4	No	ND	ND
3144	Amended Bleach Post-Decon	Floor 1	Room 102	18.976	16.883	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:41:00 PM	Desk	Smooth	Horizontal Upward	FALSE	50 percent ammended bleach in sample square.	6	No	ND	NA
3256	Amended Bleach Post-Decon	Floor 1	Room 102	19.936	17.327	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:36:00 PM	Desk	Smooth	Horizontal Upward	FALSE	ammended bleach and ceiling tile debris in sample square.	1	No	ND	ND
3299	Amended Bleach Post-Decon	Floor 1	Room 102	17.932	16.571	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:31:00 PM	Floor	Smooth	Horizontal Upward	FALSE	rust and ceiling tile debris in sample square.	4	No	ND	ND
3290	Amended Bleach Post-Decon	Floor 1	Room 102	18.868	15.527	0.000	Sponge Wipe	0.694	Willison	5/5/2011	12:27:00 PM	Floor	Smooth	Horizontal Upward	FALSE	ceiling tile debris in sample square and rust.	1	No	ND	ND
3131	Amended Bleach Post-Decon	Floor 1	Room 102	16.877	15.791	0.000	Sponge Wipe	0.694	Willison	5/5/2011	1:16:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	75 percent overlap from pre work and rust in sample square.	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3162	Amended Bleach Post-Decon	Floor 1	Room 103	13.524	6.264	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:52:00 PM	Floor	Smooth	Horizontal Upward	FALSE	to right of square box marked on floor	4	No	ND	ND
3160	Amended Bleach Post-Decon	Floor 1	Room 103	14.636	6.114	0.300	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:57:00 PM	Wall	Textured	Vertical	FALSE	vert wall sample textured	4	No	ND	ND
3314	Amended Bleach Post-Decon	Floor 1	Room 103	13.236	7.050	2.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:49:00 PM	Shelves	Smooth	Horizontal Upward	FALSE	song template was slight;y large fot shelf top	4	No	ND	ND
3317	Amended Bleach Post-Decon	Floor 1	Room 103	13.721	7.121	0.587	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:43:00 PM	Table	Smooth	Horizontal Upward	FALSE	tabletop has some white and dust on it	4	No	ND	ND
3310	Amended Bleach Post-Decon	Floor 1	Room 103	13.921	10.221	2.276	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:26:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	top of light top of light dusty sig. dust	4	No	ND	ND
3311	Amended Bleach Post-Decon	Floor 1	Room 103	15.438	11.876	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:22:00 PM	Floor	Smooth	Horizontal Upward	FALSE	little dusty	7	No	ND	ND
3265	Amended Bleach Post-Decon	Floor 1	Room 103	13.943	9.805	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:29:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank blank	7	No	ND	ND
2779	Amended Bleach Post-Decon	Floor 1	Room 103	15.671	6.916	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	1:02:00 PM	Floor	Textured	Horizontal Upward	FALSE	large liquid stain in are of sample dusty	4	No	ND	ND
1714	Amended Bleach Post-Decon	Floor 1	Room 103	13.160	8.296	2.000	Swab	0.028	Schmaedick	5/5/2011	12:46:00 PM	Shelves	Smooth	Horizontal Upward	FALSE	dust and grime smooth surface top of shelves ditting ontop of desk	4	No	ND	ND
1610	Amended Bleach Post-Decon	Floor 1	Room 103	13.617	10.227	0.000	Swab	0.028	Schmaedick	5/5/2011	12:30:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank swab	4	No	ND	ND
3120	Amended Bleach Post-Decon	Floor 1	Room 104	16.514	20.782	1.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	1:22:00 PM	Wall	Textured	Vertical	FALSE	textured wall, no visual, next to template markings	4	No	ND	ND
3119	Amended Bleach Post-Decon	Floor 1	Room 104	15.097	18.393	0.690	Sponge Wipe	0.694	Schmaedick	5/5/2011	1:40:00 PM	Table	Smooth	Horizontal Upward	FALSE	table top no visible staining- photo out of mem	7	No	ND	ND
3116	Amended Bleach Post-Decon	Floor 1	Room 104	13.552	18.444	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	1:33:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	4	No	ND	ND
3125	Amended Bleach Post-Decon	Floor 1	Room 104	14.452	18.944	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	1:30:00 PM	Floor	Smooth	Horizontal Upward	FALSE	smooth, light dust - no photo out of mem	4	No	ND	ND
3124	Amended Bleach Post-Decon	Floor 1	Room 104	15.680	19.529	2.500	Sponge Wipe	0.694	Schmaedick	5/5/2011	1:27:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	some insulation fallen on top of light ballast, dusty, covered with particulatr	4	No	ND	ND
3050	Amended Bleach Post-Decon	Floor 1	Room 104	15.593	20.245	1.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	1:17:00 PM	Table	Smooth	Horizontal Upward	FALSE	previous sttempt at this sample crashed computer, sample info was re-entered no more pics will be tsken due to full memory	4	No	ND	ND
3114	Amended Bleach Post-Decon	Floor 1	Room 104	15.036	20.383	1.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	1:09:00 PM	Table	Textured	Horizontal Upward	FALSE	no major visible dust present	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2247	Amended Bleach Post-Decon	Floor 1	Room 105	9.920	11.153	0.250	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:46:00 AM	Wall	Smooth	Vertical	FALSE	wall sample next to box marked 2	1	No	ND	ND
2581	Amended Bleach Post-Decon	Floor 1	Room 105	11.881	10.923	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:41:00 AM	Floor	Smooth	Horizontal Upward	FALSE	laser location is off when compared to map, likely due to map sccale	7	No	ND	ND
2781	Amended Bleach Post-Decon	Floor 1	Room 105	12.533	10.923	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:36:00 AM	Sink	Smooth	Horizontal Upward	FALSE	template size area on right sibe of sink	1	No	ND	ND
2780	Amended Bleach Post-Decon	Floor 1	Room 105	10.501	11.652	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:28:00 AM	Floor	Smooth	Horizontal Upward	FALSE	no coloring	1	No	ND	ND
3441	Amended Bleach Post-Decon	Floor 1	Room 105	10.271	9.409	1.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:54:00 AM	Stove	Metal	Horizontal Upward	FALSE	right over top of burner	1	No	ND	ND
3333	Amended Bleach Post-Decon	Floor 1	Room 105	11.096	9.102	2.800	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:00:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	on ballast above light dusty powder	7	No	ND	ND
3268	Amended Bleach Post-Decon	Floor 1	Room 105	11.517	6.782	0.593	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:10:00 PM	Table	Smooth	Horizontal Upward	FALSE	some white hazing color	1	No	ND	ND
3289	Amended Bleach Post-Decon	Floor 1	Room 105	10.252	6.437	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:15:00 PM	Floor	Smooth	Horizontal Upward	FALSE	no color	7	No	ND	ND
3493	Amended Bleach Post-Decon	Floor 1	Room 105	11.287	9.869	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	12:02:00 PM	Floor	Smooth	Horizontal Upward	FALSE	no visible white color	1	No	ND	ND
4031	Amended Bleach Post-Decon	Floor 1	Room 106	12.081	20.220	0.000	Vacuum Sock	4.000	Owen	5/5/2011	3:28:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor against wall infront of filing cabinet	2	No	ND	ND
3115	Amended Bleach Post-Decon	Floor 1	Room 106	10.192	16.148	0.000	Sponge Wipe	0.694	Owen	5/5/2011	3:01:00 PM	Wall	Textured	Vertical	FALSE	sample taken on wall, left of previous sample	6	No	ND	NA
2447	Amended Bleach Post-Decon	Floor 1	Room 106	11.481	16.420	2.700	Sponge Wipe	0.694	Owen	5/5/2011	3:52:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	sample taken on top of light closest to 2nd light, top of light real dirty	7	No	ND	ND
3292	Amended Bleach Post-Decon	Floor 1	Room 106	10.099	19.988	1.000	Sponge Wipe	0.694	Owen	5/5/2011	3:45:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	sample taken on filing cabinet on left side of room again the wall	6	No	ND	NA
3482	Amended Bleach Post-Decon	Floor 1	Room 106	10.853	20.362	0.000	Sponge Wipe	0.694	Owen	5/5/2011	3:37:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor to left side of window 1foot out from wall. residual bleach stains on floor between this and previous sample	6	No	ND	NA
3112	Amended Bleach Post-Decon	Floor 1	Room 106	12.125	15.780	0.000	Sponge Wipe	0.694	Owen	5/5/2011	3:09:00 PM	Table	Smooth	Horizontal Upward	FALSE	sample taken on table surface in front of last sample	6	No	ND	NA
3117	Amended Bleach Post-Decon	Floor 1	Room 106	10.676	14.675	0.000	Sponge Wipe	0.694	Owen	5/5/2011	2:58:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken 1foot inside the door to the right of old sample	6	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2810	Amended Bleach Post-Decon	Floor 1	Room 106	10.538	18.311	1.000	Sponge Wipe	0.694	Owen	5/5/2011	3:17:00 PM	Desk	Smooth	Horizontal Upward	FALSE	sample taken on desk to right of previous sample	6	No	ND	NA
3110	Amended Bleach Post-Decon	Floor 1	Room 107	8.413	9.214	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	10:57:00 AM	Floor	Smooth	Horizontal Upward	FALSE	smooth-no coloring	7	No	ND	ND
2968	Amended Bleach Post-Decon	Floor 1	Room 107	8.470	6.882	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:22:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank blank blank	1	No	ND	ND
2089	Amended Bleach Post-Decon	Floor 1	Room 107	7.113	6.514	1.191	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:17:00 AM	Cabinet	Smooth	Horizontal Upward	FALSE	really dusty white particles	1	No	ND	ND
2183	Amended Bleach Post-Decon	Floor 1	Room 107	9.631	9.214	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:01:00 AM	Floor	Smooth	Horizontal Upward	FALSE	rough on outside of sqr, dust	7	No	ND	ND
3113	Amended Bleach Post-Decon	Floor 1	Room 107	7.665	10.602	2.800	Sponge Wipe	0.694	Schmaedick	5/5/2011	10:44:00 AM	Ceiling	Metal	Vertical	FALSE	light fixture ballast	1	No	ND	ND
3486	Amended Bleach Post-Decon	Floor 1	Room 107	7.646	12.400	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	10:38:00 AM	Wall	Smooth	Vertical	FALSE	next marked square on wall	7	No	ND	ND
2389	Amended Bleach Post-Decon	Floor 1	Room 107	8.605	7.975	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	11:11:00 AM	Floor	Smooth	Horizontal Upward	FALSE	little bit of rust- no other coloring	7	No	ND	ND
3322	Amended Bleach Post-Decon	Floor 1	Room 107	8.531	11.331	0.000	Sponge Wipe	0.694	Schmaedick	5/5/2011	10:34:00 AM	Floor	Smooth	Horizontal Upward	FALSE	some white bleach coloring	1	No	ND	ND
4113	Amended Bleach Post-Decon	Floor 1	Room 108	8.651	16.730	0.000	Vacuum Sock	4.000	Bechtal	5/5/2011	12:30:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	2	No	ND	ND
3963	Amended Bleach Post-Decon	Floor 1	Room 108	9.286	20.098	0.000	Vacuum Sock	4.000	Bechtal	5/5/2011	12:26:00 PM	Floor	Smooth	Horizontal Upward	FALSE	templates don't lay flat, too dark for photos in this room	8	No	ND	NA
3297	Amended Bleach Post-Decon	Floor 1	Room 108	8.213	20.617	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	12:20:00 PM	Floor	Smooth	Horizontal Upward	FALSE	laminate flloor	8	No	ND	NA
3296	Amended Bleach Post-Decon	Floor 1	Room 108	9.543	14.554	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	12:47:00 PM	Wall	Textured	Vertical	FALSE	left of previous sample outline	6	No	ND	NA
3262	Amended Bleach Post-Decon	Floor 1	Room 108	7.473	14.771	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	12:10:00 PM	Floor	Smooth	Horizontal Upward	FALSE	laminate flloor	1	No	ND	ND
3473	Amended Bleach Post-Decon	Floor 1	Room 108	7.913	19.117	2.247	Sponge Wipe	0.694	Bechtal	5/5/2011	12:54:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	light ballast no template used	6	No	ND	NA
3413	Amended Bleach Post-Decon	Floor 1	Room 108	7.113	18.217	0.779	Sponge Wipe	0.694	Bechtal	5/5/2011	12:14:00 PM	Desk	Smooth	Horizontal Upward	FALSE	desk with white residue	8	No	ND	NA
3301	Amended Bleach Post-Decon	Floor 1	Room 108	9.551	17.930	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	12:43:00 PM	Floor	Smooth	Horizontal Upward	FALSE	laminate flloor	5	No	ND	ND
2941	Amended Bleach Post-Decon	Floor 1	Room 108	9.451	20.117	1.387	Sponge Wipe	0.694	Bechtal	5/5/2011	12:38:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	slight debris in area	8	No	ND	NA
3308	Amended Bleach Post-Decon	Floor 1	Room 108	8.651	16.930	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	12:34:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	8	No	ND	NA
3337	Amended Bleach Post-Decon	Floor 1	Room 109	5.073	10.931	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	1:30:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3331	Amended Bleach Post-Decon	Floor 1	Room 109	5.721	6.314	2.348	Sponge Wipe	0.694	Bechtal	5/5/2011	1:28:00 PM	Ceiling	Metal	Horizontal Upward	FALSE	light ballast template not used	1	No	ND	ND
3260	Amended Bleach Post-Decon	Floor 1	Room 109	5.145	6.107	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	1:25:00 PM	Wall	Textured	Vertical	FALSE		5	No	ND	ND
2314	Amended Bleach Post-Decon	Floor 1	Room 109	4.573	7.414	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	1:20:00 PM	Floor	Textured	Horizontal Upward	FALSE	concrete flloor white residue	5	No	ND	ND
3318	Amended Bleach Post-Decon	Floor 1	Room 109	5.621	8.414	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	1:17:00 PM	Floor	Textured	Horizontal Upward	FALSE	concrete flloor	4	No	ND	ND
3349	Amended Bleach Post-Decon	Floor 1	Room 109	4.312	9.662	1.000	Sponge Wipe	0.694	Bechtal	5/5/2011	1:15:00 PM	Countertop	Smooth	Horizontal Upward	FALSE		5	No	ND	ND
3298	Amended Bleach Post-Decon	Floor 1	Room 109	4.205	12.237	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	1:13:00 PM	Sink	Smooth	Horizontal Upward	FALSE	debris on surface	5	No	ND	ND
3338	Amended Bleach Post-Decon	Floor 1	Room 109	4.213	11.011	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	1:10:00 PM	Sink	Smooth	Horizontal Upward	FALSE	debris on top	4	No	ND	ND
3253	Amended Bleach Post-Decon	Floor 1	Room 109	4.515	11.567	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	1:05:00 PM	Floor	Textured	Horizontal Upward	FALSE	concrete flloor	4	No	ND	ND
3480	Amended Bleach Post-Decon	Floor 1	Room 109	6.251	12.042	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	12:57:00 PM	Floor	Textured	Horizontal Upward	FALSE	concrete flloor	8	No	ND	NA
4035	Amended Bleach Post-Decon	Floor 1	Room 110	5.873	20.396	0.000	Vacuum Sock	4.000	Bechtal	5/5/2011	11:38:00 AM	Floor	Smooth	Horizontal Upward	FALSE	floor in front of file cabinet	8	No	ND	NA
3942	Amended Bleach Post-Decon	Floor 1	Room 110	5.024	16.568	0.000	Vacuum Sock	4.000	Bechtal	5/5/2011	11:42:00 AM	Floor	Smooth	Horizontal Upward	TRUE		8	No	ND	NA
3164	Amended Bleach Post-Decon	Floor 1	Room 110	4.373	19.996	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	11:19:00 AM	File cabinet	Metal	Horizontal Upward	FALSE	file cabinet , no anomolies	1	No	ND	ND
3148	Amended Bleach Post-Decon	Floor 1	Room 110	5.111	16.451	2.381	Sponge Wipe	0.694	Bechtal	5/5/2011	12:05:00 PM	Ceiling	Metal	Horizontal Downward	FALSE	top of light fixture	1	No	ND	ND
3516	Amended Bleach Post-Decon	Floor 1	Room 110	6.582	16.306	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	11:59:00 AM	Floor	Smooth	Horizontal Upward	FALSE	laminate flloor	1	No	ND	ND
3511	Amended Bleach Post-Decon	Floor 1	Room 110	6.550	20.100	1.291	Sponge Wipe	0.694	Bechtal	5/5/2011	11:51:00 AM	Cabinet	Metal	Horizontal Upward	FALSE	file cabinet top center <initially located in wrong place, Collector noted it. Changed. R.Knowlton>	1	No	ND	ND
3163	Amended Bleach Post-Decon	Floor 1	Room 110	5.173	16.749	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	11:45:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	ND
3514	Amended Bleach Post-Decon	Floor 1	Room 110	4.293	20.744	1.298	Sponge Wipe	0.694	Bechtal	5/5/2011	11:24:00 AM	Wall	Textured	Vertical	FALSE	wall below marking	5	No	ND	ND
3305	Amended Bleach Post-Decon	Floor 1	Room 110	4.473	18.396	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	11:09:00 AM	Desk	Smooth	Horizontal Upward	FALSE	desk	5	No	ND	ND
3477	Amended Bleach Post-Decon	Floor 1	Room 110	5.973	14.796	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	10:59:00 AM	Floor	Smooth	Horizontal Upward	FALSE	laminate floor	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3161	Amended Bleach Post-Decon	Floor 1	Room 110	5.373	20.496	0.000	Sponge Wipe	0.694	Bechtal	5/5/2011	11:28:00 AM	Floor	Smooth	Horizontal Upward	FALSE	laminate flloor	5	No	ND	ND
2439	Amended Bleach Post-Decon	Floor 2	Bathroom M	26.330	20.071	3.000	Sponge Wipe	0.694	Owen	5/5/2011	2:15:00 PM	Floor	Smooth	Horizontal Upward	FALSE	inside door touching threshold	6	No	ND	ND
2303	Amended Bleach Post-Decon	Floor 2	Bathroom M	29.825	20.250	3.000	Sponge Wipe	0.694	Owen	5/5/2011	2:28:00 PM	Floor	Smooth	Horizontal Upward	FALSE	1foot inside of stall	6	No	ND	ND
2302	Amended Bleach Post-Decon	Floor 2	Bathroom M	28.197	20.621	3.000	Sponge Wipe	0.694	Owen	5/5/2011	2:24:00 PM	Wall	Smooth	Vertical	FALSE	on wall above heater, left of old sample	6	No	ND	ND
2442	Amended Bleach Post-Decon	Floor 2	Bathroom W	28.900	17.811	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	12:14:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent to pre sample on stall side. no visible bleach, but little light .dirty sample]	7	No	ND	ND
2443	Amended Bleach Post-Decon	Floor 2	Bathroom W	29.078	17.029	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	12:10:00 PM	Floor	Smooth	Horizontal Upward	TRUE	black collected at corner of stall door [towards entrance to bath]	7	No	ND	ND
2811	Amended Bleach Post-Decon	Floor 2	Bathroom W	26.955	16.470	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	12:07:00 PM	Floor	Smooth	Horizontal Upward	FALSE	could not locate pre sample. sample collected inside womens bath centered between where wall 'juts' out	7	No	ND	ND
2630	Amended Bleach Post-Decon	Floor 2	Copier Room	28.742	14.208	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	11:48:00 AM	Wall	Textured	Vertical	FALSE	sample collected immediately adjacent to the right of pre sample . in between power sockets.	7	No	ND	ND
2292	Amended Bleach Post-Decon	Floor 2	Copier Room	29.776	13.342	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	11:40:00 AM	Floor	Textured	Horizontal Upward	FALSE	sample collected center of back wall, 1 foot from wall. tile like surface. sample very dirty. could not locate previous sample.	7	No	ND	ND
2299	Amended Bleach Post-Decon	Floor 2	Copier Room	27.374	13.314	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	11:36:00 AM	Floor	Textured	Horizontal Upward	FALSE	sample collected immediately adjacent to pre sample to the right when standing in doorway. very dirty sample. tile like surface.	7	No	ND	ND
3554	Amended Bleach Post-Decon	Floor 2	Hallway	19.637	12.868	3.983	Vacuum Sock	4.000	Bartos	5/5/2011	9:38:00 AM	Floor	Smooth	Horizontal Upward	TRUE	vacuum blank. collected a .98 meter height.	2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2815	Amended Bleach Post-Decon	Floor 2	Hallway	25.370	18.503	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	10:08:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected 1 foot out [template edge] from air lock in center of hall. no residue in area. minor dirt in sample area. no photo taken	7	No	ND	ND
2786	Amended Bleach Post-Decon	Floor 2	Hallway	26.054	17.551	3.300	Sponge Wipe	0.694	Bartos	5/5/2011	10:04:00 AM	Wall	Smooth	Vertical	FALSE	sample collected immediately adjacent [right side] of pre sample. no photo taken	7	No	ND	ND
2785	Amended Bleach Post-Decon	Floor 2	Hallway	22.994	13.488	5.083	Sponge Wipe	0.694	Bartos	5/5/2011	9:55:00 AM	Return Vent	Smooth	Horizontal Upward	FALSE	sample from inside return vent. no photo taken.	7	No	ND	ND
2788	Amended Bleach Post-Decon	Floor 2	Hallway	21.637	13.568	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	9:45:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected on floor immediately adjacent to pre sample location [far side from entrance door] anddirectly in front of rm 202.	7	No	ND	ND
2761	Amended Bleach Post-Decon	Floor 2	Hallway	16.493	12.868	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	9:34:00 AM	Floor	Smooth	Horizontal Upward	TRUE	sponge stick blank. sampled directly under entrance doorway side of hazaed taped ductwork at 5 ' elevation.	5	No	ND	ND
2662	Amended Bleach Post-Decon	Floor 2	Hallway	17.008	13.751	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	9:28:00 AM	Floor	Smooth	Horizontal Upward	FALSE	immediately adjacent to pre decon sample [entrance doorway side] some bleach residue in area but not in template.	7	No	ND	ND
2663	Amended Bleach Post-Decon	Floor 2	Hallway	12.973	12.519	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	9:23:00 AM	Wall	Smooth	Vertical	FALSE	wall 1 foot above floor. immediately adjacent [right side] to #2 square box on wall.	7	No	ND	ND
2760	Amended Bleach Post-Decon	Floor 2	Hallway	11.093	13.458	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	9:16:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample on floor. no bleach residue apparent	7	No	ND	ND
2666	Amended Bleach Post-Decon	Floor 2	Hallway	7.893	13.358	4.864	Sponge Wipe	0.694	Bartos	5/5/2011	9:09:00 AM	Return Vent	Smooth	Horizontal Upward	FALSE	inside return vent.	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2664	Amended Bleach Post-Decon	Floor 2	Hallway	6.993	13.358	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	9:00:00 AM	Floor	Smooth	Horizontal Upward	FALSE	inside doorway.floor is dirty. photo is very dark. photo taken facing entrance doorway .	7	No	ND	ND
2759	Amended Bleach Post-Decon	Floor 2	Hallway	25.634	14.885	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	9:52:00 AM	Floor	Smooth	Horizontal Upward	FALSE	laser pointer not working. sample collected center of rm 24 doorway 12 inches from threshhold. [sample template edge is 12 inches off threshold. glue like residue in sample area.	7	No	ND	ND
2293	Amended Bleach Post-Decon	Floor 2	Janitor Closet	28.016	15.018	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	12:00:00 PM	Floor	Smooth	Horizontal Upward	FALSE	could not locate pre sample . sample collected center of doorway directly in front of sink. tile floor [same as previous sample] very dirty sample]	6	No	ND	ND
2612	Amended Bleach Post-Decon	Floor 2	Janitor Closet	27.290	14.906	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	11:54:00 AM	Floor	Smooth	Horizontal Upward	FALSE	could not locate pre sample. sample collected center of doorway at top of door arc [swing of door]	7	No	ND	ND
4121	Amended Bleach Post-Decon	Floor 2	Mechanical Room	18.911	19.220	3.000	Vacuum Sock	4.000	Owen	5/5/2011	2:42:00 PM	Floor	Textured	Horizontal Upward	FALSE	filter in back of furnace	2	No	ND	ND
3079	Amended Bleach Post-Decon	Floor 2	Mechanical Room	18.628	20.265	3.000	Sponge Wipe	0.694	Owen	5/5/2011	2:48:00 PM	Floor	Smooth	Horizontal Upward	FALSE	on back wall on only grey tile	7	No	ND	ND
2622	Amended Bleach Post-Decon	Floor 2	Mechanical Room	22.761	19.713	3.000	Sponge Wipe	0.694	Owen	5/5/2011	2:37:00 PM	Floor	Smooth	Horizontal Upward	FALSE		6	No	ND	ND
2295	Amended Bleach Post-Decon	Floor 2	Room 201	27.307	10.825	5.271	Sponge Wipe	0.694	Bartos	5/5/2011	10:54:00 AM	Ceiling	Smooth	Horizontal Downward	FALSE	sampled from top of light fixture. fixture farthest from exterior wall. sampke collected from the 1/2 towards exterior wall. very dirty surface. no photo taken.	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2294	Amended Bleach Post-Decon	Floor 2	Room 201	29.095	11.369	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	10:43:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent to pre on side opposite exterior wall. increased dirt in sample area [compared to previous samples]minimal residue in area	7	No	ND	ND
2304	Amended Bleach Post-Decon	Floor 2	Room 201	26.231	11.300	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	10:39:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent to pre [side away from doorway and towards rm 201a]	6	No	ND	ND
2359	Amended Bleach Post-Decon	Floor 2	Room 201A	28.420	6.019	3.300	Sponge Wipe	0.694	Bartos	5/5/2011	11:21:00 AM	Wall	Smooth	Vertical	FALSE	sample collected immediately adjacent and to the right of pre sample [under window]. very clean.	7	No	ND	ND
2297	Amended Bleach Post-Decon	Floor 2	Room 201A	27.631	7.866	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	11:26:00 AM	Ceiling	Smooth	Horizontal Downward	FALSE	sample collected on top of light fixture [when standing in doorway far and right fixture. sampled left top half [towards ceiling vent] very dirty sample.	7	No	ND	ND
2305	Amended Bleach Post-Decon	Floor 2	Room 201A	28.664	8.340	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	11:13:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent towards exterior wall [wall to the left when standing in doorway] bleach residue present in and around sample area.	7	Yes	ND	4.0
2301	Amended Bleach Post-Decon	Floor 2	Room 201A	26.731	6.840	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	11:08:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent to pre sample [to the left when standing in doorway] residual bleach visible, but probably due to available light] top left of photo shows residue]	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3479	Amended Bleach Post-Decon	Floor 2	Room 201A	26.553	9.240	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	11:00:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent [to right when standing in doorway]	7	No	ND	ND
2787	Amended Bleach Post-Decon	Floor 2	Room 202	22.325	17.163	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	10:17:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent to pre sample [doorway side of pre sample] minor dirt . no residue in area .	7	No	ND	ND
3251	Amended Bleach Post-Decon	Floor 2	Room 202	21.531	15.000	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	10:14:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent to pre sample [toward back of room]. minor dirt on sponge [consistant with other samples]	7	No	ND	ND
2736	Amended Bleach Post-Decon	Floor 2	Room 203	23.696	9.865	3.000	Sponge Wipe	0.694	Negron	5/5/2011	1:17:00 PM	Wall	Smooth	Vertical	FALSE		6	No	ND	ND
2737	Amended Bleach Post-Decon	Floor 2	Room 203	22.013	11.363	3.000	Sponge Wipe	0.694	Negron	5/5/2011	1:10:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	No	ND	ND
2733	Amended Bleach Post-Decon	Floor 2	Room 203	25.091	11.938	3.000	Sponge Wipe	0.694	Negron	5/5/2011	1:08:00 PM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	ND	3.6
2692	Amended Bleach Post-Decon	Floor 2	Room 203	23.757	11.076	3.000	Sponge Wipe	0.694	Negron	5/5/2011	1:06:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	fluorescent light closest to entrance of room 203 sample taken on side closest to entrance	5	No	ND	ND
2693	Amended Bleach Post-Decon	Floor 2	Room 203A	24.003	6.438	3.000	Sponge Wipe	0.694	Negron	5/5/2011	1:22:00 PM	Floor	Smooth	Horizontal Upward	FALSE	floor in front of window	5	No	ND	ND
2799	Amended Bleach Post-Decon	Floor 2	Room 203A	25.235	9.311	3.000	Sponge Wipe	0.694	Negron	5/5/2011	1:19:00 PM	Floor	Smooth	Horizontal Upward	FALSE	entrance of room 203A	5	No	ND	ND
2150	Amended Bleach Post-Decon	Floor 2	Room 204	19.782	16.831	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	10:27:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent [on right side when back to doorway] to pre sample . no residue in area no photo taken	7	No	ND	ND
2296	Amended Bleach Post-Decon	Floor 2	Room 204	18.637	16.719	3.500	Sponge Wipe	0.694	Bartos	5/5/2011	10:31:00 AM	Wall	Smooth	Vertical	FALSE	sample collected immediately adjacent towards back wall [approximately .5 metersoff ground.	6	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2834	Amended Bleach Post-Decon	Floor 2	Room 204	19.993	15.090	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	10:22:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected immediately adjacent to pre sample [towards back wall]. no residue in area very minimal dirt	7	No	ND	ND
2735	Amended Bleach Post-Decon	Floor 2	Room 205	18.944	9.092	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:59:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor under center fluorescent light	6	No	ND	ND
2752	Amended Bleach Post-Decon	Floor 2	Room 205	19.878	6.110	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:55:00 PM	Wall	Smooth	Vertical	FALSE		5	No	ND	ND
2715	Amended Bleach Post-Decon	Floor 2	Room 205	20.705	11.875	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:49:00 PM	Floor	Smooth	Horizontal Upward	FALSE		6	No	ND	ND
2731	Amended Bleach Post-Decon	Floor 2	Room 205	18.742	6.779	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:53:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	fluorescent light closest to window on right side facing window	5	No	ND	ND
2529	Amended Bleach Post-Decon	Floor 2	Room 206	15.742	17.154	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:53:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample collected in room 206	6	Yes	ND	3.7
2580	Amended Bleach Post-Decon	Floor 2	Room 206	18.221	20.454	3.000	Sponge Wipe	0.694	Negron	5/5/2011	10:32:00 AM	Floor	Smooth	Horizontal Upward	FALSE		7	No	ND	ND
2527	Amended Bleach Post-Decon	Floor 2	Room 206	16.042	18.354	3.497	Sponge Wipe	0.694	Negron	5/5/2011	10:19:00 AM	Floor	Smooth	Horizontal Upward	FALSE		6	No	ND	ND
3490	Amended Bleach Post-Decon	Floor 2	Room 206	16.921	15.654	3.000	Sponge Wipe	0.694	Negron	5/5/2011	10:15:00 AM	Floor	Smooth	Horizontal Upward	FALSE	product residue on desk surface	5	No	ND	ND
2632	Amended Bleach Post-Decon	Floor 2	Room 206	15.842	15.445	3.000	Sponge Wipe	0.694	Negron	5/5/2011	10:28:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sligth residue on floor	2	No	ND	ND
3096	Amended Bleach Post-Decon	Floor 2	Room 206	16.121	15.354	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:51:00 AM	Floor	Smooth	Horizontal Upward	FALSE	entrance of room 206. sample collected in room 206	6	No	ND	ND
3489	Amended Bleach Post-Decon	Floor 2	Room 206	16.521	15.654	3.000	Sponge Wipe	0.694	Negron	5/5/2011	10:11:00 AM	Floor	Smooth	Horizontal Upward	FALSE	residue on suface table [B.Melton changed to sponge stick]	2	No	ND	ND
2765	Amended Bleach Post-Decon	Floor 2	Room 206	16.574	19.497	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:10:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank sponge	6	No	ND	ND
2764	Amended Bleach Post-Decon	Floor 2	Room 206	17.980	19.520	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:07:00 PM	Floor	Smooth	Horizontal Upward	FALSE	in room 206	6	No	ND	ND
2808	Amended Bleach Post-Decon	Floor 2	Room 206	17.621	20.554	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:05:00 PM	Table	Smooth	Horizontal Upward	FALSE	in room 206	7	No	ND	ND
2805	Amended Bleach Post-Decon	Floor 2	Room 206	16.621	20.454	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:01:00 PM	Table	Smooth	Horizontal Upward	FALSE	in room 206 table in back of room	7	No	ND	ND
2768	Amended Bleach Post-Decon	Floor 2	Room 206	17.321	18.954	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:56:00 AM	Table	Smooth	Horizontal Upward	FALSE	in room 206	2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2789	Amended Bleach Post-Decon	Floor 2	Room 206	16.891	17.273	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:15:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	middle fluorescent light in room 206	6	No	ND	ND
2751	Amended Bleach Post-Decon	Floor 2	Room 207	15.925	11.853	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:20:00 PM	Floor	Smooth	Horizontal Upward	FALSE	entrance of room 207	6	Yes	ND	8.8
2688	Amended Bleach Post-Decon	Floor 2	Room 207	17.633	11.326	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:24:00 PM	Table	Smooth	Horizontal Upward	FALSE	table on left of entrance of room	2	No	ND	ND
2714	Amended Bleach Post-Decon	Floor 2	Room 207	16.455	9.804	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:44:00 PM	Countertop	Smooth	Horizontal Downward	TRUE	blank sponge	5	No	ND	ND
2729	Amended Bleach Post-Decon	Floor 2	Room 207	16.666	10.954	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:43:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	fluorescent light closest to entrance . sample taken from right side facing window	7	No	ND	ND
2705	Amended Bleach Post-Decon	Floor 2	Room 207	15.765	8.500	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:38:00 PM	Table	Smooth	Horizontal Upward	FALSE	sample 4 of 4 on table surface	5	No	ND	ND
2730	Amended Bleach Post-Decon	Floor 2	Room 207	15.735	9.023	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:36:00 PM	Table	Smooth	Horizontal Upward	FALSE	sample 3 of 4 on table surface	6	No	ND	ND
2687	Amended Bleach Post-Decon	Floor 2	Room 207	15.735	9.526	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:35:00 PM	Table	Smooth	Horizontal Upward	FALSE	sample 2 of four on table surface in front of entrance	5	No	ND	ND
2686	Amended Bleach Post-Decon	Floor 2	Room 207	16.939	9.863	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:32:00 PM	Table	Smooth	Horizontal Upward	FALSE	on top of table surface on right side of room far end of room window	5	No	ND	ND
2685	Amended Bleach Post-Decon	Floor 2	Room 207	17.633	11.326	3.000	Sponge Wipe	0.694	Negron	5/5/2011	12:27:00 PM	Wall	Smooth	Vertical	FALSE	facing window on left wall approximately 7 feet from window wall	6	No	ND	ND
3539	Amended Bleach Post-Decon	Floor 2	Room 208	14.571	19.754	3.000	Vacuum Sock	4.000	Negron	5/5/2011	11:03:00 AM	Floor	Smooth	Horizontal Upward	FALSE	no template available	8	No	ND	ND
2619	Amended Bleach Post-Decon	Floor 2	Room 208	14.470	18.770	3.000	Sponge Wipe	0.694	Negron	5/5/2011	10:38:00 AM	Wall	Smooth	Vertical	FALSE	room 208 not 206 <room location corrected per Collector's notes-R.Knowlton>	5	No	ND	ND
2524	Amended Bleach Post-Decon	Floor 2	Room 208	13.771	17.454	3.000	Sponge Wipe	0.694	Negron	5/5/2011	10:47:00 AM	Supply Vent	Smooth	Horizontal Upward	FALSE	on ceiling fluorescent	7	No	ND	ND
2362	Amended Bleach Post-Decon	Floor 2	Room 209	12.971	11.969	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:10:00 AM	Countertop	Smooth	Horizontal Upward	FALSE		2	No	ND	ND
2774	Amended Bleach Post-Decon	Floor 2	Room 209	12.471	7.469	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:42:00 AM	Wall	Smooth	Vertical	FALSE		7	No	ND	ND
2796	Amended Bleach Post-Decon	Floor 2	Room 209	13.956	6.669	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:40:00 AM	Table	Smooth	Horizontal Upward	FALSE	significant residue on suface	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2526	Amended Bleach Post-Decon	Floor 2	Room 209	14.056	8.369	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:37:00 AM	Ceiling	Smooth	Horizontal Downward	FALSE	fluorescent light closest to entrance of room . surface extremely dirty	7	No	ND	ND
2525	Amended Bleach Post-Decon	Floor 2	Room 209	14.056	8.369	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:34:00 AM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	ND	2.7
2773	Amended Bleach Post-Decon	Floor 2	Room 209	14.856	9.469	3.896	Sponge Wipe	0.694	Negron	5/5/2011	11:25:00 AM	Stove	Smooth	Horizontal Upward	FALSE	n0 template used. surface dirty	6	No	ND	ND
2528	Amended Bleach Post-Decon	Floor 2	Room 209	12.671	10.269	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:16:00 AM	Countertop	Smooth	Horizontal Upward	FALSE		5	No	ND	ND
2561	Amended Bleach Post-Decon	Floor 2	Room 209	14.456	10.969	3.000	Sponge Wipe	0.694	Negron	5/5/2011	11:19:00 AM	Floor	Smooth	Horizontal Upward	FALSE	n0 visible residue	5	No	ND	ND
3876	Amended Bleach Post-Decon	Floor 2	Room 210	11.402	19.354	3.000	Vacuum Sock	4.000	Huyser	5/5/2011	11:49:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Vacuum sample taken on floor in front of large file cabinet. In grid, thin gray line approx 2 x 8" of caked dust similar to the footprints. Rust and white discoloration on floor near grid but not in grid."	1	No	ND	ND
4122	Amended Bleach Post-Decon	Floor 2	Room 210	11.716	17.049	4.190	Vacuum Sock	4.000	Huyser	5/5/2011	11:39:00 AM	Floor	Smooth	Horizontal Upward	TRUE	Vacuum sample blank taken. Sample did not touch surface.	8	No	ND	ND
2767	Amended Bleach Post-Decon	Floor 2	Room 210	11.199	15.645	5.490	Sponge Wipe	0.694	Huyser	5/5/2011	12:14:00 PM	Ceiling	Metal	Horizontal Upward	FALSE	Sponge sample on top of ceiling light, taken on south end of light away from black X. Observed rust and dust in small piles which were collected by sponge.	6	No	ND	ND
2637	Amended Bleach Post-Decon	Floor 2	Room 210	9.836	19.778	3.797	Sponge Wipe	0.694	Huyser	5/5/2011	12:08:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	Sponge sample on small file cabinet in front of blank marking. Only 4 small surface scratches observed in paint surface.	1	No	ND	ND
2367	Amended Bleach Post-Decon	Floor 2	Room 210	10.135	20.411	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	12:03:00 PM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor between small file cabinet and wall beneath window. Lightly caked dust similar to footprints observed in grid.	2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2414	Amended Bleach Post-Decon	Floor 2	Room 210	11.699	17.045	4.496	Sponge Wipe	0.694	Huyser	5/5/2011	11:35:00 AM	Floor	Smooth	Horizontal Upward	TRUE	Sponge sample blank. Sample did not touch surface.	6	No	ND	ND
2901	Amended Bleach Post-Decon	Floor 2	Room 210	10.202	16.954	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	11:26:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor near southeast corner of desk. No unusual features in grid.	6	No	ND	ND
2611	Amended Bleach Post-Decon	Floor 2	Room 210	9.999	14.854	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	11:22:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor near doorway. Floor is faux wood laminate. Light footprints are observed on floor and in grid.	1	Yes	ND	2.3
2365	Amended Bleach Post-Decon	Floor 2	Room 210	11.999	19.754	4.398	Sponge Wipe	0.694	Huyser	5/5/2011	12:00:00 PM	Cabinet	Metal	Horizontal Upward	FALSE	Sponge sample on large file cabinet. Only 3-5 spots of rust pitting observed on surface. Very light gray dust observed on surface.	6	No	ND	ND
2593	Amended Bleach Post-Decon	Floor 2	Room 210	11.391	14.378	3.600	Sponge Wipe	0.694	Huyser	5/5/2011	11:31:00 AM	Wall	Paint	Vertical	FALSE	Sponge sample on wall to right of existing taped grid. No unusual features in grid.	5	No	ND	ND
3086	Amended Bleach Post-Decon	Floor 2	Room 211	11.099	8.940	3.394	Sponge Wipe	0.694	Huyser	5/5/2011	12:35:00 PM	Table	Smooth	Horizontal Upward	FALSE	Sponge sample on stonne table surface, in center of table away from black marking. Very light dust collected by sponge in grid.	7	No	ND	ND
2777	Amended Bleach Post-Decon	Floor 2	Room 211	11.799	8.940	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	12:29:00 PM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor between low table and wall.	5	No	ND	ND
2770	Amended Bleach Post-Decon	Floor 2	Room 211	10.899	11.159	5.497	Sponge Wipe	0.694	Huyser	5/5/2011	12:26:00 PM	Ceiling	Metal	Horizontal Upward	FALSE	Sponge sample on top of ceiling light at north end away from black marking. Observed small piles of rust and dust which were collected onto sponge.	6	No	ND	ND
2771	Amended Bleach Post-Decon	Floor 2	Room 211	9.400	11.259	3.397	Sponge Wipe	0.694	Huyser	5/5/2011	12:21:00 PM	Wall	Paint	Vertical	FALSE	Sponge sample on wall to left of black marking. No unusual features in grid.	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2776	Amended Bleach Post-Decon	Floor 2	Room 211	11.200	11.840	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	12:17:00 PM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor near doorway. Floor is smooth painted concrete. Very light dusted footprints observed in room.	1	No	ND	ND
3171	Amended Bleach Post-Decon	Floor 2	Room 211	11.099	6.240	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	12:41:00 PM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor near wall below window to left. No unusual features in grid.	6	No	ND	ND
3488	Amended Bleach Post-Decon	Floor 2	Room 211	10.815	7.181	4.475	Sponge Wipe	0.694	Huyser	5/5/2011	12:48:00 PM	Floor	Smooth	Horizontal Upward	TRUE	Sponge sample blank taken. Sample did not touch surface.	2	No	ND	ND
3510	Amended Bleach Post-Decon	Floor 2	Room 211	9.600	6.659	4.398	Sponge Wipe	0.694	Huyser	5/5/2011	12:46:00 PM	Shelves	Smooth	Horizontal Upward	FALSE	Sponge sample on top of shelves. Layer of white dust and a few small black particles on shelf collected by sponge.	1	No	ND	ND
3080	Amended Bleach Post-Decon	Floor 2	Room 211	10.899	7.940	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	12:38:00 PM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor south of table. Light brown dust in only small parts of grid, collected by sponge.	2	No	ND	ND
4110	Amended Bleach Post-Decon	Floor 2	Room 212	8.390	16.355	4.493	Vacuum Sock	4.000	Huyser	5/5/2011	10:43:00 AM	Floor	Smooth	Horizontal Upward	TRUE	Vacuum blank taken. Sample did not touch surface.	1	Yes	ND	1.6
3949	Amended Bleach Post-Decon	Floor 2	Room 212	8.606	20.405	3.000	Vacuum Sock	4.000	Huyser	5/5/2011	11:06:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Vacuum sample taken on floor adjacent to large file cabinet and wall. Whit discoloration observed on floor in spots approx 2 x 6". Some light dust observed."	1	Yes	ND	0.6
3492	Amended Bleach Post-Decon	Floor 2	Room 212	8.390	16.355	4.463	Sponge Wipe	0.694	Huyser	5/5/2011	10:40:00 AM	Floor	Smooth	Horizontal Upward	TRUE	Sponge blank taken. Sponge did not touch surface.	7	No	ND	ND
3517	Amended Bleach Post-Decon	Floor 2	Room 212	8.490	15.054	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	10:35:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor 24 from doorway. Floor is faux wood laminate. Footprints observed on floor and some thin dust from footprints wiped up by sponge."	5	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2769	Amended Bleach Post-Decon	Floor 2	Room 212	6.290	16.070	3.696	Sponge Wipe	0.694	Huyser	5/5/2011	10:55:00 AM	Wall	Paint	Vertical	FALSE	Sponge sample on wall to left of I-beam approx 12 and lower right of window. A plastic ceiling light cover that was leaned against the wall was moved. It had covered only part of the grid area."	7	No	ND	ND
2775	Amended Bleach Post-Decon	Floor 2	Room 212	6.838	19.857	3.800	Sponge Wipe	0.694	Huyser	5/5/2011	10:59:00 AM	Cabinet	Metal	Horizontal Upward	FALSE	Sponge sample on 2-drawer cabinet top. Some scratches and worn paint on surface in grid.	7	No	ND	ND
3491	Amended Bleach Post-Decon	Floor 2	Room 212	7.390	17.454	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	10:48:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor near southeast corner of desk. No discoloration or unusual features in grid.	7	No	ND	ND
2766	Amended Bleach Post-Decon	Floor 2	Room 212	6.990	20.354	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	11:15:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor between wall and small cabinet. Rust and white discoloration on floor in straight lines, partially removed by sponge.	1	No	ND	ND
2363	Amended Bleach Post-Decon	Floor 2	Room 213	6.990	7.540	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	10:03:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor near east window, 2ft from wall. Rust discoloration near location, not in grid.	7	No	ND	ND
3481	Amended Bleach Post-Decon	Floor 2	Room 213	7.918	6.040	3.594	Sponge Wipe	0.694	Huyser	5/5/2011	10:28:00 AM	Wall	Smooth	Vertical	FALSE	Sponge sample on wall to right of black marking. Approx 18 from floor. No markings or unusual features in or near grid."	5	No	ND	ND
3512	Amended Bleach Post-Decon	Floor 2	Room 213	8.818	6.840	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	10:23:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor near wall, approx 7. No discoloration or dust/debris in grid. Dust/debris in corner at wall/floor edge outside of grid."	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1988	Amended Bleach Post-Decon	Floor 2	Room 213	8.118	7.540	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	10:10:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor. Rust discoloration on floor in grid. Approx half of rust in grid was transferred to the sponge during collection.	1	No	ND	ND
2366	Amended Bleach Post-Decon	Floor 2	Room 213	8.918	8.340	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	9:57:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge sample on floor between bed frames. Rust discoloration on floor, partially in grid. Small grit and debris in corner near wall, outside sample grid.	6	No	ND	ND
2315	Amended Bleach Post-Decon	Floor 2	Room 213	6.518	10.840	4.697	Sponge Wipe	0.694	Huyser	5/5/2011	9:52:00 AM	Cabinet	Metal	Horizontal Upward	FALSE	Sponge sample on metal cabinet top. Surface is dusty with white debris and is damaged with pitted rust spots.	1	No	ND	ND
1981	Amended Bleach Post-Decon	Floor 2	Room 213	9.018	11.259	3.897	Sponge Wipe	0.694	Huyser	5/5/2011	9:42:00 AM	Sink	Smooth	Horizontal Upward	FALSE	Sponge sample on countertop adjacent to sink, not in sink. Roll of duct tape and misc. piece of small plastic moved from sample area to place template - gloves changed prior to collection.	7	No	ND	ND
2634	Amended Bleach Post-Decon	Floor 2	Room 213	8.118	10.859	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	9:36:00 AM	Floor	Smooth	Horizontal Upward	TRUE	Blank sponge. Did not touch surface.	7	No	ND	ND
2635	Amended Bleach Post-Decon	Floor 2	Room 213	7.518	12.159	3.000	Sponge Wipe	0.694	Huyser	5/5/2011	9:31:00 AM	Floor	Smooth	Horizontal Upward	FALSE	Sponge on floor. White stains on floor between sample grid and south wall. 3 stains of 3 x 12" each."	5	No	ND	ND
2778	Amended Bleach Post-Decon	Floor 2	Room 213	8.018	8.159	5.487	Sponge Wipe	0.694	Huyser	5/5/2011	10:16:00 AM	Ceiling	Metal	Horizontal Upward	FALSE	Sponge sample on top of ceiling light near north end, opposite side of black X mark. Surface is rusted and contains darkened dust/debris.	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2441	Amended Bleach Post-Decon	Floor 2	Stairwell	23.882	18.677	3.000	Sponge Wipe	0.694	Bartos	5/5/2011	12:24:00 PM	Floor	Textured	Horizontal Upward	FALSE	sample collected at center of top of stairs [just off therubberized tread]. sample collected on tilelike surface.sample very dirty.	2	No	ND	ND
2858	ClO2 Pre-Decon	Floor 1		1.851	3.672	0.000	Sponge Wipe	0.694	Mattorano	5/11/2011	3:33:00 PM	Floor	Smooth	Horizontal Upward	FALSE	metal roof, adjacent to stacks	6	Yes	6279.1	NA
2399	ClO2 Pre-Decon	Floor 1		1.212	3.672	0.000	Sponge Wipe	0.694	Mattorano	5/11/2011	3:32:00 PM	Floor	Smooth	Horizontal Upward	FALSE	on roof, inside vent cap	6	Yes	380.6	NA
2886	ClO2 Pre-Decon	Floor 1		0.574	3.672	0.000	Sponge Wipe	0.694	Mattorano	5/11/2011	3:31:00 PM	Floor	Smooth	Horizontal Upward	FALSE	on roof, inside chimney stack	6	Yes	1171.2	NA
4123	ClO2 Pre-Decon	Floor 1	Bathroom M	27.038	20.080	0.000	Vacuum Sock	4.000	Mingolla	5/11/2011	12:32:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	ceiling tile was placed on floor in front of the stall	6	Yes	2671.0	NA
2078	ClO2 Pre-Decon	Floor 1	Bathroom M	26.390	18.448	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	12:24:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor just left of the sink	1	Yes	279445.5	NA
2075	ClO2 Pre-Decon	Floor 1	Bathroom M	25.473	19.389	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	12:20:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	4	Yes	309588.3	NA
2263	ClO2 Pre-Decon	Floor 1	Bathroom M	24.783	20.224	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	12:12:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	1	Yes	273589.7	NA
2373	ClO2 Pre-Decon	Floor 1	Bathroom M	25.707	20.689	0.993	Sponge Wipe	0.694	Mingolla	5/11/2011	12:17:00 PM	Wall	Smooth	Vertical	FALSE	sponge sample taken on wall above vent	1	Yes	2682.1	NA
3956	ClO2 Pre-Decon	Floor 1	Bathroom W	27.062	15.209	2.900	Vacuum Sock	4.000	Mingolla	5/11/2011	12:09:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	ceiling tile was placed on floor	6	Yes	1137.6	NA
2258	ClO2 Pre-Decon	Floor 1	Bathroom W	25.119	16.841	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	12:01:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	1	Yes	237591.0	NA
2404	ClO2 Pre-Decon	Floor 1	Bathroom W	27.110	16.217	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	11:58:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor just inside of the stall	1	Yes	184697.0	NA
2500	ClO2 Pre-Decon	Floor 1	Bathroom W	24.915	14.513	0.595	Sponge Wipe	0.694	Mingolla	5/11/2011	11:53:00 AM	Wall	Smooth	Vertical	FALSE	wall sample taken above vent	1	Yes	6527.8	NA
2499	ClO2 Pre-Decon	Floor 1	Bathroom W	24.415	14.649	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	11:49:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	1	Yes	243350.8	NA
4229	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	7.481	12.760	0.000	Vacuum Sock	4.000	Mingolla	5/11/2011	9:32:00 AM	Ceiling	Porous	Horizontal Downward	TRUE	ceiling tile blank vacuum	6	Yes	8.3	NA
3959	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	7.481	12.760	2.900	Vacuum Sock	4.000	Mingolla	5/11/2011	9:31:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	ceiling tile, left side	6	Yes	8875.5	NA
4088	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	22.781	14.419	2.900	Vacuum Sock	4.000	Mingolla	5/11/2011	11:41:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	ceiling tile was placed on floor	6	Yes	3654390.0	NA
4028	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	15.110	13.259	2.900	Vacuum Sock	4.000	Mingolla	5/11/2011	10:29:00 AM	Floor	Textured	Horizontal Upward	FALSE	vacuum sample on top of tile	4	Yes	12709.1	NA
3960	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	15.110	13.259	2.900	Vacuum Sock	4.000	Mingolla	5/11/2011	10:26:00 AM	Floor	Textured	Horizontal Upward	TRUE	blank vacuum sample	4	No	ND	NA
2548	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	13.708	13.841	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:49:00 AM	Floor	Smooth	Horizontal Upward	TRUE	sponge blank	4	No	ND	NA
2166	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	13.708	13.841	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:53:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	4	Yes	232359.2	NA
2518	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	13.431	16.041	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:57:00 AM	Floor	Smooth	Horizontal Upward	TRUE	sponge blank	6	No	ND	NA
2519	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	13.431	16.041	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:59:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	6	Yes	196485.4	NA
2586	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	14.537	15.616	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	10:01:00 AM	Floor	Smooth	Horizontal Upward	TRUE	sponge sample blank	6	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2517	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	14.537	15.616	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	10:05:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	6	Yes	179777.2	NA
2201	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	12.481	13.341	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:46:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	6	Yes	166188.9	NA
2426	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	3.951	13.371	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:01:00 AM	Wall	Smooth	Vertical	TRUE	entrance door blank sponge	4	No	ND	NA
2205	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	12.481	13.341	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:41:00 AM	Floor	Smooth	Horizontal Upward	TRUE	sponge blank taken on floor	4	No	ND	NA
1974	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	9.707	14.081	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:38:00 AM	Floor	Smooth	Horizontal Upward	FALSE	horizontal sponge sample taken on floor	6	Yes	172179.1	NA
2239	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	9.707	14.081	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:35:00 AM	Floor	Smooth	Horizontal Upward	TRUE	horizontal sponge blank	4	No	ND	NA
2592	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	6.042	14.216	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:12:00 AM	Supply Vent	Metal	Horizontal Upward	TRUE	1st hvac sample blank	4	No	ND	NA
2607	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	5.284	13.614	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	9:04:00 AM	Floor	Smooth	Horizontal Upward	TRUE	floor blank for sample 1	4	No	ND	NA
2843	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	3.951	13.371	0.285	Sponge Wipe	0.694	Mingolla	5/11/2011	9:00:00 AM	Wall	Smooth	Vertical	FALSE	entrance door of hallway	4	Yes	5254.8	NA
2206	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	5.281	13.636	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	8:53:00 AM	Floor	Smooth	Horizontal Upward	FALSE	just before doors	6	Yes	144153.0	NA
2424	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	6.042	14.216	1.874	Sponge Wipe	0.694	Mingolla	5/11/2011	9:11:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE	first hvac sample	4	Yes	203032.3	NA
2455	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	21.521	12.982	2.800	Sponge Wipe	0.694	schademann	5/11/2011	3:23:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	169260.8	-1438.5
2501	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	22.877	15.897	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	11:44:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	1	No	ND	NA
2856	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	21.508	13.915	1.977	Sponge Wipe	0.694	Mingolla	5/11/2011	11:02:00 AM	Return Vent	Metal	Horizontal Upward	FALSE	hvac sample number 2.	1	Yes	8267.7	NA
2358	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	18.210	13.025	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	10:56:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	4	Yes	345971.0	NA
2828	ClO2 Pre-Decon	Floor 1	Corridor+Lobby	16.907	14.230	0.497	Sponge Wipe	0.694	Mingolla	5/11/2011	10:51:00 AM	Wall	Textured	Vertical	FALSE	vertical sample taken on wall	4	Yes	1889.2	NA
3962	ClO2 Pre-Decon	Floor 1	Mechanical Room	17.686	19.186	0.000	Vacuum Sock	4.000	Mingolla	5/11/2011	4:22:00 PM	Return Vent	Cloth	Horizontal Upward	FALSE	filter in back of furnace	5	Yes	TNTC	TNTC
2542	ClO2 Pre-Decon	Floor 1	Mechanical Room	16.835	19.016	0.500	Sponge Wipe	0.694	Mingolla	5/11/2011	4:18:00 PM	Wall	Textured	Vertical	FALSE	sponge sample taken on wall	7	Yes	3148.7	TNTC
2397	ClO2 Pre-Decon	Floor 1	Mechanical Room	17.818	18.467	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	4:11:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	7	Yes	269481.0	-1438.5
2909	ClO2 Pre-Decon	Floor 1	Mechanical Room	18.801	20.604	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	4:07:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor in front of door way	7	Yes	47652.6	-1438.5
3772	ClO2 Pre-Decon	Floor 1	Room 101	19.633	10.609	0.000	Vacuum Sock	4.000	Mingolla	5/11/2011	11:25:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile was placed on floor	6	Yes	14042.5	NA
2497	ClO2 Pre-Decon	Floor 1	Room 101	18.332	10.821	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	11:15:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	1	No	ND	NA
2349	ClO2 Pre-Decon	Floor 1	Room 101	21.233	10.909	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	11:27:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	1	Yes	328307.6	NA
2350	ClO2 Pre-Decon	Floor 1	Room 101	16.133	11.621	0.695	Sponge Wipe	0.694	Mingolla	5/11/2011	11:11:00 AM	Wall	Textured	Vertical	FALSE	sponge sample taken on wall behind door	1	No	ND	NA
2498	ClO2 Pre-Decon	Floor 1	Room 101	16.669	11.830	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	11:06:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor	4	Yes	343379.1	NA
4087	ClO2 Pre-Decon	Floor 1	Room 101A	19.132	8.127	0.000	Vacuum Sock	4.000	lee	5/11/2011	12:11:00 PM	Floor	Carpet	Horizontal Upward	TRUE		6	No	ND	NA
4100	ClO2 Pre-Decon	Floor 1	Room 101A	16.632	9.414	0.000	Vacuum Sock	4.000	lee	5/11/2011	12:06:00 PM	Floor	Carpet	Horizontal Upward	FALSE	loose carpet strands in template	2	Yes	2137.6	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3678	ClO2 Pre-Decon	Floor 1	Room 101A	19.632	6.955	0.000	Vacuum Sock	4.000	lee	5/11/2011	1:57:00 PM	Chair	Cloth	Horizontal Upward	FALSE	vacuumed entire seat of chair. less than surface area of template. hard to reach front of chair since it was pushed under desk. hard to vacuum straight up and down.	2	Yes	22501.3	TNTC
4125	ClO2 Pre-Decon	Floor 1	Room 101A	21.732	9.527	0.000	Vacuum Sock	4.000	lee	5/11/2011	1:17:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum over tubing on floor. difficult to reach corner.	2	Yes	2162.6	TNTC
2427	ClO2 Pre-Decon	Floor 1	Room 101A	18.532	8.427	0.000	Sponge Wipe	0.694	lee	5/11/2011	12:18:00 PM	Floor	Carpet	Horizontal Upward	TRUE		2	No	ND	ND
2306	ClO2 Pre-Decon	Floor 1	Room 101A	18.532	9.327	0.999	Sponge Wipe	0.694	lee	5/11/2011	12:37:00 PM	Desk	Plastic	Horizontal Upward	FALSE	uv APS on desk. middle back.	2	Yes	122491.4	ND
1977	ClO2 Pre-Decon	Floor 1	Room 101A	19.993	9.123	0.595	Sponge Wipe	0.694	lee	5/11/2011	12:57:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	sticky stuff on front left corner on top of filing cabinet	2	Yes	601897.3	-1438.5
1980	ClO2 Pre-Decon	Floor 1	Room 101A	19.089	6.548	0.700	Sponge Wipe	0.694	lee	5/11/2011	2:22:00 PM	Desk	Smooth	Horizontal Upward	FALSE	sticky tape residue	2	Yes	460446.7	-1438.5
2384	ClO2 Pre-Decon	Floor 1	Room 101A	18.532	8.827	0.988	Sponge Wipe	0.694	lee	5/11/2011	12:24:00 PM	Desk	Plastic	Vertical	FALSE	uv APS on desk. wiping over duct tape. ridged surface in places	2	Yes	20965.6	TNTC
2425	ClO2 Pre-Decon	Floor 1	Room 101A	18.208	6.073	0.000	Sponge Wipe	0.694	lee	5/11/2011	2:30:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE		2	Yes	631272.2	-1438.5
1987	ClO2 Pre-Decon	Floor 1	Room 101A	20.310	6.531	0.700	Sponge Wipe	0.694	lee	5/11/2011	2:05:00 PM	Desk	Smooth	Horizontal Upward	FALSE	liquid leaked out when twisting handle	2	Yes	553995.1	-1438.5
1978	ClO2 Pre-Decon	Floor 1	Room 101A	21.886	6.209	0.700	Sponge Wipe	0.694	lee	5/11/2011	1:46:00 PM	Desk	Smooth	Horizontal Upward	FALSE	extra chair not on map between desks.	2	Yes	583658.0	-1438.5
2216	ClO2 Pre-Decon	Floor 1	Room 101A	21.886	7.327	0.700	Sponge Wipe	0.694	lee	5/11/2011	1:36:00 PM	Desk	Smooth	Horizontal Upward	FALSE		2	Yes	663527.0	-1438.5
1985	ClO2 Pre-Decon	Floor 1	Room 101A	21.479	6.531	0.700	Sponge Wipe	0.694	lee	5/11/2011	1:32:00 PM	Desk	Smooth	Horizontal Upward	FALSE		2	Yes	502301.1	-1438.5
2368	ClO2 Pre-Decon	Floor 1	Room 101A	21.564	7.921	0.595	Sponge Wipe	0.694	lee	5/11/2011	1:24:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	front left on filing cabinet . liquid leaked out when breaking handle of sponge	2	Yes	518092.5	-1438.5
4081	ClO2 Pre-Decon	Floor 1	Room 102	18.792	15.750	0.000	Vacuum Sock	4.000	lee	5/11/2011	4:53:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank	4	No	ND	NA
4063	ClO2 Pre-Decon	Floor 1	Room 102	17.840	16.571	0.000	Vacuum Sock	4.000	lee	5/11/2011	4:44:00 PM	Floor	Carpet	Horizontal Upward	FALSE		4	Yes	2362.6	NA
3873	ClO2 Pre-Decon	Floor 1	Room 102	18.814	16.297	0.000	Vacuum Sock	4.000	lee	5/11/2011	4:36:00 PM	Floor	Carpet	Horizontal Upward	FALSE	electric cord cover through middle of template	4	Yes	4666.9	NA
4039	ClO2 Pre-Decon	Floor 1	Room 102	19.864	16.472	0.000	Vacuum Sock	4.000	lee	5/11/2011	4:30:00 PM	Floor	Carpet	Horizontal Upward	FALSE	cart hit filing cabinet while vacuuming sample	4	Yes	6833.7	NA
2432	ClO2 Pre-Decon	Floor 1	Room 102	19.339	16.702	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:52:00 PM	Desk	Smooth	Horizontal Upward	FALSE	inside drawer of desk. black crusty stuff. sticky.	6	Yes	132815.8	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2423	ClO2 Pre-Decon	Floor 1	Room 102	19.875	17.369	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:49:00 PM	Desk	Smooth	Horizontal Upward	FALSE		4	Yes	268261.9	NA
2523	ClO2 Pre-Decon	Floor 1	Room 102	18.737	16.866	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:41:00 PM	Desk	Smooth	Horizontal Upward	FALSE		6	Yes	141498.7	NA
2430	ClO2 Pre-Decon	Floor 1	Room 102	18.311	17.336	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:35:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	rust on surface. sticky tape residue	6	Yes	209656.1	NA
2422	ClO2 Pre-Decon	Floor 1	Room 102	17.447	17.249	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:28:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	map diagram wrong. this filing cabinet faces forward, not sideways. sample taken on top front	6	Yes	198515.7	NA
2475	ClO2 Pre-Decon	Floor 1	Room 102	16.921	15.553	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:19:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	rust on surface	6	Yes	375825.8	NA
2464	ClO2 Pre-Decon	Floor 1	Room 102	18.190	15.028	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:13:00 PM	Desk	Smooth	Horizontal Upward	FALSE	sticky tape residue	4	Yes	383889.5	NA
2522	ClO2 Pre-Decon	Floor 1	Room 102	19.470	14.612	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:02:00 PM	Desk	Plastic	Horizontal Upward	FALSE	sticker decal. ridges on uv APS on desk.	6	Yes	113558.9	NA
2431	ClO2 Pre-Decon	Floor 1	Room 102	18.923	15.980	0.000	Sponge Wipe	0.694	lee	5/11/2011	4:50:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank	6	No	ND	NA
2433	ClO2 Pre-Decon	Floor 1	Room 102	20.214	16.308	0.000	Sponge Wipe	0.694	lee	5/11/2011	4:14:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE		4	Yes	387057.4	NA
2706	ClO2 Pre-Decon	Floor 1	Room 102	18.551	14.645	0.000	Sponge Wipe	0.694	lee	5/11/2011	5:09:00 PM	Desk	Plastic	Horizontal Upward	FALSE	uv APS on desk. ridges. missing some area due to handle depression on box	6	Yes	95554.8	NA
2321	ClO2 Pre-Decon	Floor 1	Room 103	14.631	11.190	2.900	Vacuum Sock	4.000	Ball	5/11/2011	4:08:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	[B.Melton barcode is incorrect]	5	Yes	6917.1	TNTC
3649	ClO2 Pre-Decon	Floor 1	Room 103	13.779	10.310	0.000	Vacuum Sock	4.000	Ball	5/11/2011	3:36:00 PM	Floor	Smooth	Horizontal Upward	TRUE	previous 3 samples(wipe, sponge, swab) are blanks as well. forgot to check blank box. [B.Melton addressed this]	5	Yes	ND	18.6
3647	ClO2 Pre-Decon	Floor 1	Room 103	13.274	6.247	0.000	Sponge Wipe	0.694	Ball	5/11/2011	4:12:00 PM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	3094923.4	TNTC
2243	ClO2 Pre-Decon	Floor 1	Room 103	14.615	6.192	1.800	Sponge Wipe	0.694	Ball	5/11/2011	3:56:00 PM	Wall	Textured	Vertical	FALSE		5	Yes	5133.9	TNTC
2244	ClO2 Pre-Decon	Floor 1	Room 103	13.202	7.520	2.000	Sponge Wipe	0.694	Ball	5/11/2011	3:53:00 PM	Mail slot	Metal	Horizontal Upward	FALSE		5	Yes	192712.7	TNTC
2327	ClO2 Pre-Decon	Floor 1	Room 103	15.831	6.332	0.000	Sponge Wipe	0.694	Ball	5/11/2011	3:46:00 PM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	215127.9	TNTC
2718	ClO2 Pre-Decon	Floor 1	Room 103	13.734	7.926	1.000	Sponge Wipe	0.694	Ball	5/11/2011	3:51:00 PM	Table	Smooth	Horizontal Upward	FALSE		5	Yes	244790.8	TNTC
2326	ClO2 Pre-Decon	Floor 1	Room 103	13.345	9.946	0.000	Sponge Wipe	0.694	Ball	5/11/2011	3:32:00 PM	Floor	Smooth	Horizontal Upward	TRUE		5	No	ND	ND
2332	ClO2 Pre-Decon	Floor 1	Room 103	15.535	11.887	0.000	Sponge Wipe	0.694	Ball	5/11/2011	3:28:00 PM	Floor	Smooth	Horizontal Upward	FALSE		5	Yes	383601.5	TNTC
2476	ClO2 Pre-Decon	Floor 1	Room 103	13.692	6.625	1.000	Sponge Wipe	0.694	Ball	5/11/2011	3:50:00 PM	Table	Smooth	Horizontal Upward	FALSE		5	Yes	390129.3	TNTC
1790	ClO2 Pre-Decon	Floor 1	Room 103	14.643	6.597	2.900	Swab	0.028	Ball	5/11/2011	3:59:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		1	Yes	822223.9	NA
1733	ClO2 Pre-Decon	Floor 1	Room 103	13.499	10.198	0.000	Swab	0.028	Ball	5/11/2011	3:33:00 PM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3559	ClO2 Pre-Decon	Floor 1	Room 104	13.994	18.944	1.298	Vacuum Sock	4.000	schademann	5/11/2011	3:44:00 PM	Ceiling	Porous	Horizontal Upward	TRUE		2	No	ND	ND
3596	ClO2 Pre-Decon	Floor 1	Room 104	16.394	19.396	0.000	Vacuum Sock	4.000	schademann	5/11/2011	3:42:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		2	Yes	2116.8	TNTC
2330	ClO2 Pre-Decon	Floor 1	Room 104	14.852	20.496	0.600	Sponge Wipe	0.694	schademann	5/11/2011	4:00:00 PM	Table	Smooth	Horizontal Downward	FALSE		7	Yes	72285.3	TNTC
2331	ClO2 Pre-Decon	Floor 1	Room 104	15.243	20.735	1.200	Sponge Wipe	0.694	schademann	5/11/2011	4:06:00 PM	Wall	Smooth	Vertical	FALSE	overlaid previous template.	7	Yes	3124.7	TNTC
2329	ClO2 Pre-Decon	Floor 1	Room 104	14.494	20.344	0.497	Sponge Wipe	0.694	schademann	5/11/2011	3:57:00 PM	Table	Smooth	Horizontal Downward	FALSE		7	Yes	111298.2	TNTC
2325	ClO2 Pre-Decon	Floor 1	Room 104	14.094	19.344	0.000	Sponge Wipe	0.694	schademann	5/11/2011	3:52:00 PM	Floor	Smooth	Horizontal Downward	FALSE		7	Yes	333299.4	TNTC
2328	ClO2 Pre-Decon	Floor 1	Room 104	14.994	18.544	0.600	Sponge Wipe	0.694	schademann	5/11/2011	3:34:00 PM	Table	Smooth	Horizontal Upward	FALSE		7	Yes	ND	TNTC
3173	ClO2 Pre-Decon	Floor 1	Room 104	14.701	19.118	1.000	Sponge Wipe	0.694	schademann	5/11/2011	4:10:00 PM	Wall	Smooth	Vertical	TRUE		7	No	ND	ND
1672	ClO2 Pre-Decon	Floor 1	Room 104	15.160	19.308	1.000	Swab	0.028	schademann	5/11/2011	4:12:00 PM	Wall	Smooth	Vertical	TRUE		1	No	ND	NA
1673	ClO2 Pre-Decon	Floor 1	Room 104	14.952	19.696	2.900	Swab	0.028	schademann	5/11/2011	3:48:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	swab of diffuser.	1	Yes	942256.6	NA
3685	ClO2 Pre-Decon	Floor 1	Room 105	11.781	10.224	0.000	Vacuum Sock	4.000	Mingolla	5/11/2011	3:21:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample on floor	5	Yes	966.7	TNTC
3562	ClO2 Pre-Decon	Floor 1	Room 105	10.489	11.993	0.000	Vacuum Sock	4.000	Mingolla	5/11/2011	2:51:00 PM	Floor	Carpet	Horizontal Upward	FALSE	carpet vacuum sample just inside door way of room	5	Yes	2054.3	TNTC
3662	ClO2 Pre-Decon	Floor 1	Room 105	10.702	7.824	2.900	Vacuum Sock	4.000	Mingolla	5/11/2011	4:01:00 PM	Ceiling	Textured	Horizontal Downward	FALSE	top of tile in ceiling	5	Yes	3583.5	TNTC
3705	ClO2 Pre-Decon	Floor 1	Room 105	11.081	10.034	0.000	Vacuum Sock	4.000	Mingolla	5/11/2011	3:27:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample on floor in front stove	5	Yes	833.4	TNTC
3582	ClO2 Pre-Decon	Floor 1	Room 105	10.381	6.524	0.000	Vacuum Sock	4.000	Mingolla	5/11/2011	3:42:00 PM	Floor	Carpet	Horizontal Downward	FALSE	vacuum sample on floor in back of room	5	Yes	1162.6	TNTC
2322	ClO2 Pre-Decon	Floor 1	Room 105	10.320	9.197	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	3:33:00 PM	Stove	Metal	Horizontal Upward	FALSE	sponge sample taken on stove	7	Yes	94306.8	TNTC
2323	ClO2 Pre-Decon	Floor 1	Room 105	12.681	10.821	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	3:12:00 PM	Sink	Metal	Inclined	FALSE	stick wipe sample taken in sink	7	Yes	134279.7	TNTC
2228	ClO2 Pre-Decon	Floor 1	Room 105	10.081	11.221	0.500	Sponge Wipe	0.694	Mingolla	5/11/2011	2:57:00 PM	Wall	Textured	Vertical	FALSE	105 wall sample taken just inside door	7	Yes	422.4	297.4
2229	ClO2 Pre-Decon	Floor 1	Room 105	11.489	6.680	0.000	Sponge Wipe	0.694	Mingolla	5/11/2011	3:47:00 PM	Table	Smooth	Horizontal Downward	FALSE	sponge sample taken on table surface	7	Yes	147570.4	TNTC
1517	ClO2 Pre-Decon	Floor 1	Room 105	11.402	7.024	2.900	Swab	0.028	Mingolla	5/11/2011	3:52:00 PM	Supply Vent	Metal	Horizontal Upward	FALSE	vent	1	Yes	828225.5	NA
3690	ClO2 Pre-Decon	Floor 1	Room 106	11.048	19.643	1.597	Vacuum Sock	4.000	nash	5/11/2011	4:19:00 PM	Wall	Cloth	Vertical	FALSE	vertical vacuum sample on partisan facing rear of room. at top of partisan between desk and end of partisan.	7	Yes	2421.0	TNTC
3927	ClO2 Pre-Decon	Floor 1	Room 106	11.274	20.421	0.496	Vacuum Sock	4.000	nash	5/11/2011	4:12:00 PM	Chair	Cloth	Horizontal Upward	FALSE	vacuum sample on chair on back wall. chair is seated onder right side of window	7	Yes	11459.0	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3673	ClO2 Pre-Decon	Floor 1	Room 106	12.676	20.153	1.498	Vacuum Sock	4.000	nash	5/11/2011	4:07:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	vacuum sample from the books on top of the file cabinet. books were in center on top of cabinet	7	Yes	1941.8	TNTC
4052	ClO2 Pre-Decon	Floor 1	Room 106	10.968	18.394	0.497	Vacuum Sock	4.000	nash	5/11/2011	3:48:00 PM	Chair	Cloth	Horizontal Upward	FALSE	vacuum sample on chair near desk. seat cushion was vacuumed	5	Yes	7458.8	TNTC
3952	ClO2 Pre-Decon	Floor 1	Room 106	12.641	18.505	0.000	Vacuum Sock	4.000	nash	5/11/2011	4:36:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	top of ceiling tile next to wall. 2nd full tile from rear wall. the half sampled is toward the entry door to room	7	Yes	1800.1	TNTC
2255	ClO2 Pre-Decon	Floor 1	Room 106	10.570	14.962	0.000	Sponge Wipe	0.694	nash	5/11/2011	3:24:00 PM	Floor	Smooth	Horizontal Upward	FALSE	swab stick on floor in entryway. about 1 foot in right center.	7	Yes	117619.6	TNTC
2468	ClO2 Pre-Decon	Floor 1	Room 106	12.113	15.842	0.772	Sponge Wipe	0.694	nash	5/11/2011	3:31:00 PM	Table	Smooth	Horizontal Upward	FALSE	sponge stick sample on table, far end when standing in doorway [straight forward],	7	Yes	173638.3	TNTC
2262	ClO2 Pre-Decon	Floor 1	Room 106	10.142	19.885	0.696	Sponge Wipe	0.694	nash	5/11/2011	4:28:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	swab stick sample on file cabinet in back corner [left]. placed template against wall.	7	Yes	150051.9	TNTC
2285	ClO2 Pre-Decon	Floor 1	Room 106	10.623	18.139	0.896	Sponge Wipe	0.694	nash	5/11/2011	3:55:00 PM	Desk	Smooth	Horizontal Upward	FALSE	swab stick sample on table , in front/left of monitor due to previous sampling team. template on edge of table	6	Yes	146020.1	NA
2467	ClO2 Pre-Decon	Floor 1	Room 106	9.922	17.094	0.595	Sponge Wipe	0.694	nash	5/11/2011	3:39:00 PM	Wall	Textured	Vertical	FALSE	swab stick sample on wall. about 2 feet left of desk.	7	Yes	739.7	ND
1608	ClO2 Pre-Decon	Floor 1	Room 106	11.379	19.779	0.000	Swab	0.028	nash	5/11/2011	4:30:00 PM	Supply Vent	Smooth	Inclined	FALSE	diffuser on ceiling sampled with a swab. 2 feet from rear wall centerline with room.	1	Yes	780212.5	NA
1602	ClO2 Pre-Decon	Floor 1	Room 106	10.254	18.292	1.092	Swab	0.028	nash	5/11/2011	4:01:00 PM	Monitor	Smooth	Inclined	FALSE	swab sample on monitor. upper left corner of monitor.	1	Yes	68418.6	NA
3642	ClO2 Pre-Decon	Floor 1	Room 107	9.443	10.245	0.000	Vacuum Sock	4.000	nash	5/11/2011	2:22:00 PM	Couch	Cloth	Horizontal Upward	FALSE	vacuum sample, couch. facing is left cushion, sitting is right cushion.	7	Yes	9833.9	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3740	ClO2 Pre-Decon	Floor 1	Room 107	8.480	8.381	0.000	Vacuum Sock	4.000	nash	5/11/2011	2:29:00 PM	Chair	Cloth	Horizontal Upward	FALSE	vacuum sample, on chair cushion, only chair in room. On a general note, I don't like vacuum samples ;]	5	Yes	4208.6	TNTC
3579	ClO2 Pre-Decon	Floor 1	Room 107	9.431	12.131	0.000	Vacuum Sock	4.000	nash	5/11/2011	1:54:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample on floor, approximately 6 inches in room, left center of doorway... debri was collected\noted after sample was taken.	7	Yes	2075.1	TNTC
3796	ClO2 Pre-Decon	Floor 1	Room 107	9.131	7.214	0.000	Vacuum Sock	4.000	nash	5/11/2011	2:32:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank sample , vacuum, center of open area	7	No	ND	ND
3943	ClO2 Pre-Decon	Floor 1	Room 107	7.831	11.477	0.000	Vacuum Sock	4.000	nash	5/11/2011	3:15:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	top of ceiling tile... left side if standing at door. vacuum sample ... noted with marker also	7	Yes	7625.4	TNTC
2313	ClO2 Pre-Decon	Floor 1	Room 107	8.115	12.362	0.497	Sponge Wipe	0.694	nash	5/11/2011	3:07:00 PM	Wall	Textured	Vertical	FALSE	2 feet from doorway, vertical swab stick .	7	Yes	280.8	262.7
1989	ClO2 Pre-Decon	Floor 1	Room 107	7.043	6.423	1.289	Sponge Wipe	0.694	nash	5/11/2011	2:48:00 PM	Shelves	Smooth	Horizontal Upward	FALSE	sponge stick sample on shelf, back corner is where template placement is.	6	Yes	111317.4	NA
2578	ClO2 Pre-Decon	Floor 1	Room 107	9.127	7.213	1.176	Sponge Wipe	0.694	nash	5/11/2011	2:35:00 PM	Floor	Carpet	Horizontal Upward	TRUE	swab sample , blank, same height as vacuum blank. center of open area, back part of room	7	Yes	ND	4.0
2401	ClO2 Pre-Decon	Floor 1	Room 107	8.559	9.250	0.000	Sponge Wipe	0.694	nash	5/11/2011	2:13:00 PM	Table	Smooth	Horizontal Upward	FALSE	sponge stick sample, on table, centerline length, template edge width,	7	Yes	223167.6	TNTC
1492	ClO2 Pre-Decon	Floor 1	Room 107	7.406	9.724	0.794	Swab	0.028	nash	5/11/2011	3:01:00 PM	Monitor	Smooth	Vertical	FALSE	swab sample on tv monitor. upper left corner.	1	Yes	696189.6	NA
1560	ClO2 Pre-Decon	Floor 1	Room 107	8.331	6.814	0.000	Swab	0.028	nash	5/11/2011	2:53:00 PM	Supply Vent	Smooth	Inclined	FALSE	diffuser vent swab. rear center of room , on ceiling	1	Yes	126034.3	NA
1552	ClO2 Pre-Decon	Floor 1	Room 107	9.127	7.213	0.891	Swab	0.028	nash	5/11/2011	2:40:00 PM	Floor	Carpet	Horizontal Upward	TRUE	swab sample blank, same location and height as other blanks. center area of back part of room	1	No	ND	NA
3933	ClO2 Pre-Decon	Floor 1	Room 108	7.936	18.379	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	4:56:00 PM	Chair	Cloth	Horizontal Downward	FALSE		6	Yes	3916.9	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3561	ClO2 Pre-Decon	Floor 1	Room 108	8.932	16.031	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	4:46:00 PM	Floor	Smooth	Horizontal Downward	TRUE	blank taken	6	No	ND	NA
3704	ClO2 Pre-Decon	Floor 1	Room 108	8.237	20.408	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	5:16:00 PM	Chair	Cloth	Horizontal Downward	FALSE		6	Yes	11959.0	NA
3618	ClO2 Pre-Decon	Floor 1	Room 108	9.664	20.182	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	5:19:00 PM	File cabinet	Smooth	Horizontal Downward	FALSE	vacuum sample taken on books	7	Yes	208.3	162.2
4120	ClO2 Pre-Decon	Floor 1	Room 108	7.955	19.563	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	5:13:00 PM	Wall	Cloth	Vertical	FALSE	wall divider/partition	4	Yes	562.5	NA
4060	ClO2 Pre-Decon	Floor 1	Room 108	9.345	18.905	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	5:29:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE	sample taken from back half of ceiling tile	7	Yes	3362.7	TNTC
2227	ClO2 Pre-Decon	Floor 1	Room 108	7.617	15.148	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	4:33:00 PM	Floor	Smooth	Horizontal Downward	FALSE		6	Yes	168785.6	NA
2681	ClO2 Pre-Decon	Floor 1	Room 108	7.335	17.910	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	5:00:00 PM	Desk	Smooth	Horizontal Downward	FALSE		6	Yes	168152.1	NA
2281	ClO2 Pre-Decon	Floor 1	Room 108	9.364	17.233	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	4:49:00 PM	Floor	Smooth	Horizontal Downward	FALSE		6	Yes	126139.2	NA
2683	ClO2 Pre-Decon	Floor 1	Room 108	8.799	14.488	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	4:39:00 PM	Wall	Textured	Vertical	FALSE		6	Yes	423.3	NA
2264	ClO2 Pre-Decon	Floor 1	Room 108	8.349	16.219	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	4:44:00 PM	Floor	Smooth	Horizontal Downward	TRUE	blank taken	6	Yes	24191.1	NA
1562	ClO2 Pre-Decon	Floor 1	Room 108	7.335	18.454	0.000	Swab	0.028	Griffin	5/11/2011	5:02:00 PM	Monitor	Smooth	Vertical	FALSE	bottom left corner of computer monitor	1	Yes	28207.7	33399.1
1566	ClO2 Pre-Decon	Floor 1	Room 108	8.725	16.388	0.000	Swab	0.028	Griffin	5/11/2011	4:45:00 PM	Floor	Smooth	Horizontal Downward	TRUE	blank taken	1	No	ND	NA
1742	ClO2 Pre-Decon	Floor 1	Room 108	8.838	19.525	0.000	Swab	0.028	Griffin	5/11/2011	5:23:00 PM	Return Vent	Metal	Horizontal Upward	FALSE		1	Yes	2952804.1	NA
3900	ClO2 Pre-Decon	Floor 1	Room 109	5.464	8.730	0.000	Vacuum Sock	4.000	ventura	5/11/2011	11:15:00 AM	Bed	Porous	Horizontal Downward	FALSE	bottom right corner of bed	4	Yes	1437.6	NA
4132	ClO2 Pre-Decon	Floor 1	Room 109	4.900	11.275	0.000	Vacuum Sock	4.000	ventura	5/11/2011	10:46:00 AM	Floor	Carpet	Horizontal Upward	TRUE		6	No	ND	NA
4091	ClO2 Pre-Decon	Floor 1	Room 109	5.019	10.816	0.000	Vacuum Sock	4.000	ventura	5/11/2011	10:43:00 AM	Floor	Carpet	Horizontal Upward	FALSE		4	Yes	983.4	NA
4058	ClO2 Pre-Decon	Floor 1	Room 109	4.400	7.917	0.000	Vacuum Sock	4.000	ventura	5/11/2011	11:27:00 AM	Bed	Porous	Horizontal Downward	FALSE	top left of bed	6	Yes	533.4	NA
3638	ClO2 Pre-Decon	Floor 1	Room 109	6.255	11.985	0.000	Vacuum Sock	4.000	ventura	5/11/2011	10:09:00 AM	Floor	Carpet	Horizontal Downward	FALSE		4	Yes	2225.1	NA
3650	ClO2 Pre-Decon	Floor 1	Room 109	6.069	6.548	0.000	Vacuum Sock	4.000	ventura	5/11/2011	11:54:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	second tile from left if looking at window	6	Yes	6208.7	NA
2286	ClO2 Pre-Decon	Floor 1	Room 109	4.945	11.290	0.000	Sponge Wipe	0.694	ventura	5/11/2011	10:49:00 AM	Floor	Carpet	Horizontal Downward	TRUE	blank	6	No	ND	NA
2283	ClO2 Pre-Decon	Floor 1	Room 109	4.173	11.045	0.000	Sponge Wipe	0.694	ventura	5/11/2011	10:25:00 AM	Sink	Smooth	Horizontal Downward	FALSE	countertop left of sink	6	Yes	225154.7	NA
2282	ClO2 Pre-Decon	Floor 1	Room 109	4.173	12.052	0.000	Sponge Wipe	0.694	ventura	5/11/2011	10:19:00 AM	Sink	Smooth	Horizontal Downward	FALSE		6	Yes	183103.5	NA
2819	ClO2 Pre-Decon	Floor 1	Room 109	4.153	7.095	0.000	Sponge Wipe	0.694	ventura	5/11/2011	11:36:00 AM	Countertop	Porous	Horizontal Downward	FALSE	left nightstand	6	Yes	128827.1	NA
2284	ClO2 Pre-Decon	Floor 1	Room 109	5.194	6.047	0.000	Sponge Wipe	0.694	ventura	5/11/2011	11:44:00 AM	Wall	Textured	Vertical	FALSE	vertical wall sample below window	6	Yes	2763.3	NA
3928	ClO2 Pre-Decon	Floor 1	Room 110	6.246	15.318	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	4:25:00 PM	Ceiling	Smooth	Horizontal Downward	FALSE		6	Yes	1766.8	NA
3656	ClO2 Pre-Decon	Floor 1	Room 110	5.156	20.314	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	4:12:00 PM	Chair	Cloth	Horizontal Downward	FALSE		4	Yes	6333.7	NA
4119	ClO2 Pre-Decon	Floor 1	Room 110	6.565	19.976	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	4:06:00 PM	File cabinet	Smooth	Horizontal Downward	FALSE	books on cabinet	6	Yes	725.0	NA
3628	ClO2 Pre-Decon	Floor 1	Room 110	4.837	19.656	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	4:01:00 PM	Wall	Cloth	Vertical	FALSE	wall divider/partition	6	Yes	2196.0	NA
3611	ClO2 Pre-Decon	Floor 1	Room 110	4.912	18.436	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	3:37:00 PM	Chair	Cloth	Horizontal Downward	FALSE		6	Yes	1900.1	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4086	ClO2 Pre-Decon	Floor 1	Room 110	5.588	15.937	0.000	Vacuum Sock	4.000	Griffin	5/11/2011	3:17:00 PM	Floor	Smooth	Horizontal Downward	TRUE		6	No	ND	NA
2317	ClO2 Pre-Decon	Floor 1	Room 110	4.161	19.882	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	4:15:00 PM	File cabinet	Metal	Horizontal Downward	FALSE		6	Yes	185306.6	NA
2318	ClO2 Pre-Decon	Floor 1	Room 110	6.565	19.600	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	4:09:00 PM	File cabinet	Smooth	Horizontal Downward	FALSE		6	Yes	243350.8	NA
2265	ClO2 Pre-Decon	Floor 1	Room 110	4.499	17.872	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	3:41:00 PM	Desk	Smooth	Horizontal Downward	FALSE		6	Yes	202600.4	NA
2289	ClO2 Pre-Decon	Floor 1	Room 110	6.433	17.421	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	3:28:00 PM	Floor	Smooth	Horizontal Downward	FALSE		6	Yes	152922.2	NA
2316	ClO2 Pre-Decon	Floor 1	Room 110	3.954	16.088	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	3:23:00 PM	Wall	Textured	Vertical	FALSE		6	Yes	1532.1	NA
2226	ClO2 Pre-Decon	Floor 1	Room 110	5.945	16.369	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	3:12:00 PM	Floor	Smooth	Horizontal Downward	TRUE		6	No	ND	NA
2225	ClO2 Pre-Decon	Floor 1	Room 110	5.738	15.205	0.000	Sponge Wipe	0.694	Griffin	5/11/2011	2:48:00 PM	Floor	Smooth	Horizontal Downward	FALSE		6	Yes	141143.5	NA
1563	ClO2 Pre-Decon	Floor 1	Room 110	4.161	18.360	0.000	Swab	0.028	Griffin	5/11/2011	3:48:00 PM	Monitor	Smooth	Inclined	FALSE	bottom left corner	1	Yes	46212.6	NA
1711	ClO2 Pre-Decon	Floor 1	Room 110	5.457	19.544	0.000	Swab	0.028	Griffin	5/11/2011	4:20:00 PM	Return Vent	Metal	Horizontal Upward	FALSE		1	Yes	450122.6	NA
1546	ClO2 Pre-Decon	Floor 1	Room 110	5.411	16.396	0.000	Swab	0.028	Griffin	5/11/2011	3:05:00 PM	Floor	Smooth	Horizontal Downward	TRUE		1	No	ND	NA
3871	ClO2 Pre-Decon	Floor 2	Bathroom M	28.113	20.159	5.900	Vacuum Sock	4.000	schademann	5/11/2011	3:01:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		2	Yes	1891.8	TNTC
3174	ClO2 Pre-Decon	Floor 2	Bathroom M	29.213	20.258	3.000	Sponge Wipe	0.694	schademann	5/11/2011	2:54:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	9497.9	TNTC
3175	ClO2 Pre-Decon	Floor 2	Bathroom M	28.789	20.660	3.400	Sponge Wipe	0.694	schademann	5/11/2011	2:51:00 PM	Wall	Smooth	Vertical	FALSE		7	No	ND	ND
3176	ClO2 Pre-Decon	Floor 2	Bathroom M	27.203	20.259	3.000	Sponge Wipe	0.694	schademann	5/11/2011	2:47:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	11768.2	TNTC
4036	ClO2 Pre-Decon	Floor 2	Bathroom W	27.800	17.292	4.100	Vacuum Sock	4.000	schademann	5/11/2011	2:39:00 PM	Ceiling	Porous	Horizontal Upward	TRUE	had placed vac blank sample in bag with ceiling tile sample from rm 26.	2	No	ND	ND
4234	ClO2 Pre-Decon	Floor 2	Bathroom W	27.500	17.912	5.900	Vacuum Sock	4.000	schademann	5/11/2011	2:32:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		2	Yes	345.9	TNTC
3178	ClO2 Pre-Decon	Floor 2	Bathroom W	28.498	18.012	3.000	Sponge Wipe	0.694	schademann	5/11/2011	2:41:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	6479.8	ND
3179	ClO2 Pre-Decon	Floor 2	Bathroom W	26.865	16.194	3.000	Sponge Wipe	0.694	schademann	5/11/2011	2:26:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	7144.5	ND
3177	ClO2 Pre-Decon	Floor 2	Bathroom W	28.197	17.094	3.000	Sponge Wipe	0.694	schademann	5/11/2011	2:42:00 PM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
2795	ClO2 Pre-Decon	Floor 2	Copier Room	29.905	13.731	3.000	Sponge Wipe	0.694	schademann	5/11/2011	12:22:00 PM	Floor	Textured	Horizontal Upward	FALSE		4	Yes	22007.2	TNTC
2809	ClO2 Pre-Decon	Floor 2	Copier Room	28.515	14.211	5.900	Sponge Wipe	0.694	schademann	5/11/2011	12:19:00 PM	Wall	Smooth	Vertical	FALSE	overlain with team 2 template.	4	Yes	ND	10.2
2728	ClO2 Pre-Decon	Floor 2	Copier Room	27.405	13.863	3.000	Sponge Wipe	0.694	schademann	5/11/2011	12:17:00 PM	Floor	Textured	Horizontal Upward	FALSE	overlain with team 2 template.	4	Yes	8536.0	TNTC
3878	ClO2 Pre-Decon	Floor 2	Hallway	10.293	12.868	5.900	Vacuum Sock	4.000	schademann	5/11/2011	9:18:00 AM	Ceiling	Porous	Horizontal Upward	FALSE		4	Yes	495.9	TNTC
3957	ClO2 Pre-Decon	Floor 2	Hallway	25.292	16.232	5.900	Vacuum Sock	4.000	schademann	5/11/2011	10:33:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	plenum side of ceiling. middle hall panel.	4	Yes	883.4	TNTC
4053	ClO2 Pre-Decon	Floor 2	Hallway	18.837	13.468	4.200	Vacuum Sock	4.000	schademann	5/11/2011	10:07:00 AM	Ceiling	Porous	Horizontal Upward	TRUE		4	No	ND	ND
4084	ClO2 Pre-Decon	Floor 2	Hallway	18.937	12.858	5.900	Vacuum Sock	4.000	schademann	5/11/2011	10:01:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling tile between 205 and 207. on opposite side from diagram due to vent.	4	Yes	437.5	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3196	ClO2 Pre-Decon	Floor 2	Hallway	7.693	13.468	5.500	Sponge Wipe	0.694	schademann	5/11/2011	9:33:00 AM	Return Vent	Metal	Horizontal Upward	FALSE	sampled verticle on 212 side of wall.	6	Yes	148.8	37.2
3194	ClO2 Pre-Decon	Floor 2	Hallway	7.310	13.437	3.000	Sponge Wipe	0.694	schademann	5/11/2011	9:01:00 AM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	18182.2	TNTC
3198	ClO2 Pre-Decon	Floor 2	Hallway	13.193	13.068	3.300	Sponge Wipe	0.694	schademann	5/11/2011	9:45:00 AM	Wall	Smooth	Vertical	FALSE	overlaw with team 2 template.	6	No	ND	ND
3195	ClO2 Pre-Decon	Floor 2	Hallway	17.593	14.058	3.000	Sponge Wipe	0.694	schademann	5/11/2011	9:51:00 AM	Floor	Smooth	Horizontal Upward	FALSE	floor between 206 and 204 next wall.	6	Yes	15836.5	TNTC
2831	ClO2 Pre-Decon	Floor 2	Hallway	25.312	19.643	3.300	Sponge Wipe	0.694	schademann	5/11/2011	10:38:00 AM	Wall	Smooth	Vertical	FALSE	covered team 2 template.	6	Yes	ND	9.3
3197	ClO2 Pre-Decon	Floor 2	Hallway	11.193	13.358	3.000	Sponge Wipe	0.694	schademann	5/11/2011	9:40:00 AM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	18506.2	TNTC
3192	ClO2 Pre-Decon	Floor 2	Hallway	25.275	18.829	3.000	Sponge Wipe	0.694	schademann	5/11/2011	11:12:00 AM	Floor	Smooth	Horizontal Upward	FALSE	used range finder for location. appears off. actual location is 0.3 m outside of airlock. [B.Melton moved outside of airlock from room 203]	4	Yes	13218.7	TNTC
2029	ClO2 Pre-Decon	Floor 2	Hallway	25.354	14.898	3.000	Sponge Wipe	0.694	schademann	5/11/2011	10:27:00 AM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	10052.7	TNTC
2028	ClO2 Pre-Decon	Floor 2	Hallway	21.637	13.868	3.000	Sponge Wipe	0.694	schademann	5/11/2011	10:20:00 AM	Floor	Smooth	Horizontal Upward	FALSE		6	Yes	13780.3	TNTC
2862	ClO2 Pre-Decon	Floor 2	Hallway	23.137	13.668	5.096	Sponge Wipe	0.694	schademann	5/11/2011	10:19:00 AM	Return Vent	Metal	Vertical	FALSE	return vent. vertical side.	6	Yes	28.8	46.5
3187	ClO2 Pre-Decon	Floor 2	Hallway	17.737	13.168	4.200	Sponge Wipe	0.694	schademann	5/11/2011	10:05:00 AM	Ceiling	Porous	Horizontal Upward	TRUE		6	No	ND	ND
3694	ClO2 Pre-Decon	Floor 2	Janitor Closet	28.800	15.349	5.900	Vacuum Sock	4.000	schademann	5/11/2011	12:34:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		4	Yes	250.0	TNTC
3184	ClO2 Pre-Decon	Floor 2	Janitor Closet	26.898	14.954	3.000	Sponge Wipe	0.694	schademann	5/11/2011	12:26:00 PM	Floor	Textured	Horizontal Upward	FALSE	on clear spot on floor.	4	Yes	7645.2	TNTC
3185	ClO2 Pre-Decon	Floor 2	Janitor Closet	28.598	15.278	3.000	Sponge Wipe	0.694	schademann	5/11/2011	12:27:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	17510.7	TNTC
3687	ClO2 Pre-Decon	Floor 2	Mechanical Room	19.070	19.284	3.500	Vacuum Sock	4.000	schademann	5/11/2011	3:16:00 PM	Return Vent	Porous	Horizontal Upward	FALSE	vacuum from return furnace filter.	2	Yes	17459.3	TNTC
3180	ClO2 Pre-Decon	Floor 2	Mechanical Room	22.131	19.519	3.000	Sponge Wipe	0.694	schademann	5/11/2011	3:11:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	53974.0	TNTC
3172	ClO2 Pre-Decon	Floor 2	Mechanical Room	19.021	20.554	3.000	Sponge Wipe	0.694	schademann	5/11/2011	3:19:00 PM	Floor	Smooth	Horizontal Upward	FALSE		7	Yes	20980.0	-1438.5
4247	ClO2 Pre-Decon	Floor 2	Room 201	27.231	11.249	5.900	Vacuum Sock	4.000	schademann	5/11/2011	11:52:00 AM	Ceiling	Porous	Horizontal Upward	FALSE		4	Yes	416.7	TNTC
3182	ClO2 Pre-Decon	Floor 2	Room 201	29.415	11.699	3.000	Sponge Wipe	0.694	schademann	5/11/2011	11:46:00 AM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	16235.4	TNTC
3186	ClO2 Pre-Decon	Floor 2	Room 201	26.612	11.699	3.000	Sponge Wipe	0.694	schademann	5/11/2011	11:44:00 AM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	8950.7	ND
3911	ClO2 Pre-Decon	Floor 2	Room 201A	28.531	7.867	5.900	Vacuum Sock	4.000	schademann	5/11/2011	12:12:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		4	Yes	1358.4	TNTC
2782	ClO2 Pre-Decon	Floor 2	Room 201A	26.415	9.040	3.000	Sponge Wipe	0.694	schademann	5/11/2011	11:57:00 AM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	15543.7	TNTC
2867	ClO2 Pre-Decon	Floor 2	Room 201A	29.231	7.667	3.000	Sponge Wipe	0.694	schademann	5/11/2011	12:07:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	17482.4	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2890	ClO2 Pre-Decon	Floor 2	Room 201A	29.031	5.967	3.300	Sponge Wipe	0.694	schademann	5/11/2011	12:05:00 PM	Wall	Smooth	Vertical	FALSE	had put bag into foam stick bag prior to scan. [incorrect barcode for this sample, look for sponge stick in sample trailer - B. Melton, also changed barcode to 2890]	4	Yes	18.7	80.6
2865	ClO2 Pre-Decon	Floor 2	Room 201A	26.515	6.840	3.000	Sponge Wipe	0.694	schademann	5/11/2011	12:00:00 PM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	21541.6	TNTC
3191	ClO2 Pre-Decon	Floor 2	Room 202	21.964	17.597	3.000	Sponge Wipe	0.694	schademann	5/11/2011	11:21:00 AM	Floor	Smooth	Horizontal Upward	FALSE	manuel location as range finder appears to provide inaccurate results.	4	Yes	18863.3	TNTC
2920	ClO2 Pre-Decon	Floor 2	Room 202	21.534	14.786	3.000	Sponge Wipe	0.694	schademann	5/11/2011	11:18:00 AM	Floor	Smooth	Horizontal Upward	FALSE	manuel location as previous one done by range finder was incorrect.	4	Yes	12723.4	TNTC
4136	ClO2 Pre-Decon	Floor 2	Room 203	24.349	10.149	5.900	Vacuum Sock	4.000	Kroone	5/11/2011	2:16:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	tile placed on floor to ssample	1	Yes	189.0	NA
2203	ClO2 Pre-Decon	Floor 2	Room 203	22.947	10.957	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	2:02:00 PM	Floor	Smooth	Horizontal Downward	FALSE	on floor	5	Yes	14002.0	TNTC
2661	ClO2 Pre-Decon	Floor 2	Room 203	22.947	9.849	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	2:08:00 PM	Wall	Smooth	Vertical	FALSE		5	No	ND	ND
4034	ClO2 Pre-Decon	Floor 2	Room 203A	24.046	6.240	5.900	Vacuum Sock	4.000	Kroone	5/11/2011	2:35:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	placed tile on floor to sample	2	Yes	325.0	115206.3
2208	ClO2 Pre-Decon	Floor 2	Room 203A	24.046	6.640	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	2:29:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	13559.5	TNTC
2204	ClO2 Pre-Decon	Floor 2	Room 203A	24.960	9.081	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	2:24:00 PM	Floor	Smooth	Horizontal Downward	FALSE	near door entrance	5	Yes	15731.9	TNTC
3944	ClO2 Pre-Decon	Floor 2	Room 204	19.993	16.290	5.900	Vacuum Sock	4.000	schademann	5/11/2011	11:37:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	broke corner of tile while removing. see photo.	4	Yes	462.5	TNTC
3188	ClO2 Pre-Decon	Floor 2	Room 204	19.693	17.490	3.000	Sponge Wipe	0.694	schademann	5/11/2011	11:32:00 AM	Floor	Smooth	Horizontal Upward	FALSE		4	Yes	12747.4	TNTC
3189	ClO2 Pre-Decon	Floor 2	Room 204	18.756	16.990	3.396	Sponge Wipe	0.694	schademann	5/11/2011	11:28:00 AM	Wall	Smooth	Vertical	FALSE		4	No	ND	ND
3190	ClO2 Pre-Decon	Floor 2	Room 204	20.193	14.990	3.000	Sponge Wipe	0.694	schademann	5/11/2011	11:26:00 AM	Floor	Smooth	Horizontal Upward	FALSE	corrected entry.	4	Yes	14089.9	TNTC
3710	ClO2 Pre-Decon	Floor 2	Room 205	20.234	8.850	5.900	Vacuum Sock	4.000	Kroone	5/11/2011	1:54:00 PM	Ceiling	Textured	Horizontal Upward	FALSE		1	Yes	243.3	NA
2199	ClO2 Pre-Decon	Floor 2	Room 205	20.134	6.150	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	1:46:00 PM	Wall	Smooth	Vertical	FALSE		5	Yes	ND	46.4
2446	ClO2 Pre-Decon	Floor 2	Room 205	19.115	9.609	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	1:40:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	14663.4	ND
2881	ClO2 Pre-Decon	Floor 2	Room 205	20.325	11.450	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	1:34:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	8046.4	TNTC
3785	ClO2 Pre-Decon	Floor 2	Room 206	17.821	16.845	5.900	Vacuum Sock	4.000	Kroone	5/11/2011	12:05:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	ceilinbg tile	1	Yes	240.7	NA
3754	ClO2 Pre-Decon	Floor 2	Room 206	16.221	18.754	4.000	Vacuum Sock	4.000	Kroone	5/11/2011	11:32:00 AM	Table	Smooth	Horizontal Upward	TRUE	blank	1	No	ND	NA
2883	ClO2 Pre-Decon	Floor 2	Room 206	16.321	15.055	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	11:01:00 AM	Floor	Smooth	Horizontal Upward	FALSE	on floor in swing of door	5	Yes	13335.3	TNTC
2854	ClO2 Pre-Decon	Floor 2	Room 206	17.642	15.249	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	11:13:00 AM	Floor	Smooth	Horizontal Upward	FALSE	8 feet into room on left wall	5	Yes	14946.6	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3155	ClO2 Pre-Decon	Floor 2	Room 206	17.721	19.654	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	11:55:00 AM	Floor	Smooth	Horizontal Upward	FALSE	wood shavings on floor where samle taken	5	Yes	234.2	-1438.5
2348	ClO2 Pre-Decon	Floor 2	Room 206	18.248	20.671	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	11:51:00 AM	Table	Smooth	Horizontal Upward	FALSE	inadverte tly did tsable shouldhave done floor	5	Yes	3386.8	TNTC
2319	ClO2 Pre-Decon	Floor 2	Room 206	16.715	19.895	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	11:43:00 AM	Table	Smooth	Horizontal Upward	FALSE	moved tools on bench	5	Yes	3686.3	TNTC
2887	ClO2 Pre-Decon	Floor 2	Room 206	17.042	18.754	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	11:38:00 AM	Table	Smooth	Horizontal Upward	TRUE	sticks don't break	5	No	ND	ND
2853	ClO2 Pre-Decon	Floor 2	Room 206	17.821	18.354	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	11:28:00 AM	Table	Smooth	Horizontal Upward	FALSE	correcged this is thecorrect [B. Melton addressed]	5	Yes	13209.1	TNTC
1588	ClO2 Pre-Decon	Floor 2	Room 206	17.421	20.154	5.900	Swab	0.028	Kroone	5/11/2011	11:59:00 AM	Ceiling	Textured	Horizontal Upward	FALSE	ceiling ventstick did notbreak	1	Yes	86423.5	NA
1496	ClO2 Pre-Decon	Floor 2	Room 206	17.142	18.754	4.000	Swab	0.028	Kroone	5/11/2011	11:36:00 AM	Table	Smooth	Horizontal Upward	TRUE	blank nevertrust those who packyyour sz plers k	1	No	ND	NA
3709	ClO2 Pre-Decon	Floor 2	Room 207	17.553	11.059	5.900	Vacuum Sock	4.000	Kroone	5/11/2011	1:27:00 PM	Ceiling	Textured	Horizontal Upward	FALSE		1	Yes	235.2	NA
4131	ClO2 Pre-Decon	Floor 2	Room 207	16.753	9.150	3.000	Vacuum Sock	4.000	Kroone	5/11/2011	12:28:00 PM	Floor	Smooth	Horizontal Downward	TRUE		1	No	ND	NA
3241	ClO2 Pre-Decon	Floor 2	Room 207	15.886	6.487	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	1:10:00 PM	Table	Smooth	Horizontal Downward	FALSE		5	Yes	8942.1	TNTC
2864	ClO2 Pre-Decon	Floor 2	Room 207	15.477	6.767	5.000	Sponge Wipe	0.694	Kroone	5/11/2011	1:19:00 PM	Shelves	Smooth	Horizontal Downward	FALSE		5	Yes	12700.3	TNTC
2448	ClO2 Pre-Decon	Floor 2	Room 207	15.456	8.112	5.000	Sponge Wipe	0.694	Kroone	5/11/2011	1:14:00 PM	Shelves	Smooth	Horizontal Downward	FALSE		5	Yes	11746.1	TNTC
2452	ClO2 Pre-Decon	Floor 2	Room 207	15.854	7.865	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	1:06:00 PM	Table	Smooth	Horizontal Downward	FALSE		5	Yes	14101.9	TNTC
2717	ClO2 Pre-Decon	Floor 2	Room 207	17.512	9.598	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	12:53:00 PM	Table	Smooth	Horizontal Downward	FALSE		5	Yes	11413.5	TNTC
2719	ClO2 Pre-Decon	Floor 2	Room 207	16.653	9.050	4.000	Sponge Wipe	0.694	Kroone	5/11/2011	12:32:00 PM	Table	Smooth	Horizontal Downward	TRUE		5	No	ND	ND
2461	ClO2 Pre-Decon	Floor 2	Room 207	17.953	7.250	3.300	Sponge Wipe	0.694	Kroone	5/11/2011	12:50:00 PM	Wall	Smooth	Vertical	FALSE	1 f00t off floor	5	Yes	ND	9.3
2863	ClO2 Pre-Decon	Floor 2	Room 207	15.890	12.016	3.000	Sponge Wipe	0.694	Kroone	5/11/2011	12:16:00 PM	Floor	Smooth	Horizontal Downward	FALSE		5	Yes	14471.5	TNTC
1567	ClO2 Pre-Decon	Floor 2	Room 207	16.753	7.150	5.900	Swab	0.028	Kroone	5/11/2011	12:40:00 PM	Supply Vent	Smooth	Horizontal Downward	FALSE		1	Yes	39010.6	NA
1506	ClO2 Pre-Decon	Floor 2	Room 207	16.753	9.250	4.000	Swab	0.028	Kroone	5/11/2011	12:36:00 PM	Table	Smooth	Horizontal Downward	TRUE		1	No	ND	NA
4126	ClO2 Pre-Decon	Floor 2	Room 208	13.281	16.605	5.500	Vacuum Sock	4.000	Ball	5/11/2011	12:55:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		7	Yes	612.5	TNTC
3875	ClO2 Pre-Decon	Floor 2	Room 208	15.167	20.321	3.000	Vacuum Sock	4.000	Ball	5/11/2011	12:44:00 PM	File cabinet	Metal	Horizontal Upward	FALSE		7	Yes	179.2	131.7
3932	ClO2 Pre-Decon	Floor 2	Room 208	13.825	20.396	3.000	Vacuum Sock	4.000	Ball	5/11/2011	12:30:00 PM	Chair	Porous	Horizontal Upward	FALSE		7	Yes	579.2	ND
4062	ClO2 Pre-Decon	Floor 2	Room 208	13.482	19.655	3.000	Vacuum Sock	4.000	Ball	5/11/2011	12:26:00 PM	Wall	Porous	Vertical	FALSE		6	Yes	87.5	27.8
3940	ClO2 Pre-Decon	Floor 2	Room 208	13.562	18.419	3.000	Vacuum Sock	4.000	Ball	5/11/2011	12:12:00 PM	Chair	Porous	Horizontal Upward	FALSE		7	Yes	529.2	ND
2631	ClO2 Pre-Decon	Floor 2	Room 208	12.963	19.865	3.000	Sponge Wipe	0.694	Ball	5/11/2011	12:38:00 PM	File cabinet	Metal	Horizontal Upward	FALSE		2	Yes	18717.9	TNTC
3193	ClO2 Pre-Decon	Floor 2	Room 208	15.270	19.115	3.000	Sponge Wipe	0.694	Ball	5/11/2011	12:18:00 PM	Wall	Textured	Vertical	FALSE		2	Yes	100.8	35.6
2617	ClO2 Pre-Decon	Floor 2	Room 208	14.866	16.839	3.000	Sponge Wipe	0.694	Ball	5/11/2011	12:02:00 PM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	3959.9	ND
2620	ClO2 Pre-Decon	Floor 2	Room 208	13.558	15.174	3.000	Sponge Wipe	0.694	Ball	5/11/2011	11:57:00 AM	Table	Smooth	Horizontal Upward	FALSE		2	Yes	15004.2	TNTC

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1783	ClO2 Pre-Decon	Floor 2	Room 208	12.794	18.799	3.000	Swab	0.028	Ball	5/11/2011	12:05:00 PM	Monitor	Smooth	Inclined	FALSE		1	Yes	3000.8	1530.4
1678	ClO2 Pre-Decon	Floor 2	Room 208	13.816	20.093	3.000	Swab	0.028	Ball	5/11/2011	12:48:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		1	Yes	29408.0	21876.0
3954	ClO2 Pre-Decon	Floor 2	Room 209	14.703	8.642	3.000	Vacuum Sock	4.000	Ball	5/11/2011	1:20:00 PM	Floor	Porous	Horizontal Upward	FALSE	outter bag dropped on floor	7	Yes	133.3	108.7
4228	ClO2 Pre-Decon	Floor 2	Room 209	13.403	10.933	3.000	Vacuum Sock	4.000	Ball	5/11/2011	1:09:00 PM	Floor	Carpet	Horizontal Upward	FALSE		6	Yes	62.5	46.5
4037	ClO2 Pre-Decon	Floor 2	Room 209	14.611	10.995	5.500	Vacuum Sock	4.000	Ball	5/11/2011	1:36:00 PM	Ceiling	Porous	Horizontal Upward	FALSE		7	Yes	962.6	TNTC
2871	ClO2 Pre-Decon	Floor 2	Room 209	12.453	6.781	5.000	Sponge Wipe	0.694	Ball	5/11/2011	1:28:00 PM	Wall	Textured	Vertical	FALSE		1	Yes	18316.1	NA
2763	ClO2 Pre-Decon	Floor 2	Room 209	13.836	7.385	4.000	Sponge Wipe	0.694	Ball	5/11/2011	1:26:00 PM	Table	Smooth	Horizontal Upward	FALSE		2	Yes	16578.6	TNTC
3255	ClO2 Pre-Decon	Floor 2	Room 209	14.761	9.588	4.500	Sponge Wipe	0.694	Ball	5/11/2011	1:17:00 PM	Stove	Paint	Horizontal Upward	FALSE		1	Yes	11358.3	NA
2339	ClO2 Pre-Decon	Floor 2	Room 209	12.812	10.895	4.000	Sponge Wipe	0.694	Ball	5/11/2011	1:12:00 PM	Sink	Metal	Horizontal Upward	FALSE		1	No	ND	NA
2806	ClO2 Pre-Decon	Floor 2	Room 209	14.082	11.964	4.500	Sponge Wipe	0.694	Ball	5/11/2011	1:04:00 PM	Countertop	Smooth	Horizontal Upward	FALSE		2	Yes	15161.7	TNTC
1658	ClO2 Pre-Decon	Floor 2	Room 209	14.402	7.749	5.500	Swab	0.028	Ball	5/11/2011	1:31:00 PM	Supply Vent	Metal	Horizontal Downward	FALSE		1	Yes	91825.0	NA
3879	ClO2 Pre-Decon	Floor 2	Room 210	10.047	15.751	3.000	Vacuum Sock	4.000	Ball	5/11/2011	11:44:00 AM	Ceiling	Porous	Horizontal Upward	FALSE		7	Yes	725.0	TNTC
4225	ClO2 Pre-Decon	Floor 2	Room 210	12.098	19.960	3.000	Vacuum Sock	4.000	Ball	5/11/2011	11:28:00 AM	File cabinet	Metal	Horizontal Upward	FALSE	vacuum around books and on top of books	7	Yes	241.7	190.3
3955	ClO2 Pre-Decon	Floor 2	Room 210	10.680	20.329	3.000	Vacuum Sock	4.000	Ball	5/11/2011	11:16:00 AM	Chair	Porous	Horizontal Upward	FALSE		6	Yes	591.7	ND
4040	ClO2 Pre-Decon	Floor 2	Room 210	10.425	19.634	3.000	Vacuum Sock	4.000	Ball	5/11/2011	11:03:00 AM	Wall	Porous	Vertical	FALSE		7	Yes	166.7	225.4
3930	ClO2 Pre-Decon	Floor 2	Room 210	11.798	15.579	3.000	Vacuum Sock	4.000	Ball	5/11/2011	10:33:00 AM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
3472	ClO2 Pre-Decon	Floor 2	Room 210	12.098	20.542	3.000	Sponge Wipe	0.694	Ball	5/11/2011	11:21:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		2	Yes	9879.9	TNTC
3474	ClO2 Pre-Decon	Floor 2	Room 210	9.701	19.833	3.000	Sponge Wipe	0.694	Ball	5/11/2011	11:09:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		2	Yes	16449.9	TNTC
2978	ClO2 Pre-Decon	Floor 2	Room 210	10.153	14.986	3.000	Sponge Wipe	0.694	Ball	5/11/2011	9:55:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	Yes	ND	2002.2
3466	ClO2 Pre-Decon	Floor 2	Room 210	10.153	16.745	3.000	Sponge Wipe	0.694	Ball	5/11/2011	10:01:00 AM	Floor	Smooth	Horizontal Upward	FALSE		2	Yes	19692.7	TNTC
3470	ClO2 Pre-Decon	Floor 2	Room 210	11.912	15.864	3.000	Sponge Wipe	0.694	Ball	5/11/2011	10:28:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	NA
3468	ClO2 Pre-Decon	Floor 2	Room 210	11.888	14.404	4.000	Sponge Wipe	0.694	Ball	5/11/2011	10:39:00 AM	Wall	Textured	Vertical	FALSE		1	Yes	17.3	18.1
1549	ClO2 Pre-Decon	Floor 2	Room 210	10.836	19.974	3.000	Swab	0.028	Ball	5/11/2011	11:32:00 AM	Supply Vent	Metal	Horizontal Downward	FALSE	some slats bent and not swabbed	1	Yes	40211.0	33309.1
1740	ClO2 Pre-Decon	Floor 2	Room 210	9.663	18.910	3.000	Swab	0.028	Ball	5/11/2011	10:49:00 AM	Monitor	Smooth	Inclined	FALSE	upper right corner	1	Yes	4801.3	1440.4
1544	ClO2 Pre-Decon	Floor 2	Room 210	11.655	15.865	3.000	Swab	0.028	Ball	5/11/2011	10:24:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	NA
4049	ClO2 Pre-Decon	Floor 2	Room 211	10.472	11.885	3.000	Vacuum Sock	4.000	Hearn	5/11/2011	11:44:00 AM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample on right side of door in rm 211.	5	Yes	191.7	102.9
3637	ClO2 Pre-Decon	Floor 2	Room 211	10.822	7.183	3.000	Vacuum Sock	4.000	Hearn	5/11/2011	12:14:00 PM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample 1 ft behind chair on window side of room	5	Yes	95.8	67.3
3632	ClO2 Pre-Decon	Floor 2	Room 211	11.171	10.626	4.000	Vacuum Sock	4.000	Hearn	5/11/2011	12:06:00 PM	Floor	Smooth	Horizontal Upward	TRUE	vacuum blank	2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
4030	ClO2 Pre-Decon	Floor 2	Room 211	10.909	8.232	3.300	Vacuum Sock	4.000	Hearn	5/11/2011	11:59:00 AM	Chair	Cloth	Horizontal Upward	FALSE	vacuum sample taken on cloth chair cushion. chair is on side of room toward window	5	Yes	1570.9	TNTC
3869	ClO2 Pre-Decon	Floor 2	Room 211	11.835	9.403	3.400	Vacuum Sock	4.000	Hearn	5/11/2011	11:55:00 AM	Couch	Cloth	Horizontal Upward	FALSE	vacuum sample taken on couch center cushion	5	Yes	1158.4	TNTC
4056	ClO2 Pre-Decon	Floor 2	Room 211	10.839	11.728	5.900	Vacuum Sock	4.000	Hearn	5/11/2011	12:24:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	topside of ceiling tile vacuum sample . photo taken from window end of room.	5	Yes	908.4	TNTC
2338	ClO2 Pre-Decon	Floor 2	Room 211	9.493	6.256	5.000	Sponge Wipe	0.694	Hearn	5/11/2011	12:20:00 PM	Shelves	Smooth	Horizontal Upward	FALSE	sponge sample on far side of shelves in rear of room	1	No	ND	NA
2060	ClO2 Pre-Decon	Floor 2	Room 211	11.084	10.364	4.000	Sponge Wipe	0.694	Hearn	5/11/2011	12:08:00 PM	Floor	Smooth	Horizontal Upward	TRUE	sponge blank	1	No	ND	NA
2213	ClO2 Pre-Decon	Floor 2	Room 211	9.458	11.378	3.300	Sponge Wipe	0.694	Hearn	5/11/2011	11:47:00 AM	Wall	Paint	Vertical	FALSE	sponge sample on wall . 2 ft from wall on door side of room, 1.5 ft above floor	1	Yes	ND	2.3
1730	ClO2 Pre-Decon	Floor 2	Room 211	11.294	10.487	4.000	Swab	0.028	Hearn	5/11/2011	12:05:00 PM	Chair	Smooth	Horizontal Upward	TRUE	blank swab	1	No	ND	NA
1724	ClO2 Pre-Decon	Floor 2	Room 211	9.913	9.525	3.800	Swab	0.028	Hearn	5/11/2011	11:50:00 AM	Shelves	Paint	Vertical	FALSE	swab on tv screen. upper right corner of screen.	1	Yes	5401.5	5851.6
3880	ClO2 Pre-Decon	Floor 2	Room 212	7.734	15.502	3.100	Vacuum Sock	4.000	Hearn	5/11/2011	9:55:00 AM	Floor	Smooth	Horizontal Upward	TRUE	vacuum blank	2	No	ND	ND
4223	ClO2 Pre-Decon	Floor 2	Room 212	8.363	18.963	5.500	Vacuum Sock	4.000	Hearn	5/11/2011	10:36:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	vacuum top of ceiling tile . picture taken while standing in doorway. sample taken in rear half of ceiling tile	5	Yes	787.5	TNTC
4027	ClO2 Pre-Decon	Floor 2	Room 212	9.115	20.309	4.800	Vacuum Sock	4.000	Hearn	5/11/2011	10:28:00 AM	File cabinet	Porous	Horizontal Upward	FALSE	vacuum top and sides of books/binders on file cabinet	5	Yes	58.3	35.1
4289	ClO2 Pre-Decon	Floor 2	Room 212	7.717	20.413	3.400	Vacuum Sock	4.000	Hearn	5/11/2011	10:23:00 AM	Chair	Cloth	Horizontal Upward	FALSE	vacuum seat of cloth chair	2	Yes	1300.1	TNTC
4127	ClO2 Pre-Decon	Floor 2	Room 212	7.297	19.539	5.000	Vacuum Sock	4.000	Hearn	5/11/2011	10:16:00 AM	Shelves	Metal	Horizontal Upward	FALSE	vacuum top of cloth\metal room partition	2	Yes	75.0	69.6
4038	ClO2 Pre-Decon	Floor 2	Room 212	7.350	18.368	3.600	Vacuum Sock	4.000	Hearn	5/11/2011	10:08:00 AM	Chair	Cloth	Horizontal Upward	FALSE	vacuum sample taken on chair seat	1	Yes	265.0	NA
2274	ClO2 Pre-Decon	Floor 2	Room 212	7.402	15.467	3.100	Sponge Wipe	0.694	Hearn	5/11/2011	9:50:00 AM	Floor	Smooth	Horizontal Upward	TRUE	sponge blank	1	No	ND	NA
2546	ClO2 Pre-Decon	Floor 2	Room 212	9.132	14.750	3.000	Sponge Wipe	0.694	Hearn	5/11/2011	9:47:00 AM	Floor	Smooth	Horizontal Upward	FALSE	directly next to door in middle	1	Yes	27704.6	NA
2807	ClO2 Pre-Decon	Floor 2	Room 212	6.441	16.008	3.200	Sponge Wipe	0.694	Hearn	5/11/2011	9:59:00 AM	Wall	Paint	Vertical	FALSE	vertical sponge. directly left of wall beam.	1	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
2275	ClO2 Pre-Decon	Floor 2	Room 212	8.853	17.652	3.000	Sponge Wipe	0.694	Hearn	5/11/2011	10:42:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample on floor 1 ft from wall and two ft left of outlet	1	Yes	13804.3	NA
3475	ClO2 Pre-Decon	Floor 2	Room 212	6.790	19.539	3.600	Sponge Wipe	0.694	Hearn	5/11/2011	10:20:00 AM	File cabinet	Metal	Horizontal Upward	FALSE	sponge top of file cabinet behind partition. location of sample is front half of file cabinet. see red markings	1	Yes	357106.5	NA
1550	ClO2 Pre-Decon	Floor 2	Room 212	7.542	15.519	3.100	Swab	0.028	Hearn	5/11/2011	9:53:00 AM	Floor	Smooth	Horizontal Upward	TRUE	swab blank taken	1	No	ND	NA
1734	ClO2 Pre-Decon	Floor 2	Room 212	6.790	18.438	4.200	Swab	0.028	Hearn	5/11/2011	10:06:00 AM	Desk	Smooth	Vertical	FALSE	swab upper right hand corner of computer monitor	1	Yes	ND	2610.7
1525	ClO2 Pre-Decon	Floor 2	Room 212	7.769	19.959	5.500	Swab	0.028	Hearn	5/11/2011	10:13:00 AM	Supply Vent	Metal	Horizontal Upward	FALSE	ceiling vent.	1	Yes	39010.6	NA
4246	ClO2 Pre-Decon	Floor 2	Room 213	7.822	8.128	3.300	Vacuum Sock	4.000	Hearn	5/11/2011	11:16:00 AM	Bed	Cloth	Horizontal Upward	FALSE	vacuum sample foot of bed on side closest to door	5	Yes	750.0	TNTC
3881	ClO2 Pre-Decon	Floor 2	Room 213	8.569	8.204	3.000	Vacuum Sock	4.000	Hearn	5/11/2011	11:01:00 AM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample taken at foot of bed. room backwards from picture.	5	Yes	154.2	-249.8
4108	ClO2 Pre-Decon	Floor 2	Room 213	8.123	11.412	3.000	Vacuum Sock	4.000	Hearn	5/11/2011	10:52:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank vacuum	1	No	ND	NA
3950	ClO2 Pre-Decon	Floor 2	Room 213	7.267	10.713	5.900	Vacuum Sock	4.000	Hearn	5/11/2011	11:33:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	ceiling tile vacuum . second tile in from doorway and second in from right of room. see pic taken from doorway. vacuum half of tile furthesr from door	5	Yes	3187.7	TNTC
3877	ClO2 Pre-Decon	Floor 2	Room 213	6.812	11.534	3.000	Vacuum Sock	4.000	Hearn	5/11/2011	10:48:00 AM	Floor	Carpet	Horizontal Upward	FALSE	vacuum sample taken one ft in from doorway	1	Yes	256.5	NA
3537	ClO2 Pre-Decon	Floor 2	Room 213	6.829	8.204	3.300	Vacuum Sock	4.000	Hearn	5/11/2011	11:20:00 AM	Bed	Cloth	Horizontal Upward	FALSE	vacuum sample pillow end of bed on side of room furthest from door	1	Yes	609.2	NA
2480	ClO2 Pre-Decon	Floor 2	Room 213	6.583	6.861	3.800	Sponge Wipe	0.694	Hearn	5/11/2011	11:12:00 AM	Cabinet	Metal	Horizontal Upward	FALSE	horizontal sponge on cabinet next to bed on far side of room	1	No	ND	NA
2395	ClO2 Pre-Decon	Floor 2	Room 213	7.092	5.993	3.500	Sponge Wipe	0.694	Hearn	5/11/2011	11:08:00 AM	Wall	Paint	Vertical	FALSE	vertical sponge 1 ft above floor	1	Yes	192.0	77.8
2477	ClO2 Pre-Decon	Floor 2	Room 213	8.910	10.888	4.000	Sponge Wipe	0.694	Hearn	5/11/2011	10:55:00 AM	Countertop	Smooth	Horizontal Upward	FALSE	sponge sample on countertop. right side of sink	1	Yes	15119.4	NA
2543	ClO2 Pre-Decon	Floor 2	Room 213	6.812	11.534	3.100	Sponge Wipe	0.694	Hearn	5/11/2011	10:51:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank sponge	1	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3497	ClO2 Pre-Decon	Floor 2	Stairwell	23.947	19.617	3.000	Sponge Wipe	0.694	schademann	5/11/2011	3:09:00 PM	Floor	Smooth	Horizontal Upward	FALSE	disregard previous location for 3497 [B. Melton addressed]	7	Yes	218391.8	-1438.5
4106	ClO2 Post-Decon	Floor 1	Bathroom M	26.782	19.911	0.000	Vacuum Sock	4.000	Berendzen	5/16/2011	11:32:00 AM	Ceiling	Porous	Horizontal Upward	FALSE		5	No	ND	ND
2456	ClO2 Post-Decon	Floor 1	Bathroom M	25.964	18.444	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	11:42:00 AM	Floor	Smooth	Horizontal Downward	FALSE		7	No	ND	ND
2516	ClO2 Post-Decon	Floor 1	Bathroom M	26.275	20.701	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	11:29:00 AM	Wall	Smooth	Vertical	FALSE		7	No	ND	ND
3448	ClO2 Post-Decon	Floor 1	Bathroom M	24.723	20.222	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	11:26:00 AM	Floor	Smooth	Horizontal Upward	FALSE		8	No	ND	NA
2403	ClO2 Post-Decon	Floor 1	Bathroom M	24.582	19.121	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	11:48:00 AM	Floor	Smooth	Horizontal Downward	FALSE		7	No	ND	ND
3867	ClO2 Post-Decon	Floor 1	Bathroom W	27.115	15.149	2.700	Vacuum Sock	4.000	Berendzen	5/16/2011	11:12:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	sample taken on plenum side of the ceiling tile	5	No	ND	ND
3454	ClO2 Post-Decon	Floor 1	Bathroom W	25.259	16.751	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	11:18:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor	7	No	ND	ND
3471	ClO2 Post-Decon	Floor 1	Bathroom W	27.093	16.497	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	11:16:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor	7	No	ND	ND
3443	ClO2 Post-Decon	Floor 1	Bathroom W	24.356	14.917	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	11:03:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor in front of room 13	7	No	ND	ND
3455	ClO2 Post-Decon	Floor 1	Bathroom W	25.400	14.579	0.700	Sponge Wipe	0.694	Berendzen	5/16/2011	11:06:00 AM	Wall	Smooth	Vertical	FALSE	sample taken on wall	7	No	ND	ND
4124	ClO2 Post-Decon	Floor 1	Corridor+Lobby	8.281	12.861	2.800	Vacuum Sock	4.000	Berendzen	5/16/2011	9:13:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	sample was taken on hidden surface of ceiling tile	5	No	ND	ND
3625	ClO2 Post-Decon	Floor 1	Corridor+Lobby	16.096	13.519	0.000	Vacuum Sock	4.000	Berendzen	5/16/2011	9:58:00 AM	Ceiling	Porous	Horizontal Upward	FALSE		5	No	ND	ND
4051	ClO2 Post-Decon	Floor 1	Corridor+Lobby	22.804	16.441	2.600	Vacuum Sock	4.000	Berendzen	5/16/2011	10:41:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	sample taken on plenum side of ceiling tile	5	No	ND	ND
4085	ClO2 Post-Decon	Floor 1	Corridor+Lobby	17.307	13.980	0.000	Vacuum Sock	4.000	Berendzen	5/16/2011	10:09:00 AM	Floor	Smooth	Horizontal Downward	TRUE		5	No	ND	ND
4251	ClO2 Post-Decon	Floor 1	Corridor+Lobby	24.331	7.353	0.000	Vacuum Sock	4.000	Berendzen	5/16/2011	3:00:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank	4	No	ND	ND
3442	ClO2 Post-Decon	Floor 1	Corridor+Lobby	13.599	14.092	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	9:39:00 AM	Floor	Smooth	Horizontal Upward	FALSE		7	No	ND	ND
3450	ClO2 Post-Decon	Floor 1	Corridor+Lobby	12.481	12.941	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	9:34:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor	8	No	ND	NA
3437	ClO2 Post-Decon	Floor 1	Corridor+Lobby	8.281	14.138	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	9:19:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor	7	No	ND	ND
3447	ClO2 Post-Decon	Floor 1	Corridor+Lobby	6.078	13.897	2.000	Sponge Wipe	0.694	Berendzen	5/16/2011	8:57:00 AM	Supply Vent	Smooth	Horizontal Upward	FALSE	sample was taken in hvac vent	7	No	ND	ND
3452	ClO2 Post-Decon	Floor 1	Corridor+Lobby	5.081	13.565	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	8:48:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor	1	No	ND	NA
3451	ClO2 Post-Decon	Floor 1	Corridor+Lobby	4.081	13.365	0.600	Sponge Wipe	0.694	Berendzen	5/16/2011	8:44:00 AM	Wall	Smooth	Vertical	FALSE	sample was taken on door	7	No	ND	ND
3438	ClO2 Post-Decon	Floor 1	Corridor+Lobby	22.945	18.299	2.000	Sponge Wipe	0.694	Berendzen	5/16/2011	10:50:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank	8	No	ND	NA
3449	ClO2 Post-Decon	Floor 1	Corridor+Lobby	13.333	16.641	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	9:49:00 AM	Floor	Smooth	Horizontal Upward	FALSE		7	No	ND	ND
3439	ClO2 Post-Decon	Floor 1	Corridor+Lobby	14.336	15.141	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	9:53:00 AM	Floor	Smooth	Horizontal Upward	FALSE		7	No	ND	ND
3469	ClO2 Post-Decon	Floor 1	Corridor+Lobby	23.052	17.397	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	10:47:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor	8	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3446	ClO2 Post-Decon	Floor 1	Corridor+Lobby	21.010	13.516	2.600	Sponge Wipe	0.694	Berendzen	5/16/2011	10:31:00 AM	Supply Vent	Smooth	Horizontal Downward	FALSE	sample taken in hvac	5	No	ND	ND
3440	ClO2 Post-Decon	Floor 1	Corridor+Lobby	19.258	13.106	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	10:19:00 AM	Floor	Smooth	Horizontal Downward	FALSE		7	No	ND	ND
3433	ClO2 Post-Decon	Floor 1	Corridor+Lobby	18.891	14.178	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	10:16:00 AM	Wall	Smooth	Vertical	FALSE		7	No	ND	ND
3435	ClO2 Post-Decon	Floor 1	Corridor+Lobby	18.750	12.909	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	10:13:00 AM	Floor	Smooth	Horizontal Downward	TRUE		7	No	ND	ND
3359	ClO2 Post-Decon	Floor 1	Corridor+Lobby	21.284	12.837	0.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	12:09:00 PM	Floor	Smooth	Horizontal Upward	FALSE	randy collected near wall adjacent to stairs	5	No	ND	ND
3874	ClO2 Post-Decon	Floor 1	Mechanical Room	17.537	19.163	0.000	Vacuum Sock	4.000	Berendzen	5/16/2011	12:07:00 PM	Supply Vent	Textured	Vertical	FALSE		5	No	ND	ND
3465	ClO2 Post-Decon	Floor 1	Mechanical Room	18.665	20.573	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	11:53:00 AM	Floor	Smooth	Horizontal Downward	FALSE	to dark for photo	7	No	ND	ND
2324	ClO2 Post-Decon	Floor 1	Mechanical Room	17.057	18.232	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	12:00:00 PM	Floor	Smooth	Horizontal Downward	FALSE		7	No	ND	ND
3467	ClO2 Post-Decon	Floor 1	Mechanical Room	16.860	19.219	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	12:02:00 PM	Wall	Smooth	Vertical	FALSE	[B.Melton changed barcode from 3465 to 3467]	8	No	ND	ND
3953	ClO2 Post-Decon	Floor 1	Room 101	20.732	11.321	2.800	Vacuum Sock	4.000	Berendzen	5/16/2011	2:18:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	sample taken on plenum side of the ceiling tile	4	No	ND	ND
3463	ClO2 Post-Decon	Floor 1	Room 101	18.733	10.609	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	2:34:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor	2	No	ND	ND
3444	ClO2 Post-Decon	Floor 1	Room 101	16.128	11.933	0.700	Sponge Wipe	0.694	Berendzen	5/16/2011	2:31:00 PM	Wall	Smooth	Vertical	FALSE	sample taken on wall behind swing of door	2	No	ND	ND
3445	ClO2 Post-Decon	Floor 1	Room 101	16.580	11.848	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	2:27:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor in front of door of room 101	2	No	ND	ND
3460	ClO2 Post-Decon	Floor 1	Room 101	21.517	10.974	0.000	Sponge Wipe	0.694	Berendzen	5/16/2011	2:02:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor in door of room 101	2	No	ND	ND
3735	ClO2 Post-Decon	Floor 1	Room 101A	17.022	9.427	0.000	Vacuum Sock	4.000	Lee	5/16/2011	10:30:00 AM	Floor	Carpet	Horizontal Upward	FALSE	carpet fibers caught in hose and sock. included fiber in sample bag.	1	No	ND	NA
3555	ClO2 Post-Decon	Floor 1	Room 101A	20.732	8.327	0.000	Vacuum Sock	4.000	Lee	5/16/2011	11:08:00 AM	Floor	Carpet	Horizontal Upward	FALSE	closed sample bag dropped on floor before taking sample. different fron planned location. skc in the way.	4	No	ND	ND
3872	ClO2 Post-Decon	Floor 1	Room 101A	18.532	7.827	0.000	Vacuum Sock	4.000	Lee	5/16/2011	10:53:00 AM	Floor	Carpet	Horizontal Upward	TRUE	blank	4	No	ND	ND
3430	ClO2 Post-Decon	Floor 1	Room 101A	20.201	9.157	0.594	Sponge Wipe	0.694	Lee	5/16/2011	11:02:00 AM	File cabinet	Smooth	Horizontal Upward	FALSE	about 80 % overlap with predecon sample.tape on corner.	4	No	ND	ND
3428	ClO2 Post-Decon	Floor 1	Room 101A	18.932	8.827	0.892	Sponge Wipe	0.694	Lee	5/16/2011	10:35:00 AM	Desk	Plastic	Vertical	FALSE	vertical sample on uv APS on desk. ridges on box. hard to put sponge flat on surface.	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3426	ClO2 Post-Decon	Floor 1	Room 101A	18.333	9.171	1.097	Sponge Wipe	0.694	Lee	5/16/2011	10:45:00 AM	Desk	Plastic	Horizontal Upward	FALSE	sampling port in corner of template. sticker on uv APS on desk.	4	No	ND	ND
3423	ClO2 Post-Decon	Floor 1	Room 101A	21.452	7.325	0.688	Sponge Wipe	0.694	Lee	5/16/2011	11:24:00 AM	Desk	Smooth	Horizontal Upward	FALSE	sand or something on desk.	4	No	ND	ND
3431	ClO2 Post-Decon	Floor 1	Room 101A	18.332	7.714	0.000	Sponge Wipe	0.694	Lee	5/16/2011	10:58:00 AM	Floor	Carpet	Horizontal Upward	TRUE	blank	4	No	ND	ND
3432	ClO2 Post-Decon	Floor 1	Room 101A	21.332	7.914	0.696	Sponge Wipe	0.694	Lee	5/16/2011	11:17:00 AM	File cabinet	Smooth	Horizontal Upward	FALSE	about 80% overlap with predecon sample.	4	Yes	ND	3.2
3422	ClO2 Post-Decon	Floor 1	Room 101A	21.524	6.256	0.686	Sponge Wipe	0.694	Lee	5/16/2011	11:34:00 AM	Desk	Smooth	Horizontal Upward	FALSE		4	No	ND	ND
3415	ClO2 Post-Decon	Floor 1	Room 101A	20.273	6.147	0.694	Sponge Wipe	0.694	Lee	5/16/2011	11:39:00 AM	Desk	Smooth	Horizontal Upward	FALSE	cord crossing template area.	4	No	ND	ND
3424	ClO2 Post-Decon	Floor 1	Room 101A	19.258	6.546	0.700	Sponge Wipe	0.694	Lee	5/16/2011	11:50:00 AM	Desk	Smooth	Horizontal Upward	FALSE		4	No	ND	ND
3420	ClO2 Post-Decon	Floor 1	Room 101A	17.898	6.219	0.700	Sponge Wipe	0.694	Lee	5/16/2011	12:00:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	about 80% overlap with predecon sample. little bit of rust.	4	No	ND	ND
3425	ClO2 Post-Decon	Floor 1	Room 101A	21.887	6.763	0.692	Sponge Wipe	0.694	Lee	5/16/2011	11:32:00 AM	Desk	Smooth	Horizontal Upward	FALSE	outer bag dropped on floor.	4	No	ND	ND
3736	ClO2 Post-Decon	Floor 1	Room 102	19.217	15.530	0.000	Vacuum Sock	4.000	Lee	5/16/2011	12:11:00 PM	Floor	Carpet	Horizontal Upward	FALSE		1	No	ND	NA
3731	ClO2 Post-Decon	Floor 1	Room 102	19.606	16.483	0.000	Vacuum Sock	4.000	Lee	5/16/2011	12:19:00 PM	Floor	Carpet	Horizontal Upward	FALSE	black cord cover crossing template.	1	No	ND	NA
3742	ClO2 Post-Decon	Floor 1	Room 102	18.117	15.518	0.000	Vacuum Sock	4.000	Lee	5/16/2011	12:30:00 PM	Floor	Carpet	Horizontal Upward	FALSE	black cord cover crossing template.	1	No	ND	NA
3747	ClO2 Post-Decon	Floor 1	Room 102	18.632	16.034	0.000	Vacuum Sock	4.000	Lee	5/16/2011	12:33:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank. inner bag folded sideways. removed and straightened.	1	No	ND	NA
3405	ClO2 Post-Decon	Floor 1	Room 102	18.938	16.857	0.700	Sponge Wipe	0.694	Lee	5/16/2011	1:32:00 PM	Desk	Smooth	Horizontal Upward	FALSE		4	No	ND	ND
3417	ClO2 Post-Decon	Floor 1	Room 102	17.989	17.142	0.700	Sponge Wipe	0.694	Lee	5/16/2011	1:19:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	about 80% overlap with predecon sample. lots of rust.	4	No	ND	ND
3410	ClO2 Post-Decon	Floor 1	Room 102	19.992	16.899	0.700	Sponge Wipe	0.694	Lee	5/16/2011	1:44:00 PM	Desk	Smooth	Horizontal Upward	FALSE		4	No	ND	ND
3407	ClO2 Post-Decon	Floor 1	Room 102	20.583	16.224	0.000	Sponge Wipe	0.694	Lee	5/16/2011	12:44:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	about 80% overlap with predecon sample	4	No	ND	ND
3427	ClO2 Post-Decon	Floor 1	Room 102	18.811	15.929	0.000	Sponge Wipe	0.694	Lee	5/16/2011	12:37:00 PM	Floor	Carpet	Horizontal Upward	TRUE	blank	4	No	ND	ND
3414	ClO2 Post-Decon	Floor 1	Room 102	19.149	16.688	0.600	Sponge Wipe	0.694	Lee	5/16/2011	1:46:00 PM	Desk	Smooth	Horizontal Upward	FALSE	inside desk drawer.	4	No	ND	ND
3419	ClO2 Post-Decon	Floor 1	Room 102	19.507	15.106	1.100	Sponge Wipe	0.694	Lee	5/16/2011	12:53:00 PM	Desk	Plastic	Horizontal Upward	FALSE	uv APS on desk. ridges on box. little white stuff on box.	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3421	ClO2 Post-Decon	Floor 1	Room 102	18.516	15.022	1.100	Sponge Wipe	0.694	Lee	5/16/2011	12:59:00 PM	Desk	Plastic	Horizontal Upward	FALSE	uv APS on desk. lots of white stuff. ridges on box . missing some area because of handle depression	4	No	ND	ND
3418	ClO2 Post-Decon	Floor 1	Room 102	18.231	15.033	0.700	Sponge Wipe	0.694	Lee	5/16/2011	1:06:00 PM	Desk	Smooth	Horizontal Upward	FALSE	sticker residue. some white stuff on desk.	4	No	ND	ND
3416	ClO2 Post-Decon	Floor 1	Room 102	16.913	15.792	0.700	Sponge Wipe	0.694	Lee	5/16/2011	1:11:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	about 80% overlap with predecon sample. little bit of rust.	4	No	ND	ND
3412	ClO2 Post-Decon	Floor 1	Room 102	18.431	17.363	0.700	Sponge Wipe	0.694	Lee	5/16/2011	1:29:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	about 80% overlap with predecon sample. moderate rust.	4	No	ND	ND
4068	ClO2 Post-Decon	Floor 1	Room 103	14.704	9.864	0.000	Vacuum Sock	4.000	Chong	5/16/2011	3:12:00 PM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	ND
3750	ClO2 Post-Decon	Floor 1	Room 103	14.609	10.584	2.500	Vacuum Sock	4.000	Chong	5/16/2011	3:35:00 PM	Ceiling	Porous	Horizontal Downward	FALSE		1	No	ND	ND
3406	ClO2 Post-Decon	Floor 1	Room 103	13.625	7.574	0.686	Sponge Wipe	0.694	Chong	5/16/2011	3:24:00 PM	Table	Smooth	Horizontal Upward	FALSE		1	No	ND	ND
3401	ClO2 Post-Decon	Floor 1	Room 103	13.208	7.669	1.584	Sponge Wipe	0.694	Chong	5/16/2011	3:28:00 PM	Mail slot	Metal	Horizontal Upward	FALSE	top of mail slot	1	No	ND	ND
3409	ClO2 Post-Decon	Floor 1	Room 103	13.719	6.779	0.581	Sponge Wipe	0.694	Chong	5/16/2011	3:22:00 PM	Table	Smooth	Horizontal Upward	FALSE		1	No	ND	ND
3400	ClO2 Post-Decon	Floor 1	Room 103	13.322	6.249	0.000	Sponge Wipe	0.694	Chong	5/16/2011	3:20:00 PM	Floor	Smooth	Horizontal Upward	FALSE		1	No	ND	ND
3411	ClO2 Post-Decon	Floor 1	Room 103	14.212	9.751	0.000	Sponge Wipe	0.694	Chong	5/16/2011	3:08:00 PM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	ND
3403	ClO2 Post-Decon	Floor 1	Room 103	14.485	6.104	1.085	Sponge Wipe	0.694	Chong	5/16/2011	2:58:00 PM	Wall	Smooth	Vertical	FALSE		1	No	ND	ND
3408	ClO2 Post-Decon	Floor 1	Room 103	15.739	7.092	0.000	Sponge Wipe	0.694	Chong	5/16/2011	2:53:00 PM	Floor	Smooth	Horizontal Upward	FALSE		1	No	ND	ND
3402	ClO2 Post-Decon	Floor 1	Room 103	15.390	11.988	0.000	Sponge Wipe	0.694	Chong	5/16/2011	2:41:00 PM	Floor	Smooth	Horizontal Upward	FALSE		1	No	ND	ND
1657	ClO2 Post-Decon	Floor 1	Room 103	14.458	9.561	0.000	Swab	0.028	Chong	5/16/2011	3:10:00 PM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
1514	ClO2 Post-Decon	Floor 1	Room 103	14.402	6.680	2.500	Swab	0.028	Chong	5/16/2011	3:01:00 PM	Supply Vent	Smooth	Horizontal Upward	FALSE		7	No	ND	ND
3617	ClO2 Post-Decon	Floor 1	Room 104	16.385	19.583	0.000	Vacuum Sock	4.000	Jordan	5/16/2011	2:29:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	ceiling tile vacuum	4	No	ND	ND
4067	ClO2 Post-Decon	Floor 1	Room 104	15.491	19.104	1.300	Vacuum Sock	4.000	Jordan	5/16/2011	1:51:00 PM	Desk	Smooth	Horizontal Upward	TRUE	blank taken	4	No	ND	ND
3384	ClO2 Post-Decon	Floor 1	Room 104	15.763	19.298	1.300	Sponge Wipe	0.694	Jordan	5/16/2011	1:53:00 PM	Desk	Smooth	Horizontal Upward	TRUE	blank taken	2	No	ND	ND
3368	ClO2 Post-Decon	Floor 1	Room 104	13.691	19.311	0.000	Sponge Wipe	0.694	Jordan	5/16/2011	2:06:00 PM	Floor	Textured	Horizontal Upward	FALSE	sponge sample on floor	2	No	ND	ND
3389	ClO2 Post-Decon	Floor 1	Room 104	15.232	20.127	1.100	Sponge Wipe	0.694	Jordan	5/16/2011	2:13:00 PM	Desk	Textured	Horizontal Upward	FALSE	sponge sample on wooden table	2	No	ND	ND
3387	ClO2 Post-Decon	Floor 1	Room 104	15.724	20.723	1.200	Sponge Wipe	0.694	Jordan	5/16/2011	2:26:00 PM	Wall	Textured	Vertical	FALSE	sponge sample on wall above previous sample	2	No	ND	ND
3397	ClO2 Post-Decon	Floor 1	Room 104	15.815	20.114	1.100	Sponge Wipe	0.694	Jordan	5/16/2011	2:17:00 PM	Desk	Textured	Horizontal Upward	FALSE	sponge sample on wooden table	2	No	ND	ND
3379	ClO2 Post-Decon	Floor 1	Room 104	15.232	18.275	1.000	Sponge Wipe	0.694	Jordan	5/16/2011	1:46:00 PM	Desk	Smooth	Horizontal Upward	FALSE	sponge sample on table	2	No	ND	ND
1744	ClO2 Post-Decon	Floor 1	Room 104	15.167	19.311	1.300	Swab	0.028	Jordan	5/16/2011	1:57:00 PM	Desk	Smooth	Horizontal Upward	TRUE	blank taken	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
1541	ClO2 Post-Decon	Floor 1	Room 104	14.934	19.635	0.000	Swab	0.028	Jordan	5/16/2011	2:02:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	diffuser	7	No	ND	ND
3729	ClO2 Post-Decon	Floor 1	Room 105	10.565	6.857	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	4:13:00 PM	Floor	Carpet	Horizontal Upward	FALSE		1	No	ND	ND
3745	ClO2 Post-Decon	Floor 1	Room 105	10.917	9.044	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	3:49:00 PM	Floor	Carpet	Horizontal Upward	FALSE		2	No	ND	ND
3619	ClO2 Post-Decon	Floor 1	Room 105	11.786	11.059	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	3:35:00 PM	Floor	Carpet	Horizontal Upward	FALSE		4	Yes	ND	0.6
3904	ClO2 Post-Decon	Floor 1	Room 105	10.477	12.070	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	3:14:00 PM	Floor	Carpet	Horizontal Upward	FALSE		1	No	ND	ND
4066	ClO2 Post-Decon	Floor 1	Room 105	10.958	7.238	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	4:27:00 PM	Ceiling	Porous	Horizontal Downward	FALSE		1	No	ND	ND
3395	ClO2 Post-Decon	Floor 1	Room 105	11.967	6.846	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	4:03:00 PM	Table	Smooth	Horizontal Upward	FALSE		4	No	ND	ND
3394	ClO2 Post-Decon	Floor 1	Room 105	10.345	9.638	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	3:56:00 PM	Stove	Metal	Horizontal Upward	FALSE		4	No	ND	ND
3398	ClO2 Post-Decon	Floor 1	Room 105	12.481	10.947	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	3:40:00 PM	Sink	Metal	Horizontal Upward	FALSE		1	No	ND	ND
3396	ClO2 Post-Decon	Floor 1	Room 105	9.981	11.059	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	3:28:00 PM	Wall	Textured	Vertical	FALSE		4	No	ND	ND
1674	ClO2 Post-Decon	Floor 1	Room 105	11.731	6.408	0.000	Swab	0.028	Kuberacki	5/16/2011	4:17:00 PM	Return Vent	Metal	Inclined	FALSE	sample taken on diffuser	7	No	ND	ND
3732	ClO2 Post-Decon	Floor 1	Room 106	12.556	18.865	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	1:16:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	ceiling title. up faceing side	1	No	ND	NA
3846	ClO2 Post-Decon	Floor 1	Room 106	11.058	19.660	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	12:58:00 PM	Wall	Cloth	Vertical	FALSE	partition wall on window side. lower middle .	1	No	ND	NA
3730	ClO2 Post-Decon	Floor 1	Room 106	11.272	20.470	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	12:52:00 PM	Chair	Carpet	Horizontal Upward	FALSE		1	No	ND	NA
3885	ClO2 Post-Decon	Floor 1	Room 106	12.648	20.119	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	12:46:00 PM	File cabinet	Porous	Horizontal Upward	FALSE	books on desk	1	No	ND	NA
3755	ClO2 Post-Decon	Floor 1	Room 106	11.058	18.468	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	12:31:00 PM	Chair	Cloth	Horizontal Upward	FALSE		1	No	ND	NA
3365	ClO2 Post-Decon	Floor 1	Room 106	9.988	16.175	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	12:07:00 PM	Wall	Textured	Vertical	FALSE		1	No	ND	NA
3372	ClO2 Post-Decon	Floor 1	Room 106	10.477	14.876	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	11:53:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	No	ND	NA
3370	ClO2 Post-Decon	Floor 1	Room 106	12.388	15.365	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	12:03:00 PM	Table	Smooth	Horizontal Upward	FALSE		1	No	ND	NA
3363	ClO2 Post-Decon	Floor 1	Room 106	10.171	19.905	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	1:04:00 PM	File cabinet	Metal	Horizontal Upward	FALSE		4	No	ND	ND
3373	ClO2 Post-Decon	Floor 1	Room 106	10.691	18.422	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	12:22:00 PM	Desk	Smooth	Horizontal Upward	FALSE		1	No	ND	NA
1572	ClO2 Post-Decon	Floor 1	Room 106	11.257	19.889	0.000	Swab	0.028	Kuberacki	5/16/2011	1:07:00 PM	Return Vent	Metal	Horizontal Downward	FALSE		7	No	ND	ND
1613	ClO2 Post-Decon	Floor 1	Room 106	10.340	18.437	0.000	Swab	0.028	Kuberacki	5/16/2011	12:26:00 PM	Monitor	Glass	Inclined	FALSE		7	No	ND	ND
3758	ClO2 Post-Decon	Floor 1	Room 107	7.921	11.970	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	11:41:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	top of ceiling tile	1	No	ND	NA
3615	ClO2 Post-Decon	Floor 1	Room 107	8.465	8.382	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	11:10:00 AM	Chair	Cloth	Horizontal Upward	FALSE	only left and right pattern in one direction completed	1	No	ND	NA
3757	ClO2 Post-Decon	Floor 1	Room 107	9.104	6.428	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	11:01:00 AM	Floor	Carpet	Horizontal Upward	TRUE		1	No	ND	NA
4016	ClO2 Post-Decon	Floor 1	Room 107	9.345	12.170	0.000	Vacuum Sock	4.000	Kuberacki	5/16/2011	10:33:00 AM	Floor	Carpet	Horizontal Upward	FALSE	floor at door entrance	1	No	ND	NA
3364	ClO2 Post-Decon	Floor 1	Room 107	8.656	9.754	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	10:46:00 AM	Floor	Smooth	Horizontal Upward	FALSE	center left on table as you enter room.	1	No	ND	NA
2211	ClO2 Post-Decon	Floor 1	Room 107	7.733	12.345	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	11:47:00 AM	Wall	Textured	Vertical	FALSE		1	No	ND	NA

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3391	ClO2 Post-Decon	Floor 1	Room 107	7.113	6.729	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	11:27:00 AM	Shelves	Smooth	Horizontal Upward	FALSE		1	No	ND	NA
3385	ClO2 Post-Decon	Floor 1	Room 107	9.160	6.616	0.000	Sponge Wipe	0.694	Kuberacki	5/16/2011	10:50:00 AM	Floor	Carpet	Horizontal Upward	TRUE		1	No	ND	NA
1568	ClO2 Post-Decon	Floor 1	Room 107	8.221	6.522	0.000	Swab	0.028	Kuberacki	5/16/2011	11:33:00 AM	Return Vent	Smooth	Horizontal Downward	FALSE	air vent diffuser blades	7	No	ND	ND
1612	ClO2 Post-Decon	Floor 1	Room 107	7.395	9.772	0.000	Swab	0.028	Kuberacki	5/16/2011	11:14:00 AM	Monitor	Glass	Vertical	FALSE	upper middle of screen	7	No	ND	ND
1569	ClO2 Post-Decon	Floor 1	Room 107	9.254	6.729	0.000	Swab	0.028	Kuberacki	5/16/2011	10:54:00 AM	Floor	Carpet	Horizontal Upward	TRUE		7	No	ND	ND
3751	ClO2 Post-Decon	Floor 1	Room 108	8.949	18.917	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	3:52:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	vacuum from ceiling tile	2	No	ND	ND
4070	ClO2 Post-Decon	Floor 1	Room 108	9.653	20.136	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	3:44:00 PM	File cabinet	Porous	Horizontal Upward	FALSE	vacuum from books	2	No	ND	ND
4071	ClO2 Post-Decon	Floor 1	Room 108	8.270	20.475	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	3:34:00 PM	Chair	Porous	Horizontal Upward	FALSE	vacuum from chair	2	No	ND	ND
3887	ClO2 Post-Decon	Floor 1	Room 108	7.985	19.508	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	3:29:00 PM	Wall	Porous	Vertical	FALSE	vacuum from partition	2	No	ND	ND
3724	ClO2 Post-Decon	Floor 1	Room 108	7.998	18.490	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	3:21:00 PM	Chair	Porous	Horizontal Upward	FALSE	vacuum from chair	1	No	ND	ND
3739	ClO2 Post-Decon	Floor 1	Room 108	8.641	15.987	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	2:49:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank vacuum	2	No	ND	ND
3378	ClO2 Post-Decon	Floor 1	Room 108	9.653	20.513	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	3:37:00 PM	File cabinet	Metal	Horizontal Upward	FALSE	sponge stick left side of file cabinet	4	No	ND	ND
3380	ClO2 Post-Decon	Floor 1	Room 108	9.420	17.370	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	2:58:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick from floor	4	No	ND	ND
3371	ClO2 Post-Decon	Floor 1	Room 108	8.528	16.251	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	2:48:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank sponge stick	4	No	ND	ND
3390	ClO2 Post-Decon	Floor 1	Room 108	8.917	14.567	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	2:41:00 PM	Wall	Textured	Vertical	FALSE	vertical sponge stick	4	No	ND	ND
3375	ClO2 Post-Decon	Floor 1	Room 108	7.509	14.705	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	2:32:00 PM	Floor	Smooth	Horizontal Upward	FALSE	entrance	4	No	ND	ND
3361	ClO2 Post-Decon	Floor 1	Room 108	7.245	18.225	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	3:02:00 PM	Desk	Smooth	Horizontal Upward	FALSE	back middle of desktop	4	No	ND	ND
1512	ClO2 Post-Decon	Floor 1	Room 108	8.873	19.570	0.000	Swab	0.028	Ricks	5/16/2011	3:41:00 PM	Return Vent	Metal	Horizontal Downward	FALSE	swab from return vent	7	No	ND	ND
1488	ClO2 Post-Decon	Floor 1	Room 108	7.409	18.678	0.000	Swab	0.028	Ricks	5/16/2011	3:07:00 PM	Monitor	Smooth	Vertical	FALSE	bottom right of monitor	7	No	ND	ND
1615	ClO2 Post-Decon	Floor 1	Room 108	8.415	15.837	0.000	Swab	0.028	Ricks	5/16/2011	2:45:00 PM	Floor	Smooth	Horizontal Upward	TRUE	blank swab	7	No	ND	ND
3657	ClO2 Post-Decon	Floor 1	Room 109	6.105	11.964	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	9:52:00 AM	Floor	Carpet	Horizontal Upward	FALSE	floor in front of door	2	No	ND	ND
3727	ClO2 Post-Decon	Floor 1	Room 109	5.537	7.901	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	10:57:00 AM	Bed	Cloth	Horizontal Downward	FALSE	l side top of mattress at foot end	2	No	ND	ND
3624	ClO2 Post-Decon	Floor 1	Room 109	4.110	8.715	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	10:50:00 AM	Bed	Cloth	Horizontal Downward	FALSE		1	No	ND	ND
4017	ClO2 Post-Decon	Floor 1	Room 109	5.437	9.674	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	10:32:00 AM	Nightstand	Smooth	Horizontal Upward	TRUE	blank vacuum sample	1	No	ND	ND
3733	ClO2 Post-Decon	Floor 1	Room 109	4.957	11.139	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	10:06:00 AM	Floor	Carpet	Horizontal Upward	FALSE	floor in front of l side of sink	2	No	ND	ND
3651	ClO2 Post-Decon	Floor 1	Room 109	6.351	6.624	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	11:19:00 AM	Ceiling	Smooth	Horizontal Upward	FALSE	back side of ceiling tile to left of window. window parallel to bed	1	No	ND	ND
3367	ClO2 Post-Decon	Floor 1	Room 109	5.102	6.133	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	11:13:00 AM	Wall	Smooth	Vertical	FALSE	center of wall under window	4	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3360	ClO2 Post-Decon	Floor 1	Room 109	4.154	6.914	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	11:08:00 AM	Nightstand	Smooth	Horizontal Upward	TRUE	night stand between bed and window number 2	4	No	ND	ND
3393	ClO2 Post-Decon	Floor 1	Room 109	5.570	9.964	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	10:30:00 AM	Nightstand	Smooth	Horizontal Upward	TRUE	blank sponge stick	4	No	ND	ND
3381	ClO2 Post-Decon	Floor 1	Room 109	4.344	12.265	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	9:58:00 AM	Countertop	Smooth	Horizontal Upward	FALSE	r side of sink on counter surface	4	No	ND	ND
3377	ClO2 Post-Decon	Floor 1	Room 109	4.288	10.961	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	10:01:00 AM	Countertop	Smooth	Horizontal Upward	FALSE	l side of sink on coounter surface	4	No	ND	ND
3784	ClO2 Post-Decon	Floor 1	Room 110	5.111	15.259	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	11:35:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	ND
3543	ClO2 Post-Decon	Floor 1	Room 110	5.226	20.479	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	12:15:00 PM	Chair	Porous	Horizontal Upward	FALSE	chair under window at far wall opposite of entry	1	No	ND	ND
3761	ClO2 Post-Decon	Floor 1	Room 110	6.093	15.162	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	12:35:00 PM	Ceiling	Smooth	Horizontal Upward	FALSE	ceiling tile above door	1	No	ND	ND
3756	ClO2 Post-Decon	Floor 1	Room 110	6.551	20.577	0.000	Vacuum Sock	0.070	Ricks	5/16/2011	12:20:00 PM	File cabinet	Textured	Horizontal Upward	FALSE	top and around books on file cabinet [B.Melton changed to vac]	2	No	ND	ND
4107	ClO2 Post-Decon	Floor 1	Room 110	4.981	19.628	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	12:11:00 PM	Wall	Porous	Vertical	FALSE	far side of partition facing window on wall opposite of entry	2	No	ND	ND
3987	ClO2 Post-Decon	Floor 1	Room 110	4.964	18.483	0.000	Vacuum Sock	4.000	Ricks	5/16/2011	11:53:00 AM	Chair	Porous	Horizontal Upward	FALSE	chair in front of desk [B.Melton changed barcode from 3$87 to 3577] [B.Melton changed again to 3987]	2	No	ND	ND
2625	ClO2 Post-Decon	Floor 1	Room 110	5.897	14.507	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	11:27:00 AM	Floor	Smooth	Horizontal Upward	FALSE	inside front of room entry on floor	4	No	ND	ND
3343	ClO2 Post-Decon	Floor 1	Room 110	4.457	17.927	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	11:58:00 AM	Desk	Smooth	Horizontal Upward	FALSE	l side of desk in front of printer	4	No	ND	ND
3354	ClO2 Post-Decon	Floor 1	Room 110	6.240	16.504	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	11:47:00 AM	Floor	Smooth	Horizontal Upward	FALSE	floor center of room	4	No	ND	ND
3351	ClO2 Post-Decon	Floor 1	Room 110	3.934	16.455	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	11:43:00 AM	Wall	Smooth	Vertical	FALSE	wall under first window on left	4	No	ND	ND
2626	ClO2 Post-Decon	Floor 1	Room 110	5.291	15.472	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	11:40:00 AM	Floor	Smooth	Horizontal Upward	TRUE		4	No	ND	ND
3336	ClO2 Post-Decon	Floor 1	Room 110	6.600	19.971	0.000	Sponge Wipe	0.694	Ricks	5/16/2011	12:26:00 PM	File cabinet	Smooth	Horizontal Upward	FALSE	top r of file cabinet	4	Yes	ND	3.4
1490	ClO2 Post-Decon	Floor 1	Room 110	5.618	19.595	0.000	Swab	0.028	Ricks	5/16/2011	12:29:00 PM	Supply Vent	Smooth	Horizontal Downward	FALSE	vent in ceiling above partition	7	No	ND	ND
1741	ClO2 Post-Decon	Floor 1	Room 110	4.261	18.548	0.000	Swab	0.028	Ricks	5/16/2011	12:01:00 PM	Monitor	Smooth	Inclined	FALSE	bottom right of computer monitor	7	No	ND	ND
1743	ClO2 Post-Decon	Floor 1	Room 110	4.735	15.226	0.000	Swab	0.028	Ricks	5/16/2011	11:37:00 AM	Floor	Smooth	Horizontal Upward	TRUE		7	No	ND	ND
3726	ClO2 Post-Decon	Floor 2	Bathroom M	27.896	19.554	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	2:18:00 PM	Ceiling	Porous	Horizontal Upward	FALSE	vacuum sample of ceiling tile.	4	No	ND	ND
3350	ClO2 Post-Decon	Floor 2	Bathroom M	28.832	20.727	3.200	Sponge Wipe	0.694	Schaedemann	5/16/2011	2:10:00 PM	Wall	Smooth	Vertical	FALSE	stick sample on wall adjacent to pre sample.	2	No	ND	ND
2932	ClO2 Post-Decon	Floor 2	Bathroom M	28.795	20.487	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	2:04:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick sample on floor. could not locate pre sample.	2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3362	ClO2 Post-Decon	Floor 2	Bathroom M	26.534	19.583	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	2:00:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick sample on floor. could not locate pre sample.	2	No	ND	ND
3743	ClO2 Post-Decon	Floor 2	Bathroom W	28.600	16.490	3.000	Vacuum Sock	4.000	Schaedemann	5/16/2011	11:43:00 AM	Floor	Smooth	Horizontal Upward	TRUE	vacume blank taken by randy	4	No	ND	ND
3749	ClO2 Post-Decon	Floor 2	Bathroom W	28.339	17.346	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	11:55:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	randy collected near center of room	4	No	ND	ND
3392	ClO2 Post-Decon	Floor 2	Bathroom W	29.006	17.433	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	11:45:00 AM	Floor	Smooth	Horizontal Upward	TRUE	randy collected blank sponge stick	2	No	ND	ND
3358	ClO2 Post-Decon	Floor 2	Bathroom W	28.890	17.810	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	11:49:00 AM	Floor	Smooth	Horizontal Upward	FALSE	randy collected near stall wall	2	No	ND	ND
3347	ClO2 Post-Decon	Floor 2	Bathroom W	26.309	16.331	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	11:39:00 AM	Floor	Smooth	Horizontal Upward	FALSE	randy collected in doorway on left	1	No	ND	ND
2884	ClO2 Post-Decon	Floor 2	Copier Room	28.736	14.205	3.250	Sponge Wipe	0.694	Schaedemann	5/16/2011	11:18:00 AM	Wall	Textured	Vertical	FALSE	randy collected in between sockets	2	No	ND	ND
2703	ClO2 Post-Decon	Floor 2	Copier Room	30.005	13.459	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	11:14:00 AM	Floor	Textured	Horizontal Upward	FALSE	randy collected near back wall center	2	No	ND	ND
3453	ClO2 Post-Decon	Floor 2	Copier Room	27.699	13.993	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	11:11:00 AM	Floor	Textured	Horizontal Upward	FALSE	randy collected under door stop	2	No	ND	ND
4069	ClO2 Post-Decon	Floor 2	Hallway	25.379	16.089	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	9:55:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	vacuum sample on ceiling tile on opposite half of pre sample.	2	No	ND	ND
3536	ClO2 Post-Decon	Floor 2	Hallway	21.407	13.467	4.000	Vacuum Sock	4.000	Schaedemann	5/16/2011	9:28:00 AM	Ceiling	Porous	Horizontal Upward	TRUE	vacuum sample blank.	2	No	ND	ND
4055	ClO2 Post-Decon	Floor 2	Hallway	10.793	13.158	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	8:58:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	vacuum sample of top side of ceiling tile.	2	No	ND	ND
3748	ClO2 Post-Decon	Floor 2	Hallway	19.337	12.958	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	9:21:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	vacuum sample from ceiling adjacent to pre sample.	2	No	ND	ND
3328	ClO2 Post-Decon	Floor 2	Hallway	20.748	13.310	4.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:26:00 AM	Ceiling	Porous	Horizontal Upward	TRUE	sponge stick sample, blank.	2	No	ND	ND
2754	ClO2 Post-Decon	Floor 2	Hallway	26.040	17.860	3.200	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:50:00 AM	Wall	Smooth	Vertical	FALSE	sponge stick sample on wall adjacent to pre sample.	1	No	ND	ND
2757	ClO2 Post-Decon	Floor 2	Hallway	25.397	18.267	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:46:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick sample on floor adjacent to pre sample immediately adjacent to airlock.	1	No	ND	ND
3346	ClO2 Post-Decon	Floor 2	Hallway	25.422	14.643	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:42:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick sample on floor adjacent to pre sample.	1	No	ND	ND
3340	ClO2 Post-Decon	Floor 2	Hallway	22.623	13.543	5.800	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:38:00 AM	Return Vent	Metal	Vertical	FALSE	sponge stick sample on return vent on hallway side.	1	No	ND	ND
3341	ClO2 Post-Decon	Floor 2	Hallway	21.764	13.627	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:33:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick sample on floor adjacent to pre sample.	1	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3329	ClO2 Post-Decon	Floor 2	Hallway	6.993	13.376	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	8:43:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick sample on floor.	1	No	ND	ND
3326	ClO2 Post-Decon	Floor 2	Hallway	10.993	13.558	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	8:49:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick sample on floor.	1	No	ND	ND
3330	ClO2 Post-Decon	Floor 2	Hallway	7.593	13.158	5.800	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:06:00 AM	Return Vent	Metal	Vertical	FALSE	sponge stick sample on return vent on hallway side.	1	No	ND	ND
3327	ClO2 Post-Decon	Floor 2	Hallway	17.893	13.768	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:15:00 AM	Floor	Smooth	Horizontal Downward	FALSE	sponge stick sample on floor adjacent to pre sample.	1	No	ND	ND
3335	ClO2 Post-Decon	Floor 2	Hallway	13.565	12.474	3.200	Sponge Wipe	0.694	Schaedemann	5/16/2011	9:10:00 AM	Wall	Smooth	Vertical	FALSE	sponge stick sample on wall adjacent to pre sample.	1	No	ND	ND
4074	ClO2 Post-Decon	Floor 2	Janitor Closet	29.155	15.076	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	11:36:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	randy collected near center of room	2	No	ND	ND
3383	ClO2 Post-Decon	Floor 2	Janitor Closet	28.633	14.974	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	11:27:00 AM	Floor	Smooth	Horizontal Upward	FALSE	randy collected in center of room . trouble finding sample location .	1	No	ND	ND
3344	ClO2 Post-Decon	Floor 2	Janitor Closet	26.965	14.829	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	11:22:00 AM	Floor	Smooth	Horizontal Upward	FALSE	randy collected in doorway rm 24	2	No	ND	ND
4135	ClO2 Post-Decon	Floor 2	Mechanical Room	19.074	19.178	3.796	Vacuum Sock	4.000	Schaedemann	5/16/2011	2:34:00 PM	Return Vent	Porous	Horizontal Downward	FALSE	vacuum sample of return furnace filter. opposite half from pre sample.	2	No	ND	ND
2879	ClO2 Post-Decon	Floor 2	Mechanical Room	19.090	20.157	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	2:28:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sponge stick sample on floor adjacent to pre sample.	1	No	ND	ND
3334	ClO2 Post-Decon	Floor 2	Mechanical Room	22.521	19.002	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	2:24:00 PM	Floor	Smooth	Horizontal Downward	FALSE	sponge stick sample on floor adjacent to pre sample.	1	No	ND	ND
3661	ClO2 Post-Decon	Floor 2	Room 201	26.931	11.249	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	10:41:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	randy collected ceiling tile vacuum sample	2	No	ND	ND
3459	ClO2 Post-Decon	Floor 2	Room 201	29.364	10.720	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:33:00 AM	Floor	Smooth	Horizontal Downward	FALSE	randy collected near window	1	No	ND	ND
3355	ClO2 Post-Decon	Floor 2	Room 201	26.329	12.008	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:28:00 AM	Floor	Smooth	Horizontal Downward	FALSE	randy collected in doorway	1	No	ND	ND
4072	ClO2 Post-Decon	Floor 2	Room 201A	28.658	7.476	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	11:06:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	randy collected from ceiling tile near center of room	4	No	ND	ND
3376	ClO2 Post-Decon	Floor 2	Room 201A	26.336	6.626	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:50:00 AM	Floor	Smooth	Horizontal Downward	FALSE	randy collected in far right corner	2	No	ND	ND
3374	ClO2 Post-Decon	Floor 2	Room 201A	26.540	9.341	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:46:00 AM	Floor	Smooth	Horizontal Downward	FALSE	randy collected in doorway 201a	2	No	ND	ND
3462	ClO2 Post-Decon	Floor 2	Room 201A	29.133	6.053	3.250	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:58:00 AM	Wall	Textured	Vertical	FALSE	randy collected near window on far side under window	2	No	ND	ND
2821	ClO2 Post-Decon	Floor 2	Room 201A	29.787	7.346	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:54:00 AM	Floor	Smooth	Horizontal Downward	FALSE	randy collected near window on left of room	2	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3342	ClO2 Post-Decon	Floor 2	Room 202	22.278	17.445	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:03:00 AM	Floor	Smooth	Horizontal Downward	FALSE	sponge stick sample on floor adjacent to pre sample.	1	No	ND	ND
3339	ClO2 Post-Decon	Floor 2	Room 202	21.801	15.061	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:00:00 AM	Floor	Smooth	Horizontal Downward	FALSE	sponge stick sample on floor adjacent to pre sample	1	No	ND	ND
3890	ClO2 Post-Decon	Floor 2	Room 203	24.449	10.149	5.800	Vacuum Sock	4.000	Harvey	5/16/2011	12:23:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	vacuum sample on top of tile. tile is to right of entrance to room 203a. 1 tile to left of door way to 203a. 3	7	No	ND	ND
3436	ClO2 Post-Decon	Floor 2	Room 203	23.736	9.925	3.600	Sponge Wipe	0.694	Harvey	5/16/2011	12:12:00 PM	Wall	Textured	Vertical	FALSE	sponge taken on wall 8inches to right of door to 203a. 1 foot off of floor 1	4	No	ND	ND
2813	ClO2 Post-Decon	Floor 2	Room 203	23.736	10.449	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	12:16:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor. 10 feet to right of door. 5feet from door wall and 2 feetfrom left wall. 2	1	No	ND	NA
3620	ClO2 Post-Decon	Floor 2	Room 203A	22.743	6.565	5.800	Vacuum Sock	4.000	Harvey	5/16/2011	12:41:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	vacuum sample on top of tile . tile to right of window. 8 inches from back wall. 1 tile length from right wall. 3.	5	No	ND	ND
2753	ClO2 Post-Decon	Floor 2	Room 203A	24.641	8.986	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	12:31:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick taken inside door 18 inches in. 1 an extra sponge stick in bag. 2ndary containment has a whole in it,put in glove bag with large l.	1	No	ND	NA
2697	ClO2 Post-Decon	Floor 2	Room 203A	24.727	6.740	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	12:34:00 PM	Floor	Smooth	Horizontal Upward	FALSE	sponge sample taken on floor to left of window. 36 inches from back wall with window 24 inches from left wall. 2	1	No	ND	NA
3762	ClO2 Post-Decon	Floor 2	Room 204	19.696	16.274	5.800	Vacuum Sock	4.000	Schaedemann	5/16/2011	10:20:00 AM	Ceiling	Porous	Horizontal Upward	FALSE	vacuum sample of ceiling tile opposite of pre sample.	2	No	ND	ND
3356	ClO2 Post-Decon	Floor 2	Room 204	18.624	17.275	3.500	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:13:00 AM	Wall	Smooth	Vertical	FALSE	sponge stick sample on wall adjacent to pre sample.	1	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3353	ClO2 Post-Decon	Floor 2	Room 204	19.993	14.790	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:07:00 AM	Floor	Smooth	Horizontal Downward	FALSE	sponge stick sample on floor adjacent to pre sample.	1	No	ND	ND
3352	ClO2 Post-Decon	Floor 2	Room 204	19.704	17.218	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	10:10:00 AM	Floor	Smooth	Horizontal Downward	FALSE	sponge stick sample on floor adjacent to pre sample.	1	No	ND	ND
3763	ClO2 Post-Decon	Floor 2	Room 205	20.034	9.450	5.800	Vacuum Sock	4.000	Harvey	5/16/2011	12:01:00 PM	Ceiling	Textured	Horizontal Upward	FALSE	vacuum sample on top of ceiling tile. 3rdd ceiling tile inside room from door. 1tile width plus 8 inches from left wall. 4	7	No	ND	ND
2817	ClO2 Post-Decon	Floor 2	Room 205	20.054	6.064	3.600	Sponge Wipe	0.694	Harvey	5/16/2011	11:55:00 AM	Wall	Textured	Vertical	FALSE	on wall opposite door to left of windw 3feet to left of window. 3	1	No	ND	NA
2469	ClO2 Post-Decon	Floor 2	Room 205	20.525	11.450	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	11:46:00 AM	Floor	Smooth	Horizontal Upward	FALSE	inside door at entrance. 3 feet in from door. 24 inches from wall behind door. sponge sample. 1	4	No	ND	ND
2740	ClO2 Post-Decon	Floor 2	Room 205	18.725	9.669	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	11:50:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sample taken on floor 18 inches wall. 11 feet on right side of room. 2	1	No	ND	NA
3983	ClO2 Post-Decon	Floor 2	Room 206	17.442	18.254	3.000	Vacuum Sock	4.000	Harvey	5/16/2011	10:38:00 AM	Ceiling	Smooth	Horizontal Downward	FALSE	11	7	No	ND	ND
3790	ClO2 Post-Decon	Floor 2	Room 206	15.921	17.554	3.000	Vacuum Sock	4.000	Harvey	5/16/2011	10:02:00 AM	Ceiling	Smooth	Horizontal Downward	TRUE	4	7	No	ND	ND
3107	ClO2 Post-Decon	Floor 2	Room 206	16.944	20.298	3.900	Sponge Wipe	0.694	Harvey	5/16/2011	10:17:00 AM	Workbench	Smooth	Horizontal Upward	FALSE	8 (moved a tool to take sample)	2	No	ND	ND
3103	ClO2 Post-Decon	Floor 2	Room 206	17.742	20.154	3.897	Sponge Wipe	0.694	Harvey	5/16/2011	10:22:00 AM	Workbench	Smooth	Horizontal Upward	FALSE	9 (moved tool to take sample)	2	No	ND	ND
3106	ClO2 Post-Decon	Floor 2	Room 206	17.821	18.845	3.696	Sponge Wipe	0.694	Harvey	5/16/2011	10:13:00 AM	Table	Smooth	Horizontal Upward	FALSE	7	2	No	ND	ND
2802	ClO2 Post-Decon	Floor 2	Room 206	16.121	15.454	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	9:50:00 AM	Floor	Smooth	Horizontal Upward	FALSE	1	2	No	ND	ND
2449	ClO2 Post-Decon	Floor 2	Room 206	15.921	17.554	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	9:55:00 AM	Floor	Smooth	Horizontal Upward	FALSE	2	2	No	ND	ND
3165	ClO2 Post-Decon	Floor 2	Room 206	15.921	17.554	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	10:04:00 AM	Floor	Smooth	Horizontal Upward	TRUE	5	2	No	ND	ND
2801	ClO2 Post-Decon	Floor 2	Room 206	17.842	19.654	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	10:08:00 AM	Floor	Smooth	Horizontal Upward	FALSE	6	2	No	ND	ND
1565	ClO2 Post-Decon	Floor 2	Room 206	17.742	20.154	3.000	Swab	0.028	Harvey	5/16/2011	10:26:00 AM	Ceiling	Smooth	Horizontal Downward	FALSE	10	7	No	ND	ND
1539	ClO2 Post-Decon	Floor 2	Room 206	15.921	17.554	3.000	Swab	0.028	Harvey	5/16/2011	9:59:00 AM	Floor	Smooth	Horizontal Upward	TRUE	3	7	No	ND	ND
3728	ClO2 Post-Decon	Floor 2	Room 207	16.948	9.341	4.000	Vacuum Sock	4.000	Harvey	5/16/2011	10:53:00 AM	Floor	Smooth	Horizontal Upward	TRUE	vacuum blank 3	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3753	ClO2 Post-Decon	Floor 2	Room 207	17.453	11.059	5.800	Vacuum Sock	4.000	Harvey	5/16/2011	11:38:00 AM	Ceiling	Textured	Horizontal Upward	FALSE	note forr previous sample 11. cap of swab dropped on floor. cap wiped out with alcohol wipe. this sampe is vacuum sample taken on top of ceilingtile. tile on left wall when you enter room 6inches from left wall and 1 ceiling tile length from wall that	7	No	ND	ND
3321	ClO2 Post-Decon	Floor 2	Room 207	16.157	6.637	3.080	Sponge Wipe	0.694	Harvey	5/16/2011	11:11:00 AM	Desk	Smooth	Horizontal Upward	FALSE	sponge sample taken on desk.2.5 feet from edge facing door 4 inches in from longest edge. 7	2	No	ND	ND
2372	ClO2 Post-Decon	Floor 2	Room 207	16.053	11.659	3.000	Sponge Wipe	0.694	Harvey	5/16/2011	10:47:00 AM	Floor	Smooth	Horizontal Upward	FALSE	sponge stick by door 1	4	No	ND	ND
3324	ClO2 Post-Decon	Floor 2	Room 207	16.825	9.267	4.000	Sponge Wipe	0.694	Harvey	5/16/2011	10:56:00 AM	Floor	Smooth	Horizontal Upward	TRUE	sponge blank sponge 4 [B.Melton: there are two 3324. One needs to be 3320. Guessed that the other one was 3320.]	2	No	ND	ND
3276	ClO2 Post-Decon	Floor 2	Room 207	16.124	8.273	3.080	Sponge Wipe	0.694	Harvey	5/16/2011	11:05:00 AM	Desk	Smooth	Horizontal Upward	FALSE	sponge sample taken on desk corner near door. moved little box on desk. 6	4	No	ND	ND
3348	ClO2 Post-Decon	Floor 2	Room 207	15.519	6.751	4.900	Sponge Wipe	0.694	Harvey	5/16/2011	11:14:00 AM	Cabinet	Smooth	Horizontal Upward	FALSE	sponge on top of mailbox 3 feet from ceiling. 18 inches from door at leading long edge of mail box. 8	4	No	ND	ND
3325	ClO2 Post-Decon	Floor 2	Room 207	15.551	8.060	4.800	Sponge Wipe	0.694	Harvey	5/16/2011	11:18:00 AM	Cabinet	Smooth	Horizontal Upward	FALSE	sponge on top of mail cabinet at corner from door. this area partially covers previos sampled area. 9	4	No	ND	ND
2758	ClO2 Post-Decon	Floor 2	Room 207	17.956	7.733	3.500	Sponge Wipe	0.694	Harvey	5/16/2011	11:25:00 AM	Wall	Textured	Vertical	FALSE	on wall to right of desk that is opposite from door . 6 inches from desk 1 foot up. 10	1	Yes	ND	4.7

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3345	ClO2 Post-Decon	Floor 2	Room 207	17.434	10.194	3.080	Sponge Wipe	0.694	Harvey	5/16/2011	11:01:00 AM	Desk	Smooth	Horizontal Upward	FALSE	sponge sample taken on table surface 1foot in from door entrance at tablee edge 5	4	No	ND	ND
1516	ClO2 Post-Decon	Floor 2	Room 207	16.953	9.150	3.000	Swab	0.028	Harvey	5/16/2011	10:51:00 AM	Floor	Smooth	Horizontal Upward	TRUE	blank sponge 2	7	No	ND	ND
1736	ClO2 Post-Decon	Floor 2	Room 207	16.418	8.845	5.800	Swab	0.028	Harvey	5/16/2011	11:28:00 AM	Supply Vent	Textured	Vertical	FALSE	supply vent. swab. 11	7	No	ND	ND
3982	ClO2 Post-Decon	Floor 2	Room 208	14.359	15.576	5.500	Vacuum Sock	4.000	Chong	5/16/2011	11:47:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	2nd tile in from door closer to right wall	7	No	ND	ND
3799	ClO2 Post-Decon	Floor 2	Room 208	15.110	20.164	4.300	Vacuum Sock	4.000	Chong	5/16/2011	11:28:00 AM	File cabinet	Metal	Horizontal Upward	FALSE	top of cabinet and books consistent w/last sample event	1	No	ND	NA
3738	ClO2 Post-Decon	Floor 2	Room 208	13.557	18.433	3.500	Vacuum Sock	4.000	Chong	5/16/2011	11:05:00 AM	Chair	Cloth	Horizontal Upward	FALSE		7	No	ND	ND
3994	ClO2 Post-Decon	Floor 2	Room 208	13.216	19.544	4.394	Vacuum Sock	4.000	Chong	5/16/2011	11:20:00 AM	Wall	Porous	Vertical	FALSE	partition next to cabinet sample side facing window	1	No	ND	NA
3996	ClO2 Post-Decon	Floor 2	Room 208	13.786	20.370	3.300	Vacuum Sock	4.000	Chong	5/16/2011	11:24:00 AM	Chair	Cloth	Horizontal Upward	FALSE		7	No	ND	ND
3102	ClO2 Post-Decon	Floor 2	Room 208	14.780	16.905	3.000	Sponge Wipe	0.694	Chong	5/16/2011	11:38:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	No	ND	NA
3099	ClO2 Post-Decon	Floor 2	Room 208	15.326	18.593	4.179	Sponge Wipe	0.694	Chong	5/16/2011	11:35:00 AM	Wall	Smooth	Vertical	FALSE		1	No	ND	NA
3461	ClO2 Post-Decon	Floor 2	Room 208	13.367	15.450	3.700	Sponge Wipe	0.694	Chong	5/16/2011	10:57:00 AM	Table	Smooth	Horizontal Downward	FALSE		1	No	ND	NA
3105	ClO2 Post-Decon	Floor 2	Room 208	12.694	19.872	3.600	Sponge Wipe	0.694	Chong	5/16/2011	11:09:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		1	No	ND	NA
1504	ClO2 Post-Decon	Floor 2	Room 208	13.845	19.977	5.500	Swab	0.028	Chong	5/16/2011	11:42:00 AM	Return Vent	Smooth	Horizontal Upward	FALSE	ceiling vent	1	No	ND	NA
1669	ClO2 Post-Decon	Floor 2	Room 208	12.778	18.376	4.200	Swab	0.028	Chong	5/16/2011	11:01:00 AM	Monitor	Smooth	Inclined	FALSE	upper left on screen	1	No	ND	NA
3764	ClO2 Post-Decon	Floor 2	Room 209	14.769	7.934	3.000	Vacuum Sock	4.000	Chong	5/16/2011	12:22:00 PM	Floor	Carpet	Horizontal Upward	FALSE		7	No	ND	ND
4011	ClO2 Post-Decon	Floor 2	Room 209	13.475	10.916	3.000	Vacuum Sock	4.000	Chong	5/16/2011	12:03:00 PM	Floor	Carpet	Horizontal Upward	FALSE		7	No	ND	ND
3801	ClO2 Post-Decon	Floor 2	Room 209	14.669	11.022	5.500	Vacuum Sock	4.000	Chong	5/16/2011	12:32:00 PM	Ceiling	Porous	Horizontal Downward	FALSE	2nd tile in from door	1	No	ND	NA
3094	ClO2 Post-Decon	Floor 2	Room 209	13.008	11.955	3.800	Sponge Wipe	0.694	Chong	5/16/2011	11:57:00 AM	Countertop	Smooth	Horizontal Downward	FALSE		1	No	ND	NA
3100	ClO2 Post-Decon	Floor 2	Room 209	12.834	10.897	3.600	Sponge Wipe	0.694	Chong	5/16/2011	12:08:00 PM	Sink	Metal	Horizontal Upward	FALSE		1	No	ND	NA
3104	ClO2 Post-Decon	Floor 2	Room 209	14.971	9.624	3.700	Sponge Wipe	0.694	Chong	5/16/2011	12:11:00 PM	Stove	Metal	Horizontal Upward	FALSE		1	No	ND	NA
3091	ClO2 Post-Decon	Floor 2	Room 209	12.418	7.468	4.065	Sponge Wipe	0.694	Chong	5/16/2011	12:18:00 PM	Wall	Smooth	Vertical	FALSE		1	No	ND	NA
3097	ClO2 Post-Decon	Floor 2	Room 209	13.459	6.714	3.600	Sponge Wipe	0.694	Chong	5/16/2011	12:15:00 PM	Table	Smooth	Horizontal Upward	FALSE	[B.Melton moved to other side of table]	1	No	ND	NA
1722	ClO2 Post-Decon	Floor 2	Room 209	14.604	7.730	5.500	Swab	0.028	Chong	5/16/2011	12:28:00 PM	Return Vent	Metal	Horizontal Upward	FALSE		1	No	ND	NA
3787	ClO2 Post-Decon	Floor 2	Room 210	10.406	19.588	4.300	Vacuum Sock	4.000	Chong	5/16/2011	9:57:00 AM	Wall	Porous	Vertical	FALSE	partition next to desk sample faces window	1	No	ND	NA
3765	ClO2 Post-Decon	Floor 2	Room 210	10.675	20.373	3.400	Vacuum Sock	4.000	Chong	5/16/2011	10:03:00 AM	Chair	Porous	Horizontal Upward	FALSE		7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3788	ClO2 Post-Decon	Floor 2	Room 210	10.444	15.954	5.500	Vacuum Sock	4.000	Chong	5/16/2011	10:50:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	2nd tile in from door 2nd tile in from left wall	7	No	ND	ND
4013	ClO2 Post-Decon	Floor 2	Room 210	12.141	20.373	4.300	Vacuum Sock	4.000	Chong	5/16/2011	10:20:00 AM	File cabinet	Metal	Horizontal Upward	FALSE	vacuum only top of cabinet and books consistent w/last sample event -did not vacuum around bottom of cabinet	7	No	ND	ND
3773	ClO2 Post-Decon	Floor 2	Room 210	11.931	18.190	3.000	Vacuum Sock	4.000	Chong	5/16/2011	10:30:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	NA
3088	ClO2 Post-Decon	Floor 2	Room 210	9.890	16.883	3.000	Sponge Wipe	0.694	Chong	5/16/2011	9:41:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	No	ND	NA
3098	ClO2 Post-Decon	Floor 2	Room 210	9.993	14.942	3.000	Sponge Wipe	0.694	Chong	5/16/2011	9:37:00 AM	Floor	Smooth	Horizontal Upward	FALSE		1	No	ND	NA
3090	ClO2 Post-Decon	Floor 2	Room 210	9.601	19.877	3.590	Sponge Wipe	0.694	Chong	5/16/2011	10:10:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		1	No	ND	NA
3092	ClO2 Post-Decon	Floor 2	Room 210	12.037	19.774	4.400	Sponge Wipe	0.694	Chong	5/16/2011	10:15:00 AM	File cabinet	Metal	Horizontal Upward	FALSE		1	No	ND	NA
3083	ClO2 Post-Decon	Floor 2	Room 210	11.785	17.952	3.000	Sponge Wipe	0.694	Chong	5/16/2011	10:29:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	NA
3315	ClO2 Post-Decon	Floor 2	Room 210	11.793	14.358	4.196	Sponge Wipe	0.694	Chong	5/16/2011	10:38:00 AM	Wall	Smooth	Vertical	FALSE		1	No	ND	NA
1735	ClO2 Post-Decon	Floor 2	Room 210	11.666	18.282	3.000	Swab	0.028	Chong	5/16/2011	10:25:00 AM	Floor	Smooth	Horizontal Upward	TRUE		1	No	ND	NA
1559	ClO2 Post-Decon	Floor 2	Room 210	10.692	19.909	5.500	Swab	0.028	Chong	5/16/2011	10:42:00 AM	Return Vent	Smooth	Horizontal Downward	FALSE		1	No	ND	NA
1604	ClO2 Post-Decon	Floor 2	Room 210	9.704	18.267	4.200	Swab	0.028	Chong	5/16/2011	9:45:00 AM	Monitor	Smooth	Inclined	FALSE	top left	1	No	ND	NA
4216	ClO2 Post-Decon	Floor 2	Room 211	10.483	11.697	3.000	Vacuum Sock	4.000	Jordan	5/16/2011	11:52:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	ceiling tile vacuum sample	8	No	ND	ND
3734	ClO2 Post-Decon	Floor 2	Room 211	11.786	11.954	3.000	Vacuum Sock	4.000	Jordan	5/16/2011	11:50:00 AM	Floor	Porous	Horizontal Upward	FALSE	floor right inside of door	8	No	ND	ND
4096	ClO2 Post-Decon	Floor 2	Room 211	11.492	7.420	4.000	Vacuum Sock	4.000	Jordan	5/16/2011	12:13:00 PM	Countertop	Smooth	Horizontal Upward	TRUE	blank taken	7	No	ND	ND
4282	ClO2 Post-Decon	Floor 2	Room 211	10.299	6.704	3.000	Vacuum Sock	4.000	Jordan	5/16/2011	12:24:00 PM	Floor	Porous	Horizontal Upward	FALSE		7	No	ND	ND
3122	ClO2 Post-Decon	Floor 2	Room 211	9.492	11.257	3.600	Sponge Wipe	0.694	Jordan	5/16/2011	12:01:00 PM	Wall	Textured	Vertical	FALSE	left of previous sample taken	7	No	ND	ND
3121	ClO2 Post-Decon	Floor 2	Room 211	9.583	6.943	4.200	Sponge Wipe	0.694	Jordan	5/16/2011	12:11:00 PM	Countertop	Smooth	Horizontal Upward	FALSE	right side of previous sample taken	7	No	ND	ND
3111	ClO2 Post-Decon	Floor 2	Room 211	11.951	7.420	4.000	Sponge Wipe	0.694	Jordan	5/16/2011	12:14:00 PM	Countertop	Smooth	Horizontal Upward	TRUE	blank taken	7	No	ND	ND
1508	ClO2 Post-Decon	Floor 2	Room 211	9.528	9.348	4.000	Swab	0.028	Jordan	5/16/2011	12:07:00 PM	Monitor	Smooth	Vertical	FALSE	upper left of screen	7	No	ND	ND
1554	ClO2 Post-Decon	Floor 2	Room 211	11.749	7.071	4.000	Swab	0.028	Jordan	5/16/2011	12:17:00 PM	Countertop	Smooth	Horizontal Upward	TRUE	blank taken	1	No	ND	NA
3992	ClO2 Post-Decon	Floor 2	Room 212	7.826	15.482	4.298	Vacuum Sock	4.000	Jordan	5/16/2011	9:42:00 AM	Floor	Textured	Vertical	TRUE	blank	8	No	ND	ND
4000	ClO2 Post-Decon	Floor 2	Room 212	7.502	18.426	3.597	Vacuum Sock	4.000	Jordan	5/16/2011	9:50:00 AM	Chair	Porous	Horizontal Upward	FALSE	same spot as previous sample	8	No	ND	ND
3737	ClO2 Post-Decon	Floor 2	Room 212	7.177	19.552	4.298	Vacuum Sock	4.000	Jordan	5/16/2011	10:14:00 AM	Wall	Smooth	Horizontal Upward	FALSE	sample of non porous surface to repeat last sampling point	8	No	ND	ND
3771	ClO2 Post-Decon	Floor 2	Room 212	7.696	20.332	3.500	Vacuum Sock	4.000	Jordan	5/16/2011	10:22:00 AM	Chair	Porous	Horizontal Upward	FALSE		7	No	ND	ND
4018	ClO2 Post-Decon	Floor 2	Room 212	9.060	20.115	4.582	Vacuum Sock	4.000	Jordan	5/16/2011	10:24:00 AM	File cabinet	Textured	Horizontal Upward	FALSE	books on top of file cabinet	7	No	ND	ND

Barcode	Round	Floor	Room	x	y	z	Method	Area (sq ft)	Operator	Acquisition Date	Acquisition Time	Object	Texture	Orientation	Blank	BROOM Notes	Lab ID	Detected	Spread Plate Results (CFU/sq ft)	Filter Plate Results (CFU/sq ft)
3741	ClO2 Post-Decon	Floor 2	Room 212	8.541	18.535	3.000	Vacuum Sock	4.000	Jordan	5/16/2011	10:32:00 AM	Ceiling	Porous	Horizontal Downward	FALSE		8	No	ND	ND
3504	ClO2 Post-Decon	Floor 2	Room 212	8.541	14.919	3.000	Sponge Wipe	0.694	Jordan	5/16/2011	9:30:00 AM	Floor	Smooth	Horizontal Upward	FALSE		7	No	ND	ND
3320	ClO2 Post-Decon	Floor 2	Room 212	6.484	16.023	3.500	Sponge Wipe	0.694	Jordan	5/16/2011	9:35:00 AM	Floor	Textured	Vertical	FALSE	left of previous sample [B.Melton: there were two 3324, one needs to be 3320. Guessing this is the one.]	7	No	ND	ND
3101	ClO2 Post-Decon	Floor 2	Room 212	8.064	15.937	4.198	Sponge Wipe	0.694	Jordan	5/16/2011	9:39:00 AM	Floor	Textured	Vertical	TRUE	blank	7	No	ND	ND
3386	ClO2 Post-Decon	Floor 2	Room 212	6.722	19.855	3.893	Sponge Wipe	0.694	Jordan	5/16/2011	10:09:00 AM	File cabinet	Smooth	Horizontal Upward	FALSE	file cabinet	7	No	ND	ND
3133	ClO2 Post-Decon	Floor 2	Room 212	8.476	17.149	3.000	Sponge Wipe	0.694	Jordan	5/16/2011	9:47:00 AM	Floor	Smooth	Horizontal Upward	FALSE	under previous sample	7	No	ND	ND
1498	ClO2 Post-Decon	Floor 2	Room 212	6.614	18.275	4.193	Swab	0.028	Jordan	5/16/2011	10:01:00 AM	Monitor	Smooth	Inclined	FALSE	upper left of monitor	1	No	ND	NA
1499	ClO2 Post-Decon	Floor 2	Room 212	7.610	15.937	4.500	Swab	0.028	Jordan	5/16/2011	9:38:00 AM	Floor	Textured	Vertical	TRUE		1	No	ND	NA
1664	ClO2 Post-Decon	Floor 2	Room 212	7.826	19.725	3.000	Swab	0.028	Jordan	5/16/2011	10:04:00 AM	Ceiling	Smooth	Horizontal Downward	FALSE	ceiling diffuser swab	1	No	ND	NA
3769	ClO2 Post-Decon	Floor 2	Room 213	8.896	7.832	3.000	Vacuum Sock	4.000	Jordan	5/16/2011	11:16:00 AM	Floor	Porous	Horizontal Upward	FALSE	actually on the floor bed is on the opposite wall	8	No	ND	ND
4022	ClO2 Post-Decon	Floor 2	Room 213	7.743	7.863	3.300	Vacuum Sock	4.000	Jordan	5/16/2011	11:24:00 AM	Bed	Porous	Horizontal Upward	FALSE	on bed	7	No	ND	ND
4285	ClO2 Post-Decon	Floor 2	Room 213	6.741	8.197	3.300	Vacuum Sock	4.000	Jordan	5/16/2011	11:32:00 AM	Bed	Porous	Horizontal Upward	FALSE	on bed	7	Yes	4.2	ND
3984	ClO2 Post-Decon	Floor 2	Room 213	7.166	10.868	3.000	Vacuum Sock	4.000	Jordan	5/16/2011	11:41:00 AM	Ceiling	Porous	Horizontal Downward	FALSE	ceiling tile top sidey	8	No	ND	ND
3786	ClO2 Post-Decon	Floor 2	Room 213	7.954	10.291	4.096	Vacuum Sock	4.000	Jordan	5/16/2011	10:59:00 AM	Countertop	Smooth	Horizontal Upward	TRUE	blank	8	No	ND	ND
4012	ClO2 Post-Decon	Floor 2	Room 213	7.620	12.113	3.000	Vacuum Sock	4.000	Jordan	5/16/2011	10:51:00 AM	Floor	Porous	Horizontal Upward	FALSE	left of the doorway	8	No	ND	ND
3523	ClO2 Post-Decon	Floor 2	Room 213	7.499	6.102	3.596	Sponge Wipe	0.694	Jordan	5/16/2011	11:02:00 AM	Wall	Textured	Vertical	FALSE		7	No	ND	ND
3152	ClO2 Post-Decon	Floor 2	Room 213	6.377	6.679	3.694	Sponge Wipe	0.694	Jordan	5/16/2011	11:08:00 AM	Nightstand	Smooth	Horizontal Upward	FALSE	up an left of previous sample taken	7	No	ND	ND
3204	ClO2 Post-Decon	Floor 2	Room 213	8.106	10.656	4.184	Sponge Wipe	0.694	Jordan	5/16/2011	10:57:00 AM	Countertop	Smooth	Horizontal Upward	TRUE	blank	7	No	ND	ND
3309	ClO2 Post-Decon	Floor 2	Room 213	8.925	11.961	3.793	Sponge Wipe	0.694	Jordan	5/16/2011	10:55:00 AM	Countertop	Smooth	Horizontal Upward	FALSE	otherside of countertop	7	No	ND	ND
3357	ClO2 Post-Decon	Floor 2	Stairwell	23.868	19.419	3.000	Sponge Wipe	0.694	Schaedemann	5/16/2011	12:03:00 PM	Floor	Smooth	Horizontal Upward	FALSE	randy collected in doorway of stair well	5	Yes	ND	9.3

Appendix H

Waste Management and Cost Analysis Spreadsheet

Start here

Issue	Worksheet to Resolve	Status
Graph of Waste Activities	TBD	not started
Graph of time by labor type for each decon technology	TBD	not started
Graph of cost by labor type for each decon technology	TBD	not started

Room	Configuration	Length	Width	Sq Ft	Laminate Floor	Carpet	Ceiling Tiles	Books	Binders	Mail	Bed	Sofa	Chair	Monitor	TV	Printer	Wall Divider	Laminate Floor Sq. Ft	Carpet Sq. Ft	Ceiling Tile Sq Ft	HVAC Duct Refit Cost (total for all linear feet installed)	Refit Cost (Fixed)	Refit Cost (per unit area or linear foot)
Item Cost per Unit							**$ 5**	**$ 25**	**$ 25**	**$ -**	**$ 500**	**$ 750**	**$ 100**	**$ 200**	**$ 250**	**$ 250**	**$ 800**	**$ 3.70**	**$ 2.78**	**$ 0.63**	**$ 44.07**		
Unit							ea 2x4	ea	ea	ea	ea	ea	ea	ea	ea	ea	ea	Sq ft	Sq ft	Sq ft	ft		
110	Office	21	10	210	1		1	20	10				2	1		1	1	210	0	210		$ 2,200	$ 4.33
109	Residential	21	10	210		1	1				1							0	210	210		$ 500	$ 3.40
108	Office	21	10	210	1		1	20	10				2	1		1	1	210	0	210		$ 2,200	$ 4.33
107	Residential	21	10	210		1	1					1	1		1			0	210	210		$ 1,100	$ 3.40
106	Office	21	10	210	1		1	20	10				4	1		1	1	210	0	210		$ 2,400	$ 4.33
105	Residential	21	10	210		1	1						4					0	210	210		$ 400	$ 3.40
104	Shop	10	12	120			1	20										0	0	120		$ 500	$ 0.63
103	Mail room	21	10	210			1	20		20								0	0	210		$ 500	$ 0.63
213	Residential	21	10	210		1	1				1							0	210	210		$ 500	$ 3.40
212	Office	21	10	210	1		1	20	10				2	1		1	1	210	0	210		$ 2,200	$ 4.33
211	Residential	21	10	210		1	1					1	1		1			0	210	210		$ 1,100	$ 3.40
210	Office	21	10	210	1		1	20	10				2	1		1	1	210	0	210		$ 2,200	$ 4.33
209	Residential	21	10	210		1	1						4					0	210	210		$ 400	$ 3.40
208	Office	21	10	210	1		1	20	10				4	1		1	1	210	0	210		$ 2,400	$ 4.33
207	Mail room	21	10	210			1			20								0	0	210		$ -	$ 0.63
206	Shop	21	10	210			1	20										0	0	210		$ 500	$ 0.63
Floor 1	HVAC Duct	200	NA	NA																	200		
Floor 2	HVAC Duct	200	NA	NA																	200		$ -
				3270		**Cost**		**$4,500**	**$1,500**	**$ -**	**$1,000**	**$1,500**	**$2,600**	**$1,200**	**$ 500**	**$1,500**	**$4,800**	**$4,662**	**$3,500**	**$2,044**	**$ 17,628**	**$19,100**	

Time to Replace (hrs):	10
Labor Cost to replace:	$ 7,854

	Average Refit Cost	
		Fixed	**Cost/ft2**
	Office	$2,267	$ 4.33
	Residential	$ 667	$ 3.40
	Mail Room	$ 250	$ 0.63
	Shop	$ 500	$ 0.63
	Labor		$ 2.40

Round 2 Replacement Costs:	$ 46,934

Dissemination	VHP® - Characterization Sampling1	VHP® - Decon	VHP® - Clearance Sampling	AB - Characterization Sampling2	AB Decon - Removal	AB Decon - Spray	AB Decon - Dry	AB - Clearance Sampling	ClO2 - Characterization Sampling3	CLO2 - Decon	ClO2 - Clearance Sampling	AB - Building Reset
VHP® - Characterization Sampling1												
VHP® - Decon												
VHP® - Clearance Sampling												
AB - Characterization Sampling2												
AB Decon - Removal												
AB Decon - Spray												
AB Decon - Dry												
AB - Clearance Sampling												
ClO2 - Characterization Sampling3												
CLO2 - Decon												
ClO2 - Clearance Sampling												
AB - Building Reset												

Lab	HEPA Labor Hours Per Sample	Sponge Stick Analysis Labor Hours per Sample	Swab Analysis Labor Hours per Sample	HEPA Analysis Labor Cost Per Sample	Sponge Stick Analysis Labor Cost per Sample	Swabs Labor Cost per Sample	LRN Expendables Cost Per Sample	LRN Equipment Cost Per Sample	LRN HEPA Analysis Cost Per Sample	LRN Sponge Stick Analysis Cost Per Sample	LRN Swab Analysis Cost Per Sample	Aggressive Air Sample Analysis Labor + Material Hours per	Wipes (EPA) Labor + Material Cost per Sample	Wipes (LLNL) Labor + Material Cost per Sample	Note -- Aggressive Air Samples, and Wipe Samples are not calculated from LRN Worksheets	
UT	1.00	0.79	0.70	$ 151	$ 118	$ 105	$ 41.37	$ 1.87	$ 192.10	$ 159.64	$ 146.18	163.05	$ 154	$ 426	**LLNL Cost for LLNL Wipe Analysis:**	$ 145,000
															Number of RV PCR Analyses:	340
															Cost Per RV PCR Analysis:	$ 426
															INL Cost for EPA Wipe Analysis:	$ 27,000
															Number of RV PCR Analyses:	175
															Cost Per RV PCR Analysis:	$ 154
Mean	**$ 1.00**	**$ 0.79**	**$ 0.70**	**$ 150.74**	**$ 118.27**	**$ 105**	**$ 41.37**	**$ 1.87**	**$ 288.16**	**$ 239.46**	**$ 219.27**	**$ 245**	**$ 231**	**$ 640**	**Lumped Analytical Costs:**	$ 31,104
Std Dev							$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**Purchase Order LRN Expendables Costs:**	$ 77,897
															Purchase Order LRN Equipment Costs:	$ 49,283

Waste Sample Analytical Cost	244.58	average of other analysis types	
Water Sample Analytical Cost	175.08	average of other analysis types	Temperature 5 min; Free Cl 20 min; pH 5 min; Turbidity 10 min; TSS 10 min; COD 20 min

Multiplier for BSL-3 vs BSL-2 Analysis	1.5

Sampling and Analysis Costs	Cost of Sample Team Prep per Entry	Cost of Sample Team Decon per Entry	Cost of Sample Team per Entry	Cost of Aggressive Air Sampling Team Prep per Entry	Cost of Aggressive Air Sampling Team Decon per Entry	Cost of Aggressive Air Sampling Team per Entry	Labor Cost Per HEPA Sample	Material Cost Per HEPA Sample	Analysis Cost Per HEPA Sample	Labor Cost Per Sponge Stick Sample	Material Cost Per Sponge Stick Sample	Analysis Cost Per Sponge Stick Sample	Labor Cost Per Wipe (EPA) Sample	Material Cost Per Wipe (EPA) Sample	Analysis Cost Per Wipe (EPA) Sample	Labor Cost Per Wipe (LLNL) Sample	Material Cost Per Wipe (LLNL) Sample	Analysis Cost Per Wipe (LLNL) Sample	Labor Cost Per Swab Sample	Material Cost Per Swab Sample	Analysis Cost Per Swab Sample	Labor Cost Per Aggressive Air Sample	Material Cost Per Aggressive Air Sample	Analysis Cost Per Aggressive Air Sample
	Cp	Cpd	Csl	Cp	Cpd	Csl	Csli	Csmi	Csai	Csli	Csmi	Csai	Csli	Csmi	Csai	Csli	Csmi	Csai	Csli	Csmi	Csai	Csli	Csmi	Csai
Mean	$ 252	$ 697	$ 720	$ 273	$ 725	$ 779	$ 53	$ 29	$ 288	$ 34	$ 20	$ 239	$ 30	$ 19	$ 231	$ 30	$ 19	$ 640	$ 29	$ 21	$ 219	$ 57	$ 18	$ 245
Std Deviation	$ 121	$ 78	$ 328	$ 130	$ 82	$ 355	$ 18	$ -	$ -	$ 10	$ -	$ -	$ 9	$ -	$ -	$ 9	$ -	$ -	$ 9	$ -	$ -	$ -	$ -	$ -

Sampling and Analysis	Attributable Other Sampling/Analytical Costs	Non-Attributable Other Sampling/Analytical Related Costs	Decon Line Labor	Sampling Labor	Material	Analysis	Waste Management	Total Sampling Cost	Sampling Cost Std Dev	
VHP®	$ 148,513	$ 95,138	$ 10,020	$ 37,049	$ 23,894	$ 313,490	$ 42,166	$ 660,251	$ 27,398	non-attributable costs get applied to all rounds
pH-Adjusted Bleach Pr	$ 148,513	$ 95,138	$ 10,736	$ 39,564	$ 23,894	$ 313,490	$ 25,725	$ 646,324	$ 28,412	non-attributable costs get applied to all rounds
ClO2	$ 148,513	$ 95,138	$ 10,736	$ 39,673	$ 23,961	$ 314,649	$ 67,053	$ 688,987	$ 28,489	non-attributable costs get applied to all rounds
Average	$ 148,513	$ 95,138	$ 10,497	$ 38,762	$ 23,916	$ 313,877	$ 44,981	**$ 665,188**	**$ 28,099**	

Decon Costs Part 1	Cost of Decon Team Prep per Entry	Cost of Removal Team Prep per Entry	Cost of Decon Team Decon per Entry	Cost of Removal Team Decon per Entry	Cost of Decon Team Per Entry	Cost of Removal Team Per Entry	Decon Contractor Fixed Cost	Material Cost for Decon Team	Decon Waste Mgt Cost	
	Cp	Cp	Cpd	Crw	Cdl	Crw	Cdc	Cdm	Cdw	
VHP® Mean	$ 271	$ 271	$ 722	$ 722	$ 773	$ 773	$ 105,493	$ 1,587	$ 37,684	Level C
VHP® SD	$ 129	$ 129	$ 81	$ 81	$ 352	$ 352	$ -	$ -	$ -	
AB Mean	$ 345	$ 345	$ 822	$ 822	$ 985	$ 985	$ 66,831	$ 31,976	$ 230,521	Level B
AB SD	$ 165	$ 165	$ 92	$ 92	$ 449	$ 449	$ -	$ -	$ -	
CLO2 Mean	$ 271	$ 271	$ 722	$ 722	$ 773	$ 773	$ 169,093	$ 1,587	$ 4,478	Level C
CLO2 SD	$ 129	$ 129	$ 81	$ 81	$ 352	$ 352	$ -	$ -	$ -	

Decon Costs Part 2	Cost of Decon Line Operations	Cost of Decon Teams Entering	Cost of Removal Teams Entering	Decon Contractor Fixed Costs	Cost of Decon Materials	Waste Management Costs	Mean Decon Cost	Decon Cost Std Dev	
							Cd		
VHP®	$ 2,863	$ -	$ -	$ 105,493	$ 1,587	$ 37,684	$ 147,627	$ -	Additional Decon line ops costs included for decon contractor and safety entries
pH-Adjusted Bleach Pr	$ 10,378	$ 17,939	$ 30,497	$ 66,831	$ 31,976	$ 230,521	$ 388,142	$ 19,062	Decon line ops cost included for safety entries
ClO2	$ 1,431	$ -	$ -	$ 169,093	$ 1,587	$ 4,478	$ 176,590	$ -	Additional Decon line ops costs included for decon contractor and safety entries

Restoration Costs	Labor Cost of Post-Decon Material Removal	Cost of Replacing Removed Items	Restoration Cost
	Crla	Cu	Cr
VHP®	$ -	$ -	$ -
pH-Adjusted Bleach Pr	$ 7,854	$ 46,934	$ 54,788
ClO2	$ -	$ -	$ -

Total Cost	IC Cost	Average Sampling and Analysis Cost	Decon Cost	Restoration Cost	Total Cost
	Cic	Cs	Cd	Cr	C
VHP®	$ 46,737	$ 665,188	$ 147,627	$ -	$ 859,551
pH-Adjusted Bleach Pr	$ 54,907	$ 665,188	$ 388,142	$ 54,788	$ 1,163,024
ClO2	$ 46,737	$ 665,188	$ 176,590	$ -	$ 888,514

Date	Activity
4/16/11	Dissemination
4/17/11	VHP® - Characterization Sampling1
4/18/11	VHP® - Characterization Sampling1
4/19/11	VHP® - Decon
4/20/11	VHP® - Decon
4/21/11	VHP® - Decon
4/22/11	VHP® - Clearance Sampling
4/23/11	VHP® - Clearance Sampling
4/24/11	DAY OFF
4/25/11	Dissemination
4/26/11	AB - Characterization Sampling2
4/27/11	AB - Characterization Sampling2
4/28/11	AB Decon - Removal
4/29/11	AB Decon - Removal
4/30/11	AB Decon - Spray
5/1/11	AB Decon - Dry
5/2/11	DAY OFF
5/3/11	AB Decon - Dry
5/4/11	AB Decon - Dry
5/5/11	AB - Clearance Sampling
5/6/11	AB - Clearance Sampling
5/7/11	DAY OFF
5/8/11	DAY OFF
5/9/11	AB - Building Reset
5/10/11	Dissemination
5/11/11	ClO2 - Characterization Sampling3
5/12/11	ClO2 - Characterization Sampling3
5/13/11	CLO2 - Decon
5/14/11	CLO2 - Decon
5/15/11	CLO2 - Decon
5/16/11	ClO2 - Clearance Sampling
5/17/11	ClO2 - Clearance Sampling

Date	Mass (lb)	Volume (gal)	Activity
16-Apr	18	38	Dissemination
17-Apr	147.2	0	VHP® - Characterization Sampling1
18-Apr	80.2	211	VHP® - Characterization Sampling1
19-Apr	14.2	0	VHP® - Decon
20-Apr	59.8	0	VHP® - Decon
21-Apr	380.6	55	VHP® - Decon
22-Apr	171.4	36	VHP® - Clearance Sampling
23-Apr	36.8	38	VHP® - Clearance Sampling
24-Apr	0	0	DAY OFF
25-Apr	0	28	Dissemination
26-Apr	261.6	84	AB - Characterization Sampling2
27-Apr	6.2	0	AB - Characterization Sampling2
28-Apr	65	26	AB Decon - Removal
29-Apr	10236.62	0	AB Decon - Removal
30-Apr	2339.4	633	AB Decon - Spray
1-May	0	0	AB Decon - Dry
2-May	0	0	DAY OFF
3-May	0	0	AB Decon - Dry
4-May	0	0	AB Decon - Dry
5-May	157	63	AB - Clearance Sampling
6-May	887.7	38	AB - Clearance Sampling
7-May	0	0	DAY OFF
8-May	0	0	DAY OFF
9-May	0	0	AB - Building Reset
10-May	52	0	Dissemination
11-May	171.4	137	ClO2 - Characterization Sampling3
12-May	0	0	ClO2 - Characterization Sampling3
13-May	0	0	CLO2 - Decon
14-May	0	0	CLO2 - Decon
15-May	0	0	CLO2 - Decon
16-May	0	0	ClO2 - Clearance Sampling
17-May	451.6	38	ClO2 - Clearance Sampling

Date	Number of Staff	Time at Sign In	Time at Sign Out	Decon Line Time (min)	Notes
4/17/11	6	7:00	20:00	780	In addition 2 Officers, 1 hr 45 min
4/18/11	6	7:30	14:24	414	
4/19/11	4	7:30	19:02	692	
4/20/11	2	7:58	11:37	240	EMT's Only
4/21/11	4	12:00	19:30	450	All day, decon of STERIS equipment
4/22/11	7	7:00	19:30	750	4 decon line 1 paramedic 1 captain
4/23/11	6	7:45	17:00	555	ditto
4/24/11	0	na	na	na	No Deon Line
4/25/11	0	na	na	na	No Deon Line
4/26/11	6	7:00	18:00	660	1 lead, 1EMT, 4 personnel
4/27/11	0	na	na	na	No Decon Line
4/28/11	4	7:00	19:00	720	In Addition 1 person 11:50-13:30
4/29/11	4	7:00	18:30	690	In Addition 1 person 15:55-17:30
4/30/11	4	7:05	17:55	650	1 lead, 1 emt, 2 personnel
5/1/11	4	7:00	18:00	660	2 Additional People 0730-1000
5/2/11	0	na	na	na	No Deon Line
5/3/11	0	na	na	na	No Deon Line
5/4/11	0	na	na	na	No Deon Line
5/5/11	6	7:00	16:50	590	1 lead, 1 EMT, 4 personnel
5/11/11	7	7:00	18:30	690	4 Decom, 1 EMT, 1 Captain, 1 additional

Date	Team	Time at Entry	Time at Exit	Sample Team Decon Time (min)	Sample Team Recovery Time (min)	Notes	Personnel	Samples
4/17/11	7	12:27	12:47	20	33	3 personnel 27 samples	3	27
4/17/11	6	12:43	12:58	15	33	3 personnel no samples	3	0
4/17/11	5	12:51	13:14	23	33	4 personnel 42 samples	4	42
4/17/11	8	13:35	13:52	17	33	3 personnel 37 samples	3	37
4/17/11	4	15:16	15:35	19	33	3 personnel 43 samples	3	43
4/17/11	9	15:32	15:50	18	33	3 personnel 50 samples	3	50
4/17/11	3	16:47	16:57	10	33	3 personnel 58 samples	3	58
4/17/11	12	18:28	18:48	20	33	2 personnel 72 samples	2	72
4/17/11	6	17:02	17:16	14	33	3 personnel 36 samples	3	36
4/17/11	5	17:51	18:02	11	33	4 personnel and 41 samples	4	41
4/17/11	7	17:35	17:48	13	33	3 personnel and 24 sample	3	24
4/17/11	8	18:35	18:55	20	33	3 personnel 38 samples	3	38
4/18/11	6	12:04	12:20	16	33	4 personnel and 33 samples	4	33
4/18/11	4	11:57	12:09	12	33	3 personnel and 32 samples	3	32
4/18/11	3	12:41	12:47	6	33	2 personnel and 24 samples	2	24
4/22/11	4	11:08	11:15	7	33	3 personnel 0 samples	3	0
4/22/11	12	12:42	12:48	6	33	Equipment, personnel honeywell		0
4/22/11	3	13:28	13:45	17	33	Samples, 3 personnel, equipment	3	
4/22/11	5	14:37	14:51	14	33	Left to get more gloves		
4/22/11	4	14:56	15:09	13	33	37 Samples, 3 personnel	3	37
4/22/11	7	16:10	16:29	19	33	4 personnel, 37 samples	4	37
4/22/11	9	16:29	16:43	14	33	52 samples 3 people	3	52
4/22/11	8	17:09	17:33	24	33	3 personnel 53 samples	3	53
4/22/11	5	17:20	17:40	20	33	3 people 53 samples	3	53
4/22/11	13	17:38	17:55	17	33	3 people 0 samples	3	0
4/22/11	6	18:30	18:42	12	33	3 people 65 samples	3	65
4/23/11	3	11:32	11:49	17	33	3 people, 23 samples	3	23
4/26/11	3	10:45	11:03	18	33	3 people, 43 samples	3	43
4/26/11	5	11:10	11:20	10	33	3 people, 34 samples	3	34
4/26/11	6	11:30	11:45	15	33	3 people, 42 samples	3	42
4/26/11	4	11:40	11:52	12	33	3 people, 51 samples	3	51
4/26/11	8	11:25	11:40	15	33	0 samples (one sampler feeling sick); need number of people		0
4/26/11	9	12:05	12:20	15	33	3 people, 32 samples	3	32
4/26/11	7	11:52	12:04	12	33	3 people, 37 samples	3	37
4/26/11	8	13:40	13:55	15	33	3 people, 58 samples	3	58
4/26/11	3	14:10	14:25	15	33	3 people, 38 samples	3	38
4/26/11	6	14:28	14:35	7	33	3 people, 31 samples	3	31
4/26/11	5	14:40	14:52	12	33	3 people, 32 samples	3	32
4/26/11	4	14:53	15:00	7	33	3 people, 37 samples	3	37

Date	Team	Time at Entry	Time at Exit	Sample Team Decon Time (min)	Sample Team Recovery Time (min)	Notes	Personnel	Samples
5/5/11	1	12:31	12:47	16	33		4	2
5/5/11	3	13:00	13:17	17	33		3	37
5/5/11	2	12:54	13:03	9	33		3	0
5/5/11	4	13:30	13:44	14	33		3	42
5/5/11	5	14:00	14:05	5	33		3	48
5/5/11	6	13:42	13:58	16	33		3	48
5/5/11	7	13:48	14:02	14	33		3	51
5/5/11	8	11:47	11:55	8	33		1	0
5/5/11	1	15:52	16:05	13	33		3	
5/5/11	2	15:33	15:47	14	33		3	
5/11/11	1	12:40	13:05	25	33		3	
5/11/11	1	16:05	16:41	36	33		2	
5/11/11	2	12:40	12:58	18	33		3	
5/11/11	2	16:30	16:49	19	33		3	
5/11/11	3	12:30	12:50	20	33		3	
5/11/11	4	13:40	14:01	21	33		3	
5/11/11	4	16:10	16:34	24	33		3	
5/11/11	5	12:07	12:21	14	33		3	
5/11/11	5	17:35	17:51	16	33		3	
5/11/11	6	14:45	15:03	18	33		3	
5/11/11	7	14:35	14:50	15	33		3	
5/11/11	7	17:55	18:09	14	33		3	
5/11/11	8	16:45	17:11	26	33		3	

Date	Team	Time at Beginning of Donning	Time at Last Taping	Team Prep Time (min)	Notes
4/17/11	7			66	
4/18/11	6	8:00	8:53	53	
4/18/11	4	8:00	8:53	53	
4/22/11	3	9:00	9:30	30	Clearance Sampling; Exit bldg 13:28
4/22/11	4		10:14		
4/22/11	5		11:13		
4/22/11	6		11:31		
4/22/11	4		11:44		
4/22/11	9				Entered bldg 12:58
4/22/11	7				Entered 13:05, sharna w team7
4/22/11	8				Entered bldg 13:28
4/22/11	3				Entered 14:31
4/22/11	9	12:22	12:45	23	Timed by Lukas
5/5/11	1	8:15	8:51		vitals until entry
5/5/11	4			10	donning only; 3 people
5/5/11	5			14	donning only; 3 people
5/5/11	7			12	donning only; 3 people
5/5/11	6			16	donning only; 3 people
5/11/11	1	8:07	8:45	32	donning, sample briefing, mask test
5/11/11	2	8:07	8:41	34	donning, sample briefing, mask test
5/11/11	3	8:45	9:32	47	donning, sample briefing, mask test
5/11/11	4	8:45	9:24	39	donning, sample briefing, mask test
5/11/11	5	8:50	9:43	53	donning, sample briefing, mask test
5/11/11	6	9:57	10:46	49	donning, sample briefing, mask test
5/11/11	7	11:08	11:53	45	donning, sample briefing, mask test

Waste Knob	
Value:	2
1 = If Deconned Waste is treated as MSW	
2 = If Deconned Waste has Premium Charge	
3 = If Deconned Waste is treated as Contaminated	

Purchased LRN Equipment Variables		
Equipment Amortization Period (months):	60	set these numbers equal to each other to consider expendable equpment
BOTE Amortization Period (months):	6	

Multiplier for LRN BSL-3 vs BSL-2 Analysis	1.5

Average Length of Day (hrs)	12

Post-Entry Rest Period (hrs)	0.55

Travel Variables		travel = airfare + M&IE lodging + rental car + labor/M&IE for 2 travel days
Airfare to Site ($/person):	$ 450	
Rental Car (1 per team) ($/week/team):	$ 450	
Lodging ($/day/person):	$ 150	
Meals and Incidental Expenses ($/day/person):	$ 35	

Decon Round Variables	
Round 1 Characterization Sampling Days	2
Round 1 Decon Days	3
Round 1 Clearance Sampling Days	2
Round 2 Characterization Sampling Days	2
Round 2 Decon Days	5
Round 2 Clearance Sampling Days	2
Round 3 Characterization Sampling Days	2
Round 3 Decon Days	3
Round 3 Clearance Sampling Days	2

Building Info		
Number of Square Feet on Each Floor (ft2)	4025	from test plan - not used yet
Number of Rooms on Each Floor	12	from test plan - average between floor 1 and floor 2
Number of Floors	2	
Height of Story (ft)	10	not used yet
Average Area Per Room (ft2)	335	used in RoundX
Building Volume (ft3)	80500	not used yet
Average Volume Per Room (ft3)	3354	not used yet

Waste Sampling Knobs		
Number of Waste Samples Per 100 lb	3	based on Phase 2
Number of Water Samples Per 55 gal	1	

Lumped Item	Cost	Notes	Analytical	Sampling - RMC	Sampling - Swab	Sampling - Wipe	Sampling - Sponge	Sampling - HEPA	Sampling - Agg. Air	Sampling - Round 1 General	Sampling - Round 2 General	Sampling - Round 3 General	Sampling - General	Decon - VHP®	Decon - AB	Decon - CLO2	Decon - General	Incident Command Costs (VHP®)	Incident Command Costs (AB)	Incident Command Costs (CLO2)
Contract with Steris	$ 99,000													x						
Contract with Sabre	$ 165,000															x				
Heaters for Bottom Floor	$ 2,400													x						
Travel - pH-Adjusted Bleach Process Decon Team	$ 47,692	airfare + rental car + lodging + expenses + 2 travel days													x					
Pegasus soil sampling kit prep	$ 10,000	NOT USED - From email from Erin on 2/9/11: $7500-$10,000 for Pegasus to sterilize the sand, fill soil containers, and set up lab spikes for the soil project. Probably another $500-$1000 TCAD will spend on supplies for the sampling kits.																		
INL lab anlysis of samples	$ 27,000	Based on IA w INL																		
USGS lab analysis of soil samples	$ 20,000	NOT USED																		
Pegasus analysis of water samples																				
INL water sampling tasks																				
Sandia tasks for aggresive sampling																				
RV-PCR - LLNL Sampling Kit Prep																				
SKC Honeywell Sampling Kit Prep																				
Slit to agar - SNL Sampling Kit Prep																				
Water - INL Sampling Kit Prep																				
Instrumentation - HOBOs for in-room monitoring	$ 6,125	DCMD PR															x			
Instrumentation - HOBOs for sample shipment	$ 10,500	DCMD PR											x							
Heater for bldg Allmand MH-100	$ 4,050																x			
INL-Purchasing	$ 7,613	70 hours labor	x																	
INL Sample Packaging Team	$ 17,161	50 hours labor * Team Rate per round											x							
Level B Support	$ 2,700	$900/day x 3 days													x					
Round 1 Incident Command Costs (IC/safety/OSC labor + travel)	$ 46,737	airfare + rental car + lodging + expenses (over round + 2 extra days) + 2 travel days																x		
Round 2 Incident Command Costs (IC/safety/OSC labor + travel)	$ 54,907	airfare + rental car + lodging + expenses (over round + 2 extra days) + 2 travel days																	x	
Round 3 Incident Command Costs (IC/safety/OSC labor + travel)	$ 46,737	airfare + rental car + lodging + expenses (over round + 2 extra days) + 2 travel days																		x
Travel - Round 1 Characterization Sampling Teams	$ 60,803	airfare + rental car + lodging + expenses + 2 travel days								x										
Travel - Round 1 Clearance Sampling Teams	$ 60,803	airfare + rental car + lodging + expenses + 2 travel days								x										
Travel - Round 2 Characterization Sampling Teams	$ 60,803	airfare + rental car + lodging + expenses + 2 travel days									x									
Travel - Round 2 Clearance Sampling Teams	$ 60,803	airfare + rental car + lodging + expenses + 2 travel days									x									
Travel - Round 3 Characterization Sampling Teams	$ 60,803	airfare + rental car + lodging + expenses + 2 travel days										x								
Travel - Round 3 Clearance Sampling Teams	$ 60,803	airfare + rental car + lodging + expenses + 2 travel days										x								
BROOM Support - Round 1	$ 12,266	per day charge								x										
BROOM Support - Round 2	$ 12,266	per day charge									x									
BROOM Support - Round 3	$ 12,266	per day charge										x								
BROOM Team Travel - Round 1 Characterization Sampling	$ 6,319	airfare + rental car + lodging + expenses + 2 travel days								x										
BROOM Team Travel - Round 2 Characterization Sampling	$ 6,319	airfare + rental car + lodging + expenses + 2 travel days									x									
BROOM Team Travel - Round 3 Characterization Sampling	$ 6,319	airfare + rental car + lodging + expenses + 2 travel days										x								
BROOM Team Travel - Round 1 Clearance Sampling	$ 6,319	airfare + rental car + lodging + expenses + 2 travel days								x										
BROOM Team Travel - Round 2 Clearance Sampling	$ 6,319	airfare + rental car + lodging + expenses + 2 travel days									x									
BROOM Team Travel - Round 3 Clearance Sampling	$ 6,319	airfare + rental car + lodging + expenses + 2 travel days										x								
Time Preparing Sample Boxes - Round 1 Characterization Sampling	$ 1,003	based on "Room Sample Box Prep Time" worksheet								x										
Time Preparing Sample Boxes - Round 1 Clearance Sampling	$ 1,003	based on "Room Sample Box Prep Time" worksheet								x										
Time Preparing Sample Boxes - Round 2 Characterization Sampling	$ 1,003	based on "Room Sample Box Prep Time" worksheet									x									
Time Preparing Sample Boxes - Round 2 Clearance Sampling	$ 1,003	based on "Room Sample Box Prep Time" worksheet									x									

Lumped Item	Cost	Notes	Analytical	Sampling - RMC	Sampling - Swab	Sampling - Wipe	Sampling - Sponge	Sampling - HEPA	Sampling - Agg. Air	Sampling - Round 1 General	Sampling - Round 2 General	Sampling - Round 3 General	Sampling - General	Decon - VHP®	Decon - AB	Decon - CLO2	Decon - General	Incident Command Costs (VHP®)	Incident Command Costs (AB)	Incident Command Costs (CLO2)
Time Preparing Sample Boxes - Round 3 Characterization Sampling	$ 1,003	based on "Room Sample Box Prep Time" worksheet										x								
Time Preparing Sample Boxes - Round 3 Clearance Sampling	$ 1,003	based on "Room Sample Box Prep Time" worksheet										x								
EPA Personnel Purchasing Equipment and Expendables for Phase 1	$ 6,398	100 hours per MWC 8/4/11 - divided into 3 rounds											x							
Training of Sampling Crews	$ 10,076	All teams trained for 4 hours per round											x							
Post Analytical Results Data Analysis	$ 23,490	Assumed 40 hours	x																	
START Contractor Post-Deployment Activities	$ 7,752	Assumed 4.5 hours per Dave Rees 8/9/11													x					
PNNL VSP Sample Planning	$ 17,001	60 Hours Per Brett; not divided per round											x							
Notional Labor for Removing HVAC Duct During pH-Adjusted Bleach Process Decon	$ 4,594	8 hours for Removal team in Level B; Shannon S. email 11/16/11													x					
Decon Line Setup and Takedown	$ 701	2 guys, 2 hours setup; 2 hours takedown (Mike Carpenter)												x	x	x				
PNNL Statistical Data Analysis	$ 34,002	200 hours per Brett A.											x							

Worksheet	Notes and Assumptions
All	Cells with a GREEN color have user inputs associated with them
All	Cells with a YELLOW color have outstanding issues associated with their data
All	Cells with a WHITE color are calculated based on formulas
All	Cells with a BLUE color are used in other worksheets
All	Used a single average time per entry based on TGD data
Analytical Costs	There is a knob that has the multiplier for BSL-3 analysis versus BSL-2 Analysis
Cost Equations	Sampling cost does not include RMC, soil, or SKC samples
Cost Equations	Average material cost per sample type = total materials for that sample type + total lumped costs for that sample type + general sample costs distributed among number of HEPA, wipe, swab, air, sponge
Cost Equations	Decon contractor fixed costs = the sum of all lumped costs + purchase order costs for each round, plus 1/3 of the general decontamination costs that are not attributed to any given round
Cost Equations	Purchase orders for sampling supplies and HOBOs are equally distributed among all samples of all main types (wipes, swabs, sponge sticks, aggressive air)
Lumped Costs	505 gal of AB used; Remaining Stock - Vinegar 72 cases, 4-1 gal bottles per case (2.37 ea Walmart)
Lumped Costs	505 gal of AB used; Remaining Stock - Bleach 62 cases, 6 3-qt bottles per case (1.98 ea Walmart)
Lumped Costs	Assume sampling and BROOM teams fly in, rent 1 car per team, stay duration of sampling, fly out; 1 day travel each way
Lumped Costs	Assume decon teams fly in, rent 1 car per team, stay duration of decon, fly out; 1 day travel each way
Lumped Costs	Assumed that only travel being paid for samplers, decon, safety, OSC, command. Other travel (e.g., decon line ops, sample kit box prep, other helpers, from local labor)
Numbers of Samples	Total number of samples for each round was estimated by dividing the total number of each type of sample by 3
QC	Recuperation time after entries was estimated by adjusting to minimize the difference between calculating the decon line time and the decon team time using either total days or based on entries
Room Sample Time	Assumed 15 aggressive air samples per entry; 3 hours per team
Time Per Sample	Assumed 30 aggressive air samples per round; 3 hours per team
Summary	To calculate waste distribution between sampling and decon, liquid and solid were combined
Cost Equations	Cost of Safety Team is included in IC costs. Cost of decon from safety team entering building is in decon cost.
Waste	Laminate Flooring = 21 ft2/carton; 35 lb/carton = 1.67 lb/ft2
Waste Summary	Laminate Flooring was notionally added to Removal Operations
Waste	Did not include porous materials removed after CLO2 clearance sampling because it didn't have anything to do with the decon or clearance process, and wouldn't have applied to reset
Analytical Costs	The UT Lab Costs are what the costs are - no additional labs responded with tracking data
Waste	HVAC material = 24 gauge; 7.71 lb/linear foot; HVAC equations, data, and rules of thumb By Arthur A. Bell
AB Building Refit	Laminate floor cost: 3.70/ft2 installed; email from Martin 8/8/11
AB Building Refit	Cost to install HVAC Duct: from http://www.homewyse.com/services/cost_to_install_duct.html
Analytical Costs	Analytical Cost of Aggressive Air Samples = average of analytical costs of HEPA vac, sponge stick, swab, and EPA wipes
Analytical Costs	Analytical Cost of Waste Samples = average of analytical costs of HEPA vac, sponge stick, swab, and EPA wipes
Waste Cost	MSW Transportation Cost = $3/mile in 2002; assumed it is $5/mile in 2012

	Round 1 - VHP®	Round 2 - AB	Round 3 - CLO2	Total
HEPA Vac	253	253	254	760
Sponge Sticks	520	520	520	1560
Wipes (EPA Prep)	58	58	59	175
Wipes (LLNL Prep)	113	113	114	340
Swabs	105	105	105	315
RMC	54	54	54	162
Aggressive Air	30	30	30	90
			Total w/o RMC	**3240**

Purchased Item	Cost	Notes	Analysis Expenables	Analysis Equipment	Sampling - RMC	Sampling - Swab	Sampling - Wipe	Sampling - Sponge	Sampling - HEPA	Sampling - Agg. Air	Sampling - General	Decon - VHP®	Decon - AB	Decon - CLO2	Decon - General	Waste Management - VHP®	Waste Management - AB	Waste Management - CLO2
Stomachers (4)	$ 17,596.00			x														
Rainin Pipette Tips for LRN	$ 703.50		x															
Orbi Shaker	$ 5,680.00			x														
Magic Clamp Platform	$ 1,408.00			x														
Magic Clamps	$ 672.00			x														
Containers	$ 1,072.00		x															
Scissors	$ 4,620.00			x														
50 mL conical Tubes	$ 4,073.30		x															
50 mL pipettes	$ 3,276.00		x															
Forceps	$ 3,697.50		x															
15 mL Conical tubes	$ 472.00		x															
Cups	$ 868.68		x															
5 mL pipettes	$ 3,414.60		x															
Pressure Station	$ 1,936.32			x														
Vacuum bottles	$ 2,092.00			x														
Venting Closure	$ 804.00			x														
Vaccuum Tubing	$ 656.40			x														
Funnel Manifold	$ 13,818.48			x														
10 mL pipettes	$ 2,168.00		x															
Cell Spreaders	$ 2,322.18		x															
200uL pipet tips, 960/pack	$ 660.00		x															
1mL pipet tipss, 768/pack	$ 819.00		x															
Filter Funnels (extra from VWR)	$ 10,963.68		x															
forceps	$ 102.00				x													
15ml conical	$ 75.48					x												
50ml conical (RMC)	$ 48.32				x													
50ml conical (Wipe)	$ 52.20						x											
fisher twirl-em bag (24oz)	$ 324.00								x									
whirl pak bag (24 oz) (RMC)	$ 52.72				x													
whirl pak bag (24 oz) (Swab)	$ 102.50					x												
small baggie (4x6) (RMC)	$ 41.02				x													
small baggie (4x6) (Swab)	$ 79.77					x												
small baggie (4x6) (Wipe)	$ 44.32						x											
baggie (6x9) for sponges	$ 273.64							x										
ziploc sandwith bags for templates	$ 77.12										x							
large baggie (12x15)	$ 279.00										x							
10x13" 2mil ziplock bags	$ 135.66							x										
8x10" 2mil ziplock bags (RMC)	$ 31.29				x													
8x10" 2mil ziplock bags (Swab)	$ 31.29					x												
8x10" 2mil ziplock bags (Wipe)	$ 31.29						x											
large fisher baggie (100oz) (Sponge)	$ 235.02							x										
large fisher baggie (100oz) (HEPA)	$ 156.68								x									
ziploc gallon bags for templates	$ 158.76										x							
2gal ziplock bags for gloves	$ 48.41										x							
sterile swab	$ 415.61					x												
microstein tubes (2ml)	$ 44.10					x												
dispatch wipes	$ 362.36										x							
dispatch wipe canisters	$ 609.00										x							
sponge sticks	$ 2,224.00							x										
HEPA vacuum kits	$ 7,184.00								x									
Kendal gauze wipe	$ 11.20						x											
Referee coupons		NOT USED			x													
neutralizing buffer (Swab)	$ 79.06					x												
neutralizing buffer (Wipe)	$ 109.94						x											
gloves (L)	$ 1,100.00										x							

Purchased Item	Cost	Notes	Analysis Expenables	Analysis Equipment	Sampling - RMC	Sampling - Swab	Sampling - Wipe	Sampling - Sponge	Sampling - HEPA	Sampling - Agg. Air	Sampling - General	Decon - VHP®	Decon - AB	Decon - CLO2	Decon - General	Waste Management - VHP®	Waste Management - AB	Waste Management - CLO2
gloves (XL)	$ 1,100.00										x							
sampling carts	$ 2,400.00										x							
bar codes (RMC)	$ 14.76				x													
bar codes (Swab)	$ 28.70					x												
bar codes (Wipe)	$ 15.95						x											
bar codes (Sponge)	$ 142.14							x										
bar codes (HEPA)	$ 69.25								x									
Ecomony File storage box	$ 336.00										x							
Parts Bin with 4 dividers	$ 181.50										x							
sampling templates	$ 4,290.00										x							
ethanol wipes	$ 496.25										x							
sharpie markers	$ 70.32										x							
INL-Purchased TSA Plates, PBST, Pall Filters	$ 43,386.72	Labor on "Lumped Costs" Worksheet	x															
ARCADIS-Purchased Supplies for Sampling Kits	$ 23,665.00										x							
300 gallons bleach (Clorox, 96 oz bottles)	$ 792.00	1.98/3 qt; 505 gal of AB used											x					
350 gallons vinegar (Oasis Foods white vinegar 4% acidity)	$ 829.50	2.37/gal; 505 gal of AB used											x					
RFID Reader and Tags	$ 3,775.99																x	
PPE for Sampling Purchased by DTRA	$ 21,864.07	$28624.80 prorated by sampling &decon entries									x							
PPE for Decon purchased by DTRA	$ 4,760.73	$28624.80 prorated by sampling &decon entries													x			
Equipment and Materials Purchased by START Contractors	$ 28,768.00	per Dave Rees 8/9/11											x					
PPE Purchased by Dino	$ 678.50	Per Erin 8/5/11									x							
Other Sampling Equipment Purchased by Dino	$ 1,863.72										x							
PPE Purchased by TCAD (cartridges)	$ 303.30	Per Erin 8/9/11 - bought 100 used 30									x							

Date	Room	Location	Room Type	Air	Sp Stick	Swab	Wipe	Vac	Start Time (m.s)	End Time (m.s)	LOE Sampler A [BROOM] (1-5)	LOE Sampler B [Prep] (1-5)	LOE Sampler C [Sample Acquisition] (1-5)	Notes
4/17/11	213	Upstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	5.49	3	3	4	Counter
4/17/11	213	Upstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.34	3	4	3	Blank
4/17/11	213	Upstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	6.41	2	3	4	Bed
4/17/11	211	Upstairs	Residence	FALSE	FALSE	TRUE	FALSE	FALSE	1.10	4.44	3	3	4	TV
4/17/11	211	Upstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	10.12	15.15	3	3	3	Table
4/17/11	209	Upstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	4.50	8.02	4	3	4	Counter
4/17/11	209	Upstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	7.52	3	2	4	Partition
4/17/11	209	Upstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	10.04	2	3	5	Floor
4/17/11	209	Upstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	1.11	7.56	3	4	4	Wall
4/17/11	212	Upstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	4.45	5	4	4	
4/17/11	212	Upstairs	Commercial	FALSE	FALSE	FALSE	FALSE	FALSE	0.00	2.37	4	5	4	Settling plate
4/17/11	212	Upstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	4.58	4	3	4	Chair
4/17/11	212	Upstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	4.00	8.58	3	3	4	Computer screen
4/17/11	212	Upstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	3.46	4	3	4	Floor
4/17/11	212	Upstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	3.50	5.35	4	5	4	Room 213 Blank
4/17/11	210	Upstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.42	4	5	4	Floor
4/17/11	210	Upstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	8.35	12.26	4	4	4	Wall
4/17/11	210	Upstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	6.57	9.53	3	4	4	Computer screen
4/17/11	210	Upstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.02	3	4	4	File cabinet
4/17/11	210	Upstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	0.43	2.25	3	4	4	Ceiling vent
4/17/11	210	Upstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	4.43	10.14	2	3	4	Ceiling tile
4/17/11	208	Upstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	4.44	4	4	4	Table
4/17/11	208	Upstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	0.00	6.25	3	5	4	Computer screen
4/17/11	208	Upstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	3.02	9.42	3	3	4	Floor
4/17/11	208	Upstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	1.24	10.06	2	2	5	Ceiling tile
4/17/11	208	Upstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	6.23	3	3	4	File cabinet
4/17/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	12.49	17.19	3	3	4	Floor
4/17/11	109	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	4.21	3	3	4	Shelf
4/17/11	109	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	4.30	8.11	3	4	4	Cabinet
4/17/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	8.03	11.02	3	3	4	File cabinet
4/17/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	0.56	3.53	3	3	4	Nightstand
4/17/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	5.32	3	3	5	Bed
4/17/11	109	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	5.20	8.12	3	4	4	Wall
4/17/11	107	Downstairs	Residence	FALSE	FALSE	TRUE	FALSE	FALSE	0.00	2.40	3	4	4	TV
4/17/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	5.21	8.18	3	3	4	Table
4/17/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	11.03	17.11	3	4	5	Table
4/17/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	2.43	10.47	3	3	4	Couch
4/17/11	107	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	4.12	2	4	3	Cabinet
4/17/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	8.20	9.37	4	5	5	Blank
4/17/11	107	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	1.20	3	4	4	Blank
4/17/11	107	Downstairs	Residence	FALSE	FALSE	TRUE	FALSE	FALSE	2.16	4.01	3	3	4	Air vent
4/17/11	107	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	4.13	13.31	2	2	4	Ceiling tile
4/17/11	110	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	2.00	5	5	4	Blank
4/17/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	5.48	3	3	4	Floor
4/17/11	110	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.43	3	3	4	Desktop
4/17/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	3.36	7.00	2	3	4	Chair
4/17/11	110	Downstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	6.27	10.28	3	4	4	Computer screen
4/17/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	10.18	13.55	2	3	4	Books
4/17/11	110	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	4.23	3	4	4	File cabinet
4/17/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	4.45	3	4	4	Floor
4/17/11	108	Downstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	2.43	4.02	3	4	3	Blank
4/17/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	4.41	9.56	3	4	3	Floor
4/17/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	12.06	16.23	3	4	4	Chair
4/17/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	16.40	21.31	2	3	4	Desk
4/17/11	Other	Upstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	2.56	8.12	3	4	3	Wall
4/17/11	Other	Upstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	9.20	14.35	4	4	4	Floor
4/17/11	Other	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	4.50	3	4	5	Room 102 floor
4/17/11	Other	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	1.01	2.53	3	5	4	Room 102 Blank
4/17/11	Other	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	4.14	8.55	3	4	4	Room 102 vertical file cabinet
4/17/11	Other	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	5.49	8.39	3	3	4	Room 102 horizontal file cabinet
4/17/11	Other	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	9.06	11.38	3	4	5	Room 102 Horizontal file cabinet
4/17/11	Other	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	12.35	15.38	3	4	4	Room 102 File cabinet
4/17/11	Other	Downstairs	Hall	TRUE	FALSE	FALSE	FALSE	FALSE	0.00	1.57	2	3	5	Room 101A air sample rack
4/17/11	Other	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	15.48	18.27	3	3	4	Room 102 Table
4/17/11	Other	Downstairs	Hall	TRUE	FALSE	FALSE	FALSE	FALSE	0.00	1.58	2	3	5	Room 101A
4/18/11	105	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	2.50	8.09	3	3	4	Wall
4/18/11	105	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	13.02	21.56	2	3	5	Floor
4/18/11	105	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	TRUE	21.56	25.05	0	5	5	Time between vacuum and sponge sample
4/18/11	105	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	25.05	28.05	3	3	4	Stove
4/18/11	105	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	10.56	2	2	5	Floor
4/18/11	105	Downstairs	Residence	FALSE	FALSE	TRUE	FALSE	FALSE	0.00	2.39	3	3	4	Air supply duct

Date	Room	Location	Room Type	Air	Sp Stick	Swab	Wipe	Vac	Start Time (m.s)	End Time (m.s)	LOE Sampler A [BROOM] (1-5)	LOE Sampler B [Prep] (1-5)	LOE Sampler C [Sample Acquisition] (1-5)	Notes
4/18/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	9.46	3	3	5	Floor
4/18/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	FALSE	10.43	12.24	0	5	5	Time between vacuum samples
4/18/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	10.43	17.02	3	3	5	Books and file cabinet
4/18/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	19.05	26.03	3	2	5	Chair
4/18/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	27.20	38.17	2	2	5	Floor
4/18/11	106	Downstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	0.00	4.12	3	4	4	Air supply duct
4/18/11	106	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	5.25	9.07	3	3	4	File cabinet
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.43	2	2	4	Floor
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	-0.40	2.25	3	3	4	Desk
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	4.50	7.56	3	4	4	Floor
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	2.56	3	3	4	Wall
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.21	3	3	4	Work bench
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	3.33	5.28	3	4	4	Table
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	1.56	3	4	4	Top of mailbox
4/18/11	103	Downstairs	Mailroom	FALSE	FALSE	TRUE	FALSE	FALSE	3.25	5.00	3	4	4	Air supply duct
4/18/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	FALSE	TRUE	5.20	11.30	3	4	5	Ceiling tile
4/18/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	FALSE	TRUE	14.01	15.03	4	5	5	Blank
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	TRUE	15.03	16.22	0	5	5	Time between vacuum and sponge stick
4/18/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	16.22	17.18	4	5	5	Blank
4/18/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	TRUE	FALSE	17.36	18.23	4	5	4	Blank
4/18/11	103	Downstairs	Mailroom	FALSE	FALSE	TRUE	FALSE	FALSE	18.40	19.44	3	5	4	Blank
4/18/11	104	Downstairs	Shop	FALSE	TRUE	FALSE	FALSE	FALSE	3.14	6.45	3	3	4	Floor
4/18/11	104	Downstairs	Shop	FALSE	FALSE	FALSE	TRUE	FALSE	1.30	4.48	3	4	4	Floor
4/18/11	104	Downstairs	Shop	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	4.02	4	3	4	Work bench
4/18/11	104	Downstairs	Shop	FALSE	FALSE	FALSE	TRUE	FALSE	4.46	8.38	3	3	4	Work bench
4/18/11	104	Downstairs	Shop	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.35	3	3	4	Wall
4/18/11	104	Downstairs	Shop	FALSE	FALSE	TRUE	FALSE	FALSE	5.00	7.30	3	4	5	Air supply duct
4/18/11	104	Downstairs	Shop	FALSE	FALSE	FALSE	FALSE	TRUE	8.43	19.43	2	2	5	Ceiling tile
4/18/11	104	Downstairs	Shop	FALSE	FALSE	FALSE	FALSE	TRUE	20.53	21.56	3	5	5	Blank
4/18/11	104	Downstairs	Shop	FALSE	FALSE	TRUE	FALSE	FALSE	0.00	1.11	3	5	4	Blank
4/18/11	104	Downstairs	Shop	FALSE	FALSE	FALSE	TRUE	FALSE	1.32	2.47	3	5	4	Blank
4/18/11	104	Downstairs	Shop	FALSE	FALSE	FALSE	FALSE	FALSE	2.47	3.42	0	5	5	Time between blanks
4/18/11	104	Downstairs	Shop	FALSE	TRUE	FALSE	FALSE	FALSE	3.42	4.30	3	5	4	Blank
4/22/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	13.58	16.32	3	4	4	108 Floor
4/22/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	0.34	7.51	3	3	5	108 Chair
4/22/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	12.23	16.43	3	4	5	Ceiling tile
4/22/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	22.03	26.05	3	3	5	Partition
4/22/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	38.49	41.26	0	0	0	File cabinet
4/22/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	0.00	2.35	3	3	5	File cabinet
4/22/11	108	Downstairs	Commercial	FALSE	FALSE	TRUE	TRUE	FALSE	2.46	4.37	3	3	4	Air supply vent
4/22/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	7.33	13.31	3	3	5	Wall
4/22/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	15.40	16.3	5	5	5	Blank
4/22/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	16.56	20.11	5	5	5	Blank
4/22/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	22.29	24.48	3	4	4	Wall
4/22/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	0.00	3.09	3	4	4	On top of cabinet
4/22/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	7.32	8.40	4	5	4	Blank
4/22/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	10.56	17.37	3	3	5	Bed
4/22/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	18.35	23.33	3	3	5	Bed
4/22/11	109	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	3.26	9.19	3	3	5	Ceiling tile
4/22/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	18.37	21.09	3	4	4	Table
4/22/11	107	Downstairs	Residence	FALSE	FALSE	TRUE	FALSE	FALSE	21.18	22.21	5	4	5	Blank
4/22/11	107	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	24.15	28.42	3	3	4	Table
4/22/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	31.24	36.24	2	3	5	Chair
4/22/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	1.00	2.47	4	5	5	Blank
4/22/11	107	Downstairs	Residence	FALSE	FALSE	TRUE	FALSE	FALSE	3.39	6.20	5	5	4	Blank
4/22/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	18.32	21.10	3	4	5	Bookshelf
4/22/11	107	Downstairs	Residence	FALSE	FALSE	TRUE	FALSE	FALSE	24.50	27.13	3	5	5	TV
4/22/11	107	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	0.00	2.19	2	3	4	Table
4/22/11	110	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	5.00	2	4	4	Floor
4/22/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	5.53	10.02	3	3	4	Floor
4/22/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	2.12	3	5	4	Blank
4/22/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	0.00	0.35	3	5	3	Blank
4/22/11	110	Downstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	0.00	1.49	3	5	4	Blank
4/22/11	110	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	2.01	3.06	3	5	3	Blank
4/22/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	19.16	21.32	2	3	4	Desk
4/22/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	22.45	26.00	3	3	5	Floor
4/22/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	1.43	7.59	3	3	5	Books
4/22/11	110	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	13.47	16.53	3	3	5	Wall
4/22/11	110	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	29.40	35.38	3	3	5	Partition
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	2.02	5.45	3	2	5	101a Sponge
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	8.12	9.12	3	5	4	101 Blank

Date	Room	Location	Room Type	Air	Sp Stick	Swab	Wipe	Vac	Start Time (m.s)	End Time (m.s)	LOE Sampler A [BROOM] (1-5)	LOE Sampler B [Prep] (1-5)	LOE Sampler C [Sample Acquisition] (1-5)	Notes
4/22/11	101A	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.15	3	4	4	101A Desk
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	4.21	6.04	3	3	4	101A Desk
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	6.37	7.14	5	5	4	101a Blank
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	5.06	8.03	2	4	4	101A Desk
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	8.51	14.19	3	3	5	101A Floor
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	FALSE	FALSE	19.28	20.03	5	0	0	Glove change
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	22.30	27.16	3	3	5	101A Desk
4/22/11	101A	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	28.26	30.44	3	4	5	Vertical on box
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	31.02	33.34	4	4	5	Horizontal on box
4/22/11	101A	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	15.42	16.01	5	5	5	Blank
4/22/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	30.43	33.26	3	3	4	Floor
4/22/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	20.00	24.28	3	3	5	Ceiling tile
4/22/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	1.49	4.34	3	3	5	Chair
4/23/11	105	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	19.27	23.34	3	4	5	Ceiling tile
4/23/11	105	Downstairs	Residence	FALSE	FALSE	TRUE	FALSE	FALSE	15.14	18.17	3	4	4	Air supply vent
4/23/11	105	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	TRUE	8.18	12.36	2	4	4	Floor
4/23/11	105	Downstairs	Residence	FALSE	FALSE	FALSE	FALSE	FALSE	7.20	8.12	0	5	5	Change gloves
4/23/11	105	Downstairs	Residence	FALSE	TRUE	FALSE	FALSE	FALSE	4.16	7.18	3	4	5	Table
4/23/11	105	Downstairs	Residence	FALSE	FALSE	FALSE	TRUE	FALSE	0.00	3.55	3	4	4	Table
4/23/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	TRUE	FALSE	31.36	33.36	3	4	4	Floor
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	4.28	3	4	4	Floor
4/23/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	TRUE	FALSE	10.35	13.33	3	3	4	Floor
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	14.23	16.39	3	3	4	Floor
4/23/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	TRUE	FALSE	18.30	21.13	3	4	4	Floor
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	22.07	25.46	3	4	4	Wall
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	28.56	30.52	2	3	4	Floor
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	32.12	34.43	3	4	4	Table
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	34.57	37.39	3	3	4	Desk
4/23/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	TRUE	FALSE	41.27	44.06	3	3	5	On top of mailbox
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	45.10	46.40	2	4	4	On top of mailbox
4/23/11	103	Downstairs	Mailroom	FALSE	FALSE	TRUE	FALSE	FALSE	48.34	51.28	3	4	4	Air supply vent
4/23/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	FALSE	TRUE	52.03	56.59	2	3	5	Ceiling tile
4/23/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	FALSE	TRUE	101.50	102.30	4	5	4	Blank
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	103.01	104.00	4	5	4	Blank
4/23/11	103	Downstairs	Mailroom	FALSE	TRUE	FALSE	FALSE	FALSE	104.06	107.12	4	5	4	Blank
4/23/11	103	Downstairs	Mailroom	FALSE	FALSE	FALSE	TRUE	FALSE	108.03	109.01	4	5	4	Blank
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	9.39	3	3	4	101A Floor
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	10.34	15.36	4	4	4	101A File cabinet
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	8.49	13.45	3	4	4	Floor
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	16.29	20.05	3	3	5	101A File cabinet
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	17.17	20.33	3	3	5	Air duct
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	23.12	25.32	3	4	4	Floor
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	23.48	27.17	3	3	4	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	28.17	30.30	3	3	4	Lobby Wall
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	29.32	34.48	3	3	5	101A Chair
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	35.12	38.53	3	4	4	Lobby Floor
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	31.02	32.57	3	4	4	Lobby Floor
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	35.48	37.15	3	4	5	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	39.15	40.43	4	5	4	Lobby blank
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	41.04	43.59	3	3	4	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	44.27	47.44	3	3	5	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	48.07	50.41	3	3	4	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	49.43	51.48	3	4	4	Lobby Floor
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	53.48	57.35	3	4	4	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	56.50	59.08	3	3	5	Lobby ceiling light
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	53.35	55.44	3	4	4	Lobby wall
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	56.54	59.58	3	3	4	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	0.00	3.56	3	3	4	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	2.08	4.23	3	4	4	Lobby floor
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	7.25	10.17	3	4	4	101A file cabinet
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	10.21	14.04	3	3	4	101A file cabinet
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	14.41	21.53	3	3	5	101A floor
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	22.13	23.20	4	5	5	101A blank
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	26.13	26.31	4	5	5	101A blank
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	26.41	27.31	3	5	4	101A blank
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	27.45	31.09	3	4	5	101A file cabinet
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	31.25	33.32	3	4	5	101A file cabinet
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	37.15	39.57	3	4	4	101A desk
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	40.13	43.43	3	4	4	101A vertical side of UVAPS
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	44.36	47.41	3	3	4	101A top of UVAPS
4/26/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	49.00	52.03	3	3	5	101A top of UVAPS

Date	Room	Location	Room Type	Air	Sp Stick	Swab	Wipe	Vac	Start Time (m.s)	End Time (m.s)	LOE Sampler A [BROOM] (1-5)	LOE Sampler B [Prep] (1-5)	LOE Sampler C [Sample Acquisition] (1-5)	Notes
4/26/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	TRUE	FALSE	52.06	55.29	3	3	5	101A top of UVAPS
5/11/11	109	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	2.00	11.04	3	3	5	Floor
5/11/11	109	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	15.23	22.38	3	3	5	Counter
5/11/11	109	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	25.13	29.19	3	4	4	Counter
5/11/11	109	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	5.12	13.31	3	3	5	Floor
5/11/11	109	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	16.70	18.40	3	5	5	Blank
5/11/11	109	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	20.04	21.31	4	5	5	Blank
5/11/11	109	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	23.56	25.06	3	5	5	Blank
5/11/11	109	Downstairs		FALSE	FALSE	FALSE	TRUE	FALSE	5.55	10.07	3	4	4	Side table
5/11/11	109	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	14.07	21.33	3	3	5	Bed
5/11/11	109	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	27.13	34.57	3	4	5	Bed
5/11/11	109	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	0.00	5.55	3	4	4	Side table
5/11/11	109	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	7.06	12.51	3	4	4	Wall
5/11/11	109	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	16.51	22.35	3	4	5	Ceiling tile
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	2.36	3	3	4	Floor
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	5.32	8.03	3	3	4	Floor
5/11/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	5.45	3	3	5	Ceiling tile
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	9.36	11.50	2	4	4	Floor
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	15.02	16.57	3	3	4	Bathroom Floor
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	17.40	21.34	4	4	4	Bathroom Wall
5/11/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	24.45	28.18	0	4	4	Blank no A person
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	20.01	22.46	3	4	4	Wall
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.19	4	4	4	Floor
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	11.07	12.38	3	4	4	Room 101 Floor
5/11/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	FALSE	14.52	17.19	4	4	4	Room 101 Wall
5/11/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	24.45	29.45	3	4	5	Ceiling tile
5/11/11	Hall	Downstairs	Hall	FALSE	TRUE	FALSE	FALSE	FALSE	30.59	33.30	3	3	4	Floor
5/11/11	Hall	Downstairs	Hall	FALSE	FALSE	FALSE	FALSE	TRUE	0.30	5.24	3	4	4	Ceiling tile
5/11/11	105	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	5.21	8.40	3	4	4	Stove
5/11/11	105	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	13.10	18.33	3	3	5	Floor
5/11/11	105	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	20.20	23.52	0	0	0	Table
5/11/11	105	Downstairs		FALSE	FALSE	TRUE	FALSE	FALSE	24.13	28.08	3	3	4	Air supply vent
5/11/11	105	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	28.43	36.20	3	3	5	Ceiling tile
5/11/11	105	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	4.26	8.21	3	3	4	Table
5/11/11	110	Downstairs		FALSE	TRUE	FALSE	FALSE	FALSE	0.00	3.50	3	4	4	Floor
5/11/11	110	Downstairs		FALSE	FALSE	TRUE	FALSE	FALSE	0.00	2.01	3	4	4	Air supply vent
5/11/11	110	Downstairs		FALSE	FALSE	FALSE	FALSE	TRUE	3.21	8.30	3	3	5	Ceiling tile
5/11/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	13.18	15.12	3	4	4	Floor
5/11/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	18.14	21.04	4	4	4	Wall
5/11/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	22.35	23.30	5	5	5	Blank
5/11/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	29.25	31.28	3	4	4	Floor
5/11/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	36.17	38.34	3	4	4	Chair
5/11/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	40.04	41.58	3	4	4	Desk
5/11/11	108	Downstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	42.33	44.15	3	4	4	Computer screen
5/11/11	108	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	23.44	25.18	5	5	4	Blank
5/11/11	108	Downstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	25.46	27.08	5	5	4	Blank
5/11/11	108	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	27.25	28.31	4	5	4	Blank
5/11/11	106	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	13.10	16.07	3	3	4	Wall
5/11/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	TRUE	FALSE	17.45	20.40	3	3	4	Floor
5/11/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	22.48	26.24	3	4	4	Chair
5/11/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	16.03	22.04	3	4	5	Ceiling tile
5/11/11	106	Downstairs	Commercial	FALSE	TRUE	FALSE	FALSE	FALSE	28.56	32.27	3	3	4	Desk
5/11/11	106	Downstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	35.47	38.10	3	3	4	Computer screen
5/11/11	106	Downstairs	Commercial	FALSE	FALSE	FALSE	FALSE	TRUE	0.00	5.53	4	3	4	Partition
5/11/11	106	Downstairs	Commercial	FALSE	FALSE	TRUE	FALSE	FALSE	11.30	13.44	3	4	4	Air supply vent
5/11/11	104	Downstairs	Shop	FALSE	TRUE	FALSE	FALSE	FALSE	39.44	41.57	3	3	4	Wall
5/11/11	104	Downstairs	Shop	FALSE	FALSE	FALSE	TRUE	FALSE	43.20	43.43	5	5	5	Blank
5/11/11	104	Downstairs	Shop	FALSE	TRUE	FALSE	FALSE	FALSE	44.36	45.22	5	5	5	Blank
5/11/11	104	Downstairs	Shop	FALSE	FALSE	TRUE	FALSE	FALSE	46.26	47.54	4	5	4	Blank

Date	Revisions
7/26/2011	Baseline Spreadsheet
7/27/2011	added analytical costs
7/27/2011	added material costs for decontaminations
7/28/2011	added cost contribution from IC
7/28/2011	adde bar charts with breakdown of costs to "Cost Equations" worksheet
7/28/2011	improved estimation of travel costs for START contractors
7/28/2011	color coded cells: Cells with a GREEN color have user inputs associated with them; Cells with a YELLOW color have outstanding issues associated with their data; Cells with a WHITE color are calculated based on formulas; Cells with a BLUE color are used in other worksheets
7/28/2011	Added amortization table for LRN-procured equipment
8/1/2011	Added multiplier for analysis to scale BSL-2 vs BSL-3 analytical costs; created "knob" to adjust
8/1/2011	Added revision list worksheet
8/1/2011	Created AB Building Refit worksheet
8/2/2011	Added vinegar and bleach costs to Lumped Costs
8/2/2011	Added labor costs and sample time for aggressive air samples
8/2/2011	Added travel costs of sampling teams
8/2/2011	Fixed error in travel cost of decon teams
8/2/2011	Got rid of sample times for RMC, SKC
8/2/2011	Added BROOM labor and travel support
8/3/2011	Fixed error in room sample box prep time averaging
8/3/2011	Added room sample box prep time into Lumped Costs
8/3/2011	Added QC check to compare costs for decon line and AB decon team using total days versus entries
8/3/2011	Put many quantities in hours not minutes
8/3/2011	Added "names" to many cells for ease of debugging
8/3/2011	Split up sampling/analytical cost components
8/3/2011	Made plot to show sampling/analytical cost breakdown
8/3/2011	Put plots on separate worksheets
8/4/2011	Added ceiling tiles to AB Refit Worksheet (est $5 each, 2 foot x 4 foot)
8/4/2011	Added laminate flooring (est $1/ft2 material, $1/ft2 installation)
8/4/2011	Added EPA Labor for purchasing stuff
8/4/2011	Added factor for time going between samples
8/4/2011	Moved bleach and vinegar purchase to Purchases worksheet
8/4/2011	Added books, binders, and mail to AB Refit Worksheet (estimated costs)
8/5/2011	Changed Activity "AB Dry and Reset" to "AB Dry"
8/5/2011	Calculated waste cost contribution due to sampling and decon
8/5/2011	Included waste management in sampling and decon cost breakdowns
8/5/2011	Included time training sampling crews
8/5/2011	Included data analysis time
8/5/2011	Added room and building dimensions on "Knobs" sheet
8/5/2011	Added "Other" contribution to Waste Costs from Purchase Orders
8/5/2011	Add cost of RFID tag reader and tags to Waste "Other" Costs
8/5/2011	Added Charts for Waste Distribution by Category and Activity
8/10/2011	Separated Decon Line Labor from Sampling Team Entry Labor
8/10/2011	Separated Decon Line Labor from Decontamination Team Entry
8/10/2011	Added Decon line labor for Round 1 and Round 3 decon contractor entries
8/10/2011	Added Decon Line Labor for Safety Team Entries
8/10/2011	Changed START contractor purchase to match note from Dave Rees 8/9/11
8/10/2011	Added START contractor post-deployment reporting, cleanup, etc per Dave Rees 8/9/11
8/10/2011	Added laminate floor replacement and installation cost per Martin Melzer ($3/ft2)
8/10/2011	Added PPE purchased by Bruce Hinds
8/10/2011	Added PPE and stuff purchased by Dino
8/10/2011	Adjusted generation date for some waste generated from the spraying

8/10/2011	Added Liquid Waste Distribution Chart
8/10/2011	Changed Solid wase Distribution Chart to be absolute numbers
8/10/2011	Added TCAD-purchased cartridges
8/10/2011	Updated Building Refit Team makeup and hours per Steve Reese 8/10/11
8/11/2011	Update Building Refit Worksheet to calculate total refit costs
8/11/2011	Created "RoundX" worksheet and graphs to run what if scenarios on all the other data
8/11/2011	Changed Decon Line Ops Summary to have total time for each activity
8/11/2011	Added waste sampling team and water sampling team
8/11/2011	Added waste sampling time and water sampling time (need numbers)
8/11/2011	Added waste analytical cost and water analytical cost (need numbers)
8/11/2011	Added waste and water sampling and analysis to the Waste Cost worksheet
8/11/2011	On Summary worksheet estimated amount of Sabre and Steris mob/demob vs cost per square foot
8/29/2011	Changed Sabre and STERIS breakdown to 33% mobilization/demobilization
8/29/2011	Put data into water analytical costs based on Scott Minamyer email 8/18/11
8/29/2011	Changed water sampling time to reflect Scott Minamyer email 8/29/11
11/10/2011	Added PNNL VSP Sample Planning
11/10/2011	Went through the general sampling and general decon and divided by rounds if appropriate
11/10/2011	Changed Waste Samples per 100 lb from 1 to 3 to approximate the 1 sample per bag decision from Phase II
11/16/2011	Clarified a couple headings on the Cost Equations Worksheet
11/16/2011	A few corrections on AB Refit Worksheet based on Joe's QC
11/16/2011	Changed BSL2-BSL3 multiplier to 1.5 (based on email exchange between Worth, Joe, and Paul
11/16/2011	Added PNNL Statistical Analysis Labor
11/17/2011	Slightly modified Team Entry spreadsheet based on Erin's QC
11/17/2011	Added HVAC replacement cost to AB Refit Worksheet
11/17/2011	Added HVAC removal cost to Lumped Costs Worksheet
11/17/2011	Added HVAC weight into waste from AB
11/18/2011	Created Salary Table worksheet and based loaded labor rates on careermedia.salary.com & Govt Salary Table
11/18/2011	Changed Waste Sampling Team to 3 people
11/18/2011	Changed Waste Sample time to 10 minutes
5/29/2012	Updated headers to reflect that this is Appendix K
5/29/2012	Updated Graphs to add ® sign to VHP and to change Amended Bleach to "pH-Adjusted Bleach Process"
8/1/2012	Updated waste generation days to reflect correct dates for materials removed the day after spraying
8/1/2012	Updated daily waste generation graph with headings for the 3 rounds
9/21/2012	Changed CLO2 to ClO2 in graphs

Date	Number of People	Activity	Time (min)	Number of Boxes	Average Box Prep Time (person - min/box)
4/19/11	7	Folding 100 vacuum templates	12		
4/19/11	7	Tabbing 95 medium size templates	5		
4/19/11	7	Pre-bleach 22 sampling boxes packing 1st and 2nd floor	42		
4/19/11	7	Adding templates to 22 pre-bleach boxes	22	22	25.8
4/27/11	2	preparing 5 sample kits	105	5	42.0
4/27/11	2	preparing templates (for 42, 10 x 10 kits)	120		
4/27/11	3	assembled 20, pre ClO2 kits	120	20	18.0

Date	Room	Team	Sample Start	Sample End	Time to Sample Room (min)	Notes
4/17/11	102	3	14:36	16:47	131	
4/17/11	102	12	17:17	18:28	71	
4/17/11	107	8	15:50	17:16	86	
4/17/11	108	8	17:16	18:35	79	
4/17/11	109	5	16:40	17:51	71	
4/17/11	110	5	15:08	16:36	88	Sharna entered at 1520 and stayed with team 5
4/17/11	206	6	14:59	16:51	112	
4/17/11	207	4	12:36	14:05	89	
4/17/11	208	6	10:21	12:35	134	
4/17/11	209	4	11:12	12:48	96	
4/17/11	210	5	11:20	12:43	83	
4/17/11	211	8	12:13	13:22	69	
4/17/11	212	5	10:05	11:17	72	
4/17/11	213	8	10:04	12:07	123	
4/17/11	101A	3	12:20	14:35	135	
4/17/11	Floor 1 Other	9	11:12	15:32	260	
4/17/11	Floor 2 Other	7	9:18	12:27	189	Total samples include both entries
4/17/11	Floor 2 Other	7	15:15	17:35	140	Total samples include both entries
4/18/11	103	4	11:02	11:54	52	
4/18/11	104	6	10:56	12:00	64	
4/18/11	105	4	8:59	11:02	123	
4/18/11	106	6	8:53	10:56	123	
4/22/11	102	9	14:46	16:26	100	air samples 16:38 to 16:41?
4/22/11	104	8	16:32	17:09	37	
4/22/11	105	13	16:39	17:30	51	105 Continued on 4/23/11
4/22/11	106	8	15:12	16:32	80	
4/22/11	107	13	14:43	16:34	111	
4/22/11	108	8	13:36	15:12	96	
4/22/11	109	7	14:52	16:10	78	
4/22/11	110	7	13:06	14:52	106	Sharna w t 7
4/22/11	206	6	17:45	18:30	45	
4/22/11	207	6	12:53	13:55	62	
4/22/11	208	6	11:34	12:53	79	
4/22/11	209	6	16:53	17:44	51	
4/22/11	210	6	13:57	15:15	78	
4/22/11	211	5	15:58	17:20	82	
4/22/11	212	5	11:15	13:53	158	
4/22/11	213	5	13:53	15:58	125	
4/22/11	101A	9	13:01	14:46	105	EPA team, Char, Erin, Lukas
4/22/11	Floor 1 Other	3	9:34	13:27	233	
4/22/11	Floor 2 Other	4	10:14	11:04	50	Stopped sampling for bio break; total samples for bot
4/22/11	Floor 2 Other	4	11:43	14:57	194	Resumed sampling after bio break
4/23/11	103	3	10:18	11:33	75	
4/23/11	105	3	9:44	10:14	30	105 Continued from 4/22/11
4/23/11	106		9:00	12:00	180	AAS 15 samples per entry; 3 hours (time is forced)
4/23/11	Floor 1 Other		13:00	16:00	180	AAS 15 samples per entry; 3 hours (time is forced)
4/26/11	102	8	12:05	13:39	94	
4/26/11	103	5	13:45	14:35	50	
4/26/11	104	5	12:35	13:45	70	

Date	Room	Team	Sample Start	Sample End	Time to Sample Room (min)	Notes
4/26/11	105	6	12:35	13:28	53	
4/26/11	105	6	14:20	14:25	5	T. 6 had to return to rm.105; combined number of sar
4/26/11	106	6	13:29	14:20	51	
4/26/11	107	4	13:40	14:51	71	
4/26/11	108	4	12:15	13:38	83	
4/26/11	109	3	12:12	13:22	70	
4/26/11	110	3	13:22	14:10	48	
4/26/11	206	9	11:00	11:42	42	
4/26/11	207	6	10:10	10:55	45	
4/26/11	208	9	10:00	10:58	58	
4/26/11	209	6	9:08	10:10	62	
4/26/11	210	7	10:30	11:32	62	
4/26/11	211	7	9:28	10:30	62	
4/26/11	212	5	9:43	10:43	60	
4/26/11	213	5	8:45	9:42	57	
4/26/11	101A	8	9:35	11:30	115	
4/26/11	Floor 1 Other	4	8:20	11:00	160	
5/5/11	101A	7	10:44	12:15	91	
5/5/11	102	7	12:15	13:35	80	
5/5/11	103	5	12:25	13:06	41	
5/5/11	104	5	13:07	13:58	51	
5/5/11	105	5	11:23	12:24	61	
5/5/11	106	1	14:06	15:52	106	
5/5/11	107	5	10:25	11:23	58	
5/5/11	108	6	11:59	12:56	57	
5/5/11	109	6	12:57	13:33	36	
5/5/11	110	6	10:51	11:58	67	
5/5/11	206	4	11:49	12:15	26	
5/5/11	207	4	12:16	12:45	29	
5/5/11	208	4	10:02	11:05	63	
5/5/11	209	4	11:06	11:48	42	
5/5/11	210	3	11:15	12:13	58	
5/5/11	211	3	12:13	12:46	33	
5/5/11	212	3	10:29	11:15	46	
5/5/11	213	3	9:24	10:28	64	
5/5/11	Floor 1 Other	2	9:02	12:54	232	
5/5/11	Floor 2 Other	1	8:51	10:19	88	
5/5/11	Floor 1 Other	2	14:19	15:31	72	
5/6/11	105		9:00	12:00	180	AAS 15 samples per entry; 3 hours (time is forced)
5/6/11	106		13:00	16:00	180	AAS 15 samples per entry; 3 hours (time is forced)
5/11/11	101A	7	11:54	14:30	156	
5/11/11	102	7	16:04	17:53	109	
5/11/11	103	4	15:23	16:10	47	
5/11/11	104	1	15:30	16:03	33	
5/11/11	105	2	15:25	16:25	60	
5/11/11	106	8	15:19	16:40	81	
5/11/11	107	8	13:40	15:18	98	
5/11/11	108	5	16:27	17:32	65	
5/11/11	109	5	9:52	12:05	133	

Date	Room	Team	Sample Start	Sample End	Time to Sample Room (min)	Notes
5/11/11	110	5	14:40	16:26	106	
5/11/11	Floor 1 Other	2	8:42	12:35	233	
5/11/11	206	6	10:53	11:44	51	
5/11/11	207	6	11:45	13:27	102	
5/11/11	208	4	12:26	12:57	31	
5/11/11	209	4	12:59	13:36	37	
5/11/11	210	4	9:48	11:34	106	
5/11/11	211	4	11:36	12:26	50	
5/11/11	212	3	9:38	10:40	62	
5/11/11	213	3	10:41	12:27	106	
5/11/11	Floor 2 Other	1	8:46	12:39	233	
5/16/11	101A	7	10:30	12:00	90	from BROOM sheet
5/16/11	102	7	12:11	13:36	85	from BROOM sheet
5/16/11	103	4	14:41	15:35	54	from BROOM sheet
5/16/11	104	3	13:46	14:29	43	from BROOM sheet
5/16/11	105	8	15:14	16:27	73	from BROOM sheet
5/16/11	106	8	11:53	13:16	83	from BROOM sheet
5/16/11	107	8	10:33	11:47	74	from BROOM sheet
5/16/11	108	5	14:32	15:52	80	from BROOM sheet
5/16/11	109	5	9:52	11:19	87	from BROOM sheet
5/16/11	110	5	11:27	12:35	68	from BROOM sheet
5/16/11	Floor 1 Other	2	8:44	12:07	203	from BROOM sheet
5/16/11	Floor 1 Other	2	14:02	15:00	58	from BROOM sheet
5/16/11	206	6	9:50	10:38	48	from BROOM sheet
5/16/11	207	6	10:47	11:38	51	from BROOM sheet
5/16/11	208	4	10:57	11:47	50	from BROOM sheet
5/16/11	209	4	11:57	12:32	35	from BROOM sheet
5/16/11	210	4	9:37	10:50	73	from BROOM sheet
5/16/11	211	3	11:50	12:24	34	from BROOM sheet
5/16/11	212	3	9:30	10:32	62	from BROOM sheet
5/16/11	213	3	10:51	11:41	50	from BROOM sheet
5/16/11	Floor 2 Other	1	8:43	12:09	206	from BROOM sheet
5/16/11	Floor 2 Other	6	14:00	14:34	34	from BROOM sheet; all floor 2 other combined
5/16/11	Floor 2 Other	1	11:46	12:41	55	from BROOM sheet; all floor 2 other combined
5/17/11	105		9:00	12:00	180	AAS 15 samples per entry; 3 hours (time is forced)
5/17/11	106		13:00	16:00	180	AAS 15 samples per entry; 3 hours (time is forced)

Labor Category	Job Classification	Annual Salary Median including Bonuses	Hourly Rate (Assuming 1949 hours worked per year)	Loaded Hourly Rate (Assuming 3x Loading Factor)	Source
PL1	Engineer I	55561	$ 29	$ 86	http://careermedia.salary.com
PL2	Engineer II	66560	$ 34	$ 102	http://careermedia.salary.com
PL3	Engineer III	80311	$ 41	$ 124	http://careermedia.salary.com
PL4	Engineer V	110450	$ 57	$ 170	http://careermedia.salary.com
TL1	Engineering Aide I	43046	$ 22	$ 66	http://careermedia.salary.com
TL2	Engineering Aide II	51549	$ 26	$ 79	http://careermedia.salary.com
TL3	Engineering Aide III	56966	$ 29	$ 88	http://careermedia.salary.com
EMT	Paramedic	37594	$ 19	$ 58	http://careermedia.salary.com
OSC/Commander	GS-13 Step 5	95559	$ 49	$ 147	US Govt Salary Table; Locality Pay for Research Triangle Park, NC

Entry Team Prep Time (hr)	Mean	SD	Notes
VHP® - Characterization Sampling1	0.96	7.5	
VHP® - Clearance Sampling	0.44	4.9	
AB - Clearance Sampling	0.22	2.6	
ClO2 - Characterization Sampling3	0.71	7.9	
Overall Entry Team Prep Time (hr)	*0.60*	*0.29*	Used for all types of entry teams

Entry Team Decon Line Time (hr)	Mean	SD	Notes
VHP® - Characterization Sampling1	0.81	0.08	
VHP® - Clearance Sampling	0.80	0.09	
AB - Characterization Sampling2	0.76	0.06	
AB - Clearance Sampling	0.76	0.07	
ClO2 - Characterization Sampling3	0.89	0.10	
Average Entry Team Decon Line Time (hr)	*0.81*	*0.09*	Used for all types of entry teams

Room Sample Box Prep Time (man hours/box)	Mean	SD
	0.48	0.20

Sample Times (hr)	Mean	SD	Notes
Sponge Stick	0.07	0.02	
HEPA Vac	0.10	0.04	
Swab	0.05	0.02	
Wipe	0.06	0.02	
Aggressive Air	0.10	0.00	

Decon Line Ops Time (min)	Mean	SD
VHP® - Characterization Sampling1	1194.0	308.0
VHP® - Decon	1382.0	308.0
VHP® - Clearance Sampling	1305.0	308.0
AB - Characterization Sampling2	660.0	308.0
AB Decon - Removal	1410.0	308.0

Waste Generation (solids in lb and liquids in gal)	Category 1S - Uncontaminated - Solid	Category 2S - Contaminated - Solid	Category 3S - Decontaminated - Solid	Category 4S - Decon Waste - Solid	Total Solid (lb)	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total Liquid (gal)	Notes
Dissemination	70.0	0.0	0.0	0.0	70	66.0	0.0	0.0	0.0	66	
VHP® - Characterization Sampling1	17.4	0.0	0.0	210.0	227	0.0	0.0	0.0	211.0	211	
VHP® - Decon	7.2	0.0	0.0	447.4	455	0.0	0.0	0.0	55.0	55	
VHP® - Clearance Sampling	19.8	0.0	0.0	188.4	208	0.0	0.0	0.0	73.5	74	
AB - Characterization Sampling2	20.8	0.0	0.0	247.0	268	0.0	0.0	0.0	177.0	177	
AB Decon - Removal	5.6	0.0	10141.6	154.4	10302	0.0	0.0	0.0	26.0	26	amount removed is doubled
AB Decon - Spray	4.2	0.0	2157.4	177.8	2339	0.0	0.0	105.0	527.9	633	
AB Decon - Dry	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	
AB - Clearance Sampling	15.8	0.0	703.5	325.4	1045	0.0	0.0	0.0	100.5	101	
ClO2 - Characterization Sampling3	10.6	0.0	0.0	101.2	112	0.0	0.0	0.0	137.0	137	
CLO2 - Decon	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	
ClO2 - Clearance Sampling	0.0	0.0	315.0	0.0	315	0.0	0.0	0.0	37.5	38	
AB - Building Reset	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	
Breakdown by Round											
VHP®	114.4	0.0	0.0	845.8	960	66.0	0.0	0.0	339.5	406	
pH-Adjusted Bleach Process	46.4	0.0	13002.5	904.6	13954	0.0	0.0	105.0	831.4	936	
ClO2	10.6	0.0	315.0	101.2	427	0.0	0.0	0.0	174.5	175	
Total	171.4	0.0	13317.5	1851.6	15341	66.0	0.0	105.0	1345.4	1516	
Breakdown by Activity											
VHP® Sampling	37.2	0.0	0.0	398.4	436	0.0	0.0	0.0	284.5	285	
VHP® Decontamination	7.2	0.0	0.0	447.4	455	0.0	0.0	0.0	55.0	55	
AB Sampling	36.6	0.0	703.5	572.4	1313	0.0	0.0	0.0	277.5	278	
AB Decontamination	9.8	0.0	12299.0	332.2	12641	0.0	0.0	105.0	553.9	659	
ClO2 Sampling	10.6	0.0	315.0	101.2	427	0.0	0.0	0.0	174.5	175	
ClO2 Decontamination	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0	
Other	70.0	0.0	0.0	0.0	70	66.0	0.0	0.0	0.0	66	

	Solid		Liquid		Solid + Liquid		
Distribution by Activity	Sampling	Decon & Other	Sampling	Decon & Other	Sampling	Decon & Other	
VHP®	436	914	285	362	53%	47%	Lumps solid and liquid together; other costs evenly distributed among 3 rounds
pH-Adjusted Bleach Process	1313	13977	278	958	10%	90%	Lumps solid and liquid together; other costs evenly distributed among 3 rounds
ClO2	427	450	175	197	94%	6%	Lumps solid and liquid together; other costs evenly distributed among 3 rounds
Total Solid Waste (lb)	15341						
Total Liquid Waste (gal)	1516						

Sampling Waste Generation by Building Size	Solid Waste (lb/ft2)	Liquid Waste (gal/ft2)	Solid Waste (lb/ft3)	Liquid Waste (lb/ft3)
VHP®	0.05	0.04	0.005	0.004
pH-Adjusted Bleach Process	0.16	0.03	0.016	0.003
ClO2	0.05	0.02	0.005	0.002

Decon Waste Generation by Building Size	Solid Waste (lb/ft2)	Liquid Waste (gal/ft2)	Solid Waste (lb/ft3)	Liquid Waste (gal/ft3)
VHP®	0.11	0.04	0.011	0.004
pH-Adjusted Bleach Process	1.74	0.12	0.174	0.012
ClO2	0.06	0.02	0.006	0.002

Decontamination Rate and Contract Cost	Pre-Decon Prep Time (hr)	Decon and Removal Time (hr)	Post-Decon Stabilization Time (hr)	Est. Mob/Demob Fraction of Fixed Cost	Contract Cost	Mob/Demob Cost	Incremental Cost ($/Ft2)
VHP®	12.0	24.0	24	0.33	$ 99,000	$ 32,670	$ 8.24
pH-Adjusted Bleach Process	0.0	28.1	72				
ClO2	12.0	24.0	24	0.33	$ 165,000	$ 54,450	$ 13.73

Date	Activity	Sample Team Entries	Decon Team Entries	Decon Contractor Entries	Removal Team Entries	Instrumentation Team Entries	Aggressive Air Sampling Team Entries	Building Upfit Team Entries	Health and Safety Team Entries	SKC Biosampling Team Entries	Soil Sampling Team Entries	Average Entry Time (hrs)	Notes
4/16/11	Dissemination										1		
4/17/11	VHP® - Characterization Sampling1	11								1		3.05	
4/18/11	VHP® - Characterization Sampling1	2									1	2.15	
4/19/11	VHP® - Decon			2								2.10	
4/20/11	VHP® - Decon			1					1			0.18	
4/21/11	VHP® - Decon			1					1			1.37	
4/22/11	VHP® - Clearance Sampling	11				1	0		1	1		2.42	
4/23/11	VHP® - Clearance Sampling	1				1	3		1		1	1.73	
4/24/11	DAY OFF												
4/25/11	Dissemination					1					1	0.57	
4/26/11	AB - Characterization Sampling2	15				1				1	1	1.83	
4/27/11	AB - Characterization Sampling2												
4/28/11	AB Decon - Removal				9							1.72	
4/29/11	AB Decon - Removal				8	1						2.13	
4/30/11	AB Decon - Spray		4			2						2.17	
5/1/11	AB Decon - Dry		6			1			2			1.13	
5/2/11	DAY OFF												
5/3/11	AB Decon - Dry												
5/4/11	AB Decon - Dry												
5/5/11	AB - Clearance Sampling	9								1		2.73	
5/6/11	AB - Clearance Sampling	4				1	2				2	1.28	
5/7/11	DAY OFF												
5/8/11	DAY OFF												
5/9/11	AB - Building Reset												
5/10/11	Dissemination			1		1					1	0.40	
5/11/11	ClO2 - Characterization Sampling3	13										2.65	
5/12/11	ClO2 - Characterization Sampling3					1				1	1	1.62	
5/13/11	CLO2 - Decon			1					1			1.00	
5/14/11	CLO2 - Decon												
5/15/11	CLO2 - Decon												
5/16/11	ClO2 - Clearance Sampling	14				1			1	1		2.07	
5/17/11	ClO2 - Clearance Sampling						3				1		

Activity	Sample Team Entries	Decon Team Entries	Decon Contractor Entries	Removal Team Entries	Instrumentation Team Entries	Aggressive Air Sampling Team Entries	Building Upfit Team Entries	Health and Safety Team Entries	SKC Biosampling Team Entries	Soil Sampling Team Entries	Average Entry Time (hrs)	SD Entry Time (hrs)	Max Entry Time (hrs)
Round 1 - VHP®	25	0	4	0	2	3	0	4	2	3	1.72	0.78	3.0
Round 2 - AB	28	10	0	17	7	2	0	2	2	4	1.72	0.78	3.0
Round 3 - CL02	27	0	2	0	3	3	0	2	2	3	1.72	0.78	3.0
Total	80	10	6	17	12	8	0	8	6	10			
Total Entries	157												
Total Sampling Team Entries	124												
Total Decon/Removal Team Entries	27												

	OSC/Commander	EMT	PL1	PL2	PL3	PL4	TL1	TL2	TL3	# on Team	# of Teams	Folks	Cost/Hr	Notes	Included Yet
Labor Rates ($/hr Loaded)	$147	$ 58	$86	$102	$124	$170	$66	$79	$88						
Sampling Team	0.33				3.00					3.3	6	20.0	$420	AVERAGE(7,2,8,1,9,7,2,8,8)	x
Decontamination Team (Level C)	0.33				2.33	0.67				3.3	3	10.0	$451	2 monitors, 3 teams of 2 each	x
Removal Team (Level B)	0.33				3.33	0.67				4.3	3	13.0	$574	2 monitors, 3 teams of 2 each, 1 extra SCBA guy	x
Removal Team (Level C)	0.33				2.33	0.67				3.3	3	10.0	$451	2 monitors, 3 teams of 2 each	x
Decontamination Team (Level B)	0.33				3.33	0.67				4.3	3	13.0	$574	2 monitors, 3 teams of 2 each, 1 extra SCBA guy (4 hours spraying - 4 sprayers, 4 leaders, 2 folks outside)	x
Decon Line Setup Team									2.00	2.0	1	2.0	$175	2 guys for 1 day probably	x
Decon Line Ops Team	1.00	1.00						3.00		5.0	1	5.0	$443		x
Instrumentation Team	0.50		4.00							4.5	1	4.5	$416	NOT INCLUDED	
Sample Packaging Team			1.00			1.00			1.00	3.0	1	3.0	$343	50 hrs per round for Kara and Frank; Nik and Paul 50% time	x
Waste Handling Team	1.00							3.00		4.0	1	4.0	$385		x
Lab Analyst Team	0.25			0.25					1.00	1.5	1	1.5	$150		x
BROOM Team			1.00			1.00				2.0	1	2.0	$256	240 hours total re Bob K	x
PNNL Statistical Analysis						1.00				1.0	1	1.0	$170	200 hours total re Brett A	x
Neptune Statistical Analysis						1.00				1.0	1	1.0	$170		
Data Analysis Team					2.00	2.00				4.0	1	4.0	$587	40 hours total re Jacky R for aerosol	x
PNLL VSP Team						1.00				1.0	1	1.0	$170	100 hours per Brett A; notional	x
ARCADIS Sample Kit Prep				1.00						1.0	1	1.0	$102	105 hours total per Worth C	x
Aggressive Air Sampling Team	1.00			3.00						4.0	1	4.0	$454		x
Building Upfit Team			1.00				3.00	3.00	3.00	10.0	1	10.0	$785	10 guys per Steve Reese 8/10/11	x
Health and Safety Team	1.00									1.0	1	1.0	$147		x
Documentation/Plan Writing Team			0.50		0.25		1.00			1.8	1	1.8	$140		x
Command Team	1.00									1.0	1	1.0	$147		x
OSC	1.00									1.0	1	1.0	$147		x
Regulatory Coordination Team	1.00					2.00				3.0	1	3.0	$487	Notional	x
INL Equipment Purchase Team						0.25	1.00			1.3	1	1.3	$109	Assume part of a professional and a technician	x
Room Sample Box Prep Team									3.00	3.0	1	3.0	$263		x
EPA Purchasing Team						1.00			0.25	1.3	1	1.3	$192	Assume part of a professional to spec out purchases and purchasing person to make purchases	x
Waste Sampling Team			3.00							3.0	1	3.0	$257		x
Water Sampling Team			3.00							3.0	1	3.0	$257		x

Total Time Spent Sampling (min)	11630	
Time for Samples (min) [sponge, vac, swab, wipe]	9276	
Fraction of Room Sample Time Accounted For	0.798	used to adjust mean t

Sample Type	**Mean Time Per Sample (hr)**	**Std. Dev. Per Sample (hr)**	**Adjusted Time Per Sample (hr)**
Sponge Stick	0.065	0.024	0.082
HEPA Vac	0.101	0.044	0.127
Swab	0.055	0.020	0.069
Wipe	0.057	0.022	0.071
Aggressive Air	0.100	0.000	0.125

Date	Time	Source	Description	Weight (lb)	Vol (gal)	Notes
4/16/11	9:00	Building	Booties, Gloves, Parafilm, Petri Dish Lids	6.4		Pre-dissemination
4/16/11	10:56	Building	Trash from Sampling Kits	3.2		Pre-dissemination
4/16/11	11:30	Building	Composite of Rinsewater and Filtrate		38	Pre-dissemination
4/16/11	11:30	Building	Gloves, Booties, Box	7.2		Pre-dissemination
4/16/11	18:00	Decontamination line	Gloves, Booties	1.2		Pre-dissemination PPE from Decon Tent; weighed next AM
4/17/11	9:49	Donning Trailer	Glove boxes, gloves, donning trash	4.4		
4/17/11	12:30	Donning Trailer	Glove boxes, gloves, donning trash	4.2		
4/17/11	13:17	Decontamination line	PPE and boxes	13.0		
4/17/11	15:00	Decontamination line	PPE and bags	20.8		
4/17/11	15:32	Decontamination line	PPE, boxes and bags	12.2		
4/17/11	15:48	Donning Trailer	Boxes and PPE trash	8.8		
4/17/11	16:29	Decontamination line	PPE and bags	7.6		
4/17/11	17:37	Decontamination line	PPE and bags and boxes	10.8		
4/17/11	18:12	Decontamination line	PPE and bags and boxes	14.2		
4/17/11	19:00	Decontamination line	PPE and bags and boxes	16.6		
4/17/11	19:03	Decontamination line	PPE and bags and boxes	11.6		
4/17/11	19:03	Decontamination line	Boxes	6.4		
4/17/11	19:03	Decontamination line	Misc	5.6		
4/17/11	19:03	Decontamination line	Boxes	11.0		
4/18/11	09:43	Decontamination line	PPE	26.4		
4/18/11	09:43	Decontamination line	Boxes	6.0		
4/18/11	09:43	Decontamination line	Misc	5.4		
4/18/11	12:25	Decontamination line	PPE	10.8		
4/18/11	12:52	Decontamination line	PPE	13.6		
4/18/11	12:55	Decontamination line	Decontamination rinsewater		110	
4/18/11	13:09	Decontamination line	Boxes and PPE	10.4		
4/18/11	13:09	Decontamination line	Misc	7.6		
4/18/11	18:00	Decontamination line	Decontamination rinsewater		101	Leftovers from 4-18; weighed next day at 9 AM
4/19/11	18:00	Decontamination line	VHP® setup PPE waste	6.2		Leftovers from 4-19; weighed next day at 10:14 am
4/19/11	18:00	Decontamination line	VHP® setup PPE waste	8		Leftovers from 4-19; weighed next day at 10:14 am
4/20/11	10:59	Decontamination line	Misc VHP® setup waste	7		
4/20/11	10:59	Decontamination line	VHP® setup waste	5		
4/20/11	10:59	Decontamination line	VHP® setup waste	9		
4/20/11	10:59	Donning trailer	PPE, boxes, garbage	7.2		
4/20/11	12:00	Decontamination line	PPE	30		
4/20/11	12:00	Decontamination line	PPE	1.6		
4/21/11	17:56	Decontamination line	STERIS fans (5)	29.6		79 fans altogether
4/21/11	18:09	Decontamination line	STERIS hoses	18.4		
4/21/11	18:09	Decontamination line	STERIS aerator	100.6		5 aerators altogether
4/21/11	18:09	Decontamination line	STERIS cables	21		
4/21/11	18:09	Decontamination line	STERIS cables	22		
4/21/11	18:09	Decontamination line	STERIS cables	30		
4/21/11	18:09	Decontamination line	STERIS sensors (3)	41		6 altogether
4/21/11	18:09	Decontamination line	STERIS hoses and fan	26		Need to subtract fan weight
4/21/11	18:09	Decontamination line	STERIS hoses	12		
4/21/11	18:09	Decontamination line	STERIS cables	48		
4/21/11	18:58	Decontamination line	Heater	10		9 Altogether
4/21/11	19:22	Decontamination line	Misc	4		
4/21/11	18:00	Decontamination line	PPE	18		Leftovers from 4/21; weighed at 9:25 AM
4/21/11	18:00	Decontamination line	Decontamination wastewater		55	Leftovers from 4/21; Soapy water from day before; dumped at 11:22 AM
4/22/11	10:15	Donning Trailer	PPE packaging and trash	3.6		
4/22/11	10:15	Donning Trailer	PPE packaging and boxes	8		
4/22/11	14:02	Donning trailer	PPE stuff	3.4		
4/22/11	16:02	Decontamination line	PPE stuff	43		
4/22/11	16:47	Decontamination line	PPE stuff	10.2		
4/22/11	17:00	Decontamination line	Bleach water		18	
4/22/11	17:05	Decontamination line	PPE stuff	11		
4/22/11	17:00	Decontamination line	Bleach water		18	
4/22/11	17:30	Decontamination line	PPE stuff	13.2		
4/22/11	18:06	Decontamination line	PPE stuff	9		
4/22/11	18:06	Decontamination line	PPE stuff	8.8		
4/22/11	18:06	Decontamination line	Sample kit boxes	4.6		
4/22/11	18:06	Decontamination line	Sample kit boxes	7.6		
4/22/11	18:40	Decontamination line	PPE, sample kit boxes	14.6		
4/22/11	18:50	Decontamination line	PPE stuff	23.8		
4/22/11	18:57	Decontamination line	PPE, sample kit boxes	10.6		
4/23/11	11:44	Donning trailer	PPE packaging	4.8		
4/23/11	12:16	Decontamination line	PPE	10.6		
4/23/11	13:01	Decontamination line	PPE	21.4		
4/23/11	18:00	Decontamination line	Decon Line Tent		38	Notionally Added (575 lb, 37.5 gal) - reuse tents

Date	Time	Source	Description	Weight (lb)	Vol (gal)	Notes
4/25/11	10:00	Decontamination line	Bleach water		28	
4/26/11	800	Decontamination line	Soapy water		28	
4/26/11	9:45	Donning trailer	PPE	11		
4/26/11	9:50	Decontamination line	PPE	44		
4/26/11	10:10	Donning trailer	PPE	3.6		
4/26/11	12:35	Decontamination line	PPE, sample boxes	91		
4/26/11	12:45	Decontamination line	Bleach water		28	
4/26/11	15:05	Decontamination line	Bleach water		28	
4/26/11	15:24	Decontamination line	PPE, sample boxes	50		
4/26/11	0:00	Decontamination line	PPE	22.0		
4/26/11	17:40	Decontamination line	PPE	11.0		
4/26/11	17:40	Decontamination line	PPE	29.0		
4/27/11	10:05	Decontamination line	Bleach water		93	
4/27/11	12:20	Donning trailer	Sample kit box waste	6.2		
4/28/11	9:00	Decontamination line	Bleach water		5	
4/28/11	10:00	Decontamination line	PPE waste	6.4		
4/28/11	12:50	Decontamination line	PPE waste	18.4		
4/28/11	4:35	Decontamination line	PPE waste	20.2		
4/28/11	18:00	Decontamination line	Bleach water		21	
4/28/11	18:30	Decontamination line	PPE	20.0		
4/29/11	9:20	Donning Trailer	PPE packaging	5.6		
4/29/11	10:45	Decontamination line	PPE waste	11.0		
4/29/11	17:30	Decontamination line	PPE waste	51.0		
4/29/11	16:30	Decontamination line	PPE waste	27.4		
4/29/11	18:00	Room 109	porous stuff (ceiling tile, carpet, furniture, etc.)	180.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	48.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 104	porous stuff (ceiling tile, carpet, furniture, etc.)	47.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	50.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	56.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	18.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	90.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	48.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	42.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	71.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	38.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	80.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	24.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	78.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 109	porous stuff (ceiling tile, carpet, furniture, etc.)	93.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	64.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	50.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	62.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	40.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	50.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	56.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	68.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	34.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	35.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	80.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	19.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 103	porous stuff (ceiling tile, carpet, furniture, etc.)	42.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	91.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	70.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	53.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 103	porous stuff (ceiling tile, carpet, furniture, etc.)	49.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	62.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 103	porous stuff (ceiling tile, carpet, furniture, etc.)	49.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	51.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	48.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	60.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	68.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	34.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	47.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	49.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	52.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	70.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	43.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	67.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 104	porous stuff (ceiling tile, carpet, furniture, etc.)	38.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	79.6		first floor inside bldg - Qty is 2x

Date	Time	Source	Description	Weight (lb)	Vol (gal)	Notes
4/29/11	18:00	Room 109	porous stuff (ceiling tile, carpet, furniture, etc.)	94.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	45.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 104	porous stuff (ceiling tile, carpet, furniture, etc.)	38.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	49.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	75.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	79.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	45.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 109	porous stuff (ceiling tile, carpet, furniture, etc.)	88.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	77.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 104	porous stuff (ceiling tile, carpet, furniture, etc.)	18.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	61.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	36.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	11.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	65.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	18.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	61.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	34.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	86.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	84.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	88.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	65.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	69.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	45.6		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	48.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	79.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	60.8		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	61.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	porous stuff (ceiling tile, carpet, furniture, etc.)	120.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	126.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	60.0		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	119.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Rooms 101A and 102	porous stuff (ceiling tile, carpet, furniture, etc.)	53.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Rooms 101A and 102	porous stuff (ceiling tile, carpet, furniture, etc.)	82.4		first floor inside bldg - Qty is 2x
4/29/11	18:00	Rooms 101A and 102	porous stuff (ceiling tile, carpet, furniture, etc.)	61.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Rooms 101A and 102	porous stuff (ceiling tile, carpet, furniture, etc.)	49.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Rooms 101A and 102	porous stuff (ceiling tile, carpet, furniture, etc.)	35.2		first floor inside bldg - Qty is 2x
4/29/11	18:00	Room 110	Laminate Floor that Should have Been Removed	700.1		Notionally Added
4/29/11	18:00	Room 108	Laminate Floor that Should have Been Removed	700.1		Notionally Added
4/29/11	18:00	Room 106	Laminate Floor that Should have Been Removed	700.1		Notionally Added
4/29/11	18:00	Building	HVAC Duct	3080.0		Notional Assumed 24 gauge 7.7 lb/ft
4/30/11	8:30	Decontamination line	Bleach water		55	
4/30/11	10:40	Decontamination line	ppe waste	15.6		
4/30/11	11:37	Decontamination line	Bleach water		37	
4/30/11	14:55	Decontamination line	Bleach water		28	
4/30/11	17:00	Decontamination line	Bleach water		110	
4/30/11	17:45	Decontamination line	ppe waste	14.2		
4/30/11	10:45	Decontamination line	ppe waste	12.2		Collected 5/1; Leftovers from 4/30;
4/30/11	11:30	Decontamination line	ppe waste	10.0		Collected 5/1; Leftovers from 4/30;
4/30/11	13:37	Decontamination line	ppe waste	14.0		Collected 5/1; Leftovers from 4/30;
4/30/11	15:50	Decontamination line	ppe waste	12.6		Collected 5/1; Leftovers from 4/30;
4/30/11	17:10	Decontamination line	bldg decon related waste	37.2		Collected 5/1; Leftovers from 4/30;
4/30/11	17:12	Decontamination line	ppe waste	4.6		Collected 5/1; Leftovers from 4/30;
4/30/11	18:00	Decontamination line	ppe waste	11.2		Collected 5/1; Leftovers from 4/30;
4/30/11	18:00	Building	Residual Bleach water from Spray		105	Collected 5/1; Leftovers from 4/30; Pumped from Building
4/30/11	18:00	Decontamination line	Bleach water		248	Collected 5/1; Leftovers from 4/30;
4/30/11	18:00	Decontamination line	PPE waste	13.2		Collected 5/1; Leftovers from 4/30; weighed 5/3 at 11 AM
4/30/11	18:00	Decontamination line	boxes	17.2		Collected 5/1; Leftovers from 4/30; weighed 5/3 at 11 AM
4/30/11	18:00	Decontamination line	Bleach water		37	Collected 5/1; Leftovers from 4/30; weighed 5/3 at 11 AM
4/30/11	13:43	Decontamination line	PPE	8.4		Collected 5/3; Leftovers from 4/30; Entries resetting furniture locations
4/30/11	12:05	Donning trailer	PPE	2.0		Collected 5/3; Leftovers from 4/30;
4/30/11	12:05	Building	3 Fans	18.6		Collected 5/4; Leftovers from 4/30; 16 Fans Total from 1st and 2nd floors
4/30/11	12:05	Decontamination line	PPE	2.4		Collected 5/4; Leftovers from 4/30;
4/30/11	12:05	Donning trailer	Boxes	2.2		Collected 5/4; Leftovers from 4/30;
4/30/11	12:05	Decontamination line	Misc	5.0		Collected 5/4; Leftovers from 4/30;
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	13.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	55.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	5.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	29.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 109	porous stuff (ceiling tile, carpet, furniture, etc.)	23.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 108	porous stuff (ceiling tile, carpet, furniture, etc.)	97.6		first floor inside bldg - Qty is 2x

Date	Time	Source	Description	Weight (lb)	Vol (gal)	Notes
4/30/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	28.0		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	51.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	55.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	64.8		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	48.4		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	36.4		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	83.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	57.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	35.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	43.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	83.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 109	porous stuff (ceiling tile, carpet, furniture, etc.)	48.8		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	48.4		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	40.4		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	45.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	109.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	40.0		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	59.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	79.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	9.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 105	porous stuff (ceiling tile, carpet, furniture, etc.)	62.0		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 106	porous stuff (ceiling tile, carpet, furniture, etc.)	15.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	103.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	96.0		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	27.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	22.8		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	8.4		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	39.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	61.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	54.8		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	46.0		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	74.4		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	42.4		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	49.2		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 104	porous stuff (ceiling tile, carpet, furniture, etc.)	10.0		first floor inside bldg - Qty is 2x
4/30/11	18:00	Room 107	porous stuff (ceiling tile, carpet, furniture, etc.)	43.6		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	48.8		first floor inside bldg - Qty is 2x
4/30/11	18:00	Other	porous stuff (ceiling tile, carpet, furniture, etc.)	41.6		first floor inside bldg - Qty is 2x
4/30/11	8:00	Decontamination line	Wastewater		14	changed date to 4/30 - generated that day
5/5/11	11:26	Donning trailer	PPE waste	5.2		
5/5/11	12:34	Decontamination line	PPE waste	6.6		
5/5/11	14:40	Decontamination line	PPE and boxes	7.6		
5/5/11	14:40	Decontamination line	PPE and boxes	4.2		
5/5/11	14:40	Decontamination line	PPE and boxes	12.4		
5/5/11	14:40	Decontamination line	PPE and boxes	25.8		
5/5/11	14:40	Decontamination line	PPE and boxes	17.4		
5/5/11	14:40	Decontamination line	PPE and boxes	5.8		
5/5/11	14:40	Decontamination line	PPE and boxes	6.8		
5/5/11	14:40	Decontamination line	PPE and boxes	12.0		
5/5/11	15:52	Decontamination line	PPE and boxes	11.8		
5/5/11	18:00	Decontamination line	PPE and misc	16.0		5/6 from day before
5/5/11	18:00	Decontamination line	PPE and misc	5.6		5/6 from day before
5/5/11	18:00	Decontamination line	PPE and misc	6.6		5/6 from day before
5/5/11	18:00	Decontamination line	PPE and misc	10.0		5/6 from day before
5/5/11	18:00	Decontamination line	PPE and misc	3.2		5/6 from day before
5/5/11	18:00	Decontamination line	Wastewater		63	5/6 from day before
5/6/11	12:30	Decontamination line	PPE and misc	11.0		
5/6/11	13:30	Other	PPE	13.8		Building Envelope Up till 5/6
5/6/11	14:06	Building	Aggressive Air Sampling Fans (1)	7.8		4 fans total
5/6/11	16:00	Decontamination line	PPE and bleach bottles	9.4		
5/6/11	16:00	Decontamination line	PPE	16.4		
5/6/11	8:00	Building	8 Chairs w/o Backs	8.0		8 Chairs from 5/6 (recorded on 5/9)
5/6/11	8:03	Building	porous material (ceiling tile & boxes)	14.0		From 5/6 (recorded on 5/9)
5/6/11	8:05	Building	porous material (ceiling tile)	20.0		From 5/6 (recorded on 5/9)
5/6/11	8:10	Building	porous material (ceiling tile)	20.8		From 5/6 (recorded on 5/9)
5/6/11	8:14	Building	porous material (ceiling tile)	23.2		From 5/6 (recorded on 5/9)
5/6/11	8:17	Building	porous material (ceiling tile boxes)	16.8		From 5/6 (recorded on 5/9)
5/6/11	8:22	Building	porous material (ceiling tile)	18.4		From 5/6 (recorded on 5/9)
5/6/11	8:27	Decontamination line	Empty Chlorox bottles & broken ceiling tiles	22.0		From 5/6 (recorded on 5/9)
5/6/11	8:35	Building	porous material (ceiling tile)	17.8		From 5/6 (recorded on 5/9)

Date	Time	Source	Description	Weight (lb)	Vol (gal)	Notes
5/6/11	8:43	Building	porous material (ceiling tile)	40.6		From 5/6 (recorded on 5/9)
5/6/11	8:50	Building	porous material (ceiling tile)	10.0		From 5/6 (recorded on 5/9)
5/6/11	8:53	Decontamination line	Empty Chlorox bottles & boxes that they came in	15.4		From AB Decon (recorded on 5/9)
5/6/11	8:56	Building	Wooden Pallet	35.4		From 5/6 (recorded on 5/9)
5/6/11	9:00	Decontamination line	Empty vinegar bottles & boxes that they came in	19.6		From AB Decon (recorded on 5/9)
5/6/11	9:04	Decontamination line	Flexible Ducting & PPE	12.0		From AB Decon (recorded on 5/9)
5/6/11	9:08	Decontamination line	Empty Chlorox bottles & broken ceiling tiles	9.2		From AB Decon (recorded on 5/9)
5/6/11	9:09	Building	Pieces of Wooden Pallet	3.0		From 5/6 (recorded on 5/9)
5/6/11	9:12	Decontamination line	Empty Chlorox&vinegar bottles w/ boxes they came in	10.4		From AB Decon (recorded on 5/9)
5/6/11	9:15	Building	Ceiling tiles & metal pipe	25.0		From 5/6 (recorded on 5/9)
5/6/11	9:18	Building	porous material (ceiling tile)	24.4		From 5/6 (recorded on 5/9)
5/6/11	9:21	Decontamination line	Empty vinegar bottles & boxes that they came in	14.4		From AB Decon (recorded on 5/9)
5/6/11	9:23	Decontamination line	Empty Chlorox&vinegar bottles w/ boxes they came in	14.6		From AB Decon (recorded on 5/9)
5/6/11	9:25	Building	porous material (ceiling tile)	36.1		From 5/6 (recorded on 5/9)
5/6/11	9:28	Building	Vent, Screens, Ceiling Tiles, Wood Shelves	58.4		From 5/6 (recorded on 5/9)
5/6/11	9:30	Building	porous material (ceiling tiles & cardboard)	18.4		From 5/6 (recorded on 5/9)
5/6/11	9:33	Building	plastic & wire flexible ductwork	21.4		From 5/6 (recorded on 5/9)
5/6/11	9:35	Building	plastic & wire flexible ductwork	21.2		From 5/6 (recorded on 5/9)
5/6/11	9:38	Building	porous material (ceiling tile)	23.4		From 5/6 (recorded on 5/9)
5/6/11	9:41	Building	porous material (ceiling tiles & cardboard)	16.4		From 5/6 (recorded on 5/9)
5/6/11	9:45	Building	plastic & wire flexible ductwork	16.6		From 5/6 (recorded on 5/9)
5/6/11	9:48	Decontamination line	ductwork, Empty Chlorox bottles & boxes	19.2		From AB Decon (recorded on 5/9)
5/6/11	9:50	Building	porous material (ceiling tile)	23.8		From 5/6 (recorded on 5/9)
5/6/11	9:54	Building	Lighting fixture	21.0		From 5/6 (recorded on 5/9)
5/6/11	9:58	Building	porous material (ceiling tile & wood)	29.0		From 5/6 (recorded on 5/9)
5/6/11	10:00	Building	porous material (ceiling tile)	36.0		From 5/6 (recorded on 5/9)
5/6/11	10:04	Building	porous material (ceiling tile)	18.6		From 5/6 (recorded on 5/9)
5/6/11	10:08	Building	porous material (ceiling tiles & cardboard)	8.8		From 5/6 (recorded on 5/9)
5/6/11	10:12	Building	plastic & wire flexible ductwork	8.0		From 5/6 (recorded on 5/9)
5/6/11	10:15	Building	plastic & wire flexible ductwork	16.0		From 5/6 (recorded on 5/9)
5/6/11	10:18	Building	plastic & wire flexible ductwork	7.0		From 5/6 (recorded on 5/9)
5/6/11	10:22	Building	plastic & wire flexible ductwork	7.6		From 5/6 (recorded on 5/9)
5/6/11	10:25	Building	plastic & wire flexible ductwork	16.8		From 5/6 (recorded on 5/9)
5/6/11	10:30	Donning trailer	PPE waste	10.6		From 5/6 (recorded on 5/9)
5/6/11	18:00	Decontamination line	Decon Line Tent		38	Notionally Added (575 lb, 37.5 gal) - reuse tents
5/10/11	14:30	Building	Cardboard	9.2		From 5/9 (recorded on 5/9)
5/10/11	10:45	Decontamination line	PPE & Cardboard	8.2		From 5/10
5/10/11	10:45	Decontamination line	PPE & Cardboard	5.8		From 5/10
5/10/11	10:45	Building	Misc	8.2		From 5/10
5/10/11	10:45	Building	Misc	2.8		From 5/10
5/10/11	10:45	Building	Ceiling tile	17.8		From 5/10
5/11/11	10:59	Decontamination line	Status of Liquid Collection		40	Blue Barrel #1
5/11/11	11:10	Donning trailer	PPE	4.0		
5/11/11	11:11	Donning trailer	PPE	1.6		
5/11/11	11:12	Decontamination line	PPE	12.0		
5/11/11	11:23	Decontamination line	Status of Liquid Collection		55	Blue Barrel #1 now full
5/11/11	13:04	Decontamination line	PPE	14.0		
5/11/11	14:04	Donning trailer	PPE	1.6		
5/11/11	14:05	Donning trailer	Cardboard	3.4		
5/11/11	14:24	Decontamination line	Status of Liquid Collection		28	Blue Barrel #2 Half Full
5/11/11	14:25	Decontamination line	Status of Liquid Collection		14	
5/11/11	15:04	Decontamination line	PPE	15.6		
5/11/11	15:06	Decontamination line	PPE	12.6		
5/11/11	15:20	Decontamination line	PPE, Cardboard	15.0		
5/11/11	16:50	Decontamination line	PPE, Cardboard	13.6		
5/11/11	16:51	Decontamination line	PPE, Cardboard	9.8		
5/11/11	17:10	Decontamination line	PPE, Cardboard	8.6		
5/11/11	17:13	Decontamination line	PPE, Cardboard	13.4		
5/11/11	17:14	Decontamination line	PPE, Cardboard	18.4		
5/11/11	17:15	Decontamination line	PPE, Cardboard	10.6		
5/11/11	18:22	Decontamination line	PPE, Cardboard	6.6		
5/11/11	18:23	Decontamination line	PPE, Cardboard	10.6		
5/17/11	18:00	Decontamination line	PPE, Sampling Trash	82.2		
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	19.6		Couch Cushion (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	19.8		Couch Cushion (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	20.0		Couch Cushion (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	19.6		Couch Cushion (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	19.4		Couch Cushion (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	19.2		Couch Cushion (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	19.0		Chair Cushions (didn't include)

Date	Time	Source	Description	Weight (lb)	Vol (gal)	Notes
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	27.6		Chair (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	33.6		Chair (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	46.0		Chair (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	21.8		Chair Cushions (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	91.0		Queen Mattress (didn't include)
5/17/11	18:00	Building	Porous Materials Removed After ClO2 Fumigation	95.0		Queen Mattress (didn't include)
5/17/11	18:00	Decontamination line	Decon Line Tent		38	Notionally Added (575 lb, 37.5 gal) - reuse tents

Waste Fixed Cost Elements	Hours	Loaded Rate ($/hr)	Labor Cost	
Waste Management Plan	40	$ 140	$ 5,597	
Transportation Plan	40	$ 140	$ 5,597	
Tracking and Reporting Plan	40	$ 140	$ 5,597	
Health and Safety Plan and Oversight Costs	40	$ 140	$ 5,597	scaleable?
Contract Oversight Costs	40	$ 147	$ 5,884	scaleable?
Communications and Community Outreach Plan and Costs	40	$ 140	$ 5,597	scaleable?
Coordination with Regulatory Agencies and Facilities	40	$ 487	$ 19,484	scaleable?
Total Fixed Costs			$ 53,353	
Waste Variable Cost Elements				
Standard MSW Disposal Fee ($/lb)	$ 0.05	assumed $100/ton		
Standard POTW Disposal Fee ($/gal)	$ 0.005	assumed $50/10000 gal		
Standard Transportation Fee ($/mile)	$ 5			
Miles to Local Landfill	10			
Miles to Secure Landfill	200			
Miles to POTW	10			
Multiplier for Premium Disposal	10			
Multiplier for Contaminated Disposal	100			
Truck Capacity (lb)	40000			
Truck Capacity (gal)	5000			
Solid Waste Collection, Handling and Segregation, Packaging, Labeling, Containerization ($/lb)	$ 3.85	assumed rate of 100 lb/hr or 100 gal/hr		
Interim Storage		not used		

Waste Knob (1, 2, 3)	2
1 = If Deconned Waste is treated as MSW	
2 = If Deconned Waste has Premium Charge	
3 = If Deconned Waste is treated as Contaminated	

Disposal Cost for Different Waste Categories	Category 1s - Uncontaminated - Solid ($/lb)	Category 2s - Contaminated - Solid ($/lb)	Category 3s - Decontaminated - Solid ($/lb)	Category 4s - Decon Waste - Solid ($/lb)	Category 1L - Uncontaminated - Liquid ($/gal)	Category 2L - Contaminated - Liquid ($/gal)	Category 3L - Decontaminated - Liquid ($/gal)	Category 4L - Decon Waste - Liquid ($/gal)
If Deconned Waste = Contaminated	$ 0.05	$ 5.00	$ 5.00	$ 5.00	$ 0.005	$ 0.50	$ 0.50	$ 0.50
If Deconned Waste = Premium Charge	$ 0.05	$ 5.00	$ 0.50	$ 0.50	$ 0.005	$ 0.50	$ 0.05	$ 0.05
If Deconned Waste = MSW	$ 0.05	$ 5.00	$ 0.05	$ 0.05	$ 0.005	$ 0.50	$ 0.01	$ 0.01

Transportation Costs for Different Categories ($) [assuming 1 truckload to landfill or POTW]	Category 1s - Uncontaminated - Solid ($/truckload)	Category 2s - Contaminated - Solid ($/truckload)	Category 3s - Decontaminated - Solid ($/truckload)	Category 4s - Decon Waste - Solid ($/truckload)	Category 1L - Uncontaminated - Liquid ($/truckload)	Category 2L - Contaminated - Liquid ($/truckload)	Category 3L - Decontaminated - Liquid ($/truckload)	Category 4L - Decon Waste - Liquid ($/truckload)
if Deconned Waste = MSW	$ 50	$ 100,000	$ 1,000	$ 1,000	$ 50	$ 5,000	$ 50	$ 50
if Deconned Waste = Premium Charge	$ 50	$ 100,000	$ 10,000	$ 10,000	$ 50	$ 5,000	$ 500	$ 500
if Deconned Waste = Contaminated	$ 50	$ 100,000	$ 100,000	$ 100,000	$ 50	$ 5,000	$ 5,000	$ 5,000

Quantities of Different Waste Categories	Category 1S - Uncontaminated - Solid	Category 2S - Contaminated - Solid	Category 3S - Decontaminated - Solid	Category 4S - Decon Waste - Solid	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total Solid (lb)	Total Liquid (gal)
VHP®	114.4	0.0	0.0	845.8	66.0	0.0	0.0	339.5	960.2	405.5
pH-Adjusted Bleach Process	46.4	0.0	13002.5	904.6	0.0	0.0	105.0	831.4	13953.5	936.4
ClO2	10.6	0.0	315.0	101.2	0.0	0.0	0.0	174.5	426.8	174.5

Calculated Disposal Costs (Tipping Fees)									
Estimated Disposal Costs if Deconned Waste = Contaminated	Category 1s - Uncontaminated - Solid	Category 2s - Contaminated - Solid	Category 3s - Decontaminated - Solid	Category 4s - Decon Waste - Solid	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total
VHP®	$ 5.7	$ -	$ -	$ 4,229.0	$ 0.3	$ -	$ -	$ 169.8	$ 4,405
pH-Adjusted Bleach Process	$ 2.3	$ -	$ 65,012.6	$ 4,523.0	$ -	$ -	$ 52.5	$ 415.7	$ 70,006
ClO2	$ 0.5	$ -	$ 1,575.0	$ 506.0	$ -	$ -	$ -	$ 87.3	$ 2,169

Estimated Disposal Costs if Deconned Waste = Premium Charge	Category 1s - Uncontaminated - Solid	Category 2s - Contaminated - Solid	Category 3s - Decontaminated - Solid	Category 4s - Decon Waste - Solid	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total
VHP®	$ 5.72	$ -	$ -	$ 422.90	$ 0.33	$ -	$ -	$ 16.98	$ 446
pH-Adjusted Bleach Process	$ 2.32	$ -	$ 6,501.26	$ 452.30	$ -	$ -	$ 5.25	$ 41.57	$ 7,003
ClO2	$ 0.53	$ -	$ 157.50	$ 50.60	$ -	$ -	$ -	$ 8.73	$ 217

Estimated Disposal Costs if Deconned Waste = MSW	Category 1s - Uncontaminated - Solid	Category 2s - Contaminated - Solid	Category 3s - Decontaminated - Solid	Category 4s - Decon Waste - Solid	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total
VHP®	$ 5.72	$ -	$ -	$ 42.29	$ 0.33	$ -	$ -	$ 1.70	$ 50
pH-Adjusted Bleach Process	$ 2.32	$ -	$ 650.13	$ 45.23	$ -	$ -	$ 0.53	$ 4.16	$ 702
ClO2	$ 0.53	$ -	$ 15.75	$ 5.06	$ -	$ -	$ -	$ 0.87	$ 22

Transportation Costs									
Estimated Transportation Costs if Deconned Waste = MSW	Category 1s - Uncontaminated - Solid	Category 2s - Contaminated - Solid	Category 3s - Decontaminated - Solid	Category 4s - Decon Waste - Solid	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total
VHP®	50	$ -	1000	incl.	$ 50	$ -	50	incl.	$ 1,150
pH-Adjusted Bleach Process	50	$ -	1000	incl.	$ -	$ -	50	incl.	$ 1,100
ClO2	50	$ -	1000	incl.	$ -	$ -	50	incl.	$ 1,100

Estimated Transportation Costs if Deconned Waste = Premium Charge	Category 1s - Uncontaminated - Solid	Category 2s - Contaminated - Solid	Category 3s - Decontaminated - Solid	Category 4s - Decon Waste - Solid	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total
VHP®	50	$ -	$ 10,000	incl.	$ 50	$ -	$ 500	incl.	$ 10,600
pH-Adjusted Bleach Process	50	$ -	$ 10,000	incl.	$ -	$ -	$ 500	incl.	$ 10,550
ClO2	50	$ -	$ 10,000	incl.	$ -	$ -	$ 500	incl.	$ 10,550

Estimated Transportation Costs if Deconned Waste = Contaminated	Category 1s - Uncontaminated - Solid	Category 2s - Contaminated - Solid	Category 3s - Decontaminated - Solid	Category 4s - Decon Waste - Solid	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total
VHP®	50	$ -	$ 100,000	incl.	$ 50	$ -	$ 5,000	incl.	$ 105,100
pH-Adjusted Bleach Process	50	$ -	$ 100,000	incl.	$ -	$ -	$ 5,000	incl.	$ 105,050
ClO2	50	$ -	$ 100,000	incl.	$ -	$ -	$ 5,000	incl.	$ 105,050

Handling, Segregation, Packaging, Labelling, and Other Costs	Category 1s - Uncontaminated - Solid	Category 2s - Contaminated - Solid	Category 3s - Decontaminated - Solid	Category 4s - Decon Waste - Solid	Category 1L - Uncontaminated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid	Total	
VHP®	$ 441	$ -	$ -	$ 3,257	$ 254	$ -	$ -	$ 1,308	$ 5,260	includes other costs from
pH-Adjusted Bleach Process	$ 179	$ -	$ 50,077	$ 3,484	$ -	$ -	$ 404	$ 3,202	$ 61,122	includes other costs from
ClO2	$ 41	$ -	$ 1,213	$ 390	$ -	$ -	$ -	$ 672	$ 2,316	includes other costs from

Total Waste Management Costs				Decontaminated Waste = MSW			Decontaminated Waste = Premium			Decontaminated W Contaminat	
	Fixed Costs	Handling Costs	Waste Sampling and Analytical Costs	Disposal Costs	Transportation Costs	Total	Disposal Costs	Transportation Costs	Total	Disposal Costs	Transporta tion Costs
VHP®	$ 53,353	$ 5,260	$ 10,192	$ 50	$ 1,150	$ 70,004	$ 446	$ 10,600	$ 79,850	$ 4,405	$ 105,100
pH-Adjusted Bleach Process	$ 53,353	$ 61,122	$ 124,218	$ 702	$ 1,100	$ 240,495	$ 7,003	$ 10,550	$ 256,245	$ 70,006	$ 105,050
ClO2	$ 53,353	$ 2,316	$ 5,096	$ 22	$ 1,100	$ 61,887	$ 217	$ 10,550	$ 71,532	$ 2,169	$ 105,050

Waste Management Costs (Based on Waste Knob)	Total	Contribution From Sampling	Contribution From Decon & Other
VHP®	$ 79,850	$ 42,166	$ 37,684
pH-Adjusted Bleach Process	$ 256,245	$ 25,725	$ 230,521
ClO2	$ 71,532	$ 67,053	$ 4,478

Waste Quantity (solids in lb and liquids in gal)	Total (lb) or (gal)	Waste Category	Category 1S - Uncontaminated - Solid	Category 2S - Contaminated - Solid	Category 3S - Decontaminated - Solid	Category 4S - Decon Waste - Solid	Category 1L - Unconta minated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid
Decon Line Solid (lb)										
Dissemination	15.2	1S	15.2	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	210.0	4S	0	0	0	210	0	0	0	0
VHP® - Decon	447.4	4S	0	0	0	447.4	0	0	0	0
VHP® - Clearance Sampling	188.4	4S	0	0	0	188.4	0	0	0	0
AB - Characterization Sampling2	247.0	4S	0	0	0	247	0	0	0	0
AB Decon - Removal	154.4	4S	0	0	0	154.4	0	0	0	0
AB Decon - Spray	177.8	4S	0	0	0	177.8	0	0	0	0
AB Decon - Dry	0.0	4S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	325.4	4S	0	0	0	325.4	0	0	0	0
ClO2 - Characterization Sampling3	101.2	4S	0	0	0	101.2	0	0	0	0
CLO2 - Decon	0.0	4S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	4S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Decon Line Liquid (gal)										
Dissemination	28.0	1L	0	0	0	0	28	0	0	0
VHP® - Characterization Sampling1	211.0	4L	0	0	0	0	0	0	0	211
VHP® - Decon	55.0	4L	0	0	0	0	0	0	0	55
VHP® - Clearance Sampling	73.5	4L	0	0	0	0	0	0	0	73.5
AB - Characterization Sampling2	177.0	4L	0	0	0	0	0	0	0	177
AB Decon - Removal	26.0	4L	0	0	0	0	0	0	0	26
AB Decon - Spray	527.9	4L	0	0	0	0	0	0	0	527.913
AB Decon - Dry	0.0	4L	0	0	0	0	0	0	0	0
AB - Clearance Sampling	100.5	4L	0	0	0	0	0	0	0	100.5
ClO2 - Characterization Sampling3	137.0	4L	0	0	0	0	0	0	0	137
CLO2 - Decon	0.0	4L	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	37.5	4L	0	0	0	0	0	0	0	37.5
AB - Building Reset	0.0	1L	0	0	0	0	0	0	0	0
Donning Trailer (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	17.4	1S	17.4	0	0	0	0	0	0	0
VHP® - Decon	7.2	1S	7.2	0	0	0	0	0	0	0
VHP® - Clearance Sampling	19.8	1S	19.8	0	0	0	0	0	0	0
AB - Characterization Sampling2	20.8	1S	20.8	0	0	0	0	0	0	0
AB Decon - Removal	5.6	1S	5.6	0	0	0	0	0	0	0
AB Decon - Spray	4.2	1S	4.2	0	0	0	0	0	0	0
AB Decon - Dry	0.0	1S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	15.8	1S	15.8	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	10.6	1S	10.6	0	0	0	0	0	0	0
CLO2 - Decon	0.0	1S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	1S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Building - Solid (lb)										
Dissemination	54.8	1S	54.8	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	3080.0	3S	0	0	3080	0	0	0	0	0
AB Decon - Spray	18.6	3S	0	0	18.6	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	689.7	3S	0	0	689.7	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	315.0	3S	0	0	315	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Building - Liquid (gal)										
Dissemination	38.0	1L	0	0	0	0	38	0	0	0
VHP® - Characterization Sampling1	0.0	3L	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	3L	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3L	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	3L	0	0	0	0	0	0	0	0
AB Decon - Removal	0.0	3L	0	0	0	0	0	0	0	0
AB Decon - Spray	105.0	3L	0	0	0	0	0	0	105	0
AB Decon - Dry	0.0	3L	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3L	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	3L	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	3L	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3L	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1L	0	0	0	0	0	0	0	0
Room 110 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0

Waste Quantity (solids in lb and liquids in gal)	Total (lb) or (gal)	Waste Category	Category 1S - Uncontaminated - Solid	Category 2S - Contaminated - Solid	Category 3S - Deconta minated - Solid	Category 4S - Decon Waste - Solid	Category 1L - Unconta minated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Deconta minated - Liquid	Category 4L - Decon Waste - Liquid
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	1372.1	3S	0	0	1372.14	0	0	0	0	0
AB Decon - Spray	0.0	3S	0	0	0	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Room 109 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	455.6	3S	0	0	455.6	0	0	0	0	0
AB Decon - Spray	72.0	3S	0	0	72	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Room 108 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	1286.1	3S	0	0	1286.14	0	0	0	0	0
AB Decon - Spray	97.6	3S	0	0	97.6	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Room 107 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	151.6	3S	0	0	151.6	0	0	0	0	0
AB Decon - Spray	603.6	3S	0	0	603.6	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Room 106 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	1044.9	3S	0	0	1044.94	0	0	0	0	0
AB Decon - Spray	385.2	3S	0	0	385.2	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Room 105 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0

Waste Quantity (solids in lb and liquids in gal)	Total (lb) or (gal)	Waste Category	Category 1S - Uncontaminated - Solid	Category 2S - Contaminated - Solid	Category 3S - Decontaminated - Solid	Category 4S - Decon Waste - Solid	Category 1L - Unconta minated - Liquid	Category 2L - Contaminated - Liquid	Category 3L - Decontaminated - Liquid	Category 4L - Decon Waste - Liquid
AB Decon - Removal	246.4	3S	0	0	246.4	0	0	0	0	0
AB Decon - Spray	263.2	3S	0	0	263.2	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Room 104 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	143.2	3S	0	0	143.2	0	0	0	0	0
AB Decon - Spray	10.0	3S	0	0	10	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Room 103 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	141.6	3S	0	0	141.6	0	0	0	0	0
AB Decon - Spray	0.0	3S	0	0	0	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Rooms 101A and 102 (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	281.2	3S	0	0	281.2	0	0	0	0	0
AB Decon - Spray	0.0	3S	0	0	0	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0
Other (lb)										
Dissemination	0.0	1S	0	0	0	0	0	0	0	0
VHP® - Characterization Sampling1	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Decon	0.0	2S	0	0	0	0	0	0	0	0
VHP® - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Characterization Sampling2	0.0	2S	0	0	0	0	0	0	0	0
AB Decon - Removal	1938.8	3S	0	0	1938.8	0	0	0	0	0
AB Decon - Spray	707.2	3S	0	0	707.2	0	0	0	0	0
AB Decon - Dry	0.0	3S	0	0	0	0	0	0	0	0
AB - Clearance Sampling	13.8	3S	0	0	13.8	0	0	0	0	0
ClO2 - Characterization Sampling3	0.0	2S	0	0	0	0	0	0	0	0
CLO2 - Decon	0.0	2S	0	0	0	0	0	0	0	0
ClO2 - Clearance Sampling	0.0	3S	0	0	0	0	0	0	0	0
AB - Building Reset	0.0	1S	0	0	0	0	0	0	0	0

Total Solid Waste (lb)	15341	**Total**	171.4	0.0	13317.5	1851.6	66.0	0.0	105.0	1345.4
Total Liquid Waste (gal)	1516									

Appendix I

IBAC Sensor Data

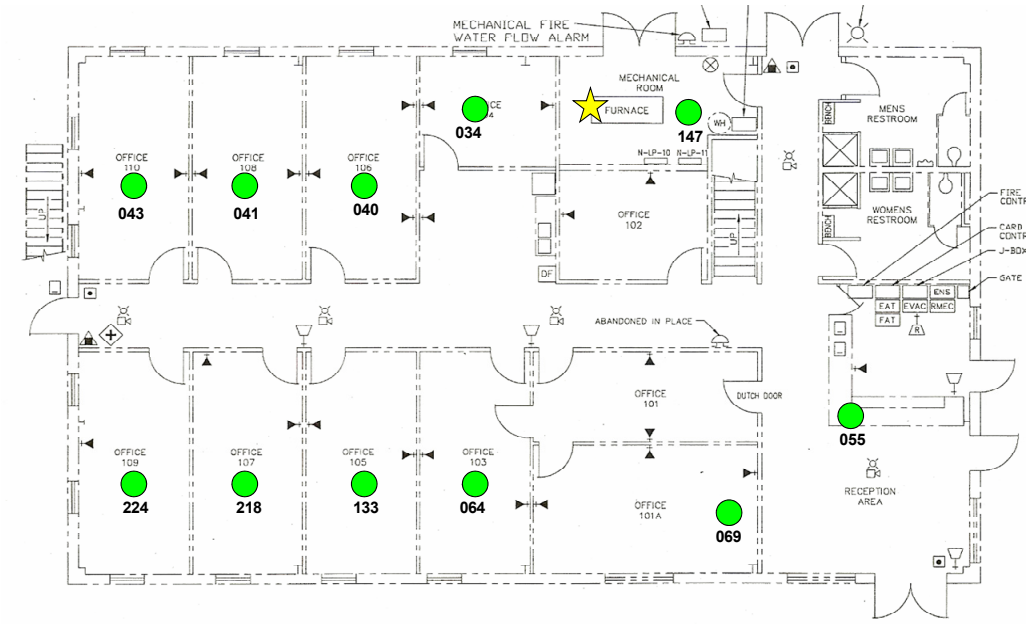
IBAC Sensor Locations

Rounds 1-3

1st Floor Layout

IBAC Sensor

Spore Release Point



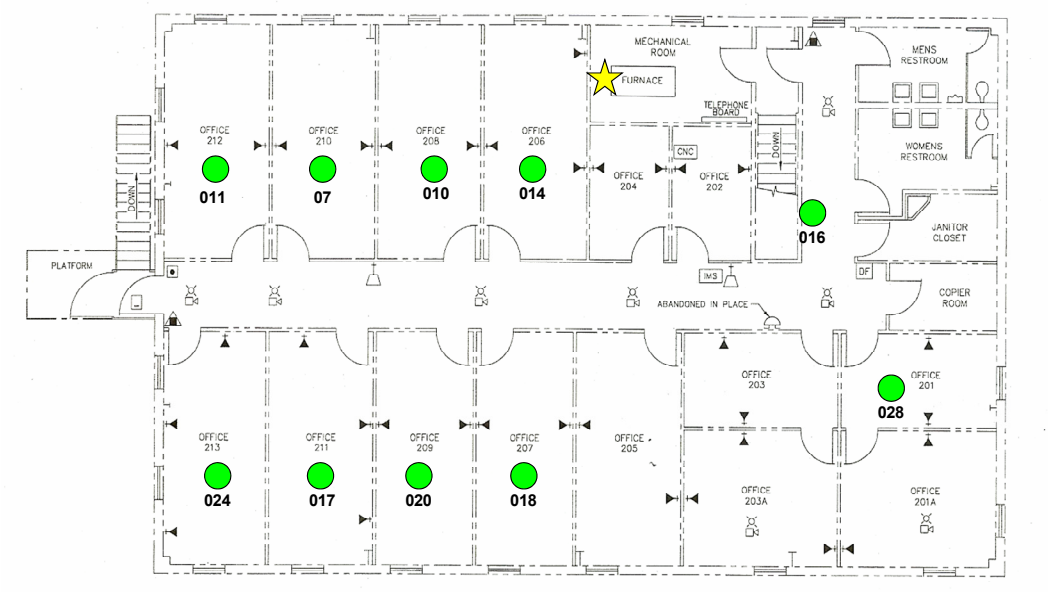
IBAC Sensor Locations

Rounds 1-3

2nd Floor Layout

IBAC Sensor

Spore Release Point



1st Floor IBAC Data
Test Event #1
April 16, 2011

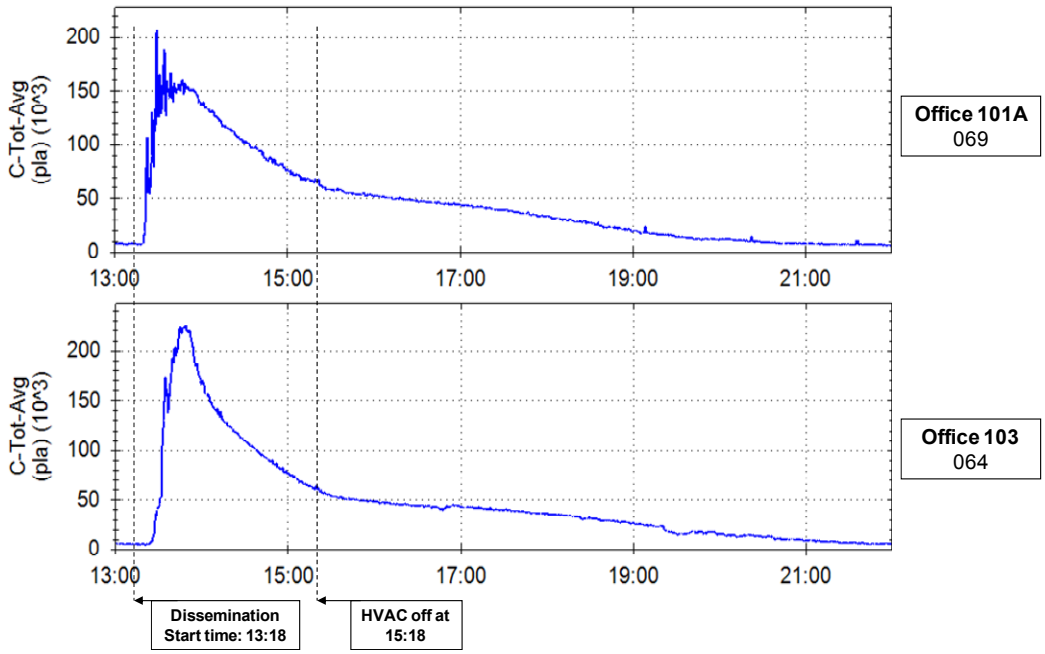
Release Material: Bacillus atropheus
Location: 1st Floor Air Supply
Release Time: 13:18
Amount: 200mg (10 generators, 4 mg/mL suspension, 5 mL solution per generator, 50 ml total)

• HVAC System shut off at 15:18 (+ 2 hours)

	IBAC SSN	Location	Time to Reach Sensor	Peak Particles (Particles/Liter)	Average Particles 2 hour duration (Particles/Liter)
1	069	Office 101A	1 minute	207,660	107,080
2	064	Office 103	5 minutes	225,900	117,250
3	034	Office 104	1 minute	287,100	131,950
4	133	Office 105	9 minutes	179,925	103,600
5	040	Office 106	2 minutes	252,200	121,550
6	218	Office 107	12 minutes	111,230	77,650
7	041	Office 108	6 minutes	198,850	104,050
8	224	Office 109	20 seconds	233,200	110,000
9	043	Office 110	2 minutes	118,400	77,300
10	147	HVAC Mechanical Room	15 seconds	465,840	144,750
11	055	Lobby	2 minutes	354,080	140,500
		Average		240,000	112,500

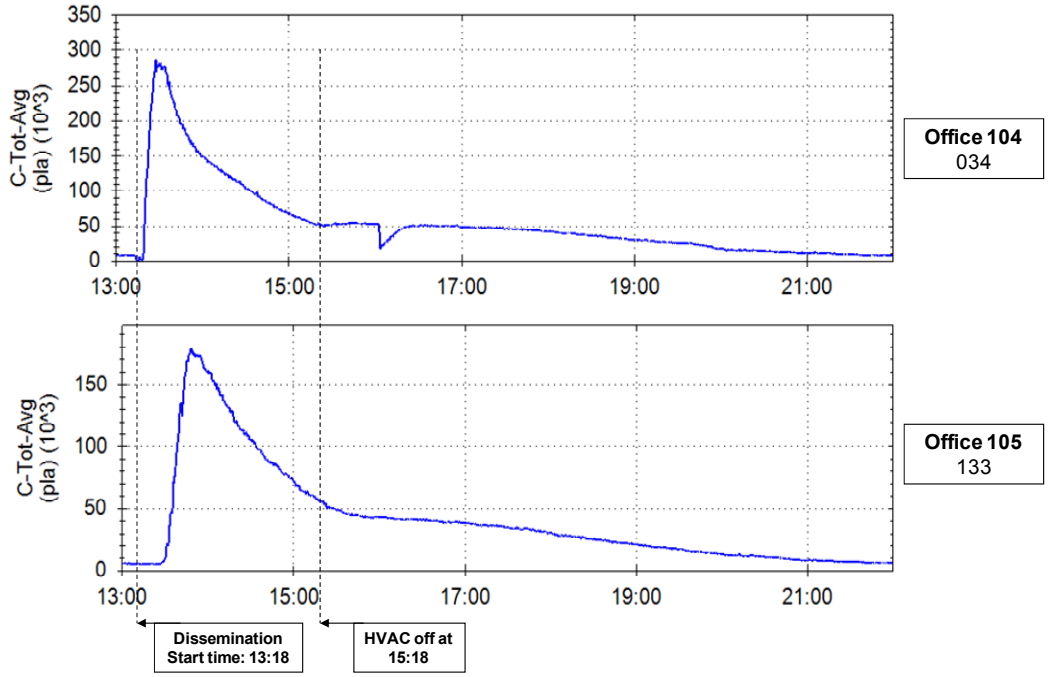
Test Event #1 – IBAC Particle Plots

April 16, 2011 – 13:00 – 22:00



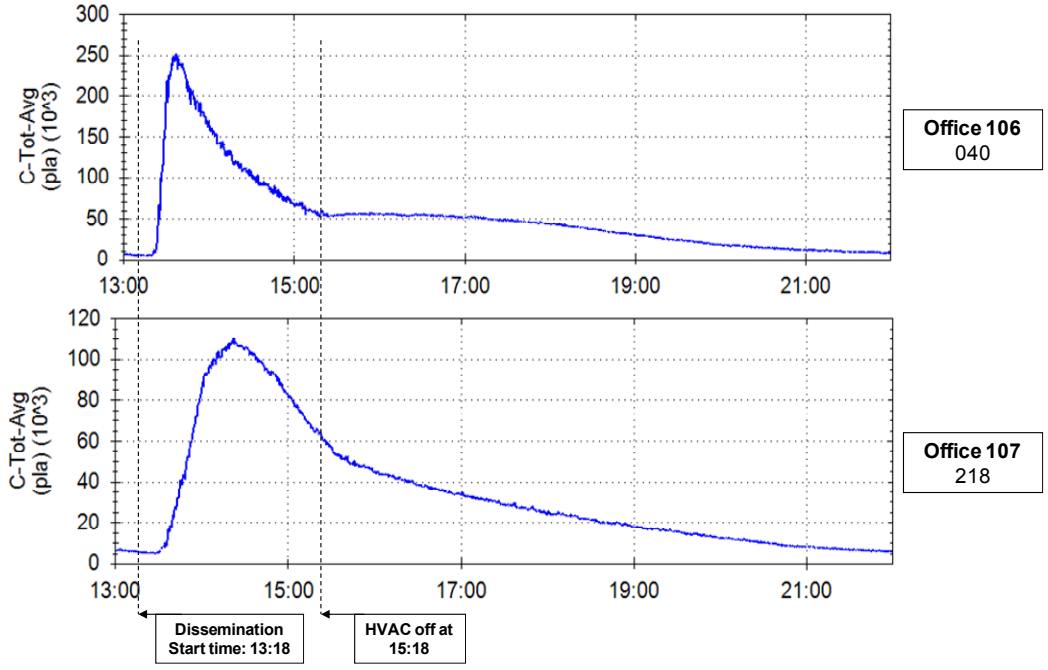
Test Event #1 – IBAC Particle Plots

April 16, 2011 – 13:00 – 22:00



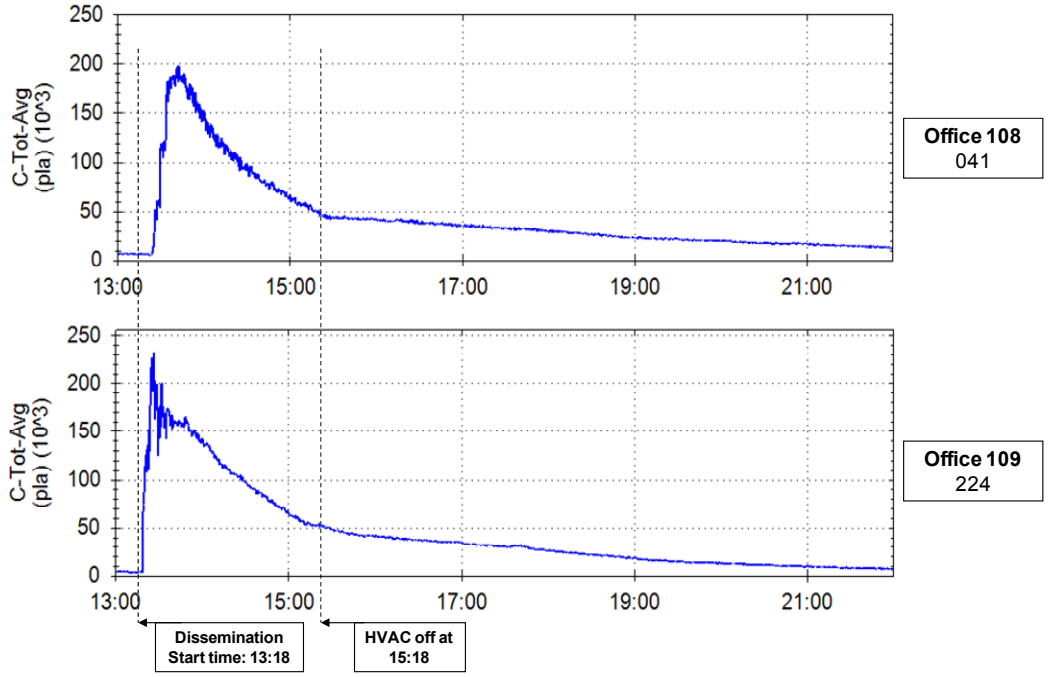
Test Event #1 – IBAC Particle Plots

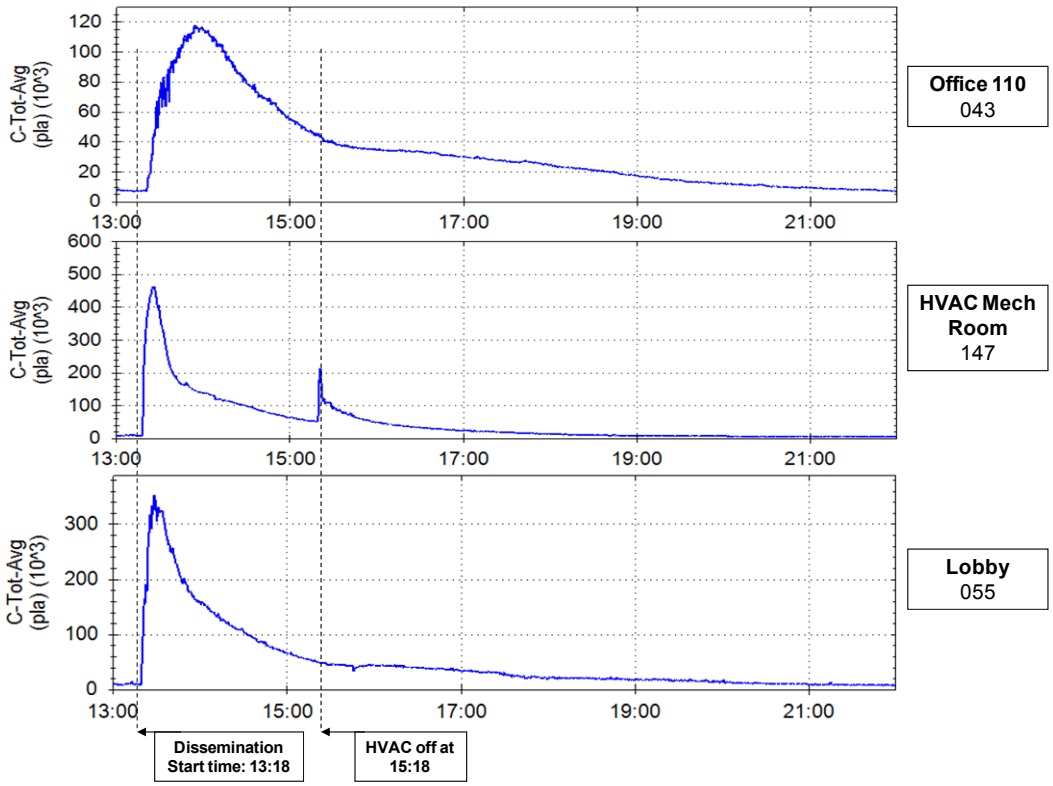
April 16, 2011 – 13:00 – 22:00



Test Event #1 – IBAC Particle Plots

April 16, 2011 – 13:00 – 22:00





2nd Floor IBAC Data
Test Event #1
April 16, 2011

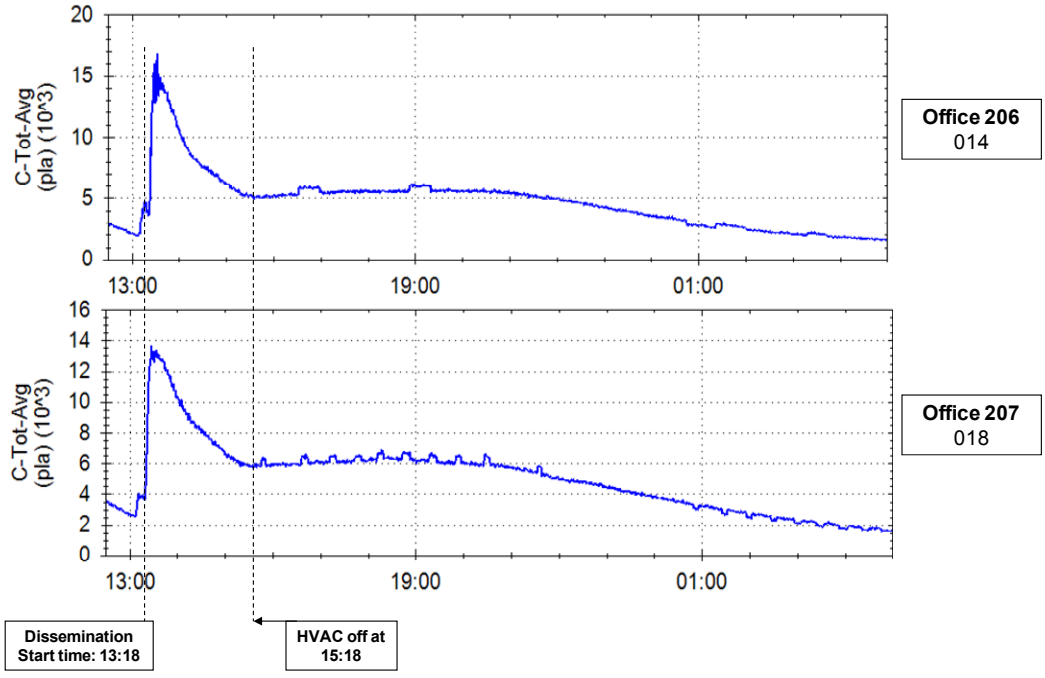
Release Material: Bacillus atropheus
Location: 2nd Floor Air Supply
Release Time: 13:18
Amount: 0.5mg (1 generator, 0.5 mg/mL suspension, 1ml total)

• HVAC System shut off at 15:18 (+ 2 hours)

	IBAC SSN	Location	Time to Reach Sensor	Peak Particles (Particles/Liter)	Average Particles 2 hour duration (Particles/Liter)
1	028	Office 201	2 minutes	11,200	5,000
2	014	Office 206	4 minutes	14,900	6,950
3	018	Office 207	1 minute	11,725	6,900
4	010	Office 208	5 minutes	10,980	5,200
5	020	Office 209	2 minutes	8,730	4,650
6	007	Office 210	2 minutes	8,000	4,550
7	017	Office 211	2 minutes	14,060	5,320
8	011	Office 212	5 minutes	10,050	4,900
9	024	Office 213	1 minute	13,575	4,400
10	016	Hallway near air lock	3 minutes	6,350	3,060
			Average	10,950	5,100

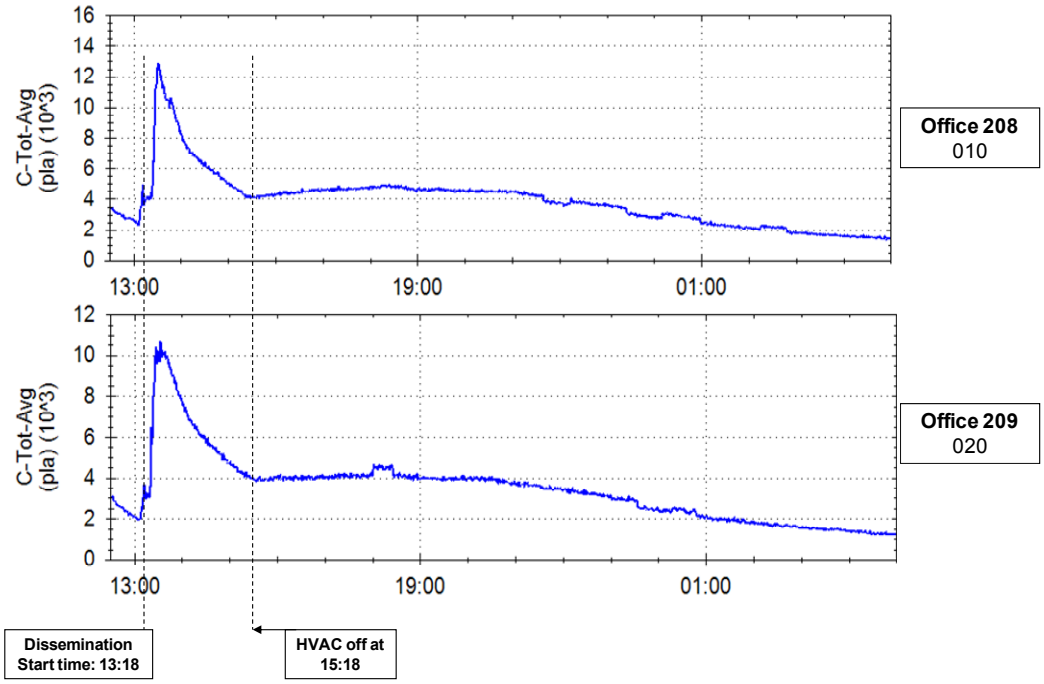
Test Event #1 – IBAC Particle Plots

April 16, 2011 – 13:00 – 05:00



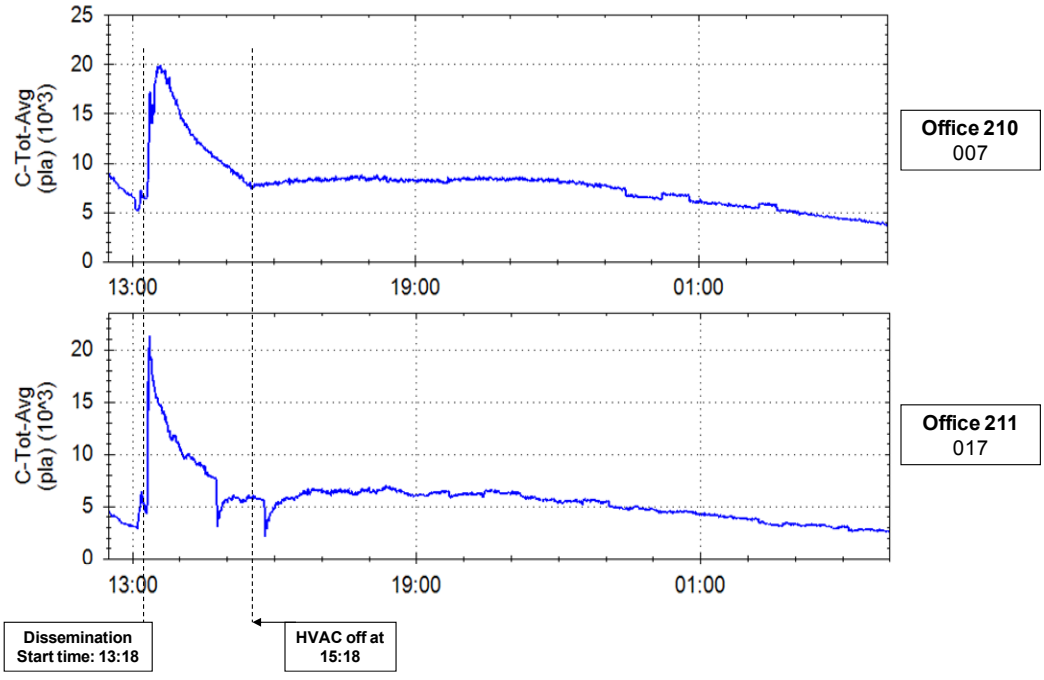
Test Event #1 – IBAC Particle Plots

April 16, 2011 – 13:00 – 05:00



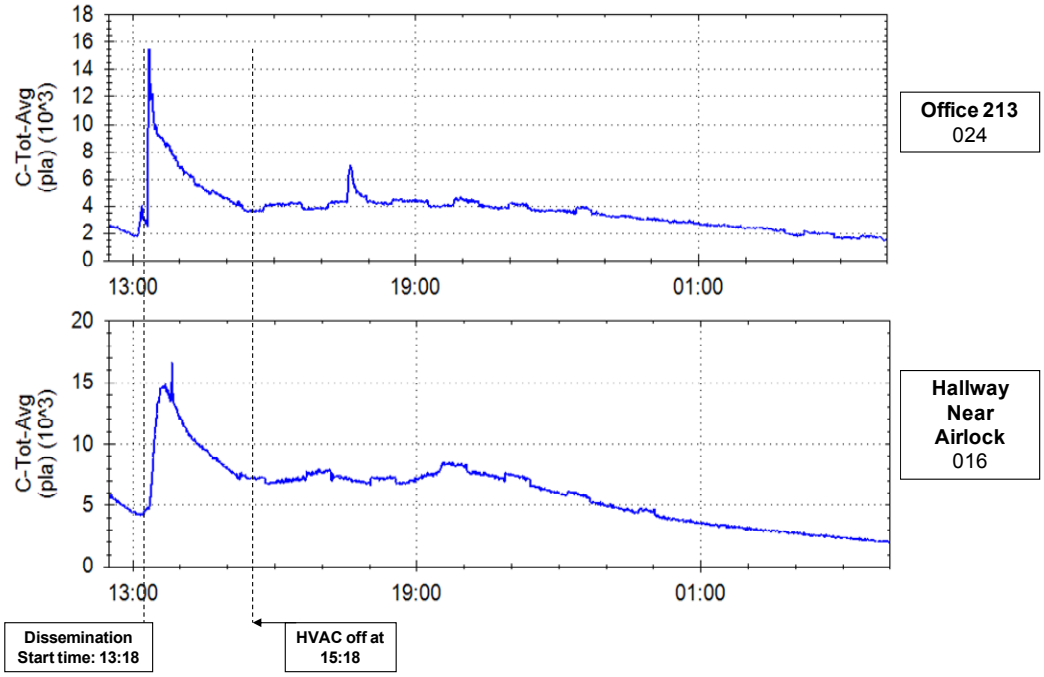
Test Event #1 – IBAC Particle Plots

April 16, 2011 – 13:00 – 05:00



Test Event #1 – IBAC Particle Plots

April 16, 2011 – 13:00 – 05:00



1st Floor IBAC Data
Test Event #2
April 25, 2011

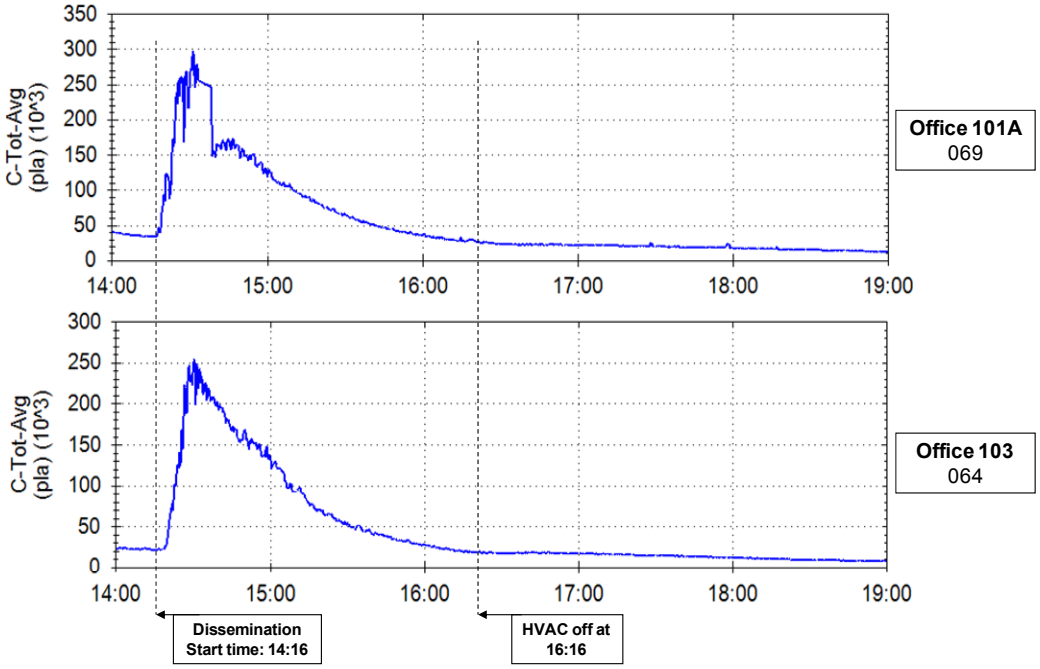
Release Material: Bacillus atropheus
Location: 1st Floor Air Supply
Release Time: 14:16
Amount: 200mg (10 generators, 4 mg/mL suspension, 5 mL solution per generator, 50 ml total)

• HVAC System shut off at 16:16 (+ 2 hours)

	IBAC SSN	Location	Time to Reach Sensor	Peak Particles (Particles/Liter)	Average Particles 2 hour duration (Particles/Liter)
1	069	Office 101A	1 minute	298,940	95,400
2	064	Office 103	3 minutes	255,800	92,950
3	034	Office 104	10 seconds	337,590	112,700
4	133	Office 105	7 minutes	164,250	84,350
5	040	Office 106	5 minutes	262,600	106,800
6	218	Office 107	5 minutes	183,000	82,500
7	041	Office 108	3 minutes	163,570	83,775
8	224	Office 109	10 seconds	214,075	88,650
9	043	Office 110	4 minutes	171,400	71,000
10	147	HVAC Mechanical Room	5 seconds	428,580	112,600
11	055	Lobby	1 minute	367,865	129,640
			Average	258,880	96,400

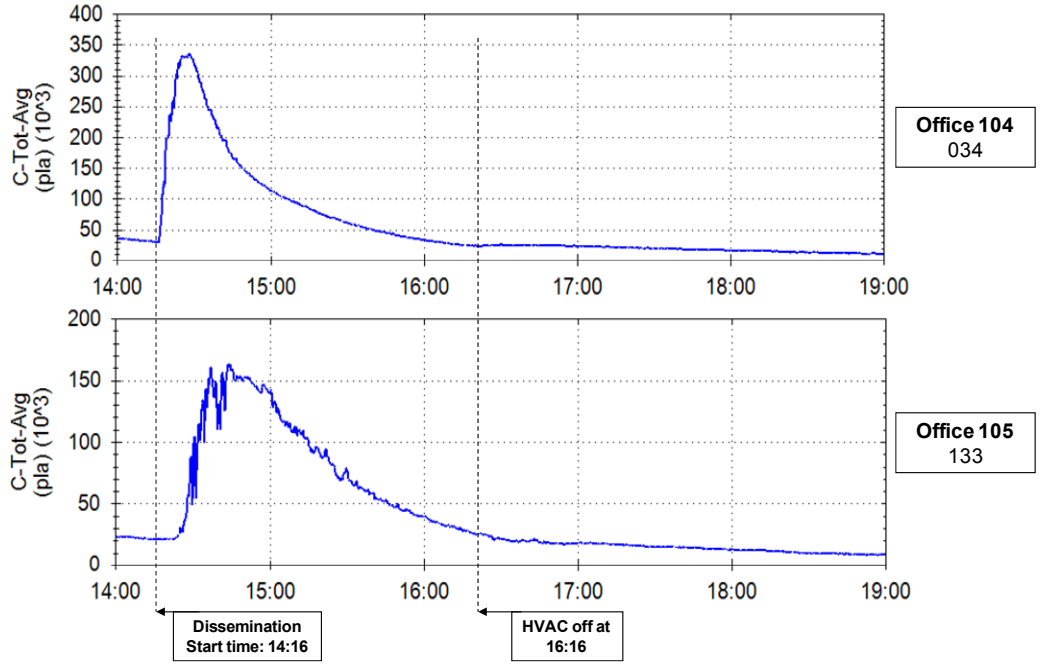
Test Event #2 – IBAC Particle Plots

April 25, 2011 – 14:00 – 19:00



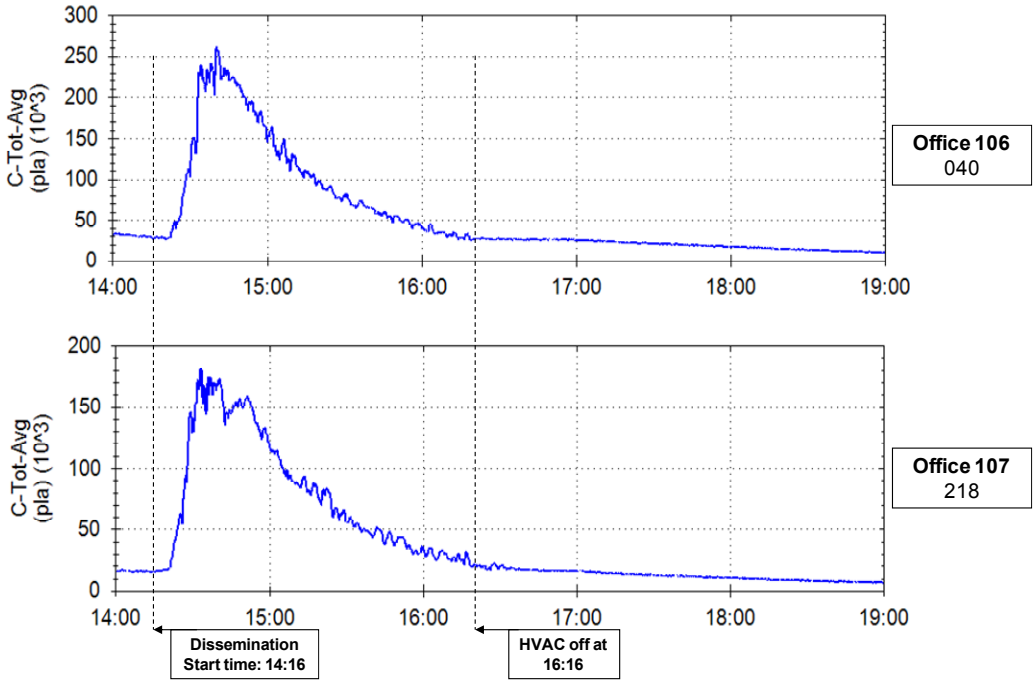
Test Event #2 – IBAC Particle Plots

April 25, 2011 – 14:00 – 19:00



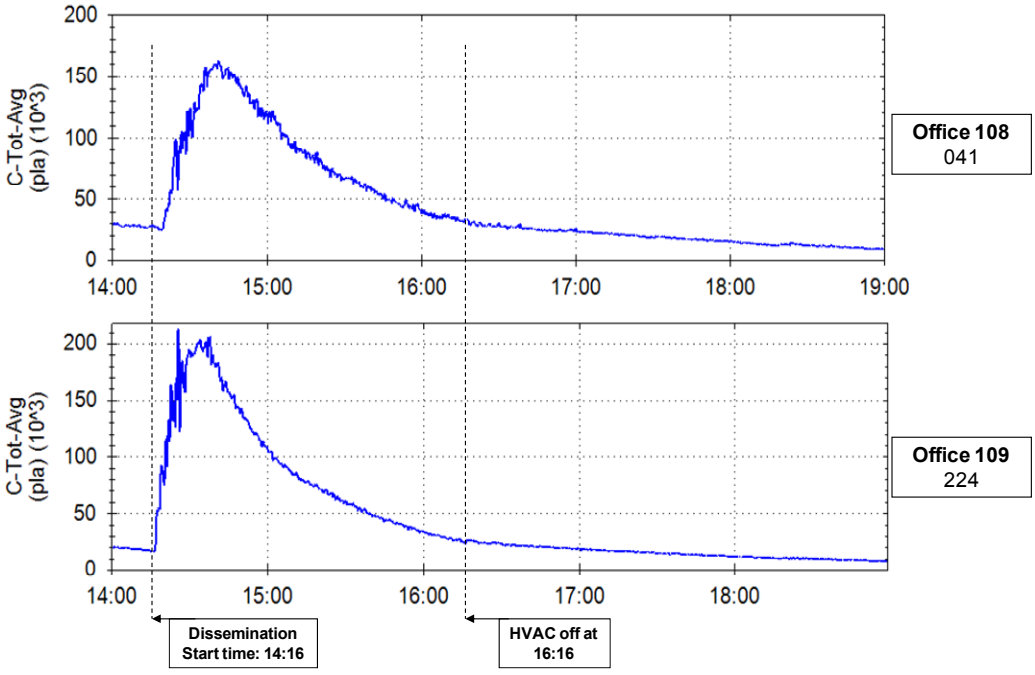
Test Event #2 – IBAC Particle Plots

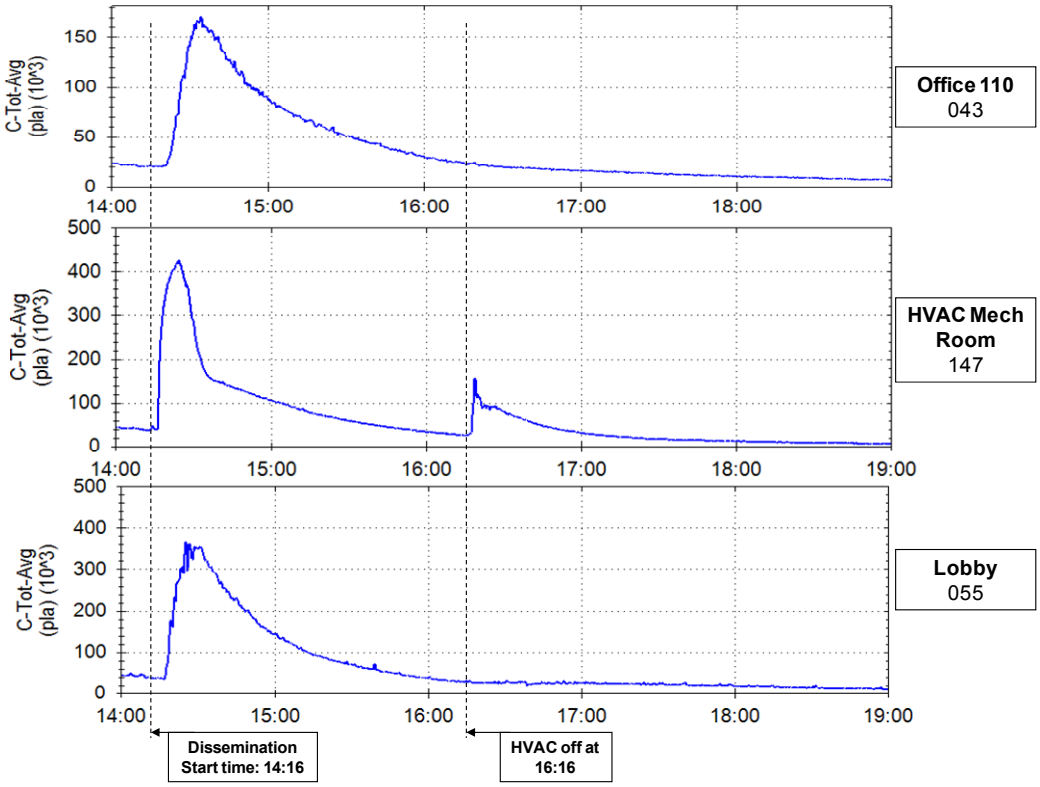
April 25, 2011 – 14:00 – 19:00



Test Event #2 – IBAC Particle Plots

April 25, 2011 – 14:00 – 19:00





2nd Floor IBAC Data
Test Event #2
April 25, 2011

Release Material: Bacillus atropheus

Location: 2nd Floor Air Supply

Release Time: 14:16

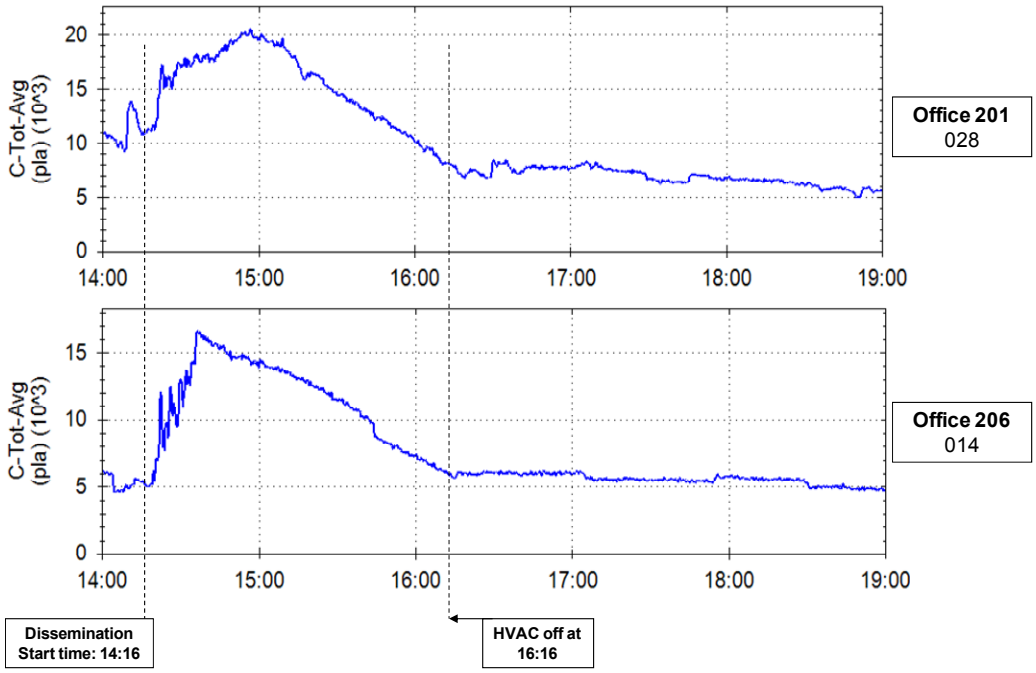
Amount: 0.5mg (1 generator, 0.5 mg/mL suspension, 1ml total)

• HVAC System shut off at 16:16 (+ 2 hours)

	IBAC SSN	Location	Time to Reach Sensor	Peak Particles (Particles/Liter)	Average Particles 2 hour duration (Particles/Liter)
1	028	Office 201	4 minutes	10,615	5,110
2	014	Office 206	3 minutes	11,700	6,230
3	018	Office 207	2 minutes	12,570	5,375
4	010	Office 208	1 minute	11,600	3,600
5	020	Office 209	1 minute	11,580	3,500
6	007	Office 210	1 minute	9,400	3,640
7	017	Office 211	1 minute	21,220	2,785
8	011	Office 212	1 minute	10,730	3,185
9	024	Office 213	1 minute	14,580	3,815
10	016	Hallway near air lock	5 minutes	8,530	4,730
			Average	12,250	4,200

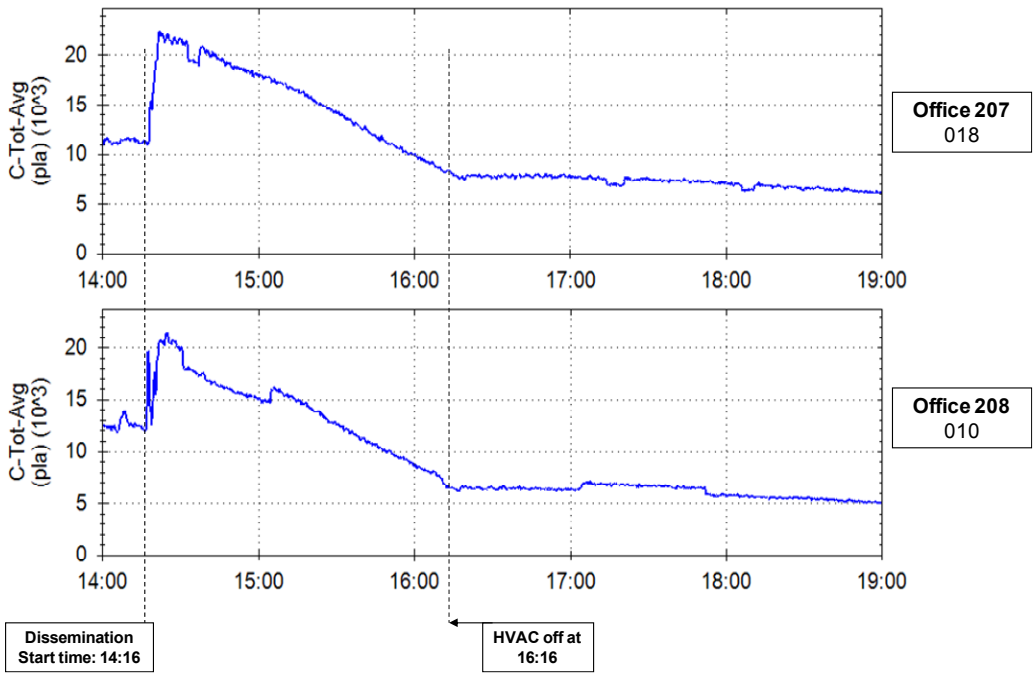
Test Event #2 – IBAC Particle Plots

April 25, 2011 – 14:00 – 19:00



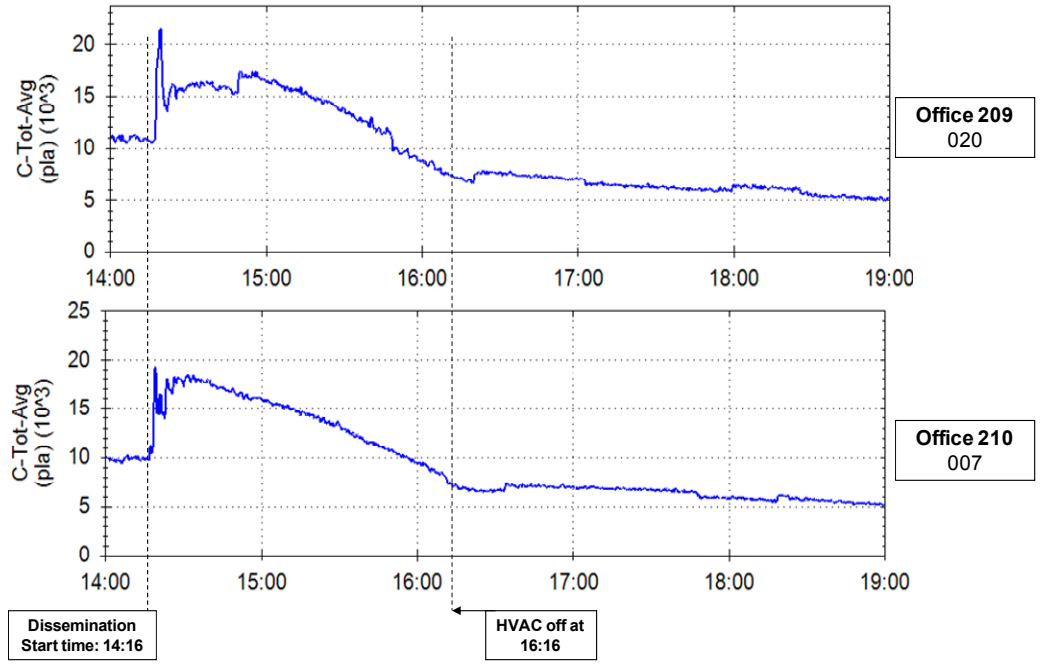
Test Event #2 – IBAC Particle Plots

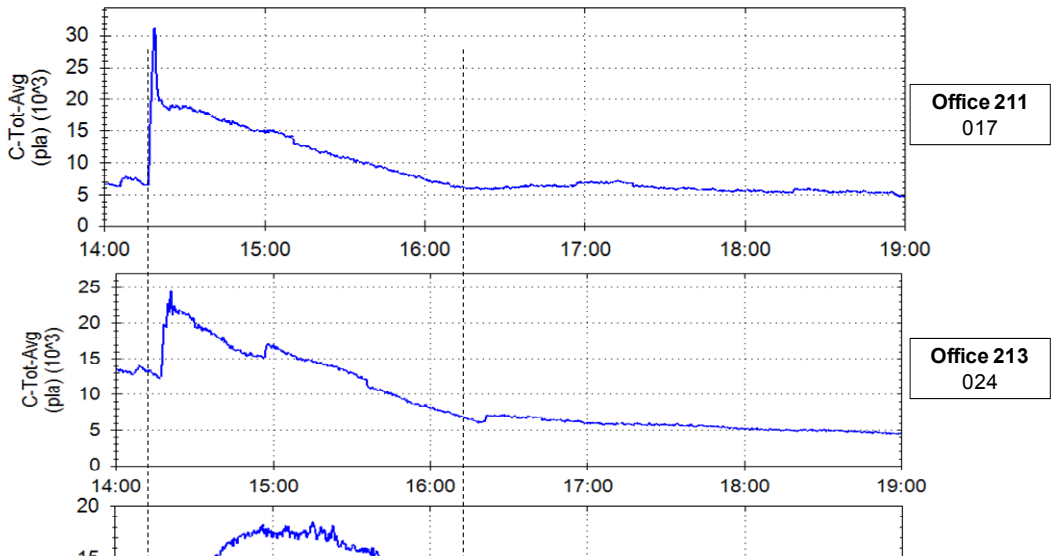
April 25, 2011 – 14:00 – 19:00

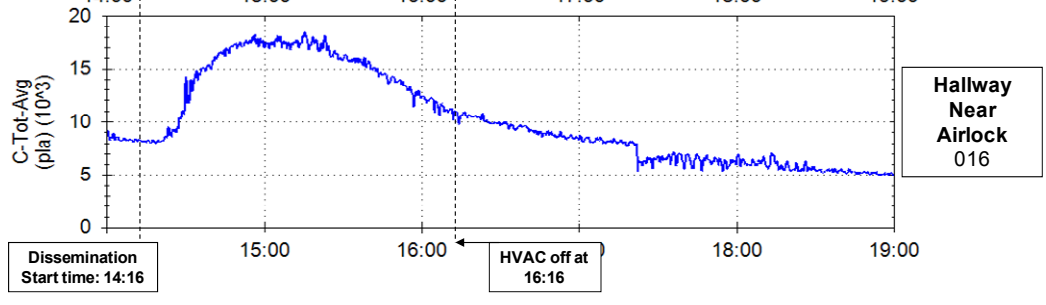


Test Event #2 – IBAC Particle Plots

April 25, 2011 – 14:00 – 19:00







1st Floor IBAC Data
Round #3
May 10, 2011

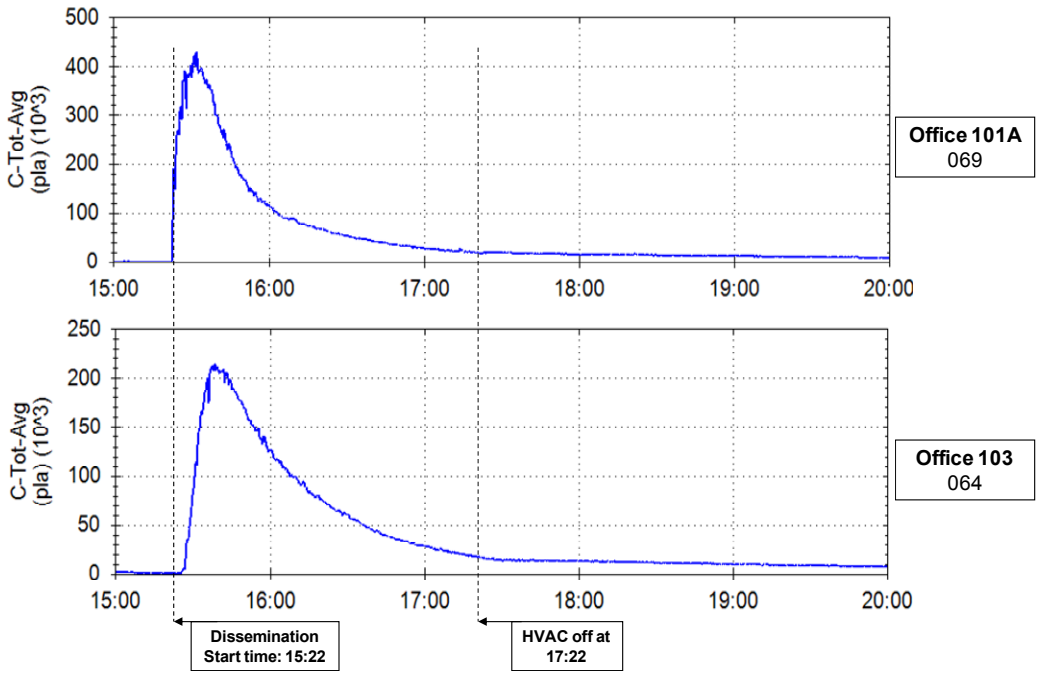
Release Material: Bacillus atropheus
Location: 1st Floor Air Supply
Release Time: 15:22
Amount: 200mg (10 generators, 4 mg/mL suspension, 5 mL solution per generator, 50 ml total)

• HVAC System shut off at 17:22 (+ 2 hours)

	IBAC SSN	Location	Time to Reach Sensor	Peak Particles (Particles/Liter)	Average Particles 2 hour duration (Particles/Liter)
1	069	Office 101A	20 seconds	430,930	112,800
2	064	Office 103	3 minutes	215,070	81,950
3	034	Office 104	10 seconds	277,675	95,950
4	133	Office 105	2 minutes	124,225	64,100
5	040	Office 106	3 minutes	178,600	75,100
6	218	Office 107	4 minutes	88,765	59,685
7	041	Office 108	4 minutes	151,830	68,315
8	224	Office 109	30 seconds	274,650	77,335
9	043	Office 110	2 minutes	205,400	61,175
10	147	HVAC Mechanical Room	10 seconds	378,100	102,915
11	055	Lobby	1 minute	394,300	108,200
			Average	247,230	82,500

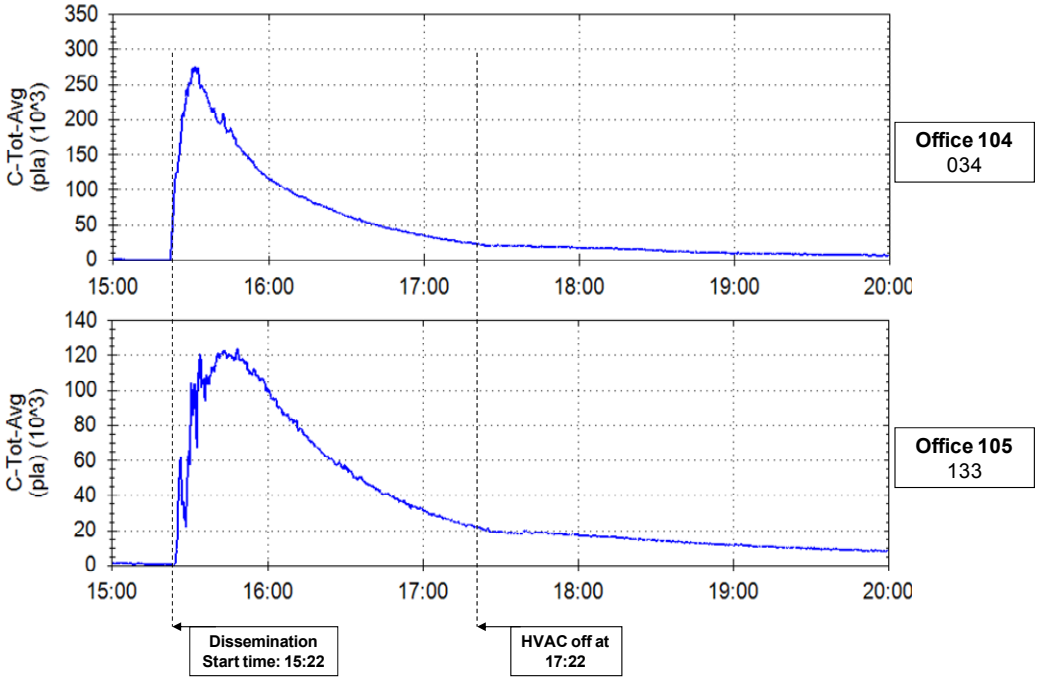
Test Event #3 – IBAC Particle Plots

May 10, 2011 – 15:00 – 20:00



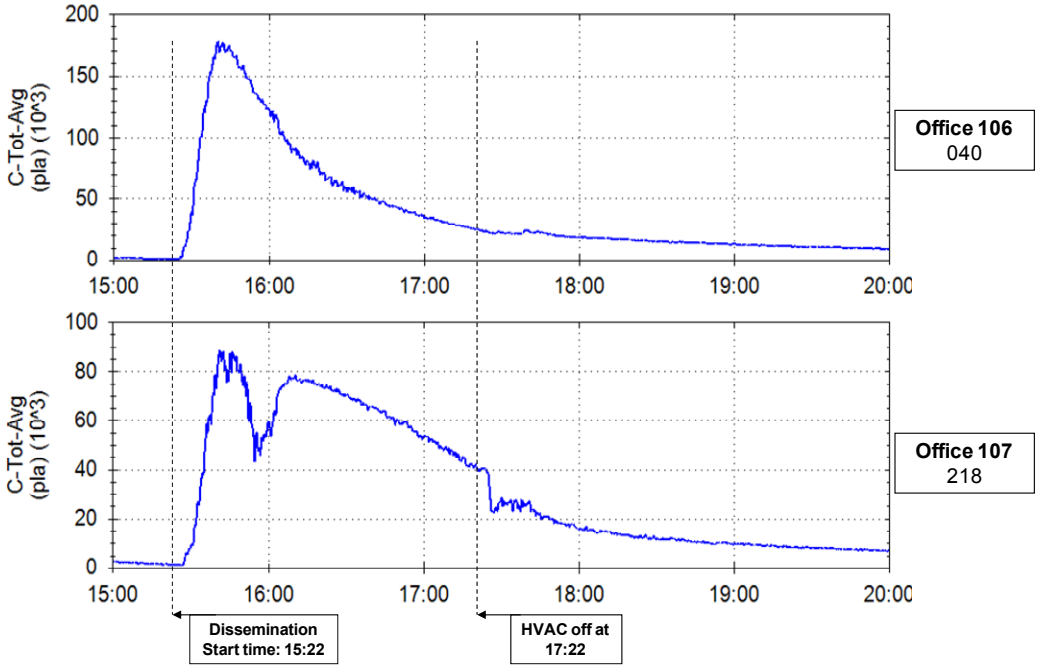
Test Event #3 – IBAC Particle Plots

May 10, 2011 – 15:00 – 20:00



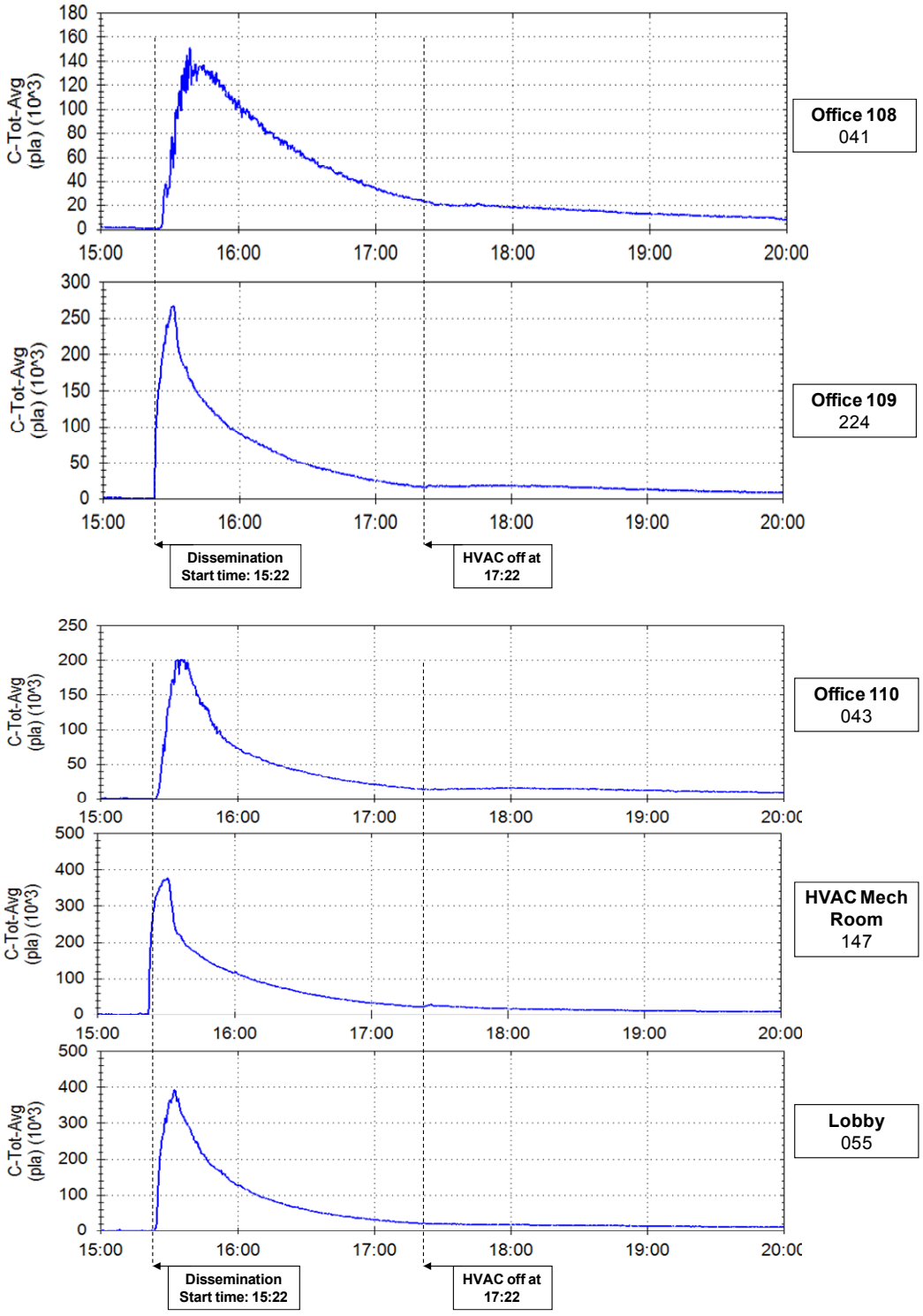
Test Event #3 – IBAC Particle Plots

May 10, 2011 – 15:00 – 20:00



Test Event #3 – IBAC Particle Plots

May 10, 2011 – 15:00 – 20:00



2nd Floor IBAC Data
Round #3
May 10, 2011

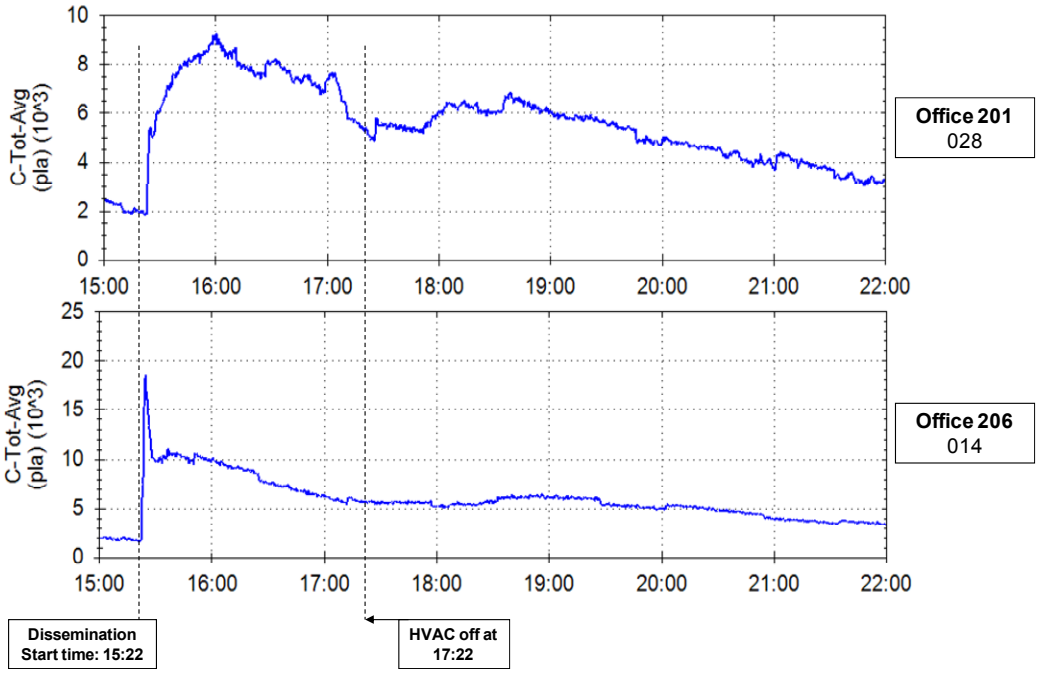
Release Material: Bacillus atropheus
Location: 2nd Floor Air Supply
Release Time: 15:22
Amount: 0.5mg (1 generator, 0.5 mg/mL suspension, 1ml total)

• HVAC System shut off at 17:22 (+ 2 hours)

	IBAC SSN	Location	Time to Reach Sensor	Peak Particles (Particles/Liter)	Average Particles 2 hour duration (Particles/Liter)
1	028	Office 201	1 minute	8,215	6,350
2	014	Office 206	1 minute	17,480	7,360
3	018	Office 207	1 minute	16,000	12,500
4	010	Office 208	30 seconds	27,290	7,430
5	020	Office 209	1 minute	14,580	8,050
6	007	Office 210	2 minutes	14,150	9,450
7	017	Office 211	10 seconds	18,950	7,730
8	011	Office 212	1 minute	11,980	7,360
9	024	Office 213	10 seconds	9,450	5,500
10	016	Hallway near air lock	30 seconds	8,220	6,340
			Average	14,630	7,800

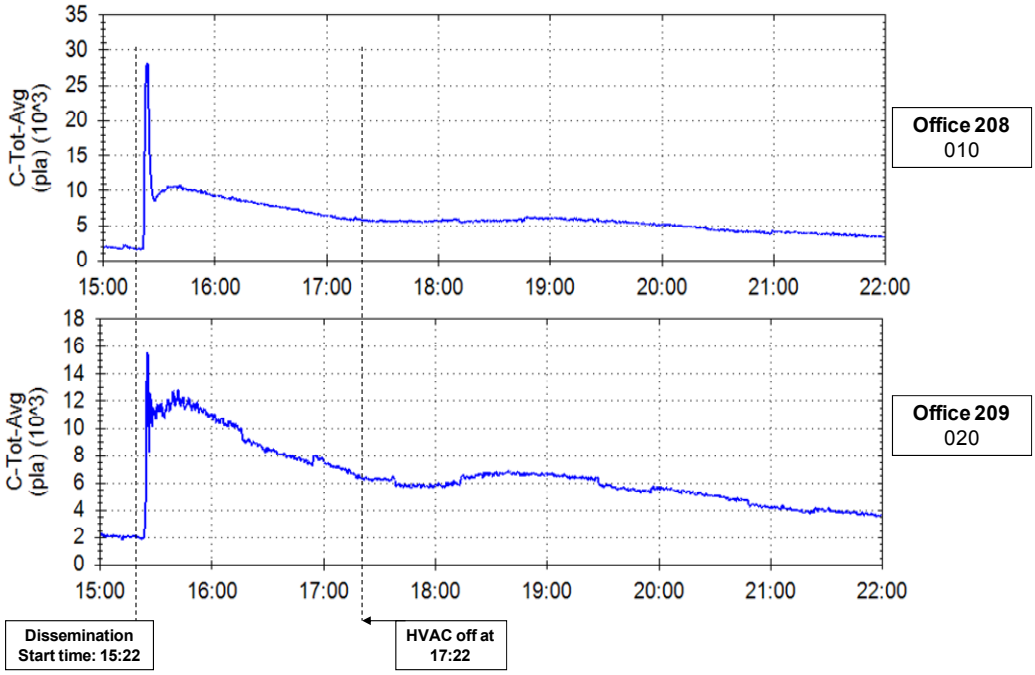
Test Event #3 – IBAC Particle Plots

May 10, 2011 – 15:00 – 22:00



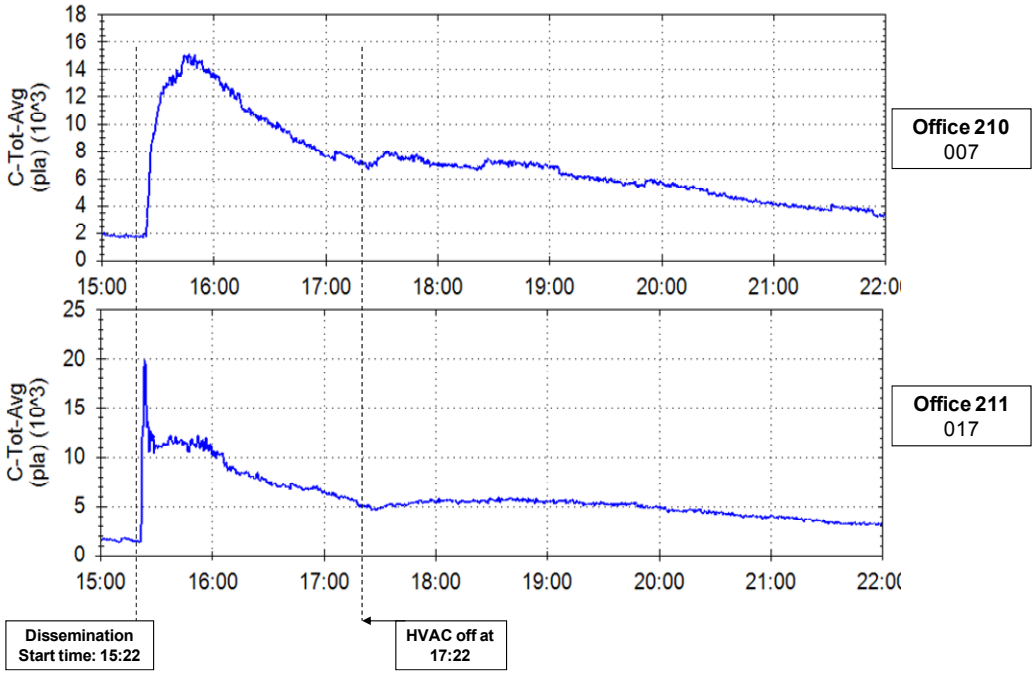
Test Event #3 – IBAC Particle Plots

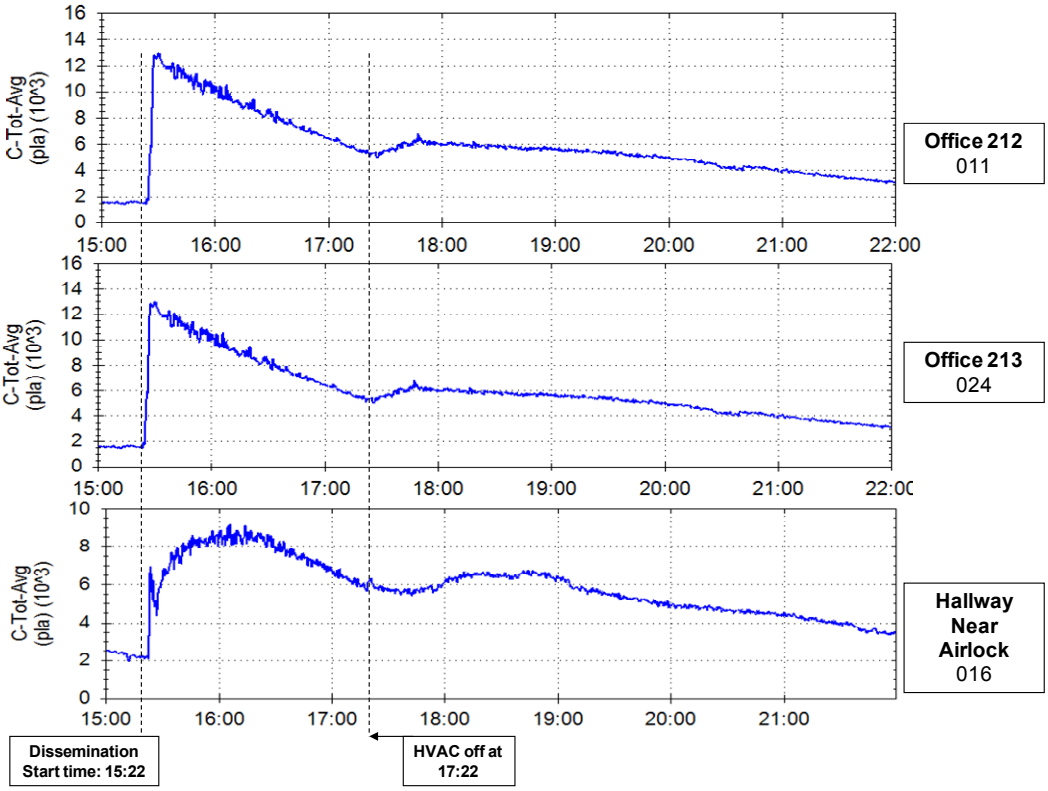
May 10, 2011 – 15:00 – 22:00



Test Event #3 – IBAC Particle Plots

May 10, 2011 – 15:00 – 22:00




C-Tot-Avg (pla) (10^3)
Office 212
011
Office 213
024
Hallway Near Airlock
016
Dissemination Start time: 15:22
HVAC off at 17:22

Appendix J

Sampling Plan Analysis

Sampling Plan Analysis for the Proposed BOTE Exercise

Brett Amidan & Brent Pulsipher, PNNL

October 2010

The following sample plan characteristics have been proposed:

- Three sampling events, one for each of three decon methods, where each event consists of sampling from 16 study rooms and 12 other rooms;
- The study rooms for each event consist of 6 commercial rooms, 6 residential rooms, 2 industrial rooms, and 2 mailrooms, where half of each type are on the lower level of the building (given one concentration level of the contaminant) and the other half on the upper level (given a different concentration level of the contaminant);
- Each study room will be sampled using 2 swabs, 2 vacuums, and 4 sponges;
- The other rooms consist of the non-study rooms on both floors;
- Each other room will be sampled using 1 swab, 1 vacuum, and 1 sponge sample;
- A sample will consist of a paired measurement, where a predefined area is sampled before decon, and then a predefined adjacent area is sampled after decon;
- This results in 164 samples taken during each of the three events.

This analysis considers the estimated statistical power when making comparisons across this data based upon proposed sample size estimates. *Statistical power* is defined as *the probability that the test will reject a false null hypothesis, or in other words, that if differences between means of different levels actually exist, then they will be detected (statistically significant difference).*

Only those comparisons that are related to the goals of the experiment will be included in the statistical power and sample size calculations. Those comparisons used to determine sample size include:

- Determining differences between the three decon methods;
- Comparing decon effectiveness in the study rooms (commercial, residential, industrial, and mail); and
- Comparing decon effectiveness with the sampling media (swab, vacuum, and sponge-wipe).

Other comparisons may be made during the analysis, but they will not be considered during the sample size determination. The "other" rooms may provide useful information in comparing decon methods, but they are not being considered in sample size calculations for the room type comparison. The "other" room samples are included in all the other comparisons. Samples are also planned for inside the air ducts, but those samples will also not be included in these calculations.

Surface types will be sampled with the most appropriate method, meaning that non-porous areas with sponges, porous areas with vacuums, and small areas with swabs. Surface types will not be included in the sample size calculations; however, it is important for the sampling plan to make sure each surface type available is well represented.

In order to calculate statistical power (Dean, 1999), the following items need to be defined:

1. The type I error rate (α),
2. The response variable,
3. The detectable difference, and
4. The estimated variability in the data (standard deviation).

The type I error rate (α) is the probability of rejecting a true null hypothesis. This is commonly called the significance or confidence level of the experiment. For this study α will be held constant at 0.05, thus allowing for a 95% confidence statement of the null hypothesis being rejected.

The response variable chosen for this exercise is dependent upon how well the decon methods work. If the reduction in contamination is in the 75% to 100% range (or even 50% to 100%) range, then it won't be necessary to take the log of the response. If the reduction in contamination is more like 98% to 100%, then it will be necessary to take the log of the response. Statistical power and sample size calculations will be presented using each possibility.

Percentage of Contamination Removed (%CR) Response Variable

Under the assumption that the reduction in contamination is in the 75% to 100% range, a reasonable response variable to be analyzed is the percentage of contamination that is removed: $\%CR = (Pre - Post)/Pre$, where *%CR* is the percentage of contamination removed, *Pre* is the pre-decon value, and *Post* is the post-decon value. To calculate this, each *Pre* value should be paired with a *Post* value that is taken from the same general location. Corrections may be necessary if *Pre* values are 0, or if a *Pre* value is smaller than the paired *Post* value. This means that although there are 164 samples taken before decon and 164 samples taken after decon, the analysis will combine these results into a new derived variable (*%CR*) that has 164 values for each event. It should be noted that these power calculations assume that we are comparing the mean *%CR* for each factor of interest.

The *detectable difference* is *the amount of difference between levels of a given factor that would be considered to be statistically significant*. For example, suppose decon method 1 removes 85% of the contamination and decon method 2 removes 90% of the contamination. Is this difference of 5*%CR* of practical significance; and how likely should the experiment be able to detect this amount of difference? This 5*%CR* difference is the detectable difference and if it is very important to detect differences of this size, then the statistical power should be high (probably in the 90% to 99% range) for that difference.

The true *%CR* values, by definition, will range between 0 and 100. Knowing this, the variability can be estimated. The measure of variability used in these calculations is the standard deviation (*SD*). If the *%CR* values generally range from 50% to 100%, meaning that between half of the contamination to all the contamination is being removed, then a conservative estimate of the *SD* would be 15*%CR*. Likewise, if the *%CR* values range from 0% to 100%, meaning that sometimes contamination is not removed and sometimes it is all removed (an extreme case scenario), then the *SD* is estimated to be about 30*%CR*. If

the *%CR* values generally range from 75% to 100%, meaning that more than ¾ of the contamination is removed, then the conservative estimate for *SD* goes down further to around 8*%CR*.

Tables 1 and 2 show the statistically detectable differences between the levels of each factor with a 15*%CR* standard deviation (Table 1) and an 8*%CR* standard deviation (Table 2). These detectable differences are calculated assuming statistical power of 95% and 90%. They are calculated for the proposed sample sizes (n) and if the sample sizes were decreased by 10% or increased by 10%. For cases where the standard deviation is 30*%CR*, the detectable differences in Table 1 would be doubled. For example, with a standard deviation of 15*%CR*, there would be a 95% probability that differences of 6.5*%CR* or more contamination removed between the three decon methods would be statistically detected. For this same case, if the standard deviation was 8*%CR*, then the detectable difference decreases to 3.5*%CR*. If the standard deviation was 30*%CR*, then the detectable difference would increase to 13.0*%CR* (double the detectable difference using 15*%CR* standard deviation).

The decon methods are expected to remove contamination and it wouldn't be surprising if they remove at least 75% of the contamination, probably more. Under those assumptions, in most comparisons a difference of 4*%CR* or more should easily be detected given the proposed sample amounts (Table 2). The only comparisons that may not be detected at that level are ones involving the industrial or mail rooms, where fewer samples are being taken. If a decon method only removes about half to ¾ of the contamination, while the others remove nearly all, then differences of around 7*%CR* should be detectable, except in comparisons involving the industrial or mailrooms (Table 1). This should still be ok because the difference between ½ (50*%CR*) and nearly one (<100*%CR*) is easily bigger than 7*%CR*.

Table 3 shows how the detectable difference decreases for comparisons involving the industrial and mailrooms when increasing the number of samples by 50% or 100%. Doubling the number of samples in industrial and mailrooms will decrease the detectable difference by about 2*%CR*.

Table 1. The Detectable Differences (reported here in ***%CR***) for each statistical comparison between the different levels of each factor given the following: 1) 95% or 90% statistical power, 2) **15 *%CR* standard deviation**, and 3) sample sizes of proposed size (n), n – 10%*n, and n + 10%*n.

Factor Levels	Proposed n	Proposed n		n – 10%*n		n + 10%*n	
		95% Power	90% Power	95% Power	90% Power	95% Power	90% Power
Decon Methods							
Chlor Dysis Vapor Hydrogen peroxide Amended Bleach	164 each	6.5	5.9	6.9	6.2	6.2	5.6
Room Type							
Commercial Residential	144 each	7.4	6.7	7.7	7.0	7.0	6.4
Industrial Mailroom	48 each	12.8	11.7	13.6	12.3	12.2	11.1
Concentration Amount							
Low High	246 each	4.9	4.4	5.2	4.6	4.7	4.2
Sampling Method							
Swabs Vacuums	132 each	7.3	6.6	7.7	6.9	6.8	6.2
Sponges (Wipes)	228	5.5	5.0	5.8	5.3	5.3	4.8

Table 2. The Detectable Differences (reported here in ***%CR***) for each statistical comparison between the different levels of each factor given the following: 1) 95% or 90% statistical power, 2) **8 *%CR* standard deviation**, and 3) sample sizes of proposed size (n), n – 10%*n, and n + 10%*n.

Factors	Proposed n	Proposed n		n – 10%*n		n + 10%*n	
		95% Power	90% Power	95% Power	90% Power	95% Power	90% Power
Decon Methods							
Chlor Dysis Vapor Hydrogen peroxide Amended Bleach	164 each	3.5	3.2	3.7	3.3	3.3	3.0
Room Type							
Commercial Residential	144 each	3.9	3.6	4.1	3.8	3.7	3.4
Industrial Mailroom	48 each	6.8	6.2	7.2	6.6	6.5	5.9
Concentration Amount							
Low High	246 each	2.6	2.3	2.8	2.5	2.5	2.2
Sampling Method							
Swabs Vacuums	132 each	3.9	3.5	4.1	3.7	3.6	3.3
Sponges (Wipes)	228	3.0	2.7	3.1	2.7	2.8	2.5

Table 3. The Detectable Differences (reported here in ***%CR***) for comparisons involving industrial and mail rooms for the proposed sample amount (48 each) and 50% and 100% increases in the sample amount, given the following: 1) 95% or 90% statistical power, and 2) 8 *%CR* or 15 *%CR* standard deviation.

Sample Amounts	8 *%CR* Standard Deviation		15 *%CR* Standard Deviation	
	95% Power	90% Power	95% Power	90% Power
n = 48 each (2 swab, 2 vac, 4 sponge per room) (currently proposed)	6.8	6.2	12.8	11.7
n = 72 each (3 swab, 3 vac, 6 sponge per room) (50% Increase)	5.6	5.1	10.4	9.5
n = 96 each (4 swab, 4 vac, 8 sponge per room) (100% Increase)	4.8	4.4	9.0	8.2

log(%CR) Response Variable

Under the assumption that the reduction in contamination is in the 98% to 100% range, a reasonable response variable to be analyzed is taking the log (Wolfe, 1999) of the percentage of contamination that is removed: $\log_{10}(\%CR) = \log_{10}(\frac{Pre-Post}{Pre})$, where *%CR* is the percentage of contamination removed, *Pre* is the pre-decon value, and *Post* is the post-decon value. The same methodology described in the previous section will be used to calculate this value, except that the $\log_{10}$ will be taken of the *%CR* values.

Assuming that the data varies in the 98% to 100% contamination removed range; a conservative estimate can be made of the standard deviation by taking the range of the data and dividing by four. The $\log_{10}$ estimate of standard deviation can then be estimated using the formula: $ESD = \frac{(\log_{10}(1)-\log_{10}(0.98))}{4} = 0.00219$, where *ESD* is the estimated standard deviation. In the case that 99% to 100% contamination is removed, the *ESD* value would be 0.00109. Both of these situations will be investigated.

Table 4 shows the statistically detectable differences between the levels of each factor with an ESD of 0.00219 (assuming a 98*%CR* to 100*%CR* range). Table 5 shows the statistically detectable differences between the levels of each factor with an ESD of 0.00109 (assuming a 99*%CR* to 100*%CR* range). These detectable differences are calculated assuming statistical power of 95% and 90%. They are calculated for the proposed sample sizes (n) and if the sample sizes were decreased by 10% or increased by 10%. These tables can be used to determine what size of difference between characteristics would be considered statistically significant. For example, if comparing the three decon methods, with 95% statistical power and assuming a range of 98*%CR* to 100*%CR*, a difference of 0.22*%CR* would be detectable, given the current sampling plan (see Table 4). This means if decon method A has a mean *%CR* of 98.78% and decon method B has a mean *%CR* of 99.00%, there is a 95% probability that this difference would be considered statistically different. If the percent contamination removed is actually

in the 99*%CR* to 100*%CR* range, then a difference of 0.11*%CR* would be detectable, with 95% statistical power and the current sampling plan (see Table 5).

Assuming the larger standard deviation in which the percent contamination removed is between 98% and 100%, nearly all characteristics (levels) can be compared with a detectable difference of 0.25*%CR* or less. The only comparisons with a larger detectable difference are ones involving the industrial and mailrooms. These comparisons will require a difference of 0.43*%CR* or more to have a 95% probability of being considered statistically significant. Increasing the numbers of samples within industrial and mailrooms would be the best way to lower this detectable difference.

Table 6 shows how the detectable difference decreases for comparisons involving the industrial and mailrooms when increasing the number of samples by 50% or 100%. Doubling the number of samples in industrial and mailrooms will decrease the detectable difference by about 0.13*%CR*.

Table 4. The Detectable Differences (reported here in **%CR**) when analyzing $\log_{10}$(%CR) for each statistical comparison between the different levels of each factor given the following: 1) 95% or 90% statistical power, 2) **ESD = 0.00219**, and 3) sample sizes of proposed size (n), n – 10%*n, and n + 10%*n.

Factor Levels	Proposed n	Proposed n		n – 10%*n		n + 10%*n	
		95% Power	90% Power	95% Power	90% Power	95% Power	90% Power
Decon Methods							
Chlor Dysis Vapor Hydrogen peroxide Amended Bleach	164 each	0.22	0.20	0.23	0.21	0.21	0.19
Room Type							
Commercial Residential	144 each	0.25	0.22	0.26	0.24	0.24	0.21
Industrial Mailroom	48 each	0.43	0.39	0.45	0.41	0.41	0.37
Concentration Amount							
Low High	246 each	0.16	0.15	0.17	0.16	0.16	0.14
Sampling Method							
Swabs Vacuums	132 each	0.24	0.22	0.26	0.23	0.23	0.21
Sponges (Wipes)	228	0.19	0.17	0.20	0.18	0.18	0.16

Table 5. The Detectable Differences (reported here in **%CR**) when analyzing $\log_{10}$(%CR) for each statistical comparison between the different levels of each factor given the following: 1) 95% or 90% statistical power, 2) **ESD = 0.00109**, and 3) sample sizes of proposed size (n), n – 10%*n, and n + 10%*n.

Factor Levels	Proposed n	Proposed n		n – 10%*n		n + 10%*n	
		95% Power	90% Power	95% Power	90% Power	95% Power	90% Power
Decon Methods							
Chlor Dysis Vapor Hydrogen peroxide Amended Bleach	164 each	0.11	0.10	0.12	0.10	0.10	0.09
Room Type							
Commercial Residential	144 each	0.12	0.11	0.13	0.12	0.12	0.11
Industrial Mailroom	48 each	0.21	0.19	0.23	0.21	0.20	0.18
Concentration Amount							
Low High	246 each	0.08	0.07	0.09	0.08	0.08	0.07
Sampling Method							
Swabs Vacuums	132 each	0.12	0.11	0.13	0.12	0.11	0.10
Sponges (Wipes)	228	0.09	0.08	0.10	0.09	0.09	0.08

Table 6. The Detectable Differences (reported here in ***%CR***) when analyzing $\log_{10}$(%CR) for comparisons involving industrial and mail rooms for the proposed sample amount (48 each) and 50% and 100% increases in the sample amount, given the following: 1) 95% or 90% statistical power, and 2) ESD = 0.00219 and 0.00109.

Sample Amounts	ESD = 0.00219		ESD = 0.00109	
	95% Power	90% Power	95% Power	90% Power
n = 48 each (2 swab, 2 vac, 4 sponge per room) (currently proposed)	0.43	0.39	0.21	0.19
n = 72 each (3 swab, 3 vac, 6 sponge per room) (50% Increase)	0.35	0.32	0.17	0.16
n = 96 each (4 swab, 4 vac, 8 sponge per room) (100% Increase)	0.30	0.27	0.15	0.14

Recommendations

In most cases, the proposed sample numbers should provide high statistical power to find reasonable detectable differences for this exercise. The one case that could use improvement is comparisons including the industrial and mail rooms. Tables 3 and 6 show how much the detectable differences decrease when increasing the numbers of samples taken in each of these room types. If the numbers of samples in each room are increased by 50% (1.5X) such that 3 swab, 3 vacuum, and 6 sponge samples are taken per room, then the detectable difference will decrease by 1*%CR* to 2*%CR* when the data ranges between 75*%CR* and 100*%CR*, or decreases by 0.08*%CR* when the data ranges between 98%CR and 100%CR. If the numbers of samples in each room are doubled (2X), then the detectable difference will decrease by 2*%CR* to 4*%CR* or by 0.13*%CR*, considering the same ranges of the data. Ideally adding another room of each type to the exercise would help alleviate these concerns. Because this is logistically not possible, it is recommended to increase the numbers of samples in each of these rooms, in order to increase the statistical power in detecting significant differences.

References

Dean, Angela and Daniel Voss. Design and Analysis of Experiments. Springer (1999).

Wolfe, Rory and John B. Carlin. "Sample-Size Calculation for a Log-Transformed Outcome Measure." Controlled Clinical Trials 20:547-554 (1999).

Appendix K

Standard Operating Procedure: Rapid-Viability Polymerase Chain Reaction (RV-PCR) Method for the Bio-Response

General Methods

Bacterial Strains, Spore Preparations, and Biological Safety

The surrogate strain *B. atrophaeus* deposited as *Bacillus subtilis* var. *niger* (American Type Culture Collection, ATCC #9372), previously named *Bacillus globigii* (BG) was used as a positive control for culture and RV-PCR analyses. Spore stocks of BG strain ATCC#9372 from Apex Laboratories, Inc. were stored in 70% Milli-Q water and 30% ethanol solution at -20ºC. The BG spore preparation from CRP was obtained in dry form and was refrigerated upon receipt. The dry spores preparation was suspended in phosphate-buffered saline solution with 0.05% Tween-20 (PBST), and dilutions were prepared in PBST and stored at 4ºC.

All procedures involving manipulation of BG spores and bacterial cultures were performed by trained personnel wearing appropriate personal protective equipment including safety glasses, double-gloves, and solid front laboratory gowns in an approved Class II biosafety cabinet (BSC). Bacterial stocks were handled in BSCs to prevent laboratory contamination as part of good laboratory practices. The BSC and equipment used in the BSC were decontaminated before and after work with bacteria following standard procedures (freshly prepared 10% bleach solution followed by isopropanol treatment and finally deionized, sterile water rinse). Sterile techniques were used for all sample handling and analysis.

Combined Culture and RV-PCR Protocols: Sample Processing and Analysis

This combined method allowed analysis of the same wipe sample by both culture and RV-PCR methods. Two spore extraction steps were included with the combined extraction solution split into half for culture analysis and half for RV-PCR analysis. The combined protocol was designed to provide the same concentration factor for both culture and RV-PCR analyses.

Experimental controls consisted of one positive and one negative control per 24-tube rack and 24-filter cup manifold that were included with samples for each pre- or post-decontamination portion of each event. Positive control samples were wipe samples spiked with BG spores (ATCC #9372) at a level of approx. 500-1000 CFU/sample (actual CFU were determined by plating). Traditional viability analysis was used to quantify the level of spores spiked onto positive control samples. Spiked control wipes were stored at 4°C until use. The control samples were processed in parallel with the field samples (all samples were processed following the same laboratory procedures). The sample processing and analysis steps are outlined below, followed by the detailed protocol.

Sample Processing

- 20 mL cold Extraction Buffer with Tween was added to the sample (wipe in a conical tube with mesh support).
- One negative wipe control and one positive wipe control were included per manifold [each manifold holds up to 24 filter cups, allowing up to 22 samples per manifold with one positive control (PC) and one negative control (NC)]. Control wipes were processed with same protocol steps as sample wipes.
- The sample was vortexed, and 14 mL were removed to a 50 mL tube.
- 14 mL Extraction Buffer without Tween was added to the original sample tube with wipe and support.
- The sample was vortexed, and 14 mL were removed and combined with the first 14 mL aliquot in the appropriate 50 mL tube. The total expected volume from spore extraction was 28 mL.
- Combined aliquots were mixed and after allowing the suspension to sit for 30 sec to let large particles to settle 13 mL were transferred to a filter cup to collect spores for RV-PCR analysis. From the remaining volume, 13 mL were used for culture analysis.

Culture Processing and Analysis Steps

- Contents of the 50 mL tube were mixed by vortexing and 13 mL were transferred to another 50 mL centrifuge tube.
- After centrifugation, 9.5 mL of supernatant were removed to waste. The pellet was suspended in the remaining 3.5 mL (referred to as the 10^0 suspension).
- A 10-fold dilution of the 10^0 suspension was performed (0.5 mL added to 4.5 mL Butterfield Buffer) yielding a 10^{-1} suspension; a 10-fold dilution was performed on the 10^{-1} suspension (0.5 mL added to 4.5 mL buffer) yielding a 10^{-2} suspension.
- Three replicates of 100 μL each for each dilution (10^0, 10^{-1}, and 10^{-2}; 9 plates total per sample) were plated onto Tryptic Soy Agar (TSA) plates, followed by incubation at 35°C for 18-24 hr, such that colony counts obtained represented 10^{-1}, 10^{-2}, and 10^{-3} dilutions of the original sample, when expressed on a per mL basis.
  Note: The 35°C incubation temperature was 35 ± 2°C.
- An aliquot of 0.5 mL from the 10^0 suspension was filtered through a microfunnel filter, and the filter was placed onto a TSA plate, followed by incubation at 35°C for 18-24 hr.
- The remaining 10^0 suspension was used for an enrichment culture. The suspension was transferred to a 15 mL conical tube, followed by centrifugation, removal of the supernatant and resuspension in 5 mL Tryptic Soy Broth (TSB). Cultures were incubated with shaking at 35°C for 18-24 hr. If turbidity was observed, the suspension was used to streak onto TSA plates for isolation of BG colonies.
- Two colonies per sample were tested by real-time PCR to confirm BG colony counts to confirm identification based on colony morphology and presence of orange pigmentation.
- If no BG colonies were detected, the enrichment culture was analyzed by real-time PCR.

RV-PCR Processing and Analysis Steps

- A 13 mL aliquot was transferred from each sample tube to a filter cup, and spores in the extraction buffer were collected on a 0.45 μm filter using a vacuum manifold and a vacuum pump (or similar vacuum source).
- Filters were then washed with 20 mL cold High-Salt Phosphate Buffer (210 mM; pH 6.0) followed by 7 mL of cold Phosphate Wash Buffer (25 mM; pH 7.4).
- Filter cups are then sealed on the bottom, and 3.5 mL of cold TSB growth medium were added.
- Top caps were added to the filter cups and cups were vortexed.
- After mixing, a 1 mL aliquot was taken from each filter cup (T0 aliquot), transferred to a 2 mL Eppendorf tube and processed for DNA extraction and purification using a Promega Magnesil kit as described below.
- The cups were sealed on the top and incubated for 9 hr with shaking at 35°C.
- After incubation, 1 mL of each sample was transferred from the filter cup into a 2 mL Eppendorf tube (referred to as T9 aliquot).
- For both T0 and T9 aliquots (1 mL), 600 μL of Promega Bead Mix (combined Lysis Buffer and Bead Mix) were added, followed by addition of 360 μL Promega Lysis Buffer.
- Sample, buffer and bead mix were mixed by pipetting and tubes were mounted on a tube rack interfaced with a magnet. Beads with attached DNA were attracted to the magnet and the supernatant was removed by pipetting.
- An additional lysis with 360 μL of Lysis Buffer was conducted with mixing by pipetting and removal of the supernatant.
- Two washes with 360 μL of Promega Salt Wash solution were then performed, followed by mixing by pipetting and removal of the supernatant.
- Finally, three washes with 500 μL of Promega Alcohol Wash solution were performed with mixing and supernatant removal.
- Beads were allowed to air-dry for 2 minutes, followed by transfer of the tube rack from the magnetic support to a 2 mL tube heat block and heating for ~45 min. at 80°C, or until beads were dry.
- Elution of DNA was then performed after removing tubes from heat block and allowing them to reach room temperature. A 200 μL aliquot of Promega Elution Buffer was added and the tube contents were mixed by vortexing. The tubes were then transferred to the magnetic support, and the eluent with DNA was recovered.
- Although a cleaner DNA sample was generated after DNA extraction and purification, a 10-fold dilution was conducted by adding 10 μL to 90 μL PCR-grade water prior to PCR for both T0 and T9 aliquots.
- Three replicate PCR analyses were conducted for each sample and control wipe for both T0 and T9. Average Ct values and standard deviations were reported, and averages were used to calculate the ΔCt from T0 to T9.

Data Analysis

Initial and final cycle thresholds [Ct(T0) and Ct(T9)] from RV-PCR assays were used in the algorithm to determine whether viable spores were present in the sample; the algorithm used Ct(T0), Ct(T9) and ΔCt [Ct(T0) – Ct(T9)]. When the PCR yielded no Ct value for T0 and/or forT9 (i.e., non-detect or "Undetermined" on instrument software), the Ct value(s) was set to 45 for Delta Ct calculation and result.

The algorithm used for positive detection by RV-PCR was Ct(T9) ≤ 39 and ΔCt ≥ 6. Ct values at T0 and T9 as well as ΔCt were expressed as the average and standard deviation of three replicate analyses.

The BG colony forming units (CFUs) were determined manually based on colony morphology and the results were recorded the day following culture incubation. Since colony counts are most accurate when between 25 and 250, any plates or filters contained more than 250 colonies were recorded as too numerous to count (TNTC). Since the comparison with RV-PCR analysis is qualitative, presence of BG colonies on any of the sample culture plates including those that were TNTC represented a positive result (BG presence) for that sample. The CFU were corrected for dilution factor. Real-time PCR analysis on selected colonies was also reported; Ct values < 35 were required to confirm the sample was positive for BG by culture. Results from the sample enrichment cultures were reported if no BG colonies were detected for serial dilution or filter membrane plates; in this case, attempts were made to isolate BG colonies from the enrichment culture, followed by real-time PCR confirmation. If no presumptive BG colonies were evident after re-streaking, the enrichment culture was extracted for DNA and analyzed by real-time PCR. As for PCR analysis of colony DNA, if Ct values < 35 were obtained, the sample was considered positive for viable BG by the culture method.

Both culture and RV-PCR data were obtained for all field samples, field blank samples, and laboratory control samples for all three events (pre- and post-decontamination). Since the RV-PCR method is qualitative, the comparison between RV-PCR and the culture method was performed in terms of positive/negative (presence/absence) BG detection, although average values (with standard deviations) for Ct values at T0 and T9, ΔCt values, and plate count data were also recorded.

References

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2. Létant, S. E., S. R. Kane, G. A. Murphy, T. M. Alfaro, L. R. Hodges, L. J. Rose and E. Raber. 2010. Most-probable-number rapid viability PCR method to detect viable spores of *Bacillus anthracis* in swab sample*. J. Microbiol. Methods* 81(2): 200-202.
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Protocol for Evaluation of the Rapid Viability Polymerase Chain Reaction (RV-PCR) Method in the Bio-Response Operational Testing and Evaluation (BOTE) Phase-I

Qualitative detection of *Bacillus atrophaeus* subsp. *globigii* (BG) spore*s in wipe sample*s

General

The purpose of this procedure is to evaluate the manual Rapid Viability (RV)-PCR method for determining the presence/absence of viable *Bacillus atrophaeus* subsp. *globigii* (BG) spores on wipe samples in the Bio-Response Operational Testing and Evaluation (BOTE). The method uses processing steps to 1) remove spores from wipes, 2) collect spores by filtration, and 3) culture spores for outgrowth and subsequent DNA extraction and real-time PCR analysis. The RV-PCR method uses the change in PCR response before and after high throughput culturing to determine if viable spores were present in the sample; results are compared with performance criteria developed from testing of low levels of live target spores in backgrounds containing high levels of killed target spores, high levels of non-target cells and spores, or high levels of debris.

Equipment

- Biosafety Cabinet (BSC)
- PCR preparation hood (optional)
- Shaker incubator (Innova, Model KS 4000i Control, or similar)
- ABI 7500 Fast Real-Time PCR System (Applied Biosystems)
- Qubit™ fluorometer (Invitrogen)
- Refrigerated centrifuge (Eppendorf 5810R or similar), with rotor adapters for 50 mL conical tubes and 96-well plates
- Filter cup manifold (custom made) – see protocol Annex C
- Allen wrench for manifold
- Capping tray (custom made) – see protocol Annex C
- 30 mL tube rack (custom made)
- Vacuum pump (Cole Parmer, Model EW-07061-40, or similar), or vacuum source capable of <20 psi
- Vacuum pump filters for pump (Acrovent, Cat. No. 4249)
- Vacuum trap accessories – see protocol Annex C
- Platform vortexer (VWR, Model 58816-115) with Velcro straps
- Single-tube vortexer
- Heat block (for 2 mL Eppendorf tubes)
- Single-channel pipettors (1 mL, 200 μL, 10 μL or 20 μL)
- Eight-channel pipettor (100 μL)
- Serological pipet aid
- Dynamag magnetic racks (Invitrogen)
- Plate turn-table

Reagents

- Extraction Buffer with Tween (see preparation procedure in protocol Annex D)
- Extraction Buffer without Tween (see preparation procedure in protocol Annex D)
- High Salt Wash buffer (see preparation procedure in protocol Annex D)
- 1X Wash Buffer (see preparation procedure in protocol Annex D)
- Phosphate-buffered Saline Tween-20 (PBST) buffer (Teknova, Cat. No. P0201, see composition in protocol Annex D)
- Butterfield Buffer (see preparation procedure in protocol Annex D)
- Tryptic Soy Broth (TSB) growth medium (VWR, Cat. No. 90000-378)
- Tryptic Soy Agar (TSA) (see preparation procedure in protocol Annex D)
- Promega reagents for DNA extraction and purification procedure:
    - Magnesil Blood Genomic, Max Yield System, Kit (Promega, Cat. No., MD1360; VWR, Cat. No. PAMD1360)
    - Salt Wash (VWR, Cat. No. PAMD1401)
    - Magnesil ParaMagnetic Particles (PMPs) (VWR, Cat. No. PAMD1441)
    - Lysis Buffer (VWR, Cat. No. PAMD1392)
    - Elution Buffer (VWR Cat. No. PAMD1421)
    - Alcohol Wash, Blood (VWR Cat. No. PAMD1411)
    - Anti-Foam Reagent (VWR, Cat. No. PAMD1431)
- TaqMan Universal PCR Master-Mix (Applied Biosystems, Cat. No. 4305719)
- PCR probe and primers for the BG chromosome (1 assay targeting the *recF* gene; Kane et al., 2009)
- PCR water – Ultra Pure, Molecular Biology Grade (Quality Biological, Inc., Cat. No. 351-029-721)
- 1 L Filter System, PES, 0.2μm (Cat. No. 87006-066)

Strains

- *Bacillus atrophaeus* (ATCC#9372) ~10^8/mL spore suspension (Apex Laboratories, Cat. No. RBC-343-E8)
- *Bacillus globigii*, dry spore preparation, Critical Reagents Program

Supplies

General supplies:

- Gloves
- Bleach wipes
- 10% bleach (prepared daily) squeeze bottle
- Wipes
- Waste Coffin
- Zip lock bags (large ~20” x 28”, medium ~12” x 16”, small ~7” x 8”)
- Sharps waste container
- Absorbent pad
- Medium and Large biohazard bag(s) and rubber band(s)
- Sterile scalpels
- Isopropyl alcohol squeeze bottle
- Deionized water squeeze bottle
- Autoclave tape
- Large photo-tray or similar tray for transport of racks
- Marker Pen

- Timer
- Disposable pipette tips: 1 mL, 200 μL, and 10 μL
- Serological pipets: 5 mL, 10 mL (with 13 mL graduation), 25 mL, and 50 mL

For culture analysis:

- TSA plates (see preparation procedure in protocol Annex D)
- Lazy-L spreaders (GSS, Cat. No. 101100-886)
- MicroFunnel Filter Funnels (0.45 μm MCE membrane) (Pall Sciences, Cat. No. 4800 or VWR, Cat. No. 28143-544)

For RV-PCR analysis:

- 30 mL screw cap tubes (E&K Scientific, Cat. No. EK-T324S)
- Disposable nylon forceps (GSS, Cat. No. 12576-933)
- Monofilament polyester mesh disc (McMaster Carr, Cat. No. 93185 T17, or 2"x2" cut squares from mesh sheets, McMaster Carr, Cat. No. 9218T13)
- Whatman Autocups (VWR, Cat. No. 1602-0465)
- Polyethylene caps, blue with pull-tabs (McMaster Carr, Cat. No. 94075K56) in beaker, for vortexing and incubation steps
- Polyethylene caps, red, tapered (Caplugs, Cat. No. T-14, red), for covering filter cups during liquid transfer steps
- Polyethylene quick turn tube fittings (Ark-Plas Products, Cat. No. 51525K365)
- 96-well 2 mL Bioblocks (E&K Scientific, Cat. No. 662000)
- Reagent reservoirs (Thermo-Fisher, Cat. No. 8086)
- Disposable serological pipettes: 25, 10, and 5 mL
- Single tube holder
- Screw cap tubes, 2 mL (GSS, Cat. No. 20170-237)
- 96 well rack(s) for 2 mL tubes (8 x 12 layout)
- Foil plate seals (E&K Scientific, Cat. No. T592100)
- Adhesive plate sealers (Edge Bio, Cat. No. 48461)

For PCR:

- PCR plates (Applied Biosystems, Cat. No. 4346906)
- PCR plate seals (Applied Biosystems, Cat. No. 4311971)
- 96 well plate holders, Costar-black (GSS, Cat. No. 29442-922)
- Optical seals (Applied Biosystems, Cat. No. 4311971)

Laboratory set-up

- Put PPE (personal protective equipment) on: lab coat, safety glasses, double gloves.
- Prepare fresh bleach solution (1 volume bleach + 9 volumes water). Date and label with initials.
- Clean/bleach Biosafety Cabinet (BSC) and bench surfaces.
- All sample manipulations are performed in the BSC.

Preparation of spore dilution for positive wipe control samples

1. Place original stock spore suspension (approx. 10^8/mL; check vial for measured concentration) in rack in bag
2. Place bagged rack on the plate vortexer for 20 min on setting 7
3. After vortexing, in a 2 mL screw-cap tube, aliquot 100 µL of the 10^8/mL stock spore suspension into 900 µL of PBST to yield a working stock with concentration of 10^7/mL
4. Vortex on single tube vortexer at 2,000 rpm or high speed for 1 min
5. Aliquot 500 µL of the working stock to a 15 mL conical tube containing 4.5 mL of PBST tube to yield a spore concentration of 10^6/mL
6. Vortex for 1 min
7. Aliquot 3 mL of the 10^6/mL spore stock, and add to 27 mL of PBST to a 50 mL conical tube to yield a spore concentration of 10^5/mL
8. Vortex for 1 min
9. Aliquot 1 mL of 10^5/mL stock to 9 mL of PBST to yield 10^4/mL or 10^3/100 µL
10. Vortex 10^4/mL stock for 1 min, and aliquot 1 mL to 9 mL of PBST to yield 10^3/mL or 10^2/100 µL
11. Vortex 10^3/mL stock for 1 min, and aliquot 1 mL to 9 mL of PBST to yield 10^2/mL or 10^1/100 µL
12. To determine actual spore concentrations added to samples, plate on TSA plates as follows:
    3 replicates each with 100 µL of 10^1 spore stock

    3 replicates each with 100 µL of 10^2 spore stock

    3 replicates each with 50 µL of 10^3 spore stock

13. Invert plates and incubate at 35°C overnight. Determine plate counts for BG and take average of 3 replicates, corrected for dilution, to determine spore density of spiking solution.

Preparation of laboratory positive and negative wipe control samples

Note: One positive and one negative control wipe should be included per manifold (up to 22 samples).

1. Set-up control wipe tubes as follows: Open wipe package and separate each wipe using disposable forceps. Add support to wipe and transfer to 30 mL tube. Repeat steps until you have all assigned control wipe tubes.
2. Place tubes in racks.
3. Pre-wet wipes by adding 1.5 mL of PBST buffer to each wipe.
4. For negative control wipes: Do not add spores. Add 100 µL of PBST buffer.
5. For positive control wipes: Add 100 µL of 10^4 spores/mL, following rack-manifold layout.
6. Store control wipe tubes at 4°C overnight and process next day.

Set up for RV-PCR analysis:

1. 50 mL tube rack: Fill tube rack with 50 mL screw cap conical tubes.
2. Manifold: In BSC, assemble manifold by connecting upper part (with 24 openings) to lower part (with port) using six Allen screws. Add filter cups to manifold. Place red cap in each filter cup. Verify all filter cups are completely pushed down in manifold such that the filter cup bottom is touching the top surface of the manifold. Prepare 2 bags for red filter cup caps (25 caps each), and two beakers each containing 25 blue filter cup caps (50 total for each 24-cup manifold).
3. Vacuum: Prepare vacuum pump or house vacuum source; connect vacuum source to in-line filter, and to waste container with fresh 10% bleach; If using external vacuum pump, tape pump exhaust tube to BSC to vent exhaust inside BSC if needed.
4. Capping Tray(s): Add bottom caps to capping tray(s).
5. For T0 Samples: In the BSC, for each sample or control, set up a 2 ml Eppendorf tube.
6. Tape filter-cup layout on outside glass window of the BSC.

Manual sample processing (T0)

Note: Sample processing and analysis flowcharts are shown in Annex E.

1. If wipe sample in 30 mL tube does not already have an internal mesh support, add support by holding the wipe to the side of the tube with a sterile forceps while introducing the mesh support inside the tube. The support keeps the wipe to the side of the tube and clear of pipetting activities, and also improves efficiency of spore extraction during vortexing.
2. In the BSC, add 20 mL of **cold** Extraction Buffer (including Tween) to wipe samples placed in 30 mL tubes in tube rack (up to 24 tubes per rack). Uncap one tube at a time, add 20 mL extraction buffer, close tube, and place it back in tube rack. Document rack and tube layout, and rack and tube labels in lab notebook.
3. Cap tubes in tube rack. Place tube rack in plastic bag and seal it. Transfer bagged tube rack to platform vortexer (outside BSC).
4. Vortex samples for 20 min on platform vortexer, position 7.
5. After vortexing, transfer sample tube rack to BSC. Remove tube rack from plastic bag.
6. Vortex one sample tube on single-tube vortexer for 3-5 seconds. Uncap tube, using 25 mL serological pipette transfer 14 mL to appropriate 50 mL tube (same position in 50 mL tube rack as in 30 mL tube rack). Dispose pipette in waste container. Cap sample tube, and place tube back in rack. Change gloves.
7. Repeat step 6 for each sample tube.
8. Change waste bag if needed.

9. Perform second spore extraction. Uncap each sample tube individually.
10. Add 14 mL of cold Extraction Buffer (without Tween). Recap tube.
11. After all tubes received 14 mL Extraction Buffer, cap tubes in tube rack. Place rack in plastic bag and seal it. Transfer bagged tube rack to platform vortexer (outside BSC).
12. Repeat steps 4-7 above, except only vortex for 10 min instead of 20 min. After the second spore extraction and transfer, each 50 mL tube should contain 28 mL.
13. Cap the original sample tube, and store at 4°C.

RV-PCR sample processing

1. Place into a 35°C incubator, blue filter cup caps (pull-ring caps) in a zip lock bag (one for each filter cup). Caps are easier to place on filter cups when pre-warmed.
2. Place into the BSC: 10 mL serological pipettes, filter cup manifold, with filter cups and red caps. Label filter cups following the same format as for the tube rack layout. Document filter cup layout and labels in lab notebook. Cap all filter cups with red caps.
3. Uncap individual 50 mL tube and mix contents by pipetting liquid up and down five or more times with a 10 mL serological pipette. Put pipet in waste and place tube cap loosely on top of tube. Let the suspension sit for 30 sec to allow large particles to settle. Using new 10 mL serological pipet with graduation up to 13 mL, transfer 13 mL to the filter cup (same position in filter cup manifold as in 50 mL tube rack). Take care to not pick up large settled particles. Dispose pipette in waste container. Replace red cap on filter cup, and cap 50 mL tube, and place in rack. Change gloves. The remaining liquid in the 50 mL tube will be used for traditional culture analysis (see below) that could occur in parallel with RV-PCR analysis. If not possible to process in parallel, store the 50 mL tubes at 4°C until samples are plated.
4. Repeat step 3 for each filter cup. After transfers are complete, remove red filter cup caps and dispose to waste.
5. Turn on vacuum pump at 10 psi. Complete filtration of liquid through filter cups. Turn off vacuum. Place a new red cap on each filter cup.
6. Place into the BSC: 25 mL serological pipettes, and cold High Salt Wash Buffer (pH 6.0).
7. To each filter cup, transfer 20 mL of cold High Salt Wash Buffer (pH 6.0) using a 25 mL serological pipette. Use new pipette for each filter cup, lifting red cap and replacing after addition. After transfers are complete, remove red filter cup caps and dispose to waste. Turn on vacuum. After filtration is complete, turn off vacuum, place new red cap on each filter cup.
8. Place into the BSC: 10 mL serological pipettes and cold 1X Wash Buffer (pH 7.4).
9. Transfer 7 mL of cold 1X Wash Buffer (pH 7.4) to each filter-cup using a 10 mL serological pipette. Use new pipette for each filter cup, lifting red cap and replacing after addition. After transfers are complete, remove red filter cup caps and dispose to waste. Turn on vacuum.
10. Complete filtration of liquid through filter cups. Turn off vacuum pump. Change gloves. Place red cap on each filter cup.
11. Unscrew manifold top using Allen wrench. Break seal on manifold to ensure there is no vacuum, by inserting a plate sealer between manifold top and bottom. Change gloves. Lift top part of manifold and transfer to capping tray fitted with bottom caps. Press down to cap bottom of filter-cups. Change gloves.
12. Place into the BSC: 5 mL serological pipettes, 200-μL pipettor, 200-μL tips, cold TSB medium, sharps container, and warm filter cup caps. Prepare TSB medium in 50 mL conical tubes and keep on ice before addition.
13. Pipette 3.5 mL of cold TSB medium into each filter cup using a 5 mL serological pipette. Use new pipette for each filter cup, lifting red cap and replacing after addition.
14. Firmly press red caps into filter cups prior to vortexing.
15. Place capped filter-cup manifold in plastic bag. Bleach bag.
16. Vortex filter cups for 10 min on platform vortexer, setting 7.
17. Place into the BSC, 2 mL Eppendorf tubes in a 96-tube rack (8 rows x 12 columns format).
18. Label 2 mL tubes as Time 0 (T0) samples following the same layout as the filter cups and place in same 8 rows x 3 columns format as the filter cup manifold. Document rack and tube layout, and labels in lab notebook.
19. After vortexing, transfer filter-cup manifold in capping tray to BSC. Remove bag.
20. Uncap one filter cup at a time, and open the corresponding 2 mL Eppendorf tube. Using a 1 mL pipettor, swirl pipette tip gently in filter cup, while gently pipetting up and down 5 or more times to mix sample (and to avoid aerosol generation). Aliquot 1 mL out of each cup, and transfer to corresponding 2 mL Eppendorf tube, cap tube and place on ice.
21. On same filter cup sample, following the same aliquoting procedure, remove 100 µL and transfer to pre-chilled 1.5 mL Eppendorf tube. Add 900 µL of cold 10 mM Tris buffer (pH 8). Cap 1.5 mL tube

and keep on ice (or cold block). If sample cannot be heat-lysed within 30 min, store at -20°C until ready to process by heat lysis. Cap filter cup firmly with blue cap. Change gloves.
22. Repeat steps 20-21 for each filter cup.
23. After aliquoting from each filter cup, place capped filter-cup manifold in plastic bag. Bleach bag.
24. Transfer bagged filter-cup manifold in capping tray to shaker incubator at 35ºC, speed 230 rpm. Incubate for 9 hr.
25. Process 1 mL T0 samples in 2 mL tubes using Manual DNA Extraction and Purification Protocol as described below.
26. Process 100 µL aliquots added to Tris buffer (1 mL total volume in 1.5 mL tubes) using Modified Heat Lysis Protocol described below. If aliquots cannot be processed immediately, store tubes at -20°C and then bring to room temperature before processing.

Traditional culture analysis of T0 samples

1. For 50 mL tubes containing remaining extract (from step 3 above), mix contents by pipetting up and down 5 times with 10 mL serological pipet. Let tube sit for 30 sec to allow coarse particles to settle. Take a new 10 mL serological pipet with graduation up to 13 mL and transfer 13 mL to a new 50 mL conical tube, being careful to not pick up any large, settled particulates. Check that tube labels match.
2. Place tubes containing 13 mL extract into adapters of swinging bucket rotor of refrigerated centrifuge (Eppendorf 5810R or similar), with rotor adapters for 50 mL conical tubes. Centrifuge at 4,000 rpm (3,220 × g) for 30 min at 4°C. Set acceleration to 9 (or high) and brake to 0. After centrifugation, place tubes back in BSC, and transfer to tube rack in original sample layout.
3. Open one tube at a time, remove 9.5 mL with a 10 mL serological pipette (taking care to keep pipette clear of tube bottom to avoid dislodging the pellet), and transfer the liquid to 15 mL tube for archive or to waste. (Note: Pellet might not be visible). Recap tube, and return tube to rack. Change gloves. Note: This produces the same concentration factor for both RV-PCR and culture analysis.
4. Repeat step 3 for remaining tubes.
   Note: Do not let tubes sit for extended time after centrifugation, to avoid resuspension of pelleted material.
5. After removing 9.5 mL supernatant from each tube, recap tube, and vortex each 50 mL tube on single-tube vortexer on low setting (to avoid foam generation) for 20 sec or until pellet is resuspended completely. Place tube back in tube rack.
6. Resuspend pellets for all 50 mL tubes.
7. Perform serial dilution of the concentrated suspension in Butterfield Buffer (BB). Keep dilution series tubes for a given sample together. Keep same sample layout with eight rows per column.
8. Uncap 50 mL tube; mix contents by vortexing at low speed for 10-20 sec. Remove 0.5 mL of spore elution suspension (10^0) and place in one 15 mL conical tube containing 4.5 mL BB, making a 10^{-1} suspension. Recap the 10^{-1} tube and vortex on high for 30 sec.
9. Open cap of the 10^{-1} suspension and remove 0.5 mL of this suspension and place in a new 15 mL conical tube containing 4.5 mL BB, making a 10^{-2} suspension. Recap the BB tube and vortex on high for 30 sec. Note: This produces three spore suspensions: the initial concentrated suspension (no dilution=10^0) and two serial dilutions of this suspension in BB (10^{-1} and 10^{-2}).
10. Repeat steps 8-9 for all samples.
11. Prior to plating onto TSA plates, vortex each 10^{-1} and 10^{-2} suspension for 10 sec on a single tube vortexer set to high. For the 10^0 suspension, vortex for 20 sec on low setting to avoid foam generation.
12. Using a 200-µL pipettor, remove 100 µL from the 10^{-2} suspension and place on to a plate of TSA labeled 10^{-3}. Repeat 2 more times with a new tip each time for a total of three inoculated plates. Note: Plating of 100 µL is an additional 1:10 dilution of the 10^{-2} suspension resulting in a 10^{-3} dilution on the plate.

13. Spread the inoculum on each of the three 10^{-3}-labeled TSA plates with a sterile Lazy-L cell spreader for each replicate plate. Discard each spreader after use.
14. Vortex the 10^{-1} tube from the same sample for 10 sec on high, remove 100 µL from the 10^{-1} suspension with the 200 µL pipettor and place on to a plate of TSA labeled 10^{-2}. Repeat 2 more times for a total of three inoculated plates.
    Note: Plating of 100 µL is an additional 1:10 dilution of the 10^{-1} suspension resulting in a 10^{-2} dilution on the plate.
15. Spread the inoculum on each of the three 10^{-2}-labeled TSA plates with a Lazy-L cell spreader for each replicate plate. Discard each spreader after use.
16. Mix the contents from the 10^{0} tube by vortexing; remove 100 µL from the 10^{0} suspension with the 200-µL pipettor and place on to a plate of TSA labeled 10^{-1}. Repeat 2 more times for a total of three inoculated plates.
    Note: Plating of 100 µL is an additional 1:10 dilution of the 10^{0} suspension resulting in a 10^{-1} dilution on the plate.
17. Spread the inoculum on each of the three 10^{-1}-labeled TSA plates with a Lazy-L cell spreader for each replicate plate. Discard each spreader after use.
18. Invert plates and incubate at 35°C for 18-24 hrs.
19. Perform filtration of spore suspension through MicroFunnel filter funnel. Set up filter funnels in vacuum filtration manifold.
20. Moisten MicroFunnel membrane with 5 mL PBST; turn on vacuum (< 5 psi) and vacuum through the filter. Turn vacuum off.
21. Pipet 10 mL of PBST buffer to filter funnel. Do not turn on vacuum.
22. Pipet 0.5 mL of 10^{0} spore suspension to filter funnel, turn on vacuum (< 5 psi) and vacuum through the filter. Turn vacuum off.
23. Rinse filter with 10 mL of PBST; turn on vacuum (< 5 psi) and vacuum through the filter. Turn vacuum off.
24. Squeeze the walls of the MicroFunnel cup gently and separate the walls from the base holding the filter. Remove each filter membrane with sterile forceps and place grid-side up on a TSA plate. Make sure that the filter is in good contact with the surface of the agar. If an air pocket occurs under the filter, use the sterile forceps to lift the edge of the filter to release the air pocket for better contact with the agar. Repeat filter funnel protocol for each sample.
25. Incubate TSA plate with filter membrane at 35°C for 18-24 hrs.
26. For preparation of enrichment sample, transfer the remaining 10^{0} spore suspension to a 15 mL conical tube. Centrifuge at 4,000 rpm (3,220 × g) for 30 min at 4°C. Set acceleration to 9 (or high) and brake to 0. Note: Use higher centrifugation speeds if supported by available instrumentation but do not exceed tube allowances.
27. Remove tubes from rotor and set up in tube rack in same layout as for filter-cup manifold. Open one tube at a time, transfer supernatant to waste using a 1 mL pipettor (taking care to keep pipette clear of tube bottom to avoid dislodging the pellet), and transfer the pipette tip containing liquid to waste (Note: Pellet might not be visible). Recap tube, and return tube to rack. Change gloves.
28. Repeat step 27 for remaining tubes.
    Note: Do not let tubes sit for extended time after centrifugation, to avoid resuspension of pelleted material.
29. Using a 5 mL serological pipette, transfer 5 mL of TSB medium to each 15 mL tube, using a new pipette for each sample.
30. After removing supernatant from each tube, recap tube, and vortex 15 mL tube on single-tube vortexer on medium setting (~1,500 rpm) for 10 sec or until pellet is resuspended completely. Place tube back in tube rack.
31. Resuspend pellets for all 15 mL tubes.
32. Incubate 15 mL tubes with media at 35°C, with shaking (200 rpm) for 18-24 hrs.
33. Follow laboratory cleanup protocol in Annex A.

Culture Data Results

1. Record colony-forming units (CFUs) per plate that are consistent with BG colony morphology (non-spreading, circular, flat colonies approximately 2 mm in size with orange color). Colony counts are most accurate when between 25 and 250. If any serial dilution plates or filter membrane plates contain more than 250 colonies, record number as too numerous to count (TNTC). If plates for all serial dilutions contain BG colonies that are TNTC, record this information, as well as that the sample is positive for BG. Qualitative results are sufficient for comparison between RV-PCR and culture methods; therefore, no corrective action is required if only TNTC culture results are obtained for one or more samples.

   For plates with <250 colonies, determine the average and standard deviation of the three replicates, then convert average CFU to CFU/mL by multiplying by the dilution factor (see below). For the serial dilution plates, use the dilution that yields CFU/plate between 25 and 250, if more than one dilution yields BG colonies. If serial dilution plates have <25 CFU per plate, examine plates with filter membranes.

   a. For 10^0 suspension, the dilution factor is 10 (since 100 μL plated).
   b. For 10^{-1} suspension, the dilution factor is 10 (since 100 μL plated) x 10 (for 1/10 dilution), or 100.
   c. For 10^{-2} suspension, the dilution factor is 10 (since 100 μL plated) x 100 (for 1/100 dilution), or 1000.
   d. For filter membrane plate, the average plate CFU is already in units of CFU/mL since 1 mL of spore extract was filtered.
   e. Convert CFU/mL to CFU/sample by multiplying CFU/mL by the total volume of spore extract added to the sample (i.e., 33 mL). Determine average and standard deviations for plate count data. Record both CFU/mL and CFU/sample.
      Note: CFU/sample is calculated based on the total extract volume; however, this result was compared qualitatively with the split sample analyzed by RV-PCR (13 mL).
   f. CFU counts based on colony morphology/pigmentation can be confirmed if necessary (see Confirmation of CFU values by real-time PCR analysis, #3 below).

2. If no BG colonies are identified from either dilution series plates or filter plates, examine the TSB enrichment sample. If broth is not turbid, incubate for an additional 24 hours at 35°C at 2,000 rpm. If broth is turbid, record as positive growth, and streak for isolation of BG colonies onto TSA plates using a sterile, disposable loop (3 replicate plates) and incubate at 35°C for 18-24 hrs. Examine plates and record if BG colonies are present after incubation.

3. Confirmation of CFU values by real-time PCR analysis (optional).

   a. If BG CFU values are inconclusive based on colony morphology and orange pigmentation, real-time PCR can be used for confirmation. Select 2-5 colonies from plates for each sample. If isolated colonies are present on serial dilution plates, select colonies from these plates. If no colonies are present, select colonies from filter plates; finally, if no colonies are present on dilution or filter plates, select colonies from enrichment broth plates.

b. Follow LRN procedure: “Rapid preparation of cell lysates from culture-grown Gram-positive bacteria for subsequent testing by fluorogenic 5’ nuclease assay” (Boil Prep protocol). Use real-time PCR recipe and conditions as outlined in Annex B.

Extended Enrichment Culture Analysis

Note: Due to low spore levels and the splitting of extract between culture and RV-PCR analysis, discrepancies might occur between method results. The following protocol involves PCR analysis of concentrated, purified enrichment culture samples remaining after conducting the modified LRN protocol (i.e., after dilution series/plating, filter funnel plating and enrichment culture re-streaking and PCR analysis of small aliquot [5 µL] of enrichment culture). By performing this protocol, a more accurate assessment of positive and negative culture results could be obtained. The protocol should only be performed for samples that are positive by RV-PCR and negative by the modified LRN protocols listed above.

1. Briefly vortex 15 mL enrichment culture (EC) tube.
2. Aliquot 1 mL to labeled 2 mL Eppendorf tube.
3. Centrifuge at 4°C for 10-15 min at 14,000 rpm.
4. Remove supernatant.
5. Repeat steps 2-4 by taking another aliquot from same EC tube and combining pellets together the remaining EC volume has been processed.
6. After centrifugation is complete, add 1 mL 10 mM Tris buffer (pH 8) and resuspend the pellet by vortexing.
7. Process using the 1 mL Manual DNA Extraction and Purification Protocol described below.

Manual DNA Extraction and Purification Protocol

1. After incubation for 9 hr, take filter-cup manifold out of incubator.
2. Vortex filter cups for 10 min on platform vortexer, setting 7.
3. Transfer filter-cup manifold to BSC.
4. Set up 2 mL Eppendorf tubes in a 96-well tube rack (8 x 12) and verify that 2 mL tube labels match the filter cup layout. Maintain the tube layout when transferring tubes between magnetic stand and 96-well tube rack. Do not use the 1.5 mL Eppendorf tubes.
5. Uncap one filter cup at a time, and open the corresponding 2 mL tube. Using a 1 mL pipettor, swirl pipette tip gently in filter cup, while gently pipetting up and down 5 or more times to mix sample (and to avoid aerosol generation). Aliquot 1 mL out of each cup, and transfer to corresponding 2 mL tube in the 96-well tube rack (T9 samples); Cap tube and place on ice.
6. On same filter cup sample, following the same aliquoting procedure, remove 100 µL and transfer to pre-chilled 1.5 mL Eppendorf tube containing cold 900 µL of 10 mM Tris buffer (pH 8). Cap 1.5 mL tube and keep on ice. Cap filter cup firmly with blue cap. Change gloves.
7. Repeat steps 5-6 for each filter cup. Store 2 mL tubes at -20°C if the remaining steps of the protocol cannot be conducted immediately, otherwise keep on ice.

Note: 1 mL T0 and T9 samples are processed using the same protocol as follows:

DNA extraction and purification phase:

Note: Prepare Lysis Buffer with Anti-Foam Reagent according to manufacturer's instructions. Prepare Alcohol Wash solution by adding ethanol and isopropanol according to manufacturer's instructions.

8. If samples were stored at -20°C, thaw, and then centrifuge at 13,000-14,000 rpm (4°C) for 5 min. Remove 900 µL supernatant taking care to not disturb the pellet. Add 900 µL 10 mM Tris buffer (pH 8) and completely resuspend pellet. Process one tube at a time.
   Note: For the following steps when processing 1-2 mL volumes in 2 mL tubes (during Lysis Buffer and PMP addition steps and buffer removal steps), change gloves between each sample.
9. Vortex PMPs for on high setting (~2,500 rpm) for 30 to 60 sec, or until resuspended. During use, verify that PMPs remain suspended, and repeat vortex step, if necessary.
10. 1st Lysis: Uncap one tube individually and add 600 µL of PMPs (lysis buffer + magnetic beads) to each tube (containing 1 mL culture), and mix by pipetting up and down 5 times.
11. Take new pipet tip and add 360 µL of Lysis Buffer to each tube. Cap tube and mix by vortexing on high for 10 sec. Change gloves between samples.
12. Repeat steps 10 and 11 for all T0 and T9 tubes.
13. Vortex each tube for 10 sec (on high) and place on magnetic stand. After all tubes are in the stand, invert tubes 180 degrees (upside-down) turning away from you, then right side-up, then upside down toward you, then to right side-up (caps up) position. This step allows all PMPs to contact the magnet. Check if beads remain in the caps and if so, repeat the tube inversion cycle again. Let tubes sit for 5-10 sec before opening.
14. Uncap each tube individually and using a 1 mL pipettor, place pipet tip in bottom of 2 mL tube, taking care not to disturb PMPs. Withdraw all liquid and discard pipet tip with liquid to waste. Recap tube. Change gloves.
15. 2nd Lysis: Uncap each tube individually and add 360 µL of Lysis Buffer. Cap and vortex on high for 10 sec, and transfer to 96-well tube rack.
16. After adding Lysis Buffer solution to all tubes, vortex each tube for 10 sec (on high) and place on magnetic stand. After all tubes are in the stand, follow tube inversion cycle as described in step 13.
17. Remove liquid as described in step 14. Recap tube.
18. 1st Salt Wash: Uncap each tube individually and add 360 µL of Salt Wash solution. Cap and vortex on high for 10 sec, and transfer to 96-well tube rack.
19. After adding Salt Wash solution to all tubes, vortex each tube for 10 sec (on high) and place on magnetic stand. After all tubes are in the stand, follow tube inversion cycle as described in step 13.
20. Remove liquid as described in step 14. Recap tube.
21. 2nd Salt Wash: Repeat steps 18-20 for all tubes.
22. 1st Alcohol Wash: Uncap each tube individually and add 500 µL of Alcohol Wash solution. Cap and vortex on high for 10 sec, and transfer to 96-well tube rack.
23. After adding Alcohol Wash solution to all tubes, vortex each tube 10 sec (on high) and place on magnetic stand. After all tubes are in the stand, follow tube inversion cycle as described in step 13.
24. Remove liquid as described in step 14. Recap tube.
25. 2nd Alcohol Wash: Repeat steps 22-24 for all tubes.
26. 3rd Alcohol Wash: Repeat steps 22-24 for all tubes.
27. Air dry for 2 min.
28. Heat dry on heat block at 80°C until samples are dry (30-60 min). Allow all alcohol solution to evaporate since alcohol could interfere with real-time PCR analysis.

DNA elution phase:

29. Move 2 mL Eppendorf tubes out of heat block and add 200 μL of Elution Buffer to each tube in 96-well tube rack. Mix briefly by vortex, place on magnet, collect liquid with a micropipette, and transfer to a clean 2 mL tube (typically 80 μL are collected) following the tube layout (check tube labels to keep correct order). Visually verify absence of magnetic bead (PMP) carryover during final transfer. If magnetic bead carryover occurred, place 2 mL tube on magnet, collect liquid, and transfer to a clean 2 mL tube (ensure correct tube labels during transfer).
30. Store DNA extract samples at 4ºC until preparation for real-time PCR analysis (use photo-tray to transport 2 mL tubes).
31. Follow laboratory cleanup protocol in Annex A.

Modified Heat Lysis Protocol for T0 and T9 aliquots

1. For 1.5 mL Eppendorf tubes containing 100 μL sample aliquot and 900 μL 10 mM Tris buffer (pH 8), keep tubes on ice until subsequent processing. If frozen, thaw tube contents prior to conducting steps 2-8 below.
2. Centrifuge at 13,000-14,000 rpm (maximum speed) at 4°C for 5 min.
3. Remove 900 μL supernatant and resuspend pellet in remaining 100 μL (keep on ice when not aliquoting or vortexing). Take care not to disturb pellet and repeat centrifugation if material is not firmly pelleted.
4. Heat for 10 min at 95°C.
5. Place tubes on ice to cool (1-2 min).
6. Centrifuge at 13,000-14,000 rpm (maximum speed) at 4°C for 5 min.
7. Transfer supernatant to new 1.5 mL tube taking care to not disturb pellet.
8. Store at -20°C until ready to perform PCR analysis.

Real-time PCR analysis of T0 and T9 aliquots

1. In clean BSC or PCR-preparation hood, set up 96-well PCR plate with PCR mix (20 μL mix per well) according to plate layout. For each sample, 3 replicate BG reactions were performed. Replicates will follow format, A1, A2, A3, followed by the next set of replicates (A4-A6) rather than A1, B1, C1 (followed by D1-F1). Note: Columns are numbered 1-12 and rows are A-H. Leave columns 10 and 11 empty. Add PCR mix to the wells in column 12 for the DNA standard controls.

   Note: One 96-well plate will accommodate samples and controls from one manifold (24 x 3 replicates = 72 total, plus PCR standard controls).
   T0 and T9 extracts from the same sample should be analyzed on the same PCR plate in order to make more consistent comparison between sample time-points.
2. Seal PCR plate and transfer to BSC.
3. Transfer 2 mL DNA extract tubes to the BSC.
4. Perform 1:10 dilution of T0 and T9 samples:
   Add 180 μL of PCR-grade water to clean 2 mL Eppendorf tubes in a 96-well tube rack (8 x 12) and label to match with the tube layout and labels of the 2 mL DNA extract tubes. Add “1/10 dil” to label. Perform one dilution at a time. Mix DNA extract up and down 5 times and transfer 20 μL to appropriate 2 mL tube, maintaining the tube layout. Cap undiluted DNA extract tube and return to tube rack. Cap diluted DNA extract tube, vortex briefly and place in appropriate tube rack. After all dilutions are completed, store remaining undiluted extract tubes at -20ºC. Store diluted DNA extract tubes at 4ºC until PCR is performed.

5. Add diluted extract to PCR plate.
   Open one diluted DNA extract tube at a time, and mix up and down 10 times and transfer 5 μL to the appropriate well on the PCR plate (containing 20 μL of PCR mix).
6. Repeat 2 times for each sample or control diluted DNA extract following the PCR plate layout to yield 3 replicates per sample or control. When all transfers are complete, seal PCR plate with clear seal. Change gloves. Store remaining diluted samples at -20ºC.
7. Centrifuge sealed PCR plate for 1 min at 2,000 rpm.
8. Remove plate and place on photo-tray, change gloves, transfer PCR plate to ABI thermocycler.
9. Run PCR (see Annex B).
10. After thermal cycling completion, discard sealed PCR plate to waste. Autoclave. PCR plates with amplified product are never to be opened in the laboratory.
11. Follow laboratory cleanup protocol in Annex A.

Data Analysis and Reporting

PCR standards:

DNA standards were generated for BG isolated from the CRP BG spore stock. BG DNA standards were analyzed on each sample PCR plate. The DNA is prepared as follows: DNA is extracted from cultured cells using a MasterPure™ Complete DNA and RNA Purification Kit (Epicentre® Biotechnologies Inc.), followed by RNase treatment. The DNA concentration was measured with a Qubit™ fluorometer using the PicoGreen™ assay (Invitrogen™, Quant-iT™ dsDNA HS assay kit for Qubit fluorometer, Cat. No. Q32854). DNA quality was assessed by spectrophotometric analysis; the UV absorbance 260 to 280 ratio should be ≥ 1.8. Standard concentrations prepared in PCR-grade water will range from a high level, 1 ng/reaction (5 µL of a 200 pg/ µL stock solution) and a low level, 100 fg/reaction (5 µL of a 20 fg/µL stock solution). Triplicate standards for each level was included on each sample plate, along with a negative (no-template) control.

Results from genomic DNA standards should be within 2 Ct of expected values (reference Ct values) based on previous testing (for at least 2 of 3 standards for each concentration), and the limit of detection should be at least 100 fg. Each lab should establish their own reference Ct values on their ABI 7500 Fast instrument. Automated analysis settings for baseline and threshold should be used. The absolute Ct values are used qualitatively to determine whether high (1 ng) and low (100 fg) levels are consistently detected and the 100 fg limit of detection is achieved. In addition, the no-template control should be non-detect.

RV-PCR Results Interpretation

Results from negative control samples (laboratory controls and field blanks) should be non-detect. Results from replicate PCR analyses from positive control samples should be within 3 Cts for ΔCt and Ct(T9).

If the Ct(T0) and/or Ct(T9) is non-reactive (non-detect) for 45 cycles, the value(s) is arbitrarily set to 45 in order to calculate ΔCt. For the BOTE, using *B. atrophaeus* (BG) spores (from CRP) on field samples

(pre- and post-decon), the PCR performance criteria were set as ΔCt [Ct(T0)-Ct(T9)] ≥ 6 (to represent at least a two log difference in DNA concentration), and an T9 Ct of ≤ 39 was used for BOTE data analysis. The ΔCt ≥ 9 criterion represents an increase in DNA concentration at T9 relative to detectable DNA at T0, if any, as a result of the presence of viable spores in the sample that germinated and propagated during the 9 hr of incubation in growth medium. If no PCR data is obtained for one or more replicates, these data should not be averaged to obtain an average Ct value. For example, if 2 of 3 replicates yield PCR data, these two data alone are used to generate an average Ct value. However, attempts should be made to repeat the PCR analysis until consistent results are obtained for all three replicates.

RV-PCR and Culture Results Reporting

Qualitative results or positive/negative (presence/absence) data for BG spores were reported for both RV-PCR and culture analyses for each sample and control. In addition, the data reports by event included the following for each sample and control: 1) Average ΔCt value (with standard deviation, SD); 2) Average CFU/sample value corrected for dilution factor; 3) Source of culture result; and 4) Data from PCR confirmation of culture result. A report template is shown in Annex F. In addition, the results for all three events were summarized using the summary form shown in Annex F. Sample barcodes from field samples and blanks were linked with sample data using a barcode scanner/software system, and final reports included sample barcode information. Excel spreadsheets with results were provided in order to link laboratory data with field identification data. While quantitative data were provided, the comparison of RV-PCR and culture methods was based on qualitative results (positive/negative or presence/absence).

Annex A: Lab Cleanup Procedure

Lab Cleanup Protocol

- Dispose of all biological materials in autoclave bags (double bagged)
- Autoclave all waste materials at end of work for the day
- Decontaminate counters and all equipment with fresh bleach (1 volume water and 9 volumes commercial bleach), followed by 70% isopropanol, and finally rinse with DI water.

Annex B: *Bacillus atrophaeus* (BG) Real-time PCR assay conditions

Real-time PCR analysis of *Bacillus atrophaeus* subsp. *globigii (BG*) on the AB 7500 Fast Real-Time PCR Thermocycler (in fast mode)

Reagents:

- Primers (Biosearch Technologies, Cat. No. P1R-1) and probes (Biosearch Technologies, Cat. No. DLO-FB1-1)
- TaqMan 2X Universal Master Mix with UNG and AmpliTaq Gold (Applied Biosystems, Cat. No. 4305719)
- Molecular Biology grade distilled water, RNase- and DNase-free (Teknova, Cat. No. W3350)

PCR Reagents Mix:

Reagent	Volume (μL)	Final Concentration
TaqMan 2X Universal PCR Master Mix	12.5	1X
Forward primer, Bg42F, 10 μM	1.25	0.5 μM
Reverse primer, Bg104R, 10 μM	1.25	0.5 μM
Probe, Bg60F/BHQ1, 1 μM	2.5	0.1 μM
Molecular Biology Grade Water	2.5	N/A
Template DNA	5	Variable
TOTAL	25	

Equipment:

- ABI 7500 Fast Real-Time PCR Thermocycler
- Optical Fast 96-well plates (Applied Biosystems, Cat. No. 4366932)
- Optical adhesive plate covers (Applied Biosystems, Cat. No. 4311971)

Thermocycling Conditions:

STEPS	UNG incubation	AmpliTaq Gold	PCR, 45 cycles

		activation		
	HOLD	**HOLD**	**Denaturation**	**Annealing/extension**
Temperature	50°C	95°C	95°C	60°C
Time	2 min	10 min	5 s	20 s

*Fast Ramp: 3.5°C/s up and 3.5°C/s down.

The *B. atrophaeus* (BG) assay (forward primer, Bg42F: CGCGCCCGAGGACTTAA; reverse primer, Bg104R: ATGTCAAGAAACCGCCGTC; and fluorogenic probe, Bg60F/BHQ1: FAM-TCTCGTAAAGGGCAGCCCGCAAG-BHQ1; 63-bp amplicon) was developed at Lawrence Livermore National Laboratory (LLNL) to specifically target the *recF* gene of *B. atrophaeus*.

Annex C: Consumables

Description	Catalog #	Units	Supplier	Item part Number
PCR Materials				
PCR plates	4346906 or 4366932	20/box or cs of 10 boxes	Applied Biosystems, Inc.	4346906 or 4366932
PCR plates seals	4311971	100/box	Applied Biosystems, Inc.	4311971
TaqMan Universal PCR master mix	4305719	(10) 5 mL bottles	Applied Biosystems Inc.	4305719
PCR probes	DLO-FB1-1	1 μmol	Biosearch Technologies	DLO-FB1-1
PCR primers (pair)	P1R-1	1 μmol	Biosearch Technologies	P1R-1
96 Well Hard Plates Costar-black 100/cs	29442-922	cs	GSS	29442-922
2.0 mL Screw cap tubes (500 bag; Eppendorf)	20170-237	bag	GSS	20170-237
PCR water – ultra pure, Molecular Biology Grade)	W3350-06	1 L	Teknova	W3350-06
Culture Materials				
TSA (BD Bacto)	236950	500 g	VWR	90002-706
TSB Media (BD Difco)	211825	500 g	VWR	90000-378
Petri dishes 60x15	25373-085	cs	GSS	25373-085
LAZY-L-SPREADERS STERILE case of 500	101100-886	500/cs	GSS	101100-886
10 µL Inoculating Loop Yellow, Sterile	12000-810	1000/cs 25/bg	VWR	12000-810
MicroFunnel Filter Funnels (0.45 µm MCE membrane;	4800	50/cs	VWR	28143-544

Pall Sciences)				
Vacuum Filtration Manifold (3-place manifold, 47 mm, stainless steel)	xx2504735	ea	Millipore	xx2504735
Buffers/Reagents				
Potassium phosphate, KH_2PO_4	P0662-500G	500 g / bottle	Sigma-Aldrich	P0662-500G
Tween® 80 9005-65-6	103170	100 mL	MP Biomedicals	103170
EtOH 200 proof absolute, anhydrous	111ACS200	1 L	Trans Meridian UCI/QUANTIUM CHEM	111ACS200
PBST Buffer, Sterile	P0201	1 L	Teknova	P0201
Butterfield's Buffer, Sterile	U190	0.5 L (10/cs)	Hardy Diagnostics	U190
NaOH	S8045-500G	500 g	Sigma	S8045-500G
Filter system (PES, 0.2μm)	87006-066	1 L (pk of 12)	VWR	87006-066

DNA extraction and purification reagents				
Promega Magnesil Kit	Promega	MD1360	VWR	PAMD1360
Promega Salt Wash	Promega	MD1401	VWR	PAMD1401
Promega Paramagnetic Particles	Promega	MD1441	VWR	PAMD1441
Promega Lysis Buffer	Promega	MD1392	VWR	PAMD1392
Promega Anti-foam Reagent	Promega	MD1431	VWR	PAMD1431
Promega Elution Buffer	Promega	MD1421	VWR	PAMD1421
Promega Alcohol Wash, Blood	Promega	MD1411	VWR	PAMD1411
Vacuum filtration materials				
Tygon Tubing 1/4" ID 1/2" OD	BH-95636-00	bx	Cole-Parmer	BH-95636-00
Nalgene 2 Liter Bottle	BH06257-20	ea	Cole-Parmer	BH06257-20
Nalgene Venting Cap	BH06258-10	ea	Cole-Parmer	BH06258-10
Vacuum pump, Model DOA-P704, or similar	EW-07061-40	ea	Cole-Parmer	EW-07061-40
3870E DOOR BELLOWS ASSEMBLY KIT - Part for vacuum pump	TUK030-2150	ea	A & A Dental & Medical Services	TUK030-2150
3870E AIR JET VALVE (BLACK TOP) - Part for vacuum pump	TUJ034-2149	ea	A & A Dental & Medical Services	TUJ034-2149
3870E DOOR GASKET (Door Seal) - Part for vacuum pump	TUG074-2146	ea	A & A Dental & Medical Services	TUG074-2146
3870E FILL/VENT MESH CHAMBER FILTER (Stainless Steel) - Part for vacuum pump	MIF062-2126	ea	A & A Dental & Medical Services	MIF062-2126
3870E PLUNGER VALVE KIT (3mm) - Part for vacuum	TUK082-2155	ea	A & A Dental &	TUK082-2155

pump			Medical Services	
3870E PLUNGER VALVE KIT (6mm) - for vacuum pump	TUK086-2156	ea	A & A Dental & Medical Services	TUK086-2156
3870E SAFETY VALVE (40 PSI) - for vacuum pump	TUV065-2166	ea	A & A Dental & Medical Services	TUV065-2166

Sample processing materials				
30 mL Screw blue-cap tubes	T3242S	100/cs	E & K Scientific	T3242S
Polyethylene caps, blue with pull-rings	57935K16	100/pk	McMaster Carr	57935K16
Polyethylene caps, red, tapered	T-14, red	100/pk	Caplugs	T-14, red
Monofilament polyester mesh disc	93185T17	ea	McMaster Carr	93185T17
Monofilament polyester mesh sheet, cut into 2” x 2” squares	9218T13	12’ x 1’ sheet	McMaster Carr	9218T13
Quick turn tube fitting polypropylene, female cap	AP17FLP00P	pk	Ark-Plas Products, Inc.	AP17FLP00P
Whatman Autocups [available from VWR under misc-supplies]	1602-0465	250/cs	VWR	1502-0465(Whatman)
Disposable Nylon Forceps	12576-933	100/pack	GSS	12576-933
100 mL Reagent Reservoirs (100/case)	8086	cs	Thermo Fisher	8086
Bioblocks for dilutions (96 wells/ 2mL per well)	662000	20/case	E & K Scientific	662000
Pipettors and tips for PCR and DNA extraction and purification				
1000 µL Filter LTS Tips	RT-L10F	cs	Rainin	RT-L20F
200 µL Filter LTS Tips	RT-L1000F	cs	Rainin	RT-L1000F
20 µL Filter LTS Tips	RT-L200F	cs	Rainin	RT-L200F
L-1000 LTS Pipettor	L1000 LTS	ea	Rainin	L1000 LTS
L-100 LTS Pipettor	L100 LTS	ea	Rainin	L100 LTS
L-200 LTS Pipettor	L200 LTS	ea	Rainin	L200 LTS
L-20 LTS Pipettor	L20 LTS	ea	Rainin	L20 LTS
L-10 LTS Pipettor	L10 LTS	ea	Rainin	L10 LTS

Carousel Stand	CR-7	ea	Rainin	CR-7
General laboratory supplies				
Diamond Grip Latex Gloves X-Small	32916-498	cs	GSS	32916-498
Diamond Grip Latex Gloves Small	32916-506	cs	GSS	32916-506
Diamond Grip Latex Gloves Medium	32916-500	cs	GSS	32916-500
Diamond Grip Latex Gloves Large	32916-502	cs	GSS	32916-502
Diamond Grip Latex Gloves X-Large	32916-503	cs	GSS	32916-503
VWR Autoclave Bags 25x35	14220-042	cs	GSS	14220-032
VWR 5.0 mL Freezer Vials	66008-400	bag	GSS	66008-400
Corning 50 mL conical tubes	21008-714	cs	GSS	89004-367
Corning 15 mL conical tubes	21008-678	cs	GSS	89004-370
BD Sharps Containers	BD305551	cs	GSS	BD305551

General laboratory supplies				
Kaydry EX-L Wipers	21903-021	cs	GSS	21903-021
Bleach gallon bottles case	37001-060	cs	GSS	37001-060
Disposable lab coats w/cuffs	CV9841N	cs	GSS	CV9841N
VWR, Bleach wipes 10 pkg/cs	47735-634	10pkg/cs	GSS	37001-060
Autoclaved ampoules	101101-788	20 ampoules/ box	GSS	14220-030
Serological pipettor and tips for manual RV-PCR				

Portable pipet aid	4-000-100	ea	VWR	4-000-100
50 mL serological pipettes, VWR	29442-440	bag	GSS	53283-712
10 mL serological pipettes, VWR	29442-430	bag	GSS	53283-708
25 mL serological pipettes, VWR	29442-436	bag	GSS	53283-710
5 mL serological pipettes, VWR	29442-422	bag	GSS	53283-706
Sample materials				
Wipes (Kendall Versalon)	8042	3000/case	GSS	89004-507

Acronyms: bx, box; cs, case; ea, each; pk, package

Government Scientific source (GSS)

Annex D: Buffers and Media Preparation

1 M Sodium Hydroxide Solution (NaOH)

Note: Label all bottles and flasks with reagent name, date and initials.

1 Add 10 g NaOH to 200 mL Milli-Q H_2O in a 500 mL glass bottle
2 Mix with magnetic stirrer
3 After NaOH pellets are dissolved, bring final volume to 250 mL with Milli-Q H_2O

10X Wash Buffer (250 mM KH_2PO_4, pH 7.4)

Note: Label all bottles and flasks with reagent name, date and initials.

Addition of NaOH is required if Milli-Q H_20 has low pH value (pH ~5).

1 Dissolve 34 g KH_2PO_4 in 500 mL Milli-Q H_2O
2 Add enough 1 M NaOH to bring to pH 7.2 (≥ 200 mL of 1 M NaOH)
3 Bring volume to 1 L with Milli-Q H_2O
4 Filter sterilize using 1 L, 0.22 micron PES filtering system with disposable bottle

1X Wash Buffer (25 mM KH_2PO_4, pH 7.4)

Note: Label all bottles and flasks with reagent name, pH level, date and initials.

1 Add 100 mL 10X Wash Buffer to 900 mL Milli-Q H_2O
2 Mix with magnetic stirrer, when mixed, measure pH
3 Filter sterilize using 1 L, 0.22 micron PES filtering system with disposable bottle

Butterfield's Buffer (0.31 mM KH_2PO_4, pH 7.2; Hardy Diagnostics Cat. No. U190)

Note: This equates to 42.5 mg KH_2PO_4/L.

Label all bottles and flasks with reagent name, pH level, date and initials.

1 Add 12.5 mL 1X Wash Buffer (pH 7.4) and bring volume to 1 L with Milli-Q H_2O
2 Mix with magnetic stirrer, when mixed, measure pH; adjust to 7.2 if necessary
3 Autoclave, or filter sterilize using 1 L, 0.22 micron PES filtering system with disposable bottle

Phosphate-Buffered Saline Tween-20 (PBST) Buffer (Teknova, Cat. No. P0201, 1 L, sterile)

137 mM NaCl

2.7 mM KCl

4.3 mM Na_2HPO_4

1.4 mM KH_2PO_4

0.05% Tween-20

High Salt Wash Buffer (207 mM KH_2PO_4, pH 6.0)

Note: Label all bottles and flasks with reagent name, date and initials. Addition of NaOH is required if Milli-Q H_20 has low pH value (pH ~5).

1 Dissolve 28.2 g KH_2PO_4 in 500 mL Milli-Q H2O
2 Add enough 1 M NaOH to bring to pH 6.0 (≥ 100 mL of 1 M NaOH)
3 Bring volume to 1 L with Milli-Q H_2O; Mix well.
4 Filter sterilize using 1 L, 0.22 micron PES filtering system with disposable bottle

Extraction Buffer w/Tween (0.25 mM KH_2PO_4, 30% EtOH, 0.05% Tween 80)

Note: Label all bottles and flasks with reagent name, date and initials.

1 Add 500 mL Milli-Q H_2O to 1 L bottle or flask
2 Add 1 mL 10X Wash Buffer
3 Add 300 mL 200 proof ethanol
4 Add 0.5 mL Tween® 80
5 Bring volume to 1 L with Milli-Q H_2O; Mix well.
6 Filter sterilize using 1 L, 0.22 micron PES system with disposable bottle

Extraction Buffer w/o Tween (0.25 mM KH_2PO_4, 30% EtOH)

Note: Label all bottles and flasks with reagent name, date and initials.

1 Add 500 mL Milli-Q H_2O to 1 L bottle or flask
2 Add 1 mL 10X Wash Buffer
3 Add 300 mL 200 proof ethanol
4 Bring volume to 1 L with Milli-Q H_2O; Mix well.
5 Filter sterilize using 1 L, 0.22 micron PES system with disposable bottle

Tryptic Soy Broth (TSB) medium

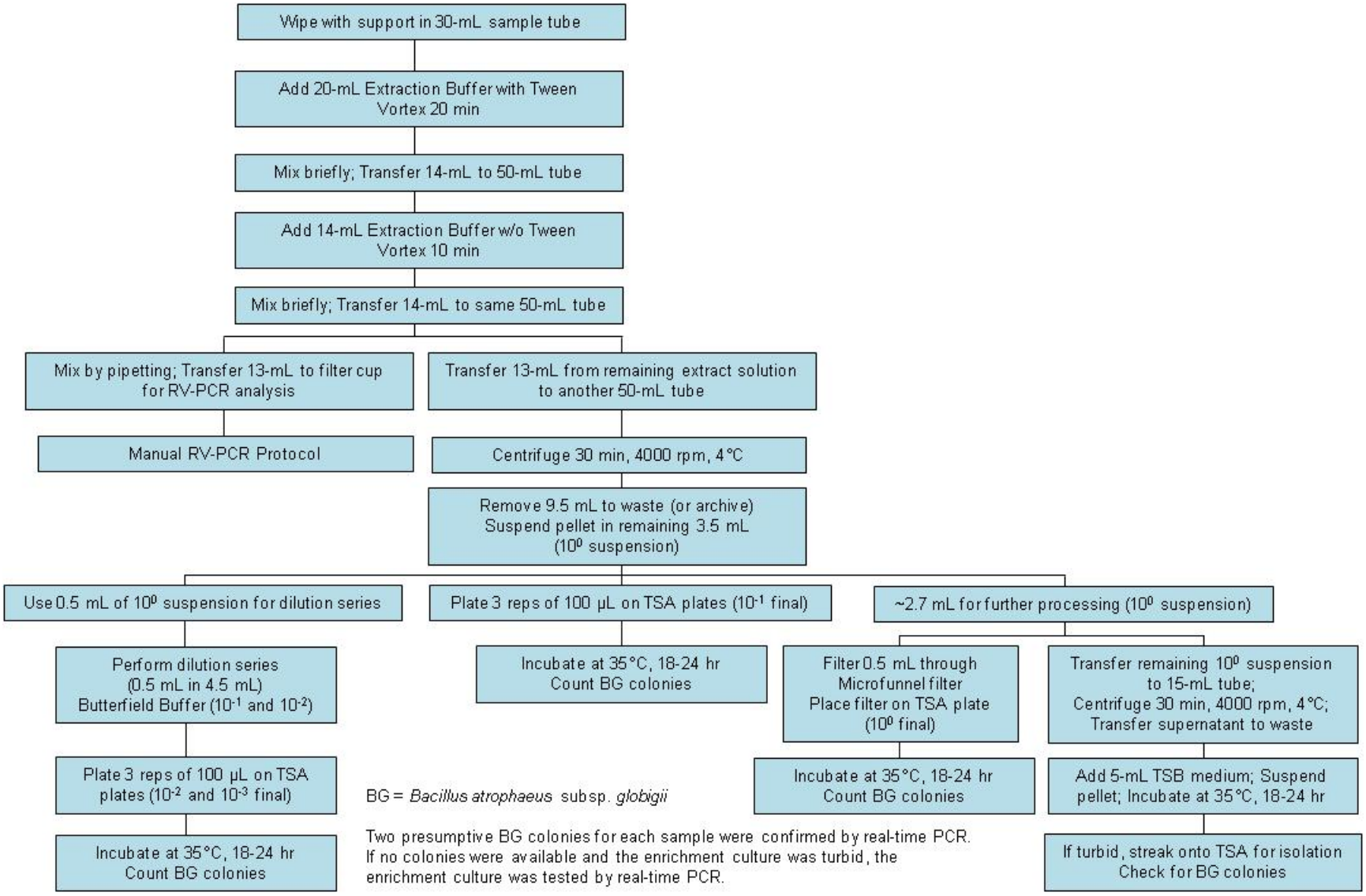
Note: Label all bottles and flasks with reagent name, date and initials.

1 Add 20 g Bacto Tryptic Soy Broth powder in 1 L glass bottle with screw cap
2 Add 500 mL Milli-Q H_2O
3 Place on hotplate and gently mix with spin bar.
4 Autoclave (121ºC at >15 psi for 15 minutes)

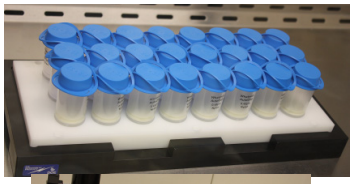
Tryptic Soy Agar (TSA)

1 Add 20 g Bacto Tryptic Soy Broth powder in 1 L bottle or flask
2 Add 8 g Bacto Agar powder
3 Add 500 mL Milli-Q H_2O
4 Place on hotplate and gently mix with spin bar.
5 Autoclave (121ºC at >15 psi for 15 minutes)
6 Place on hotplate and gently mix with spin bar.
7 Allow agar to cool down to 45°C before pouring.
8 In BSC, pour 20 mL of solution in each Petri dish using a serological pipette.

Annex E: Sample processing protocol for the BOTE



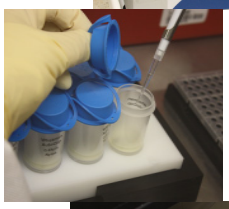
Collect and wash spores in filter cup

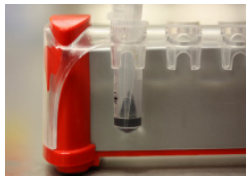


Add 3.5 mL TSB medium to filter cup

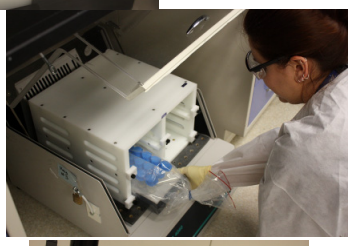
Vortex filter cups

Take T0 aliquot for
DNA concentration and purification

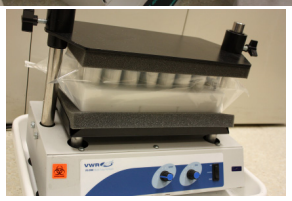




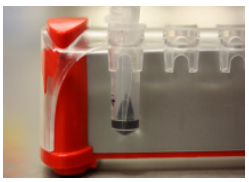
Incubate filter cups
9 hr, 35°C, 230 rpm



Vortex filter cups



Take T9 aliquot for
DNA concentration and purification



Real-time PCR analysis of
T0 and T9 aliquots:
Data reporting

1

Annex F: Data Reporting Forms

BOTE Report Form
Laboratory:
Samples Event:

Positive
Negative

	Culture (24-48 hr)				RV-PCR (9 hr)			
Sample Barcode/ ID	**Average CFU/ Sample**	**Source of Culture Result***	**Culture-PCR (Ct)****	**Culture Result* positive/ negative**	**Average ΔCt**	**Std Dev ΔCt**	**Ct(T9) ≤ 39; ΔCt ≥ 6 RV-PCR Result (positive/ negative)**	**Notes**
NC								
PC								

* Positive or negative culture determination based on the serial dilution (Plates), filter funnel plate (FF), and/or enrichment culture (EC), restreak from enrichment culture (RS), or Promega-extracted concentrated EC (EC-PE). Positive culture result obtained if >0 BG colonies are present on serial dilution or filter membrane plates, and/or BG-positive PCR results are obtained (Ct < 35) from colonies and/or the EC or RS. N/A = Not applicable; No CFUs for analysis and EC not turbid and/or no growth from RS.

** Cycle threshold (Ct) values obtained from real-time PCR analysis of selected colonies and/or enrichment culture (EC); Undetermined = Not detected

Positive RV-PCR result based on Ave. ΔCt ≥ 6 and Ave. T9 Ct ≤ 39

PC = Positive Control; NC = Negative Control; TB = True Blank

BOTE Sample Analyses Summary

BOTE Event[1]	Total Sample No.[2]	Samples							True Blanks	Negative Controls	Positive Controls
		RV-PCR and Culture Pos	RV-PCR and Culture Neg	RV-PCR Pos and Culture Neg	RV-PCR Neg and Culture Pos	Total Agreement[3] (%)	False Positive[3] (%)	False Negative[3] (%)	RV-PCR and Culture Neg	RV-PCR and Culture Neg	RV-PCR and Culture Pos
MFP											
Pre-VHP											
Post-VHP											
Pre-Bleach											
Post-Bleach											
Pre-CD											
Post-CD											
Total											

[1]MFP = Mandatory Full Participation (background samples); VHP = Vaporous Hydrogen Peroxide; CD = Chlorine Dioxide

[2]Total sample number includes surface and QC samples, and does not include True Blanks or laboratory negative and positive controls.

[3]Note that each sample was divided into two equal parts for parallel RV-PCR and culture analyses; as a result, variability could be observed for the samples with low spore levels. Percentages are based on surface and QC samples and do not include True Blanks or laboratory negative and positive controls.

Appendix L

Spatial Analysis Methodology

Spatial Analysis Methodology

One of the noticeable characteristics of the data was that within a test event, some combinations of method and object appeared to be dramatically different in their magnitude of CFUs/cm^2. This appears to create a large amount of variability when using geostatistical methods on the raw values. Furthermore, a few extremely high values tend to have a large influence on geostatistical maps. To produce maps with clearer gradients, a process was performed where similar method and object combinations were put into strata, and the raw values within a stratum were assigned their distribution percentiles.

Inspection of method, object, texture, and orientation combinations led to the following nine strata. Samples within a strata tend to have distribution of CFUs/cm^2 within an individual test event. For different Object and Method combinations within the same strata, this implies the mean CFUs/cm^2 and standard deviations were somewhat similar, and also made some logical sense.

1. **Floor Sponge Stick** - Sponge stick samples taken on the floor.
2. **Floor Vacuum** - Vacuum samples taken on the floor.
3. **Ceiling Sponge Stick** - Sponge stick samples taken on the ceiling.
4. **Ceiling Vacuum** - Vacuum samples taken on the ceiling.
5. **Non-Metal Desk/Workbench Sponge Stick** - Sponge stick samples taken on a desk or workbench, non-metal surface, facing up.
6. **Non-Metal Table/Shelves/Countertop/Nightstand Sponge Stick** - Sponge stick samples taken on a table, shelves, countertop, or nightstand, non-metal surface, facing up.
7. **Metal Sponge Stick** - Sponge stick samples taken on a metal surface facing up.
8. **Furniture Vacuum** - Vacuum samples taken on furniture facing up.
9. **Wall Vacuum** - Vacuum samples taken on a wall, inclined surface.

Some samples were removed from this analysis because of small sample sizes that didn't allow them to be properly compared to other method and object combinations. For instance, there were very few swab samples taken on an individual test event on an individual floor. Samples taken on vents and monitors were other samples not included in this analysis.

Within an individual stratum, the raw CFUs/cm^2 values are ranked, and the ranks are converted to percentiles. For example, if there were 10 samples ranked highest to lowest, they would be assigned the percentiles 0.95, 0.85, 0.75, 0.65, 0.55, 0.45, 0.35, 0.25, 0.15, 0.05, which are the centers of 10 intervals of 10 percent each. All samples were then put into VSP with their stratum percentile as the response variable.

This nonparametric approach produced geostatistical maps that appear to have some degree of gradients.

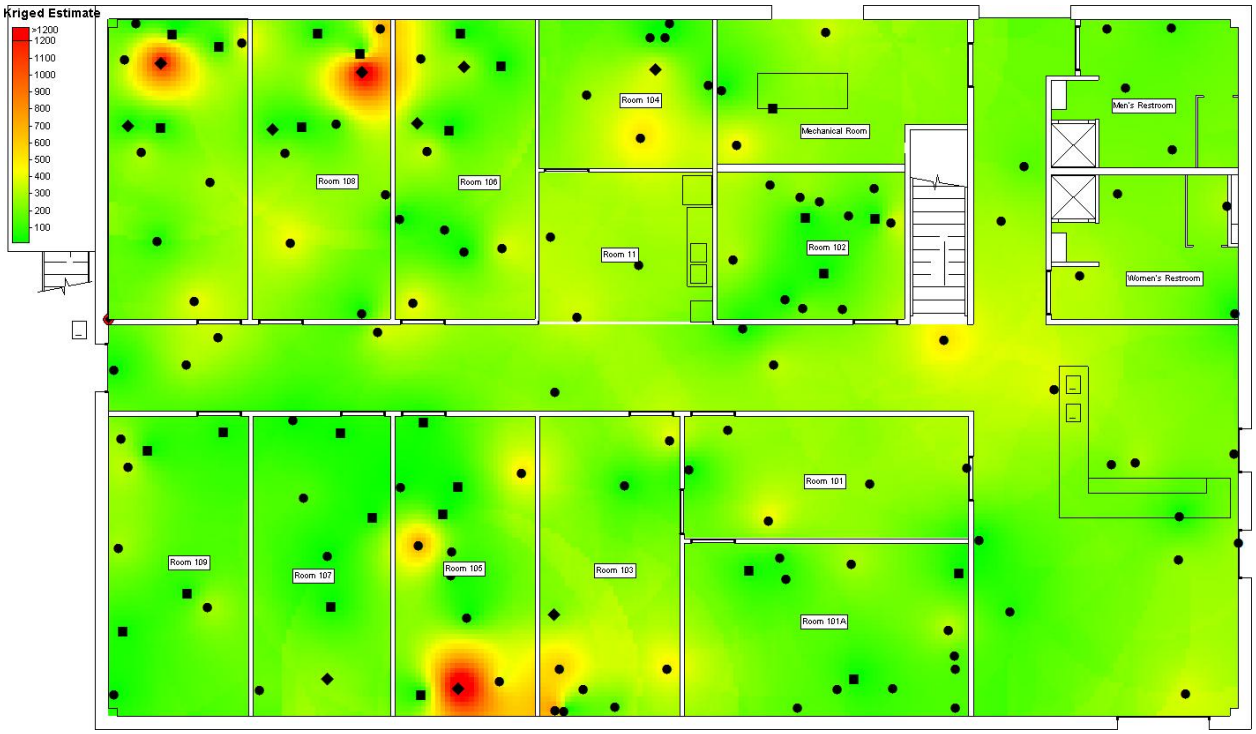


Figure L.1. Kriged Estimates of the Contamination on the First Floor Prior to the pH-Adjusted Bleach Decontamination (square = vacuum, diamond = swab, circle = sponge stick).

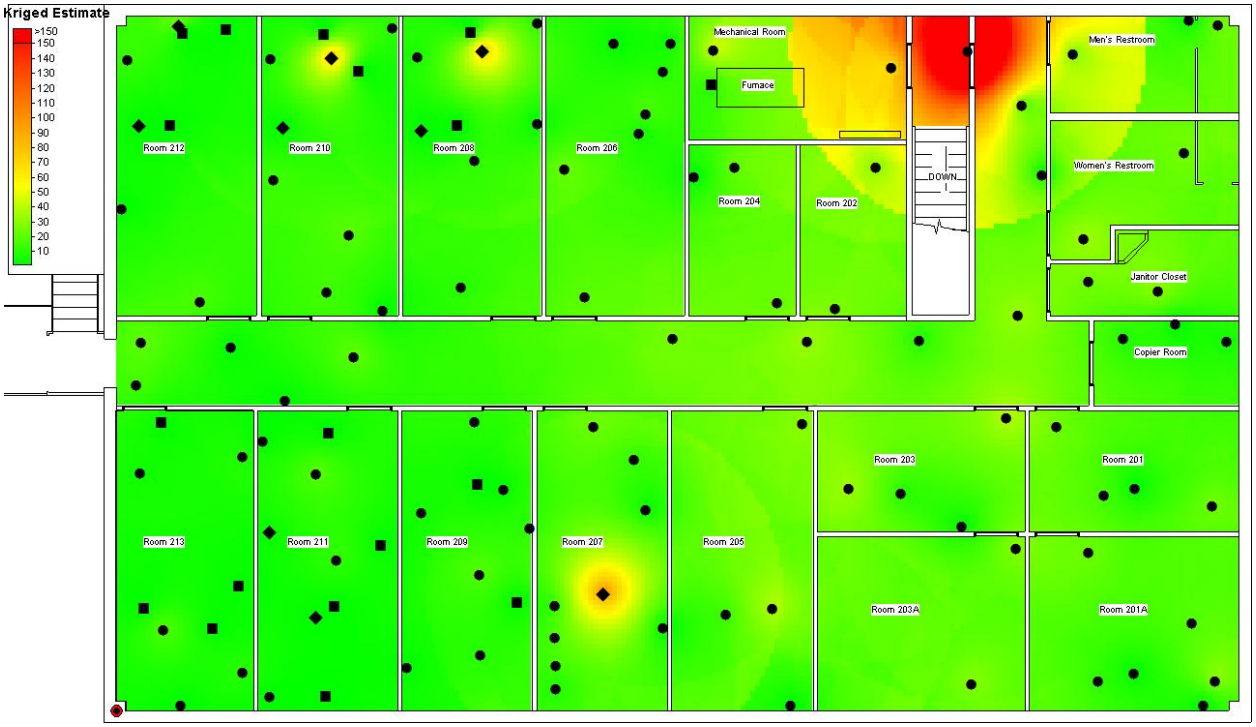


Figure L.2. Kriged Estimates of the Contamination on the Second Floor Prior to the pH-Adjusted Bleach Decontamination (square = vacuum, diamond = swab, circle = sponge stick).

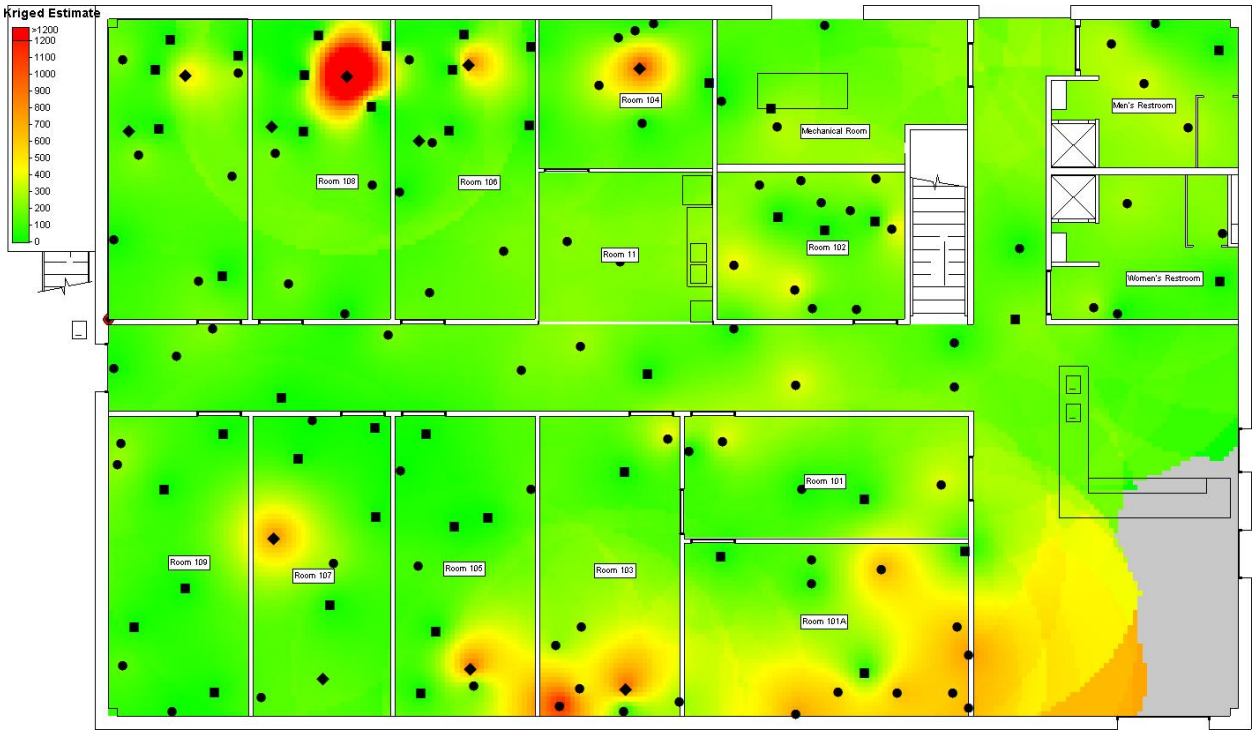


Figure L.3. Kriged Estimates of the Contamination on the First Floor Prior to the ClO_2 Decontamination (square = vacuum, diamond = swab, circle = sponge stick).

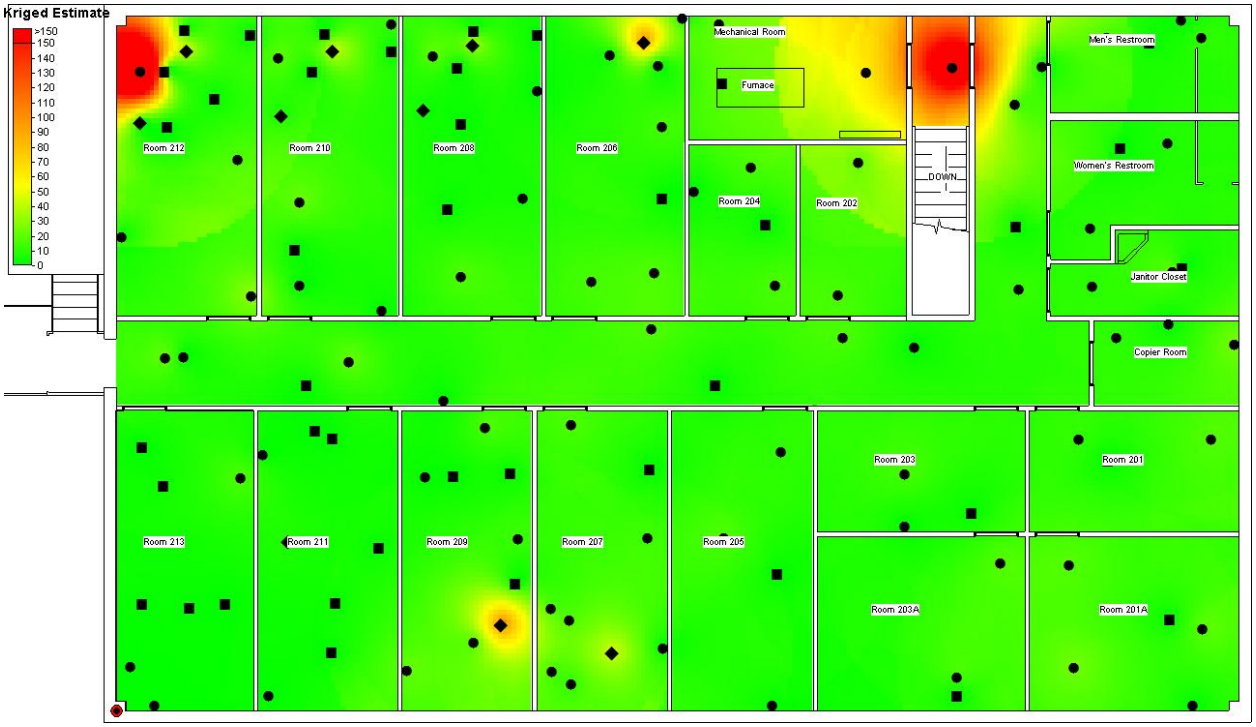


Figure L.4. Kriged Estimates of the Contamination on the Second Floor Prior to the ClO_2 Decontamination (square = vacuum, diamond = swab, circle = sponge stick).

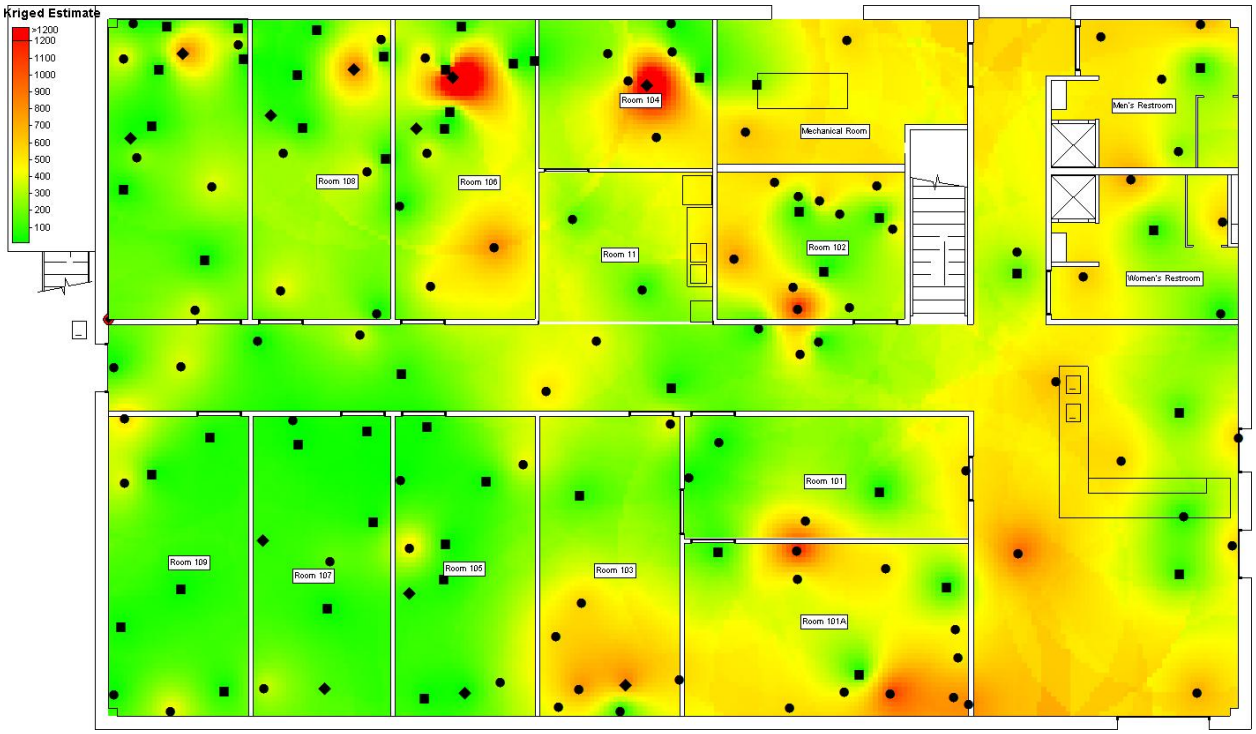


Figure L.5. Kriged Estimates of the Contamination on the First Floor Prior to the VHP Decontamination (square = vacuum, diamond = swab, circle = sponge stick).

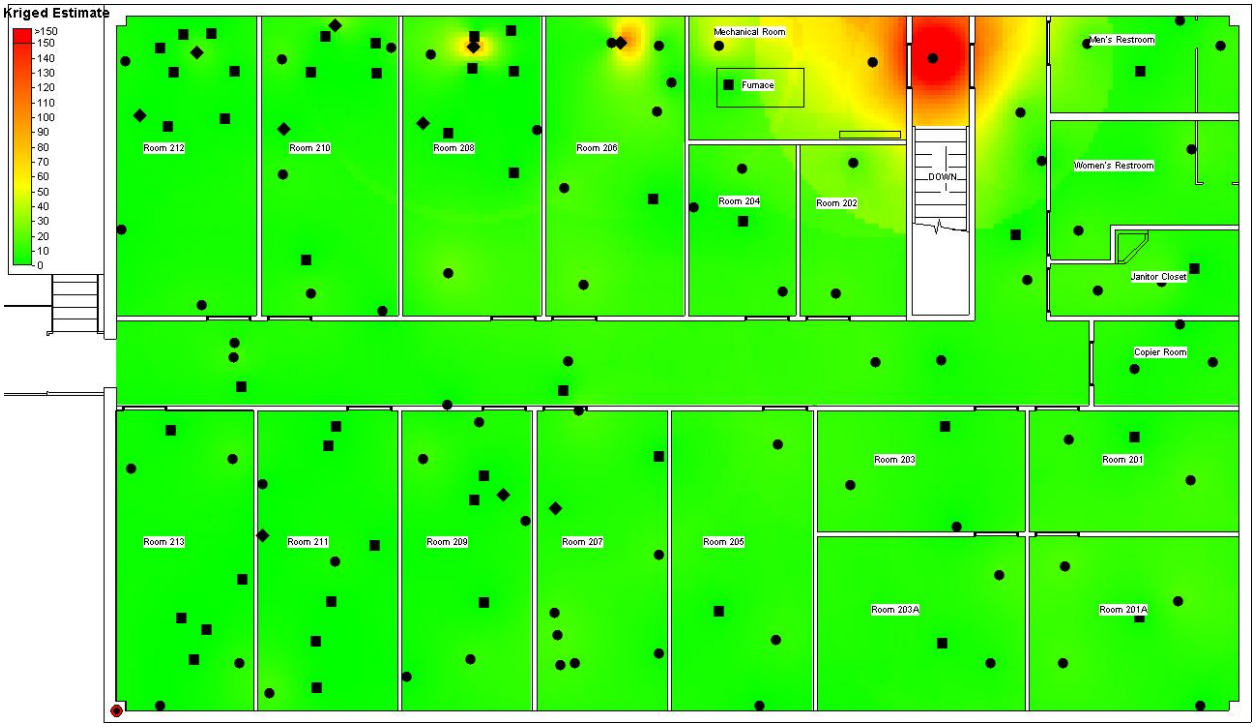


Figure L.6. Kriged Estimates of the Contamination on the Second Floor Prior to the VHP Decontamination (square = vacuum, diamond = swab, circle = sponge stick).

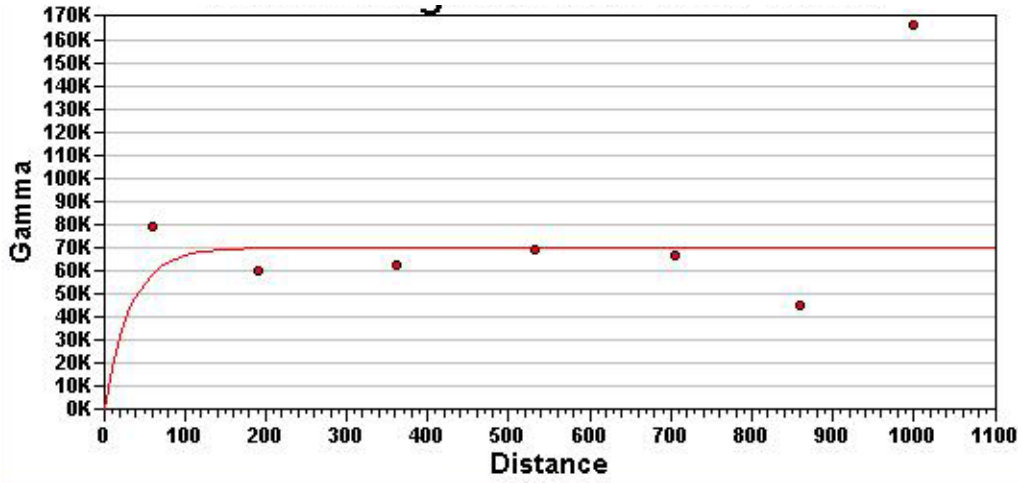


Figure L.7. Variogram for the First Floor Contamination Prior to the pH-Adjusted Bleach Decontamination.

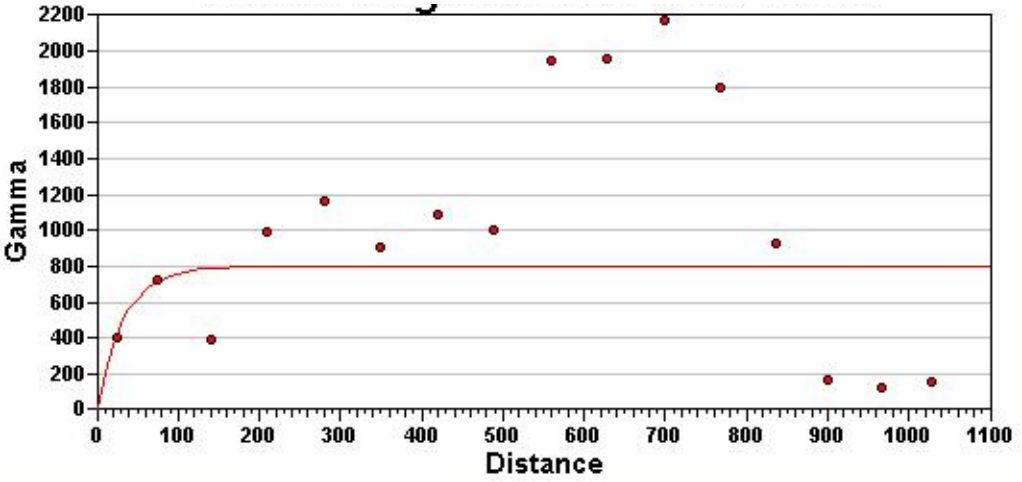


Figure L.8. Variogram for the Second Floor Contamination Prior to the pH-Adjusted Bleach Decontamination.

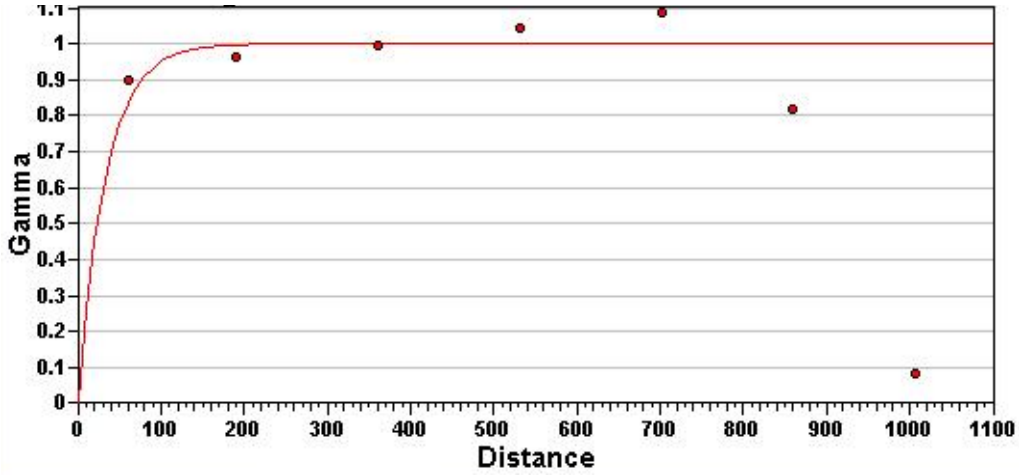


Figure L.9. Variogram for the First Floor Contamination Prior to the ClO_2 Decontamination.

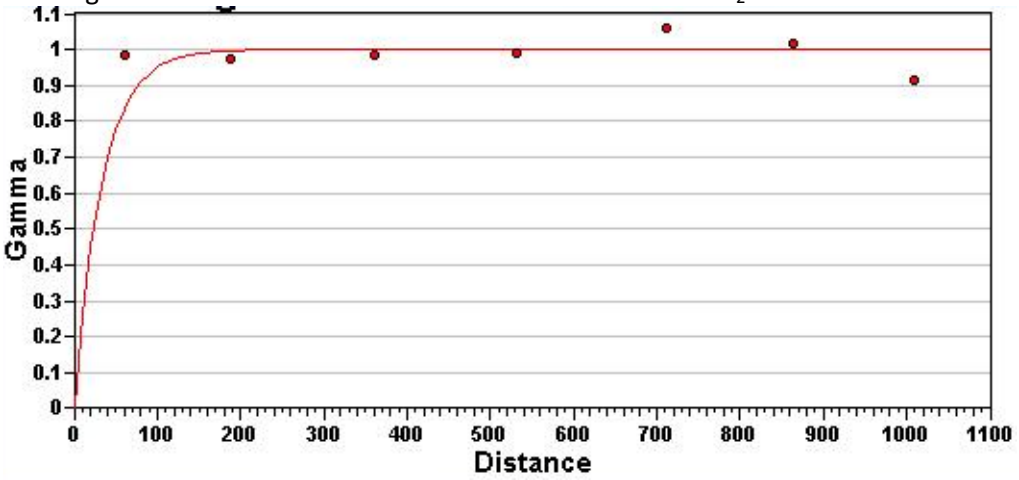


Figure L.10. Variogram for the Second Floor Contamination Prior to the ClO_2 Decontamination.

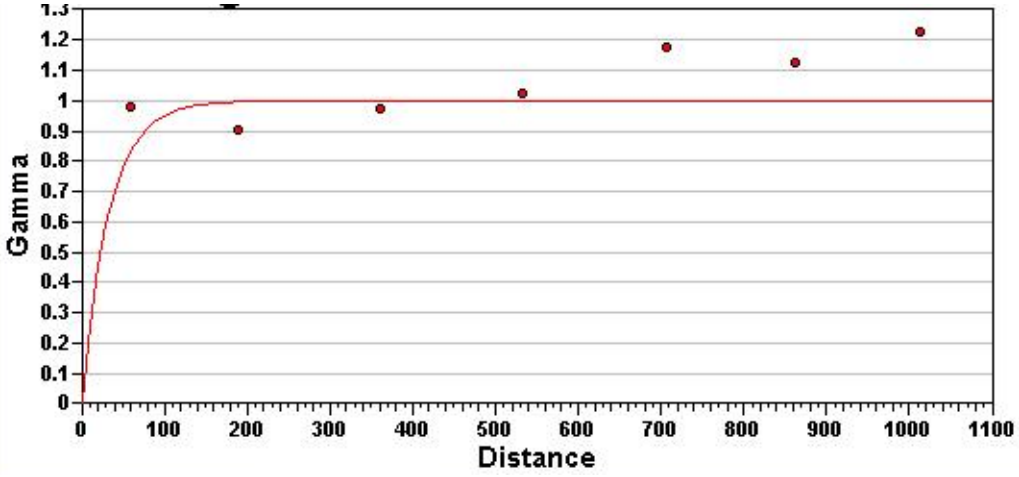


Figure L.11. Variogram for the First Floor Contamination Prior to the VHP Decontamination.

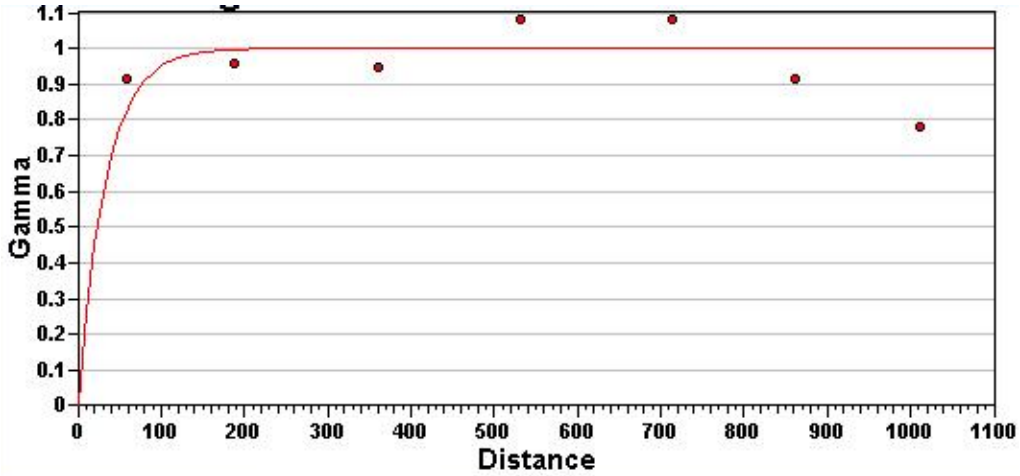


Figure L.12. Variogram for the Second Floor Contamination Prior to the VHP Decontamination.

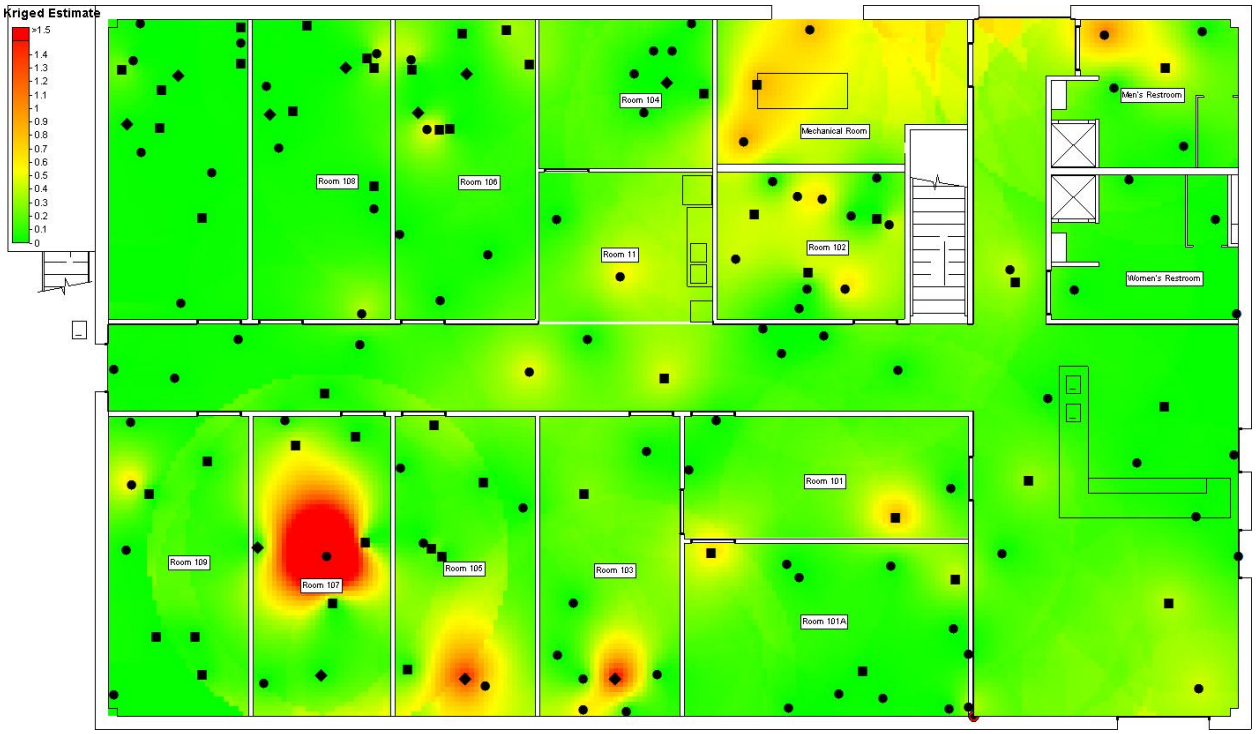


Figure L.13. Kriged Estimates of the Contamination on the First Floor after the VHP Decontamination (square = vacuum, diamond = swab, circle = sponge stick).

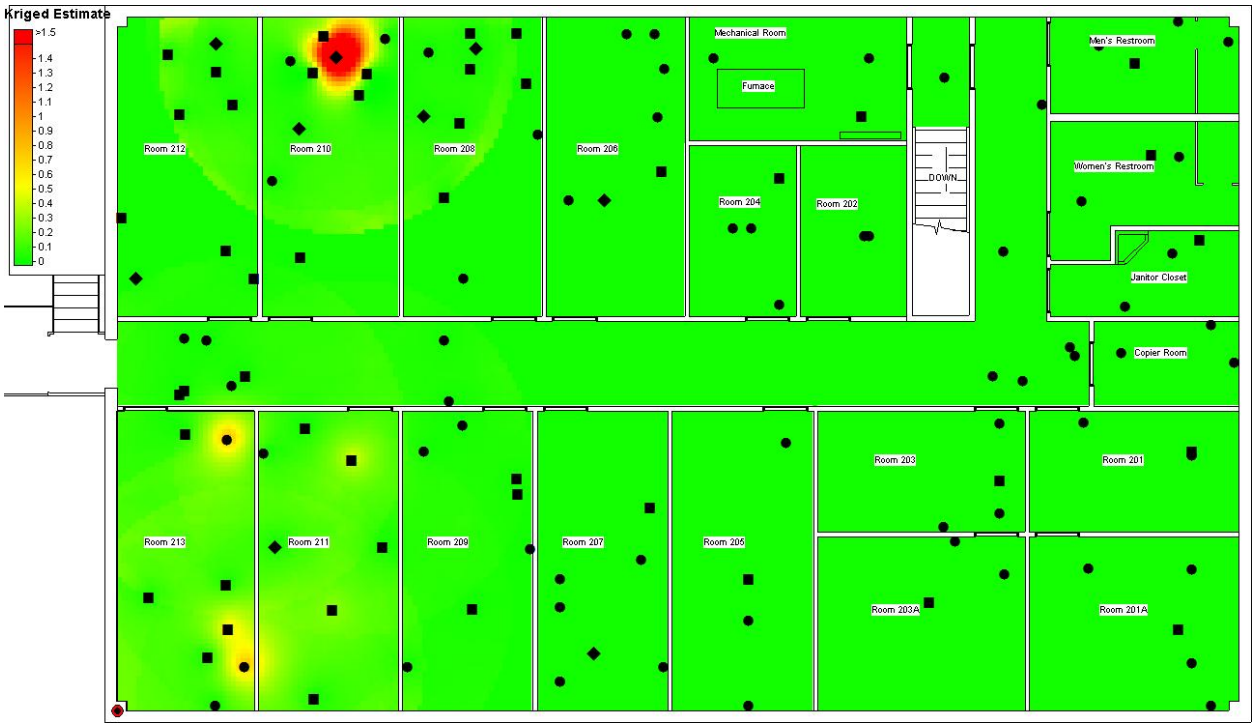


Figure L.14. Kriged Estimates of the Contamination on the Second Floor after the VHP Decontamination (square = vacuum, diamond = swab, circle = sponge stick).

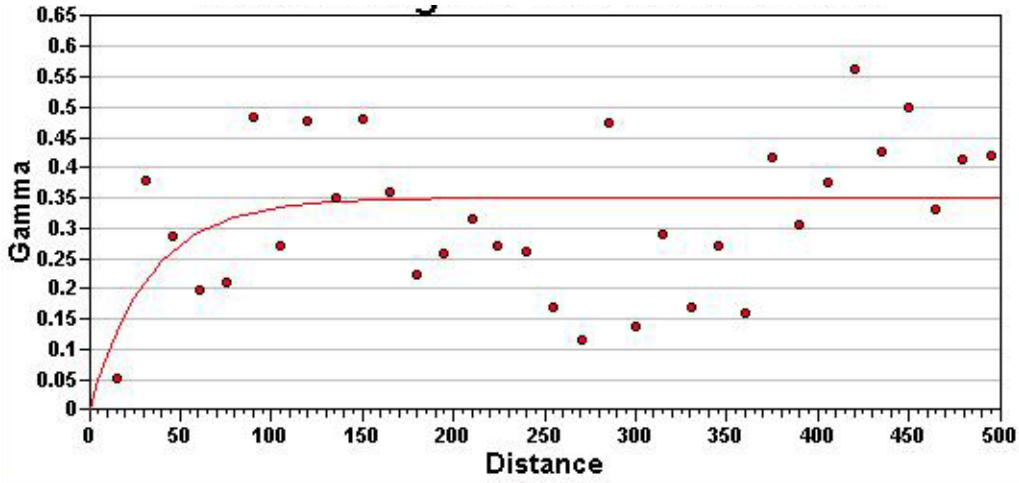


Figure L.15. Variogram for the First Floor Contamination after the VHP Decontamination.

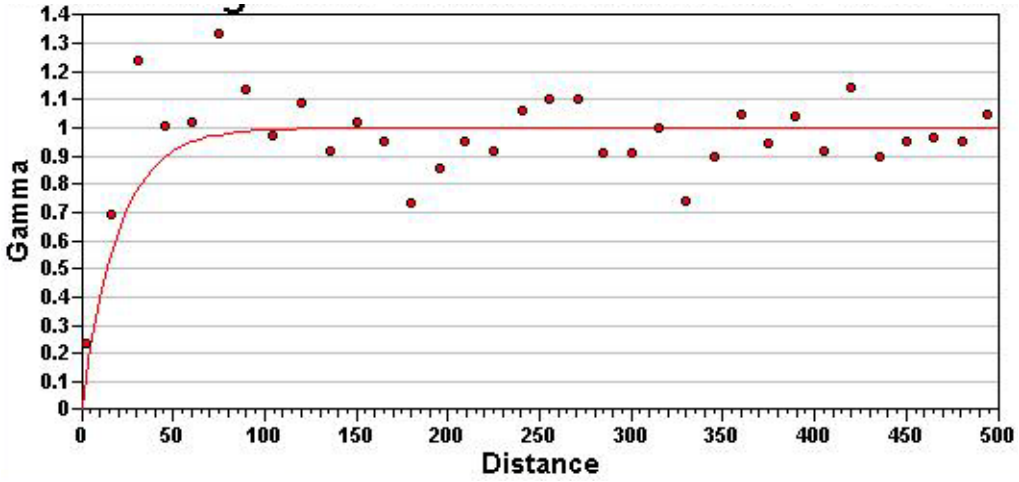


Figure L.16. Variogram for the Second Floor Contamination after the VHP Decontamination.

Appendix M

The iPad as an Electronic Laboratory Notebook

Introduction

EPA/ORD/NHSRC participated in a multi-agency test program and exercise called the Bio-Response Operational Testing and Evaluation (BOTE) program. The BOTE project is an interagency project to conduct and evaluate field-level facility biological remediation activities of various decontamination technologies directed at *Bacillus anthracis* (anthrax) over 2 distinct phases: Phase 1, a field study to evaluate the effectiveness of several different decontamination technologies; and Phase 2, a multi-agency exercise to address interagency roles and responsibilities for an anthrax response in a field setting. The BOTE testing occurred at a facility located on-site at the Idaho National Laboratory (INL) (see Figure 1). The BOTE project used the surrogate biological warfare agent (BWA) organism *Bacillus atrophaeus* instead of *Bacillus anthracis*, although most safety protocols, measures to prevent cross-contamination, and personal protective equipment (PPE) requirements were performed as if the real organism were present.

Figure 1. BOTE Test Facility (with and without tent)

The BOTE project included a detailed cost analysis. In order to perform this cost analysis, many parameters associated with the testing activities (e.g., sampling, decontamination, waste management) needed to be observed and logged as they were happening. In particular, there was an observer inside the test facility during sampling and some of the decontamination operations to track the level of effort to perform some of the sampling and decontamination activities. This observer needed to be suited up in "Level C" PPE consisting of a Tyvek suit, gloves, booties, and a full-face respirator. Since this observer would be making observations about complex activities it would be necessary for this person to have a laboratory notebook with which to record their observations. However, due to the fact that the observer would be wearing PPE and passing through a personnel decontamination line that included a wash with soapy water and bleach as they left the facility after their tasks were complete, a conventional paper laboratory notebook would not be feasible. A data logging solution was needed that had the following requirements:

- Ability to create custom forms for data entry
- Ability to withstand passing through the personnel decontamination line with soapy water and/or bleach
- Ability to operate inside Ziploc bags for extended periods of time

- Ability to wirelessly transmit data to a server so that in the event the Ziploc bags fail during decontamination, and the device was destroyed, no data would be lost
- Ability to operate for a minimum of 8 Hours on battery charge

The following hardware options were explored:

- Tablet PC
- PDA
- Apple iPad (1st generation)

The Tablet PC was an attractive option because: 1) it could operate Windows XP and be able to follow at least to a certain extent the ORD standard configurations for computer hardware; 2) custom forms and applications could be created using various application frameworks such as LabVIEW; 3) Tablet PCs could transmit data wirelessly to a remote server; and 4) Tablet PCs have large screens which would make visibility good for the user in PPE.

Unfortunately all the Tablet PCs that were evaluated had cooling fans inside the housing. This would make them not operable for extended periods of time inside a Ziploc bag. For this reason the Tablet PC was rejected for our application.

PDAs that use Windows CE, PalmOS, or other handheld operating systems were promising in that: 1) they could operate inside a Ziploc bag for extended periods of time; and 2) they could easily transmit data over a wireless network.

Unfortunately, PDAs have small LCD screens on the order of 3 inches square. This is less than optimal for the user in PPE both from a visibility standpoint, and from an ability to easily enter free-form text. PDAs are not approved configurations for use inside the EPA network, which could cause problems from an approval standpoint. For this reason, PDAs were selected as a second choice for our application.

The Apple iPad was evaluated as an option as well. Advantages the iPad has include: 1) a relatively large backlit screen; 2) it can easily transmit data over a wireless network, including over the newer 5G protocol; 3) a native spreadsheet app called “Numbers” that allows the creation of custom forms and can import and export Excel files; 4) a touch pad that can operate inside Ziploc bags with a stylus; 5) long battery life – up to 10 hours; and 6) the absence of an internal fan – the iPad can maintain manufacturer’s recommended operating temperatures even while bagged up for long hours.

The main disadvantages of the iPad involve the unsupported nature of the hardware in that iPads are not approved for use on EPA networks (the same problem as the PDAs). For this reason, the wireless network exchange capabilities were not tested until we arrived at the test site.

The iPad was our first choice for our application.

Configuration

The configuration that was settled on for the device was the 32 GB Wi-Fi only model since it was not necessary to maintain wireless network capability away from the test site, plus there are inherent bureaucratic difficulties associated with signing up for a fee-based subscription service. Figure 2 depicts the unit (iPad 1st generation) that was purchased. The "Numbers" spreadsheet app was installed on the iPad.

Figure 2. Apple iPad

Purchasing the iPad

The iPad retailed at $599 in the desired configuration. It took several months of wrangling with OSIM to get the approval to purchase the device, even with a strong justification. It was purchased with the Government Bankcard. Additional accessories that were purchased included: 1) a case/cover; 2) an additional AC adapter/charger; 3) an SD card reader; and 4) an external keyboard.

Custom Forms for Data Entry

The Numbers spreadsheet app can read and write its own proprietary file format as well as being able to output a PDF file or import/export MS Excel 2003 (xls) worksheets. Tabbed worksheets on both Numbers and Excel are interchangeable. Numbers has some additional functionality that is particularly useful in the iPad environment. First, there are some additional data types including a "stars" data type that can be used to semi-quantitatively characterize numbers using a 1 through 5 stars scale. Second, by applying a title to a table of spreadsheet cells imported from an Excel worksheet or created from scratch in Numbers, a limited ability to easily develop custom forms is activated, where each row in the spreadsheet is given a custom form tab within Numbers for entering data in that row, based on the column headings in the titled table of cells on the first page. As additional instances of the form are created, additional rows are created in the spreadsheet and populated with data from the forms as the user inputs it. Figure 3 shows a Numbers spreadsheet and associated custom forms that are created from that spreadsheet.

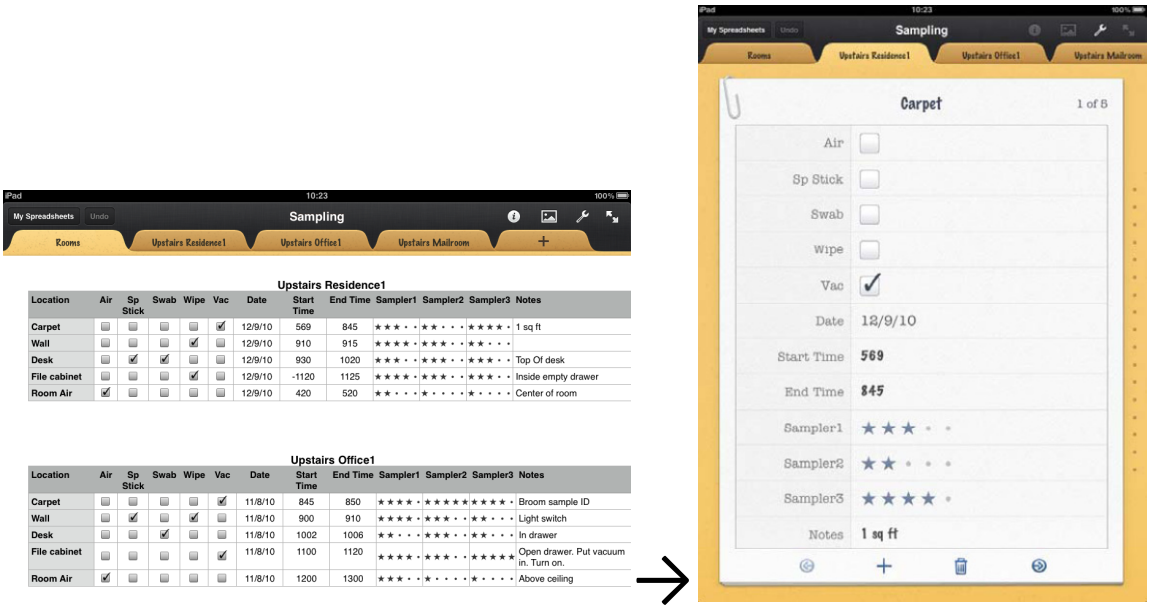


Figure 3. Custom Forms in Numbers Spreadsheet

Ability to Operate Inside Ziploc Bags.

The iPad fits inside a large capacity Ziploc bag. The unit was then double bagged and sealed. A handle was rigged up using duct tape. A stylus was used to enter data on the iPad through the Ziploc bags. The unit operated acceptably by a PPE-clad user.

The double bagging process enabled the iPad to successfully endure an indefinite number of decontamination operations, using a combination of bleach/vinegar and soapy water without getting wet and/or failing.

Transferring Files

The iPad has several ways to transfer files back and forth from a user's office computer. Files can be transferred from the iPad using a direct cable (a USB variant) hookup to a PC or Mac running iTunes or wirelessly over a network via email, Apple's iCloud service, or a "WebDAV" server running on a Mac or PC. On a PC running Windows, WebDAV is a variation of Windows File Sharing that allows the HTTP protocol to be used to access remote servers. It is built into Windows 7.

A WebDAV server was set up on an onsite PC running Windows 7 to receive data from various sources, including the iPad. Once the data were entered into the iPad, the user clicks on the "My Spreadsheets" button in the upper left corner of the screen (see Figure 4). This will yield the list of available spreadsheet data files on the iPad. Using gestures the user brings the spreadsheet that is desired to be transferred (in this case, the file "Sampling copy") to the center of the display. Clicking on the icon at the bottom-left of the screen brings up a selection list for export options (see Figure 5). Selecting "Copy to WebDAV" yields the screen in Figure 6. Selecting the appropriate file format and using standard file management dialog boxes (see Figure 7) allows the user to select the desired destination directory on

the WebDAV server. The ability for the iPad to access 5G wireless networks was particularly useful for the BOTE tests because there was an unusually large amount of Wi-Fi activity at the site, which resulted in the normal Wi-Fi connectivity intermittently dropping out, whereas the 5G connectivity was much less prone to interference.

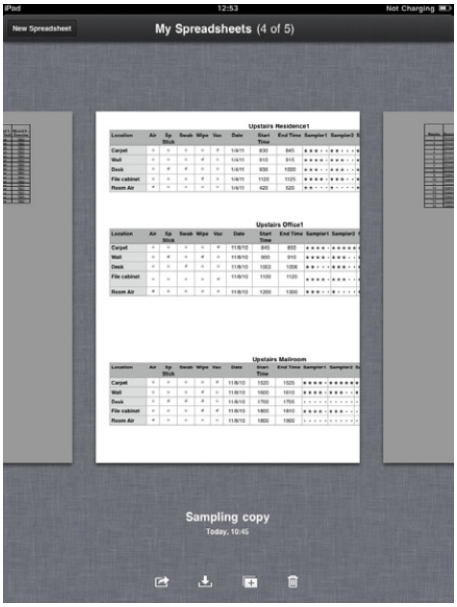


Figure 4. iPad File Selection Screen

Figure 5. iPad File Transfer Selection Menu

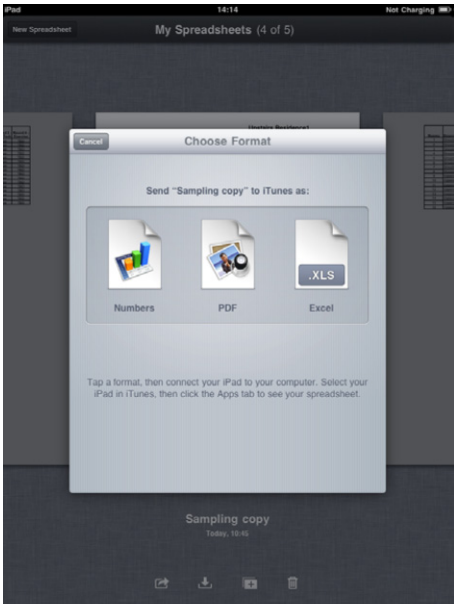


Figure 6. iPad Export File Format Option Screen

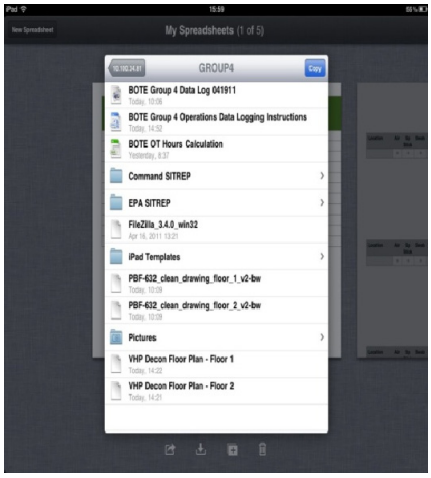


Figure 7. iPad File Management Dialog Box

Use as Lab Notebook Outdoors

The original plan was to use a conventional laboratory notebook to log data from outdoor sources, such as the waste disposal processing, sampling and decontamination team preparation, radio traffic reporting team locations and activities, and the personnel decontamination line. However, high winds on the site made use of the conventional laboratory notebook very difficult outside. Therefore the data entry Excel worksheets that were initially used to transcribe the lab notebook results into electronic form were imported to the iPad and data entry was done directly on the iPad using the Numbers application.

Adaptability to Situational Needs

As the testing was going on there was a need to overlay some notes over building floor plans, to denote the locations of certain items inside the rooms. These notes needed to be made while inside the contaminated facility and brought outside. The necessity for PPE made it impossible to use paper to record these notes. The building floor plans were loaded onto the iPad as jpg files and a freeware application called "DrawFree" was downloaded from the iPad App Store. DrawFree allows the user to make free form doodles on an imported background image. The building floor plans were emailed to me and EPA WebMail was accessed through the Safari web browser on the iPad and the floor plans were saved to the iPad's photo storage memory. DrawFree imported the floor plans as background images from the iPad's photo storage. We color coded the notes for different types of items that were placed in different rooms, and Figure 8 is an example of the output. In spite of limitations in the fineness of the input due to the size of the stylus tip, the locations for fans (F), biological indicators (B), sensors for H_2O_2 (S), and aerators (A) can be clearly identified.

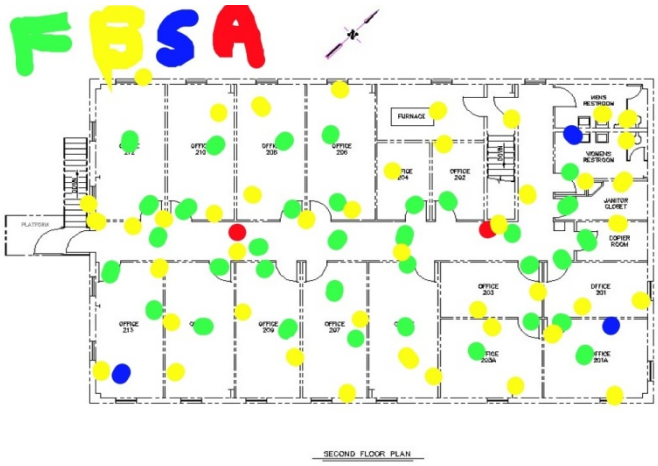


Figure 8. Example Output from DrawFree

Problems

The iPad problems that occurred were minor and workarounds were developed. The iPads were not immune to the ongoing Wi-Fi problems that were occurring at the site. These problems were corrected usually by either rebooting the iPads or rebooting the routers. Data entry into Numbers sometimes resulted in spreadsheet cells with the wrong format (e.g., a text format instead of a number format or a number format instead of a date or time format). These data type issues were easily correctable once the data were imported into Excel. Occasionally linefeed characters were found after the last character or number in some cells when Numbers spreadsheets were imported into Excel. These were easily deleted.

Conclusions

Special requirements from a high visibility field test that the EPA participated in necessitated the use of innovative data logging techniques. After evaluating several potential options, Apple iPads were used as electronic laboratory notebooks to log data both inside a building while the observer was wearing PPE,

and outside the building during periods of high winds. The battery life was very good, with the iPads' batteries lasting through long work days. The lack of a convection fan enabled the iPad to operate inside Ziploc bags and thus endure decontamination operations without damage. The "Numbers" spreadsheet easily exchanged data with MS Excel and also provided functionality to create custom data forms. Wireless networking capability and flexible file exchange capabilities simplified subsequent data archival and analysis. The iPads were very successful hardware solution for these tasks and may have good potential for routine use by ORD for certain situations.

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