# CMAT Key Projects

April 24, 2014

# Topics

- Underground Transportation Restoration Project
- CMAT and NHSRC Efforts
- Rad Responder App development
- Trans Atlantic Collaborative Restoration Demonstration

# Target: Subways

- CBRNe attacks
- Impact large number of people
  - Loss of life
  - Economic , social, and political impact
- Piston effect of system to spread contamination
- OEM and NHSRC: focus on response and remediation to anthrax contamination
  - Most difficult to remediate (may go undetected for days, requires rigorous decontamination and sampling to clear)

# Subway Contamination History

- In 1966, the Army conducted  5 dissemination tests of biological agent simulant in the NY subway system.  Agent was dissemination by releasing small amounts of simulant through sidewalk ventilation grates and by dropping simulant-filled light bulbs onto the tracks from moving trains on routes (Lexington Ave., 7th Ave., and 8th Ave)

- Measurements were taken on station platforms and on moving trains for approximately two hours

- Simulant was detected at high levels on trains passing through the contaminated area and on some distance from the release points (Bleeker to 59th Street on the Lexington Ave. line, for example)

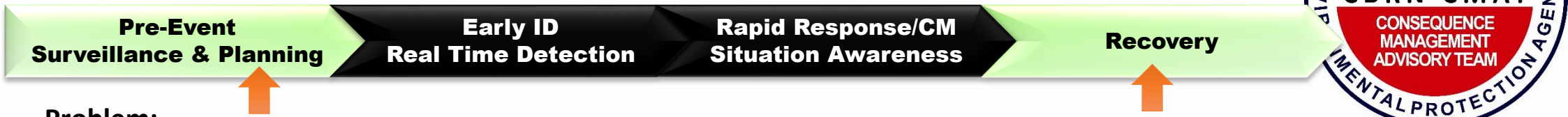
- More recent computer modeling also suggests that biological contamination can spread widely due to train and passenger movement within the subway, and also outside the system, carried by exhaust air and contaminated persons

# Remediation and Reopening Involves a Number of Actions and Decisions

- Measurements to support estimation of contaminated area, rolling stock, and equipment
- Decontamination activities to reduce the concentration of organisms on surfaces and in the air
- Measurements to support estimation that the decontamination activities have lowered the risk of exposure to subway employees and the public after subway reopening to “acceptable” levels
  - Exposure can occur from pick up and transfer of agent from deposited contamination and from resuspension of agent due to subway operations

- Other factors will enter into the reopening decision calculus
  - The social disruption arising from the cessation of subway operations
  - Economic losses
  - Public concern regarding residual hazard
  - Political influences

# Subway recovery challenges

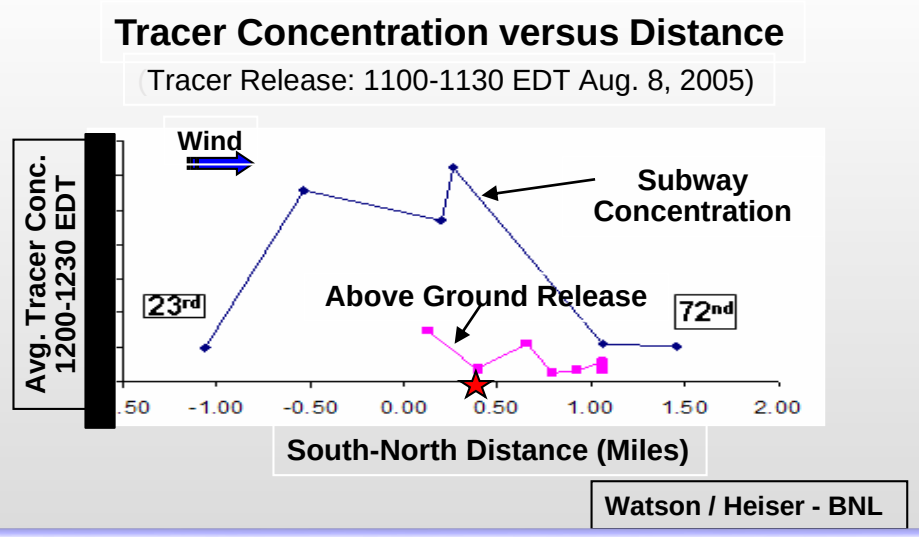



**Problem**:

Subway systems not prepared to quickly remediate and re-open after bioterrorism event

- Loss of billions of dollars to city and businesses (*Super-storm Sandy - $125M – 3 days*)
- Logistical nightmare for commuters (*NYC > 5 mil riders per weekday*)
- Above-ground release can also contaminate system

**"Urban Dispersion Program"**




**Subway contamination presents challenges (e. g., bio-load, grime, metal particulates, airflows, materials) unlike a 'clean', indoor environment**

# Subway Remediation and Restoration

## Plans and communication

- Policy and doctrine issuances
- Strategies for characterization, clearance, decontamination
- Procedure manuals
- Agent data
- Maps and blueprints
- Hazardous waste procedures, permits, waivers
- Signage templates
- Public relations templates
- Chain of custody templates
- Rolodex of stakeholders, experts, federal, state, local agencies, vendors, public health
- Message control

## Remediation operations and decisions (CONFIDENCE)

- Estimation of contaminated area
- Level of effort, area, and time for decontamination
- Decontamination procedures
- Level of effort, area, confidence, and time for clearance
- Health risk assessment
- Economic impacts of closure
- Social impacts of closures
- Epidemiological information for hazard assessments
- Cost estimation
- Reopening criteria

## Activities to gather evidence and control environment (LEVEL OF EFFORT)

- Set up and operate incident command, create common operating picture
- Hazard characterization of rolling stock, infrastructure, sensitive equipment
- Decontamination
- Disposal of hazardous waste
- Clearance of rolling stock, infrastructure, sensitive equipment
- Expedient air control
- Test runs and re-clearance

## Equipment, materials and infrastructure (SCALABLE AND CONSTRAINED RESOURCES)

- Sampling equipment
- Sample transport cases
- Analysis equipment
- Environmental detectors
- Expedient air handling equipment
- Specialized remediation rolling stock
- Rolling stock decontamination equipment
- Infrastructure decontamination equipment
- Sensitive equipment decontamination equipment
- Information handling and communication equipment
- Power generation
- Spares and replacements
- Consumables
  - Reagents
  - Decontaminants
  - Expendable “Shop” and laboratory materials
- Hazardous waste containment and related materials

# EPA and DHS Partnership: UTR Project

- $13.5 million FY14-16
- EPA leads field tests, exercises, trainings
  - Evaluate decon technologies
  - Work with various subway systems  (isolate portions of tunnel and station)
- EPA lead development of operational guidance and CONOPS
  - Exercise guidance in subways to field truth
  - ***all efforts include OEM, NHSRC and OSCs

# EPA knows how to ‘decon’ an office building, NOT a subway

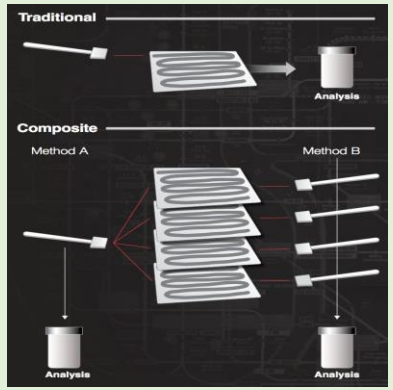
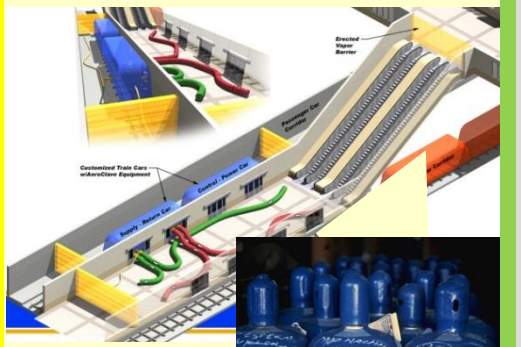
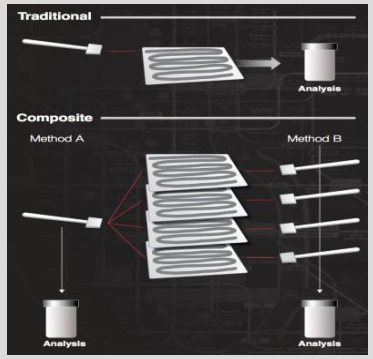
**<u>Gap</u>: Translate what we know from a ‘clean’ building to a ‘dirty’ complex environment**


Project Objectives:

- Deliver first comprehensive Federal Operational Guidance to decrease time to return a subway system to service following a biological agent event
- Field-test decontamination technologies and isolation techniques
- Reduce burden on laboratory network performing sample analysis
- Earlier start of decontamination phase

<u>Faster re-opening</u>

# Faster Recovery requires a systems approach

| Phases of Recovery | Characterization | Decontamination | Clearance |
|---|---|---|---|
| ▪ Leverage & extend prior technology investments<br>▪ Advance new decision support tools to operationally-ready posture<br>▪ Collaborate with interagency partners<br>▪ Field-test current decon technologies and promising new options |  <br>  |  <br>  <br><br>  <br>  |  <br>  |
| Recovery Strategy | Faster mapping | Field-test technologies for operational utility | Reduce lab analysis bottleneck |

# EPA Proposed and Ongoing Projects

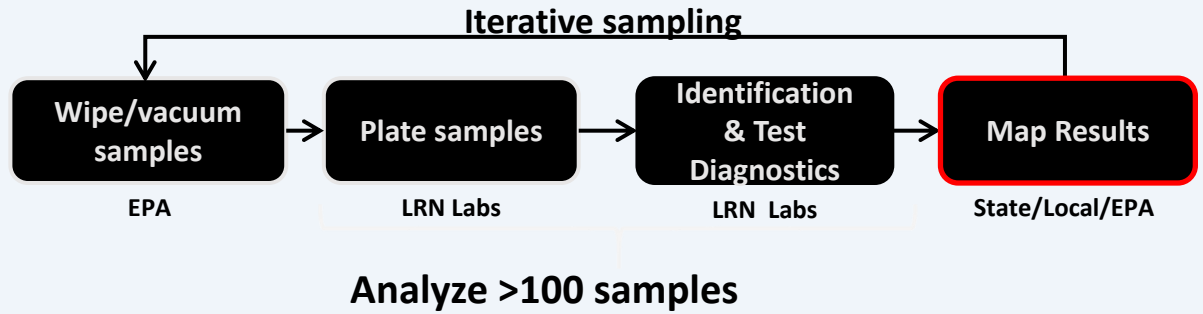
- Evaluation of Aggressive Air Sampling Method for Sampling of *Bacillus anthracis* Spores in Urban Subway System
- Evaluation of Fogging of Sporicidal Liquids for the Decontamination of Underground Transport System Relevant Materials
- Assessment of Chlorine Dioxide and Methyl Bromide Conditions as Effective Fumigants for Inactivation of Bacillus anthracis Surrogates on Realistic, Grimed, Subway System Surfaces
- Evaluation of Commercially-available Equipments for the Decontamination of *Bacillus anthracis* Spores in an Urban Subway System
- Operational Technology Demonstration for the Decontamination of Subway System Surfaces and Rolling Stock
- Examine decontamination of heavily soiled/grimed materials, such as subway materials; examine fumigation of actual subway tiles contaminated with spores and tiles covered with grimed materials prepared in the lab.
  - ***Other decon and material compatibility work continues, which will also inform subway decon.

# Efficiencies to Reduce Lab Burden

Characterization → Decontamination → Clearance → Long-term monitor

**Current Sampling and Laboratory Analysis – Iterative approach**

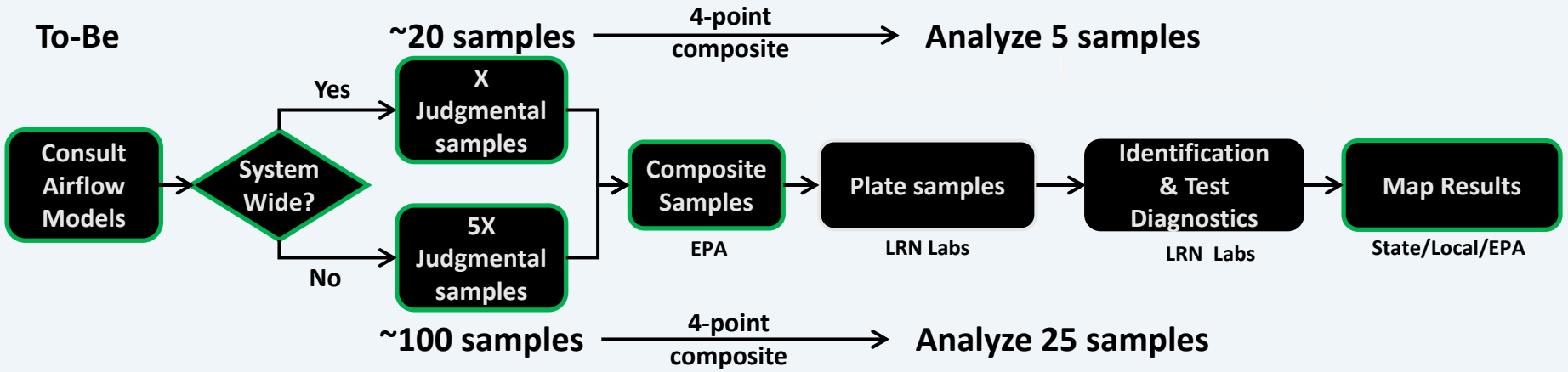
**As-Is**




**1-level station: 40 wipe + 20 vacuum**
**½ mi of tunnel: 32 wipe (at least)**
**1 rail car: 8 wipe + 1 vacuum**

**Targeted Composite Sampling Informed by Dispersion Modeling – Systematic approach**

**To-Be**



# Rapid-viability PCR can prioritize samples to culture and speed clearance (post-decon)

## RV-PCR Method

- 1 sample ➔ 1 filter cup ➔ 2 PCR analyses
- Confirmed results in ~14-16 hrs.

96 samples/incubator for 9 hours
*(24 samples/manifold;*
*4 manifolds/incubator rack)*

## Plating Method

- 1 sample ➔ 11 culture plates + culture tube ➔ presumptive *B. anthracis* colonies
  ➔ 2-5 PCR analyses/sample
- Confirmed results in ~ 48 − 72 hr

Serial dilution and plating
Enrichment culturing

Filtration and plating

>1000 plates/96 samples
~ 3 incubators for 18-24 hours

Homeland Security
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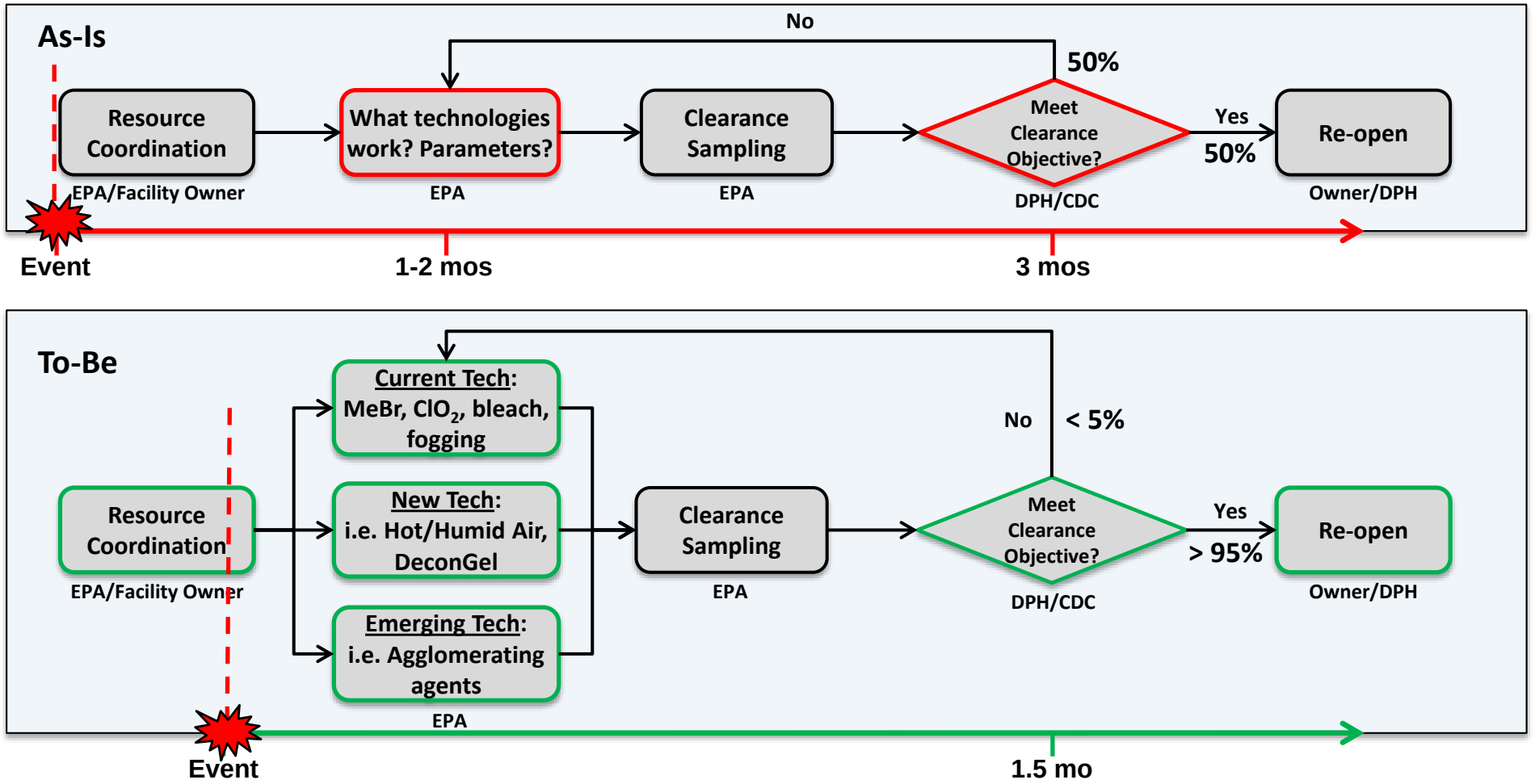
# Improved & Cost Effective Decon

Characterization → **Decontamination** → Clearance → Long-term monitor



# Leveraging EPA Bio-Decon Tests to inform planned subway system field tests



| Parameters | Operational Evaluation | Early Test Parameters |
|---|---|---|
| Methyl bromide concentration (mg/L) | 212 | 80 |
| Temperature (˚C) | 27 | 37 |
| Time of fumigation (hr) | 48 | 48 |
| Relative humidity (%) | ≥75 | Not controlled |

**Subway system field test with MeBr (planned late FY14 at customer site)**

# Risk Mitigation Strategies Examples

| Risk | Mitigation Strategy |
|---|---|
| Poor accuracy of dispersion models to predict extent of contamination | Extend outer boundary for targeted sampling |
| | |
| Inherent bio-load in system limits effectiveness of decon technologies | Pre-clean step to reduce bio-load |
| | |
| System cannot be sealed for fumigation | Develop isolation methods |
| | |
| Surface sampling method impractical in subway environment | Increased use of air sampling; enhanced capability for composite surface samples; |
| | |
| Contaminated subway car movement outside hot-zone not an option | Seal and decon cars in-place |
| | |
| RV-PCR sensitivity limited by bio-interferences in samples | Optimize sample clean-up protocols prior to analysis |

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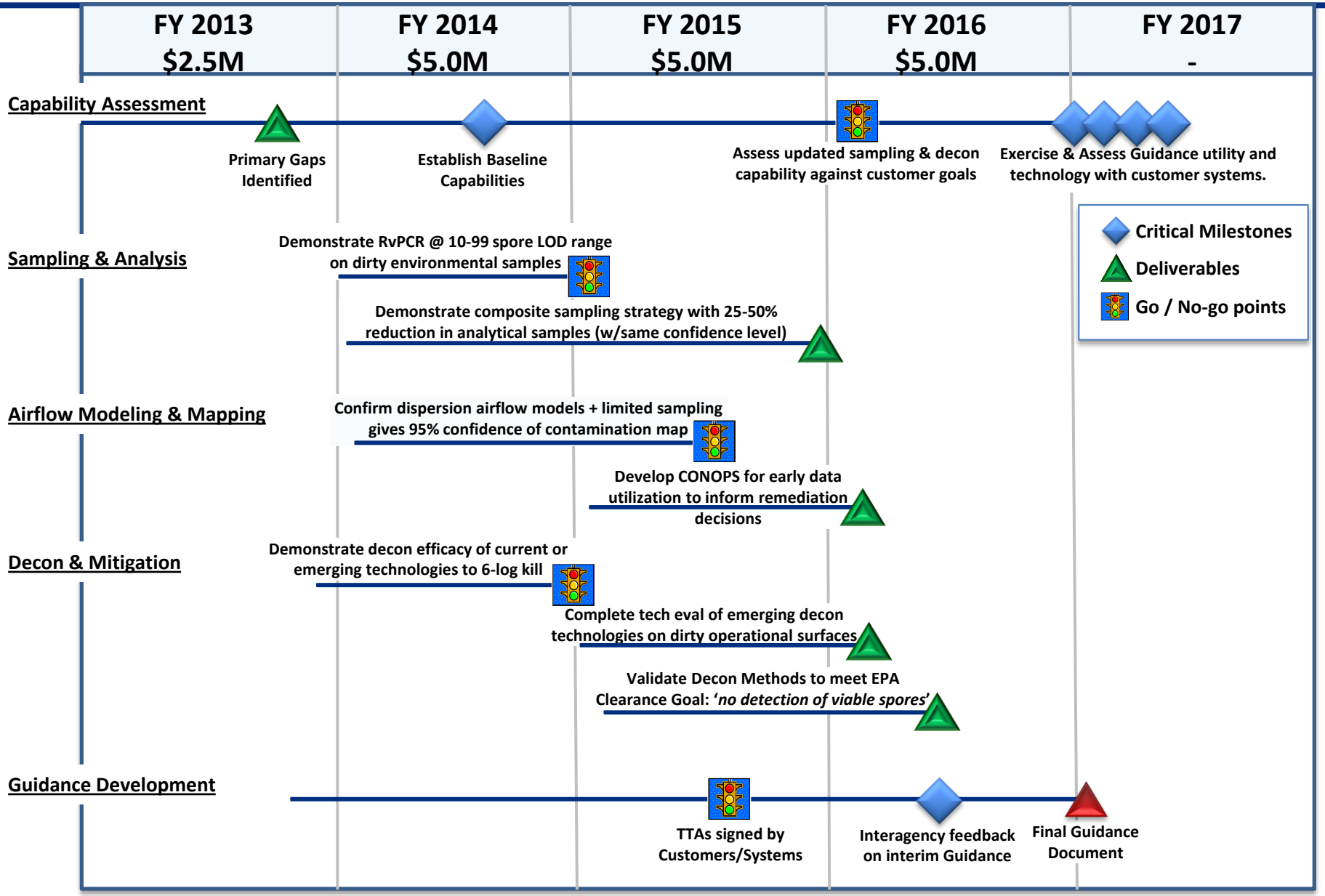
# Deliverables and Schedule



# Working Groups (DRAFT)

| Working Group | Objectives | Lead(s) | Members |
|---|---|---|---|
| Modeling/ Phenomenology/ Analysis | Transport Modeling, Phenomenology, Analysis, Release Tests | Dave Brown (ANL) – P | Meghan Peterson (SNL), Ben Ervin (LL), Christina Rudzinski (LL), Michael Dillon (LLNL), James Liljegren (ANL), Leroy Mickelsen (EPA), Tim Boe (EPA) |
| Sampling/Analysis | Sampling Methods, Plans, Analysis Methods, Data Visualization & Management | Bob Knowlton (SNL) - P<br>Marissa Mullins (EPA)<br>Sarah Taft (EPA) | Staci Kane (LLNL), Brent Pulsipher (PNNL), Brett Amidan (PNNL), Ellen Raber (LLNL), Sanjiv Shah (EPA), Worth Calfee (EPA), Sara Taft (EPA), Larry Kaelin (EPA) |
| Decon/Mitigation/ Waste | Decon & Mitigation, Waste Handling, Remediation Plans, | TBD<br>Shawn Ryan (EPA)<br>Mike Nalipinski (EPA) | Joe Hardesty (SNL), Patrick Burton (SNL), Mark Sutton (LLNL), Christina Rudzinski (LL), Leroy Mickelsen (EPA), Joe Wood (EPA), Worth Calfee (EPA), Shannon Serre (EPA), Paul Lemieux (EPA), Vipin Rastogi (ECBC), Lisa Smith (ECBC), Erica Canzler (EPA) |
| Systems Integration/ Guidance Development | Rapid Return to Service, Guidance Development, Remediation Options | Bob Fischer (LLNL) - P<br>Donna Edwards (SNL)<br>Erica Canzler (EPA) | Ellen Raber (LLNL), Mark Tucker (SNL), Lynn Yang (SNL), Bob Greenwalt (LLNL), Wilthea Hibbard (LLNL), Lessa Givens (EPA) |
| Stakeholder Interactions/ Logistics | Partnership Agreements, Facilitate Meetings, Releases, and Evaluations | Sav Mancieri (LLNL) - P | Steve Harris (LLNL), Christina Rudzinski (LL), Bob Fischer(LLNL), Marissa Mullins (EPA), Lessa Givens (EPA) |
| Operational Technology Demonstration | Conduct Technology Demonstrations & Evaluations for Sampling, Decon, Mitigation, Waste | Mike Nalipinski (EPA) - P<br>Shannon Serre (EPA) | Leroy Mickelsen (EPA), Larry Kaelin (EPA), Marissa Mullins (EPA), Worth Calfee (EPA), Shawn Ryan (EPA), Joe Wood (EPA), Paul Lemieux (EPA), Tonya Nichols (EPA), Alan Lindquist (EPA), Erica Canzler (EPA) |

P – Programmatic Lead

# Overarching Program Approach & Metrics

- Overarching System Capability Assessment – Institute for Defense Analyses (IDA)
  - Use systems analysis to establish current baseline capabilities and assess alternate solutions
  - Go/No-go: Assess updated sampling and decon capabilities against customer goals (>25% reduction in samples for lab analysis; decontamination efficacy achieves “no detection of viable spores” to meet interim EPA/CDC clearance goal) – Q1 FY16
- Sampling and Analysis – PNNL, EPA, *FFRDC Labs*
  - Adapt existing technologies and techniques, and assess performance with dirty environmental samples
  - Go/No-go: Demonstrate Rapid-Viability PCR (Rv-PCR) method at the 10-99 spore Limit-of-Detection range on dirty environmental samples – Q1 FY15
- Airflow Modeling and Mapping – SNL, EPA, *FFRDC Labs*
  - Validate existing subway airflow models to speed characterization of contaminated zones
  - Go/No-go: Confirm dispersion airflow models plus limited sampling give 95% confidence of contamination map – Q3 FY15
- Decontamination & Mitigation – SNL, CBI Polymers, EPA, *FFRDC Labs, Industry*
  - Adapt existing technologies and assess efficacy on dirty environmental surfaces
  - Go/No-go: Demonstrate efficacy of current or emerging decontamination technologies to 6-log kill of sporulated biological simulants – Q4 FY14

# Customers and Stakeholders

## Customers

- MTA – New York City Transit (*in-kind contribution of cars, access and personnel*)
- WMATA – Washington Metropolitan Area Transit Authority
- BART – Bay Area Transit Authority (volunteered system access)
- CTA – Chicago Transit Authority (briefing scheduled 10 Jan. 2014)
- MBTA – Massachusetts Bay Transit Authority

## Stakeholders

- Transportation Security Administration; FEMA
- Office of Health Affairs (BioWatch) – briefing scheduled 9 Jan. 2014
- CDC
- U.S. EPA (*in-kind contribution of OSC personnel; review test plans, field tests*)
- Local Public Health Departments (NYC, Chicago, Boston)

# Transition Pathway

**Major Deliverables / Path to Transition**

- Operational Guidance & Playbook
- Evidence-based Technology Assessments
- CONOPS

Exercises & ConOps

*Initiates pre-planning & coordination with local, state and federal responders*

TTAs/Field Tests

**Subway Systems**

- New York City
- San Francisco
- WMATA
- Boston
- Chicago

**EPA**

- Biological Response Subway Workgroup (*formed to support UTR*)
- CBRN Consequence Management Advisory Team

# Success means . . .

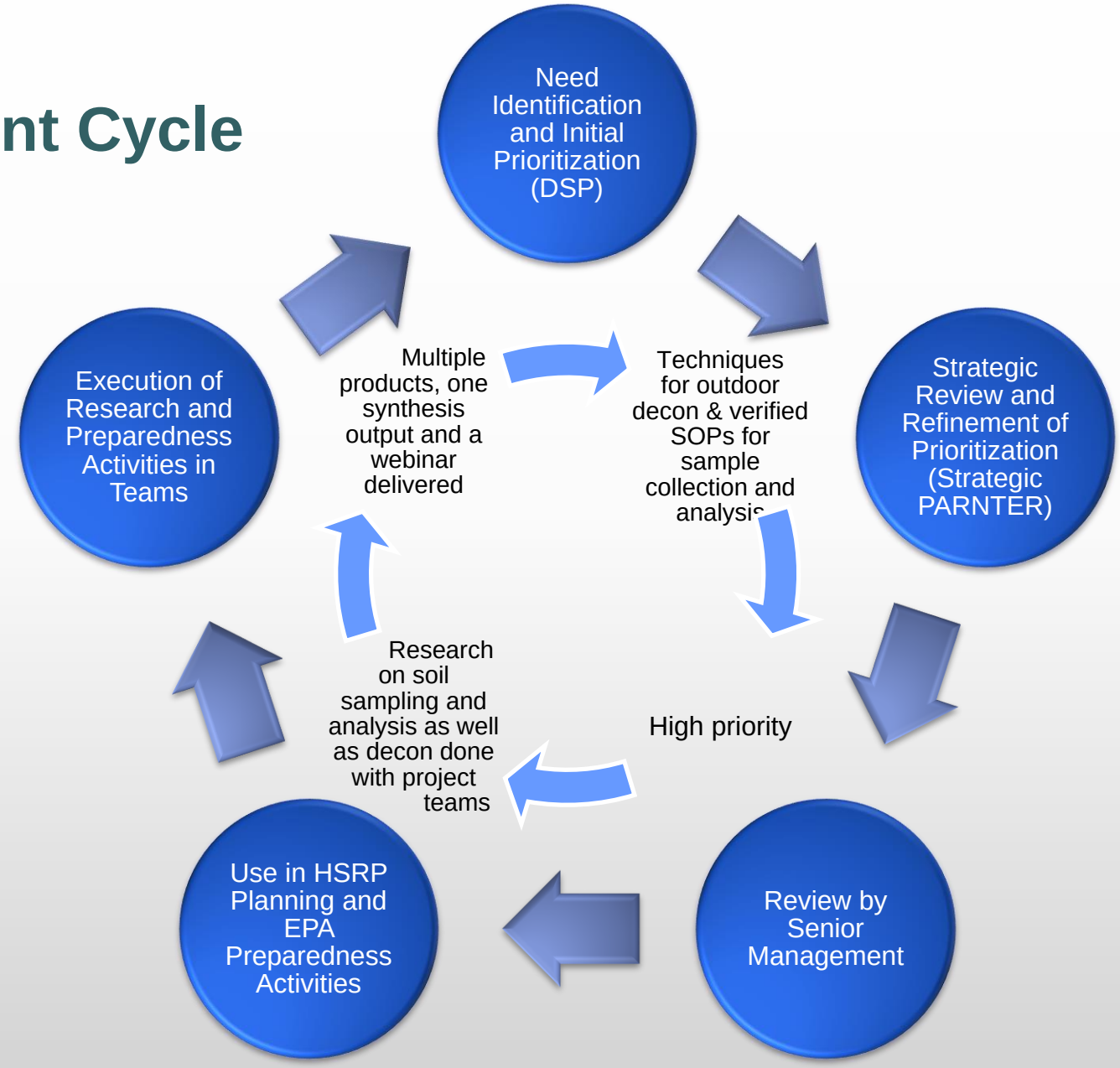
- First federal guidance for recovery of subway system contaminated with a biological agent - applicable to multiple systems
- Contamination mapping (*characterization*) requires minimal sampling – enabling early start of decontamination
- Decon technologies (*remediation*) and operational parameters for efficacy established through field tests
- Validated method(s) to isolate contaminated areas for decon
- Lab analysis bottleneck mitigated by composite sampling, Rapid-Viability PCR methods
- Subway systems and EPA are engaged and full transition partners

# Transitioning National Efforts to Regions

- UTR R&D and operational guidance will be shared with all Regions
- Exercises and technology demos will be held at major subways, bringing together EPA response personnel, state/local officials, and subway owner/operators throughout FY14-FY16
- EPA NYC project tactical/operational plan for the “if it happened tomorrow” scenario will be developed in a manner applicable to all major subway systems/urban areas
- UTR and NYC project include active participation of Regional OSCs/RM, OEM/CMAT, and NHSRC

# CMAT and NHSRC Collaborative Projects FY ‘14

# PARTNER Engagement Cycle



# Scalability Challenges for Decontamination Technologies Applied to the Wide Area

## BACKGROUND AND NEED

EPA has conducted numerous technology evaluations for methods to decontaminate the urban environment following a radiological dispersal device (RDD). These evaluations have been focused on decontamination of various radionuclides from a range of urban building materials. Many of these technologies may or may not be applicable to a wide-area scale.

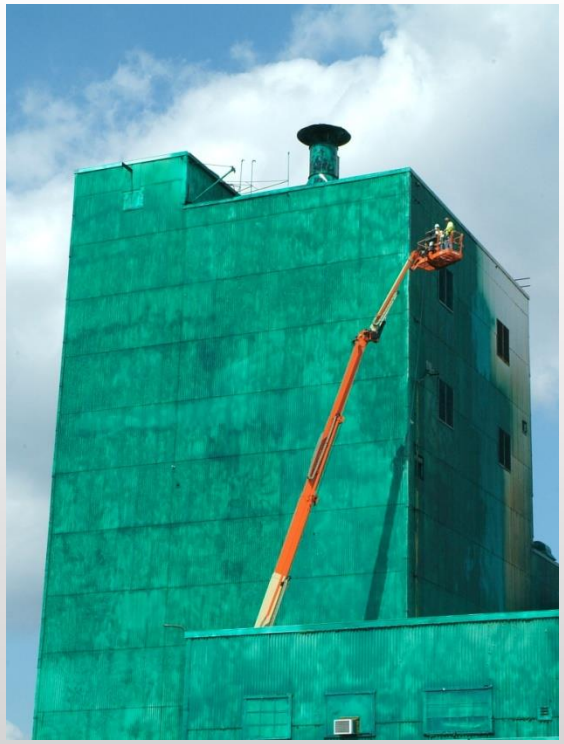
## DESCRIPTION

Literature search and Subject Matter Expert elicitation to:

(1) identify technologies applicable to a wide-area RDD event;

(2) identify challenges in applying technologies in the wide-area;

(3) provide recommendations for further developments



## COMPLETION

- Compendium of Wide Area Decon Technologies, 2013
- Recommendations Report Sep 2014

## TEAM MEMBERS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# Natural Attenuation of Persistent Chemical Warfare Agents on Nonporous Surfaces

## BACKGROUND AND NEED

Natural attenuation is a low cost, minimally invasive decontamination option with little impact to underlying materials. The duration of time to reach acceptable cleanup levels is not accurately known but is dependent on many factors.

## DESCRIPTION

Evaluate the impact of temperature, relative humidity, and airflow on the persistence of a chemical warfare agent as present on various nonporous surfaces. In addition, the potential appearance of the evaporated agent on more adsorptive building materials during the natural attenuation process will be assessed.

## COMPLETION-September 2015

## TEAM MEMBERS


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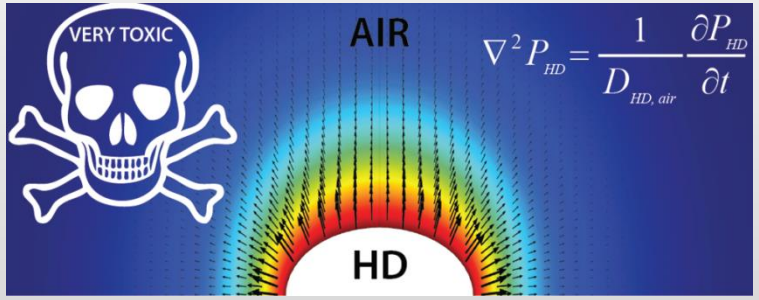

# NYC Anthrax Response Plan

## BACKGROUND AND NEED

The goal of this project is to develop a Biological Remediation and Re-occupancy Plan for New York City that will provide guidance and resources for the remediation, clearance and re-occupancy of private and public properties and infrastructure in the event of an intentional *Bacillus anthracis* release.

## DESCRIPTION

- Scalable Plan Specific for NYC
- Develop
  - Sampling and Analysis Plan (SAP)
  - Remedial Action Plan (RAP)
  - Decision Support Tree
  - Waste Management Plan (WMP)
  - Health and Safety Plan (HASP)

## COMPLETION-September 2014

## TEAM MEMBERS

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CMAT

ERT

NHSRC

ORCR

OSCs R2, R3, R5

# Attenuation of Ricin at Elevated Temperature and Humidity

## BACKGROUND AND NEED

Recent incidents involving dissemination of ricin highlight need to assess and develop remediation options for this bio-toxin.

## DESCRIPTION

Natural attenuation of ricin is one possible remediation option; this study will assess how long ricin remains toxic on different materials under varying levels of temperature and RH.

## COMPLETION- September 2015

## TEAM MEMBERS

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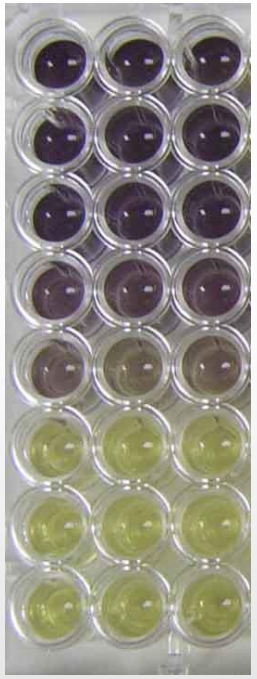
Shawn Ryan



Ricin assay

# Material Compatibility with Ethylene Oxide

## BACKGROUND AND NEED

Fumigation with ethylene oxide (EtO) for the decontamination of certain materials and equipment contaminated with anthrax spores has been suggested as a safe alternative to more harsh fumigants such as chlorine dioxide or hydrogen peroxide. Unlike hydrogen peroxide and chlorine dioxide, ethylene oxide is not an oxidizing agent and kills organisms through alkylation.

## DESCRIPTION

Desktop computers and other electronics have been exposed to EtO at several operational conditions. The computers are monitored over the course of a year to determine if the EtO had any impact on the various components.

## COMPLETION-September 2014

## TEAM MEMBERS


Shannon Serre (PI), serre.shannon@epa.gov

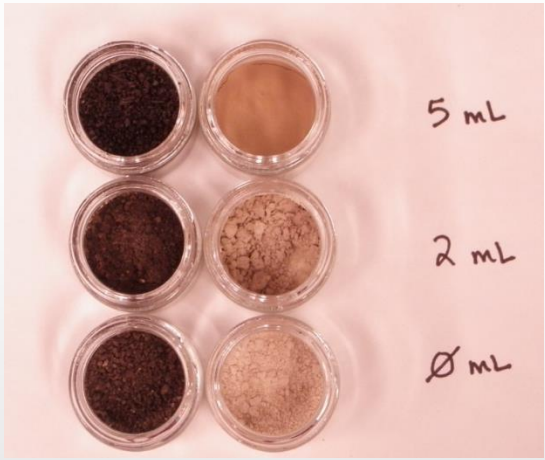
Jayson Griffin

Leroy Mickelsen


# Decontamination of Soil and Other Outdoor Materials Contaminated with *B. anthracis*

## BACKGROUND AND NEED

Remediation efforts could be extensive following an aerosol release of *Bacillus anthracis* spores over a wide area. In such a scenario, many types of materials and environments may need to be decontaminated, including soils




## DESCRIPTION

This study will build on previous work in this area and assess decontamination efficacy for a few commercially available technologies

## COMPLETION-September 2014

## TEAM MEMBERS

Joseph Wood (PI), Larry Kaelin, Leroy Mickelsen, Carter Williamson

# Decontamination with Methyl Bromide at Low T and RH

## BACKGROUND AND NEED

Remediation efforts could be extensive following an aerosol release of *Bacillus anthracis* spores over a wide area. Methyl bromide represents a widely available decontaminant that could be used in such a scenario.

## DESCRIPTION

This study builds on previous work showing MeBr to be effective, but at relatively high temperatures and humidity levels. In the present study, effective MeBr fumigation conditions will be determined for lower T and RH. This will simplify its use and lower cost.


## COMPLETION-September 2014

## TEAM MEMBERS

Joseph Wood (PI), Leroy Mickelsen, Shannon Serre, Worth Calfee

# Inactivation of *Bacillus* spores in decon wash down wastewater using chlorine bleach solution

## BACKGROUND AND NEED

Large quantities of wash water can be generated during remediation of areas contaminated with *Bacillus anthracis* spores. Simple, safe, reliable methods are needed to treat this water.

## DESCRIPTION

NHSRC in consultation with CMAT is testing the use of dilute bleach solutions to treat decontamination wash water (with various organic and inorganic loads) containing *Bacillus* spores.

## COMPLETION-July 2015

## TEAM MEMBERS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| Wash Water | Time for 6 log kill (min.) |
|---|---|
| Floor wash water (with 1% Alconox®) | 11 |
| | 29 |
| Car wash/rinse water (w/1% Dawn®) | 28 |
| | 89 |
| PPE wash water with 1% Alconox ® | 10 |
| | 12 |
| Stormwater runoff | 56 |
| | 87 |

5 % bleach solution, no pH adjustment

**Blue** highlighted data indicates colder (4˚ C) temperature

# Decontamination Line Protocol Evaluation for Biological Contamination Incidents

## BACKGROUND AND NEED

Various protocols can be deployed to decontaminate personnel and materials at active clean-up sites. The effectiveness of these protocols and the affect of protocol modifications is largely unknown.

## DESCRIPTION

Human test subjects who are trained in hazardous waste response will be recruited to execute the protocol under controlled conditions. Fluorescent inert materials as well as non pathogenic surrogates will be applied to personal protective equipment as well as sample bags to assess efficacy of decontamination.

## COMPLETION-September 2014

## TEAM MEMBERS


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# Development of a Vacuum-based Biological Agent All Surface Sampler

## BACKGROUND AND NEED

For the lack of present systems, a portable and cost effective vacuum-based sampler for collection of *B. anthracis* spores from any surface type is being developed. Spores are collected into a liquid fraction, thereby reducing the complexity and inefficiencies of required downstream analytical procedures.

## DESCRIPTION

Commercially available devices or laboratory developed and modified sampling devices will be evaluated for collection efficiency through a set of controlled tests.

## COMPLETION-September 2014

## TEAM MEMBERS


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# On-Site Treatment of Bundled/Bagged Waste

## BACKGROUND AND NEED

During expedient indoor decon, significant amounts of waste is generated for subsequent off-site treatment and disposal. On-site decontamination could significantly reduce overall waste treatment, transport, and disposal costs.

## DESCRIPTION

Common waste items (upholstery, carpet, books, PPE) were inoculated with spores and subjected to various submersion-based (in pH-adjusted bleach) decontamination procedures. Efficacy of each treatment was determined.


## COMPLETION-September 2015

## TEAM MEMBERS

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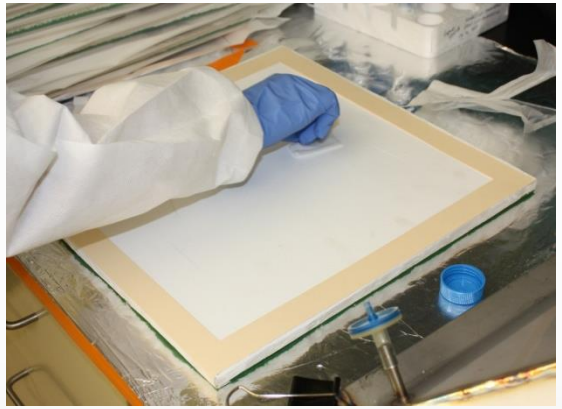
# Efficacy of Sporicidal Wipes on Select Surfaces

## BACKGROUND AND NEED

Biocidal wipes are in use and have been suggested for the decontamination of hard non-porous surfaces contaminated with anthrax spores. No quantitative efficacy data with *Bacillus anthracis*.



## DESCRIPTION

The effectiveness of these decontaminants against a B. anthracis surrogate, B. atrophaeus, under conditions reflective of their realistic field decontamination use are being evaluated.

## COMPLETION-September 2014

## TEAM MEMBERS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# Building Aware Dispersion Modeling

## BACKGROUND AND NEED

The modeling of a CBR agent dispersed through an urban environment is complex and resource intensive. Contaminant dispersion is dependent on the source and atmospheric characteristics but is also impacted the buildings that can drastically affect contaminant flow, enhancing lateral spread and retention time of dispersants in air. A building-aware dispersion model may help in clean-up and restoration.

## DESCRIPTION

Efforts are underway to understand and use for EPA ER the Los Alamos National Laboratory's (LANL's) Quick Urban & Industrial Complex (QUIC) Dispersion Modeling System. This effort includes the development of remote sensing capabilities to quickly map building footprints.

## COMPLETION-2015

## TEAM MEMBERS

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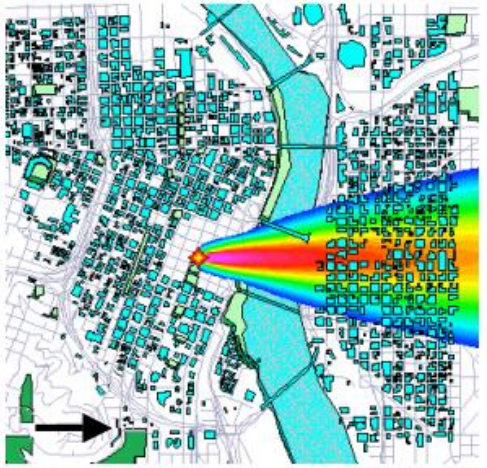
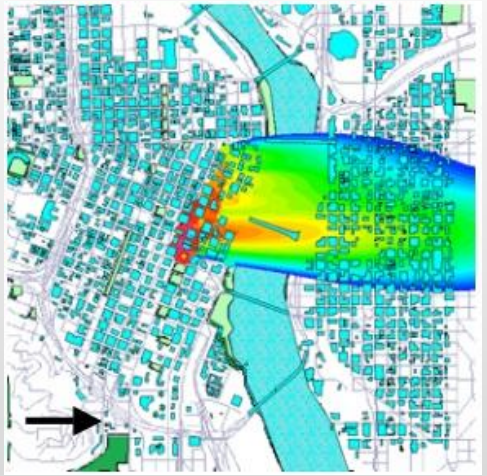


Modeled release without buildings



Modeled release with buildings

# Transportable Gasifier for Animal Carcasses

## BACKGROUND AND NEED

A comprehensive response strategy is required to effectively mitigate animal health emergencies including rapid depopulation, decontamination, and environmentally benign disposal of affected animals. Current response strategies are inadequate to meet the logistical challenges of large and/or multifocal outbreaks and fail to mitigate the psychological, social, economic, trade, social, or environmental consequences.

## DESCRIPTION

A prototype 25 ton per day gasifier was previously developed and tested with some degree of success but did not achieve its design throughput. This project will make needed repairs and modifications to the prototype gasifier system, and run a 72-hour Proof of Concept test on swine and poultry in a real world environment.

## COMPLETION-September 2014

## TEAM MEMBERS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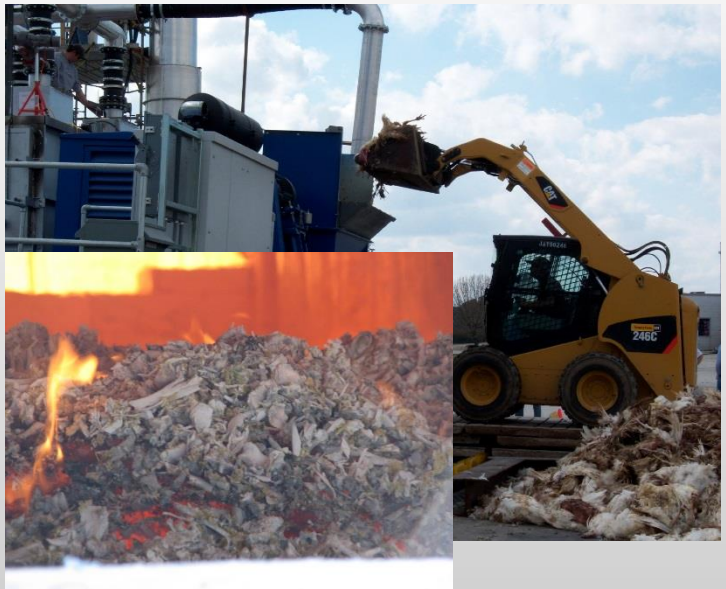


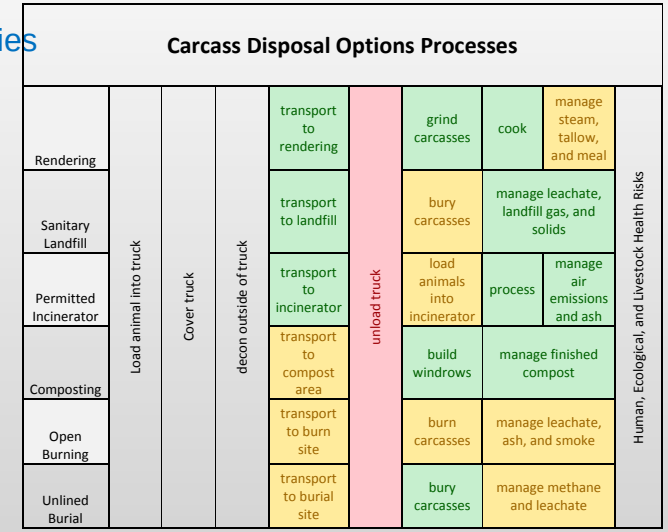
# Exposure Assessment of Livestock Carcass Disposal Options

## BACKGROUND AND NEED

EPA provides support to USDA/APHIS in helping to assure the proper disposal of animal carcasses following major event such as a natural disaster or foreign animal disease (FAD) outbreak. Currently, there are several accepted carcass disposal options including rendering, composting, sanitary landfills, permitted incinerators, open burning, and unlined burial. Developing a risk-based methodology to allow decision makers to select the most appropriate carcass disposal technology for a given incident would significantly improve the Nation's preparedness.

## DESCRIPTION

- Determine hazards associated with livestock carcass disposal options
- Determine exposure pathways, exposures, and uncertainty for each option
- Determine a process to select the optimal site-specific option
- Identify knowledge gaps for further study to help minimize uncertainties




## COMPLETION-September 2017

## TEAM MEMBERS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# Infectious Carcass Disposal Pretreatment Feasibility Study

## BACKGROUND AND NEED

Management of animal carcasses following a foreign animal disease (FAD) outbreak may require pre-treatment of the carcasses prior to transportation to treatment/disposal facilities. It is important to assess what pre-treatment technologies facilitate the most effective and environmentally benign disposal pathways.

## DESCRIPTION

The work will involve evaluating the feasibility of grinding infectious carcasses on the farm without releasing pathogens to the environment, treating the ground material to inactivate pathogens or otherwise stabilize it (as appropriate) in a manner suitable for landfilling or rendering, and loading the treated material into appropriate vehicles for transport to disposal.

## COMPLETION-September 2015

## TEAM MEMBERS

Paul Lemieux, lemieux.paul@epa.gov

TBD (not formed yet)

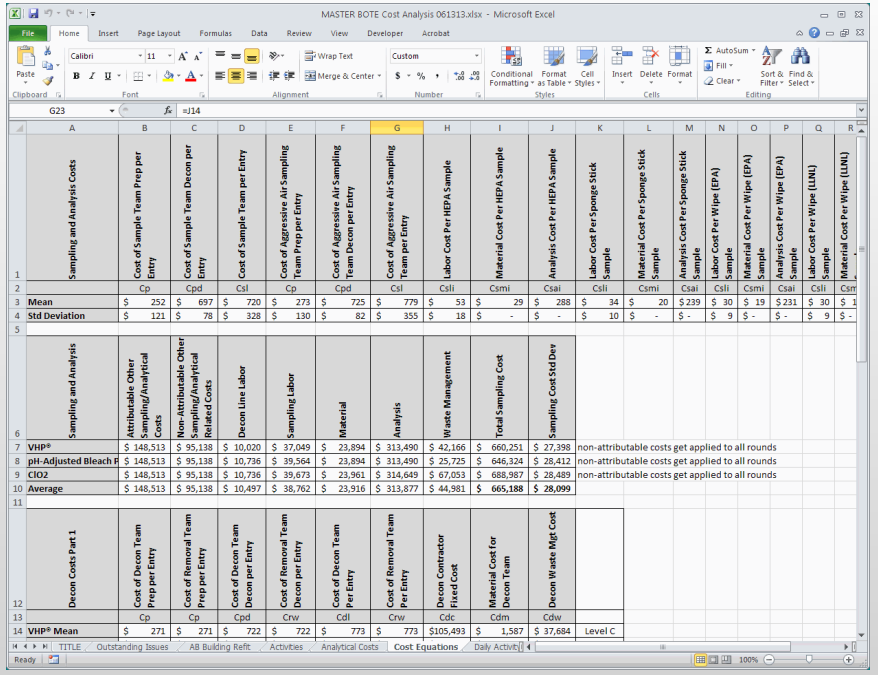
# Spreadsheet Tool to Estimate CBRN Wide-Area Incident Response Costs

## BACKGROUND AND NEED

When a CBR incident covers a wide-area, mounting an effective cleanup involves simultaneously balancing multiple considerations within a complex system-of-systems in order to ensure efficacious and cost-effective results. These multiple cost considerations include, but are not limited to: sampling, decontamination, waste management, refurbishment, transportation, and potentially denial-of-access.

## DESCRIPTION

The work will develop a spreadsheet-based tool to estimate anticipated costs associated with a wide-area cleanup from a CBR incident.




## COMPLETION-September 2016

## TEAM MEMBERS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TBD (haven't organized team yet)


# Decision Support Toolset for Weapons of Mass Destruction (WMD) Crisis Management

Michael Nalipinski on behalf of:

Mr. Ryan Madden

*U.S. Department of Defense*
*Defense Threat Reduction Agency*
*Joint Science and Technology Office*
ryan.madden@dtra.mil

# Biological Resiliency Activities

| BIOLOGICAL RESILIENCY | | | | | |
|---|---|---|---|---|---|
| **Event Continuous** | **Preparedness** | **Response** | | | **Recovery** |
| | | **Pre-incident** | **Pan-incident** | **Post-incident** | |
| Routine public health monitoring<br><br>Routine environmental monitoring<br><br>Force protection<br><br>Established communications | Research verifying best science<br><br>Trained medical staff and responders<br><br>Develop plans<br><br>Conduct exercises<br><br>Hardened infrastructure<br><br>Asset and Capability Awareness | Increased exercising of response plans<br><br>Increased environmental sampling<br><br>Increased clinical sampling<br><br>Therapeutic pre-positioning<br><br>Social distancing | Notification<br><br>Identify agent<br><br>Deploy medication<br><br>Forensic investigation<br><br>Monitor exposure statistics of affected population<br><br>Initial characterization | Optimize characterization<br><br>Prioritize recovery<br><br>Decontamination<br><br>Clearance | Reoccupation decisions<br><br>Long-term public health monitoring<br><br>Long-term environmental monitoring<br><br>Renovation |

Highlighted activities are informed by the TaCBRD program decision support toolset

# Transatlantic Collaborative Biological Resiliency Demonstration (TaCBRD)

## Threat Activity Sensing and Reporting

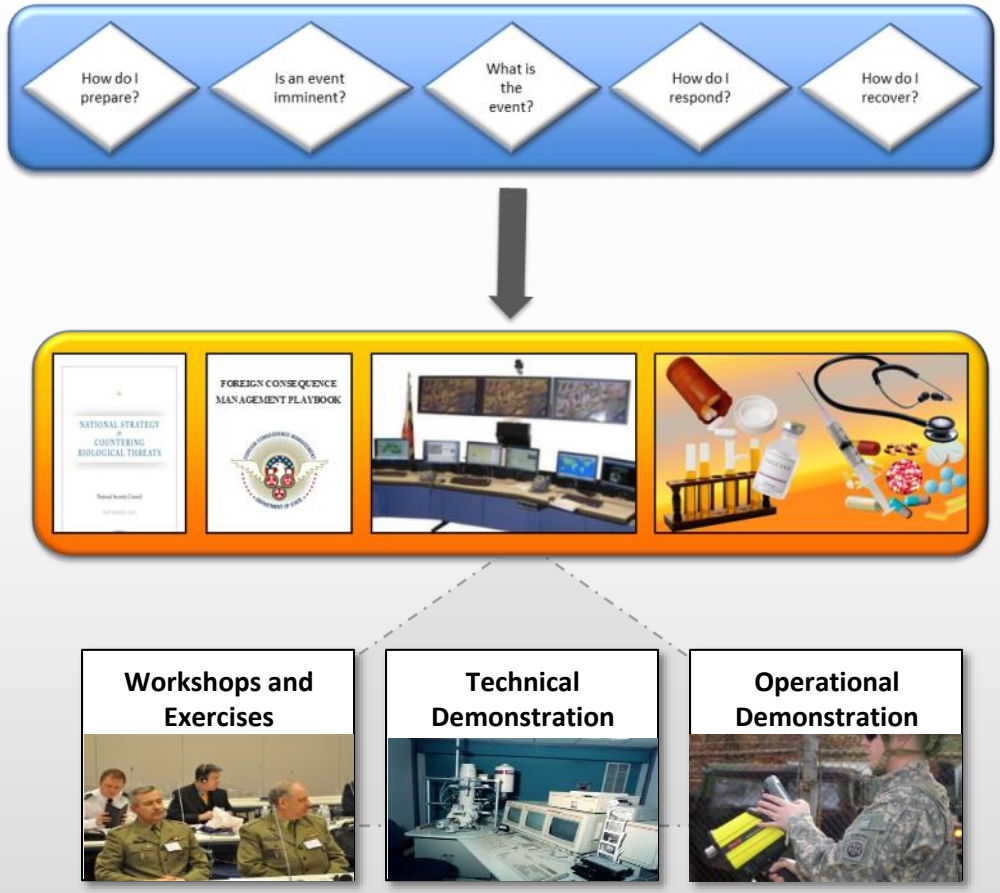
For wide area contagious biological threats, mitigate morbidity through rapid detection and containment:

- Novel use of environmental indicators
- Correlating threat probability to response actions
- Recommend response actions to prevent or mitigate catastrophic incident

## Rapid Response and Recovery

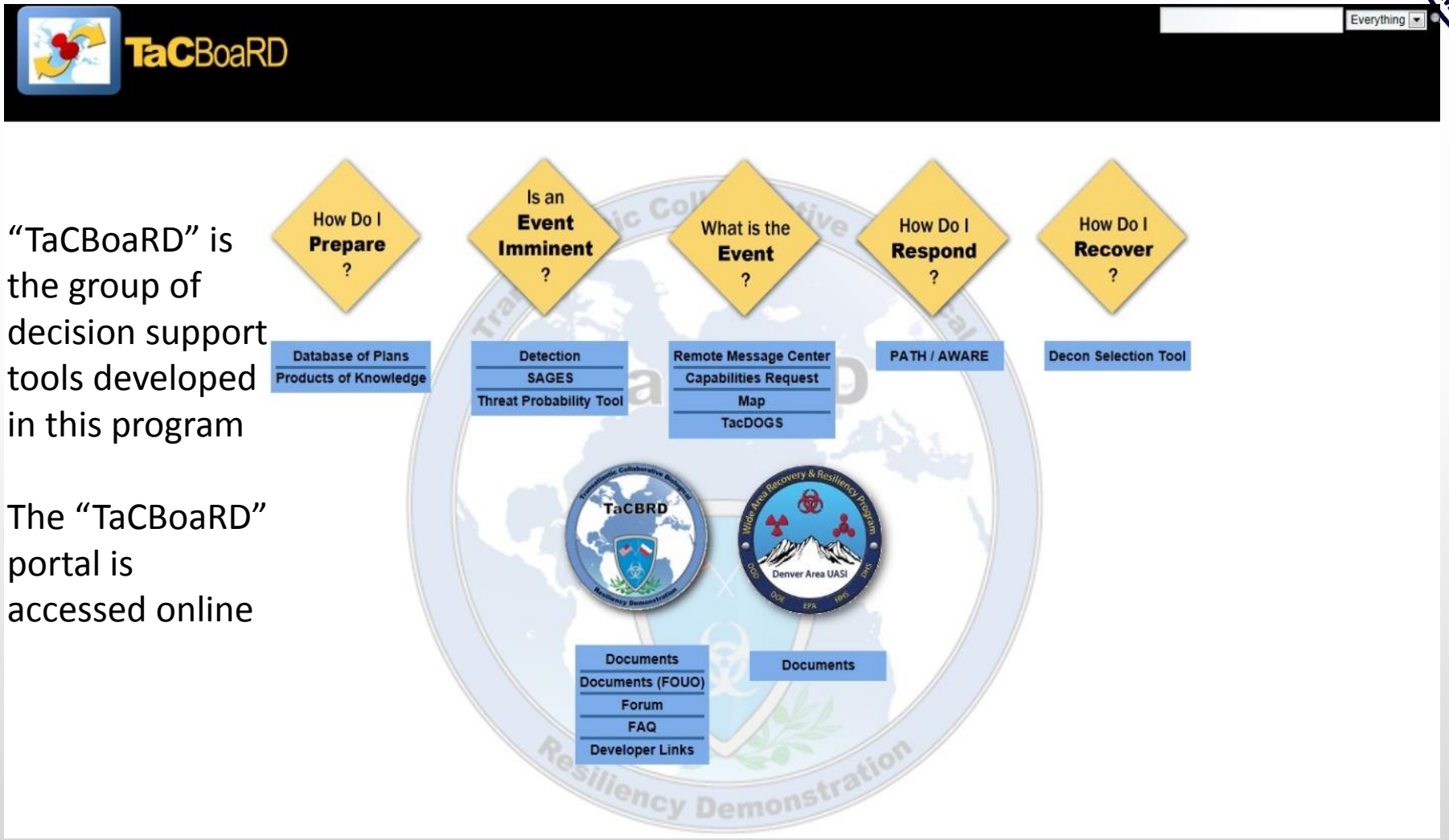
For wide area persistent biological threats, compress the timeline for recovery

- Tools to inform decisions on asset prioritization, sampling/decon strategy, tradeoff analysis
- Whole-of-government and international coordination for capability development
- Recommend response actions to recover from catastrophic incident



# Biological Incident Decision Support

- "TaCBoaRD" is the group of decision support tools developed in this program
- The "TaCBoaRD" portal is accessed online



# TaCBoaRD Toolset

**Mapping Portlet**

- Supports geospatial data sets from Google, the Open Source Geospatial Foundation (OSGeo), and the Homeland Security Infrastructure Program (HSIP)
- Renders mapping files produced by TaCBoaRD tools
- Consolidates toolset views into common picture for situational awareness
- Incorporates Internet weather streams and GeoRSS feeds

**Suite for Automated Global Electronic Surveillance (SAGES)**

- Suite of tools for temporal and geospatial surveillance
- Includes disease & syndromic surveillance
- Includes web and desktop tools for:
  - Data collection
  - Analysis and visualization
  - Modeling and simulation
  - Evaluation
  - Communications
- Web portion of the suite (“OpenESSENCE”) is used in TaCBRD

# TaCBoaRD Toolset


**Threat Probability to Action Tool (TPAT)**

- Organize and present bioterrorism and public health information
- Provide situational awareness, event characterization, response options and response guidance
- Assist responders with:
  - Selecting public health and environmental response strategies for the unfolding biological incident
  - Determine what additional information can help improve confidence levels and support better response decisions
  - Reduce downstream consequences for public health, wide-area restoration, and community recovery


**Tactical Dynamic Operational Guided Sampling (TacDOGS)**

- Predictive, dynamic software application
- Utilizes a physics-based approach to guide sample collection in response to an outdoor wide area biological agent release
- Significantly reduces the time, effort, and costs associated with the collection of numerous samples
- Provides confidence in making informative decisions regarding sampling approaches after a biological attack

# TaCBoaRD Toolset

**Prioritization Analysis Tool for all Hazards analyzer (PATH)**

- Allows for the rapid identification of key infrastructure likely to be impacted during a WMD event
- Allows users to identify restoration objectives
- Produces a prioritized list of impacted key infrastructure for recovery operations.


**Analyzer for Wide Area Restoration Effectiveness (AWARE)**

- Allows the user to input one or more WMD contamination scenarios
- User provides input on estimates of resources available to conduct recovery
- The prioritized list derived in the PATH tool (above) is passed to AWARE tool
  - Calculates recovery timelines
  - Estimates the cost of recovery for the key infrastructure list

# TaCBoaRD Toolset


**Decontamination Selection Tool (DeconST)**

- Provides cost-benefit comparisons of decontamination technology options
- Options provided for specific facilities based on:
  - Facility type
  - Construction
  - Building contents.

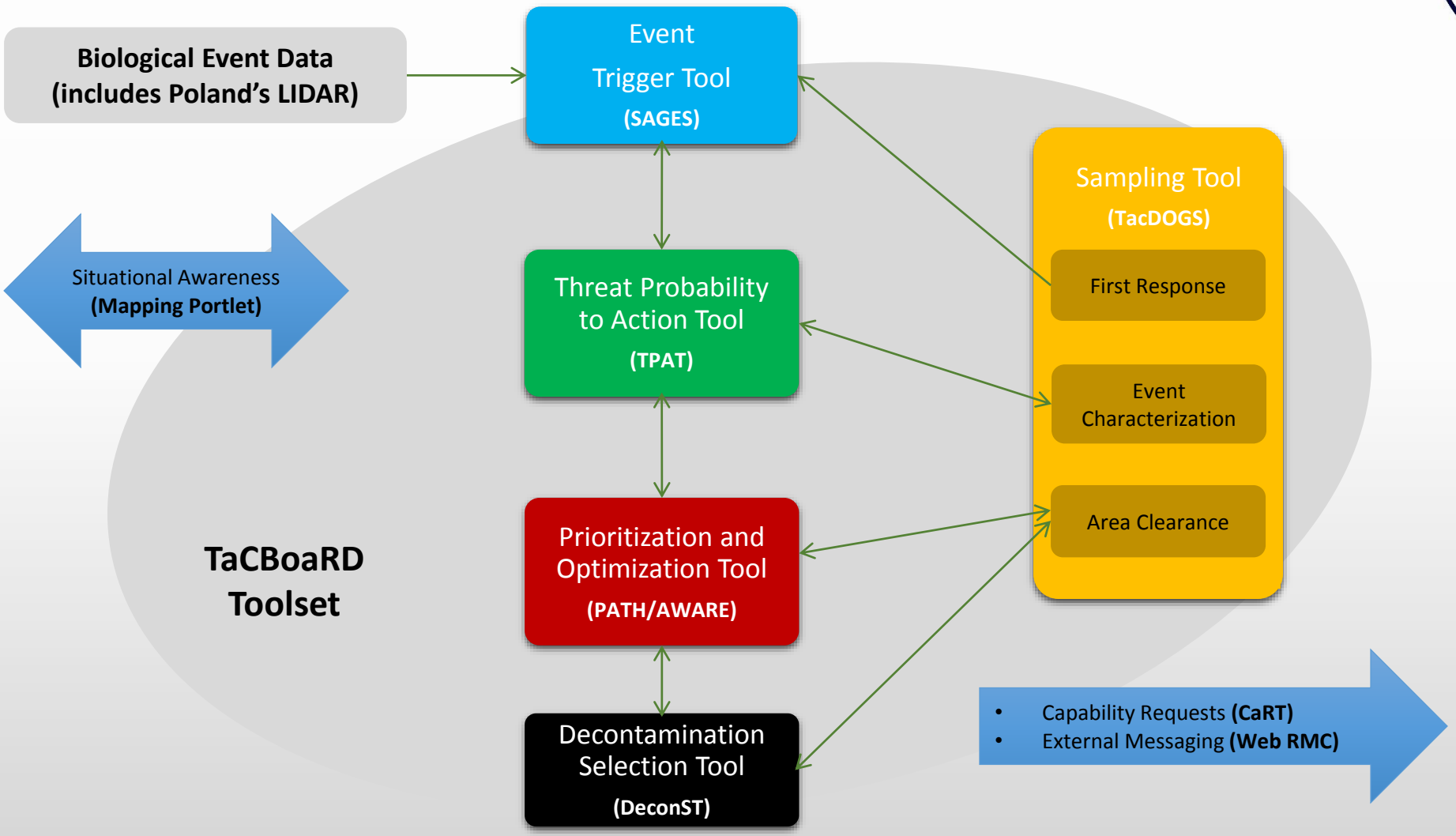
**Capability Request Tool (CaRT)**

- Standardizes foreign consequence management requests for assistance

**Web Remote Message Center (Web RMC)**

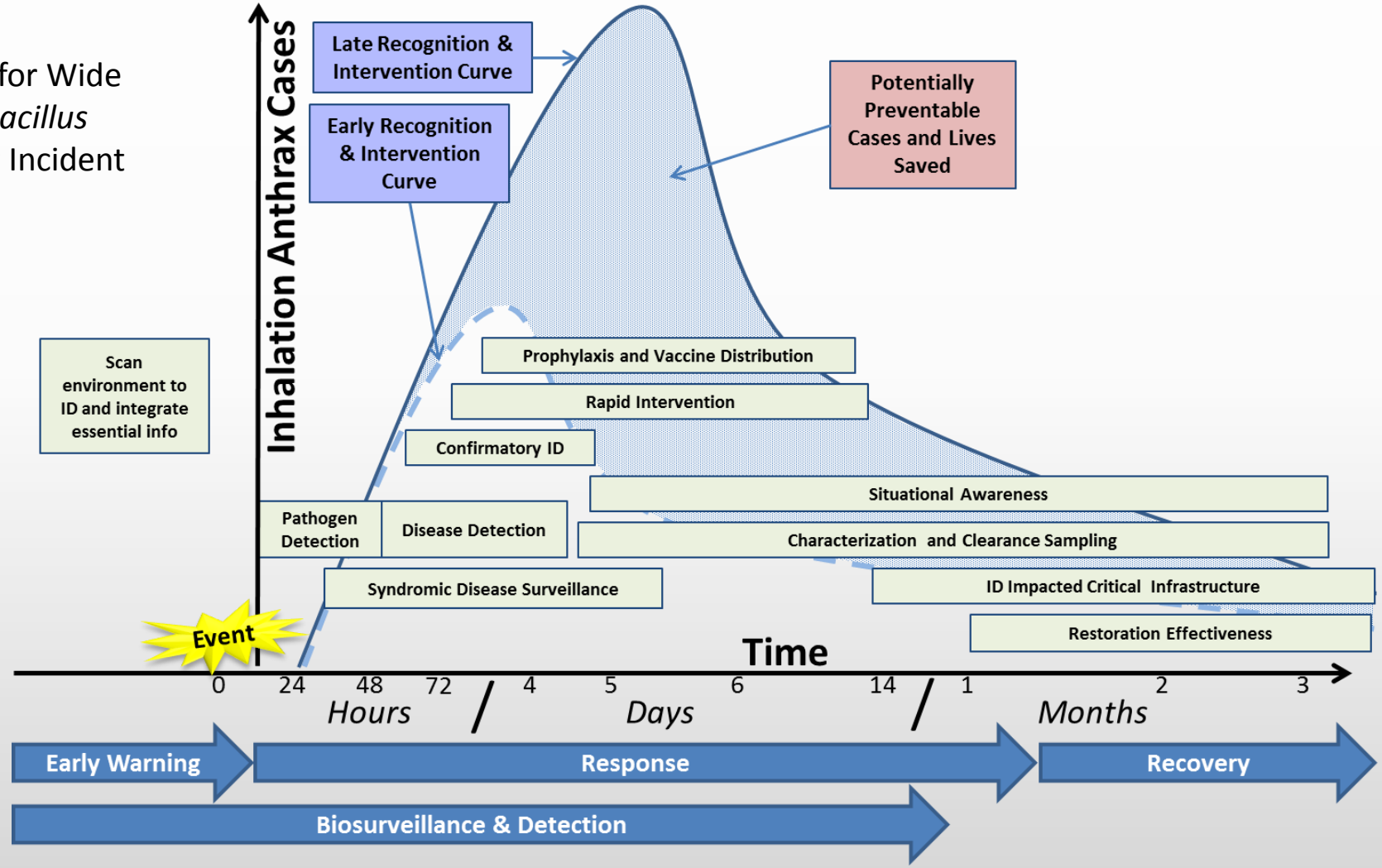
- Web-based version of the message center from the U.S. Joint Warning and Reporting Network (JWARN) program
- Capable of passing standard Nuclear, Biological and Chemical (NBC) and Common Alert Protocol (CAP) messages between organizations
- Capable of passing the results of the U.S. Joint Effects Model (JEM) program for display on a Google Map

# Biological Event Decision Support



# Reduced Biological Threat through Time-Phased Decision Making

Strategy for Wide Area *Bacillus anthracis* Incident



# Overview of Approach to develop Early Phase Decision Tool for First Responders: Phase IV

John Cardarelli, EPA CBRN CMAT

Dennis Carney, CSS-Dynamac Corp.

# Early Phase Decision Tool for First Responders: *Phase IV*

- Objective
  - Develop an On-line Application for 1st Responders
  - Focus on Early Phase Response Actions
  - Scenario: Large–scale Radiation Event
  - Accessible on mobile devices & multiple platforms (iPhone, Android, etc.)
  - Emphasize: It's a Decision Support Tool Not the Decision Itself
  - Preparedness: Available for Planning/Exercises

# Early Phase Decision Tool for First Responders: *Phase IV*

- Principal Goals
  - Ensure its an Application 1st Responders Will Find Useful
  - Strong Focus on Outreach to Response Community
  - Conduct Outreach using Multiple Forums
  - Outreach Before, During and After Tool Development

# Early Phase Decision Tool for First Responders: *Phase IV*

- Outreach Objectives
  - Fully Inform Stakeholders of Our Proposal
  - Obtain Insights on Utility, Content & Interface of Application
  - Solicit Continuing Support During Development
  - Seek Feedback During Beta Testing
  - Conduct Extensive Outreach Effort Prior to Actual Development

# Early Phase Decision Tool for First Responders: *Phase IV*

- Outreach Efforts to Date
  - Formation of Internal EPA Team to Advise
    - Regional and EPA Special Team responders
    - Key players at EPA who interact w/ Local & State responders
  - Formed a Multi-agency Development Team
    - Experience w/ radiation technologies, emergency response, response databases & software development
  - This Stakeholders Meeting
    - Introduce the concepts; Begin feedback process

# Early Phase Decision Tool for First Responders: *Phase IV*

- Outreach Efforts in Planning
  - Seminars in 5 Cities Across US
  - Cities to be Selected
  - Meet with Response Community in each Locale
  - Invitees could include 1st responders, public works, waste management officials, infrastructure personnel and local executive officials
  - Hope to solicit their ideas on utility and content of an on-line application
  - Initiate actual application development in Fall 2014

# Early Phase Decision Tool for First Responders: *Phase IV*

- Core Team Working on Application
  - EPA (CBRN CMAT & NHSRC)
  - DHS S&T (FRG/NUSTL)
  - NLM (WISER)
  - DOD/Georgia Tech (Chemical Companion)
  - UK's Public Health England (Rad Recovery Handbook & Other Decon Tools)

Homeland Security
Science and Technology

NATIONAL LIBRARY OF MEDICINE

Public Health England

# Nat'l Library of Medicine's Tools

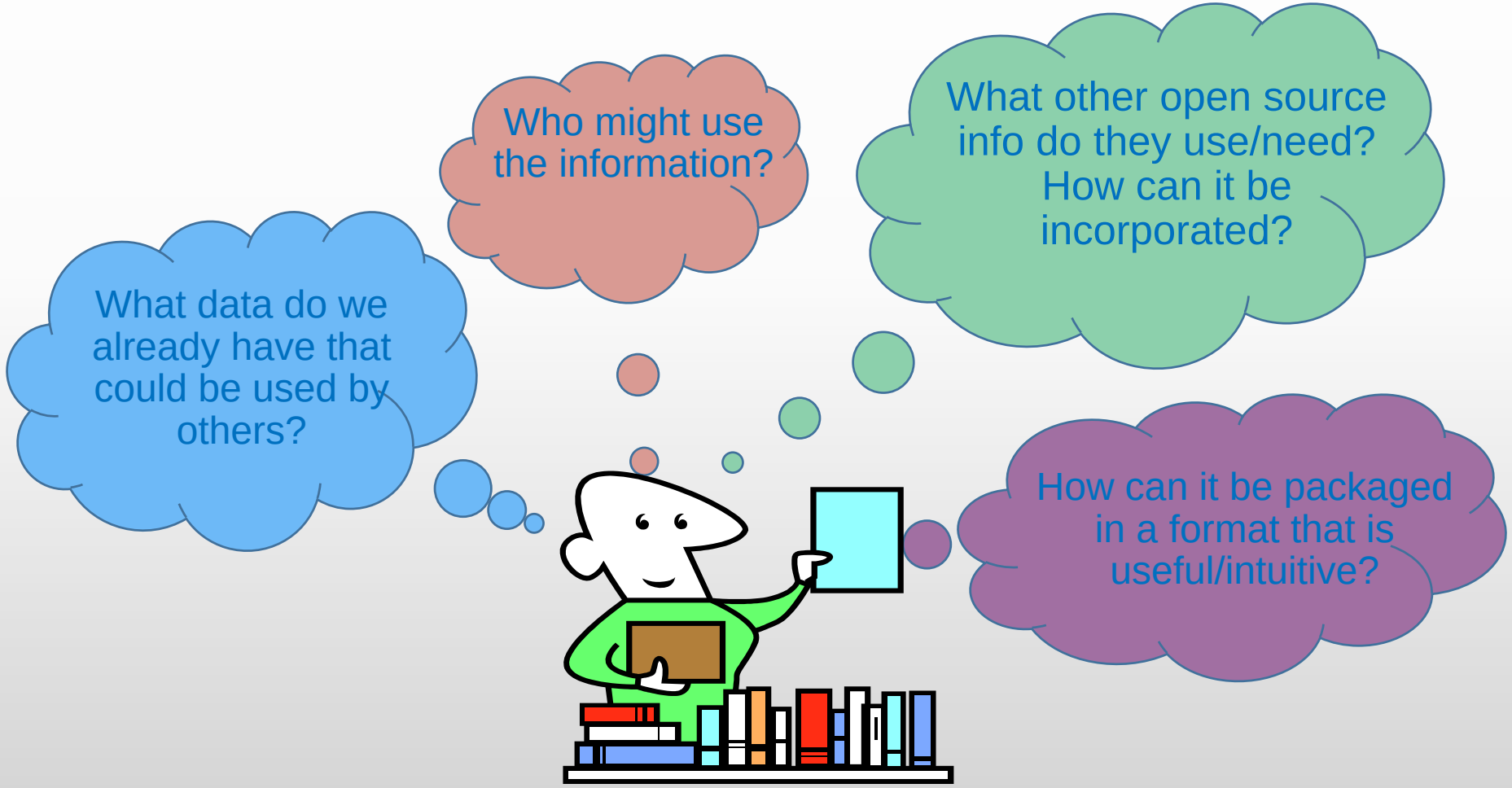
Wireless Information System for Emergency Responders (WISER)

http://wiser.nlm.nih.gov/

Chemical Hazards Emergency Medical Management (CHEMM)
(Incorporated into WISER apps)
http://chemm.nlm.nih.gov/

Radiation Emergency Medical Management (REMM)
http://www.remm.nlm.gov/

# NLM Tool Approach



# Chemical Companion Decision Support Tool

www.chemicalcompanion.org

March 2013

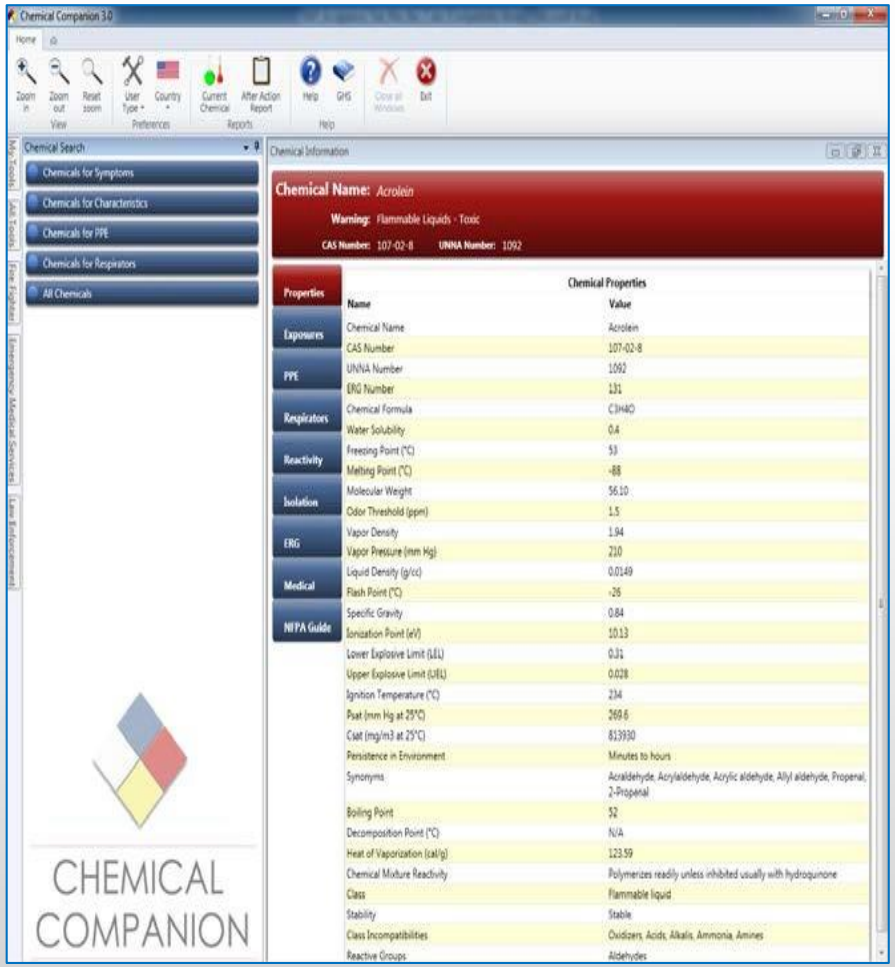
The Chemical Companion provides first responders with decision support for hazardous environments contaminated with chemical agents. This software tool, which operates on Windows-based PC devices, is provided free-of-charge to the military, law enforcement, and fire departments.

# Objective

- To provide first responders with decision support for hazardous environments contaminated with chemical agents.
- The Chemical Companion tool assists the emergency responder in making quick, accurate decisions about:
  - Personal protective equipment
  - Exposure limits and hot zone stay times
  - Odor thresholds
  - Initial symptoms of exposure
  - Breakthrough times for filters, suits, gloves, and boots
  - Standoff Distances
  - Blast effects
  - Canister Life
  - Radiation calculator

# Current State

- Desktop PC versions
- Release of iPhone, and Android smart phone versions schedule in 2013
- 554 chemicals and 3838 chemical synonyms
- Distribution and User registration via online website
  - http://www.chemicalcompanion.org
- Provided free of charge to authorized registered users



# UK Recovery Handbooks for Radiation Incidents

- Currently Version 3
- Split into three sections:
  - Inhabited areas
  - Food production
  - Drinking water


- https://www.gov.uk/government/collections/recovery-remediation-and-environmental-decontamination

# Rad Recovery Handbook: Purpose

- Handbook identifies 51 possible Response/Recovery clean-up alternatives for inhabited areas.
- Decision-makers need support in narrowing those alternatives, considering:
    - Radionuclides and deposition levels
    - Scale and timing of release
    - Land use of affected area
    - Timeframe for implementation
    - Constraints/Acceptability
- Impossible to have a generic strategy for all incident scenarios

# Scope of Handbook

- Inhabited areas
  - Buildings, roads and paved areas
  - Soil, grass, trees and shrubs
  - Specialised industrial surfaces
- Source of contamination
  - Accidents at nuclear power plants
  - Weapons transport accidents
- Timescale
  - After emergency phase → a year later

# Early Phase Decision Tool for First Responders - Discussion Topics

- Utility/Value
  - Do 1st Responders Need/Want Such a Tool?
  - Likelihood of Use During a Response?
  - Are Early Phase Decisions all Instinctive or Happening Too Quickly to Use an Application?
  - Likelihood of Use for Planning/Exercises?
  - What Information Would Encourage 1st Responders to Want to Use an App?

# Early Phase Decision Tool for First Responders - Discussion Topics

- What Outputs Would Responders Want
  - Dose rate reductions after alternative actions?
  - Waste generated?
  - Worker safety considerations?
  - Information for decision trees?

# Early Phase Decision Tool for First Responders - Discussion Topics

- Mobile Devices
  - Is mobile needed or is on-line app sufficient?
  - If we include mobile app, preferences for platform?
  - Thoughts about possible limitations on content with mobile device?
- Input Data
  - Availability of Rad monitoring equipment to collect any needed input data?
  - OK to generalized the environmental conditions of impacted area (i.e., grassy, wooded, hard surface, etc.)

# Questions?

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  - John Cardarelli; Cardarelli.john@epa.gov

If you have feedback on these webinars please let Erica Canzler know!

Note the webinar for ASPECT is Tuesday May 6th 1300 to 1500.