BOEM's GOMR Dispersion Modeling Guidelines

July 2015

The Bureau of Ocean Energy Management (BOEM) is establishing Gulf of Mexico Region (GOMR) Dispersion Modeling Guidelines for the following reasons: (1) to streamline procedures; (2) to minimize modeling efforts; and (3) to ensure compliance with federal standards. Modeling for BOEM is performed to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS). Visibility modeling for the Class I areas is discussed in Federal Land Managers' Air Quality Related Values Work Group Phase I Report (FLAG) and is not discussed in these Guidelines.

These Guidelines incorporate the latest regulatory guidance and compliance methodologies. Routinely, BOEM will modify its Guidelines to reflect recent developments, to correct prior deficiencies, and to incorporate regulatory changes. Before initiating any modeling, BOEM encourages operators to both (1) submit a modeling protocol to BOEM GOMR, Regional Supervisor, Office of Leasing and Plans, Plans Section with the appropriate plan control number and (2) consult with BOEM.

1. When does an Offshore Operator Need to Conduct Air Dispersion Modeling?
    a. An operator is required to conduct offshore air dispersion modeling whenever their proposed potential to emit emissions on their Plan's Complex Total Air Quality Spreadsheets (Forms BOEM-0138.xls or BOEM-0139.xls found at http://www.boem.gov/Air-Quality-Reporting/) exceed an exemption level as described in 30 CFR 550.303(d).
    b. Air dispersion modeling should be conducted on only the pollutant that exceeds the exemption level, but for all NAAQS averaging times for that pollutant.
2. NAAQS Standards
    a. The Clean Air Act, last amended in 1990, requires the United States Environmental Protection Agency (USEPA) to set NAAQS (40 CFR Part 50) for pollutants considered harmful to public health and environment.
    b. The USEPA has set NAAQS for 6 principal pollutants listed at: http://www.epa.gov/air/criteria.html.
3. Model Selection
    a. As stated in 30 CFR 550.218(e) and 550.249(e), "When BOEM requires air quality modeling, you must use the guidelines in Appendix W of 40 CFR part 51 with a model approved by the Director."
    b. Approved BOEM GOMR models are located at: http://www.boem.gov/Approved-Air-Quality-Models-for-the-GOMR/.
    c. The Offshore and Coastal Dispersion Model (OCD) and CALPUFF are both listed in Appendix W as preferred, recommended models and approved by BOEM's Director.
        1. Within 50km of the shoreline, the operator should use the OCD model. OCD is a straight-line Gaussian model developed to determine the impact of offshore

emissions from point, area, or line sources on the air quality of coastal regions. For more specific information on OCD, see 40 CFR Part 51, Appendix A, A.6.

2. At distances greater than 50km of the shoreline, the operator should use CALPUFF. CALPUFF is a multi-layer, multi-species, non-steady state puff dispersion modeling system that simulates the effects of time-and space-varying meteorological conditions on pollutant transport, transformation, and removal. For more specific information on CALPUFF, see 40 CFR Part 51, Appendix A, A.4.
3. Breton Class I Visibility
    a. Visibility modeling may be required if the facility is:
        1. Within 100km of Breton and 250tpy of permanent NOx, SOx, or PM emissions. Permanent emissions are defined as emissions that occur over three years or longer. Drilling that occurs during three or more consecutive years but ceases for a part of each year is considered permanent.
        2. Between 100-200km of Breton, and has greater than 250tpy of permanent NOx, SOx, or PM emissions, and Q/d greater than 10. Q/d is defined in FLAG.
    b. Consult with BOEM before conducting any modeling:
        1. BOEM might allow you to conduct one set of CALPUFF modeling for both BOEM (covering the dispersion analysis) and USFWS (covering the visibility impacts)
        2. This will only be allowed if you don't have to run VISCREEN for USFWS.

d. Both the OCD model and CALPUFF executable files and user's guides may be downloaded from the USEPA SCRAM website: http://www.epa.gov/scram001/

4. Modeling Procedures
    a. As stated in 30 CFR 550.218(e) and 550.249(e), "When BOEM requires air quality modeling, you must use the guidelines in Appendix W of 40 CFR part 51 with a model approved by the Director."
    b. An operator must use Appendix W procedures when conducting air dispersion modeling.
    c. CALPUFF NOx Conversion- Keep the scaling factor at worst case 100% and if you pass then you are done. If you do not pass, then take results and multiply by 0.8 for 1-hour and 0.75 for annual NOx. Don't double count by changing scaling factor and multiply the results.
5. Meteorological Data
    a. Five consecutive years of the most recent representative meteorological data is needed.
    b. BOEM has published a "Five-Year Meteorological Datasets for CALMET/CALPUFF and OCD5 Modeling of the Gulf of Mexico (GOM) Region" (OCS Study, MMS 2008-029), located at: http://www.data.boem.gov/PI/PDFImages/ESPIS/4/4364.pdf
    c. Datasets are available for the period of 2000-2004 for both OCD and CALPUFF
    d. OCD Meteorological Data- hourly needed for both offshore and onshore locations

1. Please send email to holli.ensz@boem.gov indicating appropriate "Group" as detailed in Section 4.1 of OCS Study Publication #MMS 2008-029
2. The meteorological dataset for that "Group" will be emailed back to you

e. CALPUFF Meteorological Data- time dependent three dimensional fields required
1. Please send a hard drive to, with return paid mailing label to:
   Holli Ensz
   BOEM, Physical Scientist
   1201 Elmwood Park Blvd.; MS GM 676E
   New Orleans, LA 70123
2. Your hard drive with the meteorological dataset will be returned to you
3. You might also use the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) meteorological dataset depending on your location

6. Terrain
   a. Overwater is considered flat and GOMR shoreline is flat as well
   b. Gridded terrain and land use data are available from the U.S. Geological Survey (USGS)
7. Modeling Domain
   a. Include sufficient detail including the area/block of the proposed activity, Breton Class I area, and the shoreline of not only the nearest state, but shoreline of adjacent states
8. Receptors
   a. The National Park Service (NPS) Air Resources Division (ARD) has developed a database of modeling receptors for all the Class I areas in the US, which can be downloaded from the NPS web site at: http://www.nature.nps.gov/air/maps/receptors/index.cfm
   b. OCSLA states offshore OCS oil and gas activities can not impact the air quality of any state so set discrete receptors along the shoreline 1km-5km apart at ground level as appropriate based on the distance from the source. Generally, receptor spacing will increase with distance from the source.
9. Source Inputs
   a. Model all sources, including but not limited to: drilling, pipeline installation, facility installation, production, and all vessels (crew, tug, supply, and support).
   b. Take the maximum pounds per hour from the Form BOEM-0138 or Form BOEM-0139 of the pollutant exceeded and convert those into grams per second as inputs into the model
   c. With agency approval, intermittent sources can use the annualized emissions in accordance with approved USEPA modeling guidance.
   d. Sources of pollutants can be classified as point, line, and area/volume sources. Facility production emissions are classified as point sources. Support vessels may be modeled as line, area, or volume sources.
   e. Stack parameters should include pollutant emission rate, stack exit diameter, volume flow rate or stack exit velocity, stack exit temperature, building height, stack height, stack angle from vertical, elevation of stack base above water surface, and gridded specification of the land/water surfaces (OCD).

10. Modeling Results
    a. Compare modeled concentrations with the appropriate SILs (40 CFR 51.165(b)(2))
    b. Since the 1-hour NOx SIL is not finalized, an operator can add the highest modeled concentration to the background value to compare to the NAAQS
        1. Use the closest 1-hour monitor with available latest three years of data
            a. For Louisiana, a map with locations of both current and previous monitoring data is available from LDEQ. http://www.deq.louisiana.gov/portal/tabid/112/Default.aspx
            b. Actual monitoring data is available from the USEPA at: http://www.epa.gov/air/data/geosel.html
        2. The background concentration is the calculated design value of that monitor
    c. Highest modeled results should be compared to the SILs at the shoreline and Breton
11. Modeling Report
    a. Brief overview of the proposed project (history including drilling, production, installation, etc.)
    b. BOEM AQ Spreadsheet showing which pollutant exceeded the exemption level
    c. Emissions rate summary for all sources, with units consistent with modeling
    d. Stack parameter summary (including emission rates (g/s), stack exit diameter (m), stack exit velocity (m/s), stack exit temperature (˚K), physical stack height (m)) for all facility sources, with units consistent with modeling. If line, area, or volume sources used for vessels, please include dimensions.
    e. Map detailing project including: area/block, location of sources in latitude/longitude, distance to shoreline in miles, distance to Breton Class I area in kilometers as defined by the USFWS Breton boundary shapefile online, non-attainment areas, receptors, location of monitors used for background concentration, and vessel mapping from source to port.
    f. Summary of all model inputs (e.g. model used, meteorological data, receptors, etc.)
    g. Comparison of all modeling results to the applicable standards (please include tables of results/figures of Surfer contour plots/etc.)
    h. Table showing the calculation of design value of the monitor if used for background concentration
    i. Electronic copies of all modeling files, including model input files, output files, meteorological data (if different than BOEM supplied)
    j. Paper copy of the output files for the worst-case year for each pollutant and averaging period.
    k. Provide two copies of the modeling report to BOEM's Plans Section with the appropriate plan control number.

BOEM may request additional information at any time during this process.