

SOUTHEAST TEXAS PHOTOCHEMICAL MODELING TECHNICAL REVIEW
COMMITTEE

Meeting Summary
April 23, 2008

H-GAC Offices
3555 Timmons Avenue
Houston, Texas

Members and Guests Present:

Jay Olaguer, Bruce Davis, James Wilkinson, Guy Donaldson, Dan Cohan, Judy Bigon, Rohit Sharma, Graciela Lubertino, Jim Smith, Marvin Jones, Jim Neece and Dick Karp, and Lola Brown, Kathy Singleton, Liz Hendler, and Tom Tesche via telephone.

SIP Planning and Implementation Update – Lola Brown (TCEQ)

Lola gave a brief update via the telephone. She indicated that initial HGB stakeholder meetings were recently held in Houston on March 25 and 26 and gave a brief summary of the meetings. In addition, she indicating that the information presented, including initial control concept lists for stationary and mobile sources, as well as a written summary are available at www.tceq.state.tx.us/implementation/air/sip/hgb_stakeholder.html. TCEQ is accepting comments through April 30, 2008, on the materials presented at these meetings. Lola encouraged interested members to sign up for e-mail updates on the TCEQ main web page. Lola's e-mail address is lbrown@tceq.state.tx.us.

H-GAC Update – Graciela Lubertino, Ph.D. (H-GAC)

(Note: Graciela's one-page presentation is available on the SETPMTMTC web site: http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html). Graciela indicated that the fuel consumption study H-GAC conducted for the Mayor's Office has been completed and the final report can be downloaded from <http://www.h-gac.com/taq/airquality/studies/default.aspx>. The results of this study indicate that about 5 million gallons of gasoline and diesel fuel are projected to have been consumed on a typical weekday in Harris County in 2007. Graciela was asked whether sales data included bio-diesel or ethanol. Graciela indicated that Harris County only compiles the tax revenue generated from fuel sales but not the actual amount or grades of fuel, so the amount, if any, of bio-diesel or ethanol isn't known. Presumably, to get the split between diesel and gasoline, vehicle registration data were used.

As part of developing the master control strategies catalog for on-road and off-road sources, Graciela indicated H-GAC plans to conduct a series of stakeholder meetings starting in May. Stakeholders will include representatives from local governments, the Houston Port Authority, the regional airports, railroads and the construction industry. The final master control strategies catalog is due to TCEQ by August 29, 2008. Graciela was asked whether the catalog would include details on the amount of VOC and/or NO_x emission reductions for each individual control strategy. She indicated that the final catalog would include a "short list" identifying the most feasible strategies, which should have emission reduction estimates. There was some

discussion about the potential for updating the off-road emission categories (i.e., marine, aircraft and locomotives). Graciela indicated she would see if emission inventory updates could be included as an agenda item at the stakeholder meetings.

Graciela also mentioned that the current conformity is being amended to change METRO projects from rapid transit (BRT) to light rail (LRT). She indicated this is a reversal of a previous conformity change from LRT to BRT.

EPA SIP Related Update – Guy Donaldson (EPA)

(Note: Guy's presentation is available on the SETPMTC web site http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html). Guy presented an overview of EPA's NAAQS reviews, EPA's perspective on the new ozone NAAQS and its attainment, and the proposed rulemaking on green-house-gases (GHG).

In addition to the new ozone NAAQS (final as of 3/12/08), EPA is reviewing the Pb, SO₂, CO, NO₂ and PM_{2.5} NAAQS's. Guy indicated that with the exception of the Pb standard, he did not know whether lower NAAQS levels were being considered for these other criteria pollutants. Guy presented a series of graphics showing the current nonattainment status of areas in Texas; the counties with monitored ozone design values greater than the new ozone NAAQS; and counties with model predicted future (year 2020) ozone design values greater than the new ozone NAAQS. In particular, the 9-county DFW area, the 3-county BPA area and the 8-county HGB area are currently designated nonattainment for the 1997 ozone NAAQS (i.e., 0.08 ppm 8-hour average). (Note that 3 of the counties in the San Antonio area are nonattainment, but the designation has been deferred by their participation in an Early Action Compact). Guy pointed out that ozone nonattainment designation typically includes all counties within a Consolidated Metropolitan Statistical Area (CMSA), not just those with monitored ozone design values greater than the NAAQS. Based upon the 2004 to 2006 monitoring data for Texas, a number of additional counties (i.e., not currently within a designated nonattainment area) have ozone design values greater than the new NAAQS (i.e., 0.075 ppm 8-hour average), including El Paso, Travis, Smith, Gregg and Harrison. Based upon the modeled 2020 ozone design values, only Harris County is predicted to have an ozone design value greater than the new NAAQS.

Guy was asked about the presumptions on controls for the 2020 modeling. Guy indicated that his understanding was that in addition to the mandated federal controls (e.g., CAIR2, Tier2), there were some local controls (e.g., based upon SIP submissions), but he was not sure what that entailed for the HGB area. Guy was also asked about the proposed monitoring rule associated with the new ozone NAAQS. Guy indicated he was not sure about the scheduling, and thought it would apply to areas with populations of 300,000 or more, but would check with other EPA staff. Subsequent to the meeting, Guy followed up on the issue of the monitoring rule: the proposed ozone monitoring rule is scheduled to come out in June 2008, with the final by March 2009, and EPA is considering populations as low as 50,000. For Texas, this could mean ozone monitoring in nine more counties. Guy was also asked if there will be any consideration about revising the classification scheme. The issue is that when the 1997 ozone NAAQS was promulgated, the application of the classification scheme, which was designed for the previous 1-hour standard, resulted in a number of nonattainment areas being classified less severe for the 8-hour standard than the 1-hour standard. Guy indicated that based upon the litigation over

subpart 1, EPA will be using subpart 2, so the classification scheme will apply to all the newly designated areas. Tom Tesche indicated that he was aware of groups that are planning to approach EPA about changing the classification scheme to address this issue. Guy indicated that a political consideration relevant to this issue is that a moderate or more severe classification requires vehicle inspection and maintenance (I/M) programs, while a marginal classification does not. It is likely that under the current classification scheme most of the new nonattainment areas would be classified marginal.

Guy indicated that the milestone dates for implementation of the new ozone NAAQS key on the signature date of the final rule, i.e., March 2008. Therefore the final designations (including classification) will be March 2010 and the SIPs will be due March 2013. Based upon the classification, the attainment dates range from 2013 for marginal to 2030 for extreme. As an example, if the HGB nonattainment area were classified serious for the new ozone NAAQS, its attainment date would be 2019, the same date as the current reclassification request for the 1997 standard. Guy was asked about the status of the current reclassification request and said it is expected to be signed by July 2008. Currently, the predominant issue being addressed is when the SIP will be due. The TCEQ requested a SIP submission date of April 15, 2010, in order to incorporate the findings from the 2006 TexAQS II in the SIP modeling demonstration.

Guy briefly discussed the rule development addressing the NSR backsliding, contingency measures and section 185 fees. Guy indicated that EPA expects to propose rules in the late fall of 2008. Of particular interest is the issue of the 185 fees, which applies to areas, such as the HGB area, which did not attain the 1-hour standard by the prescribed attainment date. Guy indicated that EPA is investigating a possible alternative using section 172(e), which may allow the EPA Administrator some flexibility when the standard is modified. Section 185 sets a fee of \$5K/ton of VOC over a baseline quantity. Since, NO_x is the preferred ozone precursor to reduce in the HGB area, Guy was asked about substituting NO_x for VOC in consideration of the 185 fees. Guy indicated that this is not an issue, since section 182 allows for substituting NO_x for VOC, and therefore fees can be charged both on NO_x or VOC, unless an area has a NO_x waiver.

Guy was also asked about the status of the litigation on the 1-hour HGB SIP, and indicated it should be finalized this summer. This litigation, in part, involves the HECT and MECT rules in the December 2004 SIP, which EPA approved in August 2006.

SIP Modeling Update: Hourly Tank landing Loss Emissions – Marvin Jones, Ph.D. (TCEQ)

Marvin presented an update concerning the incorporation of the hourly tank landing loss (TLL) emissions in the base case modeling for the 2005 episodes. (Note: Marvin's presentation is available on the SETPMTTC web site http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmttc_set.html). Marvin's presentation addressed the source of the hourly TLL emissions, the processing of the facility-provided emissions data to generate CAMx-ready files, and the comparison of the CAMx modeling results with ambient measurements of ozone and precursors.

Marvin was asked about the limited number of facilities addressed and the lack of any petrochemical facilities. Marvin and other TCEQ staff present explained that the requested

emissions inventory revision primarily focused on “tank-for-hire” facilities, which conduct a relatively large number of tank landings as part of their operation. For example, a given tank may be used for a variety of products and would need to be landed and cleaned after dispensing one product and before filling with another. Tank operations at petrochemical facilities typically involve few tank landings, since the tanks are generally used to store the same product. Based upon a review of the responses to the inventory revision request, eleven facilities were identified as accounting for ~90% of the TLL emissions.

Marvin was also asked whether TCEQ planned to initiate inventory revision requests for other sources, such as barges. Marvin and other TCEQ staff present indicated they were not aware of any pending inventory revision requests similar to this one on tank landing losses. In addition, TCEQ staff indicated that TCEQ lacks jurisdiction while barges are in transit.

In addition, Marvin and other TCEQ staff present were asked how TLL emissions would be represented in the current baseline and future baseline modeling. Staff responded that the VOC rules, recently submitted with the re-classification request, address TLL emissions and will reduce the frequency of occurrence of landing in the future, which will result in reduced emissions. Further, staff indicated that the specifics of how TLL emissions would be represented in the current baseline and future baseline modeling have yet to be worked out.

HGB SIP Modeling Update: 2nd Interim Base Case Modeling– Dick Karp (TCEQ)

Dick presented an update of the modeling for the 2005 episodes, the 2nd interim base case modeling (Note: Dick’s presentation is available on the SETPMTC web site http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html). The meteorological updates and enhancements for the 2nd interim modeling included incorporating the new UT-CSR LU/LC data for improving surface characteristics, and hourly sea-surface-temperature (SST) data to include the diurnal fluctuation in SST. The emissions updates and enhancements included an adjustment for ethane, which is not considered a VOC but is used in the CB05 mechanism, and adding episode-specific emissions for wildfires and tank landing losses.

Questions and comments that arose during Dick’s presentation included:

- A question of when the emissions reconciliation will be incorporated into the base case modeling,
- a suggestion to compare monitored versus modeled back trajectories in addition to the plume plots,
- a suggestion to present monitored versus modeled comparisons of other meteorological parameters, besides winds, and
- a comment about the baseline concentration of IOLE in the monitored data at the H03H, DRPK and WALV auto-GC sites.

Since Jim Smith, Ph.D., has been working on the emission reconciliation, he responded to the first question answering that the ISC/PSCF technique (previously presented at the Dec. 12, 2007 and Feb. 23, 2008, SETPMTC meetings) should be ready to be incorporated in the base case modeling in a couple of weeks. With regard to comparing monitored versus modeled back trajectories, Dick indicated that the software developed to generate the plume plots can be

manipulated to produce back trajectories and this certainly could be done. With respect to the suggestion to present monitored versus modeled comparisons of other meteorological parameters, Dick indicated that a number of comparisons of other meteorological parameters (e.g., temperature, humidity, clouds) have been conducted for met modeling performance evaluation, but were not included in this presentation due to time considerations. In response to the comment concerning the non-zero monitored baseline of IOLE at the auto-GC sites, Dick and the other TCEQ staff present indicated that IOLE should primarily arise from the CB05 speciation of cis-butene and trans-butene, and they would certainly review the auto-GC data.

Reconciling Reported VOC Emissions with Ambient Measurements, Continued –Jim Smith, Ph.D. (TCEQ)

Jim presented selections from a number of papers and presentations made at the recent American Meteorological Society (AMS) meeting and prepared for TERC projects (<http://www.ametsoc.org> and www.tercairquality.org, respectively).

(Note: Jim's presentation is available on the SETPMTTC website http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html.)

The selections Jim presented addressed the meteorological features of the nocturnal boundary layer and the low level jet, as well as VOC measurements including primary versus secondary formaldehyde (HCHO). In addition, Jim presented a selection from a presentation on the role of background ozone measured during TexAQS II, and a selection on the application of the WRF meteorological model to simulate meandering winds at a 0.444 km grid resolution

From the presentation entitled “Nocturnal Boundary Layer Evolution in Houston during TexAQSII” (Day, Bridget, et al., January 2008), Jim showed a graphic of the overnight mixing (10 pm to 7 am CDT) heights as measured by tethersondes and radiosondes, and a graphic of the wind speed and direction for September 7-8, 2006, measured at the Moody Tower (MT). These graphics suggest that the notable rise in the mixing height from about 125 meters to about 224 meters, which occurred at 5 am, was related to an accompanying shift in the wind direction from the southeast to the northeast, thus ushering in an air mass that was influenced by the heat and turbulence of the Houston Ship Channel (HSC). Similar overnight (9 pm to 7 am, CDT) mixing height and wind measurements, taken at the MT on September 14-15, 2006, when winds were rather consistently out of the southeast, show a rather constant mixing height at 128 meters.

From the presentation entitled “Shipboard LIDAR Measurements of Nocturnal Mean Winds, Mixing Heights, and Boundary Layer Dynamics and Correlation to Houston Ozone Measurements during TexAQS II” (Tucker, Sara, et al., January 2008), Jim showed a graphic suggesting an inverse relationship between the maximum afternoon ozone concentration and the magnitude of the flow on the preceding night of the lower level jet (LLJ), as represented by the maximum speed and height of the LLJ. Thus deeper/stronger LLJs appear to correlate to lower ozone concentrations the following day.

From the presentation entitled “Aerosol and Trace Gas Measurements at Deer Park and Bayland Park in the 2006 Houston Triangle Experiment” (Alexander, M., et al., January 2008), Jim showed a time series from September 16-26, 2006 of PTR-MS measurements at Deer Park for isoprene and alpha pinene, alkanes and alkenes, and multiple carbonyls (e.g., acetaldehyde) and

aromatics (e.g, benzene). The occasional spikes of isoprene uncorrelated with alpha pinene but coincident with spikes in the alkane and alkenes, carbonyls and/or aromatics suggest that there may be non-biogenic sources of isoprene in the HSC.

From the presentation entitled “Analysis of Primary vs Secondary Fraction of Formaldehyde in the Houston Area during TexAQS II” (Rappenglueck, B., et al., January 2008), Jim presented several slides addressing the correlation of formaldehyde (HCHO) with carbon monoxide (CO). One of the more notable HCHO:CO correlations (i.e., $R^2 = 0.61$) was based upon an analysis of nighttime measurements at MT when the winds were coming from “urban wind sectors.” Based upon the slope of the linear regression (i.e., .007), this finding suggests that primary emissions of HCHO from urban type sources (e.g., mobile) may be up to 0.7% of CO emissions. Of course this presumes none of the measured HCHO was a reaction product (secondary) created from nighttime ozone-olefin reactions. Another set of HCHO and CO measurements taken between 8 am and 10am CST on August 31, 2006, with emissions arising from a flare just upwind suggest that for flares primary HCHO may be up to 2 – 5% of CO emissions. Of course this presumes none of the measured HCHO was a reaction product (secondary) created from hydroxide-olefin reactions. Since there is typically a notable amount of olefins in the ambient air (i.e., a reactant for secondary HCHO), it seems likely these primary HCHO estimates are too high.

Jim was asked whether HCHO was created by incomplete combustion, and responded that incomplete combustion was the likely source of primary HCHO, and that is why correlations of HCHO to CO are used to identify primary emissions of HCHO. Jay Olaguer indicated that HARC is planning a \$2M field study to address primary HCHO in the Houston area. Jim was also asked about correlations of HCHO and sulfur dioxide (SO₂) at MT, and indicated he was not sure how much SO₂ data was available.

From the presentation entitled “The Role of Background versus Locally Contributed ozone During the TexAQS II Field Campaign,” (Tobin, James, et al., January 2008), Jim presented a table of ozone measurements from selected sites, which are representative of background conditions depending on the orientation of the winds. For example, the monitoring site at Conroe in Montgomery County was used to indicate background ozone concentrations when the winds are out of the northeast, and the monitoring site at on Galveston Island was used to indicate background ozone concentrations when the winds are out of the southeast. Northeast winds are typically associated with higher background ozone concentrations (e.g., ~50 ppb), while southeast winds are typically associated with lower background ozone concentrations (e.g., ~25-30 ppb).

From the presentation entitled “Evaluation of Meander-like Wind Variance in High Resolution WRF Model Simulations of the Stable Nocturnal Boundary Layer,” (Seaman, Nelson, et al., January 2008), Jim showed results of the application of the WRF model at a 0.444 km nested domain over a mountainous region of Pennsylvania (i.e., Nittany Valley), which compared quite favorably to tracer releases. It indicated, at least in this case, an ability of the WRF model to adequately replicate meteorology in a fine grid domain with complex topography.

Jim was asked if TCEQ was planning to use the WRF model at smaller grid sized domains. Jim and other TCEQ staff present explained that the current SIP modeling would probably rely on

MM5 and the current modeling domain structure due to the time frame for preparing a SIP for submission to EPA.

Preliminary Assessment of Sea-Salt PM and Nitryl-Chloride Effect on Ozone Formation – Jim Neece, Ph.D. (TCEQ)

Jim gave a presentation on the status of the science and implications of nitryl chloride (NO_2Cl) in regards to ozone SIP modeling. Jim also addressed the misinformation created by recent articles in the Houston Chronicle. (Note: Jim's presentation is available on the SETPMTC web site http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html). In particular, Jim discussed the current research, including measurements of nighttime NO_2Cl made from the Ron H. Brown research vessel during the TexAQS II field study (<http://www.nature.com/ngeo/journal/vaop/ncurrent/abs/ngeo177.html>), which were somewhat higher than expected. Jim indicated that NO_2Cl is formed at night when N_2O_5 reacts with sea salt particulate matter (NaCl), which in turn readily photolyzes at sunrise yielding a chlorine radical (Cl^*). Jim indicated that Cl^* has the potential to quickly form additional ozone, although other factors usually limit ozone formation (e.g., NO_x limitation). So the influence of NO_2Cl on the maximum daily 8-hour ozone may only be minor.

Jim indicated that inaccuracies in the recent articles in the Houston Chronicle, particularly that sea salt may increase ozone by 30%, when in fact the 30% refers to the increase in measured NO_2Cl from what was expected, have misinformed the public as to the role of sea salt in ozone formation.

Jim indicated that discussions with the TexAQS II researchers who made the measurements, as well as other knowledgeable scientist, has led to a consensus that it is too soon to base regulatory decisions on this research.

Jim was asked about TCEQ's chlorine emissions inventory and the rapid reaction of hypochlorous acid (HOCl). Jim and other TCEQ staff present responded that TCEQ does have a chlorine emissions inventory for the HGB area, although the quality of the inventory may be questionable. Regarding the rapid reaction of HOCl , Jim and other TCEQ staff present indicated that modeling sensitivities previously conducted with the rapid reaction of HOCl added to the chemical mechanism only showed maximum daily 8-hour ozone concentration increases up to 3 ppb.

Jim was asked about the fate of the NO_2 after photo-dissociation of the NO_2Cl , and responded that it was available for the typical reaction sequence involving the formation of ozone, but should not be construed as necessarily "new" NO_2 since it would likely have been made available from the nighttime reservoir of N_2O_5 through other reactions.

Jim was also asked about a Cl^* study conducted in California. Jim and other TCEQ staff present responded that other than modeling sensitivities, similar to what TCEQ did for HOCl , they were unaware of any studies related to NO_2Cl in California. Jim and other TCEQ staff present indicated that a study of NO_2Cl in the HGB area was being considered, possibly this summer.

Eight-Hour Coalition Update – Jim Wilkinson, Ph.D. (Alpine Geophysics)

Jim gave a presentation on a new air quality modeling emissions inventory review tool he has developed. (Note: Jim's presentation is available on the SETPMTC web site http://www.tceq.state.tx.us/implementation/air/airmod/committee/pmtc_set.html). Jim indicated that a principal objective of the development of this tool was to provide industry staff (as well as other interested parties) with a utility to review their model-ready emissions (i.e., post-processed emissions information), and to be able to view their emissions in context with model-ready emissions for other source categories (e.g., mobile, biogenic).

Jim explained that the tool was built using an Excel workbook and associated Visual Basic macros and is available from Alpine Geophysics (jgw@alpinegeophysics.com). In addition, although the tool is designed for inputting SMOKE emission reports, it can also be used with EPS3.0 emission reports. Jim gave a brief demonstration of the tool's capabilities.

Jim was asked about the current status of reporting capabilities in SMOKE, and indicated that they have been greatly improved over the past several years and are probably comparable to the routine reporting capabilities of EPS3.0.

Adjourn

The meeting adjourned with a brief discussion of the scheduling of subsequent meetings. Dick indicated the next scheduled meeting was in June and the exact date is posted on the web site.