# Emergency Air Monitoring During Wildfires

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# Project Details

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# Objective and Purpose

- Develop consistent, fine particulate air monitoring guidance and protocols to be used by EPA, State/Local agencies, and FLMs during wildfire emergency monitoring episodes.
- Provide appropriate monitoring data to better support public health advisories on the effects of wildfire smoke.

# Stakeholders

- States- New Mexico, Arizona, California, Oregon, Washington, Alaska, Montana, Colorado, Idaho, Nevada
- FLMs- Fish and Wildlife Service, Forest Service
- EPA- Regions 6, 8, 9, 10, and OAQPS

# Project Design

1. Develop stakeholder group to share current approaches and build consensus on essential minimum needs and requirements for instrumentation, quality assurance, reporting, logistics, and staffing.
2. Enable state/local agency collaborators to work with EPA and FLMs ;  begin operation of portable smoke monitors for comparison with PM2.5 FRMs at national air monitoring sites.
3. Formulate a basic set of operational protocols for deploying the monitors during wildfire events and incorporate USFS remote data satellite telemetry technology for rapid reporting.

# Project Design, contd.

4. Address additional issues: assess future potential for monitoring toxics, public access to real time monitoring data (AIRNOW), interaction between States, EPA, and the FLMs during emergency actions.
5. Consolidate experience feedback from trial deployments and recommend draft final protocols for nationwide application.

# Benefits

- Federal/State/Local agencies will be better prepared to provide decision makers and the public timely and reliable information on short term air quality impacts of PM2.5 produced by wildfires. Methods can be extended in the future to other emissions such as air toxics.
- Monitoring data can be used to validate emissions transport/deposition models such as CMAQ and support development of wildfire emissions factors.

# Resources and Schedule

- FY04-EPA provided funds for purchase of 9 portable monitors. Two are collocated at Arizona, one each for NM, CA, OR, WA, AK, MT, and CO. EPA funded task with Battelle for documentation preparation support. Fish and Wildlife purchased 2 portable monitors.

# Resources and Schedule, contd.

- FY05-EPA has purchased portable data telemetry systems to be used to uplink monitors with USFS and EPA/Airnow websites. Purchase EBAMS for NV and ID,  and provide contractor support for analysis of FRM data comparisons (1/05-6/05) and results from field deployment trials (6/05-12/05).

# Progress to Date

July, 2004-present

- Stakeholders agree to project plan, resources, and schedule
- Consensus on monitoring technology (portable EBAMS) to be used during comparative assessments and field deployment trials.
- Monitors (12) and satellite modems(13) ordered and installed by states at fixed sites for initial intercomparison study.

# Progress to Date, Contd

- Initial draft of operating SOP and deployment strategy under review. Draft SOP can be found at:

  https://www.sdas.battelle.org/oaqps/wa220/

  Username: oaqpswa220

  Password: orange6mouse

- EBAM training and study planning meeting held with stakeholders-January 2005.
- Satellite modem data telemetry systems activated and data link with AIRNOW Tech established.

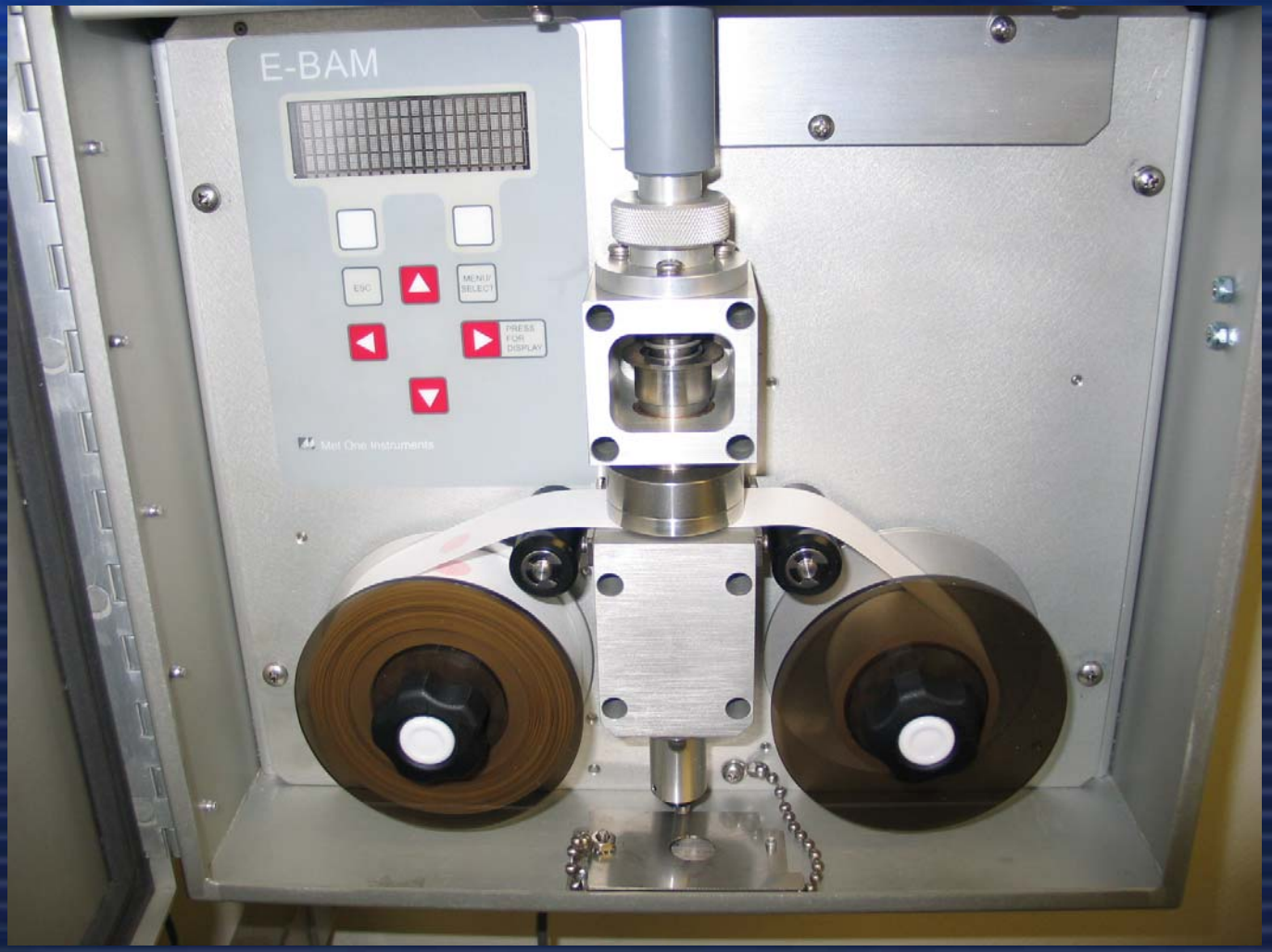
# Beta Attenuation Mass Measurement

- Defined as a decrease in the number of beta particles ($^{14}$C source) due to absorption by the traversed medium.
- Operationally, PM2.5 aerosols are collected on a filter paper strip and the difference in beta attenuation between an air sample filter and a blank filter are related to the mass weight in the sample and used with the air volume collected to produce a mass per unit volume.

# THEORY OF OPERATION

- Beta rays are measured across clean filter tape. The measured value – $I_0$
- Air containing particulate matter is sampled and deposited on the filter tape.
- Beta rays are measured across dirty filter tape. The measured value – I

# EBAM Tape Drive and Inlet/Sensor



# MASS CALCULATION

- DEFINITIONS:
  - I – beta measurement across clean filter
  - $I_0$ – beta ray measurement across dirty filter
  - $\mu$ – calibration coefficient ($m^2/\mu g$)
  - x – mass density on filter tape ($\mu g/m^2$)
  - A – dust spot deposition area on filter tape ($m^2$ )
  - V – sampled volume ($m^3$)
  - C – particulate matter concentration ($\mu g/m^3$)

# Mass Calculation

$$I = I_0 e^{-\mu x}$$

$$x = -\frac{1}{\mu} \ln\left(\frac{I}{I_0}\right)$$

$$C = \frac{Ax}{V}$$

# EBAM Training Session at EPA Las Vegas, NV, January, 2005

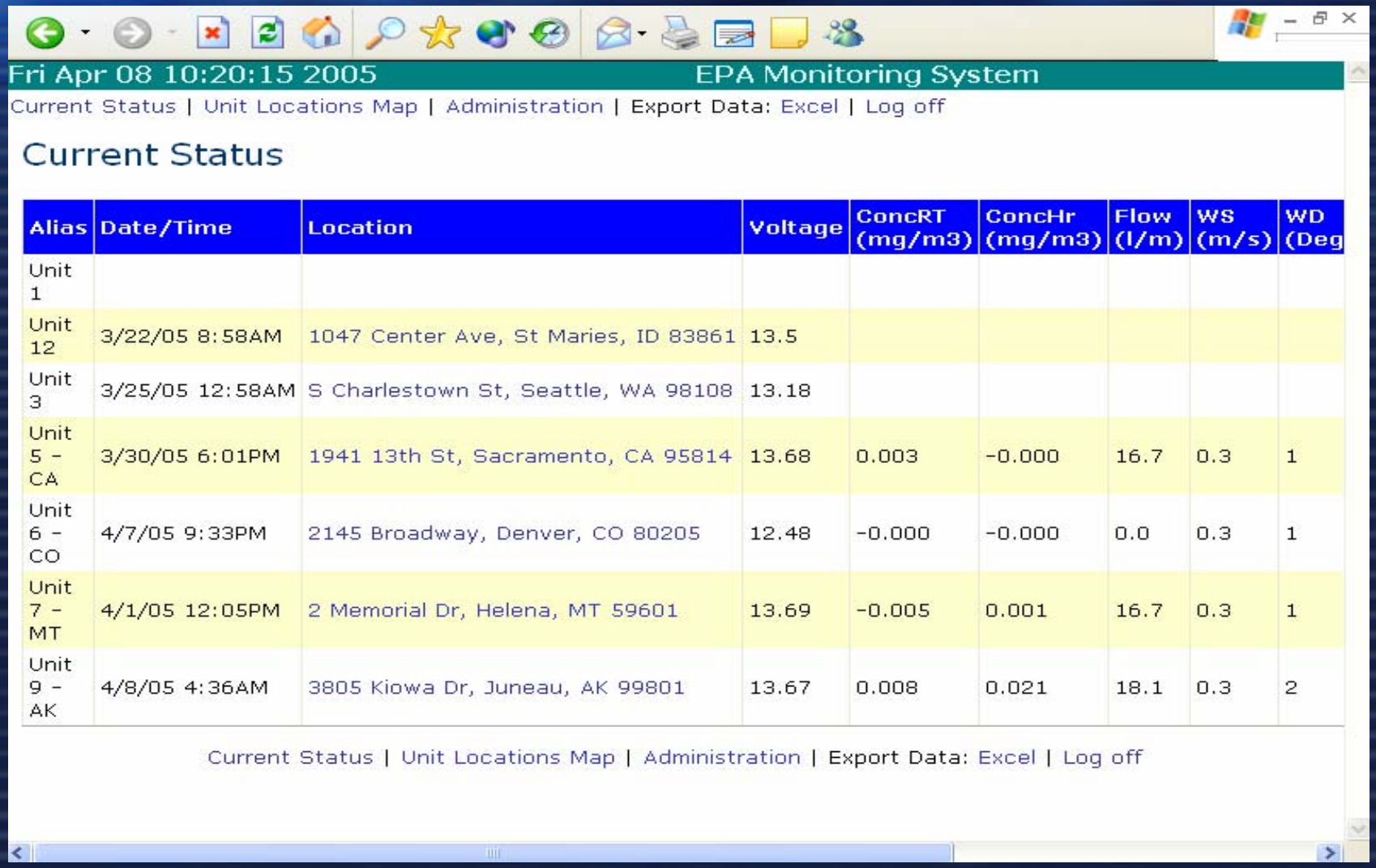
# EBAM Training, Contd.

# EBAM Training, contd.

# EBAM Airflow Calibration

# AIRSIS Satellite Modem Mounted on EBAM

# AIRSIS Temporary Datalink Site



Fri Apr 08 10:20:15 2005 EPA Monitoring System

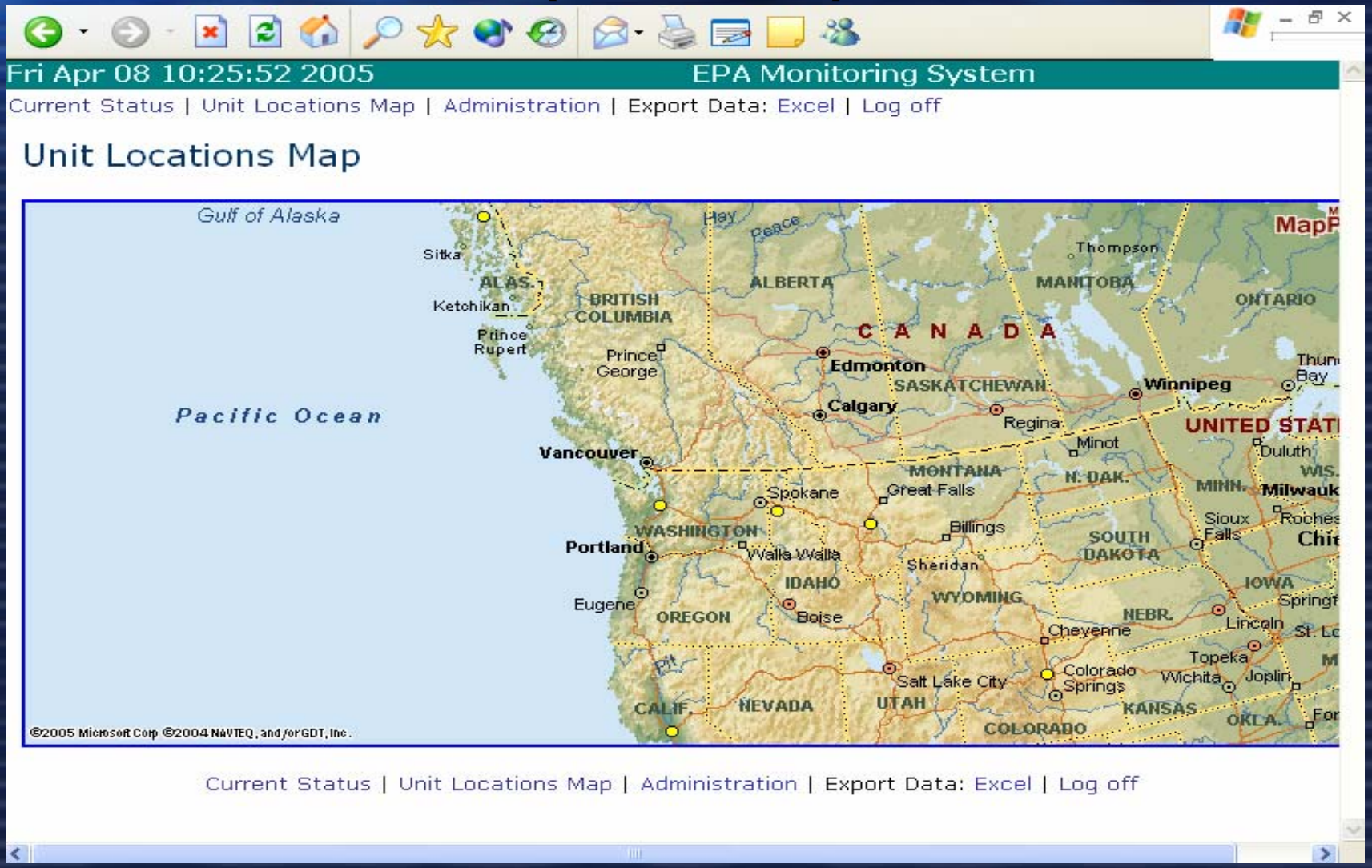
Current Status | Unit Locations Map | Administration | Export Data: Excel | Log off

## Current Status

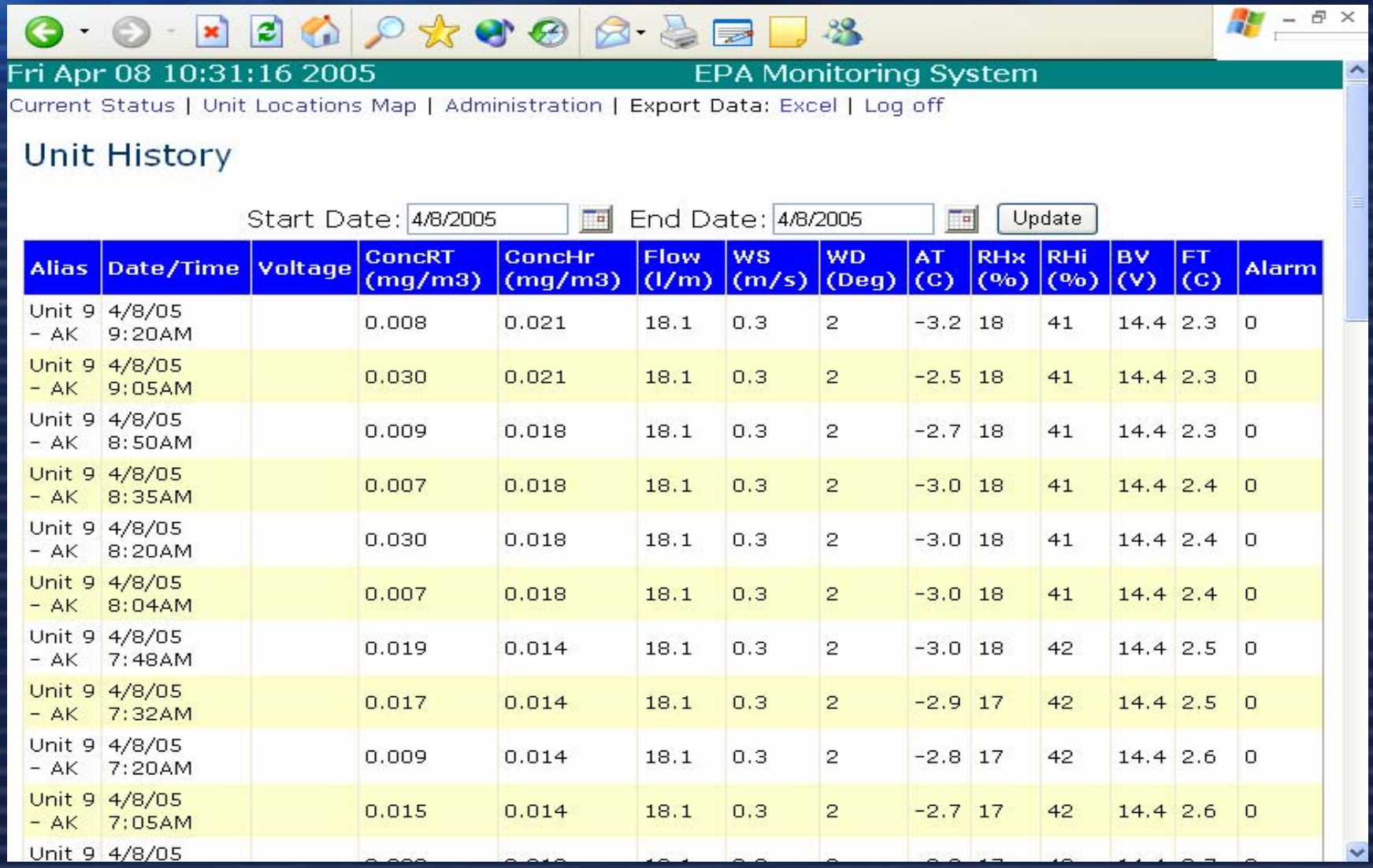
| Alias | Date/Time | Location | Voltage | ConcRT (mg/m3) | ConcHr (mg/m3) | Flow (l/m) | WS (m/s) | WD (Deg |
|---|---|---|---|---|---|---|---|---|
| Unit 1 | | | | | | | | |
| Unit 12 | 3/22/05 8:58AM | 1047 Center Ave, St Maries, ID 83861 | 13.5 | | | | | |
| Unit 3 | 3/25/05 12:58AM | S Charlestown St, Seattle, WA 98108 | 13.18 | | | | | |
| Unit 5 - CA | 3/30/05 6:01PM | 1941 13th St, Sacramento, CA 95814 | 13.68 | 0.003 | -0.000 | 16.7 | 0.3 | 1 |
| Unit 6 - CO | 4/7/05 9:33PM | 2145 Broadway, Denver, CO 80205 | 12.48 | -0.000 | -0.000 | 0.0 | 0.3 | 1 |
| Unit 7 - MT | 4/1/05 12:05PM | 2 Memorial Dr, Helena, MT 59601 | 13.69 | -0.005 | 0.001 | 16.7 | 0.3 | 1 |
| Unit 9 - AK | 4/8/05 4:36AM | 3805 Kiowa Dr, Juneau, AK 99801 | 13.67 | 0.008 | 0.021 | 18.1 | 0.3 | 2 |

Current Status | Unit Locations Map | Administration | Export Data: Excel | Log off

# Currently Operating EBAMS (4/8/05)



# 15-Minute Data Records



Fri Apr 08 10:31:16 2005 EPA Monitoring System

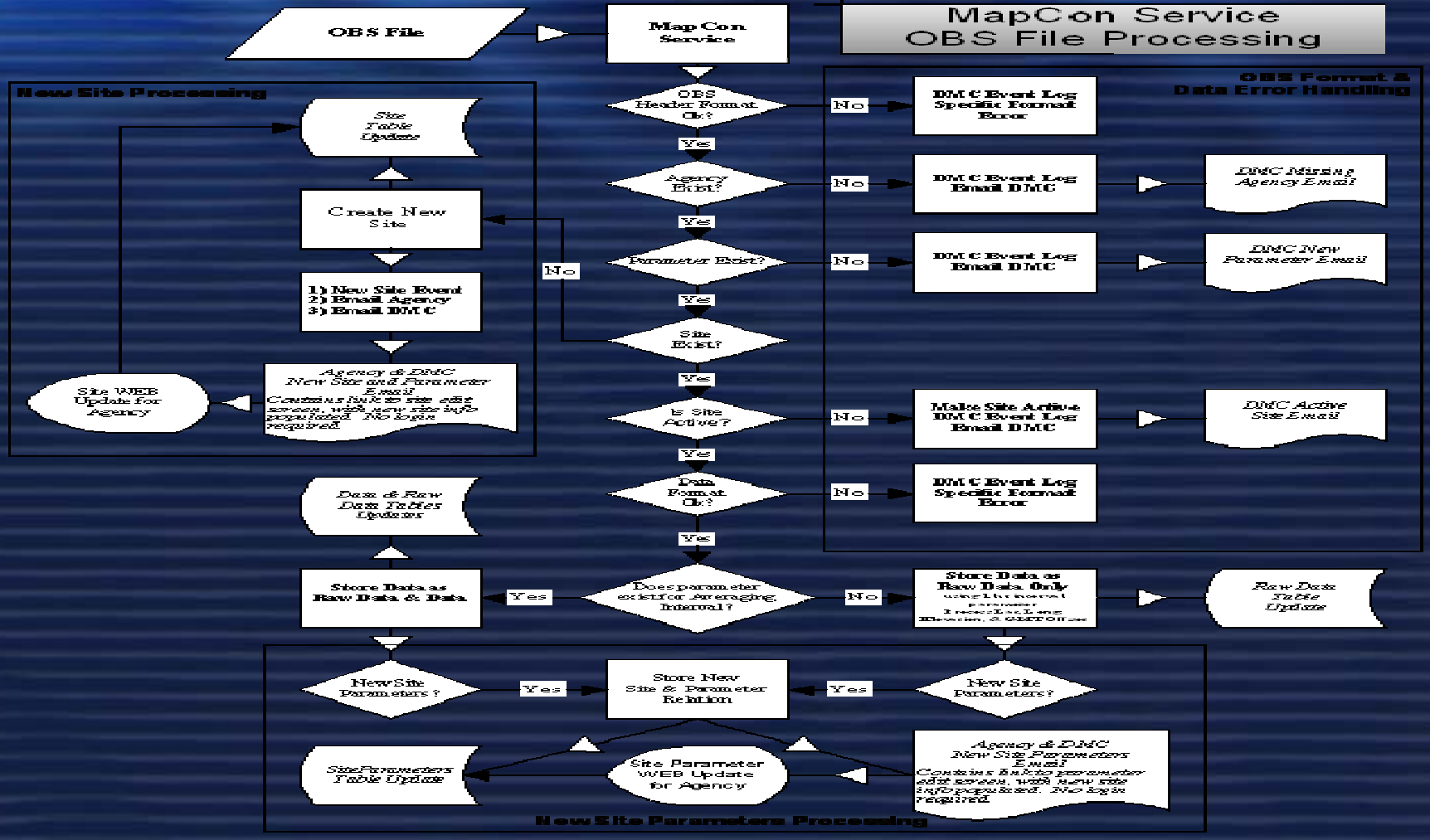
Current Status | Unit Locations Map | Administration | Export Data: Excel | Log off

## Unit History

Start Date: 4/8/2005 End Date: 4/8/2005 Update

| Alias | Date/Time | Voltage | ConcRT (mg/m3) | ConcHr (mg/m3) | Flow (l/m) | WS (m/s) | WD (Deg) | AT (C) | RHx (%) | RHi (%) | BV (V) | FT (C) | Alarm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit 9 - AK | 4/8/05 9:20AM | | 0.008 | 0.021 | 18.1 | 0.3 | 2 | -3.2 | 18 | 41 | 14.4 | 2.3 | 0 |
| Unit 9 - AK | 4/8/05 9:05AM | | 0.030 | 0.021 | 18.1 | 0.3 | 2 | -2.5 | 18 | 41 | 14.4 | 2.3 | 0 |
| Unit 9 - AK | 4/8/05 8:50AM | | 0.009 | 0.018 | 18.1 | 0.3 | 2 | -2.7 | 18 | 41 | 14.4 | 2.3 | 0 |
| Unit 9 - AK | 4/8/05 8:35AM | | 0.007 | 0.018 | 18.1 | 0.3 | 2 | -3.0 | 18 | 41 | 14.4 | 2.4 | 0 |
| Unit 9 - AK | 4/8/05 8:20AM | | 0.030 | 0.018 | 18.1 | 0.3 | 2 | -3.0 | 18 | 41 | 14.4 | 2.4 | 0 |
| Unit 9 - AK | 4/8/05 8:04AM | | 0.007 | 0.018 | 18.1 | 0.3 | 2 | -3.0 | 18 | 41 | 14.4 | 2.4 | 0 |
| Unit 9 - AK | 4/8/05 7:48AM | | 0.019 | 0.014 | 18.1 | 0.3 | 2 | -3.0 | 18 | 42 | 14.4 | 2.5 | 0 |
| Unit 9 - AK | 4/8/05 7:32AM | | 0.017 | 0.014 | 18.1 | 0.3 | 2 | -2.9 | 17 | 42 | 14.4 | 2.5 | 0 |
| Unit 9 - AK | 4/8/05 7:20AM | | 0.009 | 0.014 | 18.1 | 0.3 | 2 | -2.8 | 17 | 42 | 14.4 | 2.6 | 0 |
| Unit 9 - AK | 4/8/05 7:05AM | | 0.015 | 0.014 | 18.1 | 0.3 | 2 | -2.7 | 17 | 42 | 14.4 | 2.6 | 0 |
| Unit 9 | 4/8/05 | | | | | | | | | | | | |

# AIRNOW Tech EBAM Data Processing Flowchart



# Next Steps

- Complete monitor installations and data links to AIRNOW-Tech
- Begin comparison of EBAM PM2.5 mass data with other monitoring site instrumentation (BAM, TEOM, nephelometer, FRM, etc, as available)
- Stakeholder group will discuss details of FRM comparison study and plan for test of field deployment strategy during upcoming wildfire season.
- Begin discussion of data reporting, analysis, and linkages with providing information to health officials and general public.

# FY-06Resource Needs and Schedule

- FY06-EPA to provide contractor support to draft final recommended SOPs, QA guidance, data reporting. EPA/USFS to conduct three regional training seminars on wildfire air monitoring guidance for state agencies, as appropriate