John V. Molenar

February 17, 2003

Director, Bureau of Land Management
Attention: Ms. Brenda Williams, Protest Coordinator
1620 L Street, N.W., Room 1075
Washington D.C. 20035

Dear Director:

Enclosed is my protest of the "Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (WY-070-02-065), January 2003", (PRBO&G FEIS). I am an Atmospheric Physicist and owner of Air Resource Specialists, Inc. I have been involved in research, monitoring, modeling, and analysis of visibility and air quality issues for over 25 years. My company is a visibility/air quality/permitting contractor to (among others) the National Park Service, U.S. Forest Service, Bureau of land Management, U.S. Fish and Wildlife Service, the western states of Arizona, Colorado, New Mexico, and Wyoming, and many private business's in the west. During the past 20 years, I have been an active participant in every major visibility studies in the western United States. As well as my work as an atmospheric scientist, I have also been an active participant in western air quality policy organizations. I was a member of the Grand Canyon Visibility Transport Commission's (GCVTC) Aerosol and Visibility and Public Advisory (PAC) Committees. As a member of the GCVTC PAC, I was deeply involved in preparing the GCVTC report: "Recommendations for Improving Western Vistas, Report of the Grand Canyon Visibility Transport Commission (GCVTC) to the United States Environmental Protection Agency". I am currently a member of the Western Regional Air Partnership (WRAP) Aerosol, Monitoring, and Research and Development Forums. The WRAP is the regional planning organization (RPO) that will be developing guidelines for western states to comply with Regional Haze as well as other air quality regulations. I believe that I am highly qualified to offer my opinions on the PRBO&G FEIS.

My protest is based on a comprehensive review of the air quality and visibility analysis sections of the PRBO&G FEIS, BLM's response to comments on the DEIS, and updated Technical Support Documents prepared by Argonne National Laboratory. I believe that while the FEIS and Argonne's updated reports reasonably address some but not all of the issues raised in comments on the DEIS, the significant air quality and visibility impacts predicted in the FEIS still underestimate the magnitude of these impacts. This is due to an underestimation of PRBO&G project and regional cumulative emissions, use of lower ambient air quality levels as a baseline than actually is occurring in the region, an incomplete refined visibility impact analysis, and a failure to examine the visibility degradation of the 20% cleanest days as specified in the National Regional Haze Rule.

Sincerely;

John V. Molenar

Vice President

Protest of
Final Environmental Impact Statement
and
Proposed Plan Amendment
for the
Powder River Basin Oil and Gas Project
(WY-070-02-065)

U.S. Department of the Interior
Bureau of Land Management
Wyoming State Office
Buffalo Field Office

January 2003

Prepared by
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February 17, 2003

Executive Summary:

The Coal Bed Methane (CBM) and related development proposed by the Bureau of Land Management (BLM) in the Wyoming Powder River Basin and described in "Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (WY-070-02-065), January 2003", (FEIS) will result in massive cumulative increase in regional emissions of air pollutants. The FEIS and supporting technical documents are a significant improvement from the "Draft Environmental Impact Statement and Draft Planning Amendment for the Powder River Basin Oil and Gas Project (WY-070-02-065), January 2002", (DEIS), and address some but not all the concerns raised in comments to the BLM. In contradiction to the DEIS, the air quality analyses presented in FEIS and supporting documents indicate a high probability of significant exceedences of PSD Class I and Class II increments and severe

visibility degradation in surrounding Class I areas. However, the FEIS still underestimates these impacts due to:

- Underestimation of the emissions directly associated with the PRBO&G project;
- Underestimation of the cumulative reasonably foreseeable increase in emissions by deliberately leaving out specific planned or permitted sources;
- Failure to perform an adequate refined analysis of Class I visibility impacts in general and specifically in relationship to the National Regional Haze regulation mandating the maintenance of visual air quality on the 20% cleanest days.

The need for the United States to develop its own energy resources is apparent. However, there is no requirement that significant areas of the United States be turned into "National" sacrifice zones while developing these resources. Our local, state, and national environmental regulations and guidelines mandate that the air quality impacts of such development are to be analyzed in an unbiased scientifically supported manner; and they are to be reported completely and honestly to the concerned public for review. While an improvement over the DEIS, the FEIS by systematically underestimating the air quality and visibility impacts still fails to meet these requirements.

1.0 INTRODUCTION

The following is a protest of: "Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (WY-070-02-065), January 2003", herein called FEIS. The major focus of this protest is the updated air quality modeling effort completed by Argonne National Laboratory for the Bureau of Land Management (BLM) and described in: "Technical Support Document Air Quality Impact Assessment for the Montana Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final EIS and Planning Amendment for the Powder River Basin Oil and Gas Development Project, December 2002", herein called Argonne.

The modeling effort was specifically designed to address:

> *Issue 6: The effects of the additional development of oil and gas resource on air quality and visibility*

FEIS and Argonne present analyses that show significant exceedences of Prevention of Significant Deterioration (PSD) Class I and Class II increments and significant visibility impacts at all nearby Class I areas due to the cumulative increase in regional emissions. The BLM's primary dismissive response to these predicted impacts is:

> "BLM and the State of Wyoming are committed to preventing any exceedences of air quality standards … BLM and the state will continue to monitor and implement adaptive management strategies at the permitting stage to assure that air quality in the region continues to meet federal and

state goals for PM_{10}, HAPs, visibility impairment, and atmospheric deposition." (FEIS, p. xxix)

After careful critical review of FEIS and Argonne, I believe that:

- The estimated exceedences of PSD increments presented in FEIS are under predicted due to using lower than actual ambient background concentrations and an underestimation of direct PROB&G and cumulative regional emissions.

- Argonne's refined visibility analysis has significant problems due to: (1) unverified and uncritically accepted performance of the CALMET/CALPUFF model system; (2) a failure to adequately describe the use of transmissometer data as an indication of daily background visibility levels; and (3) a failure to use daily modeled pollution increments to analyses the visibility impacts on 20% cleanest and 20% haziest days.

2.0 ARGONNE AIR QUALITY IMPACT ANALYSIS

2.1 Air Quality Modeling System and Protocols

The FEIS /Argonne air quality impact analysis is based on:

- The assumption that use of the Environmental Protection Agency (EPA) approved dispersion model system (CALMET/CALPUFF-Version V), best available engineering assumptions, an accurate emission inventory, and appropriate meteorological data can accurately model the incremental and cumulative impacts of increased emissions in the Powder River Basin and modeling domain (315,000 km^2) on near-field and far-field ambient air quality and visibility in distant (> 100 km) Class I areas;

- The assumption that current observed ambient air quality at a limited number of near-field and far-field sites (Gillette, Sheridan, Pinedale, and Devils Tower, Wyoming) and visibility data at two Class I areas (Badlands National Park, South Dakota and Bridger Wilderness, Wyoming) adequately represent all the impact of existing regional emissions on air quality and visibility throughout the modeling domain;

- The assumption that the emissions of all projected new PRBO&G Project sources, all previously permitted sources, and all Reasonably Foreseeable Development (RFD) sources not directly associated with the PRBO&G project are accurately accounted for in a new updated emission inventory; and

- The concept that potential impacts of PRBO&G and RFD sources can be examined individually and cumulatively by running CALMET/CALPUFF

with the respective sources turned on and off and adding the maximum modeled pollutant concentrations to the appropriate measured existing air quality and visibility data.

2.2 Existing Air Quality Data

Argonne used the limited existing ambient air quality data for the PRBO&G project and surrounding areas in the analyses of NAAQS and SAAQS. The key assumption is that this limited data can adequately characterize existing air quality throughout the modeling domain such that a determination if all pertinent NAAQS and SAAQS are met can be made by adding the maximum modeled pollutant concentrations from new sources to the maximum observed pollutant concentrations at Gillette, WY. Data presented in the FEIS (Appendix F, Tables AQ-2 and AQ-3) indicate that the Gillette PM_{10} data are actually lower than other ambient measurements in the region. Thus, relying only on the Gillette data as a background to add pollution increments will underestimate possible exceedences of NAAQS annual and 24 hour standards.

2.3 Emission Inventory

The key to a successful modeling effort examining potential impacts from any proposed development is an extensive accurate accounting of ALL possible emissions resulting from ALL possible sources related to the project. The key to a cumulative impact analysis of many projects requires the same commitment to generating an extensive accurate emission inventory for ALL permitted, planned, and RFD projects. The Argonne analysis specifically excludes major sources, thus underestimating the direct PRBO&G project and cumulative source impacts.

2.3.1 Fugitive Dust

A specific problem area of the emission inventory is that existing techniques for estimating fugitive dust emissions are incomplete, inadequate, and probably severely underestimate the actual PM_{10} and $PM_{2.5}$ emissions. A recent report prepared for the Western Regional Air Partnership by a panel of experts (WGA, 2001) has extensively examined the issue of fugitive dust. Specific findings from this effort that apply directly to this impact analysis are:

- Fugitive dust emission factors need to be appropriate.
- Fugitive dust emissions are not continuous processes.
- Source activity levels need to be accurate.
- Annual fugitive dust emission inventories are not sufficient.

- Spatial allocation of fugitive dust emissions is important.

- The fine fraction of fugitive dust emissions is not adequately characterized.

- Disturbed surfaces produce significantly more fugitive dust than undisturbed surfaces.

The air quality analyses presented still rely on the out-dated EPA emission factors and, thus will underestimate fugitive dust emissions

In addition to the use of out-dated emission factors, major sources of fugitive dust emissions directly associated with the proposed PRBO&G Project are still excluded in the Argonne analysis:

- Increased road dust emissions due to increased non-project travel (recreational, curiosity, miscellaneous) on new dirt roads developed specifically for the PRBO&G project;

- Increased wind blown dust from surfaces disturbed by CBM development due to the fact that disturbed surfaces produce significantly more fugitive dust than undisturbed surfaces (WGA, 2001); and

2.3.2 Other Regional Sources

The air quality impact analysis also summarily excludes emissions from facilities generating 1950 MW of electricity (FEIS, p. S-209). No discussion of why these sources are excluded is provided.

2.4 Predicted PSD Exceedences

Even with an underestimation of emissions, the air quality impact analysis results in exceedences of PM_{10} PSD increments for PM_{10} and NO_2 due to cumulative regional emissions (FEIS, Table S-2, p. xxxvi). Correctly accounting for the actual emission increase and actual higher than used ambient background levels will only increase the magnitude, frequency and spatial extent of these exceedences.

2.5 Predicted Visibility Impacts

In 1999, the EPA promulgated a Final Regional Haze Rule (U.S.EPA, 1999) that places the responsibility on States and Tribes to work cooperatively with regional States and Tribes to manage emissions in their respective boundaries to meet the National Visibility Goals of improving visibility on the worst days and preserving visibility on the best days. With respect to the requirement for all states and tribes to develop State Implementation Plans (SIPS) and Tribal Implementation Plans (TIPS) that achieve reasonable progress toward the National Regional Haze goals of NO decrease in visual air quality on the 20% cleanest days and improving visibility on the 20% worst days in

their respective Class I areas (U.S.EPA, 1999), even the proposed (underestimated) increases in emissions in the region will be of great concern. As recommended by the Grand Canyon Visibility Transport Commission in 1996 (GCVTC, 1996):

> " … *Reasonable progress towards the national visibility goal is achieving* ***continuous emission reductions*** *(emphasis added) necessary to reduce existing impairment and attain steady improvement of visibility in mandatory Class I areas and managing emissions growth so as to prevent perceptible degradation of clean air days...*"

Thus, the reported (but underestimated) cumulative increase in emissions are in direct contradiction with national visibility goals.

2.5.1 Visibility Impact Calculations

Estimation of visibility impacts requires substantially more detailed and sophisticated analyses than analyses for NAAQS and PSD compliance. The analyses require modeling the daily incremental change in ammonium sulfate (Sulfate), ammonium nitrate (Nitrate), organics (OMC), light absorbing carbon (LAC), fine soil (Soil), PM_{10}, $PM_{2.5}$, and nitrogen dioxide (NO_2) mass concentrations at the Class I area receptors due to the cumulative impact of all new proposed emissions. Then calculating the incremental change in extinction associated with the increased species concentrations accounting for the effects of relative humidity on the extinction efficiency of ammonium sulfate and ammonium nitrate:

$$\Delta b_{ext}\ (Mm^{-1}) = 3.0f(rh)[Sulfate]+3.0f(rh)[Nitrate]+4.0[OMC]+10.0[LAC]+1.0[Soil]+0.6[CM]+0.17[NO_2] \quad (1)$$

where:

$\Delta b_{ext}\ (Mm^{-1})$	=	calculated incremental change in extinction coefficient
f(rh)	=	relative humidity weighting function
[Sulfate]	=	incremental change in Ammonium Sulfate - $\mu g/m^3$
[Nitrate]	=	incremental change in Ammonium Nitrate - $\mu g/m^3$
[OMC]	=	incremental change in Organics - $\mu g/m^3$
[LAC]	=	incremental change in Light Absorbing Carbon - $\mu g/m^3$
[Soil]	=	incremental change in Fine Soil - $\mu g/m^3$
[CM]	=	incremental change in Coarse Mass (PM_{10}-$PM_{2.5}$) - $\mu g/m^3$
$[NO_2]$	=	incremental change in Nitrogen Dioxide - $\mu g/m^3$

These daily values are then used with some baseline extinction (b_{base}) value to estimate the visual air quality impact by calculating the change in deciview (dv) from some baseline extinction (b_{base}):

$$\Delta dv = 10.0\ \ln([b_{base} + \Delta b_{ext}]/10.0) - 10.0\ \ln(b_{base}/10) \quad (2)$$

The daily values of Δdv for the modeling year are then examined for specific threshold analyses. Typically a Δdv = 0.5 is considered a significant impact and a Δdv = 1.0 is considered an adverse impact (FLAG, 2000). The implications of this are severe. The lower (better visibility) the baseline extinction used, the smaller (less cumulative emission increase) Δb_{ext} before thresholds are tripped. The higher (worse visibility) the baseline extinction used, the larger (greater cumulative emission increase) Δb_{ext} before thresholds are tripped. Argonne uses the following equation to calculate Δb_{ext}:

$$\Delta b_{ext}\ (Mm^{-1}) = 3.0\ f(rh)[Sulfate]+3.0f(rh)[Nitrate]+1.0[PM_{2.5}] \qquad (3)$$

Both Argonne (Appendix A, p. A-4) and the FEIS (Appendix S, pp. S-236 & 237) acknowledge that Equation 3 is INCORRECT and INCOMPLETE:

- Modeled increase in Organics, LAC, Coarse Mass (PM_{10}-$PM_{2.5}$) or NO_2 at any of the Class I receptors are ignored. Argonne justifies this by stating (without proof) that incremental changes in Organic, LAC, and NO_2 concentrations at the Class I receptors due to increased emissions are not significant. But, no examples of such calculations are presented just the assumption: this results in an under-estimation of Δb_{ext};

- $[PM_{2.5}]$ is used in place of Fine Soil: this results in an over-estimation of Δb_{ext}; and

In general, I believe that the combination of the above errors will result in an underestimation of modeled Δb_{ext}; thus, an underestimation of projected visibility impacts. The FEIS agrees with this assessment:

> "…Overall, this lack of information may underestimate potential visibility impacts, especially from RFD and cumulative emission sources…" (FEIS, Appendix S, p. S-237)

2.5.2 FLAG and Wyoming Screening Analyses

The FLMs are concerned about situations where a change in extinction from new source growth is greater than 5% (Δdv = 0.5) as compared against natural background. Changes in extinction greater than 10% (Δdv = 1.0) are generally considered unacceptable by the FLMs and will likely raise objections to further pollutant loading without mitigation (FLAG, 2000). FLAG has set specific seasonal "natural background" b_{ext} and specific seasonal f(rh) values for each Class I area (FLAG, 2000). These are to be used as a screening analysis for visibility impacts by setting the baseline b_{ext} equal to the natural background b_{ext}. The State of Wyoming DEQ has established baseline b_{ext} as the average of the extinction on the cleanest 20% of days at Badlands National Park and Bridger Wilderness. Since, these values will typically be greater than the assumed FLAG natural background, Δdv calculated with the Wyoming DEQ baseline b_{ext} will be lower than using the FLAG baseline b_{ext} (It takes a greater change in Δb_{ext} to trigger impacts using the Wyoming baseline b_{ext}).

The FEIS is correctly presents the screening analysis as only the first step in determining visibility impacts (Appendix S, p. S-237 & 238). The FEIS also corrects the misinformation presented in the DEIS by showing that the proposed project and cumulative emissions spectacularly fail the screening tests by having significant numbers of days with a $\Delta dv \geq 1.0$ at all Class I areas in the region.

2.5.3 Refined Visibility Impact Analysis

Since the visibility screening analysis performed by Argonne predicted significant adverse impacts at all regional Class I areas, Argonne performs a "refined" visibility analysis. However, the analysis described in Argonne has significant problems:

- As with the screening analysis, the refined analysis does not include all aerosol or gaseous species, thus underestimating the impact;
- As with the screening analysis, the refined analysis uses incorrect algorithms to calculate Δb_{ext}, thus underestimating the impact;
- Argonne assumes that the CALPUFF modeling system can accurately predict the temporal changes in pollution concentrations to add to a specific measured air quality data time series; i.e. CALPUFF can create modeled increments that are highly correlated with actual data.
- No mention is made as to how daily b_{ext} values at Badlands NP or Bridger W were calculated or missing days were accounted for.

The first two flaws have been analyzed in the previous sections. The remaining flaws will be further described. It must be pointed out that these last two concerns were presented in comments to the BLM in April, 2002. The responses to these concerns in the FEIS were at best non-responsive hand-waving dismissals and did NOT adequately address the issues raised.

2.5.3.1 Ability of modeling system to accurately simulate specific daily events

Argonne's refined visibility analysis implicitly assumes that the CALPUFF/CALMET/ MM4 receptor modeling system can accurately model the specific daily incremental change in extinction due to increasing emissions and add these increments to the corresponding daily measured extinction at the receptor site. Contrary to BLM's response to this issue (FEIS, Appendix S, p. S-239 & 240), this is still an incredibly naive and scientifically unsound assumption. Green and Tombach (2000) have recently published an extensive evaluation of the ability of current receptor models (including CALPUFF) to replicate a specific time series of tracer concentrations in complex terrain. All models essentially had "Zero" temporal correlation with the measured tracer at all sites. They have concluded:

" ... The policy lesson gained from this evaluation is that results of any model should not be given much credence until the model has been evaluated for conditions similar to the intended application..."

Argonne presents no evidence of any evaluation of the CALPUFF/CALMET/MM4 model performance in the PRBO&G region to generate modeled output (aerosol or meteorological data) that correlates with any actual daily measurements. The effect of non-temporal correlations can be either an underestimate or overestimate of the incremental impact depending on if the measured daily extinction is low or high. There is no evidence in either Argonne reports (Argonne 2002, Argonne 2003) the DEIS or FEIS that this issue was even considered.

2.5.3.2 Incomplete explanation of the use of daily transmissometer data

Argonne's refined visibility analysis replaces the FLAG and Wyoming baseline b_{ext} with the daily average b_{ext} as measured by a transmissometer at Badlands National Park or Bridger Wilderness. Transmissometers are sophisticated optical instruments that make hourly measurements of b_{ext}. These measurements must be carefully examined and flagged (identified) to remove interferences due to weather and other optical effects (Molenar et. al., 1992). When comparing b_{ext} calculated from daily average speciated aerosol data to transmissometer data, the hourly b_{ext} measured by a transmissometer must be filtered and combined in some manner to derive an appropriate daily average b_{ext}. Malm et. al. (1996) examined this issue and recommended that a minimum of 18 hourly non-flagged b_{ext} values should be available before the daily average transmissometer b_{ext} is considered appropriate.

The FEIS states that as few as 6 hourly non-flagged b_{ext} values were used to calculate the daily average transmissometer b_{ext} (FEIS, Appendix S, P. S-239). The FEIS or Argonne does not describe how the daily b_{ext} was obtained when no reported transmissometer data are available. Table 1 presents the results of analyzing existing transmissometer data, listing the number of days per year that have less than 6 hours of valid transmissometer data for 1988-1999.

Table 1

Analysis of Transmissometer Data from Badlands National Park and Bridger Wilderness

	Number of Days With Less Than 6 hours non-flagged hourly b_{ext} data	
Year	Bridger Wilderness	Badlands National Park
1988	60	227
1989	89	166
1990	174	74
1991	97	96
1992	152	69
1993	75	76
1994	45	72

1995	98	67
1996	70	99
1997	89	109
1998	76	83
1999	51	45

Argonne used 1990 as the base year for their "refined" analysis. In 1990, Badlands had 74 days and Bridger 174 days with no valid transmissometer data using the FEIS standard! Argonne makes no attempt to describe how or even if these missing days were accounted for in the analysis! Are they not included in the analysis? This would result in a severe underestimation of the number of days per year that have dv > 1.0. Were the missing days filled in with some sort of averaging technique? How would that averaging technique bias the assumed correlation of CALPUFF increments with the measured data?

These are striking examples of the incompleteness of this "refined" analysis.

Again it must be repeated that these issues were raised in comments on the DEIS submitted to the BLM in April, 2002 (Molenar, 2002) and are still not addressed in the FEIS. Without a response to these issues it is just as conceivable and very probable that the visibility impacts presented in the FEIS underestimate the true degradation in visual air quality that will result from the increased regional emissions proposed in the FEIS.

2.5.3.2 Incomplete analysis of visibility impacts on 20% cleanest days

The Regional Haze rule sets goals of NO decrease in visual air quality on the 20% cleanest days and improving visibility on the 20% worst days all Class I areas (U.S.EPA, 1999). The FEIS visibility analysis does not address this issue at all. The U.S. Congress has given Federal Land Managers a very powerful mandate to protect visibility in all Class I areas of the U.S. The extent of this mandate can be seen in the following passage from Senate Report No. 95-127, 95th Congress, 1st Session, 1977 which states (FLAG, 2000):

> "*The Federal Land Manager holds a powerful tool. He is required to protect Federal lands from deterioration of an established value, even when Class I [increments] are not exceeded. ... While the general scope of the Federal Government's activities in preventing significant deterioration has been carefully limited, the FLM should assume an aggressive role in protecting the air quality values of land areas under their jurisdiction. In cases of doubt the land manager should err on the side of protecting the air quality-related values for future generations*."

The BLM has an affirmative responsibility to do a complete visibility analysis of the cleanest days. Unlike the haziest 20% days that have a 60+ year period to be cleaned up,

the Regional Haze rule does not allow for any degradation of the cleanest 20% days (U.S.EPA, 1999). The BLM has the information at hand in the Argonne data files but has seen fit to not complete this analysis. Thus, the effect on the cleanest days is not presented.

3.0 CONCLUSIONS

After careful critical review of FEIS and supporting documents I believe that:

- The emission inventory used to model air quality and visibility impacts specifically excludes known PRBO&G Project and Reasonably Foreseeable Development sources. Thus, the predicted project and cumulative air quality exceedences and visibility impacts will be greater than stated in the FEIS.

- The Argonne "refined" visibility analysis is incomplete and very probably underestimates the actual visibility impacts that will occur from the regional development.

- BLM has decided to not complete or report the results of an extensive analysis of the possible degradation of the cleanest 20% days at surrounding Class I areas. The visibility on these days is mandated by the Regional Haze Rule to not be degraded.

4.0 REFERENCES

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