STATE OF CALIFORNIA – NATURAL RESOURCES AGENCY EDMUND G. BROWN JR., *Governor*

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March 29, 2012

Mr. Kevin Brewster
A concerned citizen of California
lzpup@yahoo.com

Subject: Computer Modeling for the Proposed Quail Brush Generation Project (11-AFC-03)

Dear Mr. Brewster,

During the March 22, 2012 workshop you requested an explanation of how the air dispersion model accounts for stagnant conditions created by the topography of the Santee Valley. For this project, two models (called AERMOD and SCREEN3) are used to model the impact of this project, should it be approved and built. Both models are discussed below.

The air dispersion model called "AERMOD" is run using meteorological data collected at the nearby Overland Ave. monitoring station. AERMOD is the air quality model approved by both the US EPA and the American Meteorological Society for use in evaluating proposed projects that would be located in either simple or complex terrain. SCREEN3 is a single source Gaussian plume model which provides maximum ground-level concentrations for point, area, flare, and volume sources, as well as concentrations in the cavity zone, and concentrations due to inversion break-up and shoreline fumigation.

The meteorological data used in AERMOD was recorded at Overland Ave. monitoring station every hour over a three year period of 2003-2005 (26,304 hours including leap year). The model is run using expected full-use, worst case emission estimates from the project site in conjunction with the three years of meteorological data. The model calculates the project impact at each receptor within the modeling domain for every hour of the three year period. The model uses a receptor grid with close spacing near the proposed facility where maximum impacts are expected and wider spacing further downwind where lower impacts are expected. More refined grids are used around "hot-spots" in case the wider spacing didn't catch the maximum impacts. The worst case impact at each receptor is independent from the worst case impacts at all other receptors (i.e. worst case impact at each receptor may occur at different hours when depicting worst case conditions). The expected hours of operation per year (4,032 hours are specified as an upper limit of operating hours in the case of Quail Brush) are used for long-term impact assessments, but not for short-term worst case impacts.

The wind rose in the AFC provides frequency distribution results for 16 wind directions and 6 groups of wind speed ranging from 0.5 meters per second (m/s) to anything above 11.1 m/s (One meter per second is equivalent to 2.2 miles per hour). Calm wind speeds (stagnant conditions) are defined as wind speeds less than the detection limit of the equipment, which are 0.45 m/s and below.

AERMOD has a method of dealing with conditions when wind is nearly "calm". During low wind speed conditions, it accounts for the meandering (lack of definite direction) of the plume based on the fraction of the random energy (for horizontal dispersion) in the total wind energy (for both transport and dispersion). AERMOD assumes data are missing if wind speed is less than the detection limit of the equipment and doesn't model these cases. The actual percentage of "calm" wind conditions that AERMOD didn't process for this project is 2.95% of the total 26,304 hours. During these times however, there would be no wind to transport emissions.

We agree that stagnant conditions are of special concern when dealing with sources that release pollutants, especially for those close to the ground, such as vehicles on the roadways. Power plant plumes are elevated and buoyant and rise until they come into equilibrium with surrounding air. They will rise higher when the wind speed is low. When the wind is blowing aloft from the power plant towards Santee (while the surface air is close to calm) emissions from the power plant would be transported above the stagnant air and gradually disperse (especially spreading side-to-side along the travel path of the plume). Eventually these emissions will mix vertically until they reach ground level and this may—or may not—occur within the limits of Santee. Nonetheless, the model will calculate emission concentrations at each receptor within the modeling domain.

One situation where a power plant may cause high ground-level impact is during what is called "inversion break-up fumigation". This is when the plume is above a surface inversion such as described above. A surface inversion is a very stable layer of air where temperatures increase with height rather than decrease, and this is an "inverted" situation. Surface inversions often occur on clear, cold nights when there are low wind speeds. The cold ground cools the air immediately above it. This inversion starts to break up during the first few hours of sunlight as the earth surface heats up. Differential surface heating causes vertical air currents (or vertical eddies) to form. Inversion break-up fumigation is the process when pollutants emitted above the inversion layer during the night are brought down to the ground during the inversion break-up process in the morning. The vertical air current essentially drags the plume down to the ground. These events occur infrequently and over relatively short time periods. Inversion break-up fumigation potential for the proposed Quail Brush Generation Project was modeled using SCREEN3 to estimate the maximum concentrations during that time. This was done to help identify maximum short-term impacts due to the short time of fumigation periods. These results will be included in the preliminary staff assessment.

Sincerely,

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