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Environmental Air Monitoring at LANL

For the Citizens' Advisory Board
September 28, 2016

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Radionuclide Air Monitoring Program

- Measure airborne emissions of radioactive material from LANL operations & subsequent impact on the public
- Not directly affiliated with cleanup operations or programmatic work; independent oversight
- Focus areas in Environmental Compliance Programs
 - Stack emissions measurements
 - Ambient air measurements
- Partnering with...
 - Meteorology Program (EPC-CP)
 - Dose Assessment Program (EPC-ES)

Air Monitoring at LANL

- Goals: Identify & quantify LANL air releases
- Assess potential impacts
- Stack monitoring – measure the source
- Ambient monitoring – measure the receptor
- Analyze for particulates (dust) – uranium, plutonium, etc.
- Analyze water vapor for tritium



Regulatory Drivers

- Federal Regulations
 - Clean Air Act, 40 CFR 61 Subpart H, *Radionuclide NESHAP*
 - Framework of operations – locations, methods, dose limit
 - Annual emissions report to EPA Region 6
- Department of Energy Orders
 - DOE Order 458.1, *Environmental Radiation Protection*
 - Radiological emissions measurements
 - Property transfer
 - Equipment release
 - DOE Order 151.1C, *Emergency Management*
 - Meteorology program
 - Accident response
 - DOE Order 231.1B, *ES&H Reporting*
 - Annual Site Environmental Report

Off-site Dose Limits

- Radionuclide NESHAP 40 CFR 61, Subpart H
 - “National Emissions Standards for Hazardous Air Pollutants” as applied to emissions of Radionuclides from DOE facilities
 - **Limits off-site dose from LANL ops to 10 millirem/year**
 - Background in NNM is about 360-400 millirem/year
 - Limit applies to air emissions pathway only
 - Reported annually to EPA in June, addressing prior year’s operations, air emissions, and resulting off-site dose
- DOE Orders
 - 100 millirem all-pathway dose (air + food + water + direct radiation)
 - Reported in Annual Site Environmental Report

Rad-NESHAP functions

Emissions Monitoring

- 28 monitored stacks, ~80 non-monitored stacks
- Sample collection & off-site analysis
- Real-time emissions measurements @ LANSCE
- Emissions calculations
- Plume modeling, dose calculations
- Stack engineering & Performance Testing

Ambient Air Monitoring

- Airnet program
46 stations
- Sample collection & off-site analysis
- Concentration calculations, dose assessment
- Real-time particulate monitoring (PM2.5/PM10)
- Real-time air concentration measurement (R&D)
- Meteorology monitoring

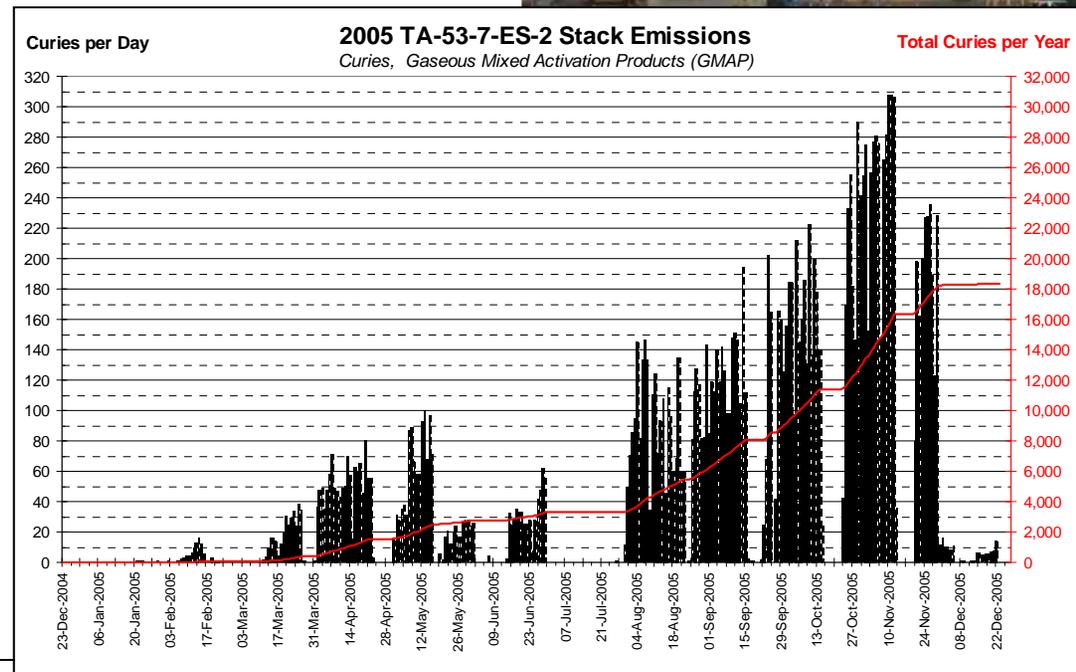
Stack Sampling

- LANL's "significant" operations are continuously sampled
 - TA-55; CMR; RLUOB
 - TA-48 radiochemistry facility & hot cells
 - WETF tritium facility
- Consider "Major sources" by EPA
- Particulates, vapors, and/or tritium
- Samples changed weekly
- Sampling data analyzed off-site (particulate) or at LANL (tritium)
- Emissions calculated & reported internally throughout the year



LANSCCE – Real Time Monitoring

- Radioactive gases: carbon, oxygen, nitrogen
- In-line detectors – cannot capture samples on media for off-line analysis
- Emissions cannot be filtered from air stream
- Short half-life (20 mins)
- 2005 Operations: over 6 millirem!
- Leak discovered at control system inlet
- Fixed – 2006+ ops less than 0.1 millirem



Stack Engineering

- Flow measurements – per EPA Methods
- Pump maintenance & sample flow calibration
- ANSI N13.1-1999 requirements for design, maintenance, testing
- Sample system inspections & cleaning
- Design input for new & upgraded facilities: TA-55, CMRR, WETF
- Performance testing (commissioning) new systems: TA-54



Minor Sources – Annual Administrative Review



Radioactive Materials Usage Survey

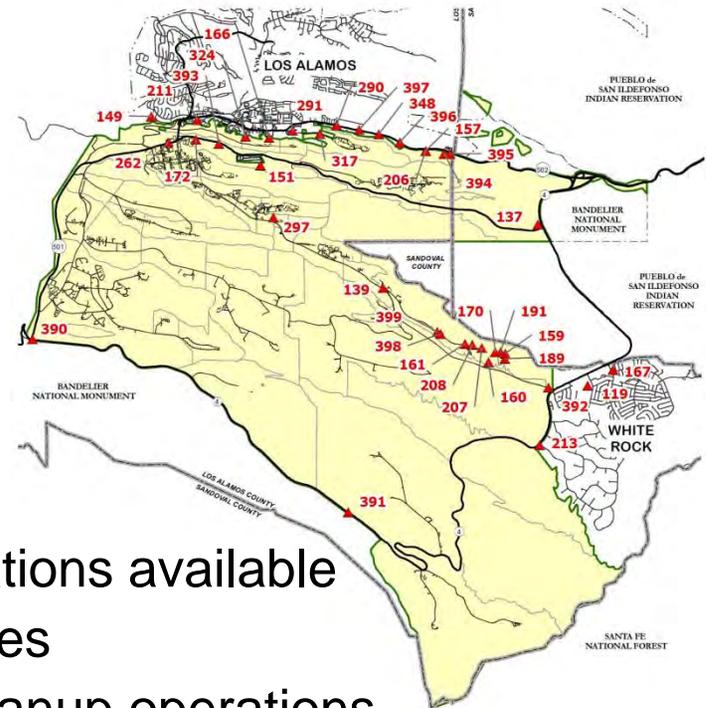
- Track operations from non-monitored sources
 - Calculate emissions
 - Estimate off-site dose
 - Ensure low-level of operations
 - Annual review
- Evaluate operations at monitored stacks
 - Ensure monitoring systems are appropriate for operations
 - Ensure we're analyzing samples for appropriate nuclides
 - Bi-annual review (odd years)

Non-Point (Diffuse) Sources

- Airnet program – Ambient Air Sampling program
 - Compliance measurements of non-point sources (double-count stacks)
 - Standard list of 20 stations + additional as needed
 - Airborne particulates (U, Pu isotopes) and tritium H-3 vapor
- LANSCE Diffuse emissions
 - Radioactive gases from accelerator facility & experimental areas
 - Not captured by Airnet
 - Air concentrations * flow rate = emissions
 - Measured at source, modeled by CAP88
- Others as needed; can vary year-to-year

Airnet Program – Ambient Air Measurements

- About 40 air sampling stations in continuous operation
 - LANL perimeter – updated 2015
 - On-site near certain diffuse sources
 - Regional stations for background
 - Bi-weekly change out (2 week runs)
 - Analyzed for particulates (Pu, U) and tritium in water vapor
 - Results posted to web, EPA report, and Annual Site Environmental Report



- High-volume air sampling stations available
 - Remote start for emergencies
 - Also used for significant cleanup operations

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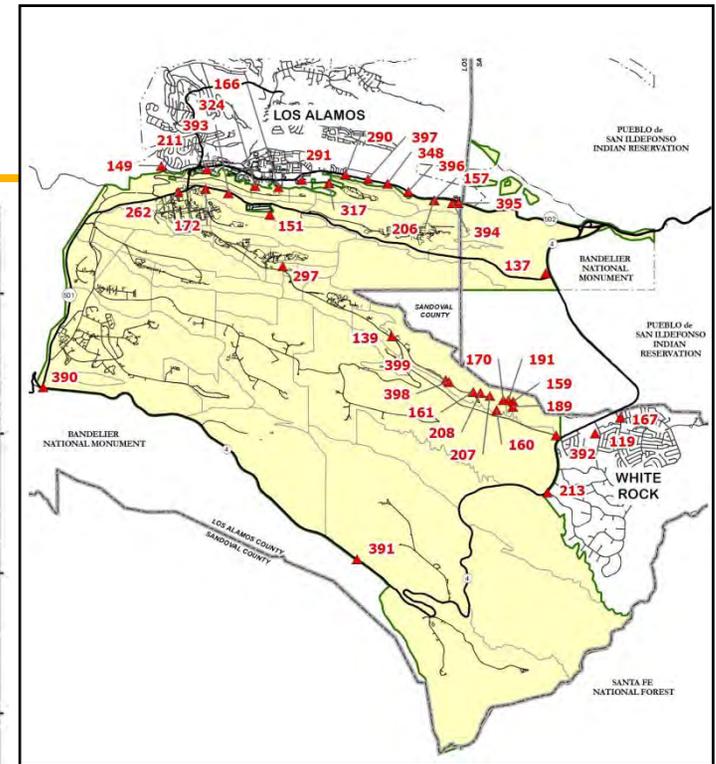
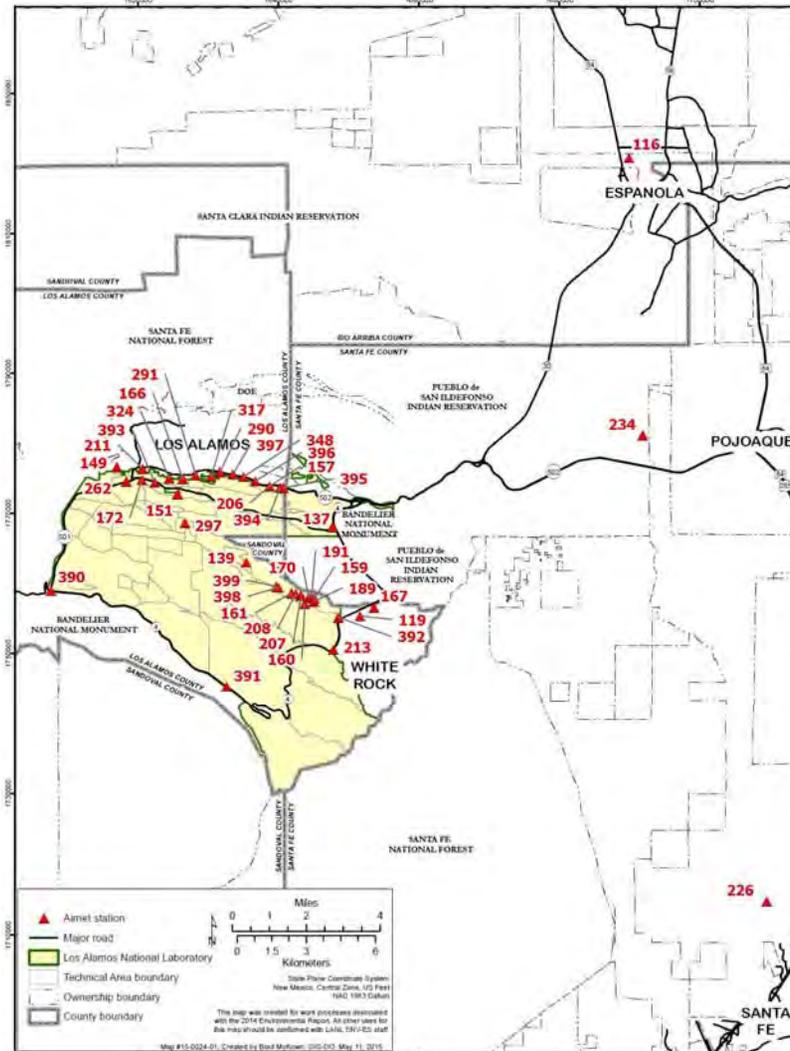
Airnet Locations

Regional Locations:

- Espanola
- Pojoaque
- Santa Fe West

Not Shown:

- San Ildefonso Pueblo (2)
- Jemez Pueblo
- Santa Clara Pueblo



**No LANL impact
has ever been
measured at
regional stations.**



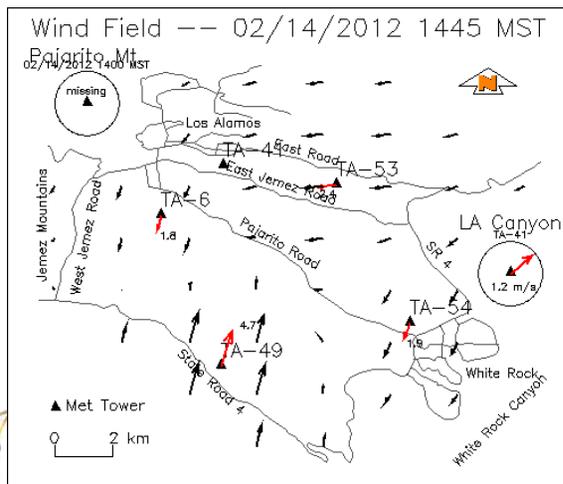
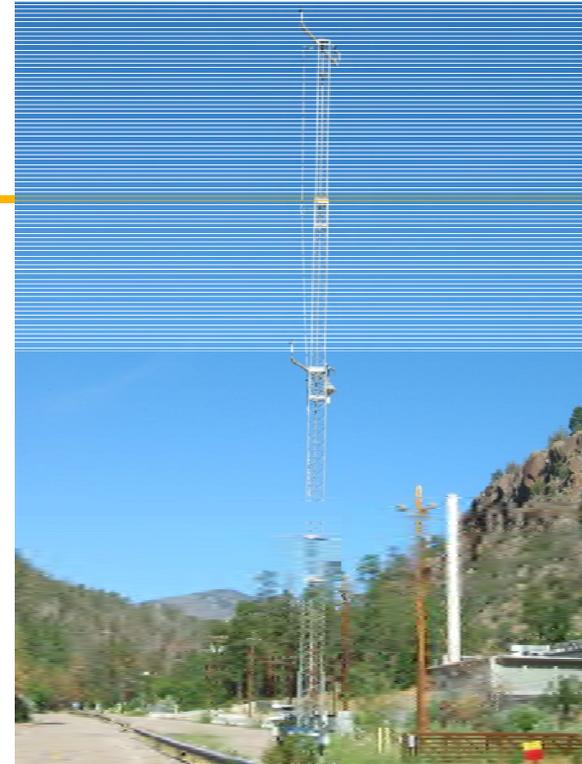
Special Response Capability

- High flow rate stations, with generators
 - “high-vol” samplers
 - 10x flow rate of Airnet
- Activate existing stations immediately
- Deploy to new locations within hours
- Submit for analysis within 24 hours



Meteorology Program

- Compliance Program
 - Compliance with DOE O 151
 - NM & Federal Clean Air Act req's
 - Plume dispersion modeling
 - LANL Construction Standards
 - Snow Removal Operations
 - Operate to QAPP & procedures
 - www.weather.lanl.gov

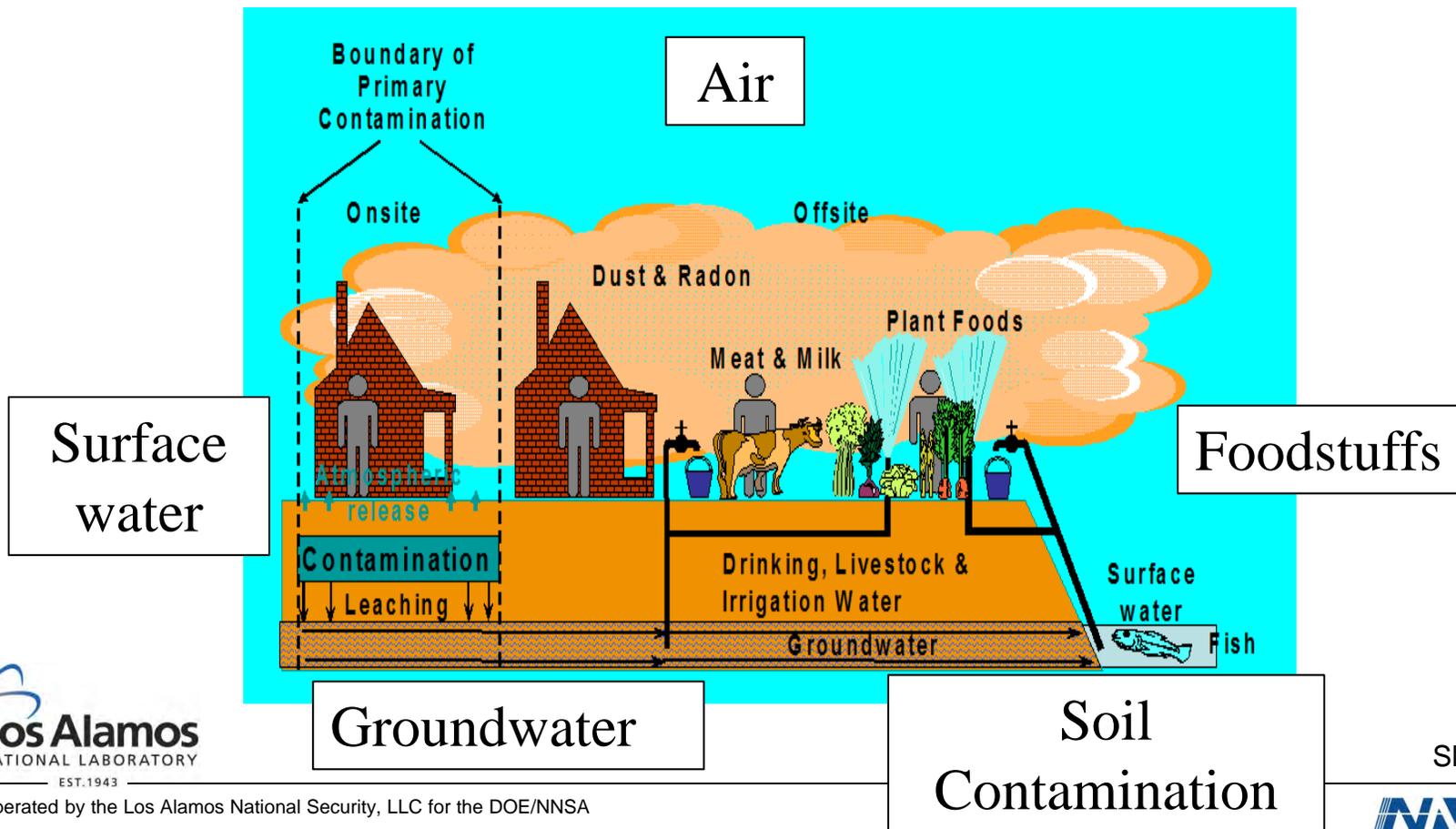


- Five Meteorology Towers
 - 4 on mesa tops, 1 in canyon
 - 15-minute avg data: wind, temp, precip
 - Real-time web data & QA checks
 - Instrument calibration & maintenance per EPA standard protocols

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Dose Assessment Program

- Provide “pathway analysis” and dose assessment for public & biota from LANL radiological operations.



Dose Assessment Program

- Determining impacts from Laboratory operations
 - Air emissions
 - Direct radiation measurements
 - Biota dose
- Pathway assessment limits
 - Air pathway – 10 millirem per year limit
 - All pathway – 100 millirem per year limit
 - Background radiation results in ~400 millirem per year; LANL all-pathway contribution is about 3 millirem or less.
- Coordinate compliance with DOE Order 458.1
 - Emissions of air, water
 - Land transfer
 - Property release

Calculations

- Dose assessment
 - Use EPA-approved codes: CAP88 PC version 3
 - Atmospheric dispersion modeling, calculates off-site dose from stack emissions

- Databases
 - Stack information
 - Flow rate information
 - Sample field data & sample analytical data
 - Airnet data, samples
 - Emissions calculations
 - Track operations @ non-monitored stacks

Other activities

- New project reviews
 - Title V / Air Quality Compliance team, EPC-CP
 - Deployed Environmental Professionals, @ facilities
- Quality Assurance Program
 - Quality Assurance Project Plans for stacks, Airnet, met, dose
 - Implementing procedures and work control documents
 - Data Quality Objectives for each area
 - Equipment calibration program
- Non-rad monitoring – particulate matter (TEOM data)
 - Public interest only – no regulatory driver
 - Smoke & dust levels (sensitive to wildfires in NM, CO, AZ)
 - 2 stations: White Rock, Los Alamos town sites
- Complex-wide activities - Other DOE sites, EPA Region 6, HQ
- Public outreach – community meetings, LANL public meetings

Recent & Upcoming Events

- Annual report of 2015 rad air emissions – EPA, June 30, 2016
 - Clean Air Act report; sources, emissions, off-site dose
 - Lowest off-site dose in LANL history: 0.13 millirem
- Annual Site Environmental Report (ASER) – DOE, Sep 30, 2016
 - Comprehensive review of LANL environmental activities & measurements
- New stacks starting operations; TA-59, TA-35, LLW, TLW
 - Response to changing DOE Standards for rad material inventory limits
 - Move small-scale operations from nuclear facilities to small lab spaces
- Review of Airnet station siting
 - Completed in 2015; shift locations to reflect changing LANL operations and changing receptor locations (LA County)
 - Re-affirmed EPA approval for diffuse source compliance
- Airnet calculations moved to Intellus
 - Sample planning & data management, concentration calculations

<http://www.intellusnm.com>

Results in perspective

- 2015 Air pathway dose = 0.13 millirem (<10 mrem limit)
 - No primary driver; LANSCE sources collectively
 - Historical levels are much less than 1 mrem/year since 2011
- Airnet shows no measurable impact at regional stations
 - We can “see” LANL impacts in Los Alamos County
 - Nothing beyond background ever measured at regional stations
- All-pathway analysis – review foodstuffs, water, air
- Comprehensive program to evaluate new operations, major & minor sources, and adapt to changing LANL and public locations.

Thanks for your time!

- Any questions?
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