Draft Concept Paper

Use of Consistent, Efficient, Transparent and State-of-Science Regional Modeling Systems to Address Air Quality and AQRV Issues in the Western U.S.

Draft 2.1
July 24, 2008

EXECUTIVE SUMMARY

The mission of the next generation of the Western Regional Air Partnership (WRAP) Regional Modeling Center (RMC) will be to build on the activities of the present RMC, and provide support during the 2009-13 time frame for WRAP members (states, tribes, and federal agencies) by completing detailed and comprehensive retrospective and prospective air quality analyses suitable for state, tribal, and local air quality planning and management across the West, as required by the Federal Clean Air Act (CAA), as well as state, tribal, and local statutes and rules. One potential role of the next generation of the WRAP RMC could be to provide technical assistance in estimating the potential ozone, air quality (AQ) and air quality related values (AQRVs) impacts due to proposed oil and gas (O&G) and other energy development projects on public lands in the western U.S.

Typically when such developments are proposed, the environmental impacts of the project, along with all other new sources in the region (cumulative assessment), must be assessed through individual Environmental Impact Statements or Reports (EIS/EIR), Environmental Assessments (EA), or documentation as part of the National Environmental Policy Act (NEPA), New Source Review (NSR), or Prevention of Significant Deterioration (PSD) programs. Such assessments have been made on a project-by-project basis in the past and have not always used consistent approaches. The assessment framework for evaluating air quality impacts at various geographic scales for multiple indicators in the context of the requirements for both resource development and protection is inherently complicated, and is often not transparent to all parties involved and/or not consistent or comprehensive.

With the movement toward using photochemical Grid Models (PGMs) for making such ozone, AQ and AQRV assessments using data developed by the WRAP RMC and other Regional Planning Organizations (RPOs), the RMC could take on a greater role in such assessments and provide a consistent, efficient, and transparent modeling and analysis approach that would benefit the States, Tribes, Federal Land Managers (FLMs), other Federal agencies, and project proponents with objective and reproducible analytical results. These results inform the land management, air quality, and related resource protection decisions; the results would not dictate specific outcomes. This future RMC task would provide a common baseline analysis that project proponents, States, Tribes, FLMs, and other Federal agencies could use to decide if and what additional analyses and consideration of air quality planning needs might be needed. We envision several roles that the RMC could take on in these efforts starting with a ***Core Effort*** that would

develop and perform regional modeling of the western U.S. and ***Optional Efforts*** that would involve more project-specific modeling.

Core Effort

In the RMC Core Effort for EIS technical assistance, they would develop 36/12 km regional modeling databases for the western U.S. for base years beginning with 2005, and develop future year emission scenarios for several milestone future years as needed, but including key milestone years for Federal CAA planning deadlines. This effort would include the necessary meteorological modeling to develop 36 and 12 km meteorological fields for the continental and western U.S., respectively. As well as developing 36/12 km emission inputs and applying PGMs for the base years and conducing a model performance evaluation. PGMs would also be applied for the future years.

Also under the Core Effort would be the a periodic update of the emissions inventories for the base and future years accounting for potential new projects and acting as a repository and central clearing house for such emissions. A starting point for these activities would be the WRAP and other RPO 2002 and future year emission databases and the WRAP Phase III oil and gas (O&G) development efforts for the western states.

The Core Effort would also perform 4 km MM5 modeling for specific locations and processing the 36/12 km region PGM base and future year modeling results to generate boundary conditions for subregional modeling that would use 4 km or 12/4 km nested grids. These last two activities are more project-specific, so may require external resources.

Note that most of this Core Effort would not only benefit EIS-type ozone, AQ and AQRV impact assessment, but would also directly benefit and support future 8-hour ozone and $PM_{2.5}$ attainment SIP planning and regional haze SIP implementation through these modeling and analysis efforts.

Optional Efforts

The Optional Effort EIS support that the RMC would offer is more project-specific activities. These activities would include the development of subregional 4 km or 12/4 km modeling databases using the 12 and 4 km meteorological model output developed in the Core Effort and performing 4 km emissions modeling. As resources are provided, perform subregional PGM base year modeling and model performance evaluation and future year modeling to assess the ozone, AQ and AQRV impacts due to the proposed project, as well as the cumulative effects from all sources in the region. The results would be documented in a Technical Support Document (TSD) using a comprehensive suite of the air quality, visibility and deposition metrics requested by interested parties, while providing to the lead agency results for specific metrics that are suitable to include as part of an EIS or other environmental assessment document.

Efficiency, Transparency and Availability

The results from the RMC EIS-type support would be available on the WRAP Technical Support System (TSS) website available to all, which brings transparency and access to the results from the whole modeling and analysis process. In addition, since much of the Core Effort will also be necessary for the mid-course regional haze SIP implementation (~2012) assessment and for 8-hour ozone and $PM_{2.5}$ SIP attainment demonstrations (due 2013 and 2012, respectively), as well as other modeling studies, having the RMC take on these efforts brings efficiency and a central repository to the process. Finally, as serving as the central development and repository for emission sources we are assured that the latest estimates of cumulative emissions are available to all studies so that there is consistency, comparability, and improved accuracy across the various EIS and other modeling assessments.

1. INTRODUCTION

This Concept Paper presents a framework and potential scope of work (SoW) for a task among several other tasks, whereby the next generation of the Western Regional Air Partnership (WRAP) Regional Modeling Center (RMC) could assist in performing the air quality components of Environmental Impact Statements (EISs), and similar documents, for new developments and projects in the western states as part of the National Environmental Policy Act (NEPA). When such projects are proposed by the Proponents, the Federal Land Manager (FLM) that oversees the land typically has to prepare an EIS that discloses the potential ozone, air quality (AQ) and air quality related values (AQRVs) impacts of the proposed development, as well as the cumulative impacts due to all developments in the region. A similar type of assessment is required for proposed new projects under the New Source Review (NSR) and Prevention of Significant Deterioration (PSD) programs.

1.1 BACKGROUND

Oil and gas (O&G) and other energy development projects in the western states have increased substantially over the last decade. The recent rise in the price of gasoline has resulted in calls for increased local production, thus the increase in demand for O&G development projects will likely continue into the future. When a new O&G development (or other project) is proposed by the Proponents, the Federal Land Manager (FLM) typically needs to prepare an EIS (or similar document such as an EIR or EA) that discloses any potential environmental impacts under NEPA. Potential environmental impacts that must be disclosed include the effects of the proposed project alone, and the proposed project plus other developments in the region, on transportation, land use, recreation, visual resources, cultural and historic air quality, noise, geology, paleontological, surface water, vegetation, grazing, wetlands, threatened and endangered species and wildlife and aquatic resources. The FLM, who is usually either the Bureau of Land Management (BLM) or USDA Forest Service (FS), will typically select a third party contractor team that is funded by the Proponents to prepare the EIS.

One component of an EIS is an assessment the proposed Project, and the proposed Project plus all new development activities in the region, on air quality (AQ) and air quality related values (AQRVs). AQRVs include visibility and deposition. Prior to ~2007, the AQ and AQRV impacts due to a proposed project were typically estimated using the AERMOD (or ISC) steady-state Gaussian plume model for near-source AQ impacts and the CALPUFF non-steady state Gaussian puff model for far-field AQ and AQRV impacts. However, ozone air quality issues are of increasing importance in the west. In 2005 the Wyoming Department of Environmental Quality (WDEQ) begin measuring ozone concentrations in a rural area of southwest Wyoming, which is an O&G

development area, and recorded winter ozone exceedances of the 8-hour ozone National Ambient Air Quality Standard (NAAQS). The lowering of the 8-hour ozone NAAQS from 0.08 ppm (85 ppb) to 0.075 ppm (75 ppb) on March 12, 2008 increases the potential areas that may be declared ozone nonattainment areas (NAAs). Past EIS have addressed ozone using a lookup table approach that is no longer accepted. Consequently, starting in ~2007 several EISs started to use photochemical grid models (PGMs) to address ozone issues. As PGMs are "one-atmosphere" models that treat particulate matter, deposition, mercury, air toxics, etc. as well as ozone, such models could also be used to address far-field AQ and AQRV issues as well. This issue is discussed in more detail under Section 2 that presents case studies of several on-going EIS examples for southwest Wyoming.

1.2 PURPOSE

The purpose of this Concept Paper is to present the types of activities that could be undertaken by the new WRAP RMC to support EIS and similar AQ and AQRV impacts assessments in the western states. The RMC would provide support for consistent, transparent and scientifically credible assessments of the potential ozone and other air quality (AQ) and air quality related values (AQRVs) impacts of proposed new projects on the individual and cumulative basis being developed as part of the National Environmental Policy Act (NEPA) and Prevention of Significant Deterioration (PSD) programs.

This effort could be one task of the next generation of the Western Regional Air Partnership (WRAP) Regional Modeling Center (RMC). The assessments proposed in this document are beyond the scope of work (2001-2008) for the current RMC, which has principally analyzed regional haze to support the visibility State Implementation Plans (SIPs) for the western states. The recently adopted WRAP 2008-12 Strategic Plan utilizes a one-atmosphere analysis approach for the analysis of progress on regional haze, ozone and particulate matter standards, as well as nitrogen and mercury deposition. The next generation of the RMC will be competitively awarded in 2009, and could include the task activities discussed in this document.

2.0 EXAMPLE CASE STUDY ANALYSIS – RECENT SOUTHWEST WYOMING OIL AND GAS EIS DEVELOPMENTS

To provide a context for the proposed work efforts discussed in this Concept Paper, in this section we present examples of the types of air quality modeling analysis needed to support EIS and similar developments. These examples discuss the evolution in the preparation of the air quality components of several recent EISs for recent and on-going oil and gas (O&G) development projects in southwestern Wyoming:

- Jonah Infill Drilling Project in Sublette County completed in 2006;
- Supplemental EIS for the Pinedale Anticline O&G Exploration and Development Projected in Sublette County finalized in June 2008;
- Moxa Arch Gas Infill Drilling Project in Lincoln, Uinta and Sweetwater Counties;
- Hiawatha Energy Development Project on the WY-CO border; and
- Continental Divide-Creston Gas Development Projected located in Sweetwater and Carbon Counties.

2.1 SOUTHWEST WYOMING O&G DEVELOPMENT

2.1.1 Background

Oil and gas (O&G) development projects have been increasing in Wyoming (Figure 2-1). As part of the NEPA process, new O&G developments typically have to prepare an Environmental Impact Statement (EIS) that disclose the potential environmental impacts of the development. Such environmental impacts include the near-source and far-field air quality (AQ) and far-field air quality related values (AQRVs), which include visibility and deposition, as well as potential ozone impacts.

Figure 2-2 displays the locations of O&G development activities in southwest Wyoming, including the locations of the O&D development projects listed above. Over the last several years the procedures for assessing the near-source and far-field ozone, AQ and AQRV impacts of O&G development projects in southwest Wyoming have been evolving.

2.1.2 Recent Southwest Wyoming EIS Modeling

The Jonah Infill Drilling Project final EIS was submitted in January 2006 (see: http://www.blm.gov/wy/st/en/info/NEPA/pfodocs/jonah.html). The near-source AQ impacts of the Jonah project were estimated using the AERMOD steady-state Gaussian plume model, whereas the far-field AQ and AQRV impacts were estimated using the CALPUFF Gaussian puff modeling system. Ozone impacts were estimated using a screening technique (Scheffe, 1988) whereby ozone increments due to the project are taken from a lookup table and added to background ozone values for comparison with the ozone NAAQS (the Scheffe Table approach).

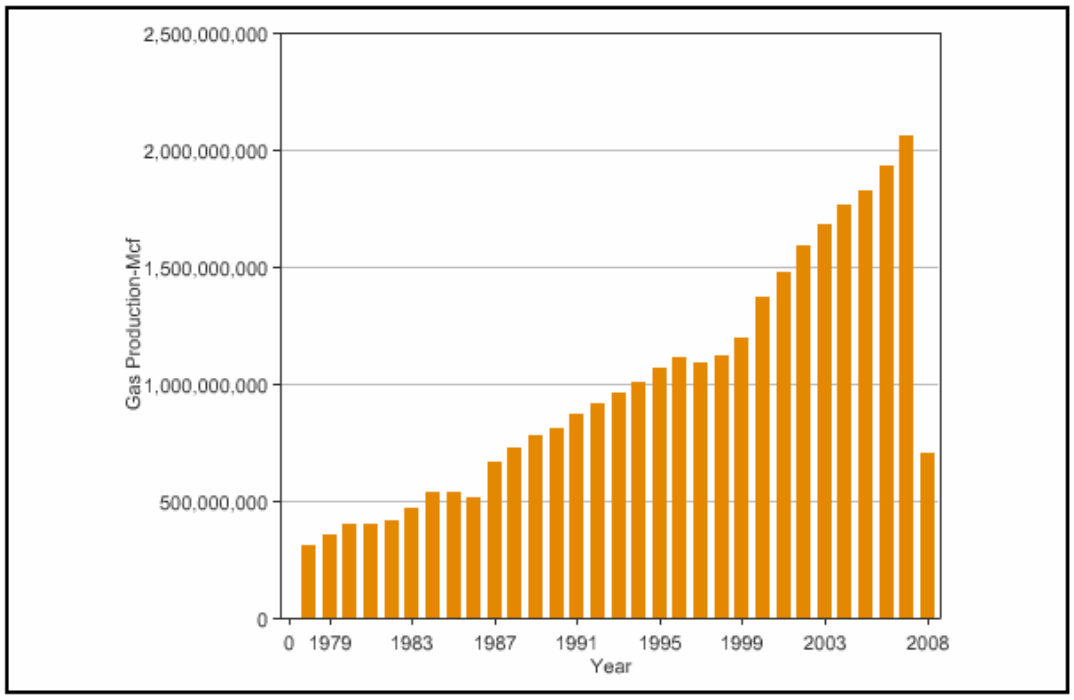

Figure 2-1. Oil and gas production in Wyoming (2008 is partial year) (Source: Wyoming Oil and Gas Conservation Commission).

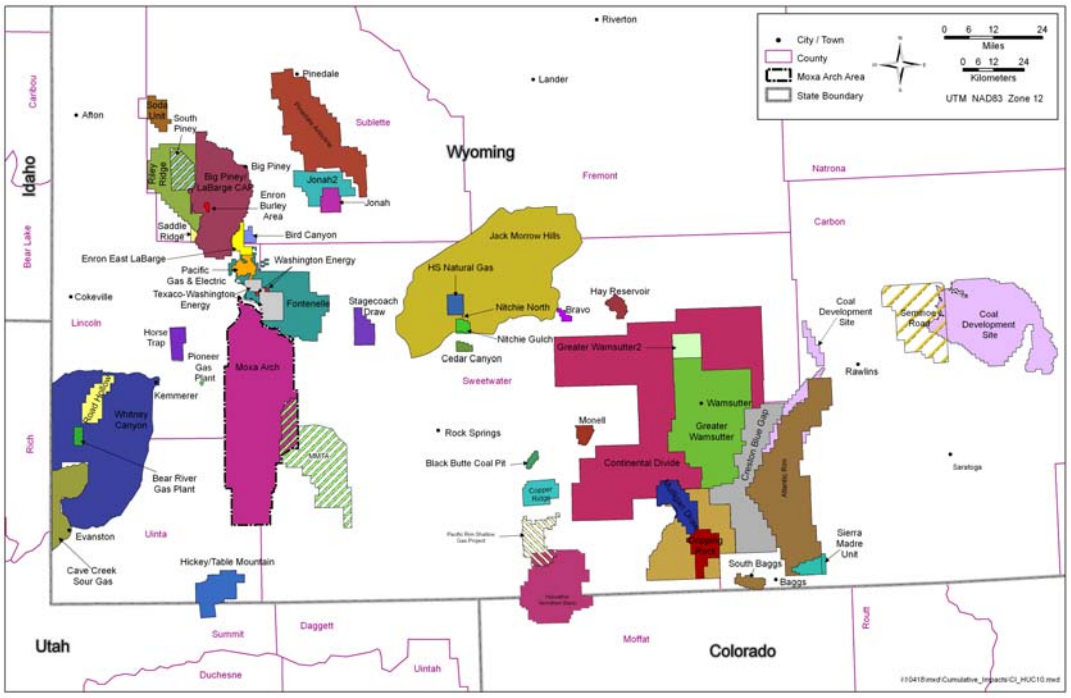

Figure 2-2. Oil and gas development regions in southwest Wyoming.

The Supplemental EIS for the Pinedale Anticline Oil and Gas Exploration and Development Project was released in June 2008 (http://www.blm.gov/wy/st/en/info/NEPA/pfodocs/anticline/seis.html). The Pinedale Anticline Project porposed in their Modeling Protocol to use the same AERMOD/CALPUFF/Scheffe Table modeling approach as used for the Jonah Infill Study to address potential ozone, AQ and AQRV impacts from the proposed project. In 2005, the Wyoming Department of Environmental Quality (WDEQ) began monitoring for ozone in the Pinedale-Jonah area in Sublette County southwest of the Wind River Range. Surprisingly, the ozone monitoring measured exceedances of the then 0.08 ppb (85 ppb) 8-hour ozone standard during the winter (Figure 2-3). Such occurrences were repeated in 2006 and 2008. Also around this time, the Scheffe Table method for assessing the ozone impacts was discredited by its developer.

Given the heightened importance of ozone in the area, the Pinedale Anticline SEIS performed ozone modeling of the project and other new developments in the region using a photochemical grid model (PGM), the Comprehensive Air-quality Model with extensions (CAMx; www.camx.com).

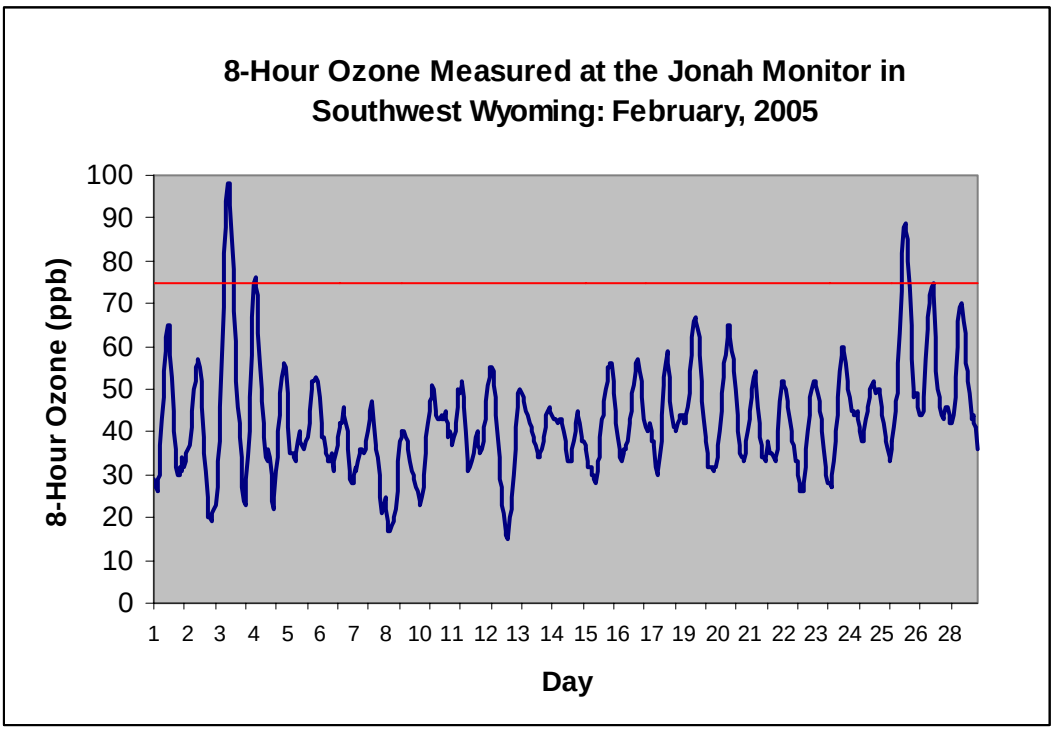

Figure 2-3. Observed 8-hour ozone concentrations from the Jonah monitoring site in Sublette County, Wyoming during February 2005.

The Moxa Arch and Hiawatha Gas Infill Projects (see Figure 2-2) were two more O&G development projects that were initiated assuming that the AERMOD/CALPUFF modeling approach would be used to address the near-source and far-field AQ and AQRV impacts. After work on the two EISs was initiated, CAMx modeling was added to address potential ozone impacts.

One potential limitation in the ozone modeling performed in these three studies was the quality of the available current and future year O&G emissions inventory used to project future year ozone impacts from all potential O&G development projects in the region. These cumulative ozone impacts are based on emission inventories contained in past EISs or RODs of Reasonably Foreseeable Development (RFD) sources. Because past EISs did not address the cumulative effects of ozone, the RFD inventories did not include VOC emissions, one of the main precursors to ozone formation.

The Continental Divide-Creston (CD-C) Oil and Gas Development Project was initiated knowing that ozone issues must be addressed. CD-C recognized that photochemical grid models (PGMs) are "one-atmosphere" models that can address far-field AQ and AQRV issues as well as ozone. Thus, the CD-C project at the outset decided to address the near-source AQ impacts using AERMOD, but all far-field AQ and AQRV and ozone assessments would be addressed using a photochemical grid model (PGM). Thus, the CALPUFF modeling system would not be used at all for the CD-C project.

The CD-C project is performing MM5 meteorological modeling for 2005 and 2006 on a 36/12/4 km grid domain as shown in Figure 2-4. The MM5 model was evaluated against surface and upper-air meteorological measurements as well as precipitation observations. For example, Figure 2-5 displays annual wind roses at the Jonah monitoring site from three sources:

- Observed during 2005 at the Jonah monitoring site (middle);
- Predicted by CALMET using 12 km MM5 data and standard NWS surface meteorological observations and a 4 km grid resolution (left); and
- Predicted by the CD-C 4 km MM5 simulation (right).

The predominate observed wind direction at the Jonah monitoring site is from the northwest, which makes sense given the southeast to northwest orientation of the Wind River Range. The 4 km MM5 meteorological model reproduces the observed distribution of the winds at Jonah quite well. The CALMET model using 12 km MM5 and surface and upper-air meteorological observations, on the other hand, is dominated by western and west-southwest winds and fails to "see" the effects of the Wind River Range. The deficiencies in the CALMET meteorological model has also been noted by EPA as well (http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/old/2008/presentations/CALPUFF%20Performance%20Evaluations_FNL.pdf), which is why EPA is likely going to recommend mapping MM5 data directly to CALPUFF in the future (http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/old/2008/presentations/mm5calpuff.pdf).

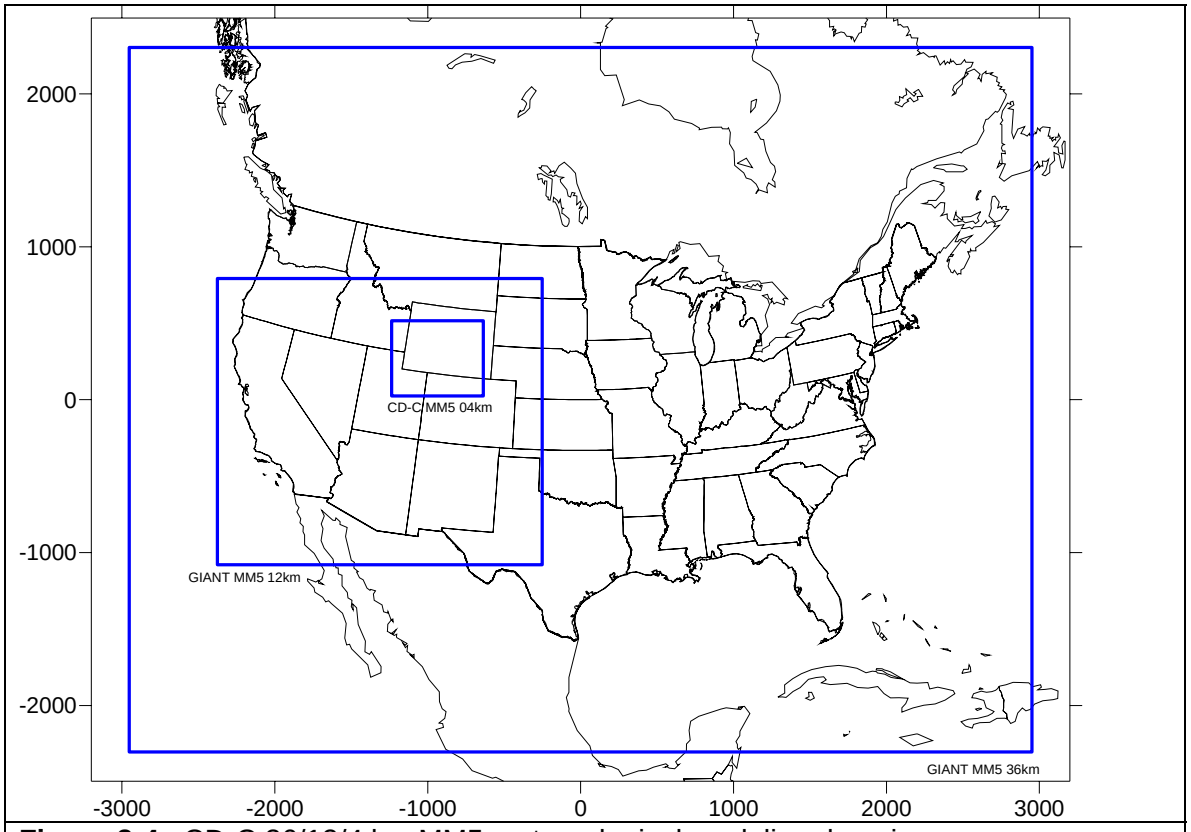

Figure 2-4. CD-C 36/12/4 km MM5 meteorological modeling domains.

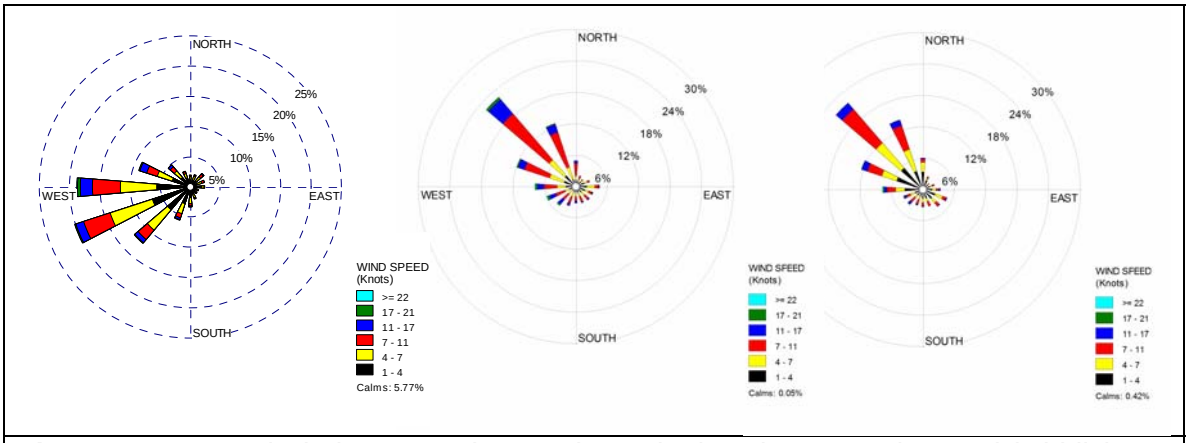

Figure 2-5. Annual wind roses at the Jonah monitoring site: 2005 observed (middle); estimated by CD-C 4 km MM5 (right) and CALMET estimated (left).

The CD-C project is developing updated emission inventories for the 2005 and 2006 years and the 36/12/4 km modeling domains. For the 36 km continental U.S. modeling domain, the WRAP and other RPO 2002 inventories are being projected to 2005 and 2006. For the 12/4 km modeling domains, a combination of projected WRAP/RPO 2002 emissions and new point source emissions data, as well as potential new O&G and other sources emissions data, for the states of WY, UT and CO is being utilized.

For oil and gas development sources in southwest Wyoming, a whole new inventory is being developed using 2005 and 2006 activity data and Basin-specific emissions and speciation factors. The preliminary updated oil and gas development VOC emissions inventory for southwest Wyoming is over 100,000 TPY, which compares to ~200 TPY for the WRAP Phase II inventory for the same region.

The CD-C Modeling Protocol proposed to evaluate both the Community Multiscale Air Quality (CMAQ; www.cmascenter.org) and CAMx PGMs using the 2005/2006 36/12/4 km modeling databases. Then based on the model performance evaluation for ozone, PM species and deposition, run times and other considerations (e.g., ease of use) one of the PGMs would be selected for use in the CD-C EIS ozone and far-field AQ and AQRV impacts assessment. Figure 2-6 displays the CD-C 12/4 km PGM modeling domain, and the locations of the CASTNET, IMPROVE, NADP and WDEQ monitoring sites that will be used in the model performance evaluation. The CD-C PGM modeling approach will first perform 36 km modeling of the continental U.S. modeling domain (Figure 2-4) for 2005 and 2006 whose results will be used to define boundary conditions (BCs) for the 12 km domain. Then the 12/4 km modeling would be conducted using either two-way (CAMx) or one-way (CMAQ) grid nesting.

Future year emissions will be developed for the CD-C Project, as well as all other potential new projects in the region. Other source categories will be projected to a future year (e.g., WRAP/RPO 2018 inventories). The impacts of the CD-C Project alone for

each of its alternatives, along with the cumulative impacts from all proposed projects in the region will be estimated using the selected PGM for comparisons against:

- National and State Ambient Air Quality Standards (e.g., 8-hour ozone, $PM_{2.5}$, NO2, SO2, etc.);
- PSD Class I and II Concentration Increments;
- Visibility Thresholds; and
- Deposition Threshold.

Due to updates in emission inventories in the region, the Moxa Arch and Hiawatha Projects must redo their modeling. With the development of the CD-C PGM modeling databases, the two other EIS studies are also dropping the CALPUFF model for the far-field AQ and AQRV assessment and instead will use a PGM for both the ozone and far-field AQ and AQRV modeling.

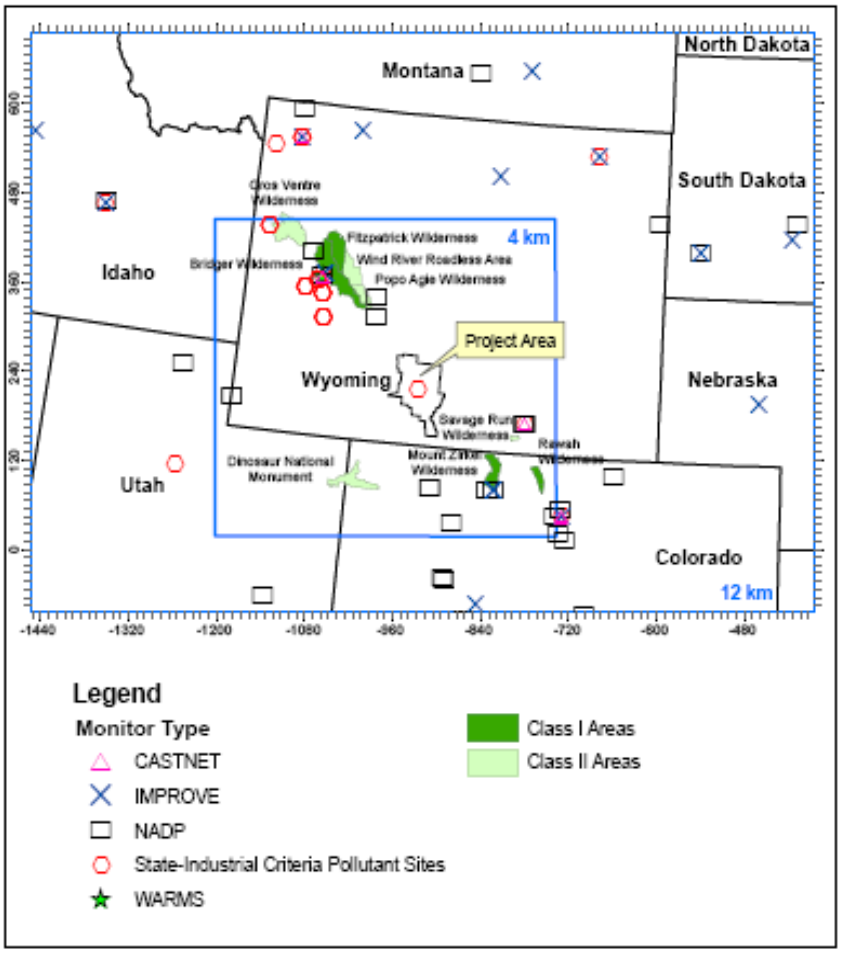

Figure 2-6. CD-C Gas Development Project 12/4 modeling domain for emissions and PGM modeling and locations of air quality monitoring sites.

3. POTENTIAL ROLES FOR RMC EIS AND OTHER STUDIES AIR QUALITY MODELING SUPPORT

3.1 INTRODUCTION

As noted in Chapter 2, there is a general movement toward using photochemical grid models (PGMs) to perform air quality modeling in support of preparing Environmental Impact Statements (EISs) for oil and gas (O&G) and other new project developments in the west. This is made possible due to the development of regional modeling databases by the WRAP Regional Modeling Center (RMC) and other Regional Planning Organizations (RPOs). The WRAP and other RPOs have developed a photochemical grid modeling infrastructure that makes the application of PGMs much more efficient and cost-effective so they can be used more readily for a variety of applications. In the past, the EIS air quality modeling process has been somewhat fragmented. In many cases emission inventories and model databases have to be redeveloped for each EIS using the available information. In particular, the development of the future year O&G sources emissions for Reasonably Foreseeable Development (RFD) scenarios from previous EISs may not always be done the same. This is particular important now that ozone must routinely be addressed so detailed information on the VOC emissions and their speciation is needed, which have not been included in past RFD inventories. These issues result in inconsistencies and potentially inaccuracies in different EIS air quality assessments.

WRAP is conducting a Phase III development of O&G sources for Basins in the western U.S. from Montana to New Mexico. The WRAP Phase III current and future year O&G emissions database is an important building block for developing more accurate and consistent cumulative impacts due to O&G and other project development sin the western states.

With the movement toward the more routine use of PGMs in EIS air quality modeling, there are several roles that the future WRAP RMC could undertake to provide a more efficient, consistent and transparent approach toward conducting EIS modeling. Below we describe several tasks the RMC could take on as part of an EIS modeling support. These tasks include a ***Core Effort*** that would routinely update the regional meteorological, emissions and air quality modeling databases for the western U.S. for current and several future years Note that this routine regional PGM modeling database update can also be used to support the regional modeling component for 8-hour ozone, $PM_{2.5}$ and visibility State Implementation Plans (SIPs) and research studies, as well as support impact assessment performed as part of New Source review (NSR) and/or Prevention of Significant Deterioration (PSD) studies.

We have also identified several ***Optional Efforts*** the RMC could take on as part of EIS support. These ***Optional Efforts*** would be more project-specific.

3.2 RMC CORE EFFORT REGIONAL MODELING SUPPORT

The RMC Core Effort would involve the periodic update of regional 36/12 km modeling databases for current and future years and would involve emissions, meteorological and photochemical grid modeling updates.

3.2.1 Modeling Protocol

At the outset of the RMC Core Effort, a Modeling Protocol would be prepared describing the regional modeling activities of the RMC, the participants and contacts and the schedule for the periodic modeling updates. The Modeling Protocol would serve as a road map for the Core Effort and document additional analysis that could be undertaken to support EIS and other modeling activities.

3.2.2 Meteorological Modeling Updates

The RMC would perform periodic regional meteorological modeling on a 36 km continental U.S. domain and a 12 km western U.S. domain, like they did for the 2002 calendar year. Figure 3-1 displays the 36 km Inter-RPO and 12 km western U.S. modeling domains used previously by the WRAP RMC. The same or similar modeling domains could be used for the new meteorological modeling.

Both the fifth generation Mesoscale Model (MM5) and the Weather Research Forecast (WRF) meteorological models would be considered for use in the periodic meteorological modeling update. The first years to be modeled would be 2005 and 2006 and the 2008 year would definitely be modeled because it is a periodic emissions update year for the National Emissions Inventory (NEI) and is included in both the 2006-2008 and 2007-2009 three-year periods that will be used to designate $PM_{2.5}$ and 8-hour ozone nonattainment areas, respectively, under the new standards. Further details on the meteorological modeling would be documented in the Modeling Protocol.

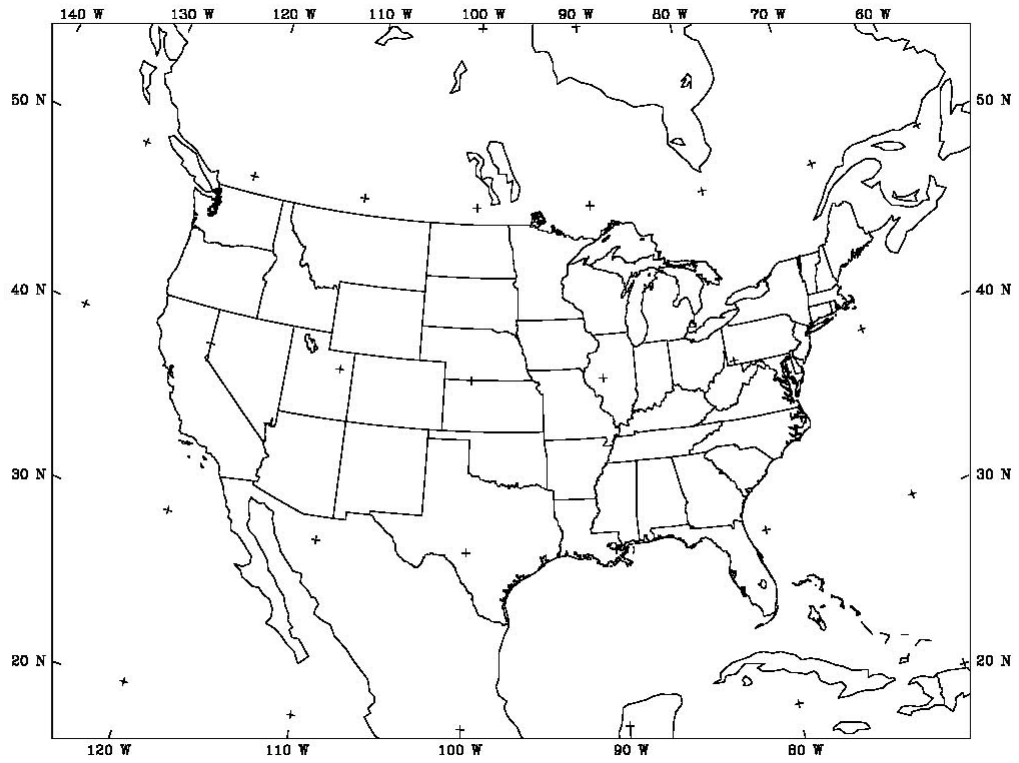

Figure 3-1a. Continental U.S. Inter-RPO 36 km meteorological modeling domain.

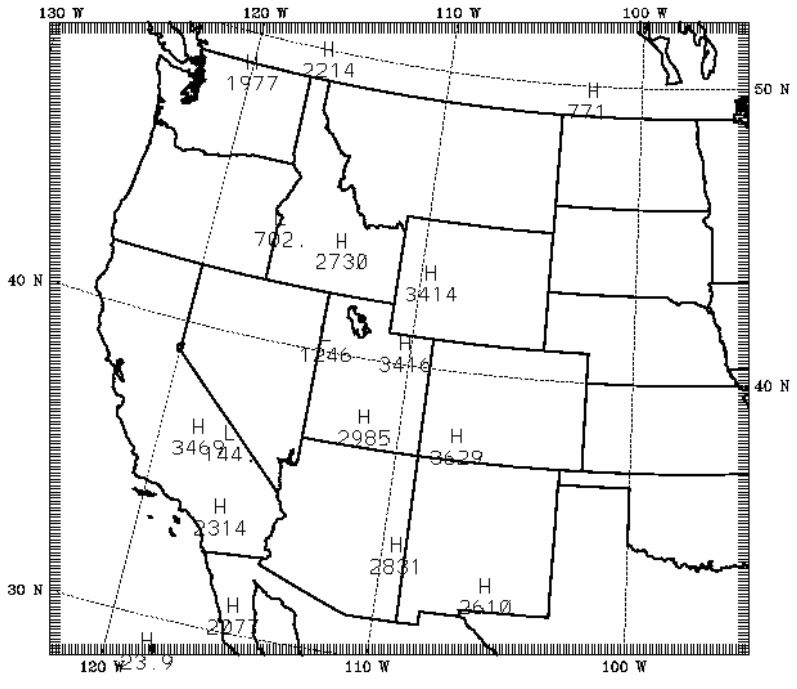

Figure 3-1b. Western U.S. 12 km meteorological modeling domain.

3.2.3 Periodic Emission Updates

In regards to emissions inventories, the RMC Core Effort would have several functions:

- To periodically update base year base case and future year emission inventories;
- To update and act as a repository for new oil and gas and other development activities for maximum emission scenarios as well as for several milestone future years; and
- To develop future-year inventories for several milestone future-years.

3.2.3.1 Base Year Base Case Emission Updates

Base year base case emissions will be developed and updated periodically. The first base year would likely be 2006 since that is the year selected by the WRAP Phase III O&G emissions development effort. Emissions would be updated for point, area, non-road mobile, on-road mobile, ammonia, wind blown dust, biogenics and fires. The starting point for the base year base case inventories would be the RPO 2002 inventories that will be projected to the base year. Where base year emission inventory information exists, it would be used to substitute for the projected inventories. Such sources would include Electrical Generating Units (EGUs) and other large stationary sources with Continuous Emissions Monitoring (CEM) systems and the WRAP Phase III O&G inventory. On-road mobile sources would be modeled directly using base year Vehicle Miles Traveled (VMT) data and the MOBILE6 (non-California) and EMFAC (California) mobile source emissions models and the base year meteorological conditions. Similarly, the EPA NONROAD and ARB OFFROAD models would be used to generate base year non-road emissions. Day-specific biogenic emissions will be generated using the MEGAN and BEIS3 models and the day-specific meteorological data. Day-specific fire emissions would also be generated likely using some combination of the MODIS satellite and ground-based observations.

Once a base year baseline inventories have has been prepared, an emissions model would be used to generate day-specific gridded, diurnally varying speciated emissions for PGM modeling. Both the SMOKE and CONCEPT emission modeling systems would be considered for use.

3.2.3.2 Periodic Update and Repository for O&G and Other New Project Emissions

Under this work element, the RMC would periodically update information on new O&G and other projects in the western U.S. The starting point for this activity will be the WRAP Phase III O&G development 2006 and future year emission inventories, Reasonably Further Development (RFD) inventories from various EISs and Records of Decisions (RODs) and state's major and minor sources from their permitting databases. These updates would not be limited to just O&G development but would include other energy development (e.g., tar sands, shale oil, electrical generation, etc.) and industrial sources. These emissions would be developed for the base modeling years (e.g., 2005,

2006 and 2008) and for several milestone future years. The new project emissions database should also include a maximum emissions year. Note that because different precursors (e.g., VOC and NOx) may have different maximum emission years, a specific project may have multiple maximum emission years.

3.2.3.3 Future Year Emission Updates

Projected future year emission estimates would be developed for all source categories for several milestone future years, for example 2018, 2015 and 2023. Emissions would be projected using emission models (e.g., MOBILE6, EMFAC, NONROAD, SMOKE and CONCEPT) and growth and control factors and using the emissions repository of new sources discussed above.. PGM model-ready emission inputs for the 36/12 km modeling grids would be generated.

3.2.4 Regional Photochemical Modeling Updates

Regional Photochemical Grid Models (PGMs) would be applied for the base year emissions scenarios (e.g., 2005, 2006 and 2008) and a model performance evaluation conducted using available ambient concentration and deposition measurements. There are two PGMs that are in wide use today for ozone, $PM_{2.5}$ and visibility planning: CMAQ and CAMx. As seen in the current RMC modeling during 2001-2008, there are features in both models that have proved useful and since the incremental cost for running both models is small compared to the overall costs in setting up one of the models, both models should be run for the current year 36/12 km base case simulations.

The two models would also be run using the current year(s) 36/12 km meteorology for the milestone future years to obtain future year concentration and deposition estimates. The EPA Modeled Attainment Test Software (MATS: http://www.epa.gov/scram001/modelingapps_mats.htm) would be used to project future year 8-hour ozone and $PM_{2.5}$ Design Values and visibility levels. Additional AQ and AQRV metrics (e.g., deposition) would also be reported as discussed in the Modeling Protocol.

3.3 EIS CORE SUPPORT FUNCTIONS

When an O&G development, or other project, needs to conduct an air quality assessment as part of an EIS (or other air quality assessment need such as PSD), as part of the Core Effort the RMC could provide the following three Core Effort support functions. These activities would likely involve funding from external sources to complete because they tend to be project-specific. However, because they would need to be performed routinely and need to build off of the Core Effort 36/12 km regional modeling, they are included as part of the Core Effort for EIS support.

3.3.1 Higher Resolution Meteorological Modeling

Air quality impacts assessment of new developments and projects using a PGM will need to be assessed using a higher resolution grid than the 12 km resolution used in the Core Effort regional modeling support. We envision that a 4 km grid would be used, or possibly a 12/4 km grid nesting with the 4 km grid focused on the project area and receptor areas of most interest. To support this modeling approach , the RMC would conduct 4 km meteorological modeling (e.g., MM5 or WRF) using one-way nesting within the 12 km meteorological modeling discussed in Section 3.2.2. The 4 km meteorological modeling could be conducted for the desired base year(s).

3.3.2 Boundary Conditions (BCs) Extractions

For the requested sub-regional modeling domains, the 12 km three-dimensional PGM modeling results for the identified base and future year(s) and model(s) would be processed to generate boundary conditions (BCs) input files. These BCs would be used for subregional modeling of proposed project and cumulative source impacts.

3.3.3 Subregional Emission Inventories

The RMC would provide the base and future year foundation files and growth and control factors that can be used for subregional modeling of proposed project impacts.

3.4 OPTIONAL RMC EIS MODELING SUPPORT ACTIVITIES

The following are additional optional activities that the RMC may consider offering to support EIS or other action air quality impact assessments. Because these activities are very project-specific, they would likely require external resources to perform. These activities would essentially conduct the EIS-specific ozone, AQ and AQRV modeling analysis using the RMC modeling database infrastructure. Although there is general agreement on the best modeling methods to use to assess ozone, AQ and AQRV impacts, in the past there has been some disagreement among the FLMs on what air quality, visibility and deposition metrics to use and what thresholds they should be compared to. The RMC would process the results to obtain the metrics for the requesting Agency. This approach was also taken when the RMC performed BART modeling for several WRAP States where the RMC presented the visibility metrics for the sources to the states, but it was up to the states to determine whether a source was BART-eligible.

3.4.1 Project-Specific Modeling Protocol

The RMC would prepare a project-specific Modeling Protocol that describes the procedures to be used in assessing the potential ozone, air quality (AQ) and air quality related values (AQRVs) impacts from a proposed new project/development. The Modeling Protocol would delineate the modeling domains (e.g., 12/4 km) and models to

be used, years and project alternatives to be modeled, and ozone, AQ and AQRV metrics to be reported.

3.4.2 Finer Scale Emissions Modeling

This work element would involve finer scale emissions modeling for a projected-specific 12/4 km modeling domain. Base year base case as well as future year emission inputs would be prepared for the selected PGM. The proposed project and other cumulative development sources would be processed separately so that project-specific as well as cumulative source contributions to ozone, AQ and AQRVs could be assessed using the PGM.

3.4.3 Development of Project-Specific Meteorological Inputs

The 12 km and 4 km meteorological fields discussed in Sections 3.2.2 and 3.3.1, respectively, would be processed to generate meteorological inputs for the selected PGM.

3.4.4 Base Year Modeling and Model Performance Evaluation for Projected-Specific Modeling Domain

The PGM would be applied for the project-specific 12/4 km or 4 km modeling domain (or alternative configuration) for the base year using the base case emissions discussed under Section 3.4.2. A model performance evaluation would be conducted using procedures and statistical measures as typically used for PGM applications and discussed in EPA's ozone, $PM_{2.5}$ and regional haze modeling guidance (EPA, 2007).

3.4.5 Future Year Modeling and Ozone, AQ and AQRV Assessment

The PGM would be applied for the future year emissions scenarios to assess the potential impacts the project alone, and the project along with all other developments in the region (i.e., cumulative assessment), would have on ozone, AQ and AQRVs. Separate runs would have to be made for each project alternative and zero-out or source apportionment modeling would have to be used to obtain the incremental concentration, visibility and deposition impacts due to the project alone and the project plus all other developments in the region (cumulative impacts).

The exact modeling metrics to be reported will be determined by the EIS lead Agency and specified in the Modeling Protocol (Section 3.4.1).

3.4.6 Preparation of a Technical Support Document (TSD)

The results of the project-specific subregional modeling would be documented in a Technical Support Document (TSD) suitable for inclusion as part of an EIS or other environmental assessment document.

3.5 ADDITIONAL OPTIONAL ANALYSIS THAT MAY BE CONSIDERED

The RMC could also consider offering CALPUFF modeling support functions as part of their EIS modeling support Optional Effort. These support activities would be project specific so would likely be funded by external sources.

3.5.1 CALPUFF Modeling Protocol

Preparation of a Modeling Protocol for project-specific CALPUFF modeling that describes the domains, years, meteorological modeling approach and CALPUFF modeling approach to be used to obtain the projected-specific and cumulative AQ and AQRV impacts.

3.5.2 CALPUFF Meteorological Inputs

CALPUFF modeling inputs could be prepared by either processing the 4 km meteorological data prepared under Section 3.3.1, along with surface, upper-air and precipitation data, for input into CALMET, or directly processing the 4 km meteorological data into CALPUFF inputs using an MM5/WRF-to-CALPUFF translator.

3.5.3 CALPUFF Emissions Processing

The SOx, NOx and PM emissions for the various project alternatives along with all other cumulative sources in the domain would be processed for input into CALPUFF.

3.5.4 CALPUFF Modeling

CALPUFF modeling of emissions associated with future year project alternatives as well as project alternatives plus cumulative sources in the region would be performed. The CALPUFF modeling results would be processed to obtain concentration, deposition and visibility increments for comparison against thresholds as discussed in the Modeling Protocol.

3.5.5 Preparation of a Technical Support Document (TSD)

A Technical Support Document (TSD) would be prepared suitable for inclusion in an EIS or other environmental assessment document that documents the CALPUFF modeling.

3.6 DOCUMENTATION AND DELIVERY OF RESULTS THROUGH TSS

Where feasible, the emissions, meteorological and modeling inputs and outputs would be made available through the WRAP Technical Support System (TSS). This will allow the full disclosure and transparency of the modeling results and full availability of the databases. Some of the databases will be too big to make them available on the TSS website (e.g., meteorological and PGM outputs). Such databases would be made available through hard disks for a reasonable fee.