Colorado State University – Cooperative Institute for Research in the Atmosphere (CSU-CIRA[1,2])

IWDW – WRAP TSS – FED Scope

April 2020

Background and Objectives

The Intermountain West Data Warehouse[3] (hereafter "IWDW" or "Data Warehouse") has been in continuous operation for over ten years, importing and disseminating multiple air quality modeling platforms and maintaining a wide variety of air quality data and analysis products for the Western Regional Air Partnership (WRAP) and its collaborators, including states, tribes, and local air agencies in the Western States Air Resources (WESTAR) Council region, the U.S. Environmental Protection Agency (EPA), U.S. Dept. of Agriculture Forest Service (USFS), and U.S. Dept. of Interior agencies (National Park Service [NPS], Fish & Wildlife Service [FWS], and Bureau of Land Management [BLM])[4]. One of the primary motivations in the original formulation of the Warehouse project was the use and leveraging of the database, software, and infrastructure that had been previously developed for the CIRA Air Data Management System (hereafter "ADMS") under the auspices of previous air quality projects like the Visibility Information Exchange Web System (VIEWS), as well as the current WRAP Technical Support System[5] (TSS), and the Federal Land Manager Environmental Database[6] (FED). The use of this existing ADMS infrastructure allowed a faster and more effective start to the IWDW project and enabled substantial cost savings overall while adding additional value to previous funding efforts. In particular, both the FED and the WRAP TSS are current projects that have built upon the same ADMS system in order to achieve a faster and more efficient start, and are the most recent examples of projects that have gained significant cost and time savings by leveraging this foundational infrastructure.

In addition, during the most recent past period of performance the IWDW team collaborated with the National Emissions Inventory Collaborative[7] (NEIC) to host their 2016 Beta, V1, and future-year modeling platforms, which are national-scale air quality modeling platforms created and organized by states, tribes, multi-jurisdictional organizations (MJOs), and the EPA. Simultaneously, the IWDW team has also been receiving, ingesting, and providing access to the WRAP / WAQS Regional Haze modeling platform[8]; this activity is ongoing. The receipt and servicing of nationwide and regional requests for these platforms comprised a notable portion of the Warehouse team's time and effort, and the NEIC and WESTAR-WRAP collaborators found this service to be of significant value. Part of the intent of this agreement is to continue providing for such national and regional, interagency collaboration amongst air quality analysis and planning communities so that economies of scale are leveraged for an increasing number of beneficiaries and collaborators in order to make the best use going forward of limited air

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[1] Air Quality team (https://www.cira.colostate.edu/teams/air-quality/, https://www.cira.colostate.edu/staff/moore-tom/)

[2] National Park Service Air Quality Research (https://www.cira.colostate.edu/welcome-about/collaborative-groups/national-park-service/)

[3] Intermountain West Data Warehouse (https://views.cira.colostate.edu/iwdw/)

[4] About the Data Warehouse (http://views.cira.colostate.edu/iwdw/About/Default.aspx)

[5] WRAP Technical Support System (https://views.cira.colostate.edu/tssv2/)

[6] Federal Land Manager Environmental Database (http://views.cira.colostate.edu/fed/)

[7] Inventory Collaborative Wiki (http://views.cira.colostate.edu/wiki/wiki/9169)

[8] WAQS 2014 v1 Shakeout Study Platform (http://views.cira.colostate.edu/iwdw/docs/waqs_2014v1_shakeout_study.aspx)

quality data management funds. Leveraging the existing ADMS and IWDW infrastructure for both these nationwide and regional modeling efforts is our approach for supporting and fulfilling this purpose.

The IWDW, WRAP TSS, and FED websites deliver national-scale monitoring data from the ADMS for pollutant indicators from thousands of ambient monitoring sites, with varying objectives. The ADMS routinely ingests AQS[9], IMPROVE[10], CASTNET[11], and other ground-based observational data. These data allow robust evaluation of regional air quality modeling, ambient air quality trends for many pollutant indicators, and air quality planning, with most work going back decades focused on visibility and ozone. In particular, the ADMS is the principal storage vessel and quality assurance platform for the IMPROVE sample filter data used to evaluate progress for the Regional Haze program, including access and display of sample uncertainty estimates, patched and substituted data, and evaluation of various Regional Haze tracking metrics. The WRAP TSS serves as the principal technical data source for Regional Haze implementation planning by states in the WESTAR-WRAP region, where 118 visibility-protected Class I areas are located (75%+ of the national total), as well as almost all of the tribal Class I areas in the U.S.

Together, the IWDW, the WRAP TSS, and the FED represent a significant, leveraged investment by multiple state, federal, and other partners in an integrated and forward-looking system for gathering, managing, and analyzing a wide variety of air quality data, and this document represents our proposal and agreement to continue the development, maintenance, and operation of these projects – together with their foundational infrastructure (the ADMS) – in order to build upon and preserve past and current funding investments and to ensure that collaborators and their constituents have a ready and economical source of bulk air quality monitoring, modeling, and emissions data to support their regional haze and other air quality analysis and planning efforts.

The primary objectives are:

- Continue maintaining, managing, and updating the hardware, software, networks, and datasets which comprise the data warehouse in order to keep it fully functional, operational, and online according to the requirements of the collaborators and dependent systems.
- Continue providing and improving access to air quality and modeling datasets that are up-to-date, comprehensive, and of known and documented quality.
- Utilize the unique skills, resources, and expertise of each entity (WESTAR-WRAP, CSU-CIRA, and collaborating agencies) to better understand the relationship between emissions, meteorology and ambient pollutant concentrations and to better understand atmospheric processes like transport, chemical conversion, and deposition. This will be accomplished by 1) operating and maintaining the data warehouse previously developed by CSU-CIRA, 2) refining existing tools and potentially developing new tools to analyze and quality-assure the air quality data housed there, and 3) providing an efficient online portal for accessing the large data sets that are inputs to the air quality models used for air quality planning activities.
- Enhance coordination and collaboration between WESTAR-WRAP, CSU-CIRA, and collaborators.
- Facilitate future communication with other federal and state agencies to encourage their inclusion and participation in the Data Warehouse effort by providing a showcase application for the online management of air quality data.

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[9] EPA-hosted national Air Quality System (AQS, contains ambient air pollution data collected by EPA, state, local, and tribal air pollution control agencies' networks, employing thousands of sites and monitors. (https://www.epa.gov/aqs)

[10] Interagency Monitoring of PROtected Visual Environments (IMPROVE) Network (http://vista.cira.colostate.edu/Improve/)

[11] Clean Air Status Trends Network (https://www.epa.gov/castnet)

<u>Statement of Work</u>

This project will benefit the public by providing a comprehensive understanding of the intricacies of the formation and transport of air pollution that affects peoples' health and welfare in the study area, and do so in such a way as to be easily accessible. This information will also be of interest and of use to academics interested in air quality in the study area, especially regarding the relationship between emissions from oil and gas activities and air quality conditions. The impact of oil and gas development and production is also of interest to the general public.

A. Colorado State University's Cooperative Institute for Research in the Atmosphere will serve as the principal agent for performing work related to the development, maintenance, and operation of the data warehouse developed under this agreement. As such, CSU-CIRA will:

- Maintain and operate the IWDW, WRAP TSS, and FED:
  - Service and manage basic ADMS infrastructure (hardware, software, networking)
  - Manage warehouse inventory (storage, backups, redundancy, and recovery)
  - Service future data requests (approve, assemble, and fulfill requests)
  - Keep monitoring data current (acquire, import, validate; leveraging other projects)
  - Import any new modeling studies/platforms
  - Provide user support (troubleshooting, guidance, questions)
  - Improve and refine data transfer and download capabilities
- Comply with operational and scope criteria established by the IWDW Oversight Committee for the project in coordination with WESTAR-WRAP and provide status reports at least annually;
- Collaborate with WESTAR-WRAP which is providing coordination assistance to the project;
- Provide a repository, data access portal, model performance evaluation products, and documentation for the upcoming 2014 base year Western Air Quality Study (WAQS) air quality modeling platform for Regional Haze and NEPA studies;
- Provide a repository for external modeling platforms as identified and approved by project Cooperators;
- Provide regular brief progress reports and a summary of next steps to the WESTAR-WRAP project coordinator;
- Coordinate and manage workgroup activity;
- Develop and deliver training and support to data warehouse users, as needed;
- Appropriately document the structure and operation of the data warehouse;
- Develop and refine the online presence of the websites to provide appropriate project background and updates, as well as making key products available to the public;
- Assess needs of current and potential users for performing air quality analyses that the data warehouse may not currently meet and report the results to the IWDW Oversight Committee and WESTAR-WRAP;
- Adjust the scope of further enhancements based on the above requirements assessment; These discretionary activities may fall into one or more of the following sub-categories:
  - Refine and expand visualization and analysis tools
  - Refine and expand metadata and data discovery tools
  - Provide context-sensitive help content for interactive tools
  - Expand introductory, navigational, and contextual content (discoverability)
  - Expand GIS integration (map-based selection, visualization, and analysis)
  - Assume the generation of model-to-obs pairings
  - Assume the production of model performance products

- o   Assume the post-processing and management of emissions data
- o   Develop programmatic data analysis routines
- o   Develop additional programmatic and database-driven QA/QC routines

B.   WESTAR-WRAP will:

- Continue to participate in project implementation, providing regular input throughout;
- Provide data and work products like air quality modeling output with appropriate documentation for populating the data warehouse;
- Provide feedback on deliverables as they are available;
- Provide timely and adequate funding to CSU-CIRA for work performed as outlined in this agreement;
- Interactively work with CSU-CIRA through operation and maintenance of the data warehouse and as features and functionality are added over time; and
- Coordinate and collaborate with Tom Moore as the on-site WESTAR-WRAP project coordinator.

Summary of Individual CSU-CIRA Assignments (2 FTEs):

The Principal Investigator will be responsible for the overall oversight of the maintenance, operation, and development work and will oversee the overall architecture and integration of the data warehouse with existing database, website, and software infrastructure. He will also ensure that the design and architecture of the data warehouse is commensurate with and complementary to existing projects that rely upon the same underlying infrastructure.

The Research Associate (RA) will be responsible for assisting the P.I. with software development work and collaborating with project scientists, modelers, and planners in order to ensure that the relevant and highest-quality model input data, monitoring data, model output data, and model performance evaluation data is acquired and appropriately organized in the data warehouse databases and file servers according to the requirements of project collaborators, and will be responsible for fielding, tracking, and fulfilling user requests for data warehouse products and datasets. The RA will help verify the quality and completeness of the modeling platforms delivered by the modelers to the warehouse, and will work with the Principal Investigator to ensure that the hardware and software infrastructure of the data warehouse is adequate for managing the ongoing accumulation, organization, and backup of the data warehouse inventory.