Agenda for August 14, 2015, Meeting of the
AERMOD Model Evaluation Workgroup
EPA, Research Triangle Park, NC

10:00-10:15 Welcome/Introductions/Agenda Review (John Bunyak)

10:15-11:15 Background: Drill Rig Study Summary Presentations

- Colorado Field Study (John Bunyak)
- Alaska Field Study (Tom Damiana)
- Amec Data Review (Clint Tillerson)

11:15-11:45 Recommendations for Analysis of CO and AK data—see below (Doug Blewitt via telephone)

- Data review
- Model evaluation

11:45-12:15 Group Discussion of Recommendations (ALL)

12:15-12:30 Wrap-up/Next Workgroup Call/Adjourn (John Bunyak)

Doug Blewitt
August 2, 2015
Draft

Recommendations for Analysis of DJ Drill Rig Data

Task recommendations needed prior to model evaluation (data review)

1. Need to calculate mass emission rate for all sources. Need to convert concentration to mass emission rate. Verification is needed to ensure data are available for calculations.
2. Calculate actual exit velocity based on stack delta pressure measurements.
3. Need to calculate the distance between the well being drilled and the downwind monitors and monitor elevation. Computations need to evaluate distance and azimuth for each sampler.

Analysis of ambient and source data

1. Ambient data needs to be reviewed to evaluate trends in ambient concentrations under different emission rates and meteorological conditions.
    a. Evaluate wind direction alignment from source to monitors to known azimuth.
    b. Identify potential influence from mobile source emissions.
    c. Review ambient ozone data and evaluate ozone scavenging.
2. Review all the ambient monitoring data (well pad 1, well pad 2 sampling configuration 1, and well pad 2 sampling configuration 2) in relation to emission data and meteorological data.
    a. This will entail reviewing all hours of monitoring data to evaluate if impacts occurred at specific monitors.
    b. Based on wind direction and ambient impacts, the ambient data should be separated into three categories:
        i. No monitored impacts from rig;
        ii. Periods when plume centerline and plume half width were identified[1]; and
        iii. Periods of source impact but plume centerline was not observed.
    c. If the no impacts were observed, those data will be defined as a background hour.

[1] Plume centerline is identified when an actual peak in the crosswind measurements was observed.

d. For periods when impacts were measured, it will be important to examine the impacts to evaluate if they are a result of the drill rig engines or a result of construction equipment that was operational at the site. This will involve detailed evaluation of meteorological conditions and examination of the 5-minute data[2] and NO2/NOx ratios.

e. Compile basic statistics on frequency of impacts/vs no impacts and overall monitoring coverage.

f. Time series and crosswind concentration plots should be developed. Care should be given to accurately presenting the crosswind data for well site 1 when the monitors were arranged in an "L" configuration and the monitors were not equal distance from the drill rig.

g. Cross-validate on-site ozone data with nearby AQS monitors and evaluate historical AQS monitors to develop plan for ozone data substitution for missing ozone. It is important that only rural ozone monitors be used in this evaluation. Before any data substitution is made, the approach should be discussed with the Study Management Team and the full Model Evaluation Workgroup.

3. Perform analysis of ambient data impacts

   a. Perform comparisons of upwind and downwind data to determine degree of ambient impacts.

   b. Evaluate plume characteristics during impact events based on meteorological conditions (e.g., plume width, variation in NO2/NOx ratio across plume width, cross-wind integrated concentrations).

   c. Characterize NO/NO2 speciation based on emissions, meteorological and background data.

   d. Construct a modeling database that identifies data to be used for model evaluation. Use a format similar to what EPA has used for previous modeling archive databases. The database should contain emission measurements, meteorological measurements and ambient measurements in a single file (Excel) so that inter- comparison of the data can be made.

[2] There appears to be a large difference between 5-minute peak values and 1-hour averages. This may be a result of intermittent or moving equipment operations. Data should be reviewed to determine if mobile impacts can be separated from actual impacts from the drilling rig engines.

4. Results of this analysis need to be summarized in a data analysis report that needs to be reviewed by the Study Management Team and the full Model Evaluation Workgroup prior to conducting model evaluation.
5. Construct a modeling database that identifies data to be used for model evaluation. Use a format similar to what EPA has used for previous modeling archive databases. The database should contain emission measurements, meteorological measurements and ambient measurements in a single file (Excel) so that inter-comparison of the data can be made.

Additional data needed for model input

1) Need to agree on the approach for the conversion of ppb to ug/m3 actual or standard.
2) Need to calculate downwash parameters for BPIP.
3) Previous modeling conducted for rigs has indicated that BPIP PRIME did not accurately estimate the ambient turbulence generated by the rig. This may or may not be an issue for the DJ rig.
4) Determine surface roughness using multiple approaches
    a. Typical surface roughness for DJ land use type.
    b. Surface roughness based on the physical structure height.
    c. Potentially evaluate surface roughness by wind direction.
5) Obtain upper air data and process met data through AERMET.

Model evaluation

1) Agree on model evaluation approach. The comprehensive nature of the database may enable different model evaluation approaches and results may be able to be paired in time and space. Possible model data comparisons:
    a. NOx
    b. NO2
    c. NO2/NOx ratio
    d. Evaluate pairing approaches
2) Develop modeling protocol
3) Perform model evaluation

Report

Doug Blewitt
August 2, 2015
Draft

Recommendations for Analysis of AK Drill Rig Data

Task recommendations needed prior to model evaluation (data review)

1) Need to calculate mass emission rate for all sources. Method 19 should be used. Verification is needed to ensure data are available for necessary calculations.
2) Calculate actual exit velocity based on stack diameter and Method 19 volume flow calculations.
3) Need to calculate the distance between the well being drilled and the downwind monitor. The distance between source and monitor changed for each well that was drilled (also, Google Earth is not accurate in this region).

Analysis of ambient and source data

1) Need to correlate emission data with the ambient data and determine a subset of ambient measurements when the drill rigs were being powered by diesel as opposed to line power. These will be the data that will be used for model evaluation.
2) Ambient data when the rigs were on diesel needs to be further reviewed to evaluate trends in ambient concentrations under different emission rates and meteorological conditions.
    a. Evaluate wind direction alignment to actual source azimuth.
    b. Evaluate NO2/NOx ratio based on what portion of the plume impacts the monitor. This may not be clear cut because of additional entrainment from structures.
    c. Evaluate the change in distance as the drill rig moved and the distance between the rig and the monitor changed.
    d. Identify potential influence from mobile source emissions.
    e. Review ambient ozone data and evaluate ozone scavenging.
    f. Identify periods of ambient and source data that can be used for model evaluation.

3) The ambient data when the rigs were on line power will be useful in determining the influence of mobile sources.

a) Examine peak concentrations when using line power.
b) Examine NO2/NOx ratios. There may be a possible change in the NO2/NOx ratio for mobile sources compared to the diesel engines.

4) Results of the analysis need to be summarized in a data analysis report and reviewed by the Study Management Team and the full Model Evaluation Workgroup prior to conducting model evaluation.
5) Construct a modeling database that identifies data to be used for model evaluation. Use a format similar to what EPA has used for previous modeling archive databases. Database should contain emission measurements, meteorological measurements and ambient measurements in a single file (Excel) so that inter- comparison of the data can be made.

Additional data needed for model input

1) Need to agree on the approach for the conversion of ppb to ug/m3 actual or standard.
2) Need to calculate downwash parameters for BPIP. Previous modeling conducted for the rig indicated that BPIP PRIME did not accurately estimate the ambient turbulence generated by the rig.
3) Determine surface roughness using multiple approaches
    a. Tundra
    b. Surface roughness based on the physical structure height
    c. Potentially evaluate surface roughness by wind direction
4) Obtain upper air data and process met data through AERMET.

Model evaluation

1) Agree on model evaluation approach. Possible model data comparisons:
    a. NOx
    b. NO2
    c. NO2/NOx ratio
    d. Evaluate pairing approaches
2) Develop modeling protocol
3) Perform model evaluation
4) Report results