DRAFT- Ozone SIP Modeling
Scope of Work
2010-2012
5 - 10 - 2010

During 2008 the Denver area and North Front Range developed a State Implementation Plan to meet the 1997 8-hour ozone NAAQS of 0.085 ppm. Photochemical air quality modeling was conducted to demonstrate that the area would meet the 0.085 ppm NAAQS by 2010. During the SIP planning process for the 85 ppb standard, on March 12, 2008, EPA promulgated a new more stringent 8-hour ozone NAAQS with a lower threshold of 0.075 ppm (75 ppb). In January 2010, EPA proposed a further tightening of the 8-hour ozone NAAQS to somewhere within the 0.060-0.070 ppm range. The 8-hour ozone SIP for the new 8-hour ozone NAAQS is due in 2013.

Further refinements and improvements to the photochemical modeling framework has continued in anticipation of updating the ozone SIP in order to meet the 0.60-0.070 ppm proposed 8-hour ozone NAAQS. A new version of the mobile source emissions model, called MOVES, was also released in January of 2010 which will need to be used in future SIP work.

This Ozone SIP Modeling Scope of Work is divided into four parts:

A. Air Quality Model Improvements-Continuation of Phase II model improvements to make preliminary future-year ozone projections using the improved Denver modeling database and new inventories to be better prepared for performing the 2013 ozone SIP attainment demonstration modeling.
B. Implementation of the MOVES model for the Denver/NFR NAA
C. 2013 Ozone SIP Base Year and Future Attainment Year modeling analysis to address the 2010 proposed 8-hour ozone standard
D. 2013 Ozone SIP Future Attainment Year Control Plan modeling analyses to address the 2010 proposed 8-hour ozone standard

A. Phase II Air Quality Model Improvements

A.1. Revised 2006 Base Case Modeling and Model Performance Evaluation (MPE) using MOVES-like Adjustments

Objective: To perform revised 2006 base case modeling and model performance evaluation using on-road mobile source data reflected in MOVES emissions recently developed for the Electric Power Research Institute (EPRI) and EPA Office of Air Quality and Planning Standards (OAQPS). Task A.1. and Task A.4, 2020 MOVES like adjustments, allows the Denver area to do sensitivity model runs approximately a year earlier than in the SIP process. This will also allow time for data collection/aggregation processing effort to fully implement CONCEPT-MOVES, Tasks B.1.& B.2.

A.2. Model-Emissions-Ambient Data Reconciliation

Objective: To perform more detailed evaluation using the ambient VOC, NOx and CO as well as ozone observations to reconcile the ambient observations with the modeled concentration estimates and the emissions inventory. In particular the modeled and emissions inventory VOC species will be compared with the measured values to identify potentially missing sources (e.g., ethane sources in Weld County) or improper VOC speciation profiles in the emissions modeling.

A.3. VOC Inverse Modeling with MPE to Identify Potential Sources of VOC Emissions Shortfall

Objective: VOC source apportionment modeling for the July 2006 period and the CB05 species would be performed to determine the contributions of major source categories to the VOC species at the times and

locations of the VOC samples. Based on these contributions, determine an adjustment (i.e., inverse modeling) to the inventories that would alleviate much of the VOC under-predictions tendency for several key species (e.g., aldehydes and ethane). This task includes a CAMx sensitivity run to see if adjustment affects model performance. If the adjusted inventory achieves better model performance for ozone and VOCs, we would then review and identify scientifically justifiable approaches toward developing the VOC emissions inventory to account for the VOC emissions adjustments.

A.4. Revised 2020 Mobile Source Base Case MOVES-like Emissions

Objective: Generate New MOVES-like 2020 on-road mobile source emission inputs.

A.5. Revised MM5 Sensitivity Modeling

Objective: To determine whether increased vertical resolution and four dimensional data assimilation improves the meteorological and photochemical grid model performance. This task would revisit the June-July 2006 MM5 modeling and configure it with the current understanding of the best MM5 model configuration. This includes more vertical layers than used in the past with much higher vertical resolution near the ground. We also would perform MM5 sensitivity tests using more extensive and aggressive data assimilation.

A.6. Meteorological Sensitivity Modeling using the Weather Research Forecast (WRF) Model

Objective: The Weather Research Forecast (WRF) meteorological model would be applied on the 36/12/4 km grid and the June-July 2006 period using a model configuration similar to the best performing configuration identified for the MM5 model.

A.7. 2006 and 2020 O&G Emission Updates

Objective: The latest WRAP Phase III 2012 O&G emissions and other recently updated oil and gas inventories (i.e. Southwestern Wyoming Five County, Four Corners, Uinta Basin) would be obtained and projected to 2020. The 2006 and 2020 O&G emissions will then be processed with SMOKE to generate model-ready O&G emissions for the 36/12/4 km domains.

A.8. Final 2006 Base Case PM and MPE and 2020 PM with Model Improvements

Objective: To perform a final 2006 base case simulation and model performance evaluation with all the model improvements along with revised 2020 ozone projections, including Report.

A.9. Sensitivity Simulations

Objective: 2020 CAMx sensitivity tests would be conducted using information provided by RAQC/CDPHE. Cost estimated by assuming five across the board sensitivity runs. However, it is assumed that some sensitivity tests could involve some level of emissions processing, therefore fewer (2-3) but more specific control plan sensitivity runs could be performed for the estimated amount.

B. CONCEPT-MOVES Implementation

B.1. & B.2. Incorporation of New TDM Data with New CONCEPT-MV-MOVES for DMA and NFR

Objective: To generate base year and future base year on-road mobile source emissions using DRCOG's new Travel Demand Model (TDM) output data from DRCOG (B.1)., and NFRCOG (B.2.), and new versions of CONCEPT-MV that fully incorporates MOVES. Perform new CAMx 2006 base year and 2020 future base year simulations and ozone projections.

The data collection/aggregation processing effort to fully implement CONCEPT-MOVES will likely be a joint effort among DRCOG, CDOT/Revenue, RAQC, and APCD. Some areas of data collection could include:

- Improve regional traffic data for new MOVES model
- Determine off-network volatile organic compounds (VOC) emission data
- Improved data on vehicle type and geographic location

C. 2013 Ozone SIP Base Year and Future Attainment Year Modeling Analysis

C.1 Modeling Protocol

Objective: Prepare a Modeling Protocol outlining the approach to be used for the Denver 8-hour ozone SIP modeling following EPA guidance and including descriptions of modeling improvements incorporated since previous SIP..

C.2. Meteorological Modeling

Objective: Generate 36/12/4 km meteorological fields for the base year period that are used in emissions modeling and to generate meteorological inputs for photochemical modeling of ozone formation in the Denver NAA and vicinity. The meteorological modeling will be consistent with the findings from the Phase II tasks, Revised MM5 Sensitivity Modeling and WRF Modeling.

C.3. Base Year Emissions Modeling

Objective: To generate Base Case emissions inputs for Actual and Typical base case emission scenarios.

C.4. Base Year Photochemical Modeling

Objective: Perform sensitivity and base case photochemical modeling of base year actual emissions, establish a model performance evaluation and perform a typical base year simulation.

C.5. Attainment Base Year Emissions Processing and PM Projections

Objective: To generate an attainment year base case emissions inventory and perform attainment year base case CAMx simulation and 8-hour ozone Design Value projections.

C.6 Attainment Year Source Apportionment Analysis

Objective: The CAMx Ozone Source Apportionment Technology (OSAT) would be used to identify the source regions and categories that contribute to elevated ozone and attainment year 8-hour ozone Design Values in the NAA

C.7. Technical Support Document & Meetings

Objective: Interim documents from the tasks listed above would be integrated into a draft Technical Support Document (TSD) and submitted to RAQC/CDPHE for comments.

Attend meetings on the Denver 8-hour ozone SIP modeling as necessary.

D. 2013 Ozone SIP Future Attainment Year Control Plan modeling analyses

D.1. Attainment Year Sensitivity Testing

Objective: Perform meaningful emission reduction 10 sensitivity tests on a subset of the episode. The attainment year emission reduction sensitivity tests would separately reduce VOC and NOx emissions by 20% from attainment year OTB base case levels within the NAA for the following major source categories (note that the area could be expanded if desired):

- On-road mobile sources;
- Non-road mobile sources;
- Oil and gas sources;
- Other area sources; and
- Point sources.

D.2 Control Plan Analyses

Objective: The CAMx model would be run for the full June-July modeling period on the 36/12/4 km grid for five attainment year control strategy packages.

D.3 Transport SIP Analysis

Objective: Analysis to support impact of upwind States/regions on the DMA/NFR NAA and the impact of Colorado/DMA/NFR on downwind locations.

D.4. Technical Support Document & Meetings

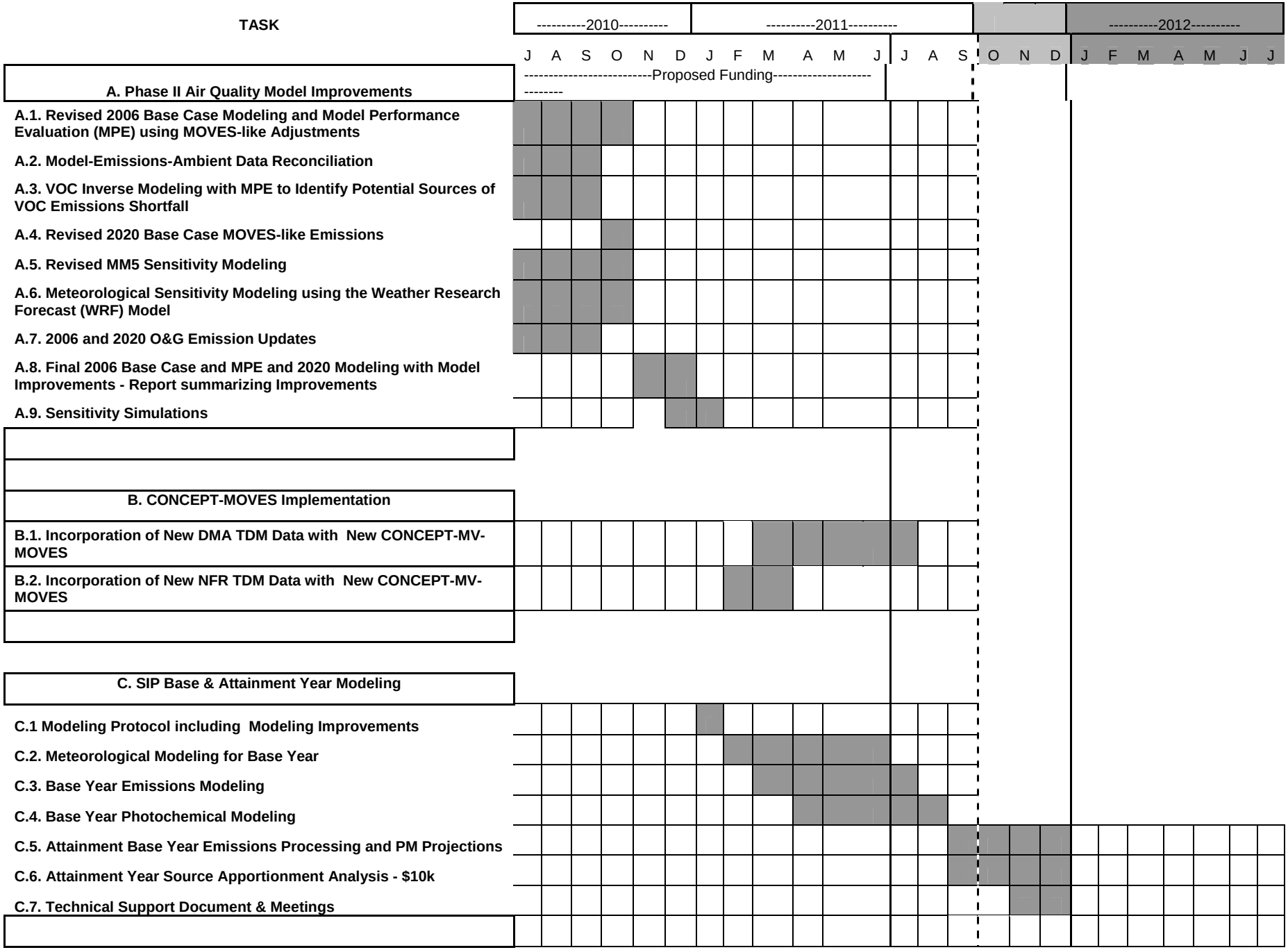
Objective: Interim documents from the tasks listed above would be integrated into a draft Technical Support Document (TSD) and submitted to RAQC/CDPHE for comments.

Attend meetings on the Denver 8-hour ozone SIP modeling as necessary

Schedule

The tasks associated with the air quality model improvements, implementation of the CONCEPT-MOVES model, and the SIP Base and Attainment Year Modeling will require approximately 15 months to complete. Following these tasks, the DMA/NFR SIP will enter into a SIP Control Plan Development phase. It is anticipated that the Control Plan phase will take approximately 6 months to prepare a Proposed SIP control package/document for presentation to the AQCC and an additional 6 months to participate in the AQCC public hearing process and prepare a final SIP model run.

The table below provides a proposed schedule by Task.


TASK
----------2010----------
----------2011----------
----------2012----------
J A S O N D J F M A M J J A S O N D J F M A M J J
----------Proposed Funding----------
A. Phase II Air Quality Model Improvements
A.1. Revised 2006 Base Case Modeling and Model Performance Evaluation (MPE) using MOVES-like Adjustments
A.2. Model-Emissions-Ambient Data Reconciliation
A.3. VOC Inverse Modeling with MPE to Identify Potential Sources of VOC Emissions Shortfall
A.4. Revised 2020 Base Case MOVES-like Emissions
A.5. Revised MM5 Sensitivity Modeling
A.6. Meteorological Sensitivity Modeling using the Weather Research Forecast (WRF) Model
A.7. 2006 and 2020 O&G Emission Updates
A.8. Final 2006 Base Case and MPE and 2020 Modeling with Model Improvements - Report summarizing Improvements
A.9. Sensitivity Simulations
B. CONCEPT-MOVES Implementation
B.1. Incorporation of New DMA TDM Data with New CONCEPT-MV-MOVES
B.2. Incorporation of New NFR TDM Data with New CONCEPT-MV-MOVES
C. SIP Base & Attainment Year Modeling
C.1 Modeling Protocol including Modeling Improvements
C.2. Meteorological Modeling for Base Year
C.3. Base Year Emissions Modeling
C.4. Base Year Photochemical Modeling
C.5. Attainment Base Year Emissions Processing and PM Projections
C.6. Attainment Year Source Apportionment Analysis - $10k
C.7. Technical Support Document & Meetings

D. 2013 SIP Future Attainment Year Control Plan Modeling Analyses
D.1. Attainment Year Sensitivity Testing - 10 @ $2.5k
D.2 Control Plan Analyses - 5 @ $5k
D.3. Transport SIP Analyses
D.4. Technical Support Document/Meetings
SIP Submittal to AQCC
Project Management