EPA Chemical, Biological, Radiological, Nuclear (CBRN) Consequence Management Advisory Team (CMAT)

Regional Response Team Meeting
April 16, 2025

Presented by: Kristy Galaleo, Larry Kaelin, and Charlie Miller

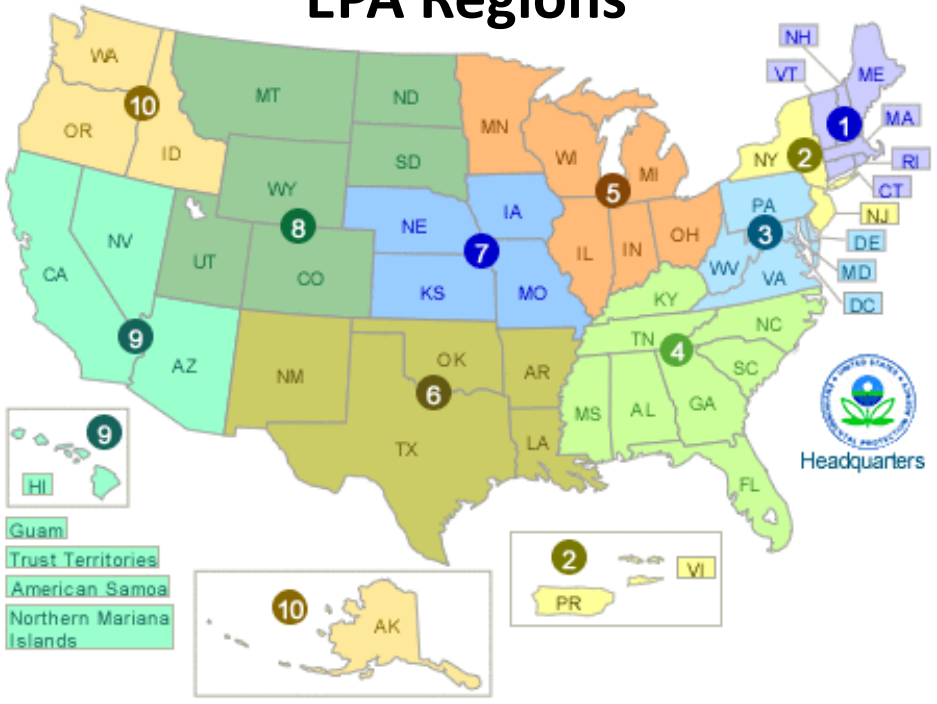
Presentation Overview

- EPA CBRN CMAT Background and Mission
- EPA CBRN Subject Matter Experts
  - Subject Matter Expertise
  - Training, Exercises, Field Studies
  - National Workgroups and Knowledge Products
- EPA CBRN Field Assets
  - PHILIS Mobile Laboratories
  - Environmental Response Laboratory Network
  - ASPECT Aerial Detection
- How to get CMAT Support

CMAT Background

- CMAT is an EPA Special Team that provides unique, specialized expertise in support of the 10 EPA Regions
- CMAT is EPA's response capability for civil CBRN national security incidents that occur domestically

EPA Regions



CMAT Mission

Provide 24/7/365 support during the consequence management phase of CBRN incidents, including characterization of contaminants, decontamination, clearance/re-occupancy guidance, and waste management.

- *Technical assistance and advice, as well as personnel*
- *Assets and response capabilities*

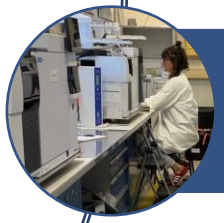
CBRN Focused But All-Hazard Capable

- Surge capacity support to Regions for non-CBRN incidents

CMAT Capabilities

Subject Matter Experts (SMEs) – CBRN SMEs provide on-site support during a response, conduct large scale exercises, and develop response guidance, training, and best-practices

Portable High-Throughput Integrated Laboratory Identification System (PHILIS) – suite of mobile laboratories with highly sensitive confirmatory analytical capabilities for chemical agents (traditional, fourth generation, pharmaceutical-based)



Environmental Response Laboratory Network (ERLN) – network of 140 public and private laboratories with CBRN capabilities; member of the Integrated Consortium of Laboratory Networks (ICLN)

Airborne Spectral Photometric Environmental Collection Technology (ASPECT) – near real-time chemical, radiological, and photographic data collection from a fixed wing aircraft

EPA CBRN Subject Matter Experts (SMEs)

CMAT Subject Matter Expertise

CMAT has a variety of SMEs available to provide CBRN specific assistance to the Regions

- Expertise: Sampling and monitoring, decontamination, toxicological and risk assessment support, data management, and waste transportation/disposal
- Develop National Security Strategies (guidelines, SOPs, best practices) and response trainings
- Provide on-site support during emergency responses

Training

CMAT SMEs have been training On Scene Coordinators (OSCs) and other Federal, State, Local, Tribal and Territorial (FSLTT) response partners for almost two decades.

- **Chemical Warfare Agent (CWA) In-Person Training**
  - Instruction on CWA response basics to all 10 regions and FSLTT partners
- **National BioDefense Strategy Biological Incident Response Training**
  - Training of EPA OSCs on biological agent response
- **OSC Readiness Training**
  - Develop and teach, on average, 4-6 courses per year at OSC Readiness
  - Past courses have included: Biological Agent Response, CWA Response, Toxicology and Risk Assessment, Meteorology for OSCs

Full-Scale Exercises / Field Studies

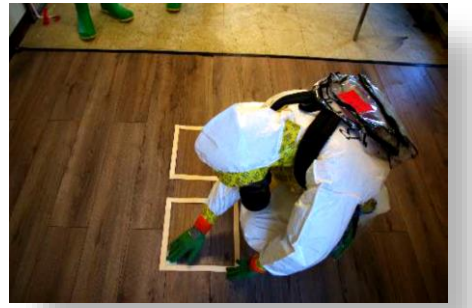
CMAT, building upon EPA's Office of Research and Development (ORD) bench-scale research, has designed and executed field studies to advance and improve responses to chemical and biological threat agent incidents

Field Study Examples

Collaboration within EPA and with other federal agencies to conduct large scale research-based and training-based field exercises

- **Analysis for Coastal Operational Resiliency (AnCOR): 2019-2025**
  - Develop capabilities and strategic guidelines to prepare for a wide-area release of a biological threat agent
  - Test research-based decontamination methods at the field scale, demonstrate remediation of marine assets - rapid return to service, minimal damage to vessels

- **Operational Testing and Evaluation of Chemical Remediation Activities (OTECRA): 2022-2023**
  - Assess CWA remediation methods at the field scale for a commercial building
  - Develop operational and tactical response guidance for a CWA response



CBRN National Workgroups and Products

Lead intra-agency workgroups for CBRN preparedness:

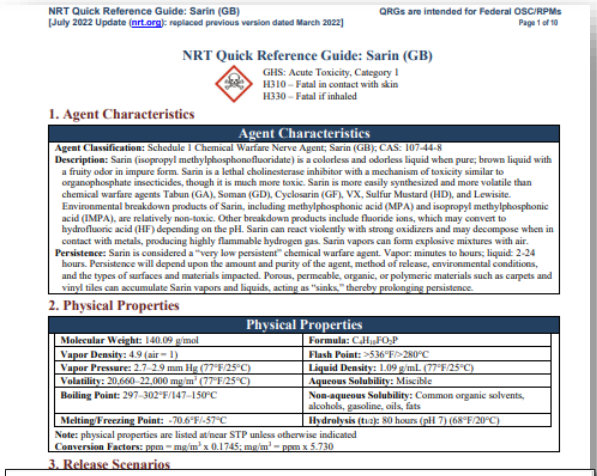
- Chemical Warfare / 4th Gen / Pharmaceutical-based, Biological, Radiological/Nuclear
  - Members include emergency responders from all 10 EPA Regions, representatives from EPA's Homeland Security Research Program, and representatives from other EPA Special Teams
  - Identify and eliminate response capability gaps
  - Develop best practices and guidelines to enhance the nation's readiness for CBRN events

Lead inter-agency workgroup for CBRN preparedness:

- Chair the National Response Team CBRN Subcommittee

CMAT develops documents (guidelines, SOPs, best practices) critical for OSC problem-solving

- NRT Quick Reference Guides (QRG)
- Emerging Chemical and Biological Threat Briefings
- Comprehensive Guidebooks and Quick Start Reference Preparedness Documents Agent-Specific Frameworks – Coming soon; Ricin Responses
- White Papers, clarifying the roles of the Environmental Clearance Committee and Technical Work Groups identified in EPA's Incident Management Handbook
- Revisions and updates to the H&S ER Manual's chapter on Chemical Warfare and Biological Agents
- Developing new chemical and biological agent decontamination lines


NRT Quick Reference Guide: Sarin (GB)

[July 2022 Update (nrt.org): replaced previous version dated March 2022]

QRGs are intended for Federal OSC/RPMs

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NRT Quick Reference Guide: Sarin (GB)

GHS: Acute Toxicity, Category 1
H310 – Fatal in contact with skin
H330 – Fatal if inhaled

1. Agent Characteristics

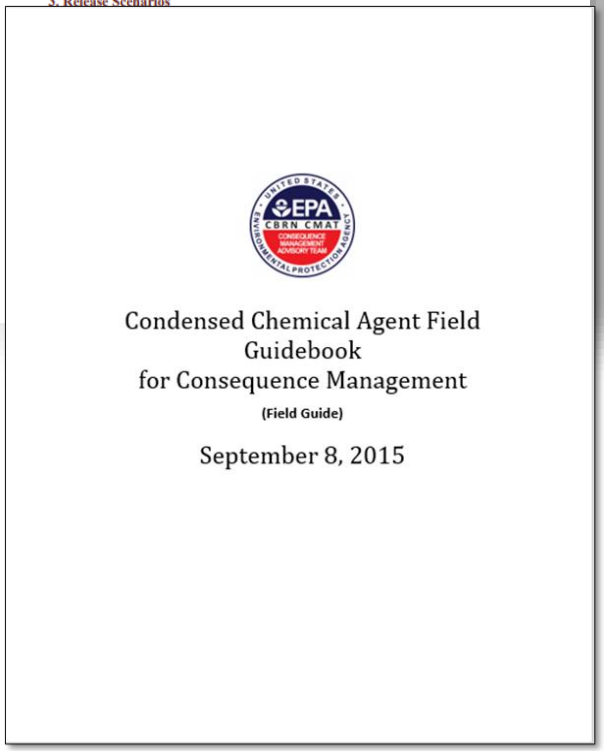
Agent Characteristics
Agent Classification: Schedule 1 Chemical Warfare Nerve Agent; Sarin (GB); CAS: 107-44-8
Description: Sarin (isopropyl methylphosphonofluoridate) is a colorless and odorless liquid when pure; brown liquid with a fruity odor in impure form. Sarin is a lethal cholinesterase inhibitor with a mechanism of toxicity similar to organophosphate insecticides, though it is much more toxic. Sarin is more easily synthesized and more volatile than chemical warfare agents Tabun (GA), Soman (GD), Cyclosarin (GF), VX, Sulfur Mustard (HD), and Lewisite. Environmental breakdown products of Sarin, including methylphosphonic acid (MPA) and isopropyl methylphosphonic acid (IMPA), are relatively non-toxic. Other breakdown products include fluoride ions, which may convert to hydrofluoric acid (HF) depending on the pH. Sarin can react violently with strong oxidizers and may decompose when in contact with metals, producing highly flammable hydrogen gas. Sarin vapors can form explosive mixtures with air.
Persistence: Sarin is considered a "very low persistent" chemical warfare agent. Vapor: minutes to hours; liquid: 2-24 hours. Persistence will depend upon the amount and purity of the agent, method of release, environmental conditions, and the types of surfaces and materials impacted. Porous, permeable, organic, or polymeric materials such as carpets and vinyl tiles can accumulate Sarin vapors and liquids, acting as "sinks," thereby prolonging persistence.

2. Physical Properties

Physical Properties	
Molecular Weight: 140.09 g/mol	**Formula:** $C_4H_{10}FO_2P$
Vapor Density: 4.9 (air = 1)	**Flash Point:** >536°F/>280°C
Vapor Pressure: 2.7–2.9 mm Hg (77°F/25°C)	**Liquid Density:** 1.09 g/mL (77°F/25°C)
Volatility: 20,660–22,000 mg/m³ (77°F/25°C)	**Aqueous Solubility:** Miscible
Boiling Point: 297–302°F/147–150°C	**Non-aqueous Solubility:** Common organic solvents, alcohols, gasoline, oils, fats
Melting/Freezing Point: -70.6°F/-57°C	**Hydrolysis** ($t_{1/2}$): 80 hours (pH 7) (68°F/20°C)

Note: physical properties are listed at/near STP unless otherwise indicated
Conversion Factors: ppm = mg/m³ x 0.1745; mg/m³ = ppm x 5.730

3. Release Scenarios


Condensed Chemical Agent Field Guidebook
for Consequence Management
(Field Guide)
September 8, 2015

EPA CBRN Field Assets

EPA's Analytical Mobile Asset

Portable High-throughput Integrated Laboratory Identification System (PHILIS)

EPA's suite of mobile laboratories for on-site analysis of environmental samples for toxic chemicals: CWAs, Opioids, and organic Toxic Industrial Chemicals (TICs).

- **ALL HAZARDS RESPONSE** – Natural disasters, accidental and intentional releases.
- Detection limits down to human health risk-based clearance levels.
- NELAP Accredited Laboratories – confirmatory analysis

PHILIS Information

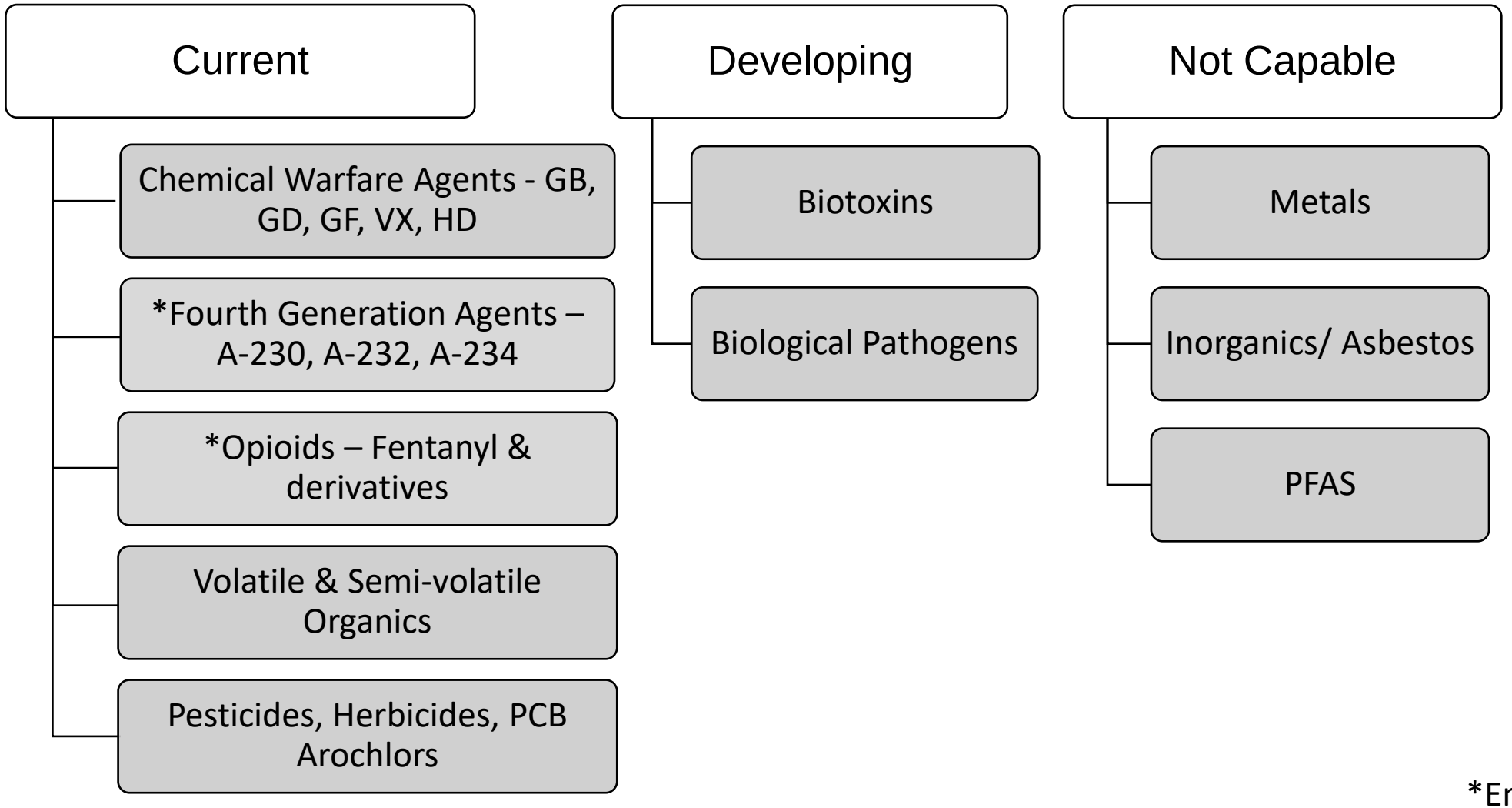
Description

- Suite of 7 mobile laboratory vehicles (PHILIS 2.0 10 lab containers)
- Based in two strategic locations to maximize access to the entire continental US (NJ and CO)
- Up to 100 samples per day
- Matrices: Soil, surface/ground water, drinking water, air, wipes
- Low limits of detection suitable for environmental clearance
- Preliminary data within 24-48 hours, QA Level IV data within 14 days
- Allows for timely and effective decision-making during responses

Deployment

- 24/7/365 deployment capabilities
- On the road within 6 hours of a deployment request
- Can operate using internal generators for 4 days before restocking supplies and fuel

PHILIS Chemical Analysis Capabilities



*Emerging threats

Emerging Threats: Fourth Generation Agents (FGAs)

- PHILIS West stores dilute (5 ppm) standards of A-230, A-232, and A-234 on-site for routine method development and proficiency testing.
- The EPA has worked with research staff from Lawrence Livermore National Lab (LLNL) Chemical Forensics Laboratory on analytical methods for environmental sample matrices. LLNL currently supplies EPA with the standards for both traditional CWAs and FGAs. Currently pursuing similar arrangement with CCDC-CBC to supply standards.
- The PHILIS program has documented enhanced H&S protocols established for handling the FGA standards.

Other Emerging Threats:

Pharmaceutical Based Agents (PBAs)
How Much Does it Take?

2-3 milligrams of Fentanyl can induce respiratory depression or arrest and possibly death

Current Opioid Run by PHILIS Labs with Draft Method Detection Limits (MDL)

	MDL			Reporting Limit
Analyte	**Wipes (µg/Wipe)**	**Water (µg/L)**	**Soil (µg/kg)**	**Wipes (µg/Wipe)**
Fentanyl	0.0004185	0.0148	0.0321	0.001
Carfentanil	0.0003285	0.0275	0.0642	0.001
Diacetylmorphine (Heroin)	0.004635	0.474	1.038	0.1
Remifentanyl	0.000963	0.0692	0.1458	0.005
Acetylfentanyl	0.0002535	0.0173	0.0963	0.002
Sufentanil	0.0002505	0.0293	0.0342	0.002
Alfentanil	0.0004935	0.0279	0.0399	0.01
CalEPA DRAFT fentanyl remediation goal is < 0.100 µg / 100 cm^2 (Salocks, 2017)				

PHILIS RRT 5 Deployment Estimates

- R5 RRT Scenario – NJ PHILIS labs could arrive from Edison, NJ to the Columbus, OH area within ~14 hours after notification
- PHILIS typically ready to accept samples ~ 24 hours after being on site, will be to yield preliminary data for immediate on-site decision-making purposes
- Currently NJ PHILIS labs aren't allowed to store chemical agent standards at their Edison location, thus standards would be shipped to PHILIS on-site. Example: agent standards were sent out for the 2024 RNC and DNC, to the R5 warehouse outside of Chicago
- PHILIS can generate SCRIBE compatible EDD data files to share with the ICS EU
- Sample throughput typically 50-100 samples/day depending on sample types, analyte, and staffing
- New PHILIS laboratory platforms are currently being constructed and will be delivered by January 2026 – these will be iso-container laboratories that could be transported by air, rail, or commercial truck
    - Potentially shorter deployment times, especially if military transport is an option

Next Generation of PHILIS (PHILIS 2.0)

Objective

Modernize PHILIS by transitioning from vehicle-based laboratory platforms to deployable ISO container laboratories.

Purpose

- Allow for OCONUS deployments – i.e., equitable response capabilities
- Replace vehicle-based platforms that are over 20 years old and no longer cost effective to repair.

PHILIS - BIO

Objective

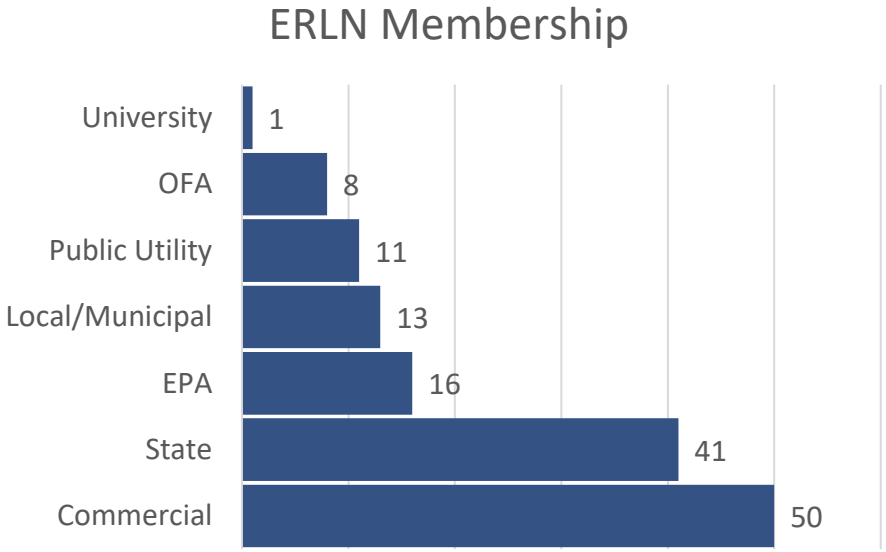
Establish a PHILIS laboratory with the capability to perform biological assays in the field

Purpose

Provide a 24/7/365 mobile laboratory response capability to EPA emergency responders to support onsite response and remediation activities related to biological agent/toxin incidents

Environmental Response Laboratory Network (ERLN)

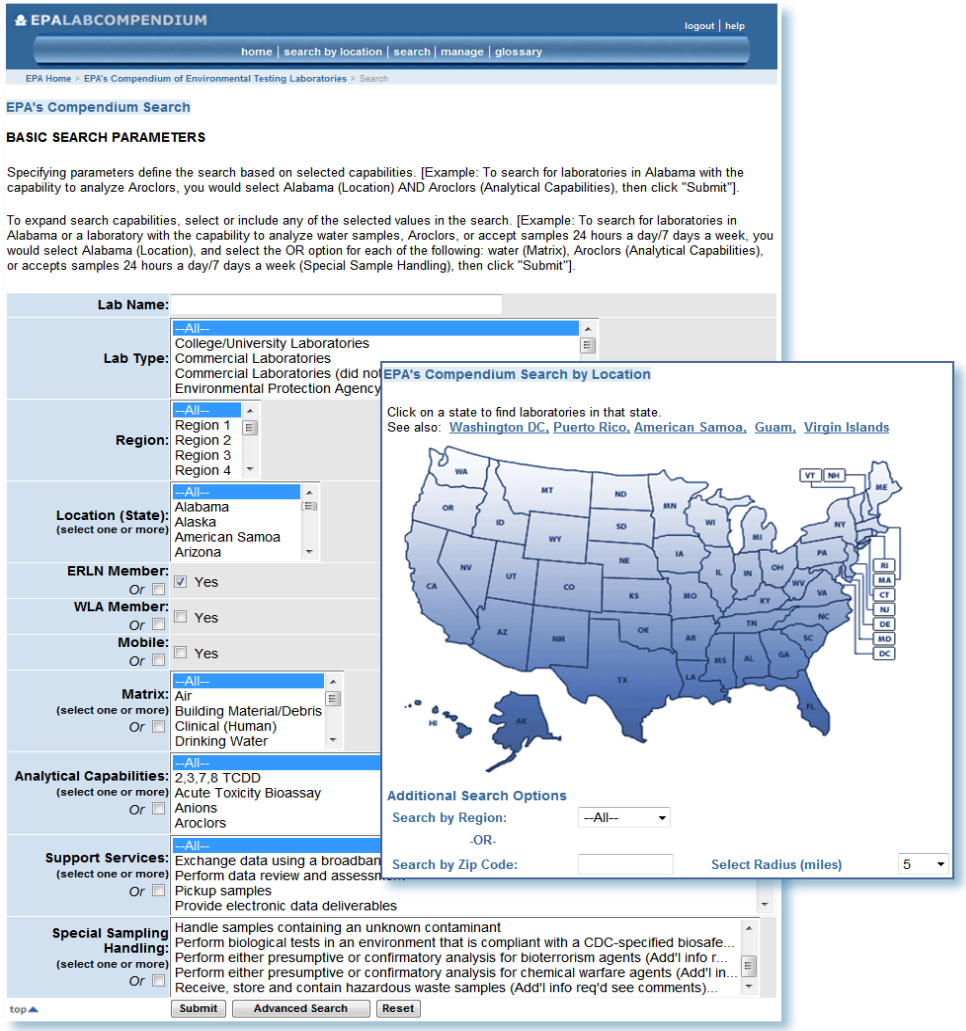
- Laboratory network supporting the emergency response community by providing analysis of CBRN contaminants in environmental samples.
- Can be used to support incidents of any scale during preparedness, response, and remediation phases.



- Provides rapid support from a network of laboratories with known data quality.
- Current membership: 140
- The ERLN is part of the larger interagency Integrated Consortium of Laboratory Networks – a partnership of 9 federal agencies and 7 federal CBRN laboratory networks established to provide coordinated laboratory support for a wide-area CBRN incident.

Compendium of Environmental Testing Laboratories (CETL)

- https://cfext.epa.gov/cetl/
- Searchable compendium for rapid identification of ERLN and other laboratory resources
  - Capabilities
  - Capacities
  - Certifications
  - Instrumentation
- CETL searches are customized for the situational analytical need
- CBRN CMAT verifies capabilities and capacities of identified labs
- Contains labs that are not in ERLN and non-CBRN capabilities of labs
- CETL is being replaced by a newer system in 2025



EPA's Aerial Detection Asset

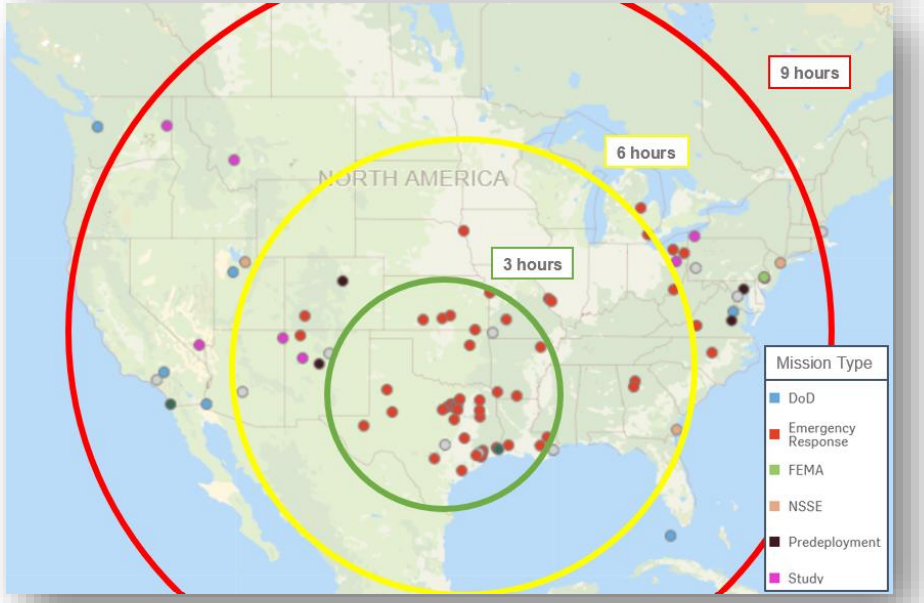
Airborne Spectral Photometric Environmental Collection Technology (ASPECT)

Description

- Airborne sensing system for chemical, radiological, thermal, and photographic data collection during emergency responses.
- Enhances situational awareness.
- Supports decision-making processes.

Advantages

- Near real-time data collection.
- Airborne deployment allows for rapid assessment of large areas.



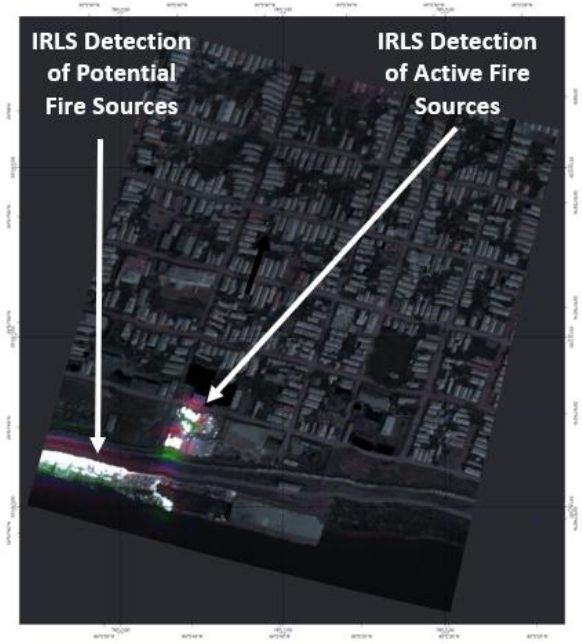
ASPECT Capabilities

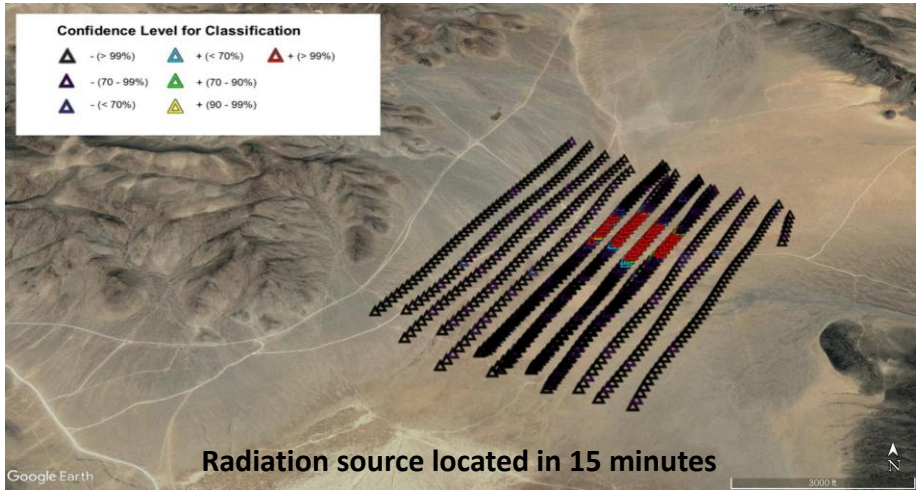
Deployment

- Stationed near Dallas, TX
- Available 24/7/365
- 1 hour to wheels up
- 0-9 hours to reach any location in the contiguous U.S.
  - ~5 hrs from notification to reach Columbus, OH

Analytical and Other Capabilities

- TIC/CWA Plume Detection and Identification
- Surface Oil Detection and Imaging
- Radiological Surveying and Source Location
- Thermal Imaging
- Orthogonal and oblique high-resolution aerial photography





ASPECT Deployments

- Chemical releases
  - Includes plume imaging and characterization
- Post-disaster wide-area chemical survey
  - Typically, this type of work is conducted in support of hurricane responses
- Radiological surveys
  - Either characterization of legacy sites or searching for previously unknown contamination
- Surface oil detection and characterization
  - Note: this capability is only effective over large bodies of water
- Thermal imaging of fires

Current Automated Compound List - Detection Limits in PPM(m)

Acetic Acid (2.0)	Cumene (23.1)	Isoprene (6.5)	Phosphine (8.3)
Acetone (5.6)	Diborane (5.0)	Isopropanol (8.5)	Phosphorus Oxychloride (2.0)
Acrolein (8.8)	1,1-Dichloroethene (3.7)	Isopropyl Acetate (0.7)	Propyl Acetate (0.7)
Acrylonitrile (12.5)	Dichloromethane (6.0)	MAPP (3.7)	Propylene (3.7)
Acrylic Acid (3.3)	Dichlorodifluoromethane (0.7)	Methyl Acetate (1.0)	Propylene Oxide (6.8)
Allyl Alcohol (5.3)	1,1-Difluoroethane (0.8)	Methyl Acrylate (1.0)	Silicon Tetrafluoride (0.2)
Ammonia (2.0)	Difluoromethane (0.8)	Methyl Ethyl Ketone (7.5)	Sulfur Dioxide (15)
Arsine (18.7)	Ethanol (6.3)	Methanol (5.4)	Sulfur Hexafluoride (0.07)
Bis-Chloroethyl Ether (1.7)	Ethyl Acetate (0.8)	Methylbromide (60)	Sulfur Mustard (6.0)
Boron Tribromide (0.2)	Ethyl Acrylate (0.8)	Methylene Chloride (1.1)	Sulfuryl Fluoride (1.5)
Boron Triflouride (5.6)	Ethyl Formate (1.0)	Methyl Methacrylate (3.0)	Tetrachloroethylene (10)
1,3-Butadiene (5.0)	Ethylene (5.0)	MTEB (3.8)	1,1,1-Trichloroethane (1.9)
1-Butene (12.0)	Formic Acid (5.0)	Naphthalene (3.8)	Trichloroethylene (2.7)
2-Butene (18.8)	Freon 134a (0.8)	n-Butyl Acetate (3.8)	Trichloromethane (0.7)
Carbon Tetrachloride (0.2)	GA (Tabun) (0.7)	n-Butyl Alcohol (7.9)	Triethylamine (6.2)
Carbonyl Fluoride (0.8)	GB (Sarin) (0.5)	Nitric Acid (5.0)	Triethylphosphate (0.3)
Carbon Tetraflouride (0.1)	Germane (1.5)	Nitrogen Mustard (2.5)	Trimethylamine (9.3)
Chlorodifluoromethane (0.6)	Hexafluoroacetone (0.4)	Nitrogen Trifluoride (0.7)	Trimethyl Phosphite (0.4)
Chloromethane (12)	Isobutylene (15)	Phosgene (0.5)	Vinyl Acetate (0.6)

Need CBRN Help?

CBRN CMAT 24/7 Phone Duty Officer

CMAT@epa.gov

(202) 250-8770

https://www.epa.gov/emergency-response/cbrn-consequence-management-advisory-team

Region 5 CMAT Liaison

Primary: Kristy Galaleo (202) 731-2671

Secondary: Christina Langlois-Miller (202) 853-7765