Response-to-Comments

"Western Regional Modeling and Analysis Platform Modeling Plan – Phase I: 2014 Platform Development and Shake-Out" dated February 2, 2019

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Comment	Response
Comments from Idaho DEQ	
In the Modeling Plan, a quantitative model performance evaluation of the WRF output is planned to be performed using the METSTAT software. There is another good option for consideration: the U.S. EPA's Atmospheric Model Evaluation Tool (AMET). In addition to calculating all necessary statistics such as RMSE, bias, and error of various meteorological variables, AMET can be used to generate a variety of figures including spatial plots, time series, scatter and box plots. Given the fact that there are many meteorological monitoring sites across each of the domains, the plots may be more efficient in presenting the results.	AMET calculates many of the same performance metrics as METSTAT so would be mostly redundant.
Page 1: The following sentence may need to be re-organized: As with the previous 2008 and 2011 PGM modeling platforms developed by WRAP in the, respectively, WestJumpAQMS and WAQS studies, the 2014 PGM modeling platform has many potential uses from analysis of regional transport of ozone, fine particulate ($PM_{2.5}$), visibility impairment and nitrogen deposition, use in ozone, $PM_{2.5}$ and/or Regional Haze State Implementation Plans (SIPs), use in National Environmental Policy Act (NEPA) air quality assessments and potentially other uses.	Awkward long sentence was revised as suggested.
Page 17: Details on the diagnostic sensitivity simulations and how they will be used to define the model configuration for the final 2014 annual 36/12-km CAMx and CMAQ Shake-Out simulations are provided in Chapter 7.	Typo corrected.
Page 21: WRF allows researchers the ability to conduct simulations reflecting either real data or idealized configurations. WRF provides an operational forecasting model that is flexible and efficient computationally, while offering the advances in physics, numerics, and data assimilation contributed by the research community.	Typo corrected.

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Page 21: Everything is true, but this looks not consistent and may be improved: The Sparse Matrix Operator Kernel Emissions (SMOKE) **is an emissions processing system** that generates hourly, gridded, and speciated emission inputs of mobile, non-road, area, point, fire and biogenic emission sources for PGMs (Coats, 1995; UNC, 2018). As with most "emissions models," SMOKE is principally an emission processing system and **not a true emissions modeling system** in which emissions estimates are simulated from "first principles."	Text changed as suggested
Page 21: SMOKE performs three main functions to convert emissions to the hourly gridded emission inputs for a PGM: (1) spatial allocation, spatially allocates county-level emissions to the PGM model grid cells typically using a surrogate distribution (e.g., population); (2) temporal allocation, allocates annual emissions to time of year (e.g., monthly or seasonally) and day-of-week (typically weekday, Saturday and Sunday); and (3) chemical speciation, maps the emissions to the species in the chemical mechanism used by the PGM, most important for VOC and PM2.5 emissions.	Text changed as suggested
Page 25: The key characteristics analyzed included: meteorology (e.g., 500 hPa heights, hydrology, surface temperatures); fires; emissions (EGUs and on-road); and air quality (visibility, nitrogen deposition, ozone and PM).	Text changed as suggested
Page 32: The 2014 GEOS-Chem run was performed by EPA in support of their development of the EPA 2014 modeling platform.	Typo corrected.
Page 33: This Chapter describes the WRF model and WAQS and EPA 2014 WRF applications and how they will be used to generate 36/12-km meteorological inputs for the CAMx and CMAQ PGMs.	Missing period added to end of sentence.
Page 33: Developed jointly by the National Center for Atmospheric Research (NCAR), NCEP and others, WRF is maintained and supported as a community model by researchers and practitioners around the globe.	Text changed as suggested.
Comments from EPA Region 8	
This chapter/section talks about EPA guidance, but are there other agency guidance docs to summarize, such as from the FLMs related to AQRVs, visibility, deposition, etc. that outline their thresholds and approaches that could be applicable to this effort?	This comment is in regard to Section 1.2.1 on EPA PGM Modeling Guidance. The comment appears to suggest that the FLAG (2010) AQRV guidance should also be

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	mentioned as applicable to this effort. The Modeling Plan is more addressing the development of a regional PGM modeling database, whereas FLAG (2010) focuses on the impacts of single-sources or groups of sources. The WRAP 2014 Shake-Out Study also performed a Webinar and is developing a Memorandum on Single-Source Visibility Screening and Modeling Techniques where the FLAG (2010) guidance will be referenced.
UT BLM is also working on a PGM Platform called ARMS that this group could potentially leverage. The BLM contact is: Erik Vernon (evernon@blm.gov)	Added text and footnote link to the BLM Utah ARMS website.
This is not an EPA Region 8 MPE Checklist. While the EPA Region 8 took the lead on this document, the document was developed to support IWDW-WAQS and within the IWDW-WAQS framework. The IWDW-WAQS Cooperators as a whole developed and approved this document. Therefore, the reference should be IWDW-WAQS MPE Checklist. Correct Reference and Version/Date: https://views.cira.colostate.edu/docs/iwdw/process/FINAL_Recommended_PGM_MPE_Analyses_WSAQS_v08172015.pdf	The reference has been updated as suggested, here and in the REFERENCES section.
Recommend adding text to explain why two domains were developed and used because it's not clear. Are the two domains used simply because the WRF modeling was conducted using two different domains?	This comment is in regard to Section 4.1 on the two 2014 WRF 12-km domains. Yes, the study is not doing WRF modeling and is instead using existing 2014 WRF runs performance by EPA and WAQS that used different 12-km domains.
Why collapse to 25 vertical layers, instead of 35 layers or a number of layers closest to the WRF modeling? Collapsing seems to generally add issues to the model performance. So, how to we know if this collapsing approach won't introduce additional errors or add to poor model performance? Consider adding a discussion to explain the benefits/limitations of collapsing to this number of layers and how it will not introduce issues or degrade model performance. What QA checks will be performed?	This comment is in regard to Section 4.2 on Vertical Domains. Layer collapsing is used so that the PGM will run faster and use less disk space. All things being equal, a 25 layer PGM will run ~30% faster than a 35 layer PGM. 25 layers have been used in past and appeared to not cause problems with too much vertical transport.

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What speciated VOCs? Please work with workgroup to ensure that the selected speciated VOCs will support future MPE.	This comment refers to displaying spatial maps of selected VOC species in Section 6.2.2.5. We will discuss this issue with the Workgroup.
This section speaks to QA of CAMx emissions and excludes CMAQ. Recommend explaining why CMAQ will not need to be considered for this phase.	Comment also on Section 6.2.2.5. QA is done for both CMAQ-ready and CAMx-ready emissions, so text changed to reflect this.
Consider re-visiting the types of sensitivity tests after workgroup has the opportunity to review MPE results. If MPE shows other significant issues then workgroup may want to consider additional tests based on available time and resources. Could emissions and boundary conditions tests be valuable?	Comment on section 7.5.1. Due to time constraint, only a limited amount of sensitivity tests will be conducted under the 2014 Shake-Out study. The Workgroup can conduct additional sensitivity test vin follow-on studies.
What resources are available to see 3D output files and speciated VOC output? Or, what 3D and speciated VOC output files are reasonable to provide so that we can plan for MPE analyses.	Comment in regard to PGM "output" being delivered to the IWDW under first paragraph of Chapter 8 Deliverables. The WRAP 2014 Shake-Out Study is a fast PGM database development study designed to identify major flaws in the initial 2014 PGM modeling platform so has a limited MPE so will not look at the 3-D and speciated aspects of the MPE that will be conducted later in the 2014 PGM platform development.
Comments from EPA OAQPS.	
The best reference for BEIS would be (Bash et al., 2016). This paper documents the more recent updates to the BEIS formulation and updates to the landuse/vegetation data that are particularly important for the western U.S. It also provides an evaluation against BVOC measurements in the Sierra Nevada.	Citation added to text and to the References Chapter.
Given the emphasis on regional haze and working under the assumption resources are limited, it does not seem like applying both MEGAN and BEIS is necessary. Perhaps just select one or the other. If biogenic emissions are already generated, then the one not used could be made available on the data warehouse. Biogenic SOA is unlikely to be a big contributor at most Class I areas in the western U.S. and ozone sensitivity to controls does also not seem as critical for	This is a good comment. But the 2014 PGM modeling platform may also be used for western ozone issues so we believed it was important to evaluate the largest source of VOC emissions. Biogenic emissions are also the largest contributor to secondary organic aerosol that is part of OC, which is

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modeling focusing on sulfate and nitrate from anthropogenic sources.	he biggest component of visibility impairment at many Class Areas.
EPA is moving toward a 1-to-1 layer mapping between photochemical and meteorological models to better represent long range transport and vertical transport in the free troposphere. Rather than doing a sensitivity focused on layer collapsing, perhaps just doing the 1-to-1 mapping could be the standard for all the simulations.	The layer collapsing strategy follows EPA's 2011 PGM Platform and the WestJumpAQMS and WAQS studies and will speed up the PGM by ~30%. A layer collapsing sensitivity test is being considered.
Since 1-to-1 layer mapping will impact model run time, some of the unnecessary model options could be eliminated like plume-in-grid. Sub-grid plume treatment makes the most impact very close to sources so given the distances between major point sources and Class I areas this treatment seems unnecessary. Further, since sub-grid puffs have different a transport mechanism than the host model it is possible that these plants may unrealistically transport further and have more impacts further away.	The PiG also treats the near-source chemistry of large point source plumes better that can affect downwind concentrations. With just a few hundred sources being treated by the PiG the additional computation requirements are minimal.
Similar to the comment on just selecting one set of biogenic emissions, if resources are limited it might make sense to use one photochemical model rather than do applications for multiple models.	WRAP may decide to use one model down the road. But the 2014 Shake-Out study is setting up both models.