In-Situ Burn Emissions

Process
Public Health Considerations
Air Monitoring

Incident Objective :

Protect Public Health

- direct contact
- inhalation/ingestion
- ISB emissions

In Situ Burning Guidelines For Alaska

Revision 1 August 2008

Process Elements:
Use model (ALOFT-FT) to predict "**Safe Distance**"

Followed by:

- Trial Burns
- Notifications
- Visual Monitoring
- Air Monitoring(SMART)
- Extinguishment

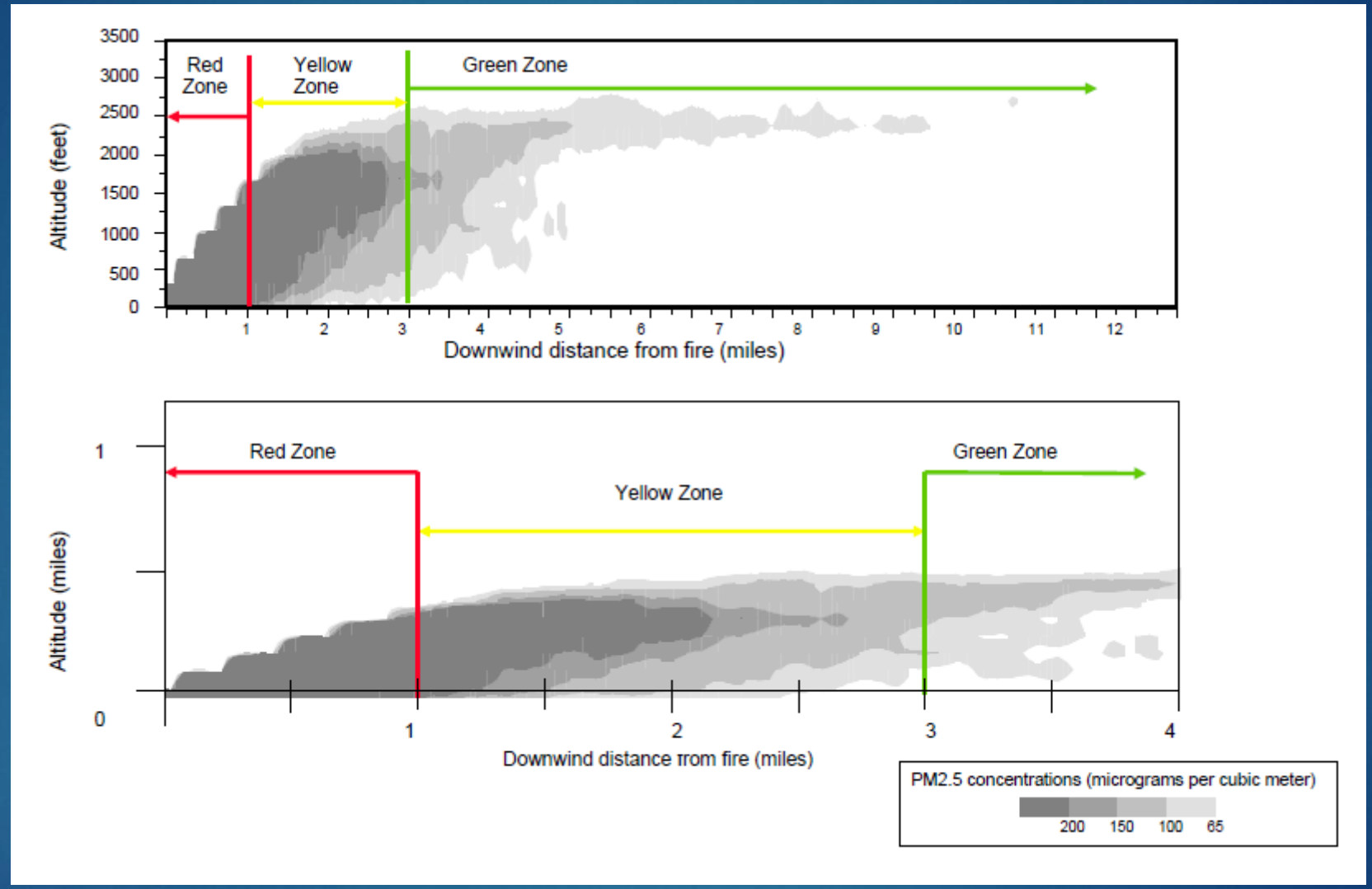
ALOFT-FT

A Large Outdoor Fire plume Trajectory model - Flat Terrain

Safe Distance

Greatest downwind distance at which the smoke plume's particulate matter of 2.5 microns or less in diameter ($PM_{2.5}$) diminishes to 35 ug/m^3 averaged over *one hour* at ground level in flat terrain

At that distance concentrations of soot and chemicals in the smoke are well below the National Ambient Air Quality Standards(NAAQS)


Red Zone
Yellow Zone
Green Zone
Altitude (feet)
3500
3000
2500
2000
1500
1000
500
0
1
2
3
4
5
6
7
8
9
10
11
12
Downwind distance from fire (miles)
Red Zone
Yellow Zone
Green Zone
Altitude (miles)
1
0
1
2
3
4
Downwind distance from fire (miles)
PM2.5 concentrations (micrograms per cubic meter)
200
150
100
65

Notifications

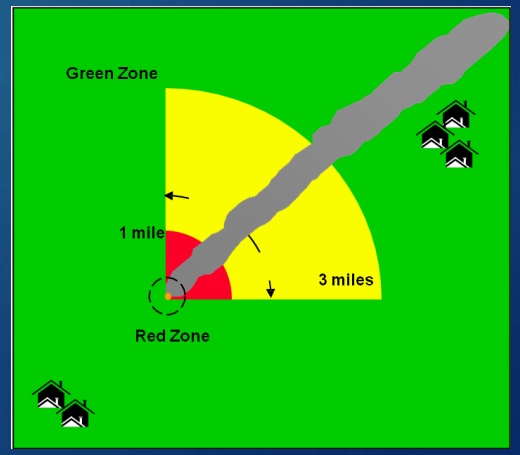
Level 1 – General- Avoid Burn area

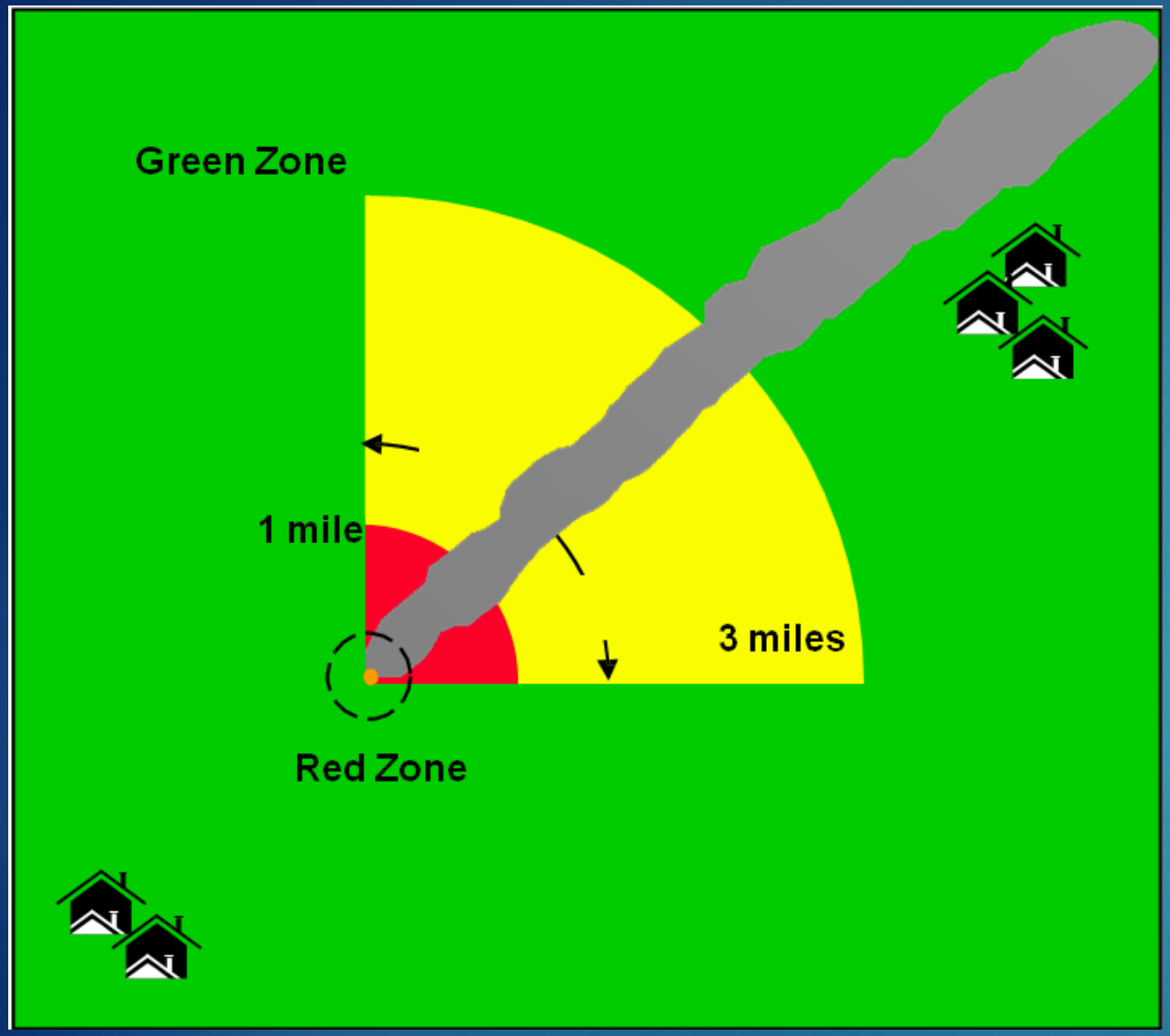
Level 2 -Alert to persons with existing conditions-state air quality alert/warning levels could be exceeded

Level 3-Warning to shelter in place -state air quality alert/warning levels could be exceeded (**yellow zone**)

Level 4- evacuation/relocation -state air quality alert/warning levels could be exceeded **(yellow or red)**

Use of 3 mile SAFE DISTANCE (only burn in green zone)should preclude Notifications in Levels 2-4





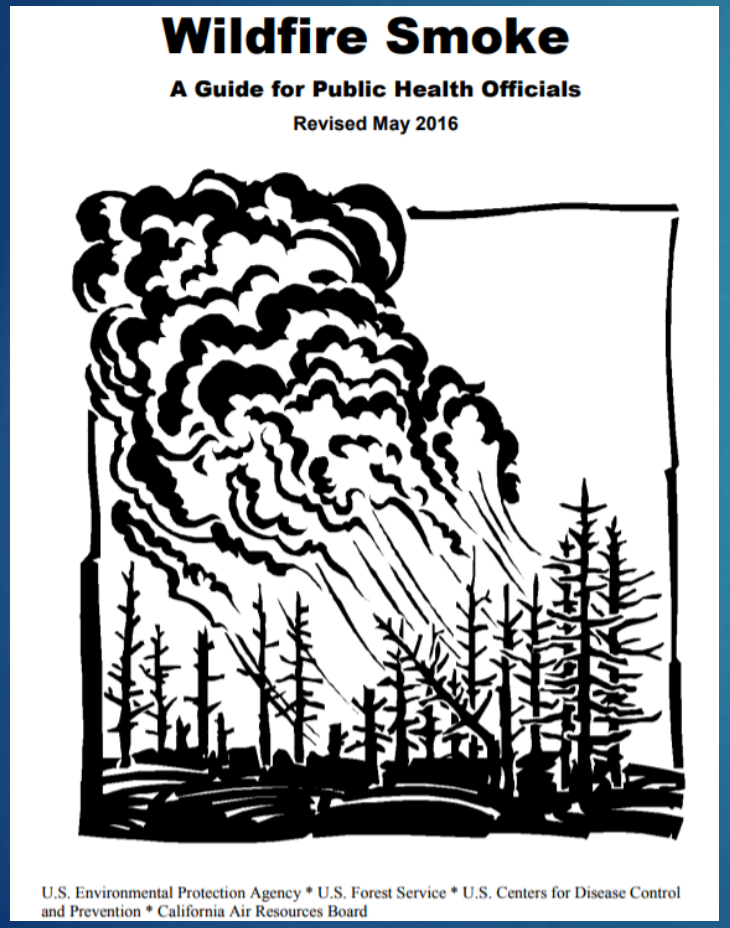
Green - safe w Level 1 Notification

Yellow – requires Level 2 and 3 Notifications and Shelter in place, evacuation contingencies

Red-requires Level 2 and 3 and 4 Notifications
If justified by FOSC (or UC)
best professional judgement(s)

1000 foot radius Operations Safety Zone inside red

USEPA Wildfire Smoke
A Guide for Public Health Officials



- Particulate matter is the public health threat from short-term exposure
- Health effects are derived from urban particulate studies
- Sensitive populations are people with pre-existing respiratory and cardiovascular disease.

EPA United States Environmental Protection Agency

December 2009
EPA/600/R-08/139F

Integrated Science Assessment for Particulate Matter

Includes Errata Sheet created on 2/10/2010

2.3.1.1. Effects of Short-Term Exposure to $PM_{2.5}$

Table 2-1. Summary of causal determinations for short-term exposure to $PM_{2.5}$.

Size Fraction	Outcome	Causality Determination
$PM_{2.5}$	Cardiovascular Effects	Causal
	Respiratory Effects	Likely to be causal
	Mortality	Causal

Table 3. Recommended Actions for Public Health Officials.

AQI Category (AQI Values)	PM2.5[1] µg/m3 24-hr avg	Recommended Actions
Good (0 to 50)	0-12	• If smoke event forecast, implement communication plan
Moderate (51 to 100)	12.1-35.4	• Prepare for full implementation of School Activity Guidelines (https://www3.epa.gov/airnow/flag/school-chart-2014.pdf) • Issue public service announcements (PSAs) advising public about health effects, symptoms and ways to reduce exposure • Distribute information about exposure avoidance
Unhealthy for Sensitive Groups (101 to 150)	35.5-55.4	• Evaluate implementation of School Activity Guidelines • If smoke event projected to be prolonged, evaluate and notify possible sites for cleaner air shelters • If smoke event projected to be prolonged, prepare evacuation plans
Unhealthy (151 to 200)	55.5-150.4	• Full implementation of School Activity Guidelines • Consider canceling outdoor events (e.g., concerts and competitive sports), based on public health and travel considerations
Very Unhealthy (201 to 300)	150.5-250.4	• Schools move all activities indoors or reschedule them to another day. • Consider closing some or all schools[2] • Cancel outdoor events involving activity (e.g., competitive sports) • Consider cancelling outdoor events that do not involve activity (e.g. concerts)
Hazardous (> 300)	>250.5-500	• Consider closing schools • Cancel outdoor events (e.g., concerts and competitive sports) • Consider closing workplaces not essential to public health • If PM level is projected to remain high for a prolonged time, consider evacuation of at-risk populations

Category (see Table 3)	Health Effects
Good	None expected
Moderate	Possible aggravation of heart or lung disease

Category (see Table 3)	Health Effects
Unhealthy for Sensitive Groups	Increasing likelihood of respiratory or cardiac symptoms in sensitive individuals, aggravation of heart or lung disease, and premature mortality in persons with cardiopulmonary disease and the elderly.

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Conservative approach is to limit exposures to 12 ug/m3 for a 24 hr average.

How to incorporate these more conservative considerations Goal of 12 ug/m^3 ?

Use ALOFT Model as Burn To Set SAFE DISTANCE

Use SMART Particulate Monitoring during burn to inform UC of particulate trends

Implement Notifications and/or terminate burning as appropriate

How would this work?

Calculate the 24 hour average Goal 12 ug/m3

A discussion proposal

1. Collect samples using a 15 minute averaging time.
2. Using a 24 hour average (24 hours x 60 minutes)/15 minutes = 96

There are 96 15 minute periods in a day

How high can a one 15 minute period be to average 12 ug/m3 for 24 hours?

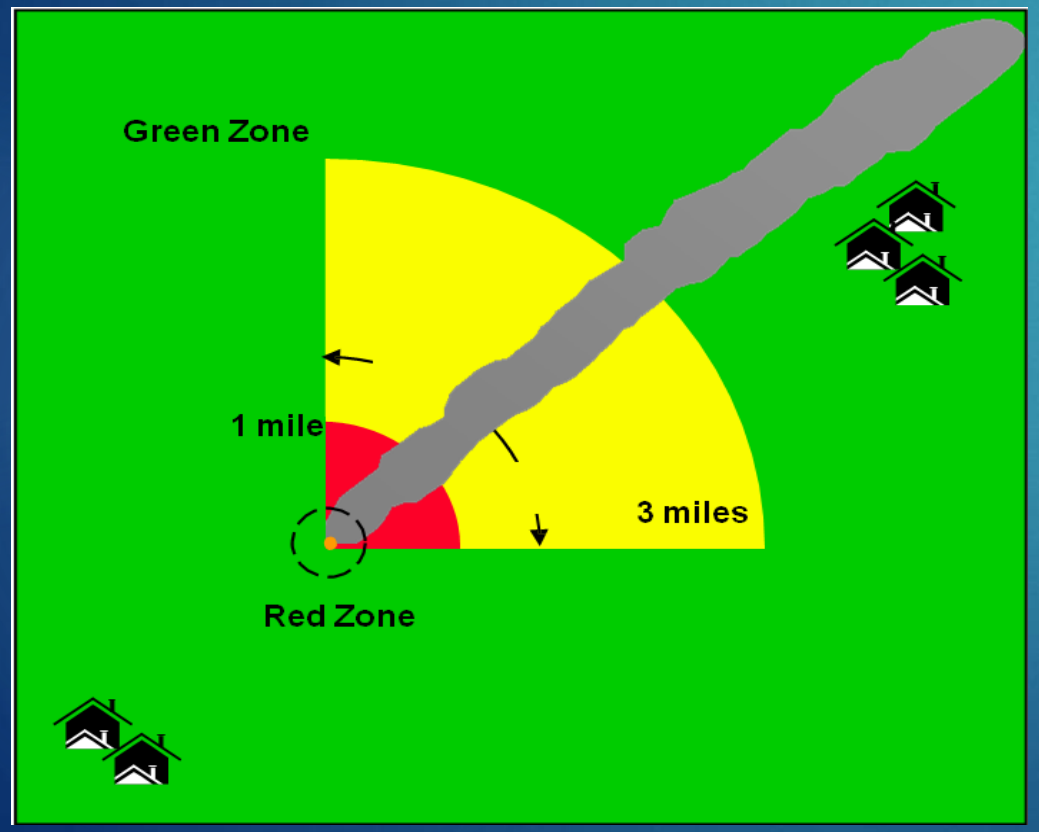
- Assume a background of 5 ug/m3, this would occur for 95 of the 15 minute periods.
  - 95 x 5 = 475
- Want the average to be 12 96 x 12 = 1152
- 1152 – 475 = 677 ug /m3 for one 15 minute period

Trial Burns

Verify predicted plume direction and dispersion

Visual Monitoring

Mandatory
Deploy teams before burn
Report to UC on plume behavior



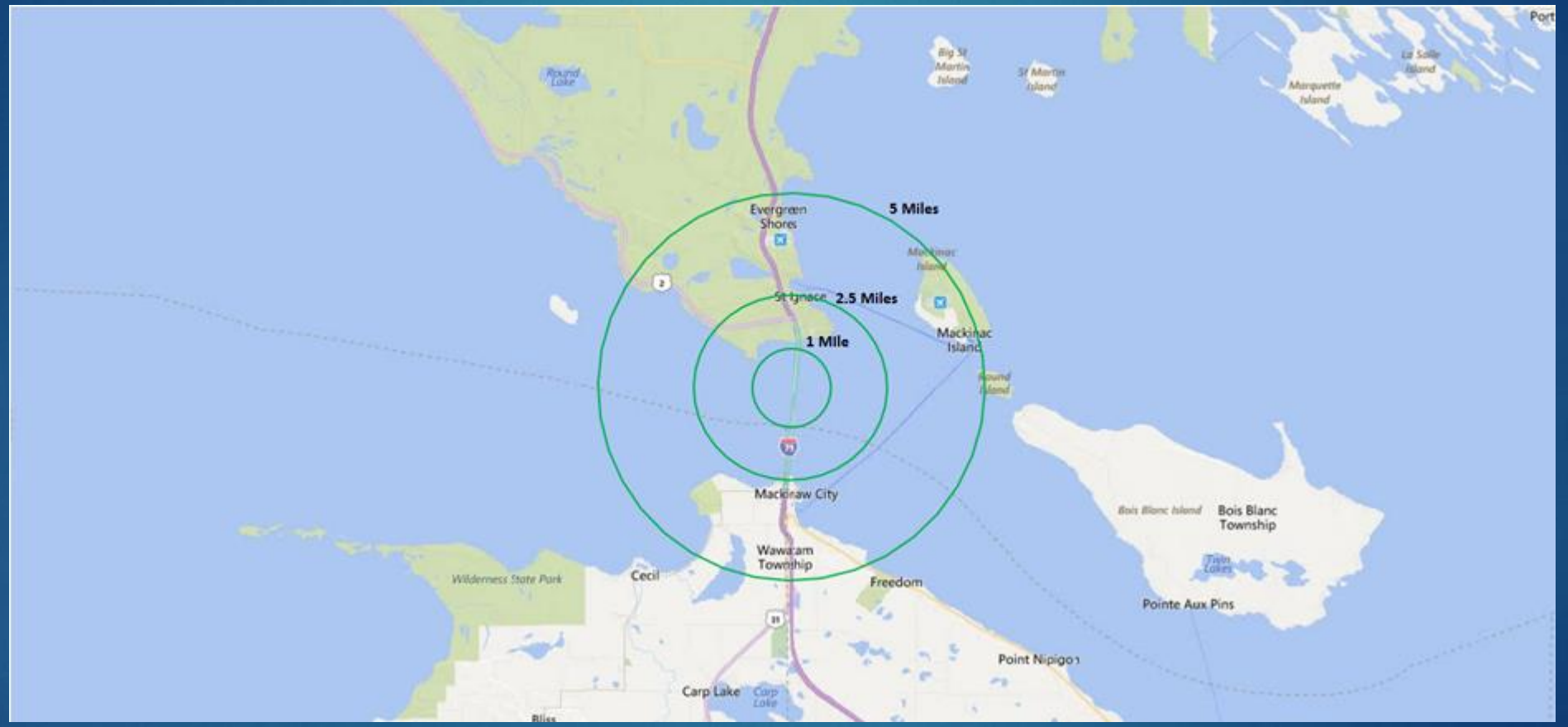
SMART

Special Monitoring
of Applied Response Technologies

Monitoring Teams – Particulate Concentration Trends

- Background
- Manual Readings
- Data logging
- Feedback to Scientific Support Team (UC)

What would SMART for ISB look like in Straits?

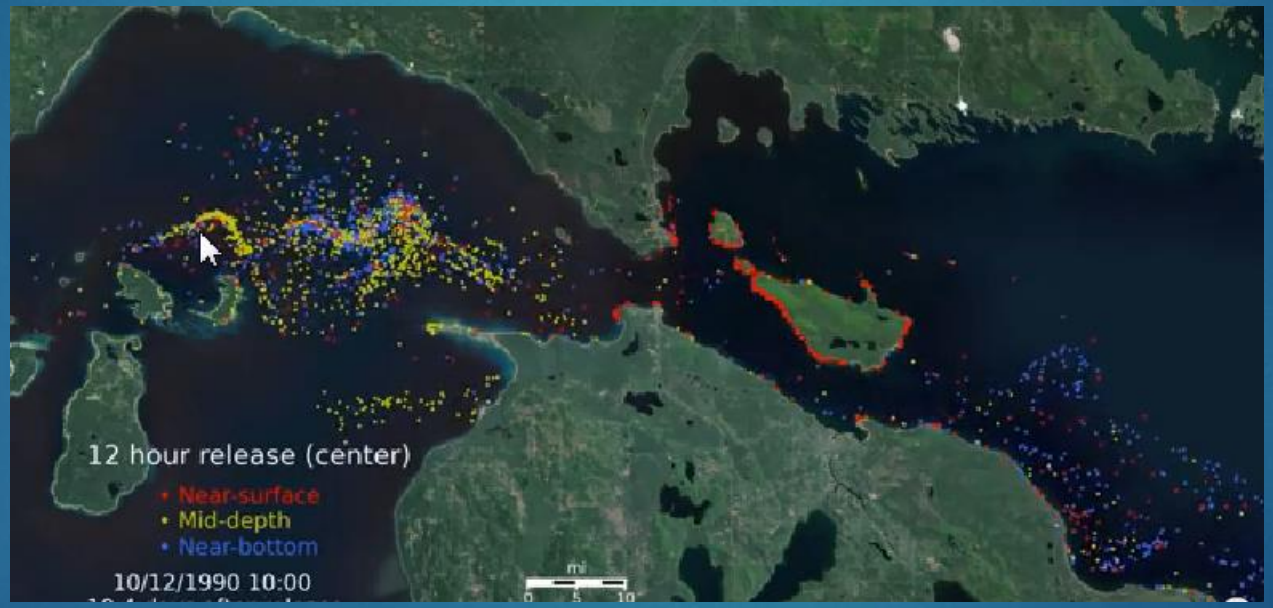


September 2015 Straits Exercise

Practice **Public Health and Public Safety Response** to a Straits Incident

- Coordination with Mackinac and Tri-County EMAs
- MDHHS
- Mac Bridge Authority
- Fire Officials on Mac Island and Bois Blanc Island
- NOAA

Straits of Mackinac Contaminant Release Scenario
University of Michigan
Graham Sustainability Institute



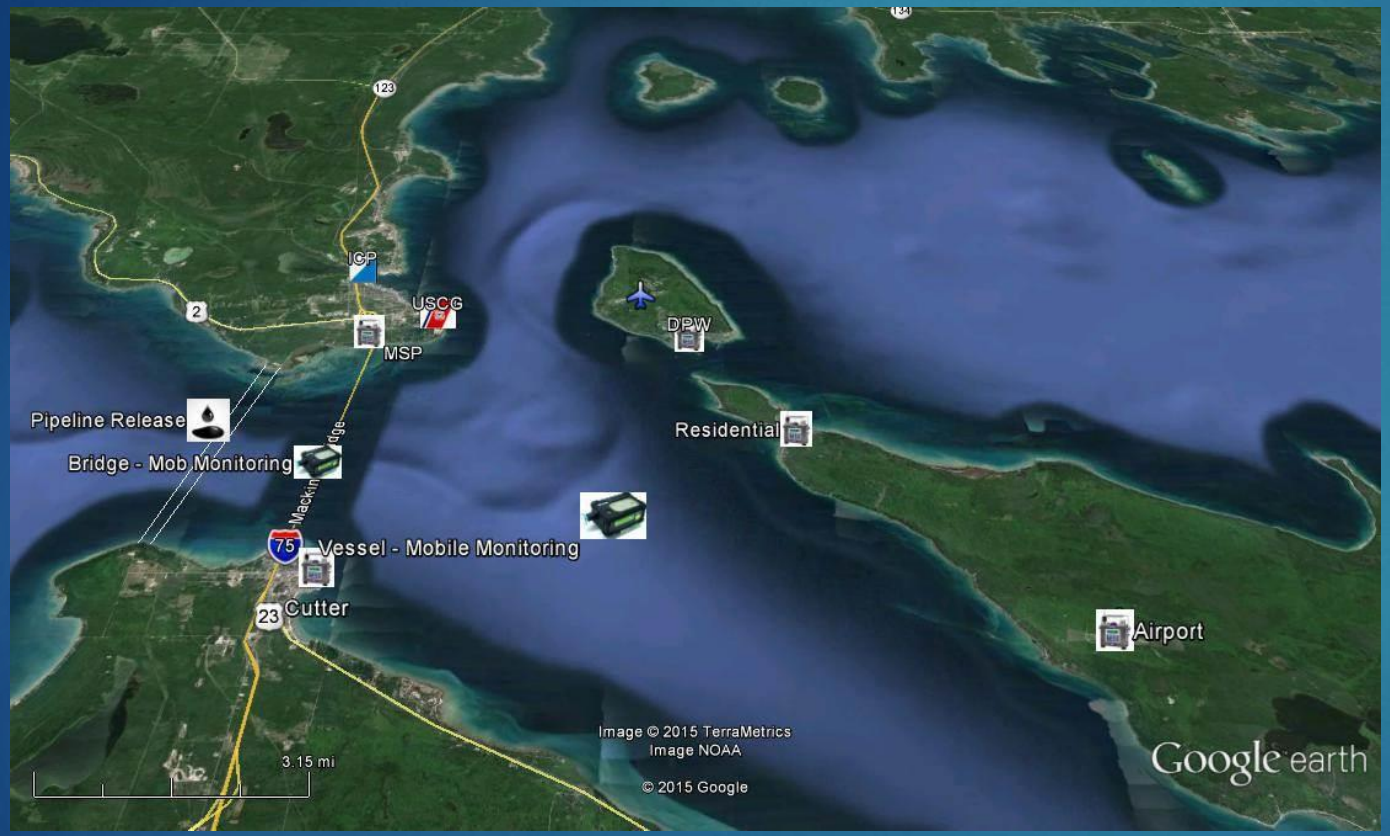
https://youtu.be/8bx4g-MPiws?list=PLkpBjHvzRryqCzUAeLDxzgrRJOBbN-nBc

USEPA Exercise Focus

- USEPA's focus: Air Impacts Assessment
  - Developed air monitoring plan
  - Performed air monitoring/sampling
    - On water
    - Islands
    - Mainland
    - Mackinac Bridge (mobile)
    - Summa canisters

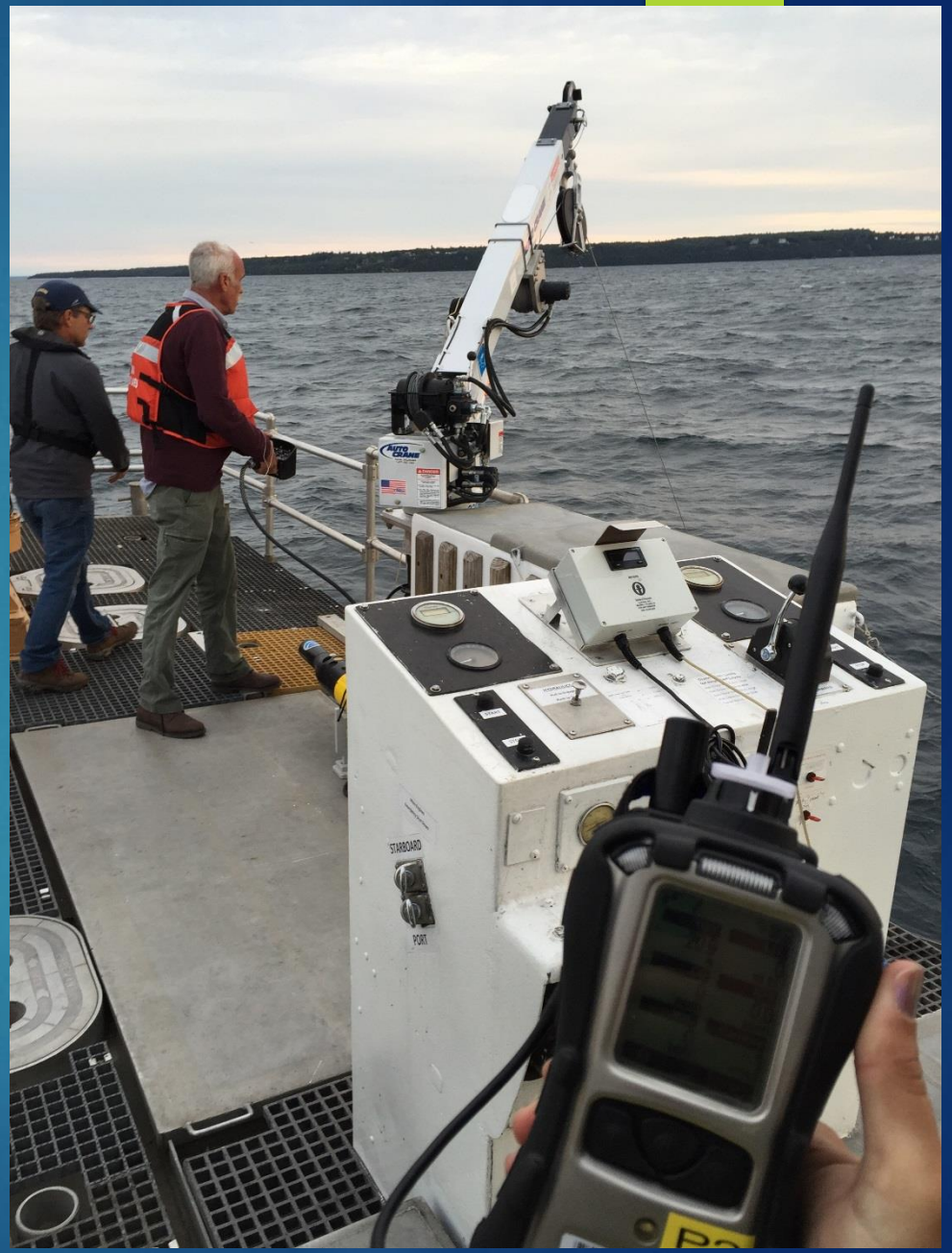
- Relay Data to UC near real time via **VIPER**

Air Monitoring



Air Monitoring – Stationary

Mobile On Water Monitoring




EPA
NOAA
GREAT LAKES

Mackinac Bridge Deck Air Monitoring

Air data streamed real time to ICP via VIPER

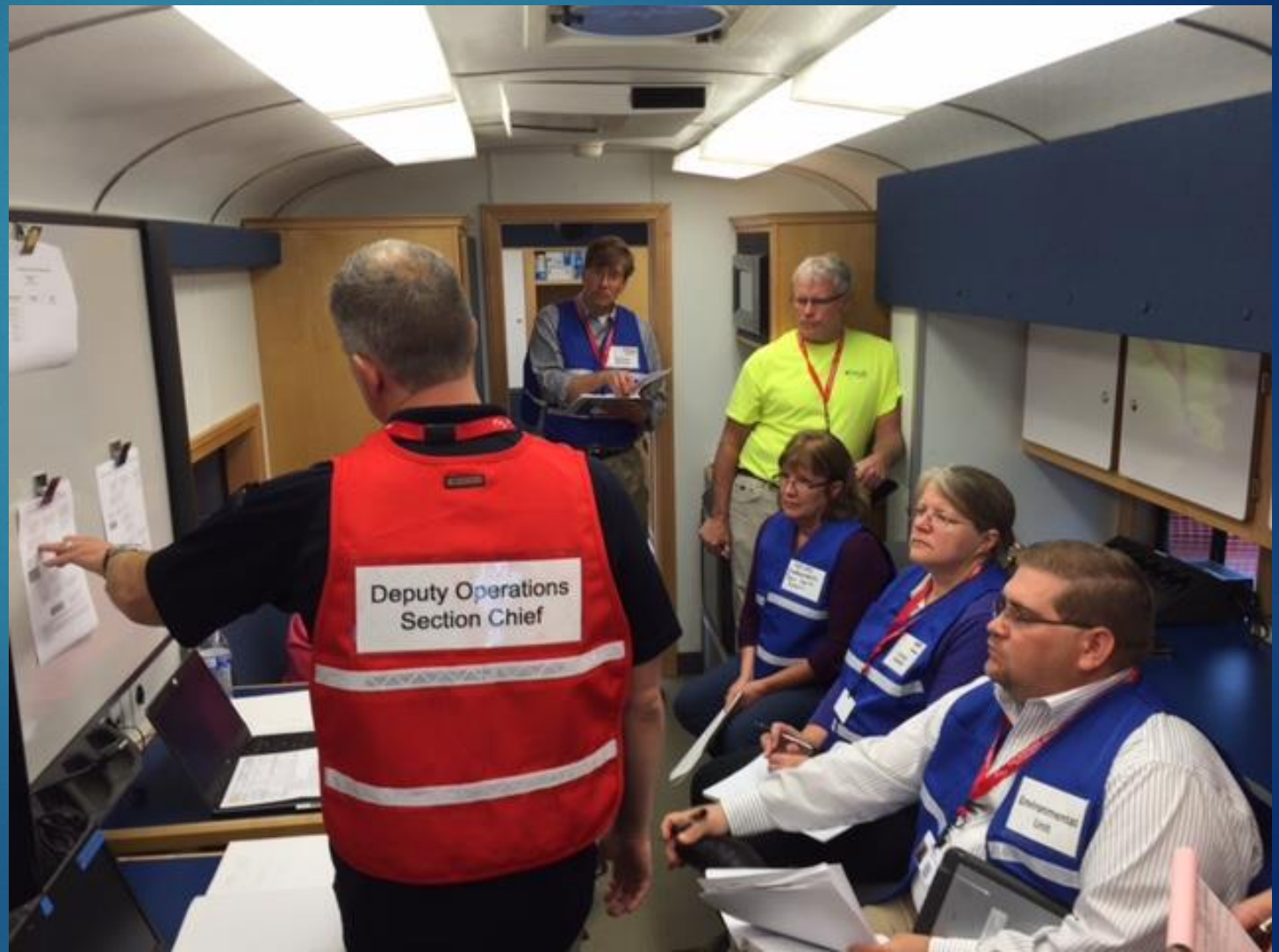
Air Sampling and Analysis

Summa Canisters and Tedlar Bag sampling

51st WMD Civil Support Team

Portable GC/MS

Coordination with Public Health Officials



Inform Local IC and UC Decisions

Outcome

Tested and confirmed our ability to collect the data and transmit it to decision makers over large, complex geographic response area

Increased overall awareness of oil spill implications for public safety and local emergency managers

Particulate Monitoring Methodologies

E-Bam

DUSTTRAK

DataRAM

DUSTTRAK Basics

- Measurement range: 0.001 to 150 mg/m^3
- Operating temperature range: 32° to 122° F
- Method of particle detection: 90° light scattering
- Flow Rate: 3 L/min
- VIPER Compatible
- Rental: ~$475 per week, Enclosure: ~100 per week

DataRAM Basics

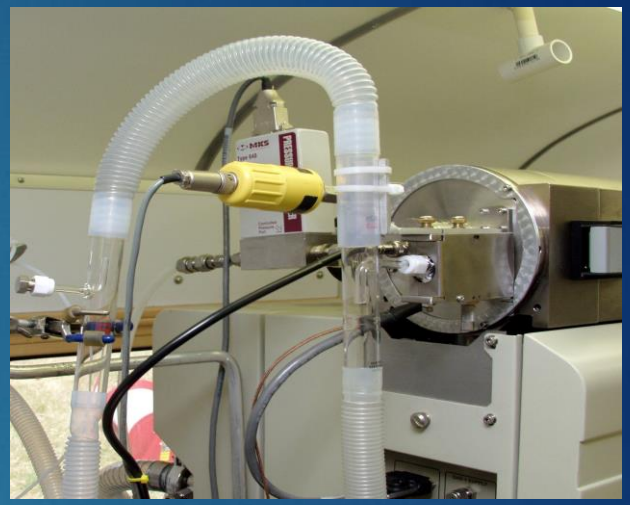
- Measurement range: Largest from 0.001 to 400 milligrams per cubic meter (mg/m^3)
- Operating temperature range: 14° to 122° F, 10 to 95% RH, noncondensing
- Method of particle detection: 90° light scattering, dual optics
- Flow Rate: 2 L/min
- VIPER Compatible
- Rental: ~$475 per week
- Limitation: Can only monitor one fraction at a time
- Field Calibration recommended prior to monitoring

E-Bam Basics

- Measurement range: 1 to 65,530 µg/m^3
- Operations in the widest temperature range: -22 to 122 degrees Fahrenheit
- Method of particle detection: Beta Attenuation
- Flow Rate: 16.7 Liters per minute (L/min)
- VIPER Compatible
- Rental: ~$600 per week
- Limitation: Can only monitor one fraction at a time

AIR TOXICS

Trace Atmospheric Gas Analyzer (TAGA) Mobile Laboratories



SUMMARY

- Safe Distance
- Local Public Safety Involvement
- Notifications
- Air Monitoring
- Communication with UC