The Analysis for Coastal Operational Resiliency (AnCOR) Wide Area Demonstration

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Acknowledgments and Partnerships

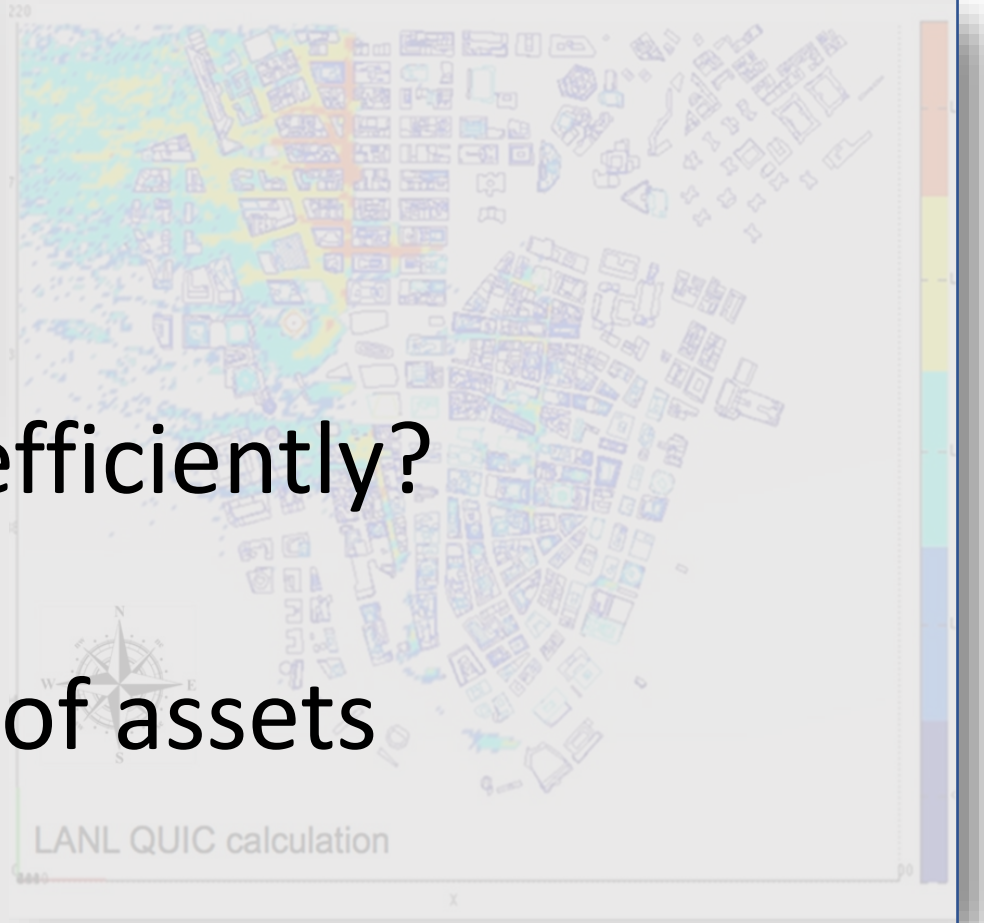
- US Department of Homeland Security, S&T
  - Interagency Agreement # 70RSAT18KPM000084
- US Coast Guard
- US EPA, Region 3, OLEM, ORD
- Centers for Disease Control and Prevention
  - Division of High Consequence Pathogens and Pathology, Division of Preparedness and Emerging Infections, and the Division of Scientific Resources
- Laboratory Response Network (LRN)
  - Bureau of Public Health Laboratories (Jacksonville, FL), NY State Department of Health, Wadsworth Center (Albany, NY), State Hygienic Laboratory at the University of Iowa (Coralville, IA), Virginia Division of Consolidated Laboratory Services (Richmond, VA)

Outline

- Introduction
- Building the Foundation with Bench-Scale Science
- Evaluating Capabilities in a Field-Scale Test
- Transition of Knowledge and Development of Response Tools
- Questions

Wide Area Biological Agent Incident (Problem)

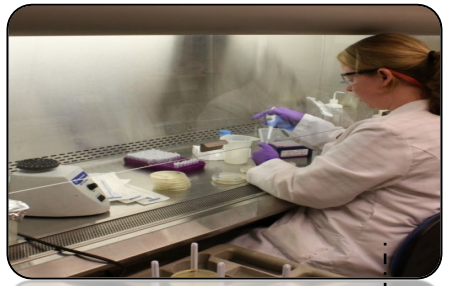
- How do we sample?
- How do we decontaminate?
- How do we manage waste?
- How do we respond safely and efficiently?
- When can we reoccupy?
- USCG – Rapid Return to Service of assets



AnCOR Program Purpose

- Develop and demonstrate capabilities and strategic guidelines to prepare the U.S. for a wide-area release of a biological agent, including mitigating impacts to USCG facilities and assets.
- Experimental findings from the bench- and pilot-scale studies have been utilized at the field scale to address biological agent preparedness.
- Taking bench scale science to the field and developing solutions for a wide area biological agent incident.

AnCOR Timeline

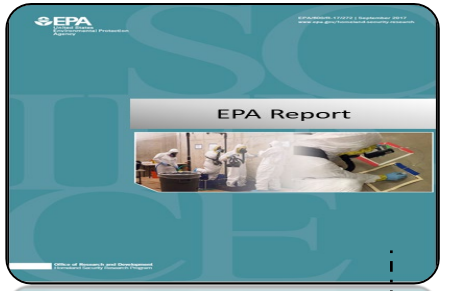


Bench-Scale Projects **FY19**

Vessel Decon Demo **FY20**

Pilot-Scale Projects **FY21**

Wide-Area Demo **FY22**



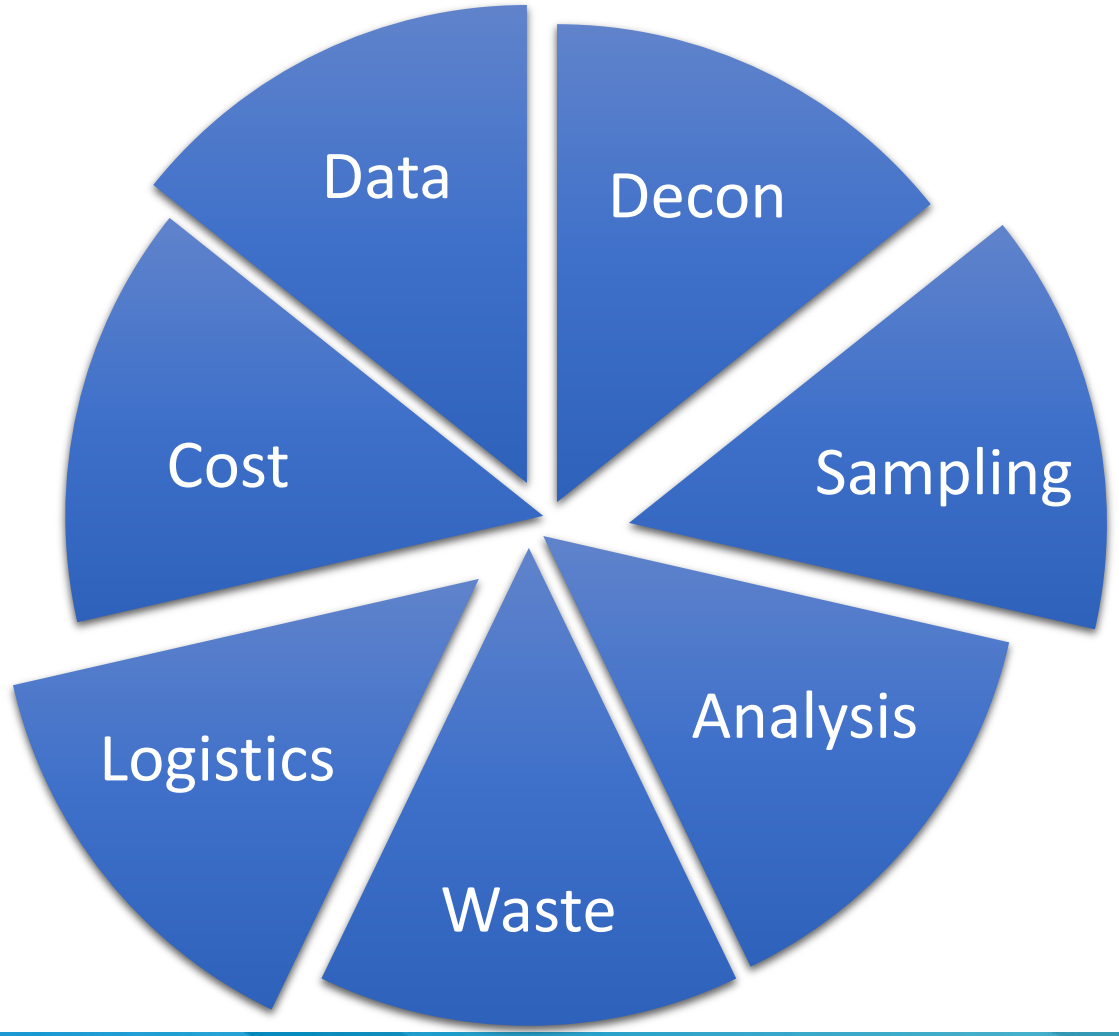
Guidance Documents & Tools **FY24**

Bench-Scale Tasks under six major research areas including:

1. Sampling and Analysis
2. Fate and Transport
3. Decontamination
4. Data Management
5. Waste Management
6. Demonstrations/Field-Scale Projects

Wide-Area Demo - Objectives

- Putting all the pieces together
  - Decontamination
  - Sampling and Analysis
  - PPE Donning and Doffing
  - Personnel Decon
  - Waste Management
  - Data Collection and Management
  - Understanding Cost and Effort

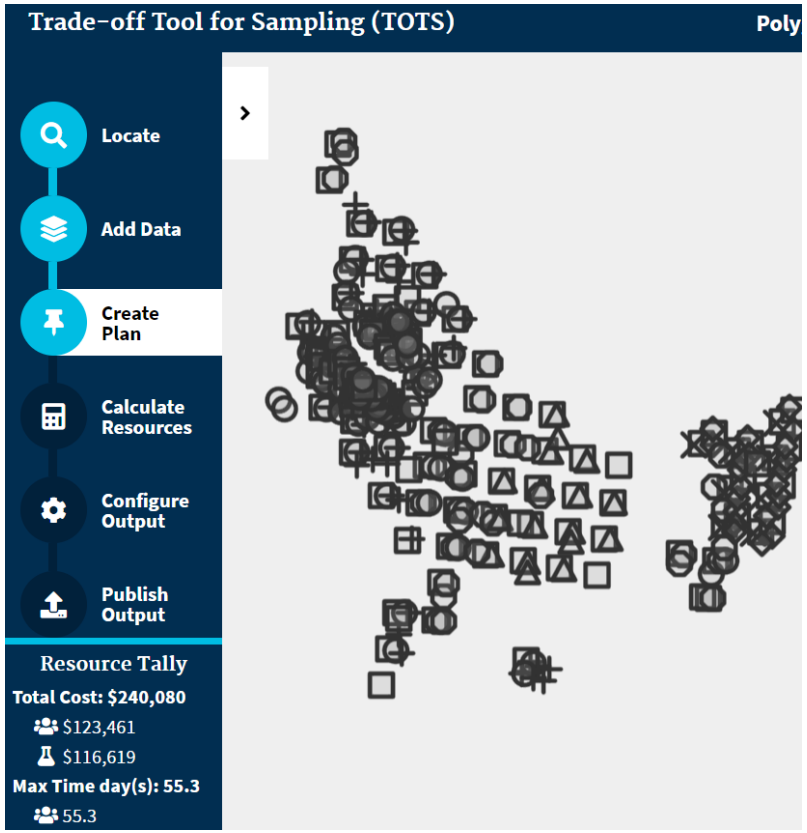


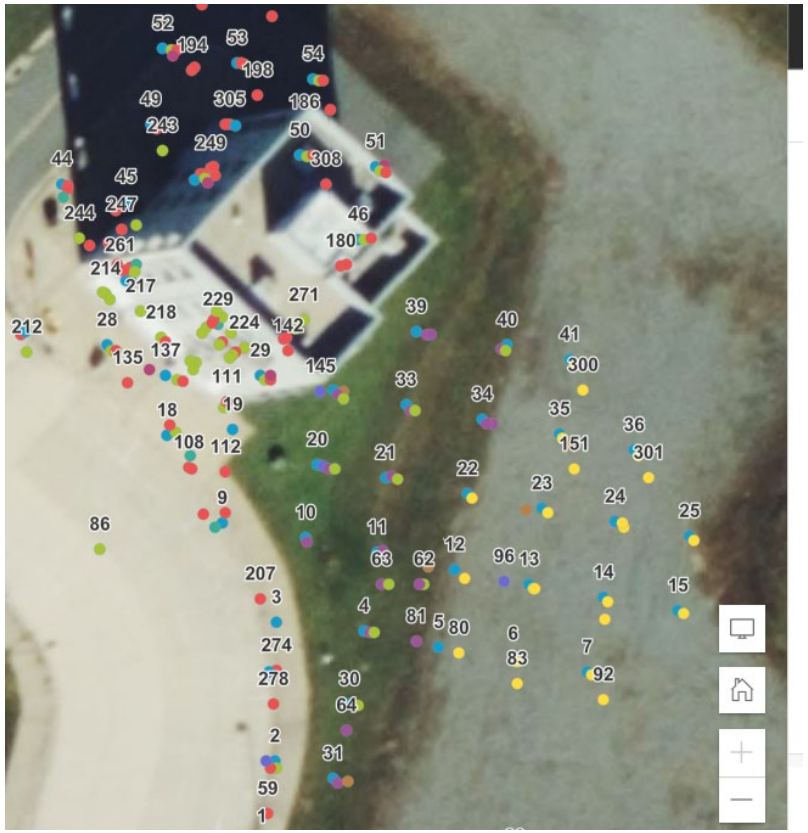
Wide-Area Demo – Test Venue

- Site Requirements:
  - Open Area, >1 acre
  - Able to release surrogate
  - Variety of Surface types
  - Large Building
- Fort AP Hill (Ft Walker), Asymmetric Warfare Training Center
- Inoculation with non-Pathogenic Bacillus spores (*Bacillus globigii*)
  - Targeted 1×10^{7} CFU ft^{-2}

Recon – Mapping & Modeling

Sample Plan Design





Determine Cost/Time Feasibility
Trade-off Tool for Sampling

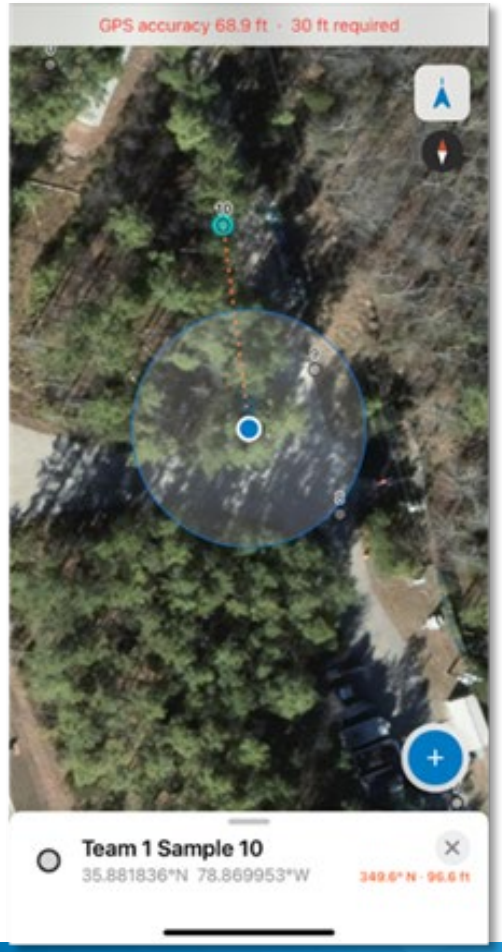
Assign **Location IDs** & Instructions
ESRI Cloud

Align Vertical Samples
ESRI Cloud

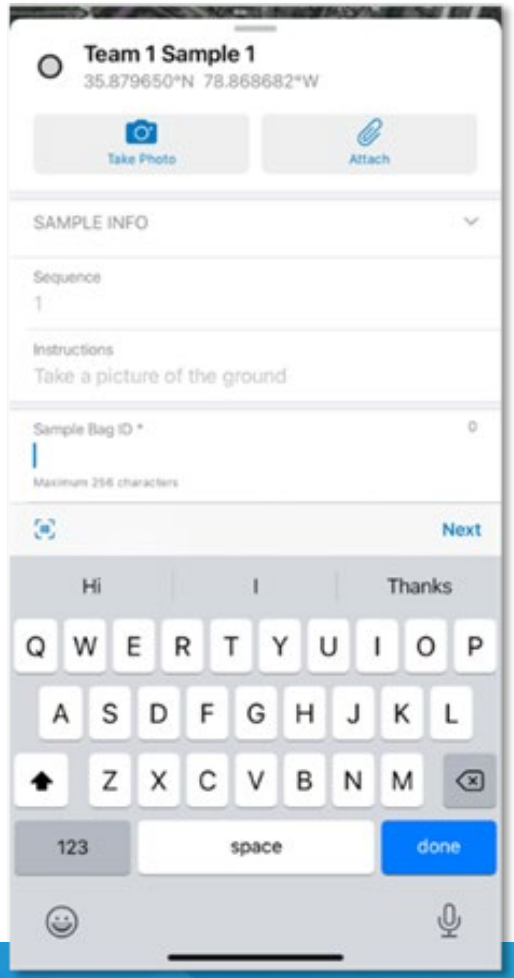
Data Acquisition Forms

Sequencing

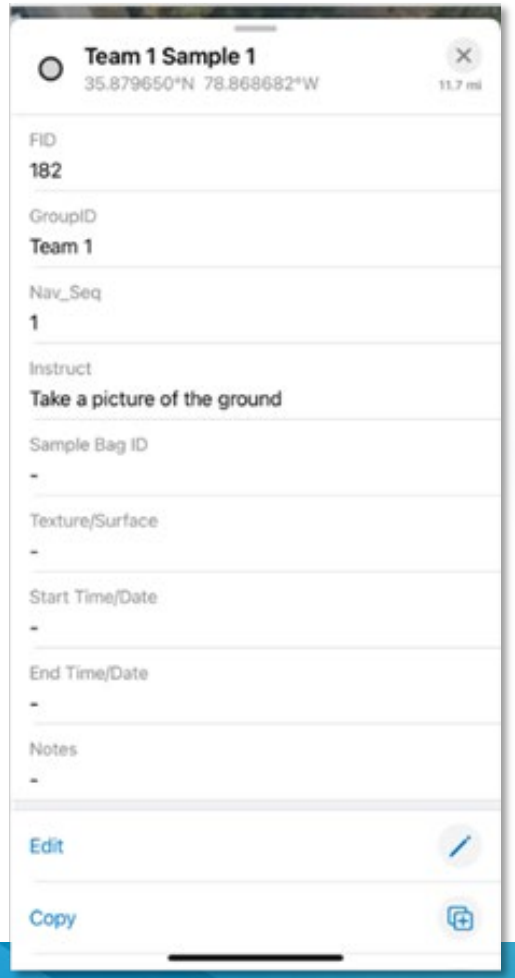
Navigation



Data Entry

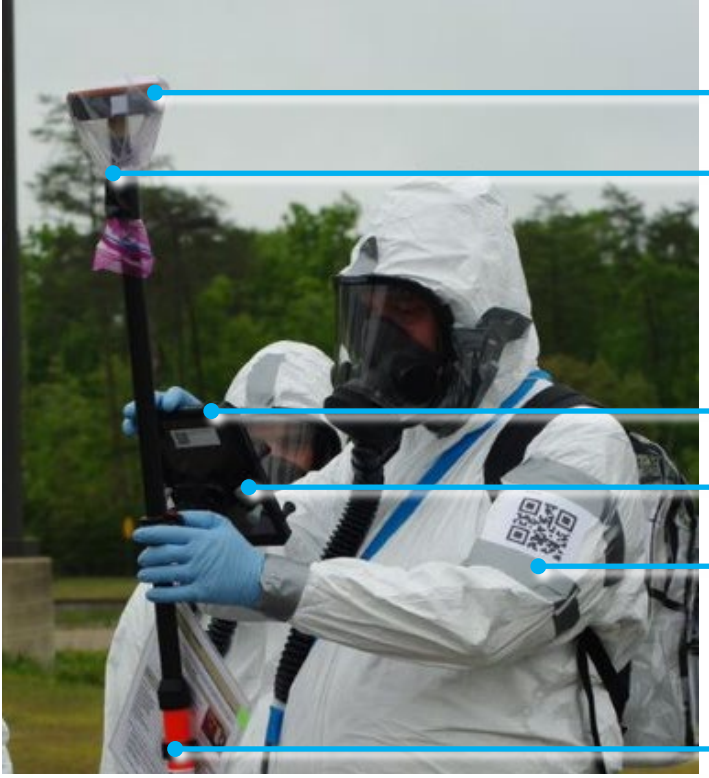


Error Checking



The Cloud

Hardware Deployment & Management



Sampling and Data Management Support Groups assisted ***3-person sampling teams*** with entry preparation.

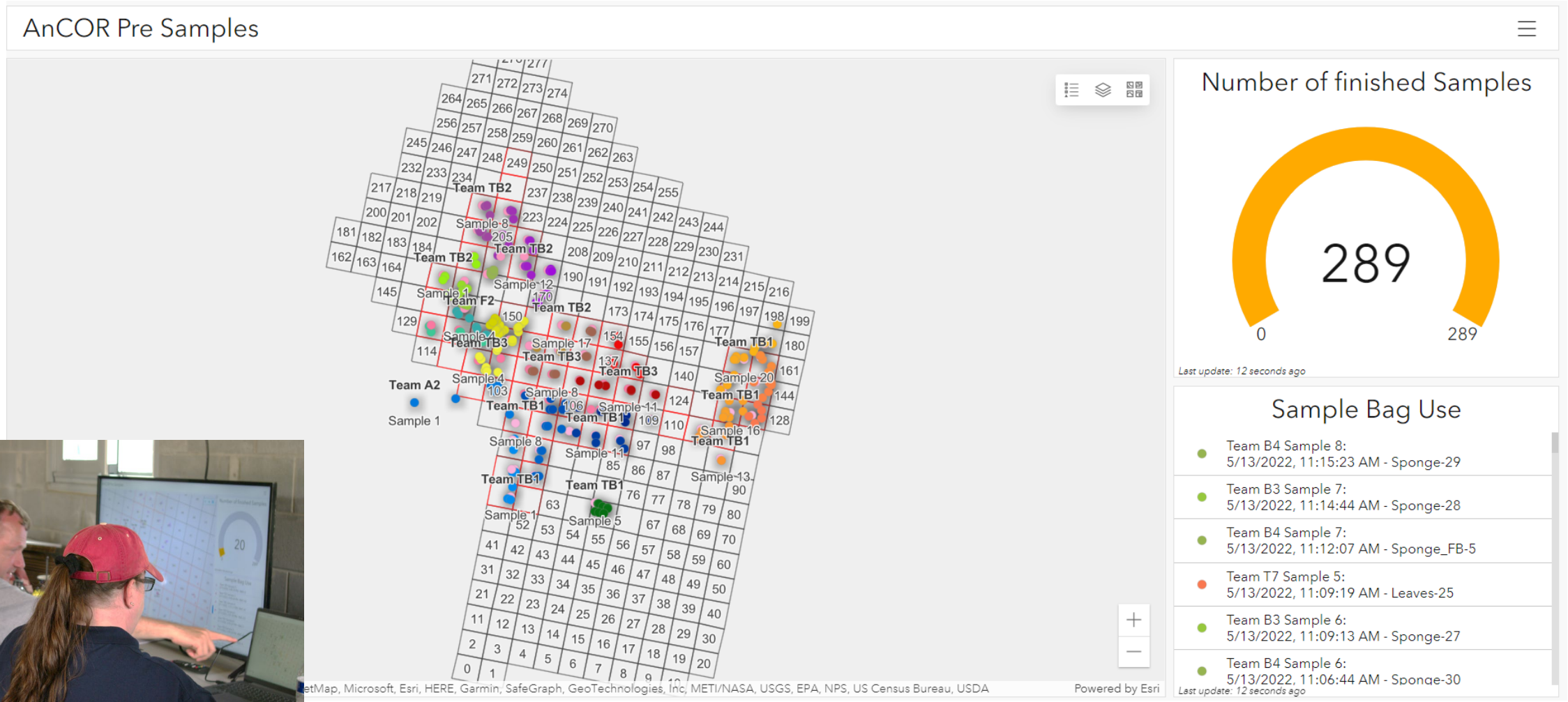
GPS Bin

Tablet Setup and Charging Station

Monitoring Station

Data Management Station

Realtime Monitoring of Sample Collection



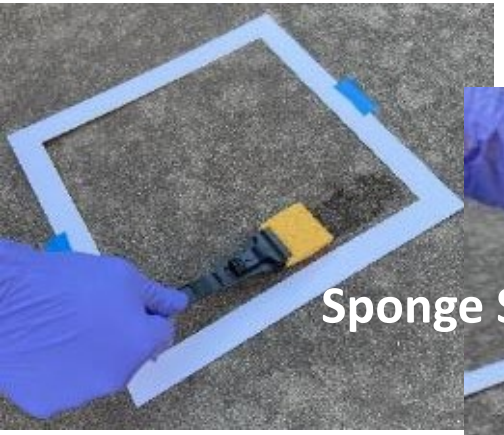
Sampling Objectives

- **Demonstrate the ability to scale-up traditional biological sampling methods in an outdoor setting**
- **Test newly developed and/or non-traditional sampling methods in an outdoor setting**

Three rounds of sampling:

- ***Background:*** Determine the presence of background concentrations of *Bg* spores prior to inoculation
- ***Pre-Decon:*** Characterize the magnitude of *Bg* contamination following inoculation
- ***Post-Decon:*** Determine if application of the decontamination chemicals effectively reduced contamination compared to pre-decon levels

Biological Sampling Methods



Sponge Sticks

Grab: Grass
(new/experimental)

Air: Dry Filter Unit (DFU)

Grab: Ground Litter

Grab:
Leaves

Grab: Gravel

37-mm filter cassette
(microvacuum)

(new/experimental)

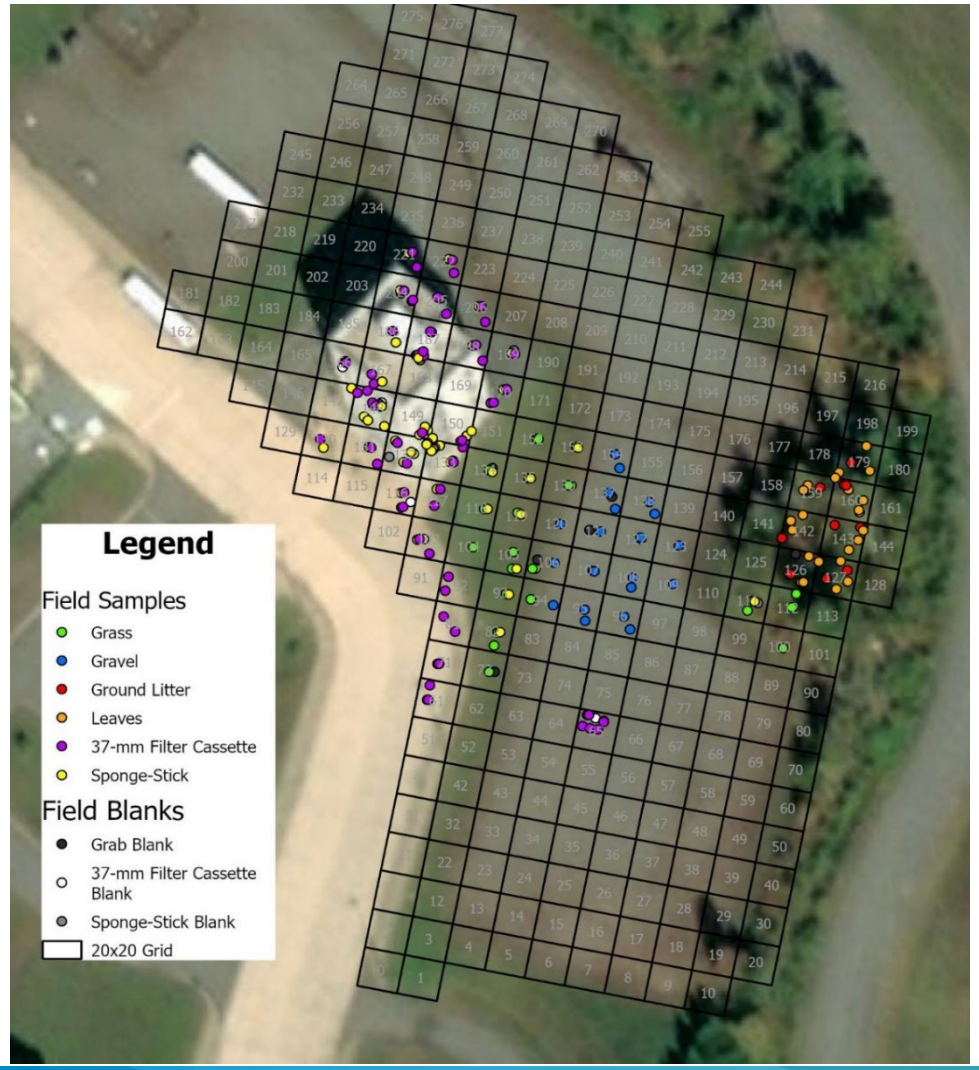
Grab, 37-mm Filter Cassette, and Sponge Stick Samples

Background Sampling

- **35** field samples and **6** field blanks
- **9** media blanks
- Samples were collected in a subset of the WAD study area

Pre- and Post-Decon Sampling

- **200** field samples and **20** field blanks *each*
- **11** media blanks *each*
- Pre- and Post-Decon Samples were paired to compare results before and after decontamination
- A subset of the samples were collected outside the contamination zone



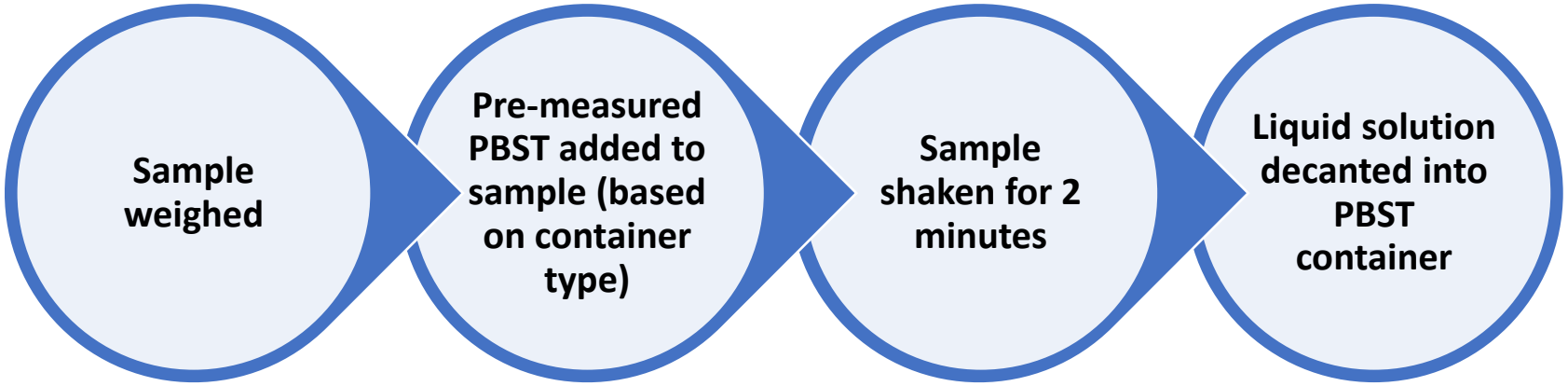
879 total samples collected

Dry Filter Unit (DFU) Samples

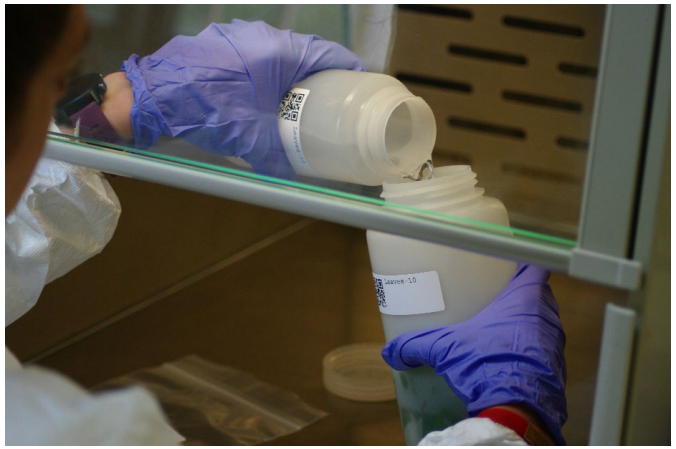
- **10 DFUs (yellow)** were positioned around the perimeter of the study area each day the site was operational
  - 10 days for a total of **100 DFU samples** collected over background, inoculation, pre-, and post-decon sampling, decontamination and waste days
- **3 DFUs (blue)** were used around the waste sampling area at end of study (**3 samples**)
- **20 field** and **13 media blanks** were collected

Grab Sample Onsite Processing

- Grab samples *(grass, gravel, ground litter, leaves, and waste grab samples)* were processed on-site prior to laboratory shipment

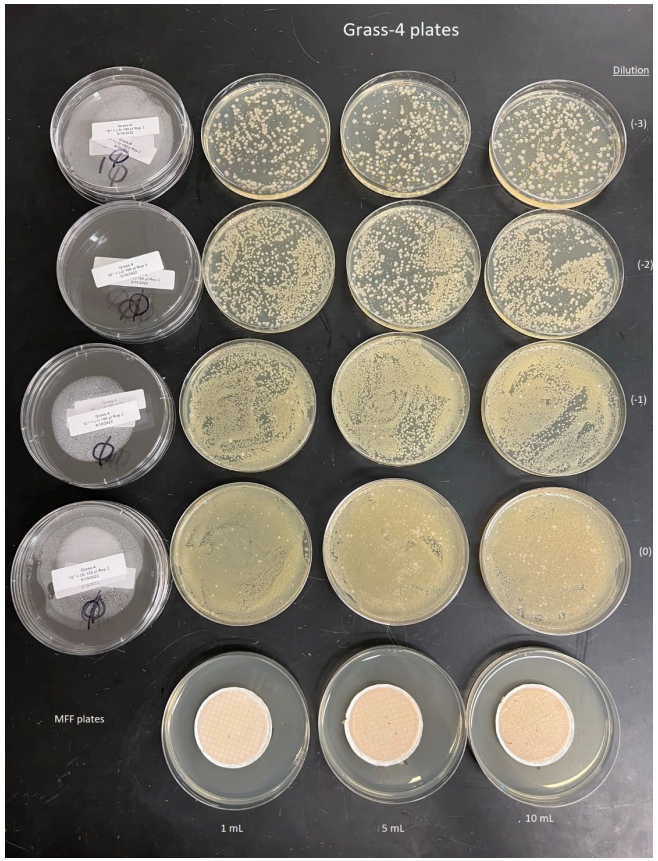


- Only the decanted solution was shipped to the laboratory for analysis



Sample Analysis and CFU Calculation

- Majority of the samples were cultured using spread plates and microfunnel filter plates
- Number of colonies indicative of *Bg* were counted on plates and results provided in number of colony forming units (CFU)
- Samples analyzed at:
  - EPA RTP Lab
  - LRN
  - CDC



Decontamination

- Objectives:
  - Conduct environmental decontamination in an urban setting, and at a real-world scale
  - Evaluate the efficacy and feasibility, in a variety of settings
  - Understand cost and time required
  - Understand pinch points and limitations

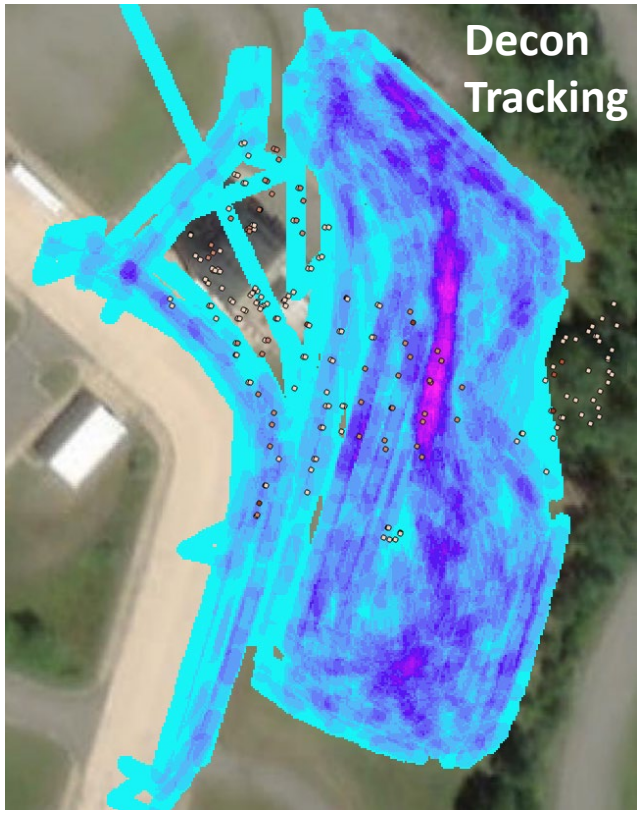
Decontaminants

- **Calcium Hypochlorite (HTH)**
- 30 lbs per 100 gallons (25,000 ppm)
- Applied to hardened surfaces
- Readily-available as pool shock
- Long shelf-life
- Solubility in water = time
- Mixing challenge with tank saddles on 500 gal-tank

- **Peroxyacetic Acid (PAA)**
- Applied to vegetation (grass & trees)
- Commercially-available as agricultural pesticide
- 15% Peroxyacetic Acid, 22% Hydrogen Peroxide
- Mixes easily with water

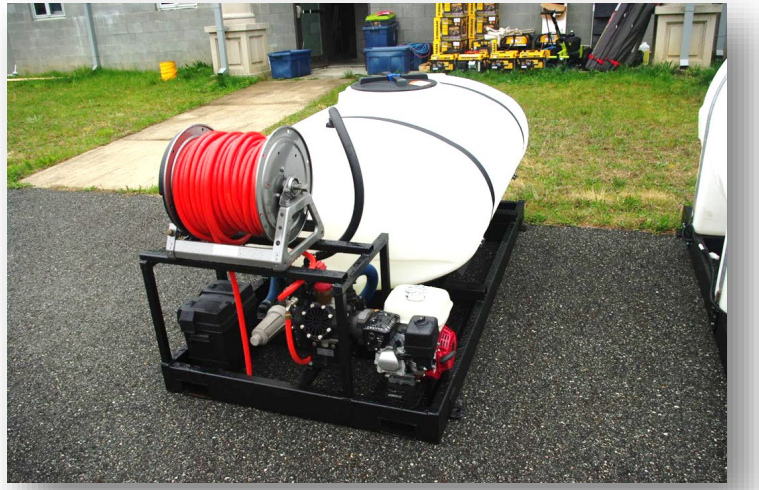
Decontamination – Horizontal Surfaces

- COTS Sprayer
- 500-gallon tank
- Chemical Resistant Pump



Decontamination – Vertical Surfaces

- COTS Sprayer
- 300-gallon tank
- Chemical Resistant Pump
- 40’ boom lift for building



Decontamination – Summary of Operations

- HTH - applied 685 lbs (2,250 gallons)
- PAA – applied 60 gallons of 15% PAA at 30:1 dilution (1,800 gallons)
- Overall – ~34 gallons decon applied per 1,000 ft^2 (4,050 gallons over 120,000 ft^2)
- 12 hours decon operations, 61 person-hours
- All decon units ~0.5 person-hours per 1,000 ft^2

Rationale for On-site Waste Treatment

- Wide-area biological response likely to generate large quantities of solid and aqueous waste
- Category A infectious agent-containing waste requires very stringent packaging and shipping requirements
- If waste can be treated on-site and designated as conventional solid waste, it can be transported to treatment/disposal facilities using same protocols as municipal solid waste

Waste Management

- Placed waste bags into 20 yd^3 roll-off
- Encapsulated roll-off and waste under a tarp
- Fumigated roll-off using chlorine dioxide
- Post decon samples were then collected
- Gas sample lines in 2 bags and one in roll-off container
- Temperature and relative humidity monitored with real-time monitors
- ClO_2 monitored via titration

Waste Sample Results Summary

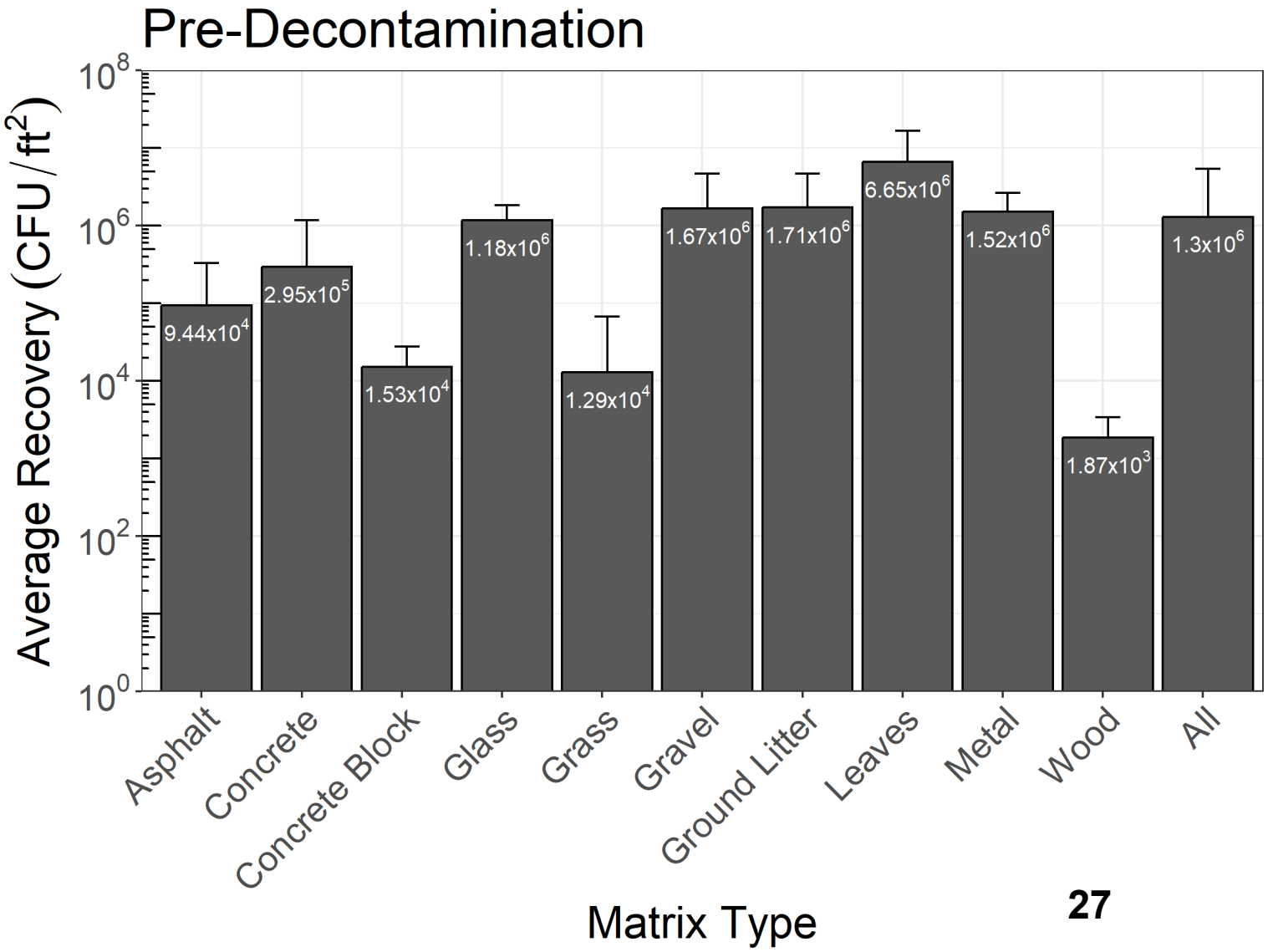
Waste Material	Acquisition Method	Post-Fumigation Detections
Carpet	Nalgene Bottle, Stomacher Bag	1/3
High Density Polystyrene	Stomacher Bag	0/3
PPE - Nitrile Gloves	Conical Tubes	0/3
PPE - Tyvek	Nalgene Bottle, Stomacher Bag	0/3
Other -- Rusty Nail	Conical Tubes	0/2
Other -- Dry jacket	Nalgene Bottle, Stomacher Bag	0/3
Other -- Life jacket	Nalgene Bottle, Stomacher Bag	0/3
Other -- Swim fin	Sponge Stick	0/2
Rope	Nalgene Bottle, Stomacher Bag	0/6
Vinyl Boat Seat Material	Nalgene Bottle, Stomacher Bag	0/3
Wood	37mm Vacuum	1/3
Biological Indicator*		0/6

*: Biological indicator pre-decon: 4/4

Pre-Decon Sample Results

- 92% (184/200) had detectable spores
- Highest recoveries from glass, gravel, ground litter, leaves, and metal (10^6 CFU/ft^2)
- Only 1 non-detect from microvac

Category	# Samples	Percent
Detect	137	68.5%
Adjusted Detect	47	23.5%
Indeterminate	15	7.5%
Non-Detect	1	0.5%

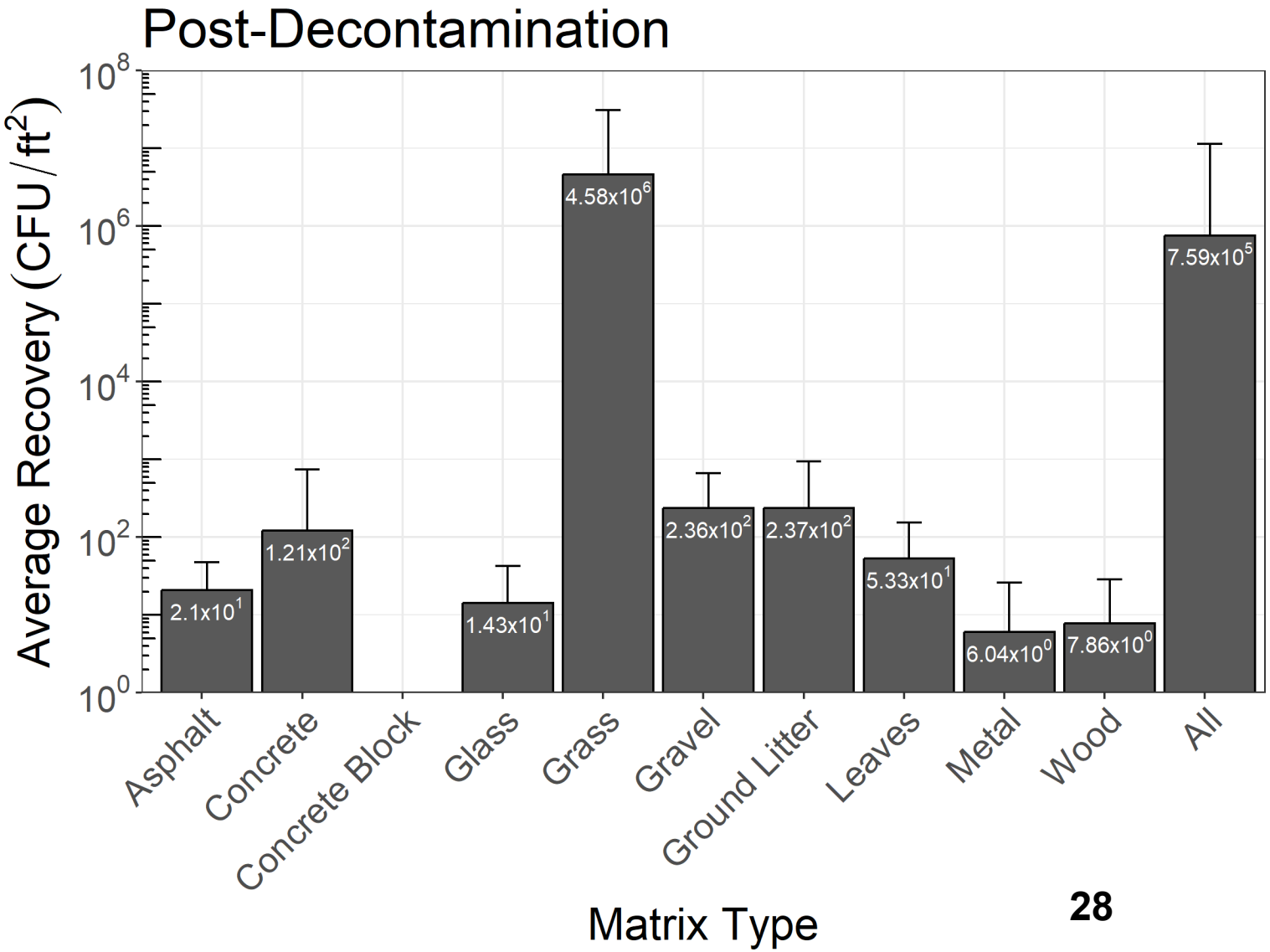


Post-Decon Sample Results

***1 post-decon sponge-stick did not make it back to the lab….**

- 19% (38/199) had detectable spores
- Grass samples had the highest detectable recoveries (10^6 CFU/ft^2)
- Remaining sample matrices had much lower recoveries post-decon (10^0-10^2 CFU/ft^2)
- 71 out of 79 of grab samples were indeterminate

Category	# Samples	Percent
Detect	4	2%
Adjusted Detect	34	17%
Indeterminate	89	45%
Non-Detect	72	36%



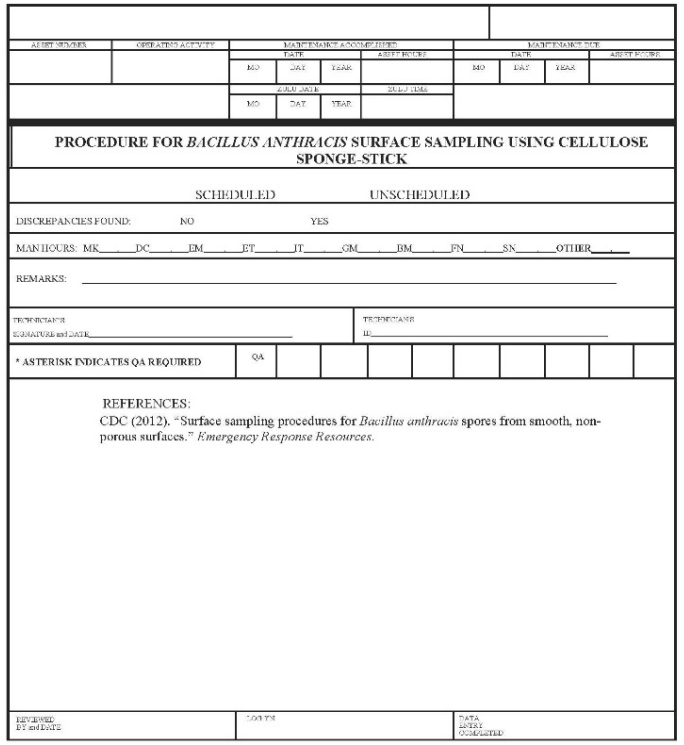
Summary

- Conducted field-scale study in an urban environment to build, improve, and evaluate capabilities for a wide area biological incident.
- Recently-developed data management tools worked well and have applications to other environmental responses.
- Vegetation sampling and analysis gaps remain – continuing to develop and test solutions.
- Decontamination reduced the contamination levels ~10^2-10^4 CFU/ft^2 depending on surface type.
- COTS equipment expedited decontamination operations.
- Novel in-situ waste treatment approach showed potential.

Transition of Knowledge Guidance Document(s) – In progress

Compiling info into guidance documents that USCG and other federal agencies can use for a biological agent incident remediation

- Focus on USCG assets
- General concepts will apply to wide area remediation



PROCEDURE FOR *BACILLUS ANTHRACIS* SURFACE SAMPLING USING CELLULOSE SPONGE-STICK

SCHEDULED UNSCHEDULED

DISCREPANCIES FOUND: NO YES

MAN HOURS: MK_____DC_____EM_____ET_____JT_____GM_____BM_____FN_____SN_____OTHER_____

REMARKS: _____

* ASTERISK INDICATES QA REQUIRED

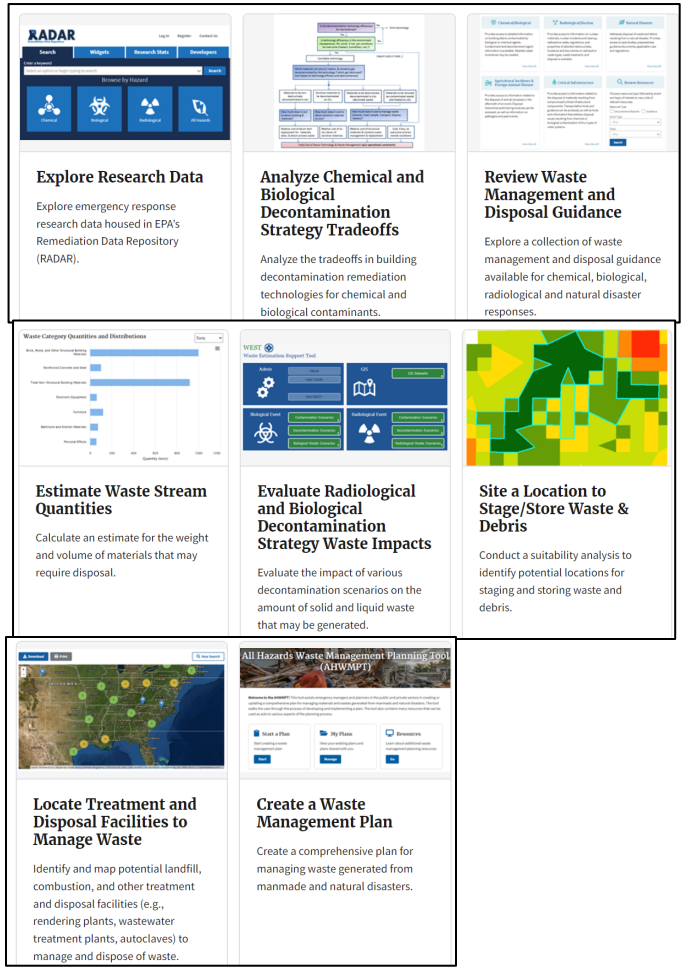
QA

REFERENCES:

CDC (2012), "Surface sampling procedures for *Bacillus anthracis* spores from smooth, non-porous surfaces." *Emergency Response Resources.*

Dashboard of Tools (In progress)

- Development of dashboard of (software) tools to support biological agent response decisions
  - Existing Tool and System Evaluation
  - Develop standardized framework
    - To guide the development of the integrated online toolbox
    - To guide development of future decision support tools
  - Tool updates and (new) development of tools



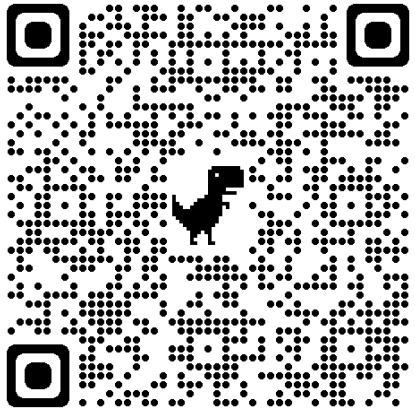
https://www.epa.gov/emergency-response-research/decision-support-tools-incident-response

Training and Tabletop Exercises (FY23 and FY24)

- To be held at three USCG National Strike Force (NSF) locations
  - Pacific Strike Team – Completed SEP 2023
    - Novato, CA
  - Gulf Strike Team – APR 2024
    - Mobile, AL
  - Atlantic Strike Team
    - Joint Base McGuire-Dix Lakehurst, NJ

AnCOR Publications

- Journal articles
- EPA reports
- Technical Summaries



Emergency Response Research

EPA's emergency response and homeland security research provides science and technology needed to effectively respond to and recover from disasters. Natural and man-made disasters, whether intentional or unintentional, can result in contamination that threatens human health, the environment, and our economy. Communities must be resilient to avoid such catastrophes. Resilience requires scientific information to support good decisions.

Research Areas

- Water Security
- Environmental Sampling & Analysis
- Contaminant Fate, Transport & Exposure
- Cleanup & Remediation
- Waste Management
- Community Resilience
- Oil Spills
- Wildfires

Outreach

- Engagement Opportunities
- Emergency Response Research Webinar Series
- International Decontamination Research & Development Conference
- Technical Support to States and Territories
- Meet Our Researchers
- All Research Events

Models, Tools & Applications

- Decision Support Tools for Incident Response
- Environmental Sampling and Analytical Methods (ESAM)
- Environmental Resilience Tools Wizard
- Water Infrastructure Modeling Tools
- Search More Science Models and Research Tools

Publications

- Technical Briefs
- All Emergency Response & Homeland Security Publications
- EPA's Science Inventory

Save the Date!

EPA's Decon Conference is December 5-7, 2023

Visit the conference website for more information and to sign up for email alerts.

https://www.epa.gov/emergency-response-research

https://www.epa.gov/emergency-response-research/analysis-coastal-operational-resiliency

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