AQRP Monthly Technical Report

PROJECT TITLE	Improving Estimates of Wind-Blown Dust from Natural and Agricultural Sources	**PROJECT #**	20-011
PROJECT PARTICIPANTS	Chris Emery, Tejas Shah, Uarporn Nopmongcol, Greg Yarwood (Ramboll)	**DATE SUBMITTED**	4/5/2021
REPORTING PERIOD	**From:** March 1, 2021 **To:** March 31, 2021	**REPORT #**	9

A Financial Status Report (FSR) and Invoice will be submitted separately from each of the Project Participants reflecting charges for this Reporting Period. I understand that the FSR and Invoice are due to the AQRP by the 15th of the month following the reporting period shown above.

Detailed Accomplishments by Task for reporting period

Task 1: Review Current CAMx WBDUST Estimates

This task was completed in September 2020.

Task 2: Review Alternative Methods and Datasets

Task 2.1 was completed in November 2020.
Task 2.2 was completed in February 2021.

Task 3: Update the WBDUST Model and Evaluate Impacts in CAMx MP

Continued to apply CAMx with the 2016 EPA Modeling Platform to assess alternative windblown dust estimates from previous and updated (from Tasks 2.1 and 2.2) versions of the WBDUST model. See below for a summary of our preliminary analysis.

Task 4: Project Reporting and Presentation

Developed February MTR and FSR and submitted to AQRP on March 3 and 22, respectively.

Preliminary Analysis

We calculated windblown dust (WBD) emissions using original and updated versions of WBDUST and supplied them to CAMx to assess air concentrations. We ran the model for the March-April 2016 period, where all model inputs except emissions were taken from the national 2016 EPA modeling platform at 12 km grid resolution covering the continental US. Monitoring of particulate matter (PM) at IMPROVE sites throughout the southwest US indicated high concentrations of dust during the windy/dry March-April period. We ran CAMx with only WBD emissions and simulated the inert dispersion of un-speciated fine and coarse PM. This model configuration allowed us to run and analyze many WBD sensitivity runs quickly.

We conducted six individual sensitivity runs through March 2021. Run 0 used WBD estimates from the original WBDUST program. Runs 1 and 2 used WBD estimates from the updated parametric formulation developed under Task 2.1; Run 1 employed monthly global leaf area index (LAI) inputs while Run 2 used default LAI assigned by CAMx landcover classification.

Runs 3 and 4 used WBD estimates from the updated WBDUST code plus the CropScape data developed under Task 2.2; Run 3 used global LAI while Run 4 used default LAI. Run 5 entailed a sensitivity run that removed key limitations on dust generation to maximize emissions. Output fine and coarse dust concentrations were compared to IMPROVE dust measurements over the 2-month period.

As similarly described in previous Task memoranda, Run 0 led to negligible dust estimates. Results from Runs 1 and 2 were practically identical and continued to exhibit large under predictions of dust concentrations very similar to Run 0, despite generating somewhat more dust both in area and magnitude. We attribute these under predictions to the fact that dust plumes in Runs 1 and 2 continued to miss many of the IMPROVE monitoring sites, thus resulting in near zero concentrations relative to measurements. Results from Runs 3 and 4 were very similar to Runs 1 and 2, despite generating even more dust both in area and magnitude with the introduction of CropScape inputs. Simulated dust concentrations did reach a few IMPROVE sites in the southwest US (southern Arizona) with better model-measurement agreement for some dust event days, but missed most sites and events throughout the south-central plains (Kansas through west Texas) and southern Rockies (Colorado, New Mexico). Run 5 was conducted to test if WBDUST was at all capable of emitting sufficient dust routinely and over broad areas of the western US. We verified that removal of key limitations in the WBDUST formulation indeed led to large PM overpredictions at all IMPROVE sites throughout the March-April modeling period. Therefore, the remaining WBDUST tests will involve identifying and adjusting key parameters and/or formulations to find an agreeable medium between results from Runs 3/4 and Run 5.

Data Collected
No data collected during the reporting period.

Identify Any Problems or Issues Encountered and Proposed Solutions or Adjustments
The updated WBDUST formulation with new CropScape inputs continues to underestimate WBD emissions at most IMPROVE sites. Therefore, the remaining WBDUST tests will involve identifying and adjusting key parameters and/or formulations to increase the area and magnitude of emissions.

Goals and Anticipated Issues for the Succeeding Reporting Period
Continue model testing of WBDUST updates using the CAMx model. Model results using original and alternative windblown dust estimates will be evaluated against ambient measurements. No anticipated issues for the succeeding reporting period.

Detailed Analysis of the Progress of the Task Order to Date
This project initiated on July 28 with the execution of the AQRP Task Order. All remaining tasks remain on schedule and budget according to our work plan.

Do you have any publications related to this project currently under development? If so, please provide a working title, and the journals you plan to submit to.

☐ **Yes** ☒ **No**

Do you have any publications related to this project currently under review by a journal? If so, what is the working title and the journal name? Have you sent a copy of the article to your AQRP Project Manager and your TCEQ Liaison?

☐ **Yes** ☒ **No**

Do you have any bibliographic publications (ie: publications that cite the project) related to this project that have been published? If so, please list the reference information. List all items for the lifetime of the project.

☐ **Yes** ☒ **No**

Do you have any presentations related to this project currently under development? If so, please provide working title, and the conference you plan to present it (this does not include presentations for the AQRP Workshop).

☐ **Yes** ☒ **No**

Do you have any presentations related to this project that have been published? If so, please list reference information. List all items for the lifetime of the project.

☐ **Yes** ☒ **No**

Have any personnel changes occurred that were not listed in the original proposal? If so, please include a detailed description of the personnel change(s) below.

☐ **Yes** ☒ **No**

Are any delays expected in the progress of the research? If so, please include a detailed description of the potential delay below.

☐ **Yes** ☒ **No**

Describe any possible concerns/issues (technical or non-technical) that AQRP should be made aware of.

None.

Are you anticipating using all the available funds allocated to this project by the end date? If not, why and approximately what is the amount to be returned?

☒ **Yes** ☐ **No**

Submitted to AQRP by
Chris Emery, Ramboll