Georgia Department of Natural Resources

Environmental Protection Division ● Air Protection Branch
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Mark Williams, Commissioner
F. Allen Barnes, Director

July 27, 2011
Mr. John Bandzul   Forwarded to: Jbandzul@SmithAldridge.com
Smith Aldridge, Inc.
P.O. Box 420485
Atlanta, GA 30342

Subject: **Review of PSD Air Dispersion Modeling Protocol**
              CARBO-Greenfield Site, Millen, Jenkins Co., Georgia

Dear Mr. Bandzul:

We have reviewed the air quality dispersion modeling protocol dated July 19, 2011, which addresses the proposed modeled conformance of CARBO Ceramics, Inc. (CARBO) kaolin processing facility in Jenkins County, Georgia with applicable air quality standards. We find that it generally conforms to the procedures and guidelines we use to assess Prevention of Significant Deterioration (PSD) modeling projects. However, we do have the following comments:

1. Since the protocol was received, we have received copies of your FLM communications with the US Fish & Wildlife Service and the US Forest Service, confirming an interest in Air Quality Related Value Assessments in the former. We understand you have not heard confirmation of such a requirement for the Shining Rock Wilderness Area. We look forward to receipt of your Class I area Modeling Protocol. We anticipate that it will include the Shining Rock Class I area, if required. Please continue to copy GA EPD on any FLM communications.

    As discussed on the April 5, 2011 conference call, EPA/EPD retain purview over Class I Increment consumption, so both agencies should get a copy of any project correspondence you may have with any FLM. In addition, if the project is not required to assess Air Quality Related Values at any Class I area (such as Shining Rock), you may wish to contact EPD for Class I Significance screening procedures involving AERMOD. If such screening modeling indicates the project will exceed applicable Significance levels at Shining Rock, such screening modeling must be repeated using CALPUFF, which should be addressed in the Class I Area Modeling Protocol that you are preparing. GA EPD does not expect your project to consume, or model any Class I PM2.5 Increment or Significance. For issues with Class I AQRV assessment, refer to the FLAG-2010 AQRV Work Group Phase I Report, or consult the applicable FLM. For issues with Class I Increment, refer to the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts, 1998, or consult the GA EPD modeling unit.

2. Class II Meteorological Data: Based on the preliminary meteorological representation results you shared with us on 7/26/11, we believe you should conduct any further Class II impacts modeling with the Daniel Field/Peachtree City 2006-2010 data set based on the surface characteristics of the Daniel Field National Weather Service (NWS) station. GA EPD processed hourly meteorological observations collected at Daniel Field using the recently promulgated, final versions of AERMINUTE and AERMET (both versions 11059), incorporating the once daily upper air observations of the Peachtree City NWS station. The data were processed using AERSURFACE (version 08009) outputs for the wet, dry, and average moisture conditions, by season and 30° sector in accordance with the AERMOD Implementation Guidance (3/19/08). Two sets of meteorological data were compiled, one for the surface characteristics of the NWS site, and one for the characteristics of the CARBO project site.

While the AERSURFACE outputs were similar for values of albedo and Bowen ratio, and generally similar for surface roughness, the ratio of surface roughness values by sector consistently indicated a pair of sectors to have ratios in excess of 10. For this reason, the EPA Region 4 modeling-based method of demonstrating representation was invoked.

You have conducted significance modeling with both sets of meteorological data for SO2, NO2 (using PVMRM), PM10, PM2.5, and CO. The results showed higher maximum short-term impacts for each pollutant were predicted using the NWS-characteristics data set. The results also indicated slightly higher maximum annual average impacts for each pollutant were predicted using the site characteristics. During our meeting of 7/26/11, we decided that:

    a.   The short-term impacts are usually the basis for model-derived permit limits.

    b.   The surface characteristics of the NWS set are those which actually influenced the data collected.

For these reasons, GA EPD authorized you to complete the air quality assessment using the meteorological data set compiled with the NWS station surface characteristics.

3. Offsite Inventory Preparation: Please provide (in the modeled air quality assessment) dimensions and/or alternate emission source characteristics for any fugitive sources modeled, and indicate how such dimensions are represented in the model(s). Please document all sources of information used to compile any offsite inventories compiled for the project. Please carefully distinguish between NOx and NO_2, and provide your definition of NO_2, in the air quality modeling report. GA EPD believes extent of the offsite inventory should be based on the significant impact distance plus 50km, as indicated in the Draft 1990 NSR Workshop Manual. For pollutants and averaging periods addressed in that guidance, the offsite inventory may be reduced using the 20D screening technique. For PM2.5, all facilities in the post-20D PM10 offsite inventory should be inventoried for emissions of PM2.5. Examination of the original basis for the 20D screening technique suggests that application of the method to PM2.5 screening is acceptable (based on approximation of the PM2.5 SILs and the tabulated impacts), if:

    a.   the technique is changed to 2D,

    b.   D is defined consistently as the distance (in km) from the source to the offsite facility, and

    c.   PM2.5 annual (tpy) emission rates are used.

EPA has indicated (1-hr NO2 guidance memo dated 3/1/11) that the minimum extent of the modeled offsite inventory is defined by the Array of Significant Receptors (ASRs). GA EPD accepts the ASR for this purpose. If the ASR is not refined to 100m resolution, then GA EPD accepts the ASR for this purpose if it is buffered by the addition of receptor locations (not to exceed 500m resolution) at which concentrations of 7 $\mu g/m^3$, or above, have been predicted during significance modeling. Refined modeling for the 1-hr standards must be conducted to the ASR locations, or the ASR+buffer locations, as applicable.

The maximum extent of 1-hr pollutant offsite inventories is determined by identifying the fastest wind speed in the project meteorological data set, and converting that speed to the appropriate transport distance:

$$\text{Wind speed (m/s)} * 3600 \text{ s/hr} * 1km/1000m) = \text{transport distance per hour}$$

GA EPD allows refinement of this maximum inventory extent using a 16-sector wind rose, as follows:

    a.   Use Lakes Environmental's WRPLOT freeware (or equivalent) to develop a wind rose based on the entire project meteorological data set.

    b.   Using wind speeds in meters-per-second, identify the sectors with undefined (designated ">") wind speed for the maximum wind speed class.

         i.   Adjust the minimum wind speed for this fastest class until the fastest wind speed is resolved.

        ii.   Repeat for all sectors with maximum wind speeds designated as ">".

    c.   Use the class upper bound speed for sectors with designated class wind speeds.

    d. Convert the fastest wind speed, or wind speed class upper bound to the appropriate transport distance for each sector.

    e. Eliminate all sources beyond this maximum transport distance from the project in each sector.

    f. This transport distance screening technique cannot be applied to sources lying within the ASR, or ASR+buffer, as applicable.

Significance modeling may predict concentrations in excess of the 1-hr SILs or 7 $\mu g/m^3$ at selected receptors which are not adjacent to the main ASR, or ASR+buffer, respectively. Such outlier locations are assumed to be continuous with the main ASR or ASR+buffer for purposes of refined model receptor locations, and defining the minimum extent of the offsite inventory. However, outlying receptors with concentrations in excess of the SILs or 7 $\mu g/m^3$ may be excluded from refined modeling if they lie farther from the source than the fastest 1-hr transport distance in their wind sector.

4. Air Toxics: Air toxics modeling should be conducted in accordance with the GA EPD Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions, 1998. Air toxics modeling may use either AERMOD, version 11059, with downwash, or ISCST3, version 02035 without downwash. Air toxics model receptors should extend to at least 2 km outward from the project site, and there must be sufficient receptors to resolve the Maximum Ground-Level Concentration (MGLC). If any receptors are located at terrain elevations in excess of the lowest stack height in the model, AERMOD must be used to assess impacts at those receptors. If the ISCST3 model (version 02035) is used for air toxics, with receptors assigned terrain elevations, use the Macon/Waycross meteorological data set downloadable from the georgiaair.org website for ISCST3 modeling. A concatenated 5-yr meteorological data set may be used to assess 1-hr, 24-hr, and/or PERIOD (instead of annual) averaging periods. In this way, EPD expects a single model run for each toxic impact requiring refined modeling. The SCREEN3 model should not be used without specific justification, due to the number of sources and the range of source emission characteristics at the site. The air toxics modeling must be conducted to involve all on-site sources of the same pollutant. Georgia EPD no longer requires derivation of Acceptable Ambient Concentrations (AACs) from NIOSH LD_{50} threshold concentration data.

The EPD Permitting Program advises that the same pollutants modeled with the last CARBO PSD/112(g) permit are the specific air toxics to be assessed. The Permitting Program will also review and, if acceptable, approve your on- and off-site emissions inventories, including PM2.5 and SO2 emissions. On page 14 of the protocol, you indicate you may not be able to locate sufficient information to model selected sources, and wish to use "average" data for missing emission data. We would prefer that you identify the missing information and allow EPD the opportunity to provide the information to you or confirm that it is missing and approve your specific missing data handling technique.

5. Actual Class II criteria pollutant dispersion modeling should use the 11103 version of AERMOD. Standards (referred to here as pre-2008) discussed in the draft 1990 New Source Review Workshop Manual should be evaluated using that guidance. Other, more recent standards (post-2007, ie., 1-hr NO2, 1-hr SO2, and PM2.5) should be evaluated considering the guidance memos listed on page 63 of the updated AERMOD User's Guide. We have provided a discussion of methods we believe to be allowable based on the latter guidance in paragraph 3 of this protocol approval letter. As provided in the AERMOD User's Guide, any DEFAULT option may be employed in the modeling. Use of Non-Default options is subject to individual approval, preferably from EPA. You will shortly receive a letter from the EPA Region 4 Dispersion Modeling contact in which he, as I understand it, will provide approval of your use of the Beta-(and non-Default) PVMRM algorithm, contingent on certain conditions being met.

The largest Significant Impact Distance (SID) for each pollutant, regardless of time-averaging period, plus 50 km, will establish the size of any model screening area to be inventoried for offsite sources of that pollutant (PM2.5, PM10, SO_2, or NO_2) for cumulative modeling. The "20D", or for PM2.5, the "2D" screening technique may be used for eliminating sources from all but the 1-hr averaging period

models, but the screening should be conducted using both a short-term "d" and a long-term "D", except for PM2.5. No source located within the pollutant-specific largest Significant Impact Areas (SIAs) may be screened from the cumulative inventory. As discussed in paragraph 3, above, 1-hr NO2 and SO2 inventories will be developed based on other criteria, so the pollutant-specific largest SIA for these pollutants refers only to pre-2008 time-averaging periods. When applying the 20D or 2D screening methods, the pollutant-specific emissions of facilities within 2 km of each other outside the SIA should be added prior to applying the screening test.

6. PM2.5 Modeling: EPD expects CARBO to conduct refined PM2.5 modeling for NAAQS (only). At this time, EPD is not aware of PM2.5 modeling techniques acceptable to EPA other than those outlined in the Stephen Page guidance memo of 3/23/10. We understand you propose to add a 50km screening annulus to your maximum PM2.5 SID in order to develop an offsite PM2.5 inventory. Offsite sources may be screened from refined modeling using the "2D" technique, though no sources may be screened which are located within the SIA

7. Increment Issues: The Jenkins Co. Air Quality Control Region minor source baseline date for annual NO2 is 5/5/88, and was set statewide on that date. The facility will not be required to assess PM2.5 Increment consumption by this project (if the application is deemed complete by 10/20/11), based on the submittal of the application in advance of the earliest possible PM2.5 trigger date. When deemed a complete application, this CARBO project's emissions will set the minor source baseline dates for PM and SO2 in Jenkins Co., and , with annual NO2 project emissions, consume such Increment.

8. Ambient Concentrations: The project background 1- and 8-hr background ambient concentrations of CO are 943 and 802 $\mu g/m^3$, respectively. The annual NO_2 background ambient concentration is 5.2 $\mu g/m^3$. The 1-hr NO_2 background ambient concentration (2008-2010) is 33.24 $\mu g/m^3$, based on the March 1, 2011 EPA memo requiring the 98th %-ile of the daily maximum 1-hr concentration over a 3-yr period to be used for this purpose. The 24-hr annual average of the daily 98th percentile concentrations of PM2.5 at Bungalow Rd, Augusta ('08-'10) is 25.0 $\mu g/m^3$, the annual average PM2.5 concentration at Bungalow Rd, Augusta ('08-'10) is 12.7 $\mu g/m^3$. The:

> 1-hr SO_2 ambient concentration (Macon SE, 2008-2010) is 67.2 $\mu g/m^3$. The
> 3-hr SO_2 ambient background (same monitor and period) is 51.48 $\mu g/m^3$, the
> 24-hr SO_2 ambient background (same monitor and period) is 16.75 $\mu g/m^3$, the
> annual average SO_2 ambient background (same monitor and period) is 3.89 $\mu g/m^3$.

The PM10 regional background ambient concentrations for 24-hr and annual are 38 and 20 $\mu g/m^3$, respectively. You indicated you may wish to employ a concurrent PM2.5 hourly ambient background concentrations in the modeling of that pollutant. A 2008-2010 file of such concentrations is available on request.

9. General Modeling considerations: Please use the applicable procedure cited in the current version of the AERMOD Implementation Guide to address any horizontal emissions and/or rain-capped stacks in the models. Please use BPIPPrm (version 04274) to assess building downwash dimensions and GEP stack heights. Stacks of heights equal to, or in excess of GEP height should be modeled using the GEP height. Stacks below GEP height must be modeled to assess building downwash influences on their plumes. Please use AERMAP (version 11103) to assess all model receptor elevations above sea level with the USGS NED database (all model coordinates, including building corners, should be referenced using the NAD83 datum). Please assess source elevations using AERMAP, if appropriate. For all criteria pollutant modeling, please use AERMOD (version 11103).

10. Model Receptors: For the pre-2008 air quality standards and PM2.5, the extent of the receptors modeled should be at least that which was agreed upon during the 7/25/11 pre-PSD meeting. All design

concentrations should ultimately be resolved to the nearest 100 meters. The SID receptors should have at least one 100-m spaced receptor located farther from the project than the farthest receptor showing a concentration greater than or equal to the respective SIL. For the 1-hr air quality standards, see the discussion detailed in paragraph 3 as regards receptor placement.

11. Additional Impacts:
   a. All additional impacts studies will be limited to no more than the largest significant impact distance from the project site based on pre-2008 (excluding PM2.5) standards. Additional impacts studies do not include National Monuments, or National Parks, unless specifically requested by a Federal Land Manager.
   b. On the basis of Tables 2.1.1-1 and 2.1.2-1, six airports, and two state parks, or less depending on the largest 24-hr PM10 or annual NO2 SIA, should be assessed for visible plume impacts using the VISCREEN model, User's Guide, and Tutorial.
   c. Only four trace elements, Cu, B, V, and Zn are included in EPA's 1980 publication, "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" which are not included on the Hazardous Air Pollutants list of Title 3 of the 1990 Clean Air Act Amendments. Additional impacts assessments of those four elements, and the criteria air pollutants should be conducted in accordance with that guidance, or more recent literature. Note that EPA has proposed modifications of the secondary SO2 and NO2 standards which are projected to be final around March 20, 2012.
   d. Please include a discussion, and if warranted, an assessment of air emissions expected to occur as a result of the growth associated with the project as indicated on pages D.3-D.4 of EPA's Draft 1990 New Source Review Workshop Manual.

Please contact me at 404-363-7095, or 706-334-2533, if you have any questions. If EPA issues guidance, or models which you believe may affect the modeling of this project subsequent to this protocol approval letter, please contact me to verify the ability to incorporate such guidance or models in the assessments of this application. If you have specific questions on issues that develop after you receive this protocol approval letter, please contact me.

Sincerely,

Peter S. Courtney, P.E.
Environmental Specialist
GA EPD

Attachments: Generally Applicable Class II Area Modeling References

Generally Applicable Class II Area Modeling References

2005, 40 CFR 51, Appendix W, Guideline on Air Quality Models

1990, Draft New Source Review Workshop Manual.

2004, USER'S GUIDE FOR THE AMS/EPA REGULATORY MODEL - AERMOD (EPA-454/B-03-001, September 2004) (version 04300)

2009, ADDENDUM, USER'S GUIDE FOR THE AMS/EPA REGULATORY MODEL - AERMOD (EPA-454/B-03-001, September 2004), October 2009 (version 09292)

2011, ADDENDUM, USER'S GUIDE FOR THE AMS/EPA REGULATORY MODEL - AERMOD (EPA-454/B-03-001, September 2004), March 2011 (version 11059)

2009, AERMOD IMPLEMENTATION GUIDE, Last Revised: March 19, 2009

2004, USER'S GUIDE FOR THE AERMOD TERRAIN PREPROCESSOR (AERMAP, version 04300), EPA-454/B-03-003, October 2004.

2009, ADDENDUM, February, 2009, to USER'S GUIDE FOR THE AERMOD TERRAIN PREPROCESSOR (AERMAP version 09040), EPA-454/B-03-003, October 2004.

2004, USER'S GUIDE TO THE BUILDING PROFILE INPUT PROGRAM (BPIP), updated to include the PRIME algorithm (BPIPPRM, version 04274, EPA-454/R-93-038, (Revised April 21, 2004), (Electronic copy only).

1995, USER'S GUIDE FOR THE INDUSTRIAL SOURCE COMPLEX (ISC3) DISPERSION MODELS, VOLUME I - USER INSTRUCTIONS, VOLUME II – DESCRIPTION OF MODEL ALGORITHMS. EPA-454/B-95-003a & b, September, 1995. Vol. a includes 02035 instructions.

2002, USER INSTRUCTIONS FOR THE REVISED ISCST3 MODEL (dated 02035), Feb 4, 2002.

1995, SCREEN3 Model User's Guide, EPA-454/B-95-004, model version 96043.

2010, Guidance Concerning the Implementation of the 1-hour NO2 NAAQS for the Prevention of Significant Deterioration Program, EPA Memorandum from Stephen D. Page, Director, OAQPS, to EPA Regional Air Division Directors, June 29, 2010.

2010, Guidance Concerning the Implementation of the 1-hour SO2 NAAQS for the Prevention of Significant Deterioration Program, EPA Memorandum from Stephen D. Page, Director, OAQPS, to EPA Regional Air Division Directors, August 23, 2010.

2010, Modeling Procedures for Demonstrating Compliance with PM2.5 NAAQS, EPA Memorandum from Stephen D. Page, Director, OAQPS, to EPA Regional Modeling Contacts and selected OAQPS Personnel, March 23, 2010.

2010, Prevention of Significant Deterioration (PSD) for Particulate Matter Less Than 2.5 Micrometers (PM2.5)--Increments, Significant Impact Levels (SILs) and Significant Monitoring Concentration (SMC), Final rule, Federal Register vol. 75, No. 202, pgs. 64863-64907, October 20, 2010.

1998, Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions, Revised June 21, 1998, Georgia Environmental Protection Division (GA EPD).

2006, Interim Dispersion Modeling Guidance, Last Revised Dec 28, 2006, GA EPD (georgiaair.org).