SIERRA CLUB
FOUNDED 1892

April 26, 2013

Dave Warner
Director of Permit Services
San Joaquin Valley Air Pollution Control District

Robert Worl, Project Manager
California Energy Commission
Re: Preliminary PM Modeling Comments on the PDOC for the HECA Project (08-AFC-8A)

Dear Mr. Warner and Mr. Worl:

Sierra Club submits these preliminary comments addressing the flaws in the PM10 Modeling for the HECA Project (08-AFC-8A). These comments were prepared with the technical assistance of modeling expert Camille Sears. The Sierra Club will supplement these comments with a more comprehensive analysis of the PDOC by May 30, 2013. The Sierra Club thought it important to alert the District and Commission staff immediately of major errors with the PDOC's conclusion that HECA's PM10 impacts would not be significant. We request that the CEC consider these flaws in its Preliminary Staff Assessment. Given Ms. Sears' findings, the District should revise the PDOC to incorporate a corrected modeling analysis for the project's PM10 impacts.

Sincerely,

Andrea Issod
Staff Attorney
Sierra Club
85 Second Street, 2nd Floor
San Francisco, CA 94115
(415) 977-5544
(415) 977-5793
andrea.issod@sierraclub.org

The PDOC's Finding that 24-hour PM10 Impacts Are Less than the Significant Impact Level Are Based on Flawed Emission Rate Calculations and Inappropriate Model Inputs

The PDOC finds that the 24-hour PM10 impacts from the proposed HECA project will be 4.90 $\mu g/m^3$.[1] This impact represents 98% of the 24-hour PM10 significant impact level ("SIL"), which is 5.0 $\mu g/m^3$. Had the HECA Project impacts exceeded the SIL, then extensive modeling analyses would have been required to verify whether project emissions, in conjunction with surrounding emission sources, will lead to violations of the applicable PM10 PSD increments and NAAQS.[2] Since the PDOC does not identify HECA PM10 impacts above the SIL, these additional modeling analyses were not performed.

The PDOC's finding of insignificant PM10 impacts is based on flawed emission rate calculations and inappropriate AERMOD model inputs. These flawed emission rate calculations and model inputs lead to under-predicted modeled impacts and incorrect findings of insignificance. When corrected, the 24-hour PM10 impacts from the proposed HECA Project will easily exceed the respective SIL and will likely violate applicable regulatory design concentrations. In particular, the 24-hour PM10 PSD increment of 30 $\mu g/m^3$ and the 50 $\mu g/m^3$ 24-hour PM10 California Ambient Air Quality Standard ("CAAQS") are sensitive standards that may be violated by the corrected HECA project impacts.

In addition, the San Joaquin Valley already experiences very high PM10 levels, which are very close to putting the region back into nonattainment status for this pollutant. The PM10 impacts from the HECA Project only add to this concern and could jeopardize the current PM10 attainment status in the southern San Joaquin Valley. It is essential that the PDOC include a complete and proper analysis of HECA PM10 impacts. The 24-hour PM10 emission rates must be corrected and completely reassessed with updated modeling analyses in the PDOC.

The PDOC Underestimates 24-hour PM10 Impacts Because It Uses Inappropriate Paved Road Emission Calculations

---

[1] San Joaquin Valley Air Pollution Control District ("SJVAPCD"), Notice of Preliminary Determination of Compliance, Facility# S-7616, Project # S-1121903, February 14, 2013, hereinafter, ("PDOC"), Appx. K, p. 49. http://www.energy.ca.gov/sitingcases/hydrogen_energy/documents/others/2013-02-07_San_Joaquin_Valley_Air_Pollution_Control_District_Notice_of_Preliminary_Determination_of_Compliance_TN-69525.pdf.

[2] SJVAPCD Rule 2410 and PDOC, Appx. K, p. 8.

HECA modeled fugitive dust PM10 emissions from onsite paved roads. These emission sources often cause the highest modeled impacts from an industrial source, due to the low-level and non-buoyant nature of how they are released to the air. The paved road PM10 emissions calculated by HECA, however, use incorrect inputs and result in significant under-predicted emission rates and subsequent modeled impacts.[3] These shortcomings are then carried over into the SJVAPCD's PDOC.

The equation HECA used to calculate particulate matter (fugitive dust) emissions from onsite vehicle traffic is obtained from EPA's air pollution emission factor equation for paved roads.[4] This equation is as follows:

$E_{ext} = [k(sL)^{0.91} * (W)^{1.02}] * [1-P/4N]$

Where: E_{ext} = emission factor in the same units as k

k = particle size multiplier; 0.25 g/vehicle mile traveled (VMT) for PM2.5; 1.0 g/VMT for PM10[5]

sL = road surface silt loading (g/m^2)

W = average weight of vehicles (tons)

P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and

N = number of days in the averaging period (*e.g.*, 365 for annual, 91 for seasonal, 30 for monthly).

The values used for any of the variables in the above equation, k, sL, W, P, and N, will have an impact on the final result, *i.e.*, the calculated particulate matter emission rates. Our review of HECA's paved road fugitive dust PM10 emission calculations finds that the key inputs to this equation are greatly under-estimated. Subsequently, the 24-hour PM10 emission rates input to the air quality impact analysis are much too low. Specifically,

- The PM10 emission calculations use an inappropriate silt loading level for paved roads which is about 50 times lower than the CARB-recommended level for rural areas in Kern County.

---

[3] Michael Carroll, Latham & Watkins, Letter to Robert Worl, Re: Updated Emissions Data for the Hydrogen Energy California Power Plant Project, January 10, 2013, hereinafter ("HECA Updated Emissions Data"), at pdf p. 61 (Fugitive Dust on Paved Roads (Nov. 13, 2012)).

[4] EPA, AP-42, Section 13.2.1 – Paved Roads, January 2011, hereinafter ("EPA Paved Roads"); http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf.

[5] *Id*., p. 13.2.1-4.

- The PM10 emission calculations use inappropriate vehicle weights for trucks traveling on paved roads.

- The 24-hour PM10 emissions from paved roads may be calculated using a yearly total of rain days per year.

Each of these inputs, including the necessary corrections to the emission rate calculations are discussed below.

Silt loading

Silt loading is the amount of particulate matter (in this case, PM10) per square meter of paved surface area. The PDOC's PM10 modeling is based on paved road emission calculations that assume a silt loading rate of 0.031 g/m^2, which is derived from the Kern County default value from URBEMIS 9.2.[6] This default value is inappropriate for rural areas of Kern County, and in fact, the URBEMIS emission calculation program is primarily designed for urban emissions (the program name is derived from URBan EMISsions).[7]

The California Air Resources Board ("CARB") developed a table of silt loading values for various areas of Kern County, ranging from freeways to rural areas. The CARB-reported silt loading values are averages of silt loadings measured by Midwest Research Institute in the South Coast Air Quality Management District and the San Joaquin Valley Unified Air Quality Management District.[8] These silt loading values were used by CARB for the 2003 SJVAPCD PM10 State Implementation Plan.

For rural areas of Kern County, CARB uses a silt loading value of 1.6 g/m^2, which is over 50 times higher than the value used in the PDOC. It should be noted that the 1.6 g/m^2 road silt loading rate is an average value for rural areas; for industrial settings such as the HECA facility, the value may be much higher.

For HECA's paved road fugitive dust PM10 emissions, correcting for the under-estimated silt loading value has a profound effect on calculated emissions. Correcting the silt loading rate from 0.031 g/m^2 to 1.6 g/m^2 will increase emissions by a factor of 36.[9] This translates to a much higher modeled 24-hour PM10 air concentration as well.

---

[6] HECA Updated Emissions Data at pdf p. 61 (Fugitive Dust on Paved Roads (Nov. 13, 2012)).

[7] URBEMIS, Environmental Management Software; http://www.urbemis.com/.

[8] CARB, Emission Inventory, Section 7.8 – SJV, Entrained Paved Road Dust, Paved Road Travel, June 2006; http://www.arb.ca.gov/ei/areasrc/PMSJVPavedRoadMethod2003.pdf.

[9] $(1.6)^{0.91}/(0.031)^{0.91} = 36.19$.

Truck weight

Vehicle weights are the other component of the AP-42 emission factor for calculating PM10 emission rates from paved roads. It is the average vehicle weight that is used for the emission calculation (usually the average of loaded and unloaded truck weights).[10]

The PDOC paved road PM10 emission calculations for product trucks assumed an empty truck weight of five tons and a full truck weight equaling 30 tons.[11] This results in an average product truck weight of 17.5 tons and means that these trucks are hauling 25 tons of material. An empty product truck weight of five tons, however, is not realistic – a five ton truck is not an appropriate size for hauling 25 tons of material. For most product-handling facilities, the emission calculations are based on an empty truck weight of at least 20 tons. The EPA, in developing AP-42 Section 13.2.1, identifies an average vehicle weight of 35 tons for heavy duty diesel trucks.[12]

A 20 ton truck (empty) hauling 25 tons of material has an average vehicle weight of 32.5 tons.[13] Correcting the average product truck weight from 17.5 tons to 32.5 tons will increase emissions by a factor of 1.88.[14] This emission increase will translate to a much higher modeled 24-hour PM10 air concentration, and will be multiplicative with the silt loading impact increase.

Rainfall correction

The 24-hour PM10 emissions from paved roads appear to be calculated using a yearly total of rain days per year. We could not confirm this emission calculation, since the spreadsheets provided to us are for annual-average emissions. Short-term PM10 emission rates should not be calculated using a rainfall correction, as there are many days in Kern County when there is no rainfall. If rainfall corrections were applied, it would result in a slight under-estimate of 24-hour PM10 emission rates.

The PDOC should confirm whether the 24-hour PM10 emission rate calculations for paved roads incorporate a rainfall correction. If the 24-hour emissions are calculated using any rainfall correction, then the PDOC should correct this error and incorporate the correction with the silt loading and vehicle weight modifications discussed above.

---

[10] EPA Paved Roads, p.13.2.1-4.

[11] HECA Updated Emissions Data at pdf p. 61 (Fugitive Dust on Paved Roads (Nov. 13, 2012)).

[12] USEPA, Emission Factor Documentation for AP-42, Section 13.2.1, January 2011, p. 4-37; http://www.epa.gov/ttn/chief/ap42/ch13/bgdocs/b13s0201.pdf.

[13] (20 tons + 45 tons)/2 = 32.5 tons.

[14] $(32.5)^{1\ 02}/(17.5)^{1\ 02} = 1.88$.

The PDOC Underestimates 24-hour PM10 Impacts Because It Uses Inappropriate AERMOD Model Inputs

In addition to the under-estimated PM10 emission rates discussed above, the PDOC also uses flawed modeling methods to predict 24-hour PM10 ambient air concentrations. These model inputs are:

- The PDOC modeling uses ground-level receptors, rather than a flagpole height of 1.5 meters for human inhalation.

- The PDOC modeling uses Bakersfield airport meteorological data processed with outdated methods.

Each of these inappropriate model inputs are discussed below.

Flagpole receptors

Receptors are locations where the AERMOD dispersion model calculates ambient air concentrations. These receptors are designated by the model user and include the geographical coordinate of the receptor, the elevation above sea level of the receptor, and the receptor height above the ground (known as flagpole height).

The PDOC modeling does not incorporate a receptor flagpole height, which results in the model calculating air concentrations at the surface of the ground. Since the HECA property boundary is less than a few hundred meters from their emission sources, a flagpole receptor height of about 1.5 meters should have been included in the PDOC modeling.[15] This corresponds to an average breathing zone of a person and will provide a better estimate of project-caused air impacts.

Meteorological data

The PDOC modeling uses 2006 through 2010 Automated Surface Observation Station ("ASOS") meteorological data collected at Meadows Field Airport, in Bakersfield. These ASOS data, however, are based on a single two-minute observation near the end of each hour and are not representative of a valid hourly-average. Furthermore, the meteorological data used in the PDOC modeling include over 27% calm hours, which are unusable by AERMOD. This large percentage of calm hours is a simple artifact of the standard ASOS reporting methods. Overstating the number of

---

[15] California Environmental Protection Agency, Air Toxics Hot Spots Program Risk Assessment Guidelines, Technical Support Document for Exposure Assessment and Stochastic Analysis, August 2012, p. 2-19; http://www.oehha.ca.gov/air/hot_spots/pdf/2012tsd/TSDportfolio2012.pdf.

calm hours tends to result in under-predicted modeled impacts since the low wind speed conditions often associated with peak impacts are artificially excluded from the modeling analysis.

EPA has been aware of this issue for several years, and on February 28, 2011, EPA finalized a revised version of AERMET, along with a pre-processor program called AERMINUTE.[16] AERMET is the program that creates the meteorological data sets used by AERMOD. The revised version of AERMET (including AERMINUTE), can process one-minute airport data, thus correcting the reporting artifact that causes an unrealistically high number of calm hours in the data sets. EPA, state, and local air agencies now routinely use the revised AERMET and AERMINUTE programs for modeling compliance with ambient air quality standards. In their modeling guidance for SO_2 NAAQS designations, EPA discussed the concern of calm hours in underestimating air impacts:

> In AERMOD, concentrations are not calculated for variable wind (i.e., missing wind direction) and calm conditions, resulting in zero concentrations for those hours. Since the SO_2 NAAQS is a one hour standard, these light wind conditions may be the controlling meteorological circumstances in some cases because of the limited dilution that occurs under low wind speeds which can lead to higher concentrations. The exclusion of a greater number of instances of near-calm conditions from the modeled concentration distribution may therefore lead to underestimation of daily maximum 1-hour concentrations for calculation of the design value.[17]

At the 10th Conference on Air Quality Modeling, held in March 2012, EPA stated that the purpose of the revised AERMET and AERMINUTE programs is "not to introduce conservatism" into the model, but rather to "Reclaim data that was "lost" due to coding, making station more representative."[18] Furthermore, EPA "recommends that AERMINUTE should routinely be used to supplement the standard NWS data with hourly-averaged winds based on the 1-minute ASOS wind data (when available)."[19]

---

[16] EPA, Addendum, User's Guide for the AERMOD meteorological Processor (AERMET), EPA-454/B-03-002, November 2004, (v. 12345, released publicly in December 2012). http://www.epa.gov/ttn/scram/7thconf/aermod/aermet_userguide.zip.

[17] EPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, p. 19. http://www.epa.gov/air/sulfurdioxide/pdfs/20110411so2designationsguidance.pdf.

[18] James Thurman, EPA/OAQPS, AERMINUTE, 10th Conference on Air Quality Modeling. http://www.epa.gov/ttn/scram/10thmodconf/presentations/1-7-aerminute_update.pdf.

[19] Roger Brode, EPA/OAQPS, Appendix W: Clarification Memoranda, 10th Conference on Air Quality Modeling. http://www.epa.gov/ttn/scram/10thmodconf/presentations/1-4-Brode_10thMC_AppW_ClarificationMemos_03-13-2012.pdf.

These recommendations have also been presented in a March 2013 Clarification Memo from EPA:[20]

> Given the limitations and significant concerns regarding the adequacy of standard ASOS data, and considering the relevant recommendations in the *Guideline* related to these concerns, we recommend that AERMINUTE be routinely used to supplement the standard ASOS data with hourly-averaged wind speed and direction to support AERMOD dispersion modeling. Since the 1-minute ASOS wind data used as input to AERMINUTE are freely available to the public, this recommendation should not impose any significant burden on permit applicants applying the AERMOD model.[21]

EPA summarizes the recommended use of ASOS meteorological data as follows:

- EPA has developed the AERMINUTE processor to calculate hourly average winds from 1-minute ASOS winds, whose purpose is to replace the single 2-minute winds that represent an hour with an hourly-averaged wind that is reflective of actual conditions and more appropriate for input for dispersion modeling.
- EPA recommends that AERMINUTE be routinely used in general practice in AERMOD modeling as the hourly average winds better reflect actual conditions over the hour as opposed to a single 2-minute observation.
- EPA has also implemented a threshold option in AERMET to treat winds below the threshold as calms, with a recommended minimum wind speed of 0.5 m/s, consistent with the threshold required for site-specific data.[22]

The SJVAPCD also has procedures that apply AERMINUTE and one-minute ASOS winds.[23] From the SJVAPCD Procedure for Downloading and Processing NCDC Meteorological Data:

> To reduce the number of calms and missing winds in the surface data, archived 1-minute winds for the ASOS stations can be used to calculate hourly average wind speed and directions, which are used to supplement the standard archive of hourly observed winds processed in AERMET (EPA, 2010b).

---

[20] EPA, Use of ASOS Meteorological Data in AERMOD Dispersion Modeling, March 8, 2013. http://www.epa.gov/ttn/scram/guidance/clarification/20130308_Met_Data_Clarification.pdf.

[21] *Id*., p. 12.

[22] *Id*., p.13.

[23] SJVAPCD, Procedure for Downloading and Processing NCDC Meteorological Data, Final, Version 3.1, April 2013, p. 8. http://www.valleyair.org/busind/pto/Tox_Resources/MeteorologicalDataProcessing4-11-13.pdf.

At a minimum, the PDOC modeling should be based on 2008 through 2012 Meadows Field Airport meteorological data, which incorporate one-minute wind data processed with EPA's AERMINUTE program. A threshold wind speed of 0.5 meter per second should also be applied to the AERMET processing of these data.

We prepared 2008 through 2012 Meadows Field Airport meteorological data incorporating EPA's recommended use of AERMINUTE and one-minute wind data. This improved meteorological data set has about 4.4% calm winds, compared to the 27% calm winds found in the 2006 through 2010 PDOC modeling data set. Our preliminary modeling analysis using the more representative meteorological data found significantly higher 24-hour PM10 impacts than were predicted using the less representative 2006 through 2010 data.

Conclusion

The PDOC finds that the HECA 24-hour PM10 concentrations is 98% of the SIL, based on underestimates in the emission rate calculations or modeled impacts. Correcting the inappropriate paved road PM10 emissions, and correcting the model inputs identified above, will result in 24-hour PM10 impacts much greater than the SIL. In fact, these corrections will likely lead to violations of the following regulatory design concentrations:

- The 24-hour PM10 Significant Monitoring Concentration (10 $\mu g/m^3$)
- The 24-hour PM10 PSD increment (30 $\mu g/m^3$)
- The 24-hour PM10 CAAQS (50 $\mu g/m^3$)

In addition, the corrected PM10 impacts from the HECA project may cause or contribute to PM10 NAAQS violations in an area that is very close to becoming nonattainment for this pollutant.

None of these significant impacts were identified in the PDOC due to the incorrect finding that the 24-hour PM10 impacts are below the SIL. The PDOC must be revised to incorporate the corrected 24-hour PM10 emission rates and subsequent modeling analyses.