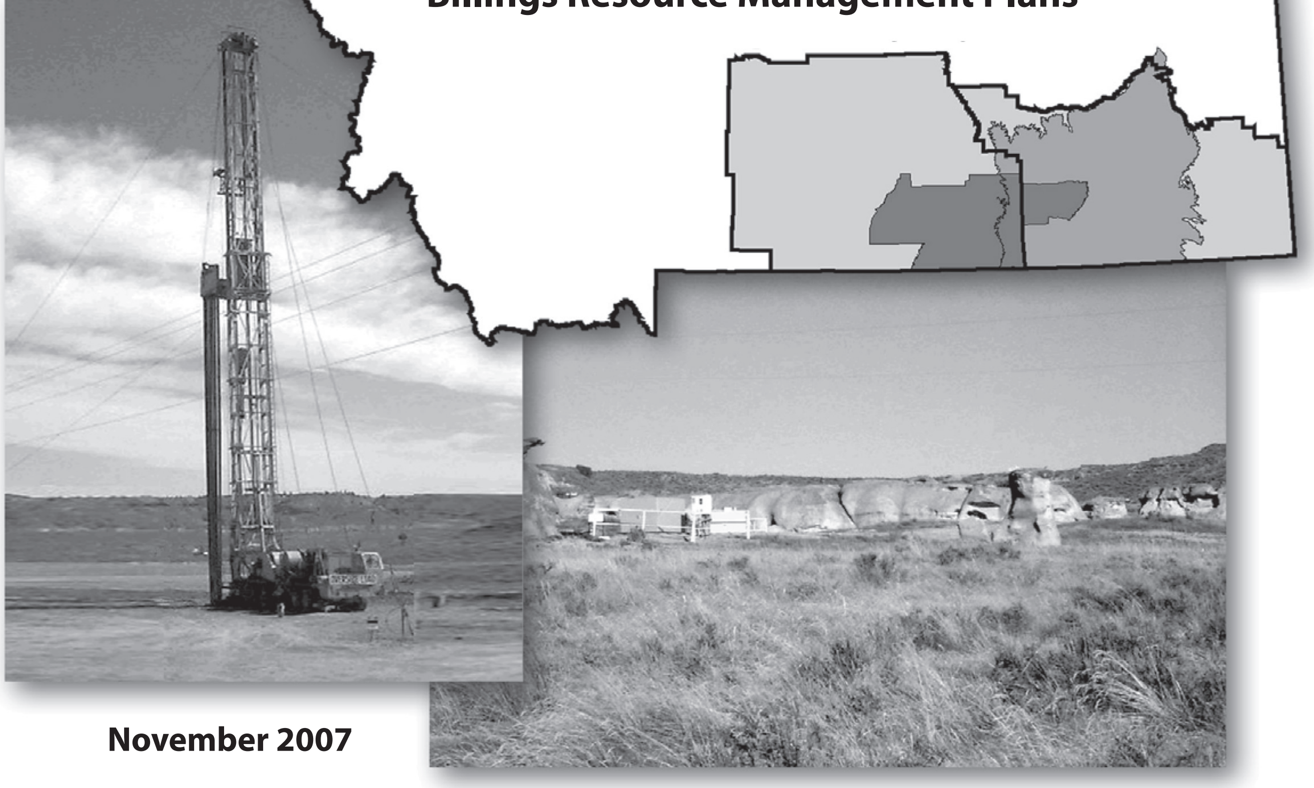
MONTANA

Supplemental Air Quality Analysis

Draft Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans



November 2007

BLM

Miles City Field Office

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based on the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation; rangelands; timber; minerals; watershed; fish and wildlife; wilderness; air; and scenic, scientific, and cultural values.

BLM/MT/PL-08/003

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Miles City Field Office
111 Garryowen Road
Miles City, Montana 59301-0940
http://www.mt.blm.gov/mcfo/

IN REPLY TO: 1310

Dear Reader:

Enclosed for your review is *the Supplemental Air Quality Analysis to the Draft Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* (Supplemental Air Quality Analysis). The document was prepared by the Bureau of Land Management (BLM) to assess the level of coal bed natural gas (CBNG) development that would require mitigation to reduce the potential for impacts to air quality. The comments received on the Supplemental Air Quality Analysis will be considered in the preparation of the *Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment to the Powder River and Billings RMPs* (Final SEIS).

The *Supplemental Air Quality Analysis* provides additional information and analyses regarding the level of CBNG development that would have the potential to impact air quality within the Powder River and Billings RMP Areas, particularly at Class I areas. It includes an analysis and comparison of the potential for CBNG development to impact air quality under different air quality emission rates under the preferred alternative (Alternative H). It also includes a revised air quality screen. The information contained within the *Supplemental Air Quality Analysis* is intended to expand on the air quality information presented in the Draft SEIS and the *Air Quality Technical Support Document* both of which can be viewed on the following BLM website: http://www.mt.blm.gov/eis/mt/milescity_seis/. You may also view the *Supplemental Air Quality Analysis* on the same website.

Copies of the *Supplemental Air Quality Analysis* document are also available for public inspection at the following BLM offices:

Bureau of Land Management
Montana State Office
5001 Southgate Drive
Billings, Montana 59107

Bureau of Land Management
Miles City Field Office
111 Garryowen Road
Miles City, Montana 59301

You are encouraged to comment on the material contained within the Supplemental Air Quality Analysis document. A 90-day comment period will begin the day the document is filed by EPA in the *Federal Register* (anticipated December 14, 2007). Submitted comments will be responded to in the Final SEIS if received within the 90-day comment period. Comments may be submitted by mail to the following address:

Draft SEIS Air Comments, Bureau of Land Management, P.O. Box 219, Miles City, Montana 59301. Comments may also be faxed to: (406) 233-2921 or submitted at the BLM's webpage.

After gathering and considering comments on the *Supplemental Air Quality Analysis*, BLM will prepare the Final SEIS. In the Final, you will be able to evaluate the BLM's responses to comments made on the Draft SEIS and the *Supplemental Air Quality Analysis*. A 30-day public protest period will be held following the publication of the Final SEIS.

Please retain this copy of the *Supplemental Air Quality Analysis* for future reference. If you have any questions or require additional copies of the document, email: cbng_seis@all-llc.com. We appreciate your interest in the management of the public lands.

Sincerely,

M. Elaine Raper
Field Manager

SUPPLEMENTAL AIR QUALITY ANALYSIS
TO THE
DRAFT SUPPLEMENT
TO THE
MONTANA STATEWIDE OIL AND GAS
ENVIRONMENTAL IMPACT STATEMENT
AND
AMENDMENT OF THE
POWDER RIVER AND BILLINGS
RESOURCE MANAGEMENT PLANS

Bureau of Land Management
November 2007

Recommended by: ______________________________
Jim Sparks, Billings Field Manager

Recommended by: ______________________________
M. Elaine Raper, Miles City Field Manager

Approved by: ______________________________
Gene Terland, State Director, Montana/Dakotas

Supplemental Air Quality Analysis to the Draft Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans

Lead Agency: U.S. Department of the Interior, Bureau of Land Management (BLM)

Type of Action: Administrative (Supplemental data)

Jurisdiction (Planning Area): The planning area includes BLM-administered lands and minerals in the Powder River RMP Area (Powder River, Carter, and Treasure counties and portions of Big Horn, Custer and Rosebud counties) and the Billings RMP Area (Carbon, Golden Valley, Musselshell, Stillwater, Sweet Grass, Wheatland, and Yellowstone counties and the remaining portion of Big Horn County). The planning area contains about 1,506,011 acres of federally managed surface and 5,009,784 acres of federal mineral estate.

Abstract: In December of 2006, BLM issued the *Draft Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans (Draft SEIS)*. The air analysis conducted for the *Draft SEIS* showed the potential for CBNG project-related activities to have an impact on air quality (particularly to visibility) at certain Class I areas, including the Northern Cheyenne Indian Reservation. The air quality analysis was conducted to determine what level of mitigation was needed to help avoid potential impacts to these Class 1 areas.

The *Supplemental Air Quality Analysis* contains data on five scenarios that were modeled for the planning area. The revised Alternative H scenario was modeled to better determine the direct impacts to air quality from project-related CBNG development. The first and second scenarios are modifications that reflect the differences in how current CBNG development is conducted within the Montana portion of the Powder River Basin versus what was predicted in the *Draft SEIS*. Two additional mitigation scenarios were modeled with data presented on impacts resulting from reduced compression requirements for project CBNG development under the first and second scenarios.

The data contained within the *Supplemental Air Quality Analysis* is intended to augment data contained within the *Draft SEIS*, not replace it.

Supplemental Air Quality Analysis to the Draft Supplement To the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans

Prepared for

U.S. BUREAU OF LAND MANAGEMENT
Miles City Field Office
Miles City, Montana

November 2007

EXECUTIVE SUMMARY

This air quality report was prepared to disclose additional air quality analyses that have been performed for the Bureau of Land Management (BLM) in support of the *Draft Supplemental Environmental Impact Statement (DSEIS) to the Montana Final Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans*. The additional air quality modeling analyses supplement the air quality analyses that were performed and summarized in detail in the *Air Quality Technical Support Document (AQTSD)* (BLM revised 2007) and the DSEIS (December 2006). The *AQTSD* addressed the potential for project related and cumulative air quality impacts resulting from the implementation of three separate alternatives; Alternatives E, F, and H with Alternative H being the preferred alternative. The additional analyses contained in this *Supplemental Air Quality Analysis (SAQA)* address the potential for project related and cumulative air quality impacts resulting from the implementation of Alternative H (Preferred Alternative) and four mitigation scenarios.

The *AQTSD* evaluated potential emissions from Coal Bed Natural Gas (CBNG) related activities by combining project related CBNG development, as outlined in the Reasonably Foreseeable Development (RFD) scenario, with non-project related CBNG development on the Crow and Northern Cheyenne Indian Reservations, as outlined in the Reasonably Foreseeable Future Actions (RFFA) scenario, into one emissions source group. This *SAQA* evaluates these two emissions groups separately to allow for the determination of potential air quality impacts that result directly from project related CBNG activities. Also included are potential air quality impacts from emission sources in Montana (All Montana Source Group), which includes project related CBNG emissions, and cumulative emissions (All Source Group) which includes all emissions sources both project related and non-project related. Information on the potential air quality impacts from specific source groups is contained within Appendix C. Additionally, emission points representing potential emissions from CBNG construction, operations, and maintenance activities were decentralized within each watershed to better represent actual development conditions (locations shown on Figure 3-2). The revised Alternative H and the four mitigation scenarios are described as follows:

- The revised Alternative H consists of adjustments to emission point locations and the separation of RFD and RFFA CBNG wells that were also applied to each of the mitigation scenarios analyzed which are described below. Emission factors used were derived from the air quality modeling analyses conducted for the 2003 Final Environmental Impact Statement (FEIS) conducted by Argonne National Laboratories (Argonne 2002). The air modeling analysis was conducted to separate project RFD emissions from non-project RFFA emissions; decentralize the project RFD and non-project RFFA emission source points; and utilize a well to field compressor to sales compressor ratio of 240 wells connected to 10 field compressors connected to 1 sales compressor (240:10:1) with a NO_X emissions factor for compressors of 1.5 grams per brake horsepower-hour (1.5 g/bhp-hr). This scenario is referred to in this *SAQA* as Alternative H Revised.

- Current CBNG development within the Montana portion of the Powder River Basin (PRB) is conducted using a ratio of 200 wells connected to 5 field compressors connected to 1 sales compressor. This *SAQA* includes an air modeling analysis scenario which uses this ratio of 200:5:1 and a NO_X emissions factor for compressors of 1.5 g/bhp-hr for project RFD wells; the well to field compressor to sales compressor ratio for non-project RFFA wells was not adjusted. This scenario is referred to in this *SAQA* as Scenario 1.
- This *SAQA* evaluates a mitigation scenario (Scenario 1A) which assumes a 50% reduction applied to Scenario 1 compressor horsepower requirements. This scenario reduces compressor operations emissions and associated maintenance emissions by 50% but leaves all other emissions the same as previously modeled for Scenario 1. The effect of this assumption reduces calculated compressor emissions by 50% for NO_X, SO_2, PM_{10}, and $PM_{2.5}$.
- This *SAQA* also evaluates an air modeling analysis scenario (Scenario 2) using the 200:5:1 well to field compressor to sales compressor ratio and the NO_X emissions factor of 1.0 g/bhp-hr for project RFD wells; the NO_X emissions factor for non-project RFFA wells was not adjusted. The 1.0 g/bhp-hr NOx emission factor was selected for Scenario 2 to reflect the emission level currently being permitted by the Montana Department of Environmental Quality (MDEQ) for CBNG compressors within the PRB. Scenarios 1 and 2 utilize the same number of operating CBNG wells and the same number of compressors and horsepower requirements but would have varying NO_X emissions based on different NO_X emissions factors for the two scenarios. The NO_X emissions factor for Scenario 2 reflects current MDEQ permitting levels.
- This *SAQA* evaluates a second air quality mitigation scenario (Scenario 2A) which assumes a 50% reduction applied to the Scenario 2 compressor horsepower requirements. This scenario reduces compressor operations emissions and associated maintenance emissions by 50% but leaves all other emissions the same as previously modeled for Scenario 2. The effect of this assumption reduces calculated compressor emissions by 50% for NO_X, SO_2, PM_{10}, and $PM_{2.5}$.
- This *SAQA* also includes revised emissions data for the Tongue River Railroad (TRR) which was reconfigured to better simulate a linear emission source. The total emissions for the TRR were kept constant and are the same as presented in the *AQTSD*; however, the number of emission points representing the TRR alignment was increased from 20 to 96.

Project related emissions include emissions from CBNG construction and operations activities in Montana. The scenarios presented within this *SAQA* were analyzed to assess project related versus non-project related CBNG emissions under Revised Alternative H, assess emissions associated with compressor operations utilizing different NO_X emissions factors and adjusting well to field to sales compressor ratios to more accurately represents current practice within the Montana portion of the PRB under Scenarios 1 and 2, and assess at what level project related CBNG emissions would need to be reduced to achieve zero days of impacts to visibility at the Prevention of Significant Deterioration (PSD) Class I areas under Scenarios 1A and 2A.

These analyses utilized the CALMET and CALPUFF models to assess the potential for impacts from project related and non-project related cumulative air emissions of PM_{10}, $PM_{2.5}$, NO_X, and SO_2 on air quality and air quality related values (AQRVs) at near-field receptor locations within the PRB and far-field receptor locations within the modeling domain. Far-field receptor locations consist of PSD Class I and Class II areas (locations shown on Figure 3-1).

Results of these analyses show that project related CBNG activities would not have the potential to exceed the National Ambient Air Quality Standard (NAAQS) or Montana Ambient Air Quality Standard (MAAQS) for NO_2, PM_{10}, $PM_{2.5}$, or SO_2 under any of the scenarios evaluated at either near-field or far-field receptors or NO_2, PM_{10}, or SO_2 prevention of significant deterioration (PSD) increments.

Visibility impacts to Class I and Class II areas were evaluated using the Federal Land Managers Air Quality Related Values Workgroup (FLAG) Method 2 and the Regional Haze Rule Method 6. Method 6 results are presented as consistent with the Best Available Retrofit Technique (BART) guideline. Utilizing Method 6, visibility impacts were evaluated for select Class I and Class II areas within the modeling domain. Visibility impacts were evaluated for the designated Class I Northern Cheyenne Indian Reservation because of it's proximity to proposed development. Using Method 6, visibility impacts to the Northern Cheyenne Indian Reservation consisted of 19 days for Scenario 1, zero days for Scenario 1A, 7 days for Scenario 2, and zero days of visibility impacts under Scenario 2A. As a result, BLM has modified the Air Quality Screen for Alternative H (Preferred Alternative) to more proactively track development and assess potential impacts with respect to CBNG project related development to mitigate potential visibility impacts before any days of visibility impacts occur from project related development to nearby Class I areas; in particular the Northern Cheyenne Indian Reservation.

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Acronyms and Abbreviations

Δdv	change in deciview
ADY	Alternative Development Year
ANC	acid neutralizing capacity
APD	Application for Permit to Drill
AQRV	Air Quality Related Value
Argonne	Argonne National Laboratory
ARM	Air Resources Management Bureau
BACT	Best Available Control Technology
BER	Board of Environmental Review
BIA	Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
BTU	British thermal unit
CAA	Clean Air Act
CBNG	coal bed natural gas
DEIS	Draft Environmental Impact Statement
dv	deciview
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FLM	Federal land managers
FLPMA	Federal Land Policy and Management Act
FR	Federal Register
HAP	hazardous air pollutants
MAAQS	Montana Ambient Air Quality Standards
MDEQ	Montana Department of Environmental Quality
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NO_X	oxides of nitrogen
PM_{10}	particulate matter less than 10 microns in diameter (inhalable particulate matter)
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter (fine particulate matter)
ppm	parts per million
PRB	Powder River Basin
PSD	Prevention of Significant Deterioration
RFFA	Reasonably Foreseeable Future Actions
RFD	Reasonably Foreseeable Development
RMP	Resource Management Plan
SEIS	Supplemental Environmental Impact Statement
SO_2	sulfur dioxide
$\mu g/m^3$	micrograms per cubic meter
VOC	volatile organic compounds
VMT	vehicle miles traveled
WAAQS	Wyoming Ambient Air Quality Standards
WYDEQ	Wyoming Department of Environmental Quality

1.0 Introduction

This Supplemental Air Quality Analysis (SAQA) supplements the Air Quality Technical Support Document (AQTSD) (BLM revised 2007) that was prepared in support of the Draft Supplemental Environmental Impact Statement (DSEIS). This SAQA uses emission factors derived from data developed for the 2003 Final EIS (FEIS) air quality model (Argonne 2002). Emissions inventory data obtained from state regulatory agencies which were used within the air model are included within Appendix C of the AQTSD.

This report addresses changes in air quality and air quality related values resulting from a reconfiguration of emission sources for the coal bed natural gas (CBNG) development in Montana. The reconfiguration includes a revision to source locations and an adjustment of emissions factors associated with nitrogen oxide (NOx) emissions from project related CBNG sources. The information in this document focuses on potential air quality impacts in the Montana near-field receptors and at receptors within the Northern Cheyenne Indian Reservation and the Crow Indian Reservation. Tabular summaries are provided in this discussion to compare impacts from the AQTSD and from the reconfigured production and emissions scenarios. The air quality modeling results for the full set of receptors (see Section 3.4) are provided in Appendix C of this document.

The AQTSD evaluated three separate development scenarios, Alternatives E, F, and H, with Alternative H being the preferred alternative. This report evaluates five additional emission scenarios related to Alternative H. The air quality evaluation of these scenarios was conducted to identify potential changes in air quality impacts and is the main objective of this study. For a more detailed review of the modeling options and technical approach, the reader is referred to the AQTSD (ALL 2007) that summarizes the modeling approach, non-project emissions data, and impacts that are generally below any thresholds of concern.

Identical to the original AQTSD, this study assesses potential impacts at “near-field receptor grids” in both Wyoming and Montana and at the individual sensitive receptor areas as well. The impacts were evaluated for the same receptor set that was used in the Coal Review (ENSR 2005), using the same dispersion model and receptor data. The near-field potential impacts refer to receptors in the Powder River Basin, near the projected development. Generally, those receptors are within 50km of the development area. This study includes an assessment of potential impacts at all receptor groups on ambient air levels of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter with aerodynamic diameter of 10 microns or less (PM_{10}). The selected hazardous air pollutants (HAPs) analyses have not been redone because there are no expected changes in those impacts. The HAPs were evaluated at the near-field receptors in Montana and Wyoming, but not at the sensitive receptor areas. At the sensitive receptor areas, potential impacts on visibility and acid deposition were also evaluated.

2.0 Revised Air Quality Screen (Preferred Alternative)

The MDEQ has permitting authority over emission sources. EPA has permitting authority in the adjacent areas of Indian Country. The BLM would conduct an annual review of available monitoring data collected in Class I areas (designated Northern Cheyenne Indian Reservation) and Federally mandated Class I areas (wilderness areas) within the Montana portion of the Powder River Basin.

In addition, the MDEQ has agreed to complete an annual cumulative air quality impact model to track air quality impacts of CBNG development, including relevant CBNG development in Wyoming (see description of Additional Air Quality Modeling Studies in Chapter 3 of the Draft SEIS).

If observed effects and modeled impacts completed for the annual review by MDEQ show state or federal regulatory standards or applicable thresholds for air quality related values would be exceeded, the BLM would require additional mitigation measures on development. The BLM would approve additional CBNG Application for Permits to Drill (APDs) only if it could be demonstrated that they would not contribute to the exceedances of air standards.

To minimize potential air impacts from CBNG operations, the number of wells connected to each compressor would be maximized, and natural-gas-fired or electrical compressors or generators would be required. When compressors or generators are located in proximity to noise sensitive areas (such as occupied dwellings or sage-grouse strutting grounds), a maximum noise level of 50 decibels (10 decibels above background measured at the sage-grouse lek) measured 0.25 mile from the compressor would be required.

To reduce dust, operators of federal leases would have to post and enforce speed limits for their employees and contractors. Operators could work with local government to use dust suppression techniques on roads.

Visibility and Haze –
There is a level of uncertainty regarding the total number of wells that would be permitted and operated during the life of this project, as well as some uncertainty associated with several other factors that affect the calculation of visibility impacts. The reasonable foreseeable development scenario of 18,225 project wells drilled is based on data delineating the extent of economically productive coalbeds and the high-end of a range of wells that are predicted. This development scenario assumes that virtually every 80-acre spacing unit within geologic limits of the PRB would have wells drilled, and 90% of those wells would be productive. However, the reasonable foreseeable development scenario of Alternative G (6,470 total wells drilled) may be the limit of productive CBNG reservoirs in the MT PRB. The most likely scenario is somewhere between Alternative G and the Alternative H. However, consistent with the analysis completed for other resource issues, potential visibility impacts from the high-end development scenario were modeled, and these results would guide BLM's long-term approach for applying the air quality screen.

Given the potential for the level of development to vary, BLM and MDEQ would perform additional visibility modeling to better assess the visibility impacts as development proceeds (e.g., when exploration programs help define the limits of development within the Montana portion of the Powder River Basin). The potential for project wells to impact visibility is due to emissions of sulfur dioxide and oxides of nitrogen from compressor engines. The total potential for emissions of oxides of nitrogen from compressor engines is based on horsepower requirements, which for the high-end development scenario of 18,225 project wells drilled would be 297,680 horsepower. The visibility modeling would be performed when horsepower requirements for CBNG wells in the Montana portion of the PRB exceed 133,956 horsepower (based on a compressor NO_X emission factor of 1.5 g/bhp-hr). Current modeling results indicate 0 days of visibility impacts would occur on the Class I Northern Cheyenne area up to a horsepower level of 148,840. BLM has selected 90% of this value as the visibility screening threshold to ensure appropriate actions can be taken in time to mitigate visibility impacts, if needed. The Class I Northern Cheyenne Indian Reservation area was selected as the "trigger Class I area" due to its proximity to the CBNG development, and the sensitivity to CBNG development of this Class I area when compared to other Class I areas in the region.

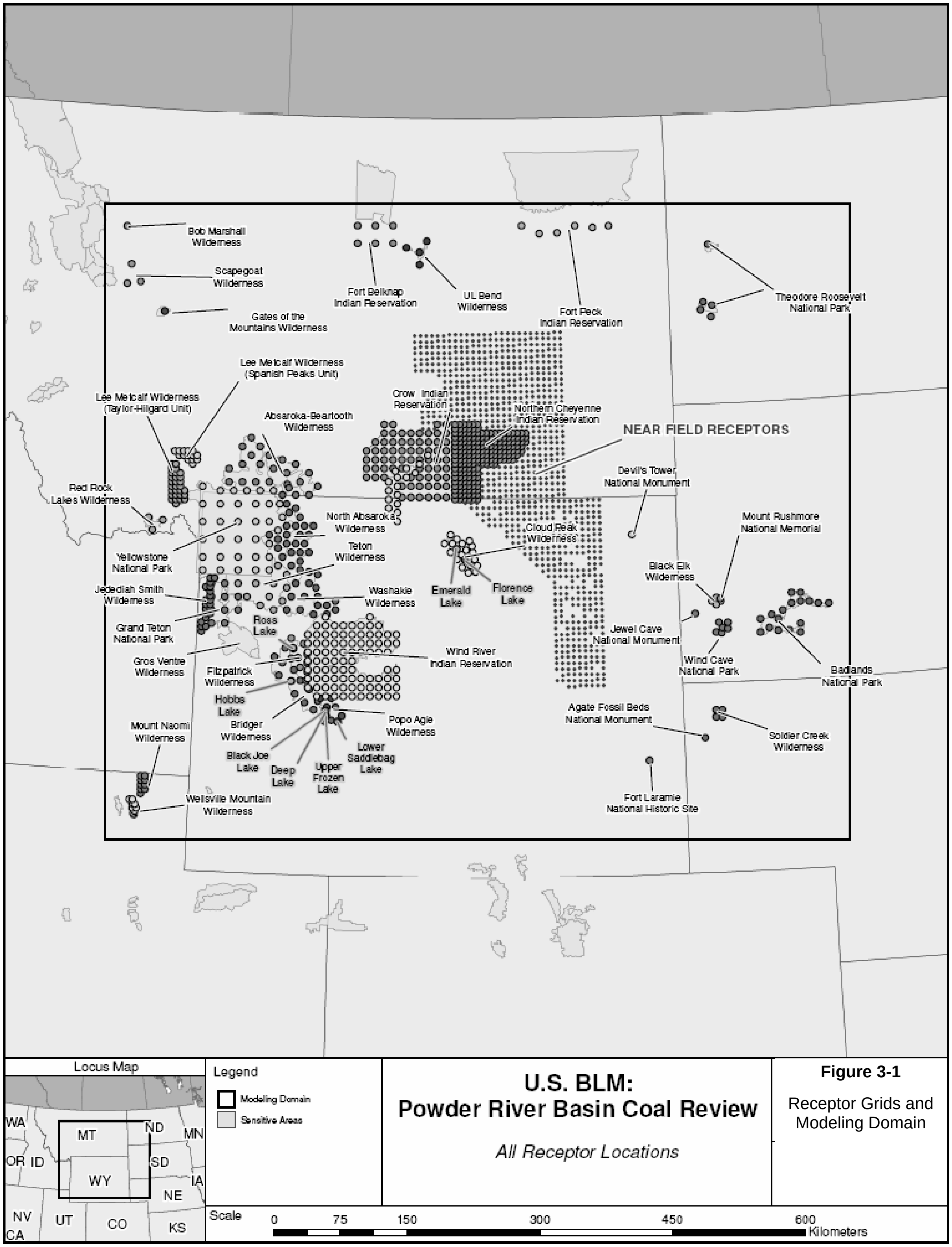
The visibility modeling effort would provide an updated prediction for future impacts and assumptions would be verified or modified to properly characterize actual conditions and technological changes. The conditions that may change or become more certain as development proceeds include:

- the total ultimate number and type of wells (type – single zone completion vs. multi-zone or commingled completions),
- the pace of development,
- BACT and the effect on compressor emission rates ,
- compressor locations,
- compressor to well ratios, and
- limits of high development potential areas
- If this subsequent modeling work indicates unacceptable impacts would occur at a future point in the PRB development, the modeling work would then include mitigation scenarios that would investigate mitigation measures. Mitigation efforts would focus on compressor motors and the extent of operating compressors because it appears that gas-fired compressor motors account for approximately 90% of the overall project emissions and visibility impacts.

3.0 Air Model and Input Parameters

3.1 CALPUFF Model

The USEPA guideline model CALPUFF (Scire, et al. 2000) was used to estimate potential impacts at both the Powder River Basin (PRB) receptors and the sensitive surrounding areas. The CALPUFF modeling system was selected for a refined modeling analysis of the region in order to assess potential impacts over near-field and distant receptor areas. As indicated in Figure 3-1, the supplemental modeling utilized the same receptor grids for near field and far-field receptors, and sensitive area receptors as in the earlier DSEIS analysis. Furthermore, the same CALPUFF model version and settings were used to allow direct comparison with the previous modeling results. The specific model settings used are contained in Appendix B.



U.S. BLM:
Powder River Basin Coal Review

All Receptor Locations

Figure 3-1

Receptor Grids and Modeling Domain

The CALPUFF modeling system has three main components:

- CALMET - a diagnostic three-dimensional meteorological model, which develops the meteorological data for modeling input;
- CALPUFF - the transport and dispersion model that carries out calculations of dispersion;
- CALPOST - a post processing package that is used to depict overall concentrations and potential impacts.

The CALMET input files were initially developed for the DSEIS from the regional MM5 data base for 2001, 2002, and 2003. All three years were used to develop the potential impacts for the base year (2004 emissions). The study first analyzed the potential impacts for all three years for the base year, focusing on potential impacts in the near-field. A comparison of the potential impacts from those three years concluded that the year 2002 would provide the highest potential impacts in the near-field. For each of the DSEIS development scenarios, the potential impacts were then analyzed using only 2002 meteorological data. The supplemental air modeling analysis scenarios and revised Tongue River Railroad included the same 2002 meteorological data set as used for the DSEIS.

The CALPUFF modeling system is designed to treat the time-varying point and area source emissions, model domains at distances from tens of meters to hundreds of kilometers from the sources; predict averaging times from 1 hour to 1 year; predict impacts for inert pollutants that are not chemically changed in the atmosphere; predict potential impacts of pollutants that may be subject to removal and chemical conversion mechanisms; and be applied to rough terrain situations. Given these strengths and the objectives of the study, the CALPUFF model is aptly suited to carrying out the required atmospheric dispersion modeling.

3.2 Emissions Input

The analysis focuses on a revision of operations and emissions associated with Alternative H (ALL 2007), including separate scenarios for evaluation. The supplemental evaluation initially addressed some inconsistencies with the modeling results for the original (Argonne 2003) TSD for the Statewide FEIS.

Consistency with Original Statewide FEIS

In order to maintain consistency with previous air modeling conducted by Argonne National Laboratory (Argonne) for the 2003 FEIS, the calculation tables presented for the preferred Alternative E Coal Bed Natural Gas (CBNG) and Conventional Oil & Gas (ONG) development in Appendix B of the 2002 Argonne Technical Support Document were recreated utilizing the same data and assumptions provided to Argonne by BLM and other cooperating agencies. In most cases, the calculations were reproduced based on formulas presented within annotations to the tables. In the case of vehicular particulate matter emissions, the formula presented did not produce the emission factor that was shown in the table. In this case, the value used for the Argonne model was inserted as a numerical value rather than as a calculation to maintain consistent results between this model and the model conducted by Argonne. The results of the recalculation effort in comparison to the original

Argonne project emissions estimation are show in Table 3-1. Appendix A contains data tables used to prepare the emission calculations for each of the scenarios described within this report.

Modifying the Reproduced Argonne Spreadsheets to Provide Alternative H Emissions Estimates

As noted above the Alternative H was proposed as the preferred alternative, and this effort addresses revised impacts from that alternative. Following the resolution of differences with the Argonne results, the emission sources were modified to reflect the anticipated rate of development for the preferred Alternative H. One of the modifications was the removal of anticipated CBNG and Conventional ONG wells in Park, Blaine, and Gallatin Counties which were included in the 2003 FEIS, but are no longer in the planning area for the Powder River and Billings Resource Management Plans. The changes made to the Argonne CBNG spreadsheets included the following:

- Reducing the number of CBNG wells drilled from 18,266 to 18,225
- Reducing the number of well pads from 6089 to 6075
- Adjusting the ratio of CBNG wells to field compressors and sales compressors to 240:10:1
    - This resulted in decreasing field compressors from 741 to 673, and sales compressors from 76 to 67
- Reducing the number of impoundments from 357 to 356
- Reduced the Total Gas Produced (MMCFD-YR) from 45,728 to 44,944
- Reducing the Total Number of Operating Station-Year for both field compressors and sales compressors
    - This resulted in a reduction from 8,989 to 7,299 for field compressors and 1,084 to 730 for sales compressors
- Reduced the Total Number of Operating Well-Years from 228,640 to 175,181

The changes made to the Argonne ONG spreadsheets included the following:

- Reducing the number of ONG wells from 1,855 to 1,730
- Reduced the Total Number of Operating Well-Years from 20,982 to 19,644
-

Table 3-1
Total CBNG and Conventional Oil & Gas Project Emissions (ton/project[1])

	NOx	PM10	PM2.5	SO2	CO	VOCs
Argonne	120,780	14,956	6,775	4,094	91,954	46,630
Recalculation	120,772	14,958	6,773	4,096	91,948	46,623
Difference	-8	+2	-2	+2	-6	-7

1 ton/project = total emissions for the 20 year life of the project related CBNG development.

All other changed values within the revised CBNG and ONG spreadsheets are calculated values based upon the above changes. Table 3-2 presents the total project emissions estimations for development under Alternative H used in the DSEIS and the newly recalculated emissions estimations from the recreated Argonne spreadsheets.

The decreases in emissions that can be seen in Table 3-2 are due to reduction in number of wells, removal of RFFA wells, and removal of a second set of construction and maintenance emissions inadvertently counted twice in the development of the per well emission factors used to calculate DSEIS emissions.

Distribution of Total Project Emissions Over the 20-Year Development Period for Alternative H

Once total project emissions were developed, the CBNG emissions were distributed to each development year by taking the rate of development for Alternative H CBNG presented in the Minerals Appendix of the DSEIS. Construction emissions were divided by the total number of wells and then multiplied by the number of wells to be constructed within a particular year. Operation emissions were obtained by calculating the total number of well years, dividing the total project operation and maintenance emissions by the total number of well years, and then multiplying this derived value by the number of wells operating within a particular year. A similar procedure was used to distribute Alternative H Conventional ONG emissions over the project period of development. The Alternative Development Year (ADY) 20 emissions are presented in Table 3-3 for the Argonne FEIS model, the DSEIS model, and the recalculated DSEIS emissions for the remodeling effort.

Table 3-2
Total Alternative H CBNG and Conventional Oil & Gas Project Emissions (ton/project[1])

	NOx	PM10	PM2.5	SO2	CO	VOCs
DSEIS	127,347	31,825	-----	3,655	-----	115,549
Recalculation	100,505	13,509	5,895	3,878	73,248	35,745
Difference	-26,842	-18,316		+223		-79,804

1 ton/project = total emissions for the 20 year life of the project related CBNG development.

Table 3-3
Alternative H CBNG and Conventional Oil & Gas Project Emissions for ADY 20 (tons)

	NOx	PM10	PM2.5	SO2	CO	VOCs
Argonne (Alt E)	6,956	564	326	88	6,692	3,454
DSEIS	9,734	2,275	-----	231	-----	9,882
DSEIS Recalc.	6,909	706	363	122	6,199	3,162

Distribution of ADY 20 Emissions to Modeling Point Source Locations

To reduce the potential for model induced overestimation of impacts, CBNG source point locations were redefined to be consistent with known coal reserves and known conventional oilfields. Thus, to be consistent with the development of CBNG wells by watershed and by County as described in the Minerals Appendix of the DSEIS it was decided to increase the number of points by assuming that each point would represent approximately 100 CBNG wells (i.e. for 18,225 wells, there are approximately 180 points). The rational for the placement of emission points is as follows:

CBNG Project Emission Points: These emissions points were placed within 4th order watersheds based on the predicted number of wells in the DSEIS as per Tables 4-1 (Chapter 4, page 4-5) and Table 4-40 (Chapter 4, page 4-94) and in areas with existing known sub-bituminous coals. The points were placed within known existing PODs, and concentrated (southern Big Horn and Powder River counties) where multiple coal seams are known to exist. The tables were generated from the predicted wells within the RFD Minerals Appendix Table MIN-1 (page MIN-25) per county. Emission points were used to represent approximately 100 wells each as a baseline, but adjusted to reflect county limits or watershed limits. Hence, the only point in Treasure County represents the 25 wells predicted for this county and the other 16 points within the Yellowstone-Sunday watershed represent either 104 or 105 wells to get the total to 1700 as was predicted for the watershed.

RFFA CBNG Emission Points: These emission points were placed evenly throughout the reservation where sub-bituminous coal seams are known to exist since the actual areas where the tribes may develop are not known at present. Both the Northern Cheyenne and Crow Indian reservation have 40 points representing 4,000 wells. The two points in the Ashland Ranger District were placed in the south portion to represent the estimated 200 wells that may be developed. The thought was that they would be closer to existing infrastructure.

Conventional Oil and Gas Emission Points: These points were placed within known existing oil and gas fields and represent the number of conventional wells predicted within the RFD for each county. A point was placed in each existing field per watershed, so if a field is located within two watersheds but within one county there are two points and each one is assigned a representative number of wells based on the size of the field in the watershed as compared to the whole field size.

A map showing all modeling source point locations is provided in Figure 3-2.

The distribution of project CBNG emissions for ADY 20 were divided by the total number of operating wells in ADY 20, and then the derived values were multiplied by the number of wells represented by each point. For construction emissions, the total construction emissions for ADY 20 were distributed equally among the modeling source points. This same approach was used to distribute Conventional ONG emissions.

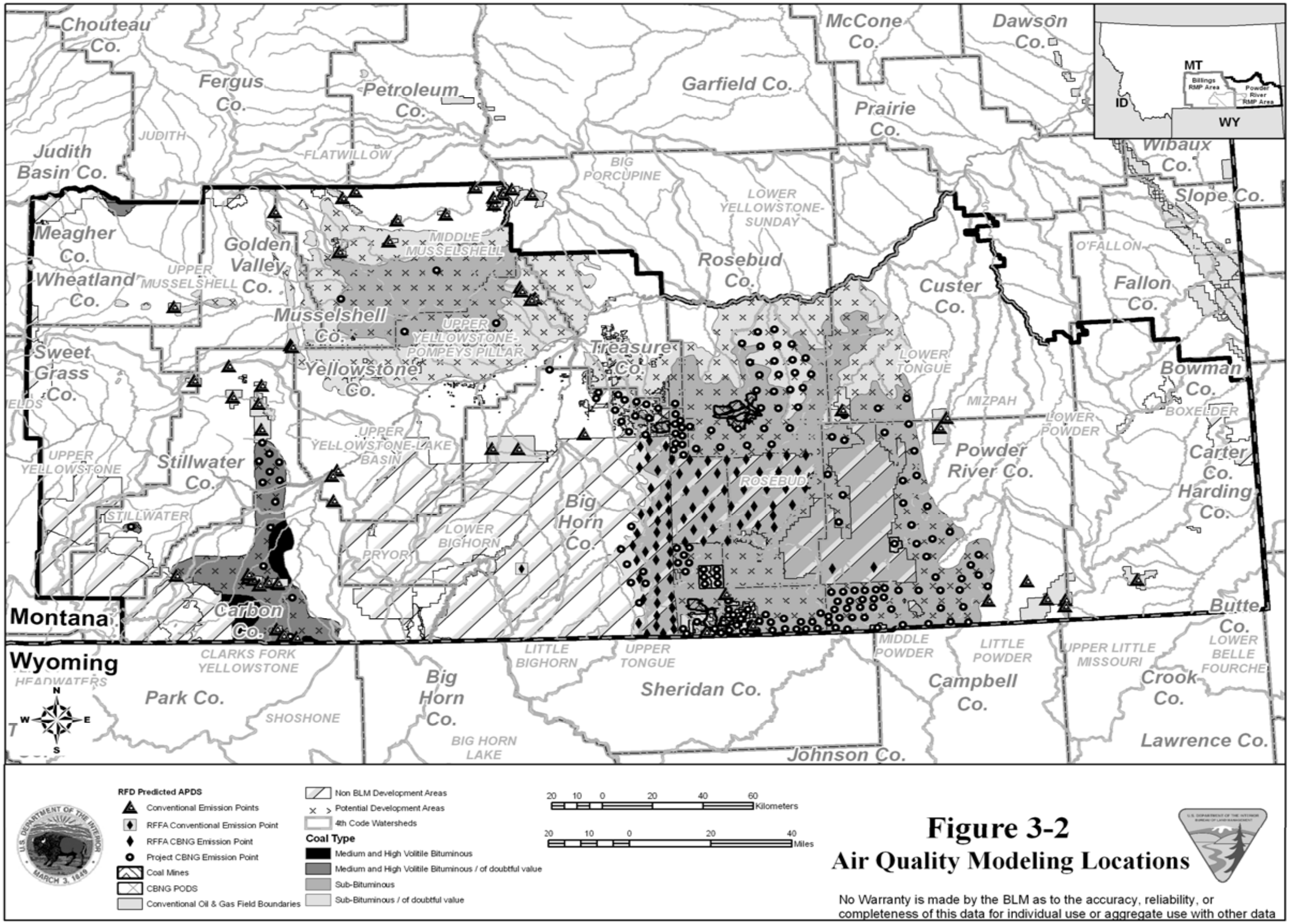


Figure 3-2
Air Quality Modeling Locations

No Warranty is made by the BLM as to the accuracy, reliability, or completeness of this data for individual use or aggregate use with other data

Tongue River Railroad

In the original air modeling analysis for the DSEIS, the spatial distribution of individual source points for the Tongue River Railroad did not suitably represent a mobile emission source for a railroad line. Specifically, a total of 20 emission source points were utilized to simulate emissions from the Tongue River Railroad line; emissions were apportioned to each of these 20 source points. The results of that modeling showed that 20 source points did not satisfactorily characterize a line source and resulted in "hotspots" of impacts to air quality around the 20 source points For this revision the spatial distribution of individual source points was changed to include 96 separate point sources, each with a proportionally revised emission rate.

3.3 Visibility Impacts Determination Methodology

Under the Clean Air Act, visibility has been established as a critical resource for identified Class I areas. The study provides an analysis of potential impacts at the Class I areas and at sensitive Class II areas in the region. Visibility impacts to Class I and Class II areas were evaluated using the Federal Land Mangers Air Quality Related Values Workgroup (FLAG) Method 2 and the Regional Haze Rule Method 6. A detailed discussion of these alternate methods is provided in the original analysis. Fundamentally, Method 2 is the Federal Land Managers Air Quality Workgroup (FLAG) approach (USEPA 2000) and Method 6 is the current method preferred for BLM analyses, and is used for the compliance demonstration for Regional Haze.

Visibility potential impacts are based on the highest 24-hour calculated extinction at the indicated source receptors. Potential impacts are based on a presumed pristine background and calculated as a percent increase in extinction (reduced visibility) from that background value. The study tabulated the reduced visibility at the maximum impact receptor in each of the Class I and Class II groups in terms of the maximum reduction on any one 24-hour period, the number of days annually that showed visibility reductions of 5 percent and 10 percent. These reductions are indicated as reductions in deciviews, with 1.0 deciview corresponding to a reduction of approximately 10 percent from the background level. A significance threshold of 10 percent has been used in this analysis to evaluate the impact from the source groups.

Visibility impacts using Method 6 for the listed sensitive areas were developed for each of the three alternative development scenarios: Alternative E; Alternative F; and the Preferred Alternative H, which were evaluated in the DSEIS. The analysis in this report focuses on impacts from the Preferred Alternative H. Separate evaluations were provided for five scenarios involving project CBNG construction and operation emissions.

3.4 Receptors (Near Field and Sensitive Receptors)

For any modeling run, the project must identify a set of receptors at which the potential impacts to air quality and other air quality related values are to be analyzed. This analysis evaluated impacts at the same set of receptor groups that were analyzed in the BLM 2003 Statewide FEIS, the PRB Coal Review, and the DSEIS analysis of air quality impacts that focused on Alternative evaluation. The receptors include a near field set of receptors in the development area of the PRB, in both Montana and

Wyoming, and they include receptors at the air quality designated Class I areas, and at specific other receptor areas within the region.

Figure 3-1 provides a depiction of the modeling domain as well as each of the receptor areas. In the near-field receptor grid, any receptor that was within 1 km of a source was eliminated from the analysis. This avoids over-predicting impacts due to a single source or characterization that affects air quality near any single receptor. Overall the near-field receptor grid points were spaced at 1-km intervals over the study area. At the Class I and other areas, receptor grids were used based on the data provided by the National Park Service. At other non-Class I areas, a receptor grid of 3-km was developed based on digital topographic data. Figure 3-1 depicts the receptors at each sensitive area, and includes the sensitive lakes that have been identified by the Forest Service.

Near-field receptors were arranged to obtain the maximum estimated concentrations that result from CBNG development within the PRB. The purpose of establishing the near-field receptors is to characterize the overall air quality conditions in the PRB as a result of this development. The elevation of each receptor was obtained from the Digital Elevation Model data for the 1:250,000 quads with 90-meter horizontal resolution (USGS 2000a).

Receptors were located along boundaries and within each of the following Class I and specified Class II sensitive areas of concern within the modeling domain:

- Badlands National Park
- Wind Cave National Park
- Bridger Wilderness Area
- Fitzpatrick Wilderness Area
- Washakie Wilderness Area
- North Absaroka Wilderness Area
- Northern Cheyenne Indian Reservation (Class 1, Northern Cheyenne Tribal Council)
- Devils Tower National Monument
- Mount Rushmore National Memorial
- Jewel Cave National Monument
- Agate Fossil Beds National Monument
- Fort Laramie National Historic Site
- Black Elk Wilderness Area
- Soldier Creek Wilderness Area
- Cloud Peak Wilderness Area
- Yellowstone National Park
- Grand Teton National Park
- Teton Wilderness Area
- Absaroka Beartooth Wilderness Area
- Bighorn Canyon National Recreation Area
- Popo Agie Wilderness Area
- Crow Indian Reservation (Class II Crow Tribal Council)
- Theodore Roosevelt National Park

The following areas are near the edge of the modeling domain. Modeled impacts at receptors within these areas near the edge of the modeling domain might be associated with model inaccuracies and uncertainties due to edge effects of the modeling. Therefore, estimates of potential impacts to these areas near the edge of the modeling domain were made by placing representative receptors no nearer than 25 km from the edge of the modeling domain:

- Bob Marshall Wilderness Area
- Gates of the Mountains Wilderness Area

- Lee Metcalf Wilderness Area, Spanish Peaks Unit
- Lee Metcalf Wilderness Area, Taylor Hillgard Unit
- Red Rock Lakes Wilderness Area
- Jedediah Smith Wilderness Area
- Mount Naomi Wilderness Area
- Wellsville Mountain Wilderness Area
- U.L. Bend Wilderness Area
- Fort Peck Indian Reservation
- Scapegoat Wilderness Area
- Fort Belknap Indian Reservation.

These locations, as well as other sensitive receptors such as lakes, are shown in Figure 3-1. The receptors were determined with sufficient accuracy to assure that the maximum potential air quality impacts are evaluated. All sensitive receptors were identified and reviewed in the modeling protocol by the stakeholder group, prior to initiating the modeling

4.0 Baseline (Existing Environment) Analysis

The base year air quality analysis was conducted under the original study, and the input data and results have not changed since that analysis. The existing emissions were based on data for 2004, using actual data where available and potential emissions in lieu of actual data. Emissions from conventional oil and gas operations were adjusted by a factor (0.7) from the permitted levels to represent actual operations and to account for sites that were permitted but never installed. A summary of emissions data for the base year is provided in Appendix A.

The original analysis included the full range of near field receptors in Montana and Wyoming, as well as the Class I and sensitive Class II areas in both states and in North and South Dakota. This report also included an analysis of the same area but focuses on providing data on changes that occurred at sites near the CBNG development in Montana; the results of the baseline study are provided in Tables 4-1 to 4-4. Data is presented within these tables for project related CBNG emissions (MT CBNG Construction and MT CBNG Operations), emissions from sources located in Montana which include project related CBNG emissions (All MT), and emissions from all sources which also includes project related CBNG emissions (ALL Sources). The modeled air quality impacts for each receptor area are included in Appendix C. Additional information on base year results is presented within Section 3 of the AQTSD (BLM revised 2007).

Overall the base year modeled results showed some impacts above applicable air quality standards from existing major sources in Montana; however these sources are not related to CBNG development or operation. Air quality impacts from project related CBNG sources are all within applicable air quality standards.

4.1 Potential Air Quality Impacts

The results of the air quality modeling for the base year presented in Table 4-1 show that all model predicted impacts from each source group category would be below applicable regulatory threshold levels at the near-field, the Crow Indian Reservation, and the Northern Cheyenne Indian Reservation receptor grids. The impacts from the CBNG construction and operation sources are well below the applicable standard. In addition, all impacts are below the federal annual NO_2 standard.

4.2 Potential Visibility Impacts

Visibility modeling results for the base year are provided in Tables 4-2 for “Method 2” and Table 4-3 for “Method 6.” The results showed impacts from existing sources at most of the identified receptor groups. The impacts from CBNG construction and operation, however, were much less.

Method 2 results showed only 1 day with impacts above 10% of background at the Northern Cheyenne Indian Reservation, for both construction and operation. The model also predicted 2 days with impacts above 10 % at the Crow Indian Reservation and 1 day above 10% at the Cloud Peak Wilderness Area.

Method 6 results showed no days above the 10% impact at any of the receptor groups. The highest levels were 9.5% at the Northern Cheyenne Indian Reservation and 7.2% at the Crow Indian Reservation. Further the critical Method 6 parameter is the 8^{th} highest value in the year, and all the predicted levels are well below the 5% significance threshold for this analysis.

4.3 Acid Deposition

All modeled deposition rates for sulfur and nitrogen from CBNG construction and operation are below 0.1 kilograms per hectare per year. See Table 4-4 for potential modeled deposition for nitrogen and sulfur for the base year. This modeled impact is also well below the threshold deposition rate of 3 kg/hectare-year for nitrogen and 5 kg/hectare-year for sulfur compounds.

Table 4-1 Modeled Concentrations of NO2, PM10, PM2.5 and SO2 for BASE YEAR

Receptor Set	Pollutant	Averaging Period	RANK	MT CBNG Construction	MT CBNG Operation	ALL MT	ALL SOURCES	NAAQS/ MAAQS ($\mu g/m^3$)
NEAR FIELD RECEPTORS								
Montana Near Field Receptors	NO_2	1-Hr	1ST HIGH	122	200	322	428	565
		ANNUAL	1ST HIGH	0	1	1	4	100
	PM_{10} Total	24- Hr	2ND HIGH	3	3	31	31	150
		ANNUAL	1ST HIGH	0	0	2	4	50
	$PM_{2.5}$ Total	24- Hr	2ND HIGH	0	1	2	7	35
		ANNUAL	1ST HIGH	0	0	0	1	15
	SO_2	1-Hr	1ST HIGH	11	5	140	140	1300
		3- Hr	2ND HIGH	3	1	44	44	1300
		24- Hr	2ND HIGH	0	0	15	15	260
		ANNUAL	1ST HIGH	0	0	2	2	60
CLASS I AREAS								
North Cheyenne IR Class I Area	NO_2	1-Hr	1ST HIGH	4	6	11	13	565
		ANNUAL	1ST HIGH	0	0	0	0	100
	PM_{10} Total	24- Hr	2ND HIGH	0	0	2	7	150
		ANNUAL	1ST HIGH	0	0	0	1	50
	$PM_{2.5}$ Total	24- Hr	2ND HIGH	0	0	1	6	35
		ANNUAL	1ST HIGH	0	0	0	0	15
	SO_2	1-Hr	1ST HIGH	0	0	16	16	1300
		3- Hr	2ND HIGH	0	0	7	10	1300
		24- Hr	2ND HIGH	0	0	2	4	260
		ANNUAL	1ST HIGH	0	0	0	1	60
SENSITIVE CLASS II AREAS								
Crow IR Class II Area	NO_2	1-Hr	1ST HIGH	14	23	462	462	565
		ANNUAL	1ST HIGH	0	0	2	2	100
	PM_{10} Total	24- Hr	2ND HIGH	0	0	47	47	150
		ANNUAL	1ST HIGH	0	0	4	4	50
	$PM_{2.5}$ Total	24- Hr	2ND HIGH	0	0	3	7	35
		ANNUAL	1ST HIGH	0	0	0	1	15
	SO_2	1-Hr	1ST HIGH	1	1	151	151	1300
		3- Hr	2ND HIGH	0	0	61	61	1300
		24- Hr	2ND HIGH	0	0	15	15	260
		ANNUAL	1ST HIGH	0	0	2	3	60

Notes:
(1) Bold type with shading indicates a modeled impact that is above the NAAQS/MAAQS
(2) Includes 75% NO_X to NO_2 conversion
(3) Concentrations in Micrograms per cubic meter.

Table 4-2 Visibility Impacts - Method 2 - Base Year

Receptor Set	MT CBNG Construction			MT CBNG Operation			ALL MT			ALL SOURCES		
	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}
	5%	10%		5%	10%		5%	10%		5%	10%	
CLASS I AREAS												
Badlands NP	0	0	0.1	0	0	0.2	62	25	43	249	183	358
Bob Marshall W	0	0	0.0	0	0	0.0	23	13	59	30	19	71
Bridger W	0	0	0.3	0	0	0.5	41	28	68	207	146	840
Fitzpatrick W	0	0	0.3	0	0	0.5	41	22	82	152	99	554
Fort Peck IR	0	0	0.1	0	0	0.2	64	37	51	133	94	364
Gates of the Mountain W	0	0	0.0	0	0	0.0	61	33	81	76	45	121
Grand Teton NP	0	0	0.1	0	0	0.1	52	25	46	168	100	223
N. Absaorka W	0	0	0.3	0	0	0.5	105	54	93	160	101	407
North Cheyenne IR	3	1	10	7	1	15	209	113	90	298	235	416
Red Rock Lakes	0	0	0.0	0	0	0.0	49	25	36	91	49	77
Scapegoat W	0	0	0.0	0	0	0.0	35	24	122	47	33	173
Teton W	0	0	0.1	0	0	0.2	59	32	116	167	107	407
Theodore Roosevelt NP	0	0	0.2	0	0	0.2	65	32	59	198	143	440
UL Bend W	0	0	0.1	0	0	0.2	67	25	44	106	62	152
Washakie W	0	0	0.3	0	0	0.4	90	45	125	171	115	611
Wind Cave NP	0	0	0.2	0	0	0.3	71	30	29	291	206	468
Yellowstone NP	0	0	0.3	0	0	0.4	110	61	73	192	114	380
SENSITIVE CLASS II AREAS												
Absaorka Beartooth W	0	0	0.7	0	0	1.0	176	99	160	207	133	464
Agate Fossil Beds NM	0	0	0.1	0	0	0.2	43	16	24	259	195	299
Big Horn Canyon NRA	0	0	1.9	0	0	3.0	239	189	1147	356	313	1158
Black Elk W	0	0	0.2	0	0	0.4	60	28	32	270	176	469
Cloud Peak	1	0	6.8	1	1	10.2	110	60	79	212	142	414
Crow IR	3	0	8.3	8	2	12.1	365	350	710	365	358	714
Devils Tower NM	0	0	0.2	0	0	0.4	71	30	43	306	221	368
Fort Belknap IR	0	0	0.1	0	0	0.1	59	25	53	98	59	199
Fort Laramie NHS	0	0	0.1	0	0	0.2	40	13	23	262	200	417
Jedediah Smith W	0	0	0.1	0	0	0.1	48	25	47	164	99	215
Jewel Cave NM	0	0	0.4	0	0	0.5	64	29	37	291	190	507
Lee Metcalf W	0	0	0.1	0	0	0.1	156	108	172	186	130	183
Mt Naomi W	0	0	0.0	0	0	0.1	3	1	17	72	48	255
Mt Rushmore	0	0	0.2	0	0	0.3	59	26	32	260	173	454
Popo Agie W	0	0	0.3	0	0	0.5	40	28	63	183	118	933
Soldier Creek WA	0	0	0.1	0	0	0.2	62	20	30	274	210	323
Wellsville Mountain W	0	0	0.0	0	0	0.1	1	1	10	65	38	187
Wind River IR	0	0	0.4	0	0	0.5	104	59	155	282	220	1073

Table 4-3 Visibility - Method 6 and Monthly f(RH) values - Base Year

Receptor Set	MT CBNG Construction				MT CBNG Operation				ALL MT				ALL SOURCES			
	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}
	5%	10%			5%	10%			5%	10%			5%	10%		
CLASS I AREAS																
Badlands NP	0	0	0.1	0.1	0	0	0.1	0.1	53	20	25	14	271	206	217	118
Bob Marshall W	0	0	0.0	0.0	0	0	0.0	0.0	20	10	34	17	28	21	48	30
Bridger W	0	0	0.2	0.0	0	0	0.2	0.1	38	19	40	18	226	151	432	153
Fitzpatrick W	0	0	0.1	0.0	0	0	0.2	0.1	35	17	58	23	156	103	289	127
Fort Peck IR	0	0	0.1	0.0	0	0	0.2	0.1	55	25	26	17	120	79	168	77
Gates of the Mountain	0	0	0.0	0.0	0	0	0.0	0.0	66	39	60	34	85	52	113	52
Grand Teton NP	0	0	0.1	0.0	0	0	0.1	0.0	45	19	31	13	163	90	179	71
North Absaorka W	0	0	0.2	0.0	0	0	0.3	0.1	90	41	66	37	148	85	227	109
North Cheyenne IR	1	0	6.8	2.2	2	0	9.5	3.1	192	97	79	33	299	234	312	121
Red Rock Lakes	0	0	0.0	0.0	0	0	0.1	0.0	49	20	41	16	95	47	86	49
Scapegoat W	0	0	0.0	0.0	0	0	0.0	0.0	36	20	52	37	47	29	78	48
Teton W	0	0	0.1	0.0	0	0	0.2	0.0	53	21	64	23	149	87	245	108
Theodore Roosevelt NP	0	0	0.2	0.1	0	0	0.3	0.1	74	33	57	26	213	153	356	130
UL Bend W	0	0	0.1	0.0	0	0	0.1	0.0	79	27	43	21	125	62	139	48
Washakie W	0	0	0.2	0.0	0	0	0.3	0.1	75	38	85	43	169	109	333	143
Wind Cave NP	0	0	0.2	0.1	0	0	0.2	0.1	69	22	24	16	319	245	264	146
Yellowstone NP	0	0	0.2	0.0	0	0	0.2	0.0	102	45	64	30	187	102	206	91
SENSITIVE CLASS II AREAS																
Absaorka Beartooth W	0	0	0.4	0.1	0	0	0.6	0.1	170	100	135	45	201	131	265	109
Agate Fossil Beds NM	0	0	0.1	0.1	0	0	0.2	0.1	54	14	21	14	295	224	395	129
Big Horn Canyon NRA	0	0	1.2	0.6	0	0	1.9	0.9	245	189	1129	406	358	312	1137	430
Black Elk W	0	0	0.1	0.1	0	0	0.2	0.1	67	23	22	15	305	214	250	142
Cloud Peak	0	0	3.1	0.3	0	0	4.5	0.4	92	44	34	24	201	136	231	162
Crow IR	1	0	5.2	2.6	5	0	7.2	3.4	365	352	659	430	365	360	664	441
Devils Tower NM	0	0	0.2	0.1	0	0	0.3	0.2	82	29	29	17	324	260	268	130
Fort Belknap IR	0	0	0.1	0.0	0	0	0.1	0.0	56	21	44	26	100	52	131	45
Fort Laramie NHS	0	0	0.1	0.0	0	0	0.1	0.1	48	10	21	13	288	243	499	144
Jedediah Smith W	0	0	0.0	0.0	0	0	0.1	0.0	45	22	31	14	166	93	170	59
Jewel Cave NM	0	0	0.2	0.1	0	0	0.4	0.1	65	24	22	14	309	238	269	140
Lee Metcalf W	0	0	0.1	0.0	0	0	0.1	0.0	140	87	89	40	165	107	137	55
Mt Naomi W	0	0	0.0	0.0	0	0	0.1	0.0	4	1	12	3	78	51	194	70
Mt Rushmore	0	0	0.1	0.1	0	0	0.2	0.1	61	23	22	15	297	202	247	139
Popo Agie W	0	0	0.2	0.1	0	0	0.2	0.1	37	17	38	17	204	135	480	165
Soldier Creek WA	0	0	0.1	0.1	0	0	0.2	0.1	59	18	20	15	297	240	391	119
Wellsville Mountain W	0	0	0.0	0.0	0	0	0.1	0.0	1	0	8	2	62	36	156	54
Wind River IR	0	0	0.2	0.1	0	0	0.3	0.2	97	44	88	39	295	229	523	221

Table 4-4 Modeled Deposition for Nitrogen and Sulfur - Base Year

Note: Bold type with shading indicates a modeled impact that is above the Comparative Deposition Value

Receptor Set	POLLUTANT	*MT CBM Construction*	*MT CBM Operation*	*ALL MT*	*ALL SOURCES*	**Comparative Deposition Value (kg/ha - yr)**
CLASS I AREAS						
Badlands NP	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
Bridger W	Nitrogen	0.0	0.0	0.0	0.0	3
	Sulfur	0.0	0.0	0.0	0.0	5
Bob Marshall W	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
Fitzpatrick W	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
Fort Peck IR	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.1	5
Gates of the Mountain W	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.1	0.1	5
Grand Teton NP	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
North Absaorka W	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.1	0.2	5
North Cheyenne IR	Nitrogen	0.0	0.0	0.1	0.3	3
	Sulfur	0.0	0.0	0.2	0.4	5
Red Rock Lakes	Nitrogen	0.0	0.0	0.0	0.0	3
	Sulfur	0.0	0.0	0.0	0.1	5
Scapegoat W	Nitrogen	0.0	0.0	0.0	0.0	3
	Sulfur	0.0	0.0	0.0	0.0	5
Teton W	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.1	5
Theodore Roosevelt NP	Nitrogen	0.0	0.0	0.0	0.3	3
	Sulfur	0.0	0.0	0.0	0.3	5
UL Bend W	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.1	5
Washakie W	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.1	0.2	5
Wind Cave NP	Nitrogen	0.0	0.0	0.0	0.2	3
	Sulfur	0.0	0.0	0.0	0.3	5
Yellowstone NP	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.1	5
CLASS I / CLASS II SENSITIVE LAKES						
Black Joe Lake, Bridger WA	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
Deep Lake, Bridger WA	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
Emerald Lake, Cloud Peak WA	Nitrogen	0.0	0.0	0.0	0.2	3
	Sulfur	0.0	0.0	0.1	0.2	5
Florence, Cloud Peak WA,	Nitrogen	0.0	0.0	0.0	0.2	3
	Sulfur	0.0	0.0	0.1	0.2	5
Hobbs Lake, Bridger WA	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
Lower Saddlebag, Popo Agie WA	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
Ross Lake, Cloud Peak WA	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5
Upper Frozen Lake, Bridger WA	Nitrogen	0.0	0.0	0.0	0.1	3
	Sulfur	0.0	0.0	0.0	0.2	5

5.0 Preferred Alternative Modeling Analysis

5.1 Impacts Summary

This section summarizes the potential impacts for the revised Alternative H scenarios. Results are presented for the potential impacts associated with project CBNG emissions and can be compared to the base year by referring to Tables 4-1, 4-2 and 4-3. Cumulative results for all source groups combined (CBNG project sources plus all other source groups) are also included in Tables 5-1 through 5-5. In addition, Tables 5-4 and 5-5 show results from all Montana sources (includes all emission sources in Montana including project CBNG emissions). The discussion analyzes the impacts for the key receptors, which for this supplemental analysis include the Montana Near-Field, the Northern Cheyenne Indian Reservation, and the Crow Indian Reservation. Maps depicting the modeled results for each of the five scenarios evaluated are presented on Figures D-1 through D-28 in Appendix D. These figure present data on the projected emissions for NO_2, SO_2 and PM_{10} for the project CBNG Operations emission source group and the ALL Sources source group.

The impacts from CBNG development and operation are provided for each key receptor group. The modeling results showed that there are increased impacts over the base year levels, and there are some differences between impacts associated with the various control strategies. Comprehensive results from the model runs for air quality, visibility, and acid deposition are provided for all source groups and receptor groups in Appendix C. The five CBNG development scenarios that were evaluated are summarized as follows:

- Impacts from Alternative H Revised (1.5 g NO_x/bhp-hr, 240:10:1 ratio)
- Impacts from Scenario 1 (1.5 g NO_x/bhp-hr, 200:5:1 ratio)
- Impacts from Scenario 1A (50% of compressor operation and maintenance emissions from Scenario 1)
- Impacts from Scenario 2 (1.0 g NO_x/bhp-hr, 200:5:1 ratio)
- Impacts from Scenario 2A (50% of compressor operation and maintenance emissions from Scenario 2)

For each of the five CBNG development scenarios, the projected impacts on air quality were determined for each receptor group. The analyses for the key receptor groups are provided in Table 5-1 for the Montana near-field receptor grid, in Table 5-2 for the Northern Cheyenne Indian Reservation, and in Table 5-3 for the Crow Indian Reservation. The project CBNG impacts for construction and operation activities have been combined in Tables 5-1, 5-2, and 5-3 to provide a conservative estimate of total project impacts. In actuality, the impacts from different source groups are not arithmetically additive, as maximum impacts may occur at different receptors and/or at different times. Changes from these scenarios at other receptors were generally very minor or not detectable, but are provided in Appendix C.

Table 5-1 Potential Modeled Concentrations of NO_2, PM_{10}, $PM_{2.5}$ and SO_2 for Montana Near-Field Grid

Pollutant	Avg. Time	Project CBNG Impact Alt H Revised (μg/m³)	Project CBNG Impact Scenario 1 (μg/m³)	Project CBNG Impact Scenario 1A (μg/m³)	Project CBNG Impact Scenario 2 (μg/m³)	Project CBNG Impact Scenario 2A (μg/m³)	ALL Sources Montana Base Year (μg/m³)	PSD[1] Increment Class II (μg/m³)	NAAQS /[2] MAAQS (μg/m³)
NO2	Annual	2.41	1.93	1.09	1.39	0.81	3.91	25	100
	1-Hour	354	284	158	203	118	428	n/a	565
SO2	Annual	0.03	0.03	0.03	0.03	0.03	1.71	20	60
	24-Hour	0.21	0.21	0.19	0.21	0.19	15.1	91	260
	3-Hour	1.21	1.22	1.08	1.22	1.08	43.9	512	1,300
	1-Hour	4.09	4.12	3.65	4.12	3.65	140	n/a	1,300
PM10	Annual	0.64	0.61	0.40	0.59	0.39	3.52	17	50
	24-Hour	4.33	4.03	2.58	3.75	2.44	30.6	30	150
PM2.5	Annual	0.30	0.26	0.16	0.24	0.14	0.88	n/a	15
	24-Hour	2.18	1.86	1.11	1.60	0.98	6.83	n/a	35

Pollutant	Avg. Time	ALL Sources Impact Alt H Revised (μg/m³)	ALL Sources Impact Scenario 1 (μg/m³)	ALL Sources Impact Scenario 1A (μg/m³)	ALL Sources Impact Scenario 2 (μg/m³)	ALL Sources Impact Scenario 2A (μg/m³)	ALL Sources Montana Base Year (μg/m³)	PSD[1] Increment Class II (μg/m³)	NAAQS /[2] MAAQS (μg/m³)
NO2	Annual	3.5	3.32	3.00	3.11	2.90	3.91	25	100
	1-Hour	540	540	539	540	539	428	n/a	565
SO2	Annual	1.79	1.79	1.79	1.79	1.79	1.71	20	60
	24-Hour	15.1	15.1	15.1	15.1	15.1	15.1	91	260
	3-Hour	43.9	43.9	43.9	43.9	43.9	43.9	512	1,300
	1-Hour	140	140	140	140	140	140	n/a	1,300
PM10	Annual	2.88	2.88	2.87	2.87	2.86	3.52	17	50
	24-Hour	46.9	46.9	46.8	46.8	46.8	30.6	30	150
PM2.5	Annual	0.89	0.85	0.78	0.83	0.77	0.88	n/a	15
	24-Hour	7.01	6.95	6.77	6.90	6.72	6.83	n/a	35

[1]PSD Increment is to be compared directly to the modeled impact
[2]Background should be added to modeled impact for comparison to AAQS
n/a – not applicable

Table 5-2 Potential Modeled Concentrations of NO_2, PM_{10}, $PM_{2.5}$ and SO_2 for Northern Cheyenne Indian Reservation

Pollutant 1-Hour	Avg. Time	Project CBNG Impact Alt H Revised (µg/m³)	Project CBNG Impact Scenario 1 (µg/m³)	Project CBNG Impact Scenario 1A (µg/m³)	Project CBNG Impact Scenario 2 (µg/m³)	Project CBNG Impact Scenario 2A (µg/m³)	ALL Sources Montana Base Year (µg/m³)	PSD[1] Increment Class I (µg/m³)	NAAQS /[2] MAAQS (µg/m³)
NO2	Annual	0.65	0.52	0.29	0.37	0.22	3.91	2.5	100
		125	100	56	71.7	42	428	n/a	565
SO2	Annual	0.01	0.01	0.01	0.01	0.01	1.71	2	60
	24-Hour	0.07	0.08	0.07	0.08	0.07	15.1	5	260
	3-Hour	0.49	0.50	0.44	0.50	0.44	43.9	25	1,300
	1-Hour	1.50	1.52	1.34	1.52	1.34	140	n/a	1,300
PM10	Annual	0.20	0.19	0.12	0.18	0.12	3.52	4	50
	24-Hour	1.55	1.48	0.95	1.42	0.92	30.6	8	150
PM2.5	Annual	0.10	0.09	0.05	0.08	0.05	0.88	n/a	15
	24-Hour	0.76	0.64	0.38	0.57	0.34	6.83	n/a	35

Pollutant	Avg. Time	ALL Sources Impact Alt H Revised (µg/m³)	ALL Sources Impact Scenario 1 (µg/m³)	ALL Sources Impact Scenario 1A (µg/m³)	ALL Sources Impact Scenario 2 (µg/m³)	ALL Sources Impact Scenario 2A (µg/m³)	ALL Sources Montana Base Year (µg/m³)	PSD[1] Increment Class I (µg/m³)	NAAQS /[2] MAAQS (µg/m³)
NO2	Annual	2.27	2.15	1.84	2.0	1.85	3.91	2.5	100
	1-Hour	428	428	428	428	428	428	n/a	565
SO2	Annual	0.72	0.72	0.72	0.72	0.72	1.71	2	60
	24-Hour	4.70	4.70	4.70	4.70	4.70	15.1	5	260
	3-Hour	10.5	10.5	10.5	10.5	10.5	43.9	25	1,300
	1-Hour	30.7	30.7	30.7	30.7	30.7	140	n/a	1,300
PM10	Annual	1.32	1.31	1.24	1.30	1.23	3.52	4	50
	24-Hour	8.46	8.40	8.25	8.34	8.22	30.6	8	150
PM2.5	Annual	0.72	0.70	0.67	0.69	0.66	0.88	n/a	15
	24-Hour	6.02	5.97	5.85	5.92	5.82	6.83	n/a	35

[1]PSD Increment is to be compared directly to the modeled impact
[2]Background should be added to modeled impact for comparison to AAQS
n/a – not applicable

<u>Table 5-3 Potential Modeled Concentrations of NO_2, PM_{10}, $PM_{2.5}$ and SO_2 for Crow Indian Reservation</u>

Pollutant	Avg. Time	Project CBNG Impact Alt H Revised (µg/m³)	Project CBNG Impact Scenario 1 (µg/m³)	Project CBNG Impact Scenario 1A (µg/m³)	Project CBNG Impact Scenario 2 (µg/m³)	Project CBNG Impact Scenario 2A (µg/m³)	ALL Sources Montana Base Year (µg/m³)	PSD[1] Increment Class II (µg/m³)	NAAQS /[2] MAAQS (µg/m³)
NO2	Annual	1.18	0.94	0.53	0.67	0.39	3.91	25	100
	1-Hour	469	376	210	269	157	428	n/a	565
SO2	Annual	0.02	0.02	0.01	0.02	0.01	1.71	20	60
	24-Hour	0.17	0.17	0.15	0.17	0.15	15.1	91	260
	3-Hour	1.28	1.29	1.14	1.29	1.14	43.9	512	1,300
	1-Hour	5.42	5.46	4.84	5.46	4.84	140	n/a	1,300
PM10	Annual	0.33	0.31	0.20	0.29	0.19	3.52	17	50
	24-Hour	3.52	3.39	2.19	3.30	2.14	30.6	30	150
PM2.5	Annual	0.16	0.14	0.08	0.12	0.07	0.88	n/a	15
	24-Hour	1.49	1.29	0.79	1.29	0.75	6.83	n/a	35
Pollutant 1-Hour	Avg. Time	ALL Sources Impact Alt H Revised (µg/m³)	ALL Sources Impact Scenario 1 (µg/m³)	ALL Sources Impact Scenario 1A (µg/m³)	ALL Sources Impact Scenario 2 (µg/m³)	ALL Sources Impact Scenario 2A (µg/m³)	ALL Sources Montana Base Year (µg/m³)	PSD[1] Increment Class II (µg/m³)	NAAQS /[2] MAAQS (µg/m³)
NO2	Annual	7.15	7.14	7.13	7.13	7.12	3.91	25	100
		1,589	**1,589**	**1,589**	**1,589**	**1,589**	428	n/a	565
SO2	Annual	2.62	2.62	2.62	2.62	2.62	1.71	20	60
	24-Hour	16.5	16.5	16.5	16.5	16.5	15.1	91	260
24-Hour	3-Hour	106	106	106	106	106	43.9	512	1,300
	1-Hour	254	254	254	254	254	140	n/a	1,300
PM10	Annual	15.5	15.4	15.4	15.4	15.4	3.52	17	50
		205	**205**	**205**	**205**	**205**	30.6	30	150
PM2.5	Annual	0.83	0.81	0.77	0.80	0.76	0.88	n/a	15
	24-Hour	7.57	7.56	7.55	7.56	7.55	6.83	n/a	35

[1]PSD Increment is to be compared directly to the modeled impact
[2]Background is to be added to modeled impact for comparison to AAQS
n/a – not applicable **bold text indicates potential exceedance**

5.2 Direct Project Impacts (RFD)

This section describes the CALPUFF model predicted direct project impacts for reasonably foreseeable development of CBNG within the project planning area. Only impacts directly attributed to project CBNG construction and operations are discussed in this section. Comprehensive details of modeled emission impacts are provided in Appendix C.

This section also provides discussion of potential project related CBNG impacts as they pertain to Potential for Significant Deterioration (PSD) increment thresholds within the Class I and Class II areas located in the model domain. All National Environmental Policy Act (NEPA) analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD increment consumption analysis.

5.2.1 Alt. H Revised (Compression Ratio 240:10:1 @ 1.5g/bhp-hr)

Under the Alternative H Revised modeling, potential direct project CBNG impacts for both operation and construction activities are below applicable standards for NO_2, SO_2, PM_{10} and $PM_{2.5}$ at the Montana Near-Field receptor grid. Similar results are seen at the Northern Cheyenne Indian Reservation and the Crow Indian Reservation. The predicted project CBNG operation impacts at the Crow Indian Reservation indicate a 1-hour NO_2 ambient concentration of 425 micrograms per cubic meter ($\mu g/m^3$) in comparison with a NAAQS standard of 565 $\mu g/m^3$. Combined project CBNG construction and operation impacts shown in Tables 5-1 through 5-3 as "Project CBNG" indicate that Class I PSD increment levels for at the Northern Cheyenne Indian Reservation and Class II PSD increment levels at the Montana near-field and Crow Indian Reservation receptors would not be exceeded. Combined project CBNG impacts would not exceed the MAAQS as well.

5.2.2 Scenario 1 (Compression Ratio 200:5:1 @ 1.5g/bhp-hr)

Potential direct project CBNG impacts for both operation and construction activities are below applicable standards for NO_2, SO_2, PM_{10} and $PM_{2.5}$ at the Montana Near-Field, Northern Cheyenne Indian Reservation, and Crow Indian Reservation receptor grids under Scenario 1. Impacts for SO_2 would be unchanged from the Alternative H Revised Scenario at the Montana Near-Field and Crow Indian Reservation receptors, and only slightly increased at the Northern Cheyenne Indian Reservation receptors. Combined project CBNG impacts shown in Tables 5-1 through 5-3 as "Project CBNG" are decreased from the Alternative H Revised Scenario, and are still below both Class I and Class II PSD increment levels at all receptors.

5.2.3 Scenario 1A (50 Percent Reduction of Scenario 1 Compressor Operation and Maintenance Emissions)

Scenario 1A potential impacts are less than the impacts described in the Alternative H Revised Scenario, Scenario 1, and Scenario 2 for SO_2, but are the same as the SO_2 impacts predicted by Scenario 2A. Similar results are seen with other modeled pollutants, with the exception that impacts are slightly higher than those predicted by Scenario 2A. Combined project CBNG impacts shown in Tables 5-1 through 5-3 as “Project CBNG” are decreased from the Alternative H Revised Scenario, Scenario 1, and Scenario 2. Combined project CBNG impacts are still below both Class I and Class II PSD increment levels at all receptors.

5.2.4 Scenario 2 (Compression Ratio 200:5:1 @ 1.0g/bhp-hr)

The model predicted potential impacts under Scenario 2 are less than those of Scenario 1, with direct project CBNG construction and operation impacts well below any applicable standard for NO_2, SO_2, PM_{10} and $PM_{2.5}$ at the Montana Near-Field receptor grid and on the Northern Cheyenne Indian Reservation and the Crow Indian Reservation. The predicted impacts at the Crow Indian Reservation indicate a decrease in the 1-hour NO_2 ambient concentration from the project CBNG operation source to 225 $\mu g/m^3$. Combined project CBNG impacts shown in Tables 5-1 through 5-3 as “Project CBNG” are still below both Class I and Class II PSD increment levels at all receptors.

5.2.5 Scenario 2A (50 Percent Reduction of Scenario 2 Compressor Operation and Maintenance Emissions)

As would be anticipated with a 50 percent reduction in Scenario 2 emissions from the CBNG field and sales compressor operation and maintenance emissions, potential direct impacts at the Montana Near-Field receptor grid and on the Northern Cheyenne Indian Reservation and the Crow Indian Reservation are further reduced from Scenario 2. The predicted impacts at the Crow Indian Reservation indicate a further reduction in the 1-hour NO_2 ambient concentration to 113 $\mu g/m^3$. Combined project CBNG impacts shown in Tables 5-1 through 5-3 as “Project CBNG” are still below both Class I and Class II PSD increment levels at all receptors.

5.3 Potential Visibility Impacts

Table 5-4 shows the impacts at the Northern Cheyenne Indian Reservation and the Crow Indian Reservation for the base year, and each of the modeled Alternative H scenarios. Results are provided separately for the Montana project CBNG construction and operation, as well as combined Montana project CBNG construction and operation with RFFA sources as the All Montana and All Sources source groups. Comprehensive details of the modeling results are given in Appendix C and the key impacts under the Method 2 approach are summarized in Table 5-4. Visibility impacts for each of the scenarios for the Northern Cheyenne Indian Reservation and Crow Indian Reservation under Method 6 are summarized in Table 5-5.

5.3.1 Method Two

Potential impacts at Northern Cheyenne Indian Reservation from project CBNG construction are reduced slightly from the Alternative H Revised Scenario through Scenario 2A. For this construction source group there are no days with impacts greater than 10% of the background at either the Northern Cheyenne Indian Reservation or the Crow Indian Reservation. For project CBNG operation there are 35 days per year with impacts above 10% at the Northern Cheyenne Indian Reservation for Scenario 1, but the number of days drops to 2 per year for Scenario 2A. The number of days with impacts above 10% at the Crow Indian Reservation drops from 87 days per year for Scenario 1 to 11 days per year under.

Table 5-4 Potential Visibility Impacts – Method 2 - Summary

Receptor Set	Project CBNG Construction			Project CBNG Operation			ALL MT			ALL SOURCES		
	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}
	5%	10%		5%	10%		5%	10%		5%	10%	
Northern Cheyenne Indian Reservation Class I												
Base Year	3	1	10	7	1	15	209	113	90	298	235	416
Revised Alternative H	2	0	6.0	129	55	51.1	357	279	186.0	363	314	467.7
Scenario 1	2	0	6.0	108	35	40.1	357	276	177.6	363	314	461.6
Scenario 1A	1	0	5.0	35	7	20.1	353	269	170.3	363	310	450.8
Scenario 2	2	0	6.0	67	17	27.7	354	273	173.0	363	312	454.8
Scenario 2A	1	0	5.0	17	2	13.9	353	264	168.0	363	308	447.4
Crow Indian Reservation Class II												
Base Year	3	0	8.3	8	2	12.1	365	350	710	365	358	714
Revised Alternative H	17	0	8.3	195	107	71.0	365	365	>1,000	365	365	>1,000
Scenario 1	17	0	8.3	169	87	55.6	365	365	>1,000	365	365	>1,000
Scenario 1A	7	0	6.7	87	29	28	365	365	>1,000	365	365	>1,000
Scenario 2	17	0	8.3	141	60	38.1	365	365	>1,000	365	365	>1,000
Scenario 2A	7	0	6.7	60	11	19.1	365	365	>1,000	365	365	>1,000

Table 5-5 Potential Visibility Impacts – Method 6 and Monthly f(RH) values - Scenarios

Receptor Set	Project CBNG Construction				Project CBNG Operation				ALL MT				ALL SOURCES			
	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}
	5%	10%			5%	10%			5%	10%			5%	10%		
Northern Cheyenne Indian Reservation Class I																
Base Year	1	0	5.0	2.2	2	0	9.5	3.1	192	97	79	33	299	234	312	121
Revised Alternative H	1	0	5.0	2.6	97	24	21.9	17.1	356	271	140.7	68.5	364	316	339.2	156.1
Scenario 1	1	0	5.0	2.6	64	19	18.6	13.9	356	268	139.1	65.7	364	314	337.89	154.4
Scenario 1A	1	0	5.0	2.6	20	0	9.3	7.0	355	261	136.1	61.2	364	311	335.4	151.5
Scenario 2	1	0	5.0	2.6	37	7	15.2	9.9	355	264	137.3	62.6	364	312	336.40	152.6
Scenario 2A	1	0	5.0	2.6	7	0	7.6	4.9	354	257	135.2	60.8	364	310	334.68	150.5
Crow Indian Reservation Class II																
Base Year	1	0	5.2	2.6	5	0	7.2	3.4	365	352	659	430	365	360	664	441
Revised Alternative H	7	0	6.7	4.9	173	82	36.7	27.7	365	365	999.5	651.9	365	365	>1,000	666.9
Scenario 1	7	0	6.7	4.9	146	61	29.2	22.0	365	365	999.5	651.3	365	365	>1,000	664.8
Scenario 1A	7	0	6.7	4.9	61	11	14.6	11.0	365	365	999.5	650.3	365	365	>1,000	663.2
Scenario 2	7	0	6.7	4.9	118	38	21.1	16.6	365	365	999.5	650.7	365	365	>1,000	663.6
Scenario 2A	7	0	6.7	4.9	38	3	10.6	8.3	365	365	999.5	649.9	365	365	>1,000	662.8

Scenario 2A. Note that the maximum percentage impact also is reduced with each succeeding scenario. For all sources combined, the model continues to predict impacts on visibility, largely due to the proximity of receptors to the nearby large sources (e.g., Colstrip power plants and coal mine and RFFA CBNG emissions). It is clear that visibility impacts can be substantially reduced with the controls and operations that are applied under Scenario 2A

5.3.2 Method Six

In general, Method 6 predicts slightly lower potential impacts than Method 2. Technically the method involves the evaluation of the eighth highest impact in each calendar year. The impacts for CBNG construction continue to have zero days with impacts above 10% for both receptor groups. The impacts from CBNG operation are less than those of Method 2. For Northern Cheyenne Indian Reservation those impacts are roughly half the Method 2 results for 10% impacts. The number of days impacted at Crow Indian Reservation for this method is also less than the number of days impacted under Method 2. Note that, at the Northern Cheyenne Indian Reservation under Scenarios 1A and 2A there are zero days predicted with impacts above 10% from CBNG construction and operation. At the Crow Indian Reservation there are only 3 days with impacts greater than 10% under Scenario 2A. Impacts for all sources in terms of the number of days with impacts above 10% are nearly identical to the results of Method 2.

5.4 Acid Deposition Impacts

The acid deposition rates for nitrogen and sulfur compounds from project CBNG operation and construction are below established thresholds which are 3 kilograms per hectare per year (kg/ha-year) for nitrogen compounds and 5 kg/ha-year for sulfur compounds (Fox, et. Al. 1989). Complete results are provided in Appendix C, with the base year summary in Table 4-4. A careful examination of those results shows that there are no exceedances of applicable regulatory thresholds for any of the modeled scenarios.

5.5 Cumulative Impacts (Existing Sources+RFD + RFFA Sources)

The cumulative impacts analysis discussion which follows describes the combined effects of project CBNG development sources with reasonably foreseeable future action sources and existing sources which may contribute to potential air quality impacts within the project planning area (Additional detail on potential modeled emissions is provided within the tables in Appendix C). Model results indicate the potential to exceed the 1-hour NO_2 and the 24-hour PM_{10} ambient air quality standards on the Crow Indian Reservation as well as the Class II PSD increment for 24-hour PM_{10}. The Montana Near-Field shows a potential to exceed the Class II PSD increment for 24-hour PM_{10}. There is also a potential to exceed the Class I PSD increment for 24-hour PM_{10} at the Northern Cheyenne Indian Reservation. Cumulative impacts to the key receptors from the All Montana source group and the All Sources source group are very similar between all modeled scenarios. This indicates that there is most likely a dominant emission source in the RFFA CBNG emissions which affects the impacts at a given receptor.

5.5.1 Alt. H Revised (Compression Ratio 240:10:1 @ 1.5g/bhp-hr)

The cumulative impacts under the Alternative H Revised scenario for the Montana Near-Field receptor grid indicate that there are no exceedances of air quality standards predicted (Additional detail on potential modeled emissions is provided within the tables in Appendix C). The 1-hour NO_2 ambient concentration for the All Montana source group is 539 μg/m^3 and for the All Sources source group is 540 μg/m^3. Thus, while the standard is not exceeded, the model predicts that there is a potential for impact to this standard. Cumulative impacts at the Northern Cheyenne Indian Reservation are all predicted to be below any applicable air quality standards. On the Crow Indian Reservation cumulative impacts to the 1-hour NO_2 standard and the 24-hour PM_{10} standard are predicted to be exceeded in the All Montana and All Source group categories. The 1-hour NO_2 is 1,589 μg/m^3 for both of these source groups in comparison with a standard of 565 μg/m^3, and the 24-hour PM_{10} is 205 μg/m^3 in comparison with a standard of 150 μg/m^3. The Base Year impacts for the All Montana and All Sources source groups for 1-hour NO_2 is 428 μg/m^3 indicating an increase of 1,161 μg/m^3, and the 24-hour PM_{10} is 134 and 135 μg/m^3 indicating an increase of 103.4 μg/m^3 above the Base Year for the All Sources source group and 104.4 μg/m^3 for the All Montana source group. The increase in 24-hour PM_{10} is above the PSD increment of 30 μg/m^3 for Class II areas. All other impacts are below any applicable air quality standard.

5.5.2 Scenario 1 (Compression Ratio 200:5:1 @ 1.5g/bhp-hr)

Cumulative impacts under Scenario 1 for the Montana near field receptor grid indicate that there are no exceedances of air quality standards predicted (Additional detail on potential modeled emissions is provided within the tables in Appendix C). The 1-hour NO_2 ambient concentration for the All Montana source group is 539 μg/m^3 and for the All Sources source group is 540 μg/m^3. While the standard is not exceeded, the model predicts that there is a potential for impact to this standard. At the Northern Cheyenne Indian Reservation cumulative impacts are all predicted to be below any applicable air quality standards. Cumulative impacts to the 1-hour NO_2 standard and the 24-hour PM_{10} standard on the Crow Indian Reservation are predicted to be exceeded in the All Source group category. The 1-hour NO_2 is 1,589 μg/m^3 in comparison with a standard of 565 μg/m^3, and the 24-hour PM_{10} is 205 μg/m^3 in comparison with a standard of 150 μg/m^3. All other impacts are below any applicable air quality standard.

5.5.3 Scenario 1A (50 Percent Reduction of Scenario 1 Compressor Operation and Maintenance Emissions)

There is a small difference between Scenario 1A and Scenario 1 cumulative impacts at the Montana near field receptor grid. The 1-hour NO_2 ambient concentration for the All Montana source group and All Sources source group is 539 μg/m^3. Cumulative impacts to the Northern Cheyenne Indian Reservation are all predicted to be below any applicable air quality standards. The same results for cumulative impacts to the 1-hour NO_2 standard and the 24-hour PM_{10} standard on the Crow Indian Reservation are predicted under Scenario 1A as in Scenario 1. All other impacts are below any applicable air quality standard.

5.5.4 Scenario 2 (Compression Ratio 200:5:1 @ 1.0g/bhp-hr)

There is no difference between Scenario 2 and Scenario 1 cumulative impacts at the Montana near field receptor grid. This indicates that there is most likely a dominant emission source in the RFFA source emissions or other existing emission sources (such as the Colstrip power plants and coal mine) which affects the impacts at a specific receptor. Cumulative impacts to the Northern Cheyenne Indian Reservation are all predicted to be below any applicable air quality standards. The same results for cumulative impacts to the 1-hour NO_2 standard and the 24-hour PM_{10} standard on the Crow Indian Reservation are predicted under Scenario 2 as in Scenario 1. All other impacts are below any applicable air quality standard.

5.5.5 Scenario 2A (50 Percent Reduction of Scenario 2 Compressor Operation and Maintenance Emissions)

There is a small difference between Scenario 2A and Scenario 2 cumulative impacts at the Montana near field receptor grid. The 1-hour NO2 ambient concentration for the All Montana source group and All Sources source group is 539 $\mu g/m^3$. Cumulative impacts to the Northern Cheyenne Indian Reservation are all predicted to be below any applicable air quality standards. The same results for cumulative impacts to the 1-hour NO_2 standard and the 24-hour PM_{10} standard on the Crow Indian Reservation are predicted under Scenario 2A as in Scenario 1. All other impacts are below any applicable air quality standard.

5.6 Tongue River Railroad

The results from the revised modeling effort shown in Table 5-6 indicate that the reductions in emissions and the reconfiguration of the Tongue River Railroad sources led to reductions in visibility impacts at nearby sensitive Class I and Class II areas, and no notable reductions in impacts at the more distant sensitive area receptors.

In the original configuration, the Tongue River Railroad emissions led to measurable impacts on the Northern Cheyenne Indian Reservation and on the Crow Indian Reservation. Originally, the number of days with impacts above 1.0 deciview was 23 days for the Northern Cheyenne Indian Reservation, 8 days for the Crow Indian Reservation, and 2 days at the Cloud Peak Wilderness area. As a result of modifying the source configuration, those numbers dropped to one day at the Northern Cheyenne and zero days at the Crow Indian Reservation and Cloud Peak Wilderness area. The reconfiguration of the emission source points demonstrates that the Tongue River Railroad by itself does not have the potential to cause any impacts on visibility at any mandatory Class I or Class II areas.

Table 5-6
Visibility Impacts of Original Versus Revised Tongue River Railroad Source

Receptor Set	Original Analysis Tongue River Railroad				Revised Source Configuration Tongue River Railroad			
	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}
	5%	10%			5%	10%		
CLASS I AREAS								
Badlands NP Class I	0	0	1	1	0	0	0	0
Bob Marshall W Class I	0	0	0	0	0	0	0	0
Bridger W Class I	0	0	2	1	0	0	0	0
Fitzpatrick W Class I	0	0	2	0	0	0	0	0
Fort Peck IR Class I	0	0	2	1	0	0	0	0
Gates of the Mountain W Class I	0	0	1	0	0	0	0	0
Grand Teton NP Class I	0	0	1	0	0	0	0	0
North Absaroka W Class I	0	0	3	1	0	0	1	0
North Cheyenne IR Class I	71	23	27	14	1	0	7	3
Red Rock Lakes Class I	0	0	1	0	0	0	0	0
Scapegoat W Class I	0	0	1	0	0	0	0	0
Teton W Class I	0	0	1	0	0	0	0	0
Theodore Roosevelt NP Class I	0	0	3	1	0	0	1	0
UL Bend W Class I	0	0	2	1	0	0	0	0
Washakie W Class I	0	0	2	1	0	0	0	0
Wind Cave NP Class I	0	0	2	1	0	0	0	0
Yellowstone NP Class I	0	0	3	0	0	0	1	0
SENSITIVE CLASS II AREAS								
Absaroka Beartooth W Class II	1	0	6	1	0	0	1	0
Agate Fossil Beds NM Class II	0	0	1	1	0	0	0	0
Big Horn Canyon NRA Class II	3	0	7	3	0	0	1	1
Black Elk W Class II	0	0	2	1	0	0	0	0
Cloud Peak Class II	4	2	24	3	0	0	5	1
Crow IR Class II	27	8	21	11	0	0	5	2
Devils Tower NM Class II	0	0	2	1	0	0	0	0
Fort Belknap IR Class II	0	0	2	1	0	0	0	0
Fort Laramie NHS Class II	0	0	1	1	0	0	0	0
Jedediah Smith W Class II	0	0	1	0	0	0	0	0
Jewel Cave NM Class II	0	0	2	1	0	0	0	0
Lee Metcalf W Class II	0	0	2	0	0	0	0	0
Mt Naomi W Class II	0	0	1	0	0	0	0	0
Mt Rushmore Class II	0	0	2	1	0	0	0	0
Popo Agie W Class II	0	0	2	1	0	0	0	0
Soldier Creek WA Class II	0	0	1	1	0	0	0	0
Wellsville Mountain W Class II	0	0	0	0	0	0	0	0
Wind River IR Class II	0	0	3	1	0	0	1	0

6.0 Other Revisions to Draft SEIS

6.1 Monitoring

Monitoring would be conducted according to the following parameters (see Table 6-1) which are also contained in the Draft SEIS Monitoring Appendix.

 SUPPLEMENTAL AIR QUALITY ANALYSIS

Table 6-1 Monitoring

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
AIR QUALITY	Gaseous and particulate critical air pollutants	area-wide	air quality modeling and ambient air samples	$\mu g/m^3$ and parts per million concentrations as ($\mu g/m^3$)	hourly to 24 hr samples as per standards	predicted or measured exceedances of NAAQS and/or PSD increments by MDEQ	implement additional emission controls or operating limits
	Gaseous and particulate critical air pollutants	Birney/Ashl and area	ambient air samples	$\mu g/m^3$ and parts per million concentrations as ($\mu g/m^3$)	hourly to 24 hr samples as per standards	before expanded development activity	implement additional emission controls or operating limits
	Gaseous and particulate critical air pollutants	area-wide	emission inventory	lbs/hr and tons/yr	annually	continuous	require submittal of annual reports
	Cumulative compressor horsepower	area-wide	tracking	horsepower	continuous	when horsepower requirements for CBNG wells in the Montana portion of the PRB exceed 133,956	subsequent visibility modeling; if it indicates unacceptable impacts would occur at a future point in the PRB development, the modeling work would include mitigation scenarios

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