Retrospective Soot Deposition Analysis for the East Palestine Derailment Incident Response
May 31, 2023
U.S. Environmental Protection Agency

The Interagency Modeling and Atmospheric Assessment Center (IMAAC) coordinates and disseminates federal atmospheric dispersion modeling and hazard prediction products. These products inform federal decision-making during actual or potential incidents involving hazardous material releases. Through plume modeling analysis, IMAAC provides emergency responders with predictions of hazards associated with atmospheric releases to aid in the decision-making process to protect the public and the environment.

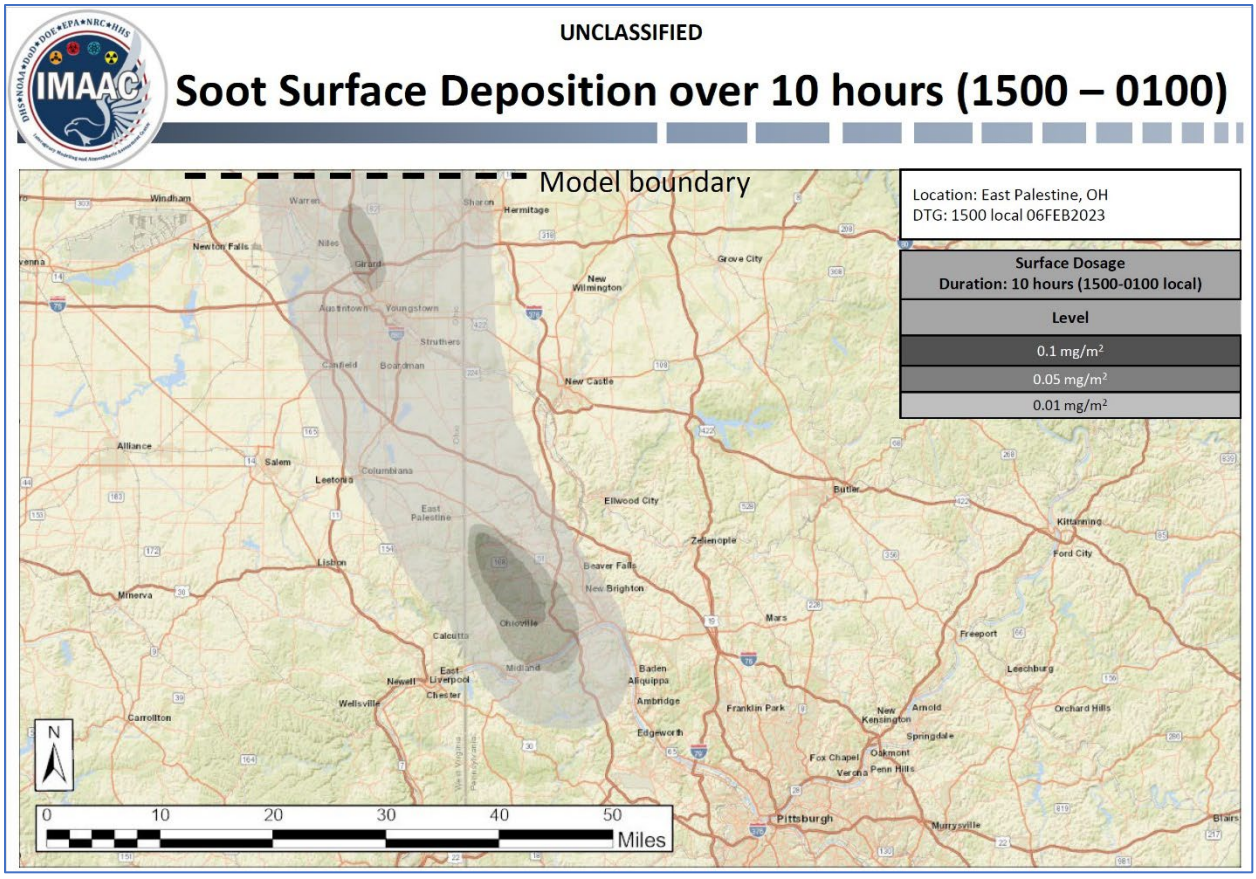
EPA requested a retrospective IMAAC analysis to include actual meteorological data that occurred during the "vent and burn" operation at the East Palestine train derailment emergency response on February 6th, 2023. EPA requested the analysis to help support off-site characterization efforts aimed at investigating impacts from the derailment.

For the analysis, it was assumed that at the train derailment location 90% of the total available mass of vinyl chloride and 90% of the total available mass of other compounds (ethylene glycol, ethyl hexyl acrylate, butyl acrylate) was burned. This is because some material was initially spilled prior to the vent and burn operation. The burn was specified to occur over a duration of six hours on February 6, 2023. Soot deposition was calculated to last over the course of ten hours (six hours of burning plus four hours of transport after burning). Soot falls out of the air as it cools down.

Weather used in the retrospective analysis was from the National Oceanic and Atmospheric Administration (NOAA) High Resolution Numerical North American Model.[1] The winds were initially towards the southeast, and later shifted towards the north and northwest. As reported in the news and seen by observers, the smoke was trapped from rising higher into the atmosphere due to an inversion layer at around 3,000 feet.

This IMAAC analysis is based on best estimates of the situation at the time of and during the vent and burn at East Palestine, OH.

[1]National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information, North American Mesoscale Forecast System (NAM) [12 km] - https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.ncdc:C00630



Notes:

- There are numerous unknowns and inherent uncertainty in models and model results that must be recognized.
- This IMAAC model does not claim to be the "ground truth" of what happened at the site.
- Total soot deposition is plotted to demonstrate areas where soot is most likely to have settled. It does not imply any specific health effects; it should only be used as a guide for where soot may have settled on the ground.
- Caveat: The settling rate of soot is highly dependent on its particle size. IMAAC did not have good information on the particle size distribution of this particular fire. Smaller or larger particles could settle in different patterns than indicated by this analysis.
- The greyscale color selection is meant to visually distinguish the contours and does not imply risk nor hazard.
- For comparison on the levels in the legend:
    - 0.1 milligram (mg) = 0.0001 gram (g) = 0.0000035 ounces (oz)
    - 1 acre = 4,046.9 square meters (m^2) = 43,560 square feet (ft^2)
    - Converting to ounces per acre (U.S. units):
        - 0.1 mg/m^2 is approximately 0.014 oz/acre
        - 0.05 mg/m^2 is approximately 0.007 oz/acre
        - 0.01 mg/m^2 is approximately 0.0014 oz/acre
    - A pinch of salt is generally 0.3 to 0.4 grams, or about 1/16 of a teaspoon of salt, so the 0.1 mg/m^2 soot deposition is roughly equivalent to a pinch of salt spread across an acre of land.