

WRAP Regional Technical Center Work Plan

Introduction

The regional haze rule identifies two pathways for implementation plan development. These are found in Sections 308 and 309. In the development of SIPs under either section 308 or 309, all states must analyze visibility impacts in Class I areas in their state and in other states. In order to achieve a common basis for the analysis, common analysis tools and common data sets (meteorology, emissions, etc.) must be used. Without this commonality, there will be no basis for analyzing relative contributions to visibility impairment. A Regional Technical Center (RTC), formed under the auspices of the WRAP, is viewed as the most logical method for achieving a unified technical approach.

A critical question under Section 309 is whether the control strategies developed for the Grand Canyon Visibility Transport Commission (GCVTC) will have commensurate benefits at other Class I areas. If an implementation plan is to follow this route, it must be submitted at the end of 2003, thus requiring that modeling analyses be completed somewhat sooner. For states that can not make that Section 309 demonstration for their Class I areas, or who choose to develop an implementation plan under Section 308, the SIP revision due date is by the end of 2008. For section 309, the intermediate time frame analysis will be confined to examining the effect of the GCVTC control strategies on other Class I areas. With the longer time frame of section 308, more detailed examination of various control strategies can be accommodated. The Regional Technical Center will provide information germane to both processes. The base analyses developed for section 309 SIPs will also serve for section 308 analyses.

The technical center will be a distributed center in that the participants may be physically located in different locations (i.e. state air quality offices) but all will be direct participants in the center, communicating and sharing information electronically. A critical component of the technical center is a director with direct oversight of the center. The center will build advanced modeling capabilities by the WRAP states, federal agency participants, tribes, academic institutions, industrial representatives, and non-government organizations in support of both 308 and 309 SIP/TIP development. One advantage of the distributed center approach is that the people who will be serving as the technical staff will be, in large part, members of air quality offices who will be needing to do this work on a state or tribal basis, as well. This will ensure technical integration of all of the planning processes. Contracting out the analysis work of the WRAP will not yield this direct benefit to the various air quality agencies. While the Models-3 framework is envisioned as the analysis tool of choice, other tools can easily be used by the center as needed. The budget includes the development of infrastructure (i.e. computer hardware and software) to utilize these analysis tools.

A technical project with similar goals has been established in the Pacific Northwest. It is working on adapting Models-3 in Oregon, Washington, and Idaho. The WRAP technical center includes the resources already established there, but expands the efforts to include all of the WRAP states.

With oversight from the Wrap Modeling Forum, the technical center will serve the WRAP states, but will also be providing technical insight to other regional planning bodies as they embark on similar regional planning processes. The WRAP is the first regional body to be using the current analysis tools in Models-3 and will therefore be one of the first to test the system in a real-world application. Communication of what is learned in this process to the air quality community is considered an integral part of the technical center duties. Improvements in the system, such as the conversion of the SAS scripts, noted in the budget, will also benefit the air quality community at large.

While the center will be distributed, there is a critical need for a center director, to coordinate the work of the center participants; the center is not likely to be successful without this. The skills of the other participants include meteorological modeling, air quality modeling, emission inventory/control strategy evaluation, and data analysis. (The center will not develop control strategies, but will analyze their effect.) It is anticipated that the center director and the various participants will be committed to participation in the center through Memoranda of Understanding (MOUs) or Interagency Agreements (IGAs) or cooperative agreements or may be assigned through the Intergovernmental Personnel Act (IPAs). The participation may be on a half-time or full-time equivalent basis. The budget includes these personnel costs.

The budget outlined below is segregated by the FY99 funding and by subsequent year's funding. The FY99 funding is focussed on some initial infrastructure expenses. The subsequent years include expansion of the infrastructure and personnel costs (including benefits and overhead).

In-kind services are not itemized in the budget. These currently include 2 SGI workstations from Washington DOE and EPA Region 10 and 1½ FTE from these organizations. The National Park Service will be providing ½ FTE and workstation availability. The EPA ORD and OAQPS are providing technical assistance and the base meteorological files (MM5 model runs for 1996) that will be used.

Goals of the Regional Technical Center

1. Provide a common basis for all WRAP states to analyze the effect of emission control strategies on visibility impairment.
2. Develop a common capacity to use advanced modeling platforms, such as Models-3, among the WRAP participants, particularly air quality agencies who must develop state or tribal implementation plans.
3. Provide technical support, outreach, and training to WRAP participants and other regional planning groups.

Two primary motivations for the development of a Regional Technical Center are to meet the needs of the members of the WRAP through service and outreach. Services provided by the RTC include helping to build capacity of states and tribes to do air quality modeling in support of revisions to State and Tribal Implementation Plans (SIPs/TIPs) to accommodate recent federal regional haze regulations; to facilitate training of state/tribal agency staff; to provide to member states/tribes modeling products, e.g., initially a 36-km resolution regional haze analysis for a base case and a

future case assuming implementation of Grand Canyon Visibility Transport Commission (GCVTC) control strategies; to facilitate peer review of WRAP modeling products; to make modeling tools, e.g., Models-3 framework, available to interested member states/tribes; to build and improve model input data bases; to facilitate acquisition of hardware/software necessary for modeling by member states/tribes; and to be available as a technical resource for states/tribes regarding air quality modeling problems.

In addition to services, the RTC will have responsibility for various outreach functions. The RTC will reach out to member states/tribes to make them aware of RTC services and to encourage their development of technical capability. The RTC will also reach out to industry and research centers in the West to encourage their work to be complimentary to that of the WRAP RTC. Also, the RTC will interface with other RTCs across the country to share information/data, and to promote consistency in technical methods and modeling policies

Organization

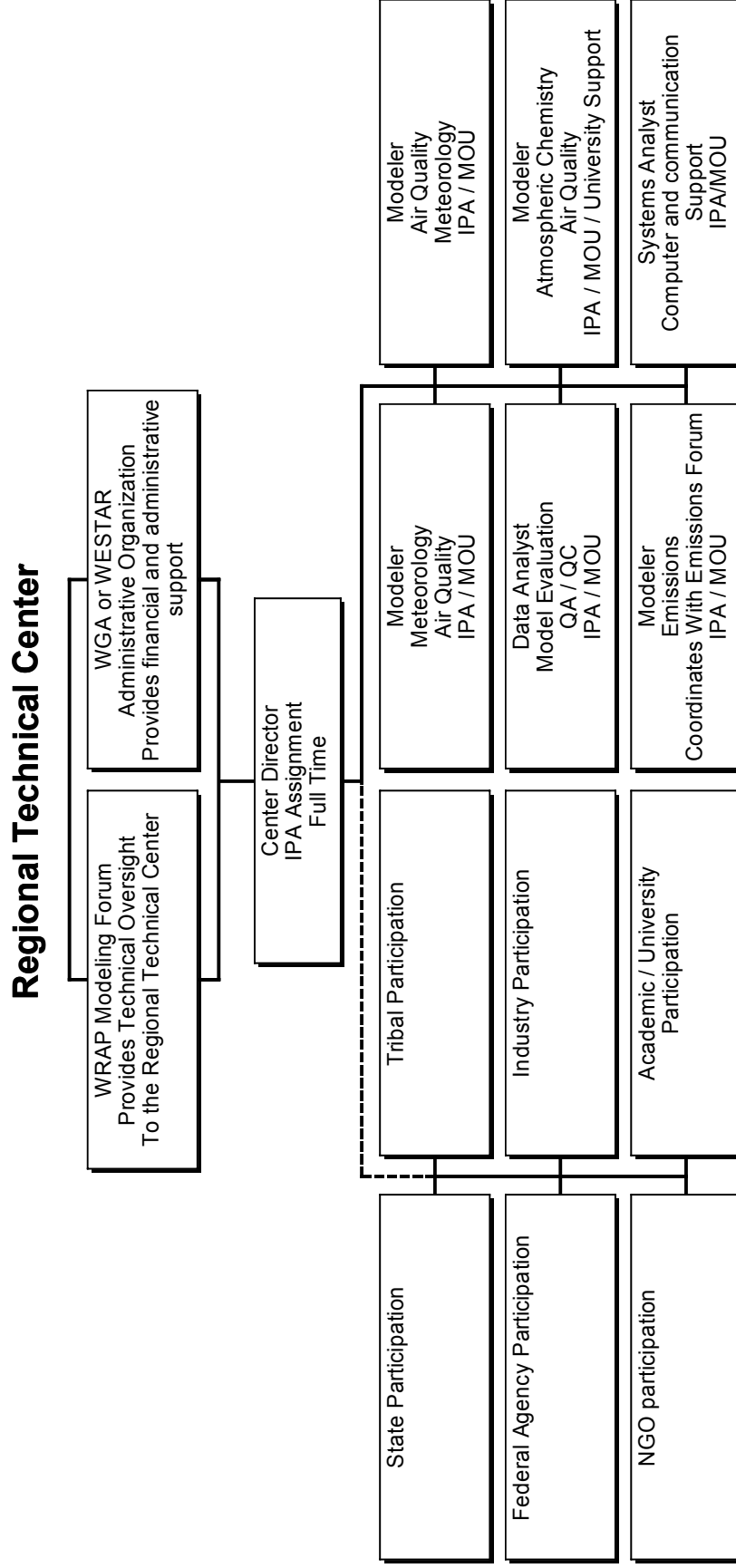
The organization of the regional technical center is illustrated schematically in Figure 1. The technical center will receive technical oversight and guidance from the WRAP modeling forum with input from the other technical forums, as well. The center also needs an administrative home to handle personnel, funding, contracts, and purchases. Two organizations may potentially serve the administrative function, either the Western Governors' Association (WGA) or the Western States Air Resources Council (WESTAR).

The key to making the technical center work is the director, who will be responsible for taking the guidance of the modeling forum and implementing it, as well as ensuring that the administrative aspects of the center are handled. The center director will be accountable to both the modeling forum and the administrative organization. The director will also be responsible for overseeing the work of the center staff and coordinating with other cooperating groups. It is anticipated that this position will be filled through an Intergovernmental Personnel Act transfer (IPA) to the administrative agency. The director will need both administrative and technical skills. The center director needs to be dedicated to this task full time.

The center staff will be assigned to the center either through IPAs or through other administrative mechanisms, such as MOUs or IGAs. Staff will primarily be assigned from the air agencies of participating states and tribes. They will be accountable to the center director. This arrangement will enable the work of the WRAP to proceed, at the same time providing training and complete familiarity of the modeling systems to air agency staff members. Depending on the needs of the agencies providing staff to the technical center, the staff may be assigned either full or part time. It will be necessary to clearly identify the exact commitment, in terms of time, to the center.

The staff positions in Figure 1 are identified by functional areas that need to be covered for the types of regional analyses being undertaken by the WRAP. These positions include a meteorological modeler who is also familiar with air quality modeling, someone who is familiar with Eulerian air quality models and who also has some background in meteorological modeling, someone familiar with atmospheric chemistry,

Figure 1 – WRAP Technical Center Organization Chart



someone to process the emissions for base scenarios and control strategies, and a data analyst to work on model evaluation and quality control, and a systems analyst keep the infrastructure operating.

Examination of the organization chart in Figure 1 also indicates a dashed line from the director to participation by states, tribes, federal agencies, NGOs, industry and universities. It is intended that the technical center be all inclusive; other groups are encouraged to participate. Because of the timing of funding and the nature of the WRAP analyses, the center will not be fully staffed until the FY01 budget cycle. The initial setup and exploratory analyses will necessarily be done through the in-kind resources of some of these groups. These efforts will be an integral part of the technical center.

Logistics

The Regional Technical Center can be physically distributed and it is expected that it will be distributed. The center director can be physically located with the administrative organization, but it is not necessary. It is anticipated that the technical staff working on the WRAP analyses will be physically located with their organizations. This will help foster the analysis capabilities of the participating agencies.

Part of the work plan and budget outlined below is the establishment of the infrastructure necessary to make the virtual center work. This relies heavily on internet communications to exchange information and data. The computer hardware identified is necessary to run regional air quality analyses, and the communications is necessary to disseminate information, whether the center is distributed or centrally located.

The center director will be in constant communication with the participants and the participants will be in constant communication with their peers. This will be achieved through electronic mail, routine teleconferences and net meetings, and by face-to-face meetings.

One of the advantages of a distributed center is that the limited resources available to the WRAP for analyses will be directly used for analyses rather than paying for facilities or relocating staff. A second consideration is the uncertain nature of long-term funding. By using the distributed center concept, much of the infrastructure and technical capabilities will be in place to support SIP/TIP development, even if future funding is not available.

Parallel Efforts

Motivated by the relatively short times frames associated with intermediate-term SIP/TIP modeling needs, the WRAP-MF has decided to initially develop its RTC by building upon the existing organization and work of the Pacific Northwest Regional Modeling Consortium. Some of the members of this Consortium are involved in a Regional Modeling Center Demonstration Project, which at this writing is still in its developmental stages. The scope of work for the Project calls for the development and application of the CMAQ model to two air quality problems. The first application of CMAQ will be for an ozone episode in Western Washington; the second application will be for a regional haze episode in the Pacific Northwest. The performance evaluation

and sensitivity testing associated with these two applications of CMAQ are intended to develop the technical basis for further application of the model. The Project scope also includes the development of necessary regional emission inventory data bases for the Pacific Northwest, and the implementation of the Models-3 framework.

The WRAP efforts will initially build upon the Pacific Northwest effort by expanding the analysis region to include the WRAP domain. This effort will utilize the experience currently being gained in the execution of the Models-3 Framework by the Pacific Northwest Regional Modeling Consortium. For further information on the parallel efforts, see attachment A.

Analysis Tools

In the work plan which follows, the Models-3/CMAQ system is identified as the analysis tool which will be used by the technical center. This was chosen because it currently represents a robust, state of the science, modeling system, designed to analyze regional visibility degradation and designed to be used in a distributed environment like the WRAP.

It should be clear from the outset, that this is a starting point. Other modeling and analysis tools will be considered if they provide other features needed for the WRAP analyses or if the Models-3/CMAQ system does not work as planned. The capability being developed through the technical center and the infrastructure of the technical center easily allows for the use of other analysis tools. For example, a less robust modeling system, REMSAD, is being set up to run on a 36 kilometer grid over the contiguous United States by the EPA Office of Air Quality Planning and Standards. If the Models-3 system is not providing the results needed in a timely fashion, the center can relatively easily move to running this alternate modeling platform, although the robust scientific treatment of the important atmospheric phenomena will be lost.

Work Plan

Intermediate-term Scope of Work

The tasks listed below are those that need to be accomplished within two years. The completion of these tasks will get the Models-3/CMAQ system operational for the West. Two important results of these efforts will be, first, an analysis will be performed that can serve the states/tribes in developing SIP/TIP revisions under Section 309 due at the end of 2003, and, second, the technical groundwork will be laid for states/tribes to build upon in developing SIP/TIP revisions under Sec. 308 due in 2008.

- Initial Episode Identification

Analyze IMPROVE data in the West for 1996. Identify three to four interesting regional haze episodes of several days in length, to include initial good regional visibility, build-up of regional visibility impairment, and then a return to good visibility. Variety of episodes should reflect the range of important pollutant contributions (sulfates, nitrates, elemental carbon, organic carbon, soil) to

extinction found in the West. Episode variety should reflect periods of significant emissions from important sources such as wildland fire, and should result from coordination with Fire Forum. Length of episodes must include adequate time for pollutant build-up and transport, especially during stagnant conditions.

- Identify Modeling Domains

Select domains consistent with guidance in Using MM5 Version 2 with Models-3/CMAQ, A User's Guide and Tutorial, by Tanya Otte, EPA-600/R-99/065, July 1999, and consistent with EPA MM5 run at 36 km for 1996.

- Initial Emission Inventory Processing

Obtain and use EPA NET 96 emission data (includes individual point source data, and area and mobile source data by county) from the WRAP Emissions Forum and Mobile Source Forum. Translate NET data into 36-km gridded comprehensive EI for the West for all pollutants for 1996. Overlay 1996 36-km gridded EI being developed by Mobile Source Forum. This EI doesn't have to be perfect, just an initial attempt. At this point this EI will not include specific EI improvements from individual states. Depending on the timing of the availability of SMOKE, this effort will also begin the application of SMOKE in the West. - Base case for 1996

Future case for 2018 with GCVTC strategies implemented

Develop report to document EI development methods.

- Apply and Evaluate CMAQ for Case Studies

For selected episodes, use above 1996 EI data and MM5 data from EPA (one year, 36-km run for 1996) in CMAQ runs to estimate speciated concentrations and extinction budgets for comparison with IMPROVE data. Evaluate CMAQ model performance including an evaluation of the predicted meteorology compared to local observations (especially winds and moisture fields) where available, and evaluate adequacy of emissions inventory. We need to be getting the right answer for the right reasons. Develop report of CMAQ model performance evaluation.

- Determine Meteorology for 309 SIP Demonstration

Evaluate methodologies for assessing meteorology associated with 20% best and 20% worst and annual average visibility. Consider practicality vs. technical credibility of: 1) running one year of meteorology, 2) running aggregation method (R. D. Cohn, et al., Development of an Aggregation and Episode Selection Scheme to Support the Models-3 Community Multi-scale Air Quality Model, for example, 40 five-day episodes), and 3) running selected episodes considered adequately representative based largely on IMPROVE data.

- Make CMAQ Runs for 309 SIPs

Use SIP demonstration meteorology and WRAP EIs for base and future cases to assess changes in visibility at all Class I areas in the West, for 20% best, 20%

worst, and annual average conditions. Develop report to document results. Make results available to WRAP states/tribes

- Provide individual state/tribe assistance for 309 SIP
 - Perform nested CMAQ runs at finer resolution (12 or 4 km) for problem sub-areas (if any) of West to improve estimates for selected Class I areas

Intermediate Timeline and Milestones

Task	Begin	End
Identify Center Director	now	7/1/00
Initial hardware acquisition	now	4/28/00
Obtain MM5 data for 1996	3/1/00	3/31/00
Initial Emission Inventory Processing		
- Base case for 1996	now	6/30/00
- Future case for 2018 w/ GCVTC strategies	7/1/00	9/30/00
Develop technical analysis plan for 309 SIP	now	12/31/00
Initial Episode Identification	now	6/1/00
Identify Modeling Domains	now	6/1/00
Improved EI from Emissions Forum	now	Nov 00
Improved 2018 EI from Emissions Forum	Aug 00	Apr 01
Apply and Evaluate CMAQ for Case Studies	now	1/1/01
Determine Meteorology for SIP Demonstration	now	12/31/00
Make CMAQ Base Case Runs	1/1/01	12/31/01
Make CMAQ Runs for 309 SIP strategies	9/1/01	6/30/02
Provide individual state/tribe assistance for 309 SIP	1/1/02	6/30/02
309 SIPs Due		12/31/03

Long-term Scope of Work In Support of Sec. 308 SIP Development (SIPs to be submitted by 12/31/2008)

By necessity, the long term scope of work in support of 308 SIP development and for further evaluation of 309 SIPs is somewhat abbreviated. The actual tasks will likely be modified as the technical center develops specific knowledge of the modeling and analysis systems and as the WRAP develops strategies.

SIPs/TIPs submitted under section 308 are due by 12/31/2008. To support this requirement, much of the modeling support will need to be completed by 2006. The following outlines a rough set of activities to be implemented by the Regional Technical Center in the longer term. Some of the implementation of the long-term activities overlap with those of the intermediate phase; thus, planning will begin at an early stage. These specific tasks and dates will need to be revised as the WRAP analyses proceed.

1. Technical Plans	12/04
A. Develop Modeling Protocols	
Develop Methodology for modeling for long term average (Full years or Aggregation or based on monitoring)	1/02 - 9/04
Develop Methodology for modeling to maintain best 20%, and for improving the worst 20% episode distribution	1/02 - 9/04
Establish the Science configuration from science options (e.g., Chem mech, Solver, Advection and diffusion, Ping-no Ping, Gridding, vertical layers, aqueous processor, etc.....)	1/03 - 9/04
Provision for modeling regional reanalysis from the projected SIPS strategy projections (iteration)	1/04 - 9/04
B. Development of SIPs/TIPS plans and products	12/05
Develop and implement Communication Plan (Attach Tim's communications plan writeup)	1/01 - 9/03
Develop and analyse Control Strategies Projections, Options	1/04 - 9/05
Develop Cost of Controls projections	1/04 - 9/05
Prepare SIPs/TIPS , Reasonable Progress plans	1/03 - 9/05
Develop, Incorporate Smoke Management plans	1/02 - 9/05
C. Conduct timely set of Workshops, Public Reviews for various (A) and (B) tasks	
2. RTC Facilities infrastructure	12/04
Business Plan	1/01 - 9/03
Update, Upgrade hardware and M3 software	6/00 - 9/04
Set up Virtual Centers for States and Tribes	1/02 - 9/04
Provide training (Ongoing)	
Upgrade test SMOKE, Models-3 EI Processor	9/00 - 9/01
Incorporate into SMOKE , advanced databases for prescribed burns smoke emissions Improved biogenic for the west Improved fugitive dust algorithm	9/02 - 9/04
Develop, test 4 km resolution nested modeling capability	12/00-9/03
3. Implementation: Model Operations	12/06
Identify, prepare additional episodes of interest in years other than 1996.	1/03 - 9/05
Develop additional meteorological data bases with MM5 for episodes (support aggregation), and/or possibly additional full years of data.	1/03 - 9/05
Develop improved emissions inventory databases	1/03 - 9/05

for additional episodes of interest
Run, evaluate CMAQ base case model performance 1/03 -9/05
Run, evaluate CMAQ projection cases for SIPS 1/04 - 9/06
Provide training, technical support and assistance to
states/tribes for SIP/TIP development (continuous)
Conduct Workshops and Public hearings as appropriate

6. Source attribution work 12/06
Analysis of existing data
Receptor modeling to develop extinction budgets

Budget

FY99 Items	
1 Models-3 Compatible Workstation	\$70,000
Software licenses	\$30,000
Contract to convert SAS scripts to Pearl Scripts	\$50,000
Total	\$150,000

FY00 Items	
2 Models-3 Compatible Workstations	\$150,000
NT Workstations for Models-3	\$75,000
Emission Modeling Conversion	\$50,000
Training for WRAP participants	\$75,000
Director (IPA) Salary/Benefits/Overhead/Travel	\$100,000
2 FTE – IPA/IAG/MOU/Coop Salary/Benefits/Overhead/Travel	\$200,000
Total	\$650,000

FY01 Items	
Workstation Upgrades	\$50,000
Director (IPA) Salary/Benefits/Overhead/Travel	\$100,000
5 FTE – IPA/IAG/MOU/Coop Salary/Benefits/Overhead/Travel	\$500,000
Total	\$650,000

Attachment A

Pacific Northwest Regional Modeling Consortium

**Regional Technical Center Demonstration Project:
A Comprehensive Work Plan**

January 25, 2000

Presented to:

Washington Department of Ecology
Air Quality Program
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and

Environmental Protection Agency
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Introduction

This document describes the development and demonstration of a virtual Regional Technical Center (RTC). Such a center is tasked with the comprehensive analysis of transport, dispersion, and chemical transformation of airborne emissions throughout a given airshed (Figure 1). In some situations, emissions may influence air quality values thousands of miles from the source and even produce air quality impacts in unanticipated ways. These impacts may influence another region's or state's method of addressing local air pollution maintenance.



Figure 1. (Source: U.S Fish & Wildlife Service)

Because a study area can easily encompass many states, a virtual center can be created to distribute the development, operation, and costs associated with center activities. Through the use of high-speed network connections with on-line storage systems and processing, concurrent analysis can be performed through assigned subtasks in support of a much larger project without equipment co-location. Materials from a virtual center can be combined electronically at appropriate times for further analysis and actions.

The RTC demonstration is scheduled for a two year period and is tasked with the construction and utilization of a virtual center. The foremost goal of this project is to develop the RTC foundation and to produce guidance for regional, state, tribal, or private entities to form other successful technical centers.

Because the Department of Ecology (Ecology) Air Quality Program and the Environmental Protection Agency (EPA) Region 10 intend to produce a technical center to assess at both local and large scales, this document describes efforts and obligations to support two distinct subsets of a single overall project. At the local level, the technical center will provide a demonstration of analysis suitable for State and Tribal Implementation Planning (SIP and TIP respectively), and at the larger coarse grid scale, the center will include partners from the Western Regional Air Partnership (WRAP) and will address the immediate needs of the federal regional haze rule. The WRAP domain will be all inclusive of the western half of the United States.

Background

The following discussions provide background and motivation for the demonstration of a virtual RTC at both local and large scales.

Northwest Region

Air quality in the Pacific Northwest can be degraded due to a range of air pollutant sources including: summertime ozone formation within and downwind of the major population centers, primary and secondary particulate pollution associated with urban emissions, prescribed and wild forest fires, agricultural field burning, and windblown dust from erosive soils. In order to develop effective control strategies for this range of issues, comprehensive air quality modeling tools are required, and expertise in the application of these models must be available.

During the 1990's, regional air quality modeling capabilities in the Pacific Northwest were developed which included software systems and a collaborative modeling team (Barna et al., 1999a,b,c; Claiborn et al., 1998; Strand et al., 1999; Villasenor et al., 1999). These efforts were based on use of the Mesoscale Meteorological Model Version 5 (MM5, Grell et al., 1995) and the CALMET/CALGRID photochemical modeling system (Scire et al., 1995; Yamartino et al., 1992). Issues addressed with this work included summertime ozone in western Washington, wintertime particulate matter in Spokane, WA, windblown dust in the Columbia Plateau, and agricultural field burning in northern Idaho. The modeling team involves the Laboratory for Atmospheric Research (LAR) at Washington State University (WSU), the Washington Department of Ecology, and EPA Region 10, with assistance from the University of Washington and Puget Sound Clean Air Agency.

At the same time, the US EPA developed a new state-of-the-art comprehensive modeling system called Models-3 along with a new air quality simulation model called the Community Multi-scale Air Quality Model (CMAQ). Models-3 is an operating system designed for cross-platform implementation of a complete system of environmental models (Dennis, 1998). The goals of Models-3 are to provide an effective support system for regulatory decision making and to ensure continued evolution and progression of environmental models. Models-3 addresses the "one atmosphere"

concept where a variety of inter-related issues can be treated. These issues include oxidant formation, nitrogen deposition and eutrophication of coastal waters, fine particulate formation and regional haze, transport and transformation of air toxics, and other, perhaps, unrecognized air quality problems.

Western Regional Air Partnership Region – Modeling Forum

Driven by recent federal regional haze regulations, the WRAP Modeling Forum (MF) has attempted to identify the member states'/tribes' needs and to address these needs through a virtual RTC.

Under this new rule, there are two methods identified for states and tribes to conduct implementation plan development. These methods are described in Sections 308 and 309 of the rule. A critical question under Section 309 is whether the control strategies developed by the Grand Canyon Visibility Transport Commission will have equal benefits at other Class I areas. If a state or tribe proceeds under Section 309, implementation plans must be submitted at the end of 2003, requiring analyses to be completed within a short timeframe. For states/tribes that cannot meet Section 309 demonstration for their Class I areas or for those that choose to develop an implementation plan under Section 308, the revision due date is by the end of 2008.

Because of the analysis necessary to qualify for Section 309 and the short-to-intermediate timeframes associated with Section 309 and 308 submittals, new, more effective tools are necessary to comply with the rule. WRAP has recognized that the RTC concept will provide a process for development and use of these tools and has decided to collaborate with the Pacific Northwest RTC to expedite its effort.

Scope

Tasks

The demonstration project will include three primary tasks.

Task 1 will be divided into two concurrent efforts. First, the CMAQ dispersion model will be applied to an ozone episode from July, 1996 which was previously modeled with the MM5/CALMET/CALGRID system. The objectives of this effort are to: gain familiarity with CMAQ; obtain experience with the compilation of the emission inventory for CMAQ; and evaluate the performance of CMAQ in comparison to previous modeling studies and to available air quality observations.

The second effort will include: installation and initial testing of the Models-3 framework; organization of an emission inventory conference/workshop; and documentation of common methods and practices for use by the RTC. The objectives of this effort are to: install, operate, and verify the proper function of the Models-3 framework utilizing

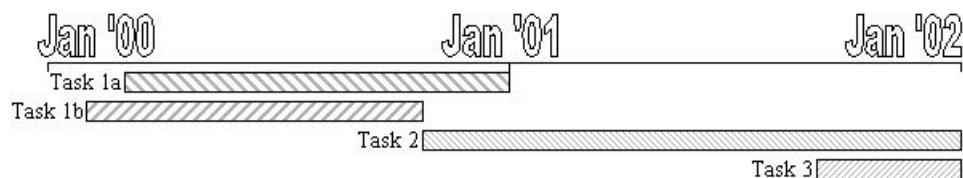
tutorial examples provided by the EPA for the east coast of the United States; organize and host a conference/workshop to develop and document a common approach to emission inventory production, quality assurance/quality control, data quality grading, and distribution practices that will be utilized by the technical center; and further document the policies, practices, and expectations associated with the operation of the RTC demonstration.

Task 2 will involve application of the CMAQ dispersion model to a large-scale particulate pollution episode. The objectives of this task are to: demonstrate the full application of the Models-3/CMAQ system for aerosol and regional haze predictions; develop capabilities for regional emission inventory consolidation; and evaluate the performance of the model compared to available air quality observations. The final product will be a full implementation of Models-3/CMAQ in the Pacific Northwest nested within a coarser WRAP domain and an initial investigation of regional particulate pollution and regional haze.

Task 3 will involve the development and application of an extensive outreach and training effort through the WRAP (and WESTAR) organizations to promote the formation and support of local RTCs.

Timeline

Motivated by the relatively short timeframe associated with SIP/TIP development, the RTC demonstration timeline adherence will be strict. The following outlines general project performance versus time.



Task Descriptions

Task 1a – Simulation of the July, 1996 Ozone Using CMAQ

The CMAQ model will be applied to the same ozone episode previously modeled by WSU/Ecology with the MM5/CALMET/CALGRID system (Barna et al., 1999a,b,c). This episode occurred during July 11-14, 1996 when ozone concentrations reached as high as 118 ppb at the Enumclaw, WA monitor downwind of Seattle, WA and 145 ppb at the Milwaukee, OR monitor downwind of Portland, OR. The CALGRID domain employed a horizontal grid resolution of 5 km and extended from north of Vancouver, British Columbia to south of Portland, OR and from beyond the Pacific coast on the west to beyond the crest of the Cascade mountain range on the east.

During the application of CMAQ in this task, the primary goal is to compare the results from the two different modeling systems based on essentially identical meteorological and emissions inputs and grid scale. Additional sensitivity runs and comparisons of the CMAQ model will be conducted as time permits.

The steps involved in repeating the simulation of this episode utilizing the CMAQ model will include the following:

- revise the MM5 output file to meet the CMAQ input requirements;
- convert the existing gridded emission inventory into the appropriate Carbon Bond IV species;
- convert the initial and boundary condition species into Carbon Bond IV species;
- setup the CMAQ model for the existing 5 km CALGRID modeling domain;
- simulate the event with the CMAQ code;
- analyze the model results in comparison to the previous CALGRID simulation and to existing observational data;
- implement any changes needed based upon the results of the analysis of the model performance; and
- present a summary of the task.
 - ✓ Feb-Jun '00 - basic emissions and CMAQ
 - ✓ Jun-Sep '00 - refined emissions and CMAQ
 - ✓ Sep-Dec '00 - final analysis and reports, transition to task 2
 - ✓ Resources - Ecology, WSU, WRAP

Task 1b – EI Workshop, Models-3 Framework, and Communications

This task will involve three components: to organize and host an emission inventory conference/workshop; to demonstrate the Models-3 framework system for use in Task 2 of the RTC project; and to oversee the development and efficient use of a virtual communication and documentation system in support of all local and large scale RTC tasks.

1.. Since the States and Tribes within the RTC domains have varied levels of background and expertise with emission inventory development, a training session in the form of a conference/workshop will be presented to promote a common methodology and development practice. This conference will consist of presentations, breakaway workgroups, and consensus-building discussions to promote common methods of calculating, grading, and distributing emission inventory data, while maintaining a minimal level of quality control and data standards.

This subtask will involve the following steps:

- establish a time and location of the event;

- solicit speakers, facilitators, and note takers;
 - coordinate workshop with WRAP emission and mobile forums;
 - organize and distribute agenda and travel information for participants;
 - host a multi-day conference/workshop;
 - document and distribute resulting discussion and methods for RTC use; and
 - establish an ongoing support mechanism for continued inventory development by RTC institutions.
- ✓ Feb-Apr '00 - develop, implement, summarize workshop
 - ✓ Resources - Ecology, EPA, OR-DEQ, ID-DEQ, WESTAR, WRAP

2.. The Models-3 framework consists of underlying utilities, database storage, and task management subsystems that support the basic dispersion modeling tool. System utilities include a meteorological, emission inventory, and post-processing toolset. By standardizing these utilities with a basic data storage and study planning system, a team can create, test, and maintain planning efforts.

For this subtask, efforts will be made to install and demonstrate the basic Models-3 framework by utilizing EPA tutorial runs for the east coast of the United States. The SGI UNIX-based computing systems from Ecology, EPA Region 10, and possibly other WRAP institutions will be utilized to run collaborative tests. Additional demonstrations using the Windows NT operating system will be used when possible. Because of the *beta* nature of the Models-3 system, the UNIX-based demonstration will be a priority.

This subtask will involve the following steps:

- coordinate with EPA Research Triangle Park staff on the SGI port;
 - install the Models-3 framework on the SGI UNIX-based systems;
 - test the operation of each subsystem of the framework;
 - demonstrate and analyze test run tutorials for the east coast of the United States;
 - assess and document resource needs for use of the Models-3 system in support of a RTC at both the local and large grid scale;
 - attempt successful demonstration of framework using Windows NT system; and
 - present a summary of the subtask.
- ✓ Feb-Sep '00 - install, test, and document full framework
 - ✓ Resources - Ecology, EPA, CIRA, WRAP

3.. The RTC project consists of a collaboration of government, tribes, academia, and private institutions working toward the common goal of analyzing the impacts and effects of fine particulate emissions. Because of the diversity of interests, distribution of personnel, and a lack of funds to form and support a centralized physical center, this study will develop and utilize a virtual office.

Because the RTC is virtual in design, performance of tasks, creation and processing of data, and location of technical specialists will be spread throughout the local and large scale area. A strong communication strategy will be established and followed to ensure a smooth transfer of

information, computer system access, and a timely effective completion of tasks.

This subtask will involve the development and maintenance of a communication strategy through the following steps:

- develop a centrally-based communication system (web, email, chat, etc.);
- develop a project-wide communication use policy and protocol;
- develop a centrally-based project information site posting updated information on tasks, personnel, timelines, priorities, dependencies, and equipment needs;
- develop and maintain a comprehensive information distribution list;
- develop and maintain a web-based tool for tracking and archiving information sent through the communication system. This type of server should provide a graphical ability to sort messages by threads, making it possible for users to easily track multiple discussions; and
- develop and maintain meeting schedules and minutes postings.
 - ✓ Feb-Jun '00 - develop, implement communications system and strategy
 - ✓ Resource - Ecology, EPA, WRAP

Task 2 - Simulation of a Regional Particulate Pollution Episode

The Models-3/CMAQ modeling system has the capability to treat primary and secondary aerosol formation, transport and fate on a regional basis, and to predict the impact of aerosols on regional haze. The system will be applied to reflect periods of significant emissions when particulate levels were elevated and haze was persistent over a large area. The event will exhibit a trend of increasing and then decreasing particulate levels. The selection of the event period will be based on a review of available meteorological and air quality data and must include adequate time for pollutant build-up and transport, especially during stagnant conditions.

The large scale domain will encompass the WRAP member states, with a nested local sub-domain that includes Oregon, Idaho, and Washington. This task will rely on the communication strategy to facilitate the flow of information from WRAP forums and state/tribal agencies and groups. Emissions data will be compiled from a number of sources into a single complete emission inventory using the Models-3 framework and electronic communications sub-systems.

The steps involved in repeating the simulation of this episode utilizing the Models-3/CMAQ system will include the following:

- implement the communications strategy to identify and distribute development, modeling, and analysis functions throughout the virtual center;
- select 2-3 week long regional haze episode in 1996;
- setup the Models-3 system for shared use among the project members;
- consolidate an emission inventory for use with the Carbon Bond IV mechanism;
- setup the modeling run (MM5/CMAQ) for the selected period and domains;
- complete analysis of the EPA 1996 MM5 performance.

- complete supplemental MM5 simulations to incorporate appropriate regional nesting and observational nudging (if needed);
- complete a CMAQ simulation of the event and analysis of model performance;
- implement sensitivity runs and/or revisions to the model setup depending on the test results; and
- present a summary of the task.
 - ✓ Sep-Dec '00 - transition into task 2, initialize framework
 - ✓ Jan-Mar '01- basic implementation
 - ✓ Mar-Nov '01 - refined implementation
 - ✓ Nov-Dec '01 - summary of tasks, local outreach
 - ✓ Resources - All

Task 3 – WRAP Outreach and Section 309 Evaluations

The two primary motivations for WRAP's participation in the RTC are to meet the members' service and outreach needs. Services provided by the RTC include: building capacity of states and tribes to perform air quality modeling to accommodate recent federal regional haze regulations; facilitating training of state/tribal agency staff; and providing member states/tribes with modeling products. In addition to services, the RTC will have responsibility for various outreach functions. The RTC will: make member states/tribes aware of RTC services and to encourage their development of technical capability; encourage industry and research centers in the West to undertake work that compliments the WRAP RTC; and interface with other RTCs across the country to share information/data and promote consistency in technical methods and protocols.

- 36-km resolution regional haze analysis for a base case and a future case assuming implementation of Grand Canyon Visibility Transport Commission (GCVTC) control strategies; and
- Models-3 outreach to interested member states/tribes.
 - ✓ Sep '01-ongoing - WRAP 309 evaluations
 - ✓ Nov '01- ongoing – WRAP outreach
 - ✓ Resources – WRAP