PRELIMINARY EVALUATION OF AERMOD USING SITE SPECIFIC STACK AND AMBIENT SAMPLING DATA

T.W. Moore
M.D. Buser
Biosystems & Agricultural Engineering Department, Oklahoma State University
Stillwater, OK
D.P. Whitelock
Southwestern Cotton Ginning Research Laboratory, USDA-ARS
Mesilla Park, NM
J.D. Wanjura
Cotton Production and Processing Research Unit, USDA-ARS
Lubbock, TX

Abstract

A cotton ginning industry-supported project was initiated in 2008 to develop a robust particulate matter (PM) dispersion modeling dataset that could be used for evaluating current and future PM dispersion models. This paper compares total PM data collected by the industry-supported study at one gin to outputs from EPA's AERMOD ambient air modelling software. Ambient air samplers were placed at 35 locations that were arranged around a gin in three concentric circles. Stack emissions data, on-site weather data, emissions points, and structure data were used as inputs in AERMOD. Modeled outputs were compared to the collected total PM concentrations at the specified locations around the gin. The percent difference of modeled from collected concentrations were mapped in order to analyze its spatial distribution. This analysis found that the model tended to underestimate concentrations close to the emission source. As distance increased from the emissions source, modeled and sampled data began to align then flipped, with the model overestimating nearly all concentrations at distances greater than 100 meters from the source. Slides used in this presentation are shown in Figure 1.

Acknowledgements

The authors appreciate the cooperating gin managers and personnel who generously allowed and endured sampling at their gins. In addition, we thank California Cotton Ginners' and Growers' Association, Cotton Incorporated, San Joaquin Valleywide Air Pollution Study Agency, Southeastern Cotton Ginners' Association, Southern Cotton Ginners' Association, Texas Cotton Ginners' Association, Texas State Support Committee, and The Cotton Foundation for funding this project. This project was support in-part by the USDA National Institute of Food and Agriculture Hatch Project OKL02882. The authors also thank the Cotton Gin Advisory Group and Air Quality Advisory Group for their involvement and participation in planning, execution, and data analyses for this project that is essential to developing quality data that will be used by industry, regulatory agencies, and the scientific community. The advisory groups included: the funding agencies listed above, California Air Resources Board, Missouri Department of Natural Resources, National Cotton Council, National Cotton Ginners' Association, North Carolina Department of Environment and Natural Resources, San Joaquin Valley Air Pollution Control District, Texas A&M University, Texas Commission on Environmental Quality, USDA-NRCS National Air Quality and Atmospheric Change, and U.S. Environmental Protection Agency (national, Region 4 and 9).

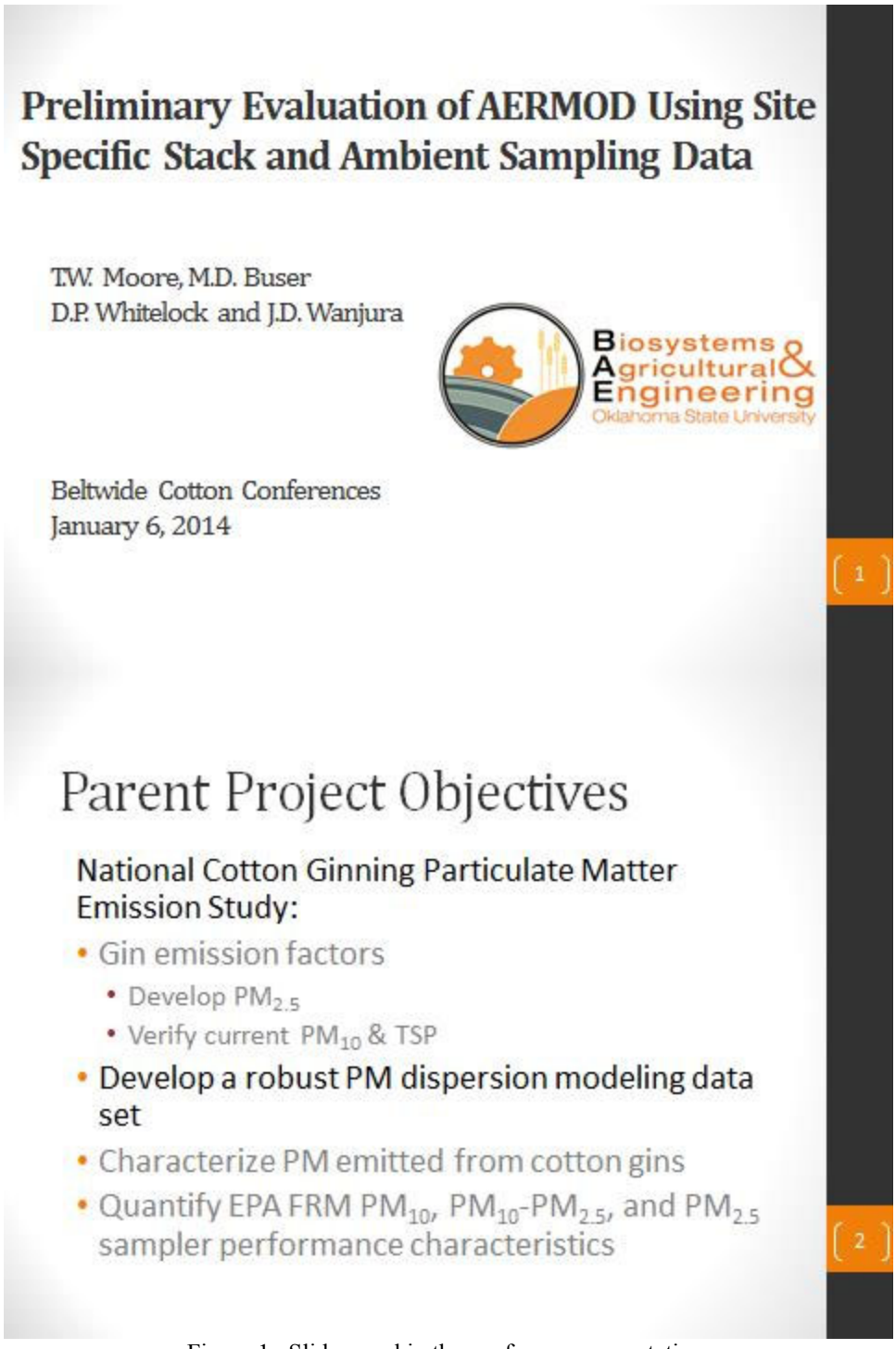
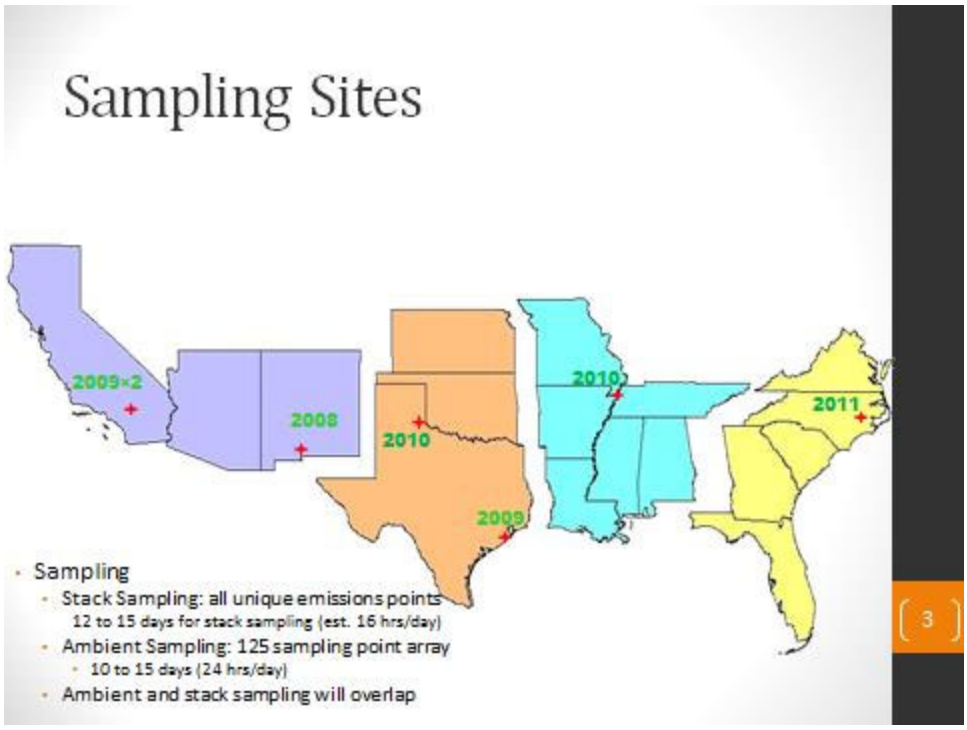


Figure 1. Slides used in the conference presentation.



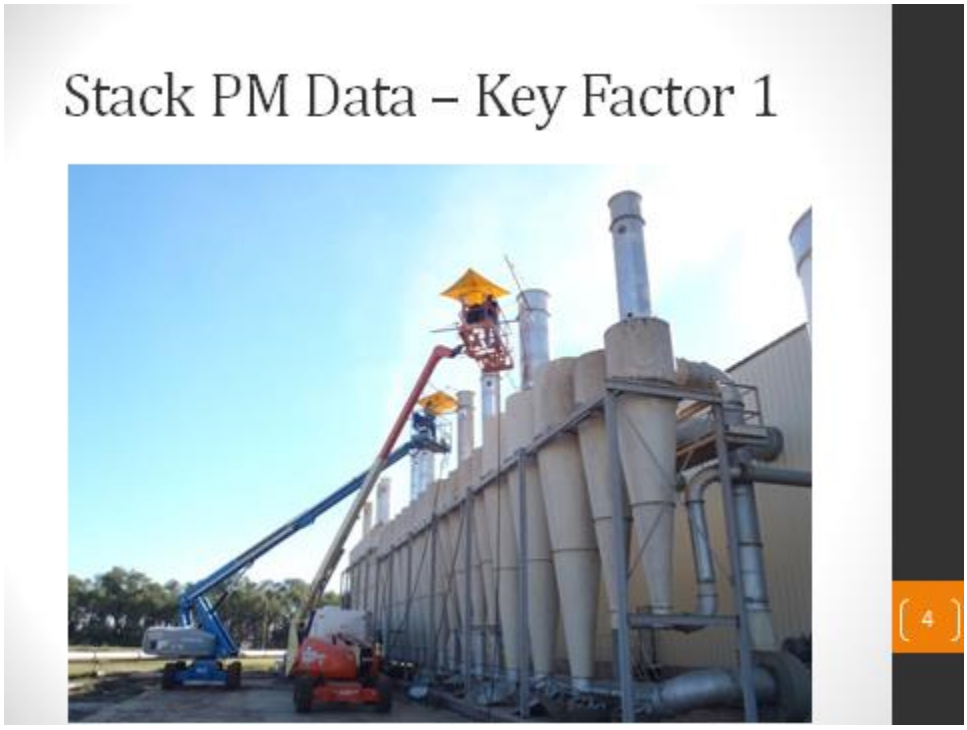


Figure 1 (cont.). Slides used in the conference presentation.

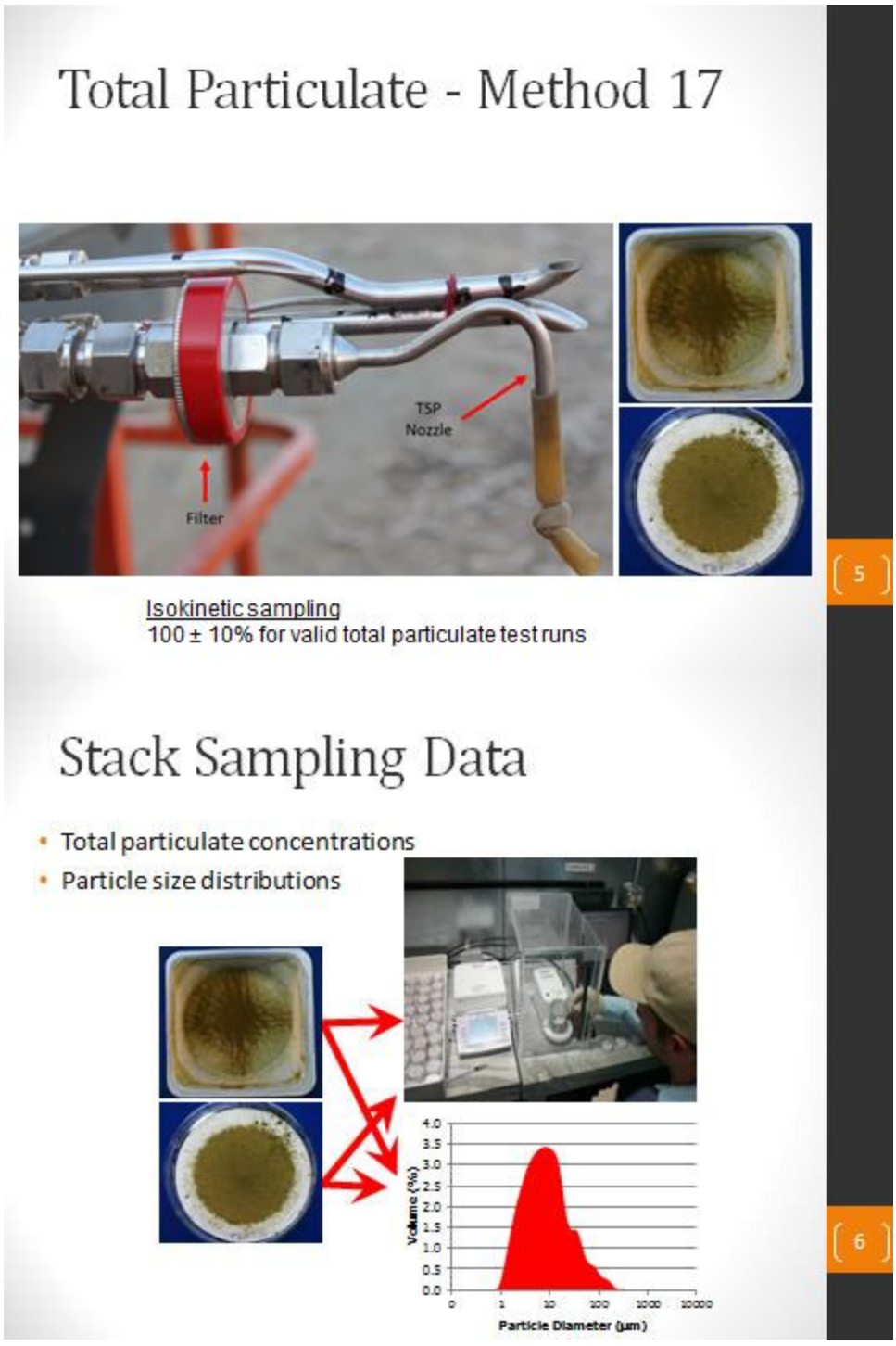


Figure 1 (cont.). Slides used in the conference presentation.

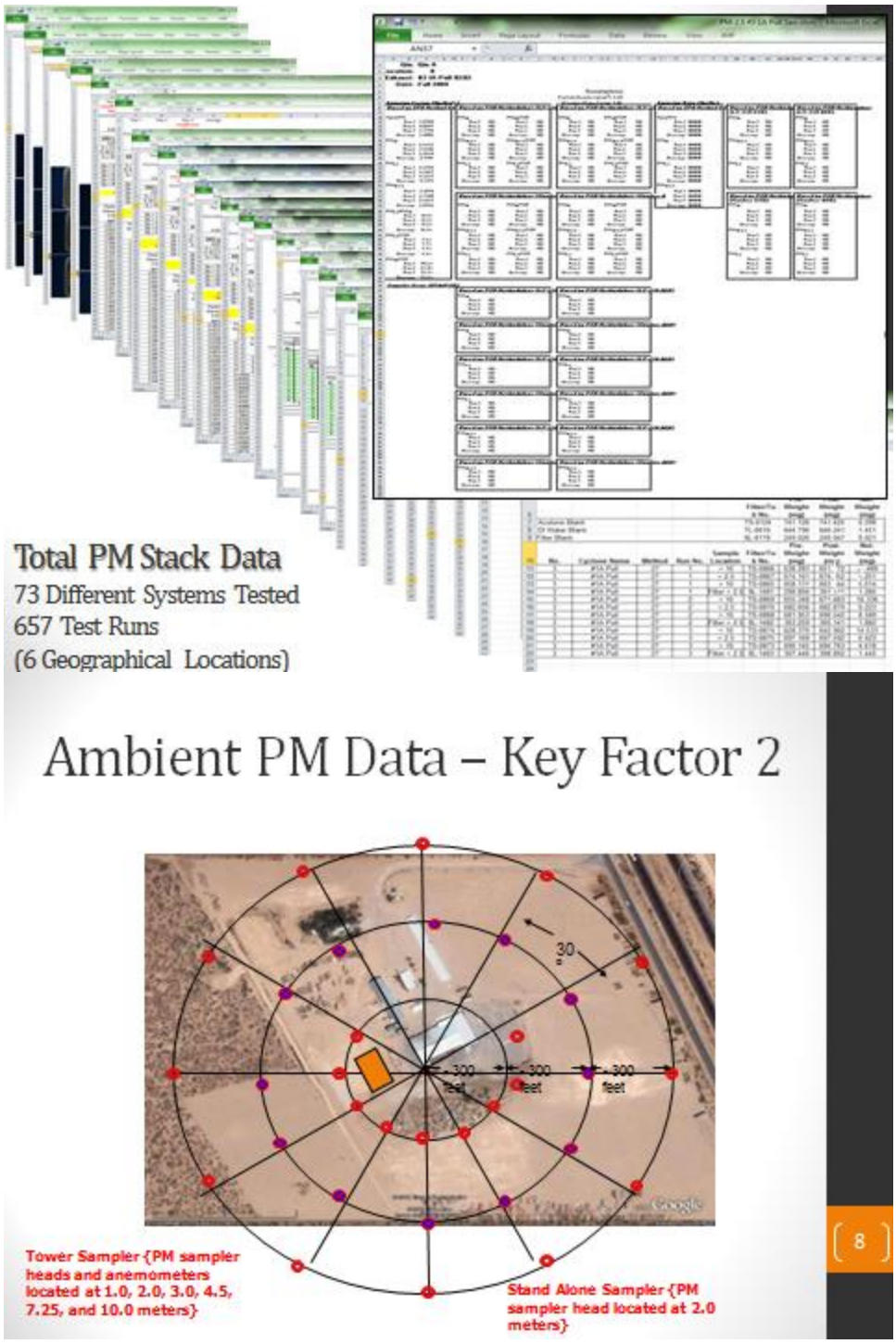


Figure 1 (cont.). Slides used in the conference presentation.

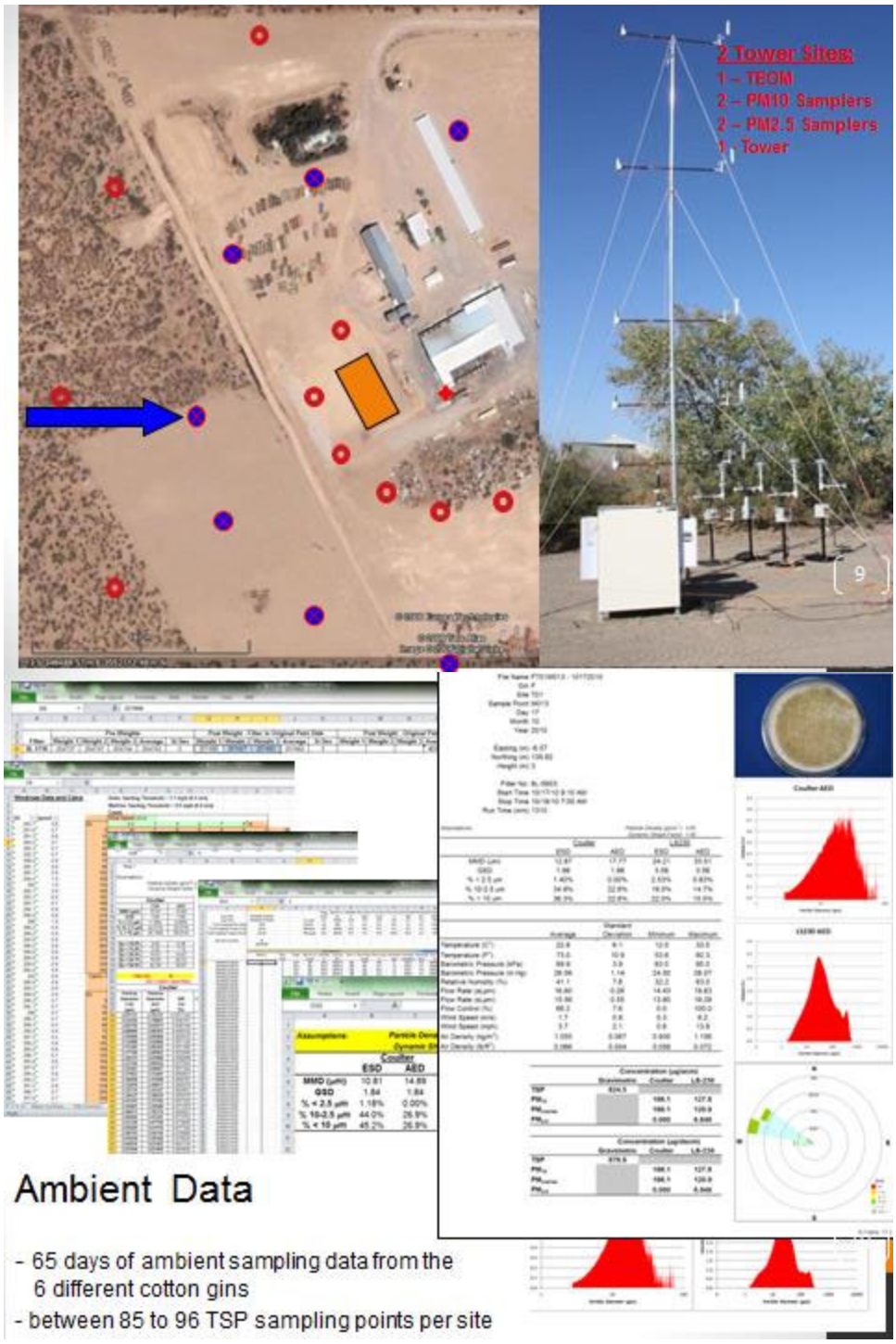


Figure 1 (cont.). Slides used in the conference presentation.

Meteorology Data – Key Factor 3

- On-site meteorology data collected during on-site PM sampling
  - Base tower station (pictured)
  - Wind field data - 72 anemometers on the ambient PM sampling towers
- Seasonal on-site meteorology data
  - 4 or 5 years of data per site
- Local or regional meteorology data
  - Typically used by regulators or consulting firms
  - Upper air data will be used in all modeling evaluations

11

Structures Data – Key Factor 4

- Measure all on-site structures
  - Complete for all 6 sites
- Create 3D wireframe drawings that can be imported into the dispersion modeling software
  - ~40% complete

12

Figure 1 (cont.). Slides used in the conference presentation.

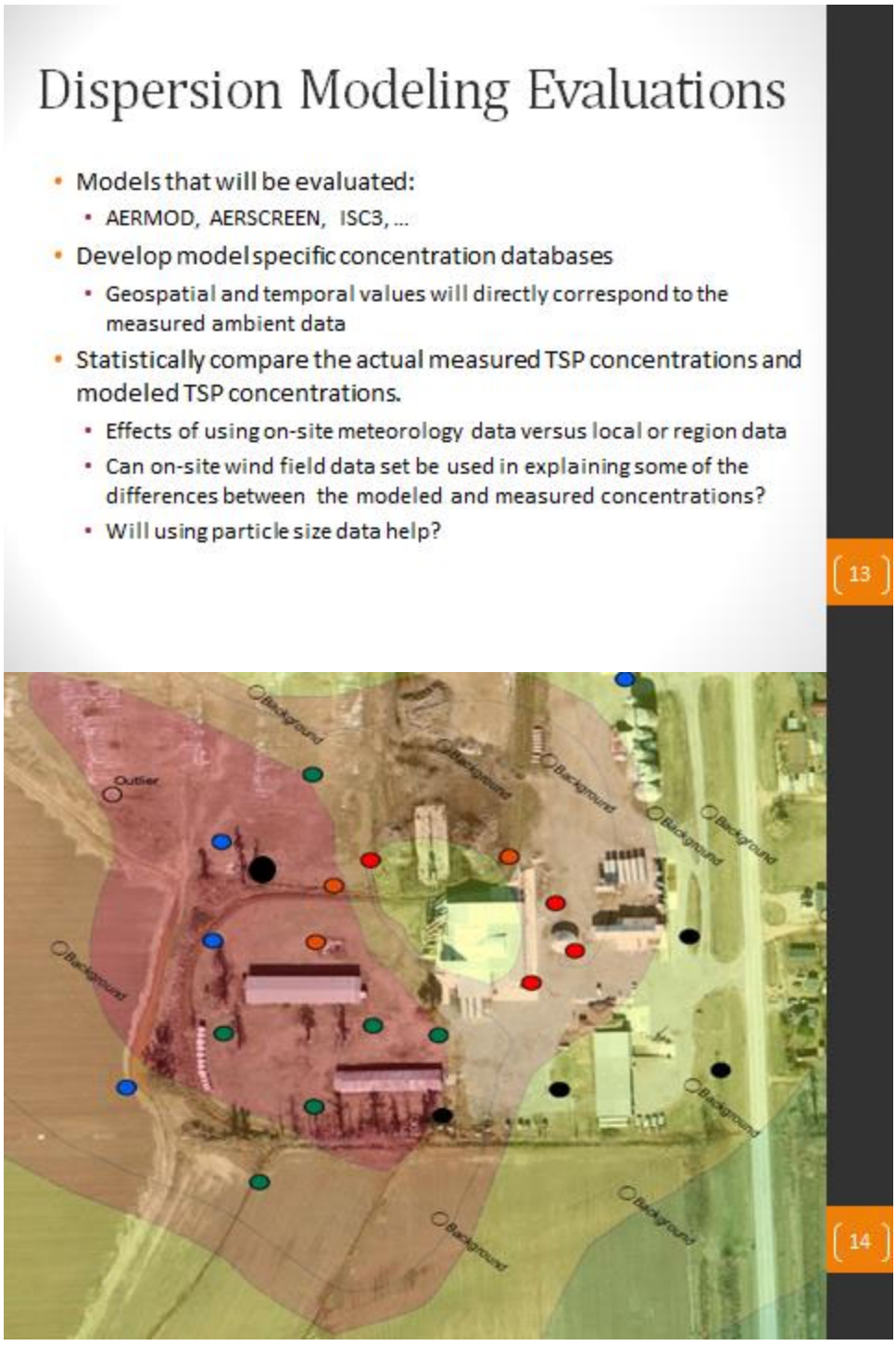


Figure 1 (cont.). Slides used in the conference presentation.

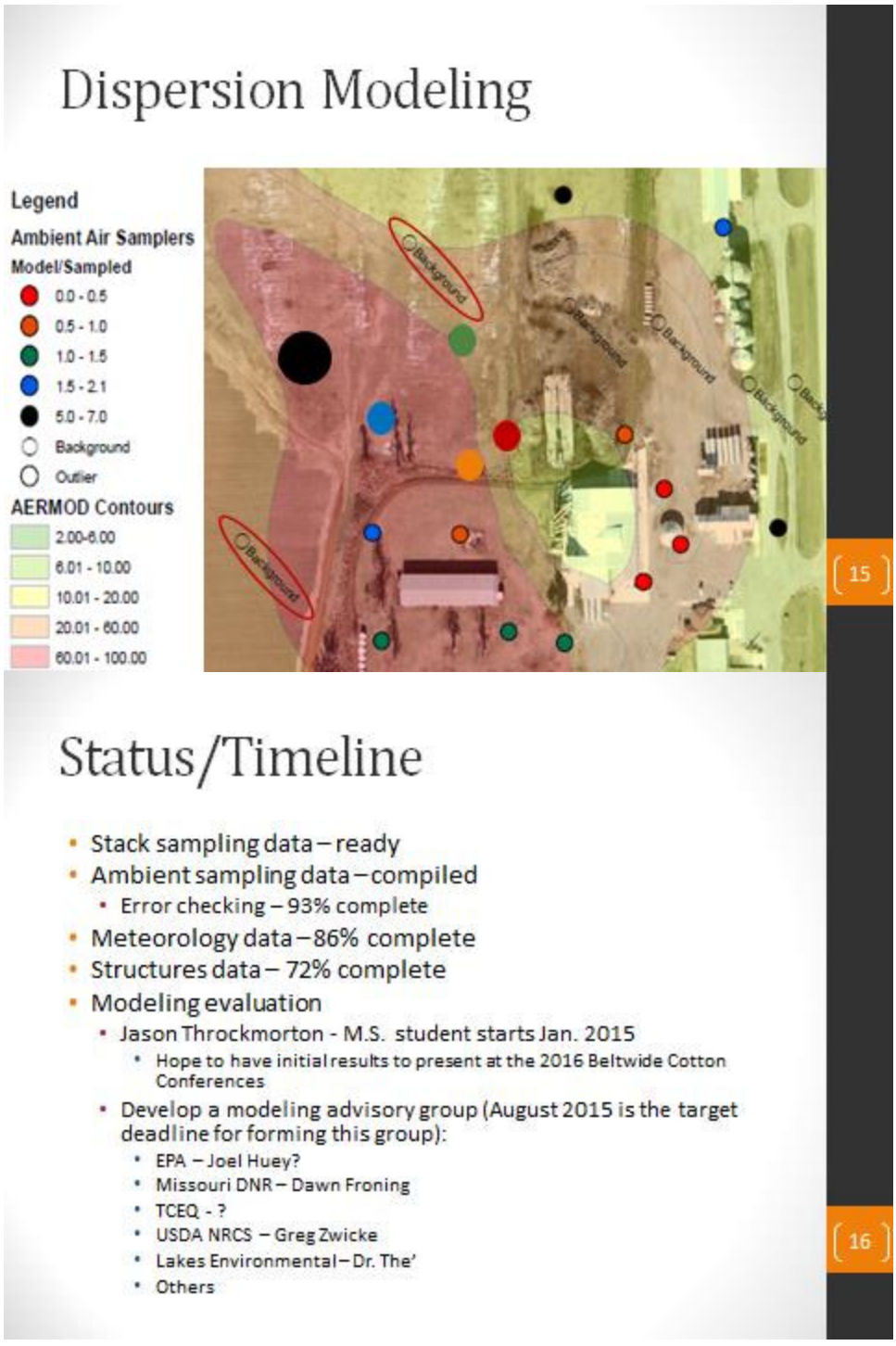


Figure 1 (cont.). Slides used in the conference presentation.