Air Quality Modeling Analysis for Modifications at Existing Facilities

19 August 2008

Concepts Related to Ambient Air Quality

- Air quality in a particular area is determined by the ambient concentrations (i.e., concentrations in the air that people breathe) of specific pollutants

- The U.S. EPA has established National Ambient Air Quality Standards (NAAQS) for these pollutants. Ambient concentrations lower than the NAAQS are safe to breathe.

- Air quality in a particular area can be evaluated by measurements or by mathematical modeling.

Concepts Related to Ambient Air Quality (cont.)

- Areas which have ambient air quality below the NAAQS are called attainment areas and those with ambient air quality above the NAAQS are non-attainment areas.
- New Castle County is an attainment area for SO_2
- Measurements taken at locations surrounding the refinery show attainment of the NAAQS for SO_2

Concepts Related to Ambient Air Quality (cont.)

- Air quality regulations are in place to ensure that air quality in a given area is either maintained (attainment areas) or improved (non-attainment areas)
- In attainment areas, maintenance of air quality is achieved by projecting the impacts of new sources, or modifications to existing sources that result in emissions increases
- Projecting impacts for future changes is done by mathematical modeling

Goals of Air Quality Modeling Analysis

- To demonstrate that the project related emissions increases do not result in exceedances of NAAQS in the surrounding area
- Impacts are tested against U.S. EPA-defined "significant impact levels" (SILs), typically 1-2 % of the NAAQS (very small level)
- EPA approved air quality models such as AERMOD and CALPUFF are used to evaluate the air quality impacts of new or increased emissions
- An evaluation of impacts against the SILs is considered to be a "first pass" evaluation. Results below the SILs are deemed to be insignificant and do not require further modeling evaluation.

What do you do in air quality modeling and how?

- Air quality models are used with historical meteorological data such as wind speed, wind direction, etc. and emissions from a project to predict future air quality impacts resulting from the project once it is in operation

- Historical meteorological data needs to be complete (for five continuous years) and appropriate and representative of the conditions at the facility

Modeling for the Bin 1 Project

- Meteorological data from New Castle Airport was used for five years (1991-1995)
- These five years have complete data records and are part of the "Hourly US Weather Observations" (HUSWO) data set that contains standardized data for modeling
- More recent data do not necessarily reflect better/more complete data; climatological changes are generally slow and have little effect on local meteorological parameters that are important for modeling
- EPA's AERMOD and CALPUFF models were used
- Sulfur dioxide (SO_2) was the only pollutant which had an emissions increase which necessitated any modeling analysis

Some Results from the Modeling

- Maximum impacts from the project were less than the SILs at all locations

- Impacts from the project resulted in insignificant impacts in Shenandoah National Park and Brigantine National Wildlife Reserve ("Class I Areas" of particular concern)