Atmospheric Dispersion and Consequence Analysis at Sandia's TA-V Nuclear Facilities

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Jim Dahl
Manager, Nuclear Safety Analysis
Sandia National Laboratories
Office: 505-284-9067 Email: jjdahl@sandia.gov

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TA-V
LEADING NUCLEAR TECHNOLOGIES

Dispersion and Consequence Analysis at Sandia's TA-V

Topics:

- Site Characteristics
- Dispersion Analysis Inputs
  - Meteorological Data
  - Stability Class
  - Dispersion Coefficients
  - Deposition Velocity
  - Surface Roughness
  - Dose Conversion Factors
- Issues

TA-V
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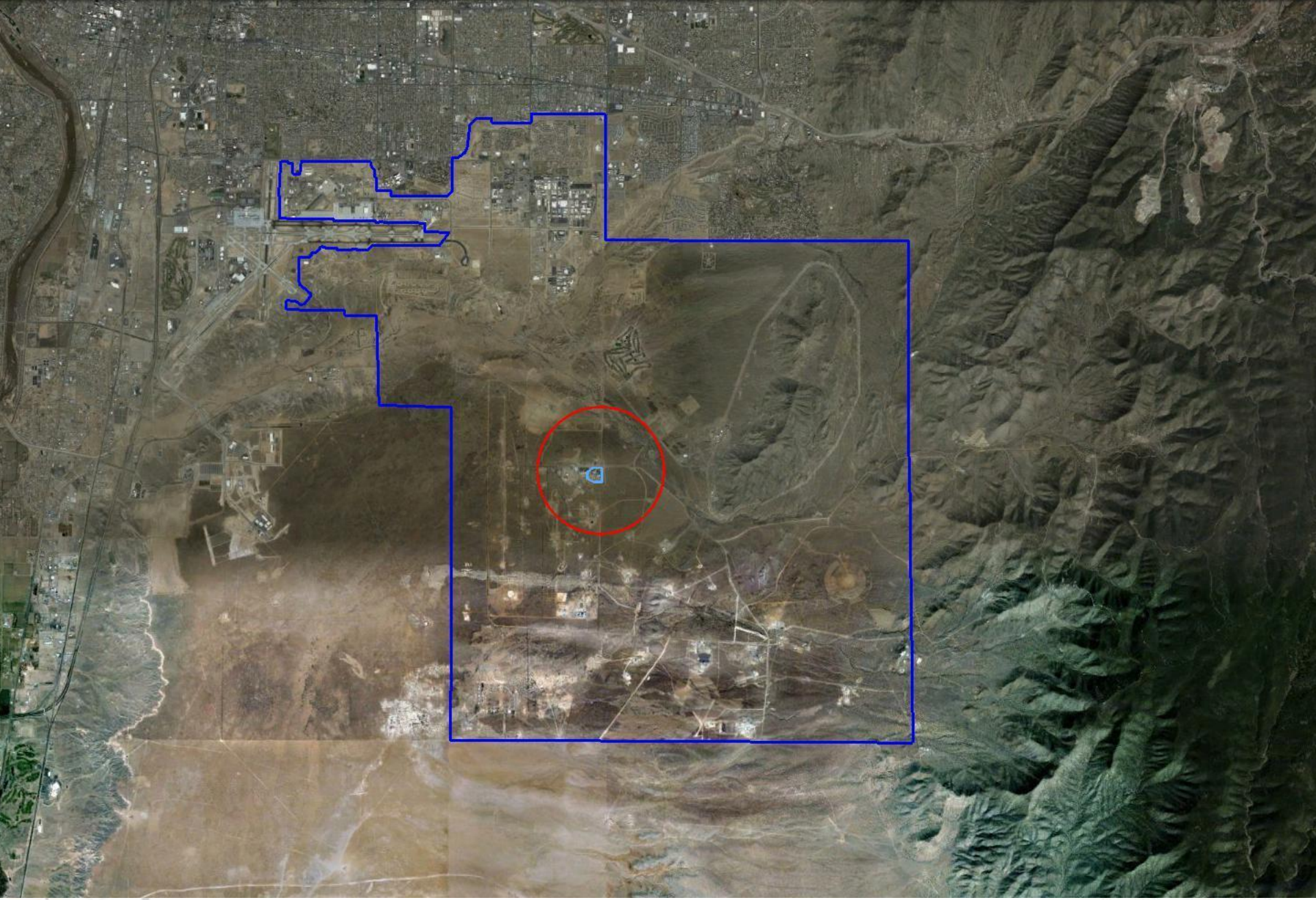
Site Characteristics

- High arid basin with desert grasses and sage
  - TA-V is 5400 ft. above sea level
  - Annual total precipitation ~ 8.5 inches
- Heterogeneous terrain characterized by an alluvial fan with eroded canyons and arroyos
- To the east are the Manzano and Sandia mountains with dramatic elevations changes resulting in down and up slope diurnal wind patterns
  - Manzanos 7700 ft. 7 miles from site (2300 ft. elevation Δ)
  - Sandias 9600 ft. 10 miles from site (4200 ft. elevation Δ)
- TA-V nuclear facilities located on Air Force Installation
- Site boundary established using an exclusion area concept at a radius from the site within the Air Force Base (1350 m, 0.84 miles)



Dispersion Analysis

- Current consequence analyses derived using WinMACCS *v* 3.4, windows interface for MACCS2 *v* 2.4
- Meteorological data logged from a tower adjacent to TA-V and hourly averaged data from the 10 m high station is used as input to MACCS2
  - Five years of meteorological data are used (2003-2007)
- PG stability class is derived using the EPA σ^{θ} method
- Dispersion coefficients are power law calculations taken from Tadmor-Gur parameters

Consequence Analysis

- Inputs and assumptions consistent with DOE-EH-4.2.1.4, MACCS2-Code Guidance, 2004
- 95th percentile straight-line dose calculated for each weather year
  - Of the five weather year 95th percentile results, the year with the largest dose is used
  - Wind direction was not considered since the 1350 m boundary is symmetrical
- Two release heights were evaluated, ground release (0 m) and stack release
  - 10 m for Sandia Pulsed Reactor Facility
  - 14.3 m for Annular Core Research Reactor Facility

Consequence Analysis

- Dry Deposition Velocity (DV)
  - 0.0 cm/s for vapor, gases and tritium (^3H_2O vapor)
  - 1.0 cm/s for all other particles
- Surface roughness 15 cm based on site specific evaluation
  - Calculated using a modified Wierenga gustiness method using data from Sandia meteorological tower network
- Dose Conversion Factors built into WinMACCS based on EPA Federal Guidance Report No. 13

Issues

- HSS-SB-2011-2
  - Sandia's evaluation of the SB determined that assumptions used in the SB to derive the 0.1 cm/s DV do not align with observed weather conditions at TA-V, thus a site specific DV may need to be calculated
- Quality Assurance
  - WinMACCS runs of same weather data used by the toolbox version of MACCS2 and the results were identical
  - Pre and post processors undergo QA review
- TA-V's worst case accidents are operational upsets (reactor accidents, experimental disruption, etc.)
  - All TA-V operations are on a single shift daytime schedule
  - 95th percentile doses are based on evening meterlogical conditions (stable conditions, calm winds)
  - For operational accidents is it acceptable to use only daytime meteorology?