NATURAL EVENTS ACTION PLAN

FOR THE COAL MINES OF THE

POWDER RIVER BASIN

Of

Campbell & Converse Counties, Wyoming

Wyoming Department of Environmental Quality

Air Quality Division

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October 2006

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LIST OF ACRONYMS

AQD	Wyoming DEQ, Air Quality Division
AQS	Air Quality System
BACM	Best Available Control Measures
BACT	Best Available Control Technology
BLM	Bureau of Land Management
BTM	Black Thunder Mine
DEQ	Wyoming Department of Environmental Quality
EPA	United States Environmental Protection Agency
LQD	Wyoming DEQ, Land Quality Division
MRP	Mitigative Response Plan
NARM	North Antelope Rochelle Mine
NEAP	Natural Events Action Plan
NEP	Natural Events Policy
NRM	North Rochelle Mine
NWS	National Weather Service
PM_{10}	Particulate Matter of 10 microns or less aerodynamic diameter
PMT	Post Mining Topography
PRB	Powder River Basin
SIP	State Implementation Plan
TEOM	Continuous PM Monitor (Tapered Element Oscillating Microbalance)
USFS	United States Forest Service
WMA	Wyoming Mining Association

DEFINITIONS

Blowing Dust Health Advisory Alert—Public notification that a high wind/blowing dust event is imminent or is currently taking place.

High Wind Alert—When average hourly wind speeds of 30 mph or greater are forecast by the National Weather Service; forecast winds trigger the issuance of a Blowing Dust Advisory Alert. Elderly citizens, young children, and individuals with respiratory problems are advised to avoid excessive physical exertion and minimize outdoor activities during a high wind alert. Although these people are most susceptible to health impacts, it is recommended that everyone take precautions to avoid exposure to poor air quality conditions.

High Wind Event—When average hourly wind speeds of 20 mph or greater are present. The trigger for affected mines to implement reactionary measures.

Natural Event—A 'natural event' can be any seismic/volcanic, wildland fire, or high wind event. For purposes of this plan it refers to a high wind event.

1.0 EXECUTIVE SUMMARY

A number of Federal Reference or Equivalent PM_{10} monitors are located in Wyoming's Powder River Basin (PRB) at several large mining operations. Some of the monitors have recorded exceedances of the 24-hour National Ambient Air Quality Standard (NAAQS) for PM_{10} (particulate matter having a nominal aerodynamic equal to or less than 10 microns). Each of the monitored exceedances was associated with high winds and blowing dust resulting from prolonged periods of low precipitation and consequential low soil moisture content. Appendix A contains a summary of the PM_{10} measurements and wind speed data during the drought of the past several years.

On May 30, 1996, the Environmental Protection Agency (EPA) issued a Natural Events Policy (NEP) [1] which recognized that certain uncontrollable natural events, such as high winds, wildland fires, and volcanic/seismic activity can result in adverse consequences for the NAAQS. The NEP set forth procedures for protecting public health through the development of a Natural Events Action Plan (NEAP) which implements Best Available Control Measures (BACM) for human-generated particulate emissions in areas where the PM_{10} standard may be violated due to these uncontrolled natural events. The NEP also provides that if an approved NEAP is implemented, future air quality exceedances due to uncontrollable natural events may be flagged, and, if demonstrated to be a natural event, not be considered when determining the region's air quality designation if BACM measures are being implemented. The guiding principles of the policy are:

1. Protection of public health is the highest priority of the Federal, State and local air pollution control agencies.
2. The public must be informed whenever air quality in an area is unhealthy.
3. All valid ambient air quality data should be submitted to the EPA Air Quality System (AQS) and made available for public access.
4. Reasonable measures safeguarding public health must be taken regardless of the source of PM_{10} emissions.
5. Emission controls should be applied to sources that contribute to exceedances of the PM_{10} NAAQS when those controls will result in fewer violations of the standards.

In response to the measured exceedances of the PM_{10} NAAQS as the result of dust generated by high winds and in anticipation of possible future exceedances, the Wyoming Department of Environmental Quality, Air Quality Division and stakeholders have developed this NEAP for the Powder River Basin of Wyoming. The Wyoming Mining Association has held approximately six working sessions (November 11, 2004; December 1, 2004; December 17, 2004; January 17, 2005; February 23, 2005; and

[1] Natural Events Policy (NEP) Memorandum. EPA, May 30, 1996.

September 12, 2005) to assist the Air Quality Division in developing this NEAP.

All coal mines in the Wyoming PRB employ Best Available Control Technology (BACT). This Natural Events Action Plan for the Powder River Basin identifies BACT measures in place as the result of existing permit requirements, additional potential control measures identified as BACM, and reactionary control measures directed at transient problem sites that may be implemented during Natural Events. Implementation of BACT, BACM, and reactionary control measures will assure that anthropogenic dust emissions from the coal mines in the PRB are controlled to the greatest extent possible. The goal is to protect public health and to minimize exceedances of the PM_{10} NAAQS through the continued implementation of BACT, and implementation of BACM and reactionary control measures.

2.0 INTRODUCTION

The Powder River Basin of Wyoming is bounded by the Black Hills uplift on the east; the Big Horn Mountains on the west; the Hartville Uplift, Casper-Arch, and Laramie Mountains on the south. Elevations range from less than 2,500 ft. to greater than 6,000 ft. above sea level. The climate is semi-arid (10 – 15 inches of precipitation annually) with vegetation that is primarily sagebrush and mixed grass prairie. The basin experiences relatively large seasonal and diurnal variation in temperature and seasonal variations in precipitation. Winds are largely affected by local topographic features and are predominantly from the northwest or southeast. The winds tend to be strongest in the winter and spring and calmer in the summer. The average annual wind speed measured at the Campbell County Airport near Gillette (period of record 1992-2002) is 10.0 miles per hour (mph).

The average daily mean temperature is approximately 44°F. The highest recorded temperatures at Wright have been 103°F with the lowest a -34°F. July is normally the warmest month, with a mean daily temperature of 70°F, and January the coldest at 21°F.

The average annual precipitation for Gillette (period of record 1925-2004) is 15.62 inches. The highest recorded annual precipitation was 26.4 inches in 1982 with a lowest of 8.1 inches in 1936. Average seasonal distribution is: Winter – 1.72 inches, Spring – 5.43 inches, Summer – 5.36 inches, and Fall – 3.10 inches. Since 1996, the average annual precipitation has been 14.29 inches with a low in 2004 of 10.30 inches and a high of 23.56 inches in 1998.

The Powder River Basin Area identified in this Natural Events Action Plan is the area bounded by Township 40 through 52 North, and Range 69 through 73 West, inclusive of the Sixth Principal Meridian, Campbell and Converse Counties, Wyoming. This area is an active energy development region whose industrial activities include surface coal mining, oil and gas production, coal bed natural gas production, and coal fired electrical generation. There are fourteen surface coal mines in the described area, which produce almost 400 million tons of subbituminous coal annually, see Figures 1, 2, and 3.

Figure 1: Coal Mine Locations in the Northern Powder River Basin

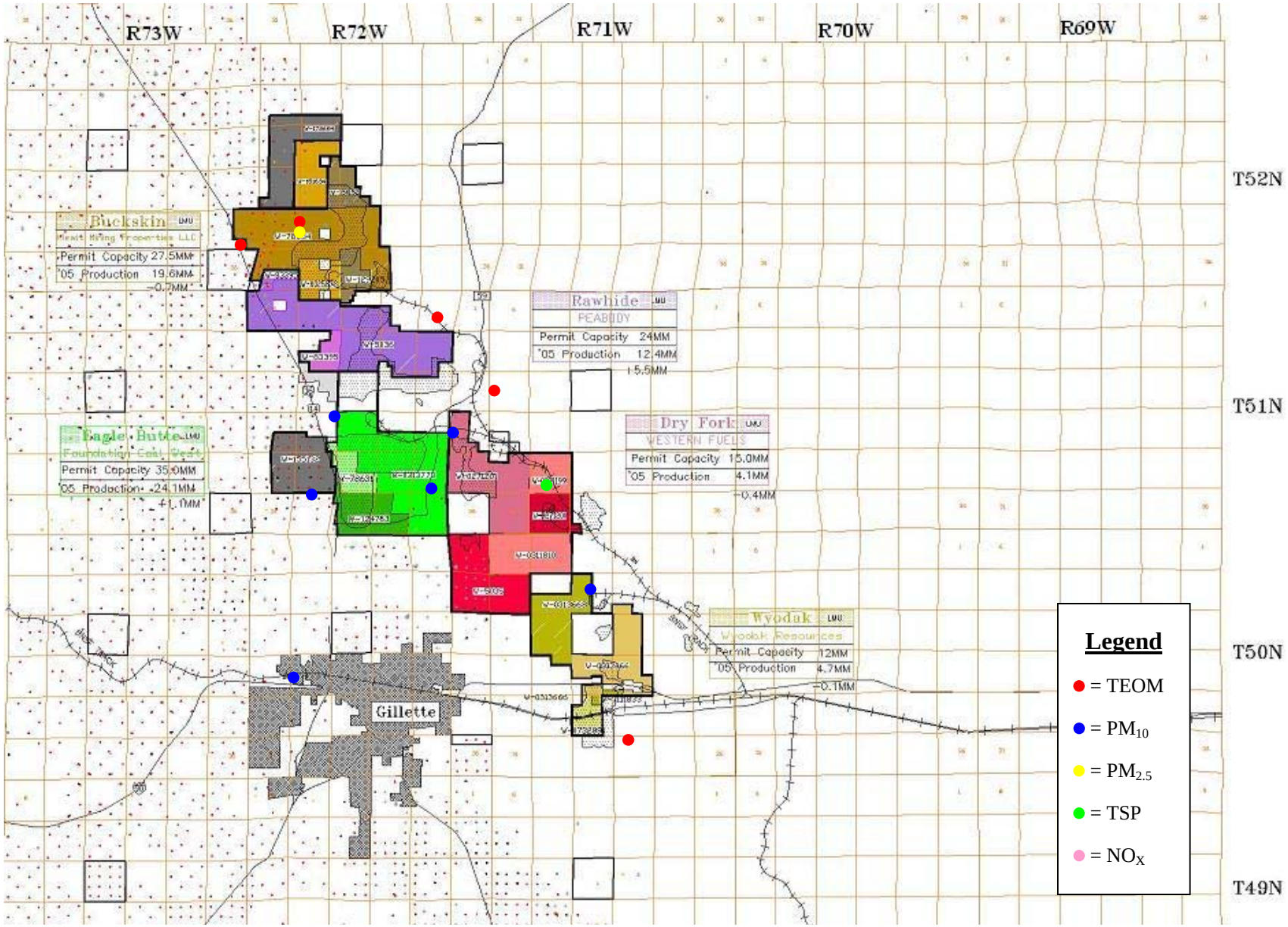


Figure 2: Coal Mine Locations in the Central Powder River Basin

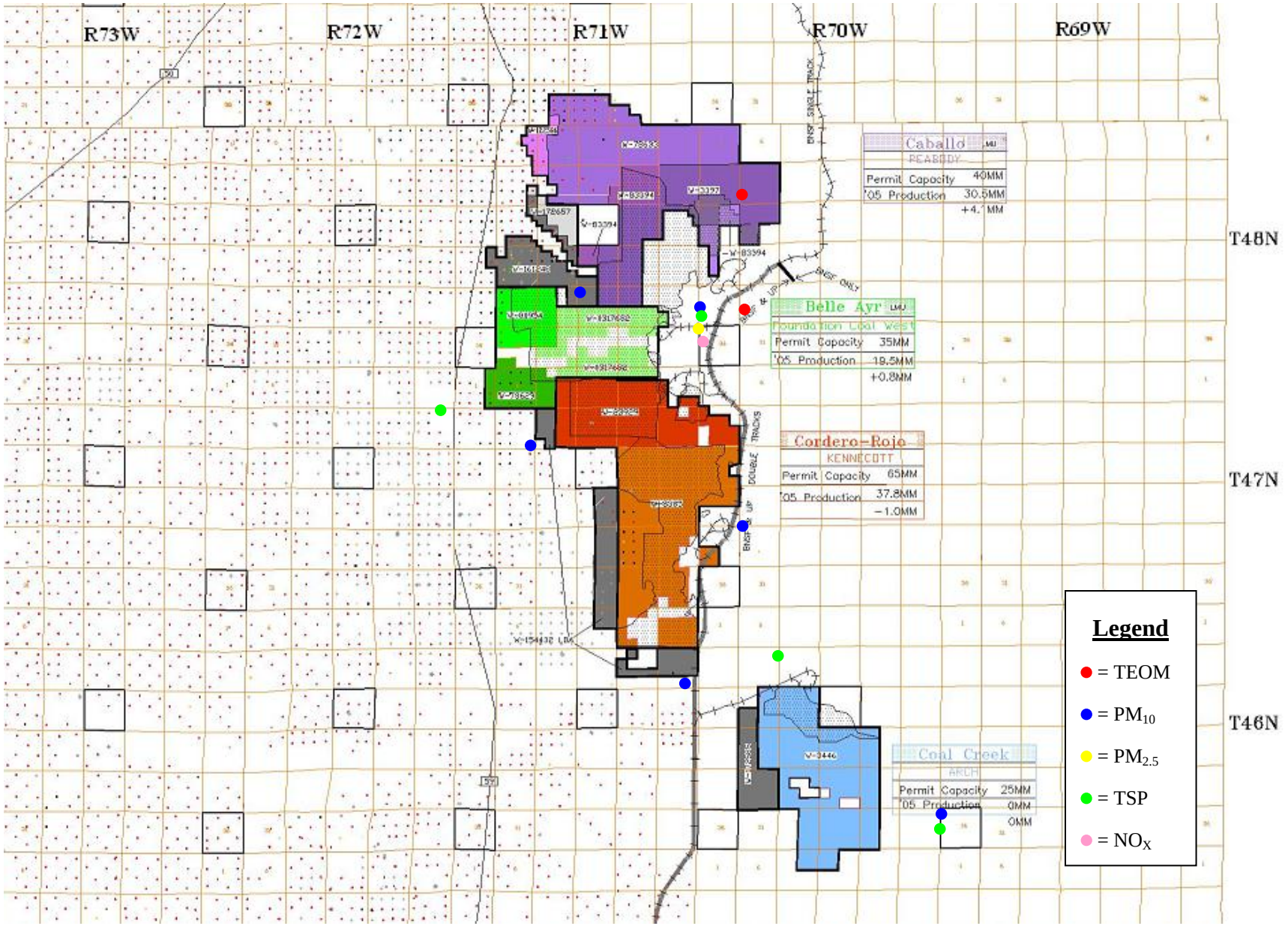
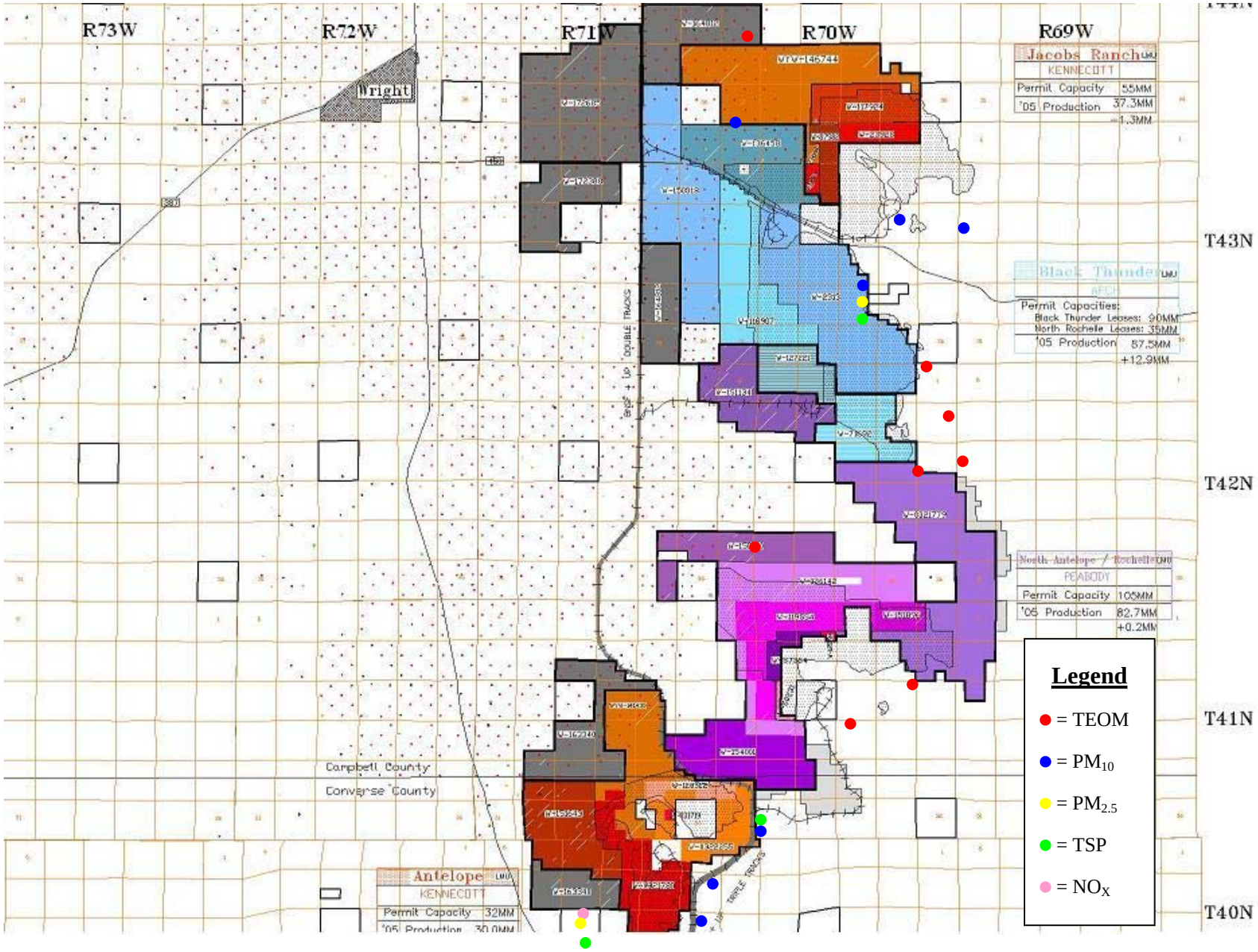


Figure 3: Coal Mine Locations in the Southern Powder River Basin



These mines have an extensive air quality monitoring system as required by State and Federal regulations and their individual air quality permits.

The mines have implemented Best Available Control Technology (BACT) to address point source emissions (coal crushing, storage, and handling facilities) with baghouse dust collection systems, passive emission control systems, or atomizers/foggers. Fugitive emissions are controlled by a variety of methods which include, but are not limited to paving of mine access roads, application of water and chemical dust suppressants on haul roads, speed limits on haul roads, minimization of material drop heights for shovels and draglines, timely permanent and temporary revegetation of disturbed areas, and stilling sheds on truck dumps.

The recent exceedances of the PM_{10} NAAQS have been associated with high wind speeds and drought conditions. The circumstances associated with the exceedances have provided adequate reason for the Division to believe that high wind events and blowing dust have caused exceedances of the NAAQS that otherwise would not have occurred.

Recognizing the need to protect public health in the Powder River Basin where measured PM_{10} values have exceeded the NAAQS because of wind generated dust; the State of Wyoming has prepared a Natural Events Action Plan based on EPA Natural Event Policy (NEP) guidance. This plan outlines specific procedures to be taken in response to future high wind events. In short, the purpose of the plan is to:

1. Educate the public about the problem;
2. Mitigate health impacts on exposed populations during future events; and
3. Identify and implement Best Available Control Measures (BACM) for significant, anthropogenic sources of windblown dust.

As can be seen in Figures 1, 2, and 3, there are numerous monitors located at, and adjacent to mining activities in the Powder River Basin. These include six (6) Total Suspended Particulate monitors, four (4) $PM_{2.5}$ monitors, and 30 PM_{10} monitors including 15 TEOMs (continuous PM_{10} monitors). This count does not include the collocated monitors that have been installed for quality assurance purposes throughout this area. There are approximately 60 Reference and Equivalent Method PM_{10} monitors operating at the coal mines in the PRB. Where elevated emissions have occurred, TEOMs are installed and allow monitoring of emissions on a real-time basis.

2.1 Background

While high winds are not uncommon in northeast Wyoming, during low soil moisture/drought conditions the winds entrain particulate matter into the air and cause elevated levels of PM_{10}, occasionally exceeding Federal and State standards.[2,3] The PRB's monitoring history shows no exceedances of the annual PM_{10} standard of 50 µg/m^3. From 1987 through 2000, there were no exceedances of the 24-hour PM_{10} standard of 150 µg/m^3 as measured by any of the coal mines' PM_{10} monitors. However, the 24-hour PM_{10} standard was exceeded on several occasions from 2001 through 2004 at 8 of the coal mine monitor locations as shown in Appendix A.

2.2 Natural Events Policy

2.2.1 Policy Background

On May 30, 1996, EPA issued the Natural Events Policy in a memorandum from Mary D. Nichols, Assistant Administrator for Air and Radiation. In this memorandum EPA announced its new policy for protecting public health when the PM_{10} NAAQS are violated due to natural events. If a NEAP is designed and implemented to minimize PM_{10} concentrations, EPA will exercise its discretion under Section 107(d)(3) of the Clean Air Act not to redesignate areas as nonattainment, provided exceedances are demonstrated to be the result of natural events. BACM measures are to be developed to provide additional control for sources that have been identified as significant sources during natural events. Under this policy three categories of natural events are identified as affecting the PM_{10} NAAQS: (1) volcanic and seismic activity; (2) wildland fires; and, (3) high wind events. This NEAP addresses only high wind events.

Based on EPA's Natural Events Policy, PM_{10} concentrations due to dust raised by unusually high winds will be treated as uncontrollable natural events under the following conditions: (1) the dust originated from non-anthropogenic sources, or (2) the dust originated from anthropogenic sources controlled with best available control measures (BACM). The Natural Events Policy goes on to state that the conditions that create high wind events vary from area to area with soil type, precipitation, and the speed of wind gusts.[4] The State is charged with the responsibility for determining the unusually high wind conditions that will overcome BACM in the area of concern.

2.2.2 Action Plan Content

In order for exceedances of the NAAQS to be considered to be caused by a natural event, a Natural Events Action Plan must be developed to address future events. The following is a summary of the specific elements of a NEAP according to EPA guidance.[5]

1. Establish public notification and education programs. Such programs may be designed to educate the public about the short-term and long-term harmful

[2] 40 CFR 50.6
[3] Wyoming Air Quality Standards and Regulations, Chapter 2
[4] Natural Events Policy (NEP) Memorandum. EPA, May 30, 1996
[5] Natural Events Policy (NEP) Memorandum. EPA, May 30, 1996

effects that high concentrations of PM_{10} could have on their health and inform them that:

a) certain types of natural events affect the air quality of the area periodically,

b) a natural event is imminent, and

c) specific actions are being taken to minimize the health impacts of the events.

2. Minimize public exposure to high concentrations of PM_{10} due to future natural events. Programs to minimize public exposure should:

a) identify the people most at risk,

b) notify the at-risk population that a natural event is imminent or currently taking place,

c) suggest action to be taken by the public to minimize their exposure to high concentrations of PM_{10}, and

d) suggest precautions to take if the exposure cannot be avoided.

3. Abate or minimize appropriate contributing controllable sources of PM_{10}. Programs to minimize PM_{10} emissions may include:

a) Volcanic & seismic activities…… (not addressed in this plan)

b) Wildland fires…… (not addressed in this plan)

c) High Winds – application of BACM to any sources of soil that have been disturbed by anthropogenic activities. The BACM application criteria require analysis of the technological and economic feasibility of individual control measures on a case-by-case basis. The NEP should include analyses of BACM for contributing sources. The BACM for windblown dust include, but are not limited to application of chemical dust suppressants to unpaved roads, parking lots and open areas; dust suppression at construction sites; use of conservation farming practices on agricultural lands; tree rows and other physical wind breaks; restricting or prohibiting recreational off-road vehicle activities; and use of surface coverings. If BACM are not defined for the anthropogenic sources in question, step 4 below is required.

4. Identify, study and implement practical mitigating measures as necessary. The NEAP may include commitments to conduct pilot tests of new emission reduction techniques. For example, it may be desirable to test the feasibility and effectiveness of new strategies for minimizing sources of windblown dust through pilot programs. The plan must include a timely schedule for conducting such studies and implementing measures that are technologically and economically feasible.

5. Periodically reevaluate:
    a) the conditions causing violations of a PM_{10} NAAQS in the area,
    b) the status of implementation of the NEAP, and
    c) the adequacy of the actions being implemented. The State should reevaluate the NEAP for an area every 5 years at a minimum and make appropriate changes to the plan.

3.0 NATURAL EVENTS ACTION PLAN

3.1 Public Education Programs

The purpose of this program is to inform and educate the public about the problem. The Division and several of the coal mining companies have worked with the Campbell County Commissioners, the Wyoming Mining Association, and interested stakeholders to educate the public about the problems associated with elevated levels of PM_{10} occurring in the PRB. Several meetings have taken place with the County government to discuss these issues and to develop a plan to address future high wind events in the PRB. Elements of the public education program include: a plan for informing the public when air quality in an affected area may be unhealthy; explaining what the public can expect when windblown dust and high winds occur; what steps will be taken to control dust emissions during future high wind events; and, how to minimize the public's exposure to high concentrations of PM_{10} during high wind conditions.

The public notification and education programs include but are not limited to:

- An informational, health-related brochure has been developed and will be made available to the public through local government offices and the Campbell County Health Department. A copy of the Blowing Dust Health Advisory Brochure is available in Appendix C.
- At least annually, and at such other times as necessary, press releases will be prepared for both print and the local radio to raise public awareness of blowing dust and high wind conditions.
- Public meetings have been and will continue to be held to discuss the wind-generated dust emissions in the area, and the development of this Natural Events Action Plan.
- A task force will be formed to investigate and address additional, potential anthropogenic sources not already identified and addressed in this document whenever a new contributor is identified. At minimum the task force will consist of the Air Quality Division, the company operating the monitor which is affected by the additional anthropogenic source, and the organization or government agency responsible for the newly identified contributor.
- A website has been established at http://deq.state.wy.us/aqd/NEAP.asp to provide the public with the most up to date information regarding the natural events action plan.

3.2 Public Notification Program and Health Advisory Program

The Blowing Dust Health Advisory program will notify the public that a high wind/blowing dust event is imminent or currently taking place, and will include an advisory suggesting what actions can be taken to minimize exposure to high concentrations of particulate matter. Elderly citizens, young children, and individuals with respiratory problems will be advised to avoid excessive physical exertion and minimize outdoor activities during a Blowing Dust Health Advisory Alert. Although these people are most susceptible to health impacts, it is also recommended that everyone take precautions to avoid exposure to poor air quality conditions.

3.2.1 Area of Impact

Blowing Dust Health Advisory Alerts will be issued for impacted portions of the Powder River Basin when hourly average wind speeds forecast by the National Weather Service reach or exceed 30 mph. These affected portions are generally identified as the "North", "Central" and/or "South" region of the PRB.

3.2.2 Meteorological Criteria

A high wind event will be called for mines in the affected region of the PRB when hourly average wind speeds reach or exceed 20 mph. The statistical analysis presented in Appendix D determined that wind speed becomes the predominant predictor of PM_{10} concentration at these wind speeds. During these events coal mines in the affected region will employ reactionary control measures. A high wind event will be discontinued by affected mines, when the average wind speeds are less than 20 mph for 3 consecutive hours.

Public notification of high wind alerts will be accomplished through Blowing Dust Health Advisory Alerts when average hourly wind speeds of 30 mph or greater are forecast. Table 1 shows the average number of days per year with wind speeds that exceed 20 and 30 mph at four mines throughout the PRB. Based on PM_{10} data from 2001 through 2004 and meteorological data from Black Thunder Mine, the probability of a PM_{10} exceedance in the PRB occurring on days when the 20 mph criteria are met is 6%. At 30 mph, the probability of an exceedance is 36%. This criteria will assure that alerts are called when conditions make elevated PM_{10} concentrations more likely, without over using the alert system.

Table 1. Average High Wind Days Per Year in the PRB (Hourly Averages)

Mine	At 20 mph	At 30 mph
Buckskin Mine (North)	96	13
Cordero Rojo Complex (Central)	105	15
Black Thunder Mine (South)	77	11
Antelope Mine (South)	135	26

3.2.3 Blowing Dust Health Advisory Alert

The Blowing Dust Health Advisory Alerts will be called, issued, and discontinued based on wind forecasts provided by the National Weather Service (NWS). Alerts will be issued to the local media for the duration of the event as that mechanism appears to be the most effective and timely for alerting the general public. Upon request, an email notification list will be established to provide specific notification to interested parties. Additional notification methods will be added to this Plan as they are discovered.

The Air Quality Division and personnel from the PRB coal mines will access the hourly wind forecast information from the NWS' website at: http://www.crh.noaa.gov/forecast/wxplanner.php?site=unr. During all Natural Events, mines employing continuous PM_{10} monitors with near real-time access to concentration data will notify their operations, as well as nearby mining operations when PM_{10} concentration trends indicate exceedances are possible.

3.2.4 Precautions

The public will be advised of the following precautions to take during any of these situations:

> Elderly citizens, young children, and individuals with respiratory problems should avoid excessive physical exertion and minimize outdoor activities. Although these people are most susceptible to health impacts, it is recommended that everyone take precautions to avoid exposure to poor air quality conditions.

3.2.5 Voluntary Actions to Reduce Air Pollution Levels

To minimize pollution levels, each mine in the Powder River Basin area will institute and document the Category 2 Best Available Control Measures (BACM) that are appropriate for their mine. These Category 2 control measures are in not required by air quality permit conditions, and will not be required for all mines at all times. Rather, the mines are expected to use measures from the Category 2 listing, found in Section 3.4.2, that are appropriate for their location and current activities. The mines will document which procedures are in use, and these control measures may change from time to time depending on the work being conducted. Most of the BACM control measures must be in place on an ongoing basis to be effective during an high wind event. Additionally, during high wind events, the mines will initiate Category 3 reactionary control measures based on their on-site meteorological observations and real-time PM_{10} monitoring systems (Section 3.5.3).

3.2.6 Basis for Criteria Selection

The AQD commissioned a study of the relationship between meteorological conditions and PM_{10} concentrations in the PRB. The result was a report entitled "Statistical Analysis of the Influence of Wind Speed on PM_{10} Concentration in the Powder River Basin". This report is included as Appendix D. The study found that at wind speeds exceeding 20 mph, wind speed is the dominant predictor of PM_{10} concentrations. It also indicates that the influence of wind speed on PM_{10} concentration increases as wind speed increases. This study was unable to characterize the

effect of soil moisture, precipitation or wind gusts because of the scarcity of data during or shortly following precipitation events, over the time frame of the study, 2002-2004.

3.3 Abate or Minimize Appropriate Contributing Controllable Sources of PM_{10}

According to the NEP, Best Available Control Measures (BACM) must be implemented for anthropogenic sources contributing to NAAQS exceedances in attainment and unclassifiable areas, like the PRB. BACM for PM_{10} are defined (in 59 F.R. 42010, August 16, 1994) as techniques that achieve the maximum degree of emissions reductions from a source as determined on a case-by-case basis considering technological and economic feasibility.

3.3.1 BACM Determination

BACM for this NEAP were determined by the mining industry with AQD oversight. First, BACT for mining operations, as applied through air quality permits were cataloged and documented. Then, additional control measures were proposed and considered by a committee of mining industry environmental department personnel. A good deal of the information discussed involved company experiences with additional control measures associated with high wind events. The materials attached as Appendix B of this Plan discuss exceedances which occurred in the 2001 and 2002 time frame and a study conducted by McVehil-Monnett Asssociates and the development of control measures addressing problems at the North Rochelle and Black Thunder Mines. The proposed control measures were evaluated for their effectiveness to control significant PM_{10} sources during High Wind Events, given the nature of the problem, and the feasibility of their implementation at the various types of mining operations in the PRB. This process identified 3 categories of control measures; 1) existing controls (BACT), 2) additional, pre-planned measures (BACM), and 3) reactionary measures. The varied operational parameters at individual mines make the uniform application of all control measures impractical. If a reactionary control measure is impractical or unfeasible, the mine operator has the obligation to document the rationale for not implementing it. All mining companies operating in the PRB participated in the determination of BACM.

Detailed economic analysis for individual control measures is not feasible because of the disparate operations among the mines in the PRB. The economic impact of control measures must be determined on a mine-by-mine basis. The AQD may require an economic analysis for a control measure to demonstrate feasibility at individual mines. Excessive economic impact is considered justification for not implementing specific control measures if it is demonstrated on a case-by-case basis.

This Natural Events Action Plan includes only measures for control of coal mine sources since it is the ambient monitoring systems around these large surface coal mines that have experienced exceedances of the NAAQS. If it is demonstrated that there are non-coal sources contributing to elevated measurements in the area of concern, the Division may address these dust sources and operations separately from this plan or as a future update of this plan.

3.3.2 Mine Implementation

The PRB area is unique in its size (approximately 2,340 sq miles), has large open distances between the sources, and wide variability in topography, soils and vegetative conditions spanning that large area. Because of this, the meteorological conditions on one side of the PRB area often are not the same at the other side. Often they are not even the same at adjoining mines. In fact, most of these mines control surface areas exceeding the size of a typical rural municipality. It is possible for one mine to be experiencing a high wind event, while most or all of the remaining mines are not experiencing those same weather conditions. Therefore, it is inappropriate to designate the entire PRB as being in a high wind event simply because one meteorological station is recording conditions which indicate an event is occurring locally. Additionally, the dust generating activities at a mining operation at one end of the PRB area do not impact operations at the other end, located as much as 80 miles away. Accordingly, should an exceedance occur, the AQD intends to limit its investigation and documentation to the localized area and activities potentially contributing to the exceedances.

In order to manage a program over an area with this size and variability, the mining community must do a significant amount of self-monitoring of meteorological conditions in order to recognize when an event has been triggered on their premises. Most of the coal mines are equipped with real-time meteorological monitoring equipment, are qualified to quickly recognize when they are in the midst of a high wind event, and can then quickly react to it. A split into sub-regions is necessary in order to manage this program over such a large size and with so many different companies, with variable operations. The AQD recognizes that implementation of this NEAP will be more effective if the mines are communicating with their nearby neighboring mining operations.

Coal mines in the PRB area have committed to conducting additional dust control activities after observing that their respective regional area is experiencing a high wind event. *(The public notification procedures are triggered by higher wind speeds and are described in Section 3.2 of this Natural Events Action Plan.)* Notifications and alerts will be identified on a sub-region, or cluster basis. There are three clusters of mines in the PRB; North, Central and South (see Table 2 and Figures 1, 2, and 3). When a high wind event is forecast, all mines in the affected cluster(s) will implement reactionary control measures as appropriate.

Table 2. Coal Mines in the PRB

North PRB	Central PRB	South PRB
Buckskin	Caballo	Jacobs Ranch
Rawhide	Belle Ayr	Black Thunder
Eagle Butte	Cordero Rojo	North Rochelle
Dry Fork	Coal Creek	North Antelope/Rochelle
Ft. Union		Antelope
Wyodak		

The following is the plan for implementation at PRB coal mines.

1. The National Weather Service will forecast possible high wind events (winds exceeding 20 mph on an hourly average) on the NWS website; http://www.crh.noaa.gov/forecast/wxplanner.php?site=unr. It is possible that a high wind event, which is not forecast, can occur. The AQD and each of the PRB coal mining operations will monitor the localized wind forecasts for the PRB.

   At more elevated wind speeds (National Weather Service forecast of winds exceeding 30 mph on an hourly average), a Blowing Dust Health Advisory Alert will be broadcast on local radio frequencies to allow public notification in advance of a possible high wind alert. In the event that the National Weather Service forecasts a high wind alert, the public radio alert will be as follows:

   > "A possible Blowing Dust Advisory Alert for the _____ (north/central/south) has been forecast for the Powder River Basin area of Northeast Wyoming. The forecast for a high wind event is predicted to last from ___ (am/pm) to ___ (am/pm) on _____(date). Elderly citizens, young children, and individuals with respiratory problems are advised to avoid excessive physical exertion and to minimize outdoor activities during a Blowing Dust Health Advisory Alert. Although these people are most susceptible to health impacts, it is also recommended that everyone take precautions to avoid exposure to poor air quality conditions."

2. The National Weather Service wind speed forecasts will trigger increased surveillance by mine-site field personnel. Mines with real-time meteorological stations will monitor data when field conditions indicate a possible high wind event.

3. If the mine operator notices conditions indicating that a high wind event is imminent when none has been forecast by the NWS, the mine will notify adjacent mines in their sub-region, effectively issuing a high wind event for the sub-region. A list of mine contacts will be maintained on the Wyoming Mining Association News Service, which is emailed out weekly to the WMA membership.

4. Mines with continuous PM_{10} instruments will monitor concentrations in near real-time during high wind events. When PM_{10} concentration levels appear to be trending to exceedances levels, potentially effected adjacent mines will be notified.

5. Those mines whose meteorological data indicate that a high wind event is occurring will implement reactionary control measures, at their operation. Those mines will additionally notify potentially effected adjacent mines. Mines with written reactionary control or mitigative response plans will implement those plans.

If a PM_{10} exceedance in a sub-region of the PRB occurs during a high wind event, the Division will first document that a high wind event has occurred. The determination of a high wind event will be made by confirming that wind speeds exceeding 20 miles per hour through review of regional and site specific meteorological data. Any exceedance which occurs at wind speeds below 20 mph will not be attributed to a high wind event and the exceedance will be addressed

separately from this Natural Events Action Plan. The presence of winds exceeding 20 mph will not automatically result in the flagging of an exceedance as a Natural Event. The Division will also review any other available data which documents the presence of a high wind event. Reports will be sent from any affected mine in the sub-region that records an exceedance to the AQD, documenting the meteorological conditions and other confirming evidence of the event, the BACM in effect during the PM_{10} exceedance, and the reactionary measures that were employed and the timetable for that employment during the high wind event. Additional information on the content of high wind event documentation packages can be found in Section 3.4.5 of this Plan. If the criteria are met, the PM_{10} exceedance will be flagged as a Natural Event when it is entered into the EPA's AQS database.

3.4 Best Available Control Measures (BACM)

The NEP requires the identification, study, and implementation of practical mitigating measures as necessary. The NEP allows for the use of pilot tests for new emission reduction techniques, but the plan must then include a timely schedule for conducting studies and implementing measures that are technologically and economically feasible. No new emission techniques requiring pilot tests have been identified in this document.

The Wyoming Mining Association, in coordination with the Air Quality Division, has reviewed and listed control measures the mines can implement that are technologically and economically feasible and will reduce emissions from sources potentially contributing to exceedances. To be able to flag ambient air quality data that is adversely influenced by high winds, it is in the best interest of all mines to implement BACM.

Three classifications of control measures are identified in this document. They are the Best Available Control Technology (BACT) that the mines already continuously employ as requirements of their individual AQD permits. Throughout the remainder of this document these control measures are referred to as Category 1 control measures. With the implementation of this Natural Events Action Plan, the affected coal mining operations will also be adding two new types of control measures. There will be an additional list of measures the mines are able to implement continuously (Category 2 BACM), and a list of control measures the mines may be able to implement as appropriate while an event is occurring (Category 3 Reactionary Control Measures). Because of the density of the ambient monitoring systems and the number of real time monitors in the PRB area, most of the mines are uniquely prepared to institute reactionary control measures when a high wind event occurs. Some mines, however, do not operate multiple office staffing shifts and it may be impossible for them to implement reactionary control measures during off-shift hours.

All three control measure categories are explained further below.

3.4.1 Category 1: Best Available Control Technology and AQD Required Measures

As described above, the mines in the PRB area all employ Best Available Control Technology (BACT) as identified in their air quality permits, and all comply with WDEQ, Air Quality Division dust control requirements. These BACT- and AQD-required measures control PM_{10} emissions and reduce the dust generated from the mining process. The interested public should

be aware of these existing requirements to reduce dust from mining facilities; therefore, these control measures were included as control measures defined in this Natural Events Action Plan. The AQD permits for all the coal mines in Campbell County require the following dust control measures:

1. No mines are allowed to have out-of-pit open coal stockpiles. Instead, all coal removed from the mine pits must be stored in totally enclosed coal silos or barns. This eliminates the dust generated from equipment operating on out-of-pit stockpiles and potential dust generated from open stockpiles themselves.
2. Unless specifically exempted, all coal mine main access roads are paved to reduce dust generated by employees and vendors entering/exiting the mines.
3. As use and conditions warrant, the minor access roads at coal mines which are unpaved must be watered or treated with dust suppressants.
4. All coal conveyor transfer points are shrouded or otherwise enclosed to direct coal fines from one belt to the next.
5. The transfer points and crushers within coal processing plants are also equipped with control devices and measures as specified in the individual permits. These control devices and measures may include, but are not limited to, the use of dust collection baghouses, cyclones, scrubbers, fog systems, and controlled flow transfer chutes.
6. All out-of-pit coal conveyors are hooded or contained in a conveyor gallery. Enclosed and hooded conveyors reduce the amount of dust being re-entrained.
7. All out-of-pit coal dump hoppers are fitted with a dust control stilling shed, water sprays, or a baghouse dust collector.
8. Active long-term coal haul roads are treated with dust control chemicals and/or water.
9. Active short-term mine haul roads which are continuously being relocated are maintained and watered while in use.
10. All haul roads are regularly maintained to reduce the amount of dust re-entrained by haulage equipment.
11. There may be additional site-specific requirements in the individual mine permits that are related to mine layout and mining practices.

Any person interested in any of the active permits associated with a specific mine may obtain copies or review them by contacting the Air Quality Division office in Cheyenne or Sheridan, Wyoming.

3.4.2 Category 2: Additional Best Available Control Measures

This second category of BACM measures does not belong in the Category 1 measures because they are not current requirements in all of the PRB mines' air quality permits. The Category 2 measures are similar to the Category 1 measures, in that they must be employed continuously by the mines so that they are in place before a high wind event occurs. Category 2 control measures

primarily address the principal mine-controlled source of fugitive dust; large contiguous disturbed areas as described in Appendix B. These measures include the following:

1. Established reclamation is the best defense against wind erosion. Topsoiled (salvage and replacement) areas should be stabilized as soon as practicable following topsoil replacement. As appropriate, topsoiled areas will be either mulched, chiseled, ripped, or seeded. Chiseling and ripping create a roughened surface which has less wind erosion potential, because the rougher surface reduces wind shear at ground level until vegetation is re-established. Mulching and seeding are suitable activities for re-establishing vegetation during appropriate seasons.
2. Areas greater than 300 contiguous acres (see Appendix B) which have been stripped of topsoil, but will not be mined in the near future should either be ripped with buffer strips, windrowed, mulched, seeded with a quick growing temporary seed mix, or be chemically treated. Ripped buffer strips and windrowing roughen the surface to reduce wind shear at ground level, thereby reducing wind erosion.
3. Graded backfill greater than 300 contiguous acres should either be ripped with buffer strips, windrowed, seeded with a quick-growing temporary seed mix, mulched, chemically treated, or should be topsoiled in a timely fashion and treated as in #1 above.
4. Long-term, out-of-pit overburden and topsoil stockpiles which have been graded should either be ripped with buffer strips, mulched, seeded with a quick-growing temporary seed mix or be chemically treated.
5. Where appropriate, non-vegetative barriers (e.g., gravel or other large-diameter particles) will be applied to erodible surfaces to reduce surface erosion.
6. Pads in front of truck dumps shall be cleaned, treated and maintained to prevent material that accumulates on the pads due to spillage from becoming pulverized and a potential source of fugitive dust.
7. Mines should schedule topsoil removal, grading of backfill, and topsoil replacement concurrently to minimize open areas when possible.
8. Contractors are required to apply water and/or chemical dust suppressants in their haulage area.

The coal mines in the Powder River Basin are dynamic in nature and the control measures identified as BACM are meant to allow flexibility to account for this. Seasonal variations may also dictate the type of interim control measures which may be undertaken for wind erosion. Control measures #2 and #3 have identified a 300 acre threshold, as discussed in Appendix B, where additional control measures are effective and practical to apply. If an area of less than 300 contiguous disturbed acres appears to have impacted a monitor which records an exceedance, the documentation package submitted for the high wind event must address the control measures taken for that area. Additional BACM measures may be added for the smaller areas during the five year Plan review if existing reactionary control measures don't appear to be sufficient.

All of the PRB area coal mines will be expected to utilize Best Available Control Measures continuously, as appropriate, and to document the type of control measures that are in place for each area susceptible to high winds. The documentation will describe which measures have been taken at each susceptible location, and when they last occurred. The documentation will have to address any obvious deviations from the BACM measures. In the event of an exceedance, a report to the AQD will be required as outlined in Section 3.3.2, documenting the BACM measures in place. Division's inspection staff will review the BACM documentation during field inspections and discuss any questions or deficiencies identified.

As stated in Appendix B, the open pits at the mines were not included in the determination of disturbed contiguous areas because these below grade pits are normally observed to act as windbreaks. The temporary pit roads receive regular maintenance attention and watering and other dust generating activities are under constant surveillance by the mining supervisor who utilizes reactionary controls as described in 3.4.3.

3.4.3 Category 3: Reactionary Control Measures

The third category of control measures are those not currently required by individual air quality permits, but are actions which can be taken during a high wind event, depending on site-specific conditions. This document recognizes that not all Reactionary Control Measures can be conducted by all mining operations. When PRB coal mines are experiencing a high wind event, the operators will implement the following control measures as practical for their operation. The duration of a high wind event may influence the practicality and feasibility of Category 3 control measures.

1. The mine operator will consider relevant information to confirm that a high wind event is occurring. This information can include, but is not limited to NWS forecast, local meteorological information, including wind speed, wind direction and/or the near-term forecast for precipitation.
2. The mine operator will visually evaluate the mine, determine areas of mining activity that are generating excessive visible dust and should direct water trucks to those areas.
3. In order to maximize the ability of the water trucks to keep up, the supervisor should direct the overburden operations to the shortest haul available during a high wind event.
4. The mine operator will evaluate whether it is practicable to dump the overburden as low as possible, so that windblown dust settles in the pit more readily.
5. The mine employees will inspect for coal fires, and extinguish them as soon as possible after they are discovered and conditions are safe enough to allow access by equipment. High winds can exacerbate spontaneous combustion fires.
6. Scoria crushing operations may be shut down by the mine operator during the high wind event if they appear to be generating excess dust.
7. Road maintenance activities, such as road rock hauling and road rock dumping may be shut down during a high wind event if it is generating dust. Blading of the active haulage roads may continue if it will help prevent the generation of haulage dust.

8. The mine may order their contractors to increase watering, reduce operating equipment, or shut down haulage in its entirety during a high wind event.
9. The need to shut down and/or reduce earthmoving activities will be evaluated and adjusted as the mine schedule and conditions will allow.

Category 3 control measures have been formally implemented at several southern coal mines (Black Thunder, North Rochelle and Jacobs Ranch mines) through the establishment of a formal site-specific mitigative response plan (MRP). These plans are available for review at the Air Quality Division Office or at the mine site. The plan specifics were determined jointly with the mines and Air Quality Division. A mitigative response plan will be developed by any mine that records an exceedance or violation of the NAAQS downwind of its mining operation.

3.4.4 Unreasonable and Uneconomical Control Measures

In addition to the measures the coal mines will implement, the following list of prospective dust control measures were determined to be uneconomical, impractical, ineffective to implement, or do not address high wind events:

1. Suspension of blasting during a high wind event. Several of the mines have numerous restrictions on blasting in place for their operations. The mines report that delay of blasting can result in additional moisture entering the holes, causing safety concerns, and impacts to shot performance. "Sleeping" the loaded patterns is dangerous and disrupts normal mining activity and traffic. In smaller mines, mining is suspended until the loaded pattern is shot. To date, blasting emissions have not been identified as a source of the dust causing an exceedance. This potential control measure was discarded because it was not technologically viable and resulted in serious safety concerns.
2. Windbreak. Tree stands are rare in Campbell County, as they are nearly impossible to establish and maintain without extraordinary effort. It is more economical to rip the backfilled, smoothed areas instead, which would accomplish the same objective, while also meeting WDEQ, Land Quality Division objectives for reclamation success. Additionally, wind breaks would be inefficient since they are designed for deposition, rather than minimization of entrainment.
3. Sprinkler systems. Several of the mines have tried to install dust control sprinkler systems on the reclaimed areas, at rail loadouts, and along roads at their respective operations. This potential dust control measure has been largely unsuccessful primarily due to lack of availability of water, and problems with pipelines or sprinklers freezing and breaking. Accidental over-application to roads has resulted in dangerously slippery road conditions. This potential control was discarded because it was not technologically feasible. Voluntary efforts by the mines to apply dust control water in unique methods will continue to be reported in the annual dust control report for each mine.
4. Irrigation. Supplemental artificial irrigation of reclaimed areas seems to have the potential to significantly increase the vegetative cover on reclaimed areas which would

then reduce dust generation. However, studies[6] in the semi-arid west have documented that this practice of supplemental irrigation actually hurts the long-term establishment of reclaimed native vegetation. In addition, often times the water supply is inadequate to irrigate, or the right to irrigate reclaimed mine land is legally usurped by the rights of downstream water rights holders.

5. Paving mine haul roads. No pavement is able to withstand the loads of mine equipment used in the PRB. This proposal is not technologically viable.

Several other potential measures which could help reduce the generation of dust were evaluated but rejected as BACM because they are required by other environmental regulations. These measures include: not stripping topsoil, not constructing out-of-pit overburden piles, reclaiming graded backfill prior to an approved PMT revision, and conducting smaller topsoil salvage operations.

3.4.5 Documentation Packages

When an exceedance occurs at one of the monitoring sites in the PRB the mine will be responsible for submitting a documentation package for circumstances surrounding the exceedance within 30 days of the recorded event. At a minimum the documentation package will include:

- Sampling dates for the affected monitor
- Meteorological data from the site and/or from regional sites if appropriate
- Description of the Best Available Control Measures (BACM) in place at the time of the exceedance and anthropogenic activities which might have impacted the monitor
- Description of the Reactionary Control Measures taken during the event and the time table detailing the implementation of those measures
- An area map detailing emission sources and the impacted monitoring site
- For any contiguous disturbed area smaller than 300 acres that contributes to an exceedance, a description of control measures taken if BACM were not in place

The documentation package may also include the following optional items:

- Filter analysis and speciation information if appropriate
- Historical data for the monitoring site
- Videos and/or photos of the event and resulting emissions
- News accounts of the event
- Eyewitness accounts

[6] "Effect of Temporary Irrigation On Revegetation of a Northern Cold Desert Mined Site", Kevin B. Powell, Master of Science Thesis, University of Wyoming, August 1988; "Temporary Irrigation For Revegetation of Mined Lands Under Cool Desert Conditions", Kevin B. Powell, Richard B. Vincent, Edward J. DePuit, and Fred E. Parady, paper presented at the Fourth Biennial Billings Symposium on Mining and Reclamation in the West, March 1987.

- Any other pertinent information

3.5 Stakeholder Involvement

The EPA's NEAP development guidance states that the NEAP should be developed by the State in conjunction with the stakeholders affected by the plan. The Wyoming AQD worked with stakeholders mentioned in this document. Numerous meetings and telephone conversations occurred with the stakeholders, and the final plan reflects control measures offered as part of the NEAP.

3.6 Public Review

The AQD has made presentations and provided documentation on the NEAP to the public in an effort to ensure public review and comment. The following is a sample of some of the processes used in reaching the public.

1. A NEAP website, (http://deq.state.wy.us/aqd/NEAP.asp), has been added to the WDEQ web page to provide the public with information about the PRB exceedances and the NEAP process. Below are some of the items available to users.
    a. Notices of meetings, minutes of meetings, copies of handouts and documents presented at meetings
    b. The Natural Events Policy Memorandum from Mary D. Nichols, Assistant Administrator for Air and Radiation, USEPA
    c. Natural Events Action Plan
2. Presentations:
    a. Presentation to the Wyoming Mining Association Regulatory Affairs Committee, January 17, 2005 and March 6, 2006, Cheyenne
    b. Public meeting, July 11, 2006
3. Mass mailing of letters and attachments to interested parties, stakeholders, and local and State elected officials prior to all general NEAP meetings.
4. Advertised NEAP meetings in Legal Notices section of local newspapers.

3.7 Periodic Evaluation

EPA's Natural Events Policy guidance requires the DEQ to periodically reevaluate a NEAP for:

1. the conditions causing violations of the PM_{10} NAAQS in the area,
2. the status of implementation of the NEAP, and
3. the adequacy of the actions being implemented.

Evaluation of the effectiveness of the NEAP includes several key strategies to ensure protection of public health and a robust plan. Strategies included: review of Natural Events Policy in specific relation to the PRB, review of the effectiveness/appropriateness of ongoing control strategies, consideration of new/additional control options, review of meteorological and climatological conditions leading to blowing dust, review of local and regional PM_{10} monitoring data, discussions with other States (e.g., South Dakota, Colorado) and Federal (US EPA) personnel regarding NEAP updates and protocols, review of the established emission inventory and identification of new emission sources, review of the blowing dust advisory protocol and notification records, public/stakeholder meetings and community outreach/education efforts, etc.

The AQD will review the effectiveness of the PRB Natural Events Action Plan and improve the Plan, accordingly, at a minimum of every 5 years.

Appendix A

Powder River Basin PM_{10} Exceedances 2001 – 2005

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Powder River Basin PM_{10} Exceedances 2001 – 2005

	Mine	Sampler ID	PM_{10} Conc. ($\mu g/m^3$)	Date	Avg Wind (mph)	Max 1 Hr Wind (mph)
1	North Rochelle	B/Met	168	4/19/2001	18.4	39.0
2	North Rochelle	H	287	5/22/2001	20.8	36.3
3	Jacobs Ranch	5PM-10	168	9/4/2001	18.6	39.0
4	North Rochelle	G	156	9/22/2001	12.4	24.5
5	North Rochelle	B/Met	268	12/1/2001	28.3	37.2
6	North Rochelle	B/Met	284	12/8/2001	23.2	29.8
7	Black Thunder	36-2	290	1/8/2002	16.9	29.9
8	North Rochelle	B/Met	214	1/8/2002	23.3	35.1
9	North Rochelle	B/Met	162	2/1/2002	21.1	26.2
10	North Rochelle	B/Met	196	2/7/2002	24.1	33.0
11	North Rochelle	B/Met	211	2/9/2002	25.1	39.5
12	North Rochelle	B/Met	186	2/11/2002	25.4	41.1
13	Buckskin	N	182	8/16/2002	17.6	45.5
14	North Rochelle	GH	159	8/16/2002	22.6	45.0
15	North Rochelle	B/Met	165	12/15/2002	30.0	40.5
16	Black Thunder	36	217	12/15/2002	30.0	40.5
17	North Rochelle	B/Met	181	12/26/2002	19.5	27.2
18	North Rochelle	B/Met	157	12/27/2002	33.6	40.0
19	Black Thunder	36	198	12/27/2002	33.5	40.0
20	Black Thunder	36	159	1/26/2003	16.4	28.2
21	Buckskin	W	202	12/27/2003	27.6	32.1
22	Black Thunder	36	625	1/1/2004	25.1	32.5
23	Black Thunder	36	436	3/6/2004	22.6	36.1
24	N. Ant. Rochelle	RO-1	168	12/30/2004	22.0	39.0
25	Wyodak	TEOM	165	3/6/2005	20.2	36.8

26	N. Ant. Rochelle	NA5	166	3/9/2005	16.0	33.0
27	North Rochelle	GH	180	3/10/2005	25.3	39.1
28	Antelope*	5PM-10	203	9/19/2005	8.7	18.6
29	North Rochelle	GH	167	12/14/2005	28.5	36.4

PM_{10} concentrations have been rounded to whole numbers in the table.

* attributed to maintenance/construction on adjacent railroad

Appendix B
Documentation and Analysis

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Documentation and Analysis

High Wind Events

The Wyoming Powder River Basin has experienced a number of PM_{10} air quality exceedances. Appendix A lists all of the PM_{10} exceedances that have occurred in the Powder River Basin prior to January 2005. The exceedances are discussed below by site, in order to determine the primary contributing factors to the occurrences. In summary, based on this investigation it is believed that the primary contributing factors to the exceedances include the following conditions.

- Exceptionally high wind speeds;
- Lower than normal precipitation (low soil moisture);
- Recently disturbed, relatively smooth, contiguous non-vegetated lands greater than 300 acres; and
- In some cases, proximity of scoria roads or other non-mining sources to the monitors.

In an effort to define the primary contributing factor(s) of these air quality exceedances, a number of items were reviewed and evaluated. These included:

- Meteorological conditions;
- Ground surface conditions;
- Operational activities; and
- McVehil-Monnett Associates (MMA) Study of the North Rochelle Mine's exceedances prior to February 11, 2002.[7]

Investigations of the exceedances were conducted and are presented in the remainder of this section.

North Rochelle Mine/Black Thunder Mine Exceedances

The majority of the exceedances have occurred primarily in the North Rochelle Mine (NRM) air monitoring network in 2001-2002 when the mine was owned by New Vulcan Holdings and operated by Triton Coal Company. In August 2004, NRM was purchased by Arch Coal, the owners of Thunder Basin Coal Company, who operate Black Thunder Mine (BTM). BTM is contiguous to NRM. BTM has had exceedances at one of its monitoring sites, which is the sampler closest to NRM. Given the contiguous mining disturbance area and now the common ownership of these two mines, it is appropriate to discuss these exceedances together.

Summary information regarding the NRM's exceedances was obtained from a study initiated by Triton Coal and conducted by McVehil-Monnett Associates (MMA). This

[7] McVehil-Monnett Associates (MMA), Triton Coal Company, LLC – North Rochelle Mine (NRM) Completion of Final Compliance Plan Requirements, Triton Coal Company, LLC, May 13, 2002

study looked at the NRM exceedances from April 19, 2001 through February 11, 2002 to determine the cause of the exceedances and develop actions to remediate the problem. The primary conclusions of this study are presented below:

- This study concluded that the single largest contributor to fugitive emissions was wind erosion of relatively smooth, disturbed ground. In addition, it was determined that material haulage and dozing of overburden spoils could have also been significant contributing factors.
- The study concluded that in nearly all cases the highest hourly PM_{10} concentrations were associated with the higher hourly wind speeds.
- Control techniques applied at NRM to reduce wind erosion from disturbed areas after the exceedances were successful. Control techniques included surface manipulations, revegetation, mulching, and/or soil stabilizers as applicable.

In that the MMA study determined that the single largest contributing factor of fugitive emissions at NRM was disturbed ground, additional research was conducted to try to further define the problem. Specifically, is there is a contiguous acreage threshold that has the potential to contribute significant windblown emissions if no additional control measures are applied?

Annual historical photos were pieced together for the NRM and BTM mines from 1999 to 2004 in order to further analyze the impacts of contiguous disturbed acreage. These photos provide a picture of the changes over time at each mine site. For each year, the potential disturbed acreage affecting the monitor based on the day's predominate wind direction was determined using a standard vector grid. Both BTM 36 and NRM B/MET monitors had multiple exceedances from one predominate wind direction over a period of years; these monitors and the predominate wind direction were used to try and determine if there is a threshold disturbed acreage for which BACM measures should be determined to further control wind erosion problems. When determining the total disturbed acreage for each mine, the open pit was not included as part of the total acreage as the pit actually served as a wind break and is below the surrounding ground surface elevation. Information from this analysis is presented below. It was determined that the worst-case scenario shows that 300 acres of non-vegetated, relatively smooth, contiguous acreage represents a threshold that can be used to determine when control techniques should be applied to disturbed acreage.

The NRM B/MET monitor indicated that a relatively smooth, non-vegetated acreage threshold of approximately 300 acres is appropriate. Over the period of time evaluated, 272 acres was the maximum disturbed, contiguous acreage before the monitor recorded an exceedance on December 8, 2001. Exceedances were recorded from this time through 2003. The minimum disturbed, contiguous acreage during years when there were exceedances was 295 acres. Table 1 shows the total disturbed acreage for the different time frames. The acreages shaded in gray indicate years when there were exceedances.

It is believed that the 2002 time frame represents one of the worst air quality operating scenarios possible. Due to the separate ownership of the mines at that time, operational conditions mandated that large areas could not be reclaimed immediately. In the case of NRM, BTM's operations adjacent to the pit cut off access for topsoil haulage such that revegetation could not be completed. In addition, large areas were needed in which to store the mined overburden until the pit had advanced and coal removal allowed for the mined overburden to be placed below grade. In the case of BTM, final coal removal from a pit was occurring. In this case, reclamation had to be delayed in some areas in order to not have to redisturb it for borrow material to fill in the hole where the final coal is removed. Unfortunately, and somewhat anomalously, these two major activities at the separate mines were taking place in the same area, which created a scenario with larger than normal amounts of non-vegetated lands being contiguous at the two separate properties.

When the MET-TEOM monitor recorded exceedances the wind was generally blowing from the S-SW. The majority of the NRM mine-related activity was located generally to the west and south of the monitor. At this time, the Southeast Pit activities were generally less than 1 mile from the monitor. It is also interesting to note that the BTM 36 monitor recorded exceedances when the predominate wind direction was S-SW. During winds of this nature, the problems that were influencing the NRM B/MET monitor were potentially impacting the BTM monitor also, which is located approximately 10,000 feet north of the B/MET monitor.

Table 1. Disturbed Acreage – NRM B/MET Monitor

		Disturbed acres from predominate wind direction SSW					
Date	PM_{10} Concentration	July-August 1999	August 2000	July 2001	January 2002	January 2003	January 2004
12/8/2001	284.7	168	255	272	407	427	295
2/1/2002	162	168	255	272	407	427	295
2/7/2002	195.5	168	255	272	407	427	295
2/11/2002	186.2	168	255	272	407	427	295
12/15/2002	165	168	255	272	407	427	295
12/26/2002	181.4	168	255	272	407	427	295
12/27/03	158.5	168	255	272	407	427	295

Acreages shaded in gray indicate days when exceedances occurred.

Information from the BTM 36 monitor initially indicated that an appropriate contiguous disturbed acreage threshold was 1,150 acres when considering only contiguous disturbed acreage. As stated above, activities at the BTM precluded the normal practice of contemporaneous reclamation because of the final pit reclamation in this area. Thus, there were an unusually high number of open, disturbed acres at this time. The maximum disturbed acreage prior to any exceedances was 1,152 acres. During the exceedance years, the minimum disturbed acreage was 1,258 acres. Based on the Black Thunder Mine evaluation, it became apparent that not all disturbed acreage has equivalent wind erosion potential when comparing the BTM and NRM thresholds. Therefore, when trying to determine a minimum threshold for disturbed acreage additional factors must be considered.

Table 2 Disturbed Acreage – BTM 36 Monitor

Date		Disturbed acres from predominate WSW wind direction					
	PM_{10} Concentration	July-August 1999	August 2000	July 2001	January 2002	January 2003	January 2004
1/8/2002	290	626	853	1,152	1,258	1,534	1,392
12/15/2002	217	626	853	1,152	1,258	1,534	1,392
12/27/2002	198.2	626	853	1,152	1,258	1,534	1,392
1/26/2003	159.1	626	853	1,152	1,258	1,534	1,392
1/1/04	625.2	626	853	1,152	1,258	1,534	1,392
3/6/04	135.8	626	853	1,152	1,258	1,534	1,392

Acreages shaded in gray indicate days when exceedances occurred.

Further examination of the historical photos suggests that several additional factors need to be considered when trying to set a minimum disturbed acreage threshold to help control potential wind erosion. These factors include:

- topography,
- surface roughness,
- surface vegetation condition,
- recent disturbance activity, and
- meteorological conditions.

As the North Rochelle Mine study pointed out, meteorological conditions greatly influence potential PM_{10} concentrations. Particulate concentrations are the greatest when the wind speeds are the highest. Appendix D demonstrates the relationship between wind

speed and particulate concentration. It is generally accepted that for wind speeds greater than thirteen miles per hour, wind erosion increases with the cube of the wind speed. Therefore, when wind speeds double, wind erosion can increase by a factor of 2^3 or 8. Appendix A presents a summary of the average and maximum wind speeds recorded on the exceedance days. Over seventy percent of these days recorded an average hourly wind speed greater than 20 miles per hour and seventy five percent of the days had maximum 1-hour wind speed greater than 30 miles per hour. It is clear that excessive winds contribute significantly to the disturbed acreage wind erosion potential.

Topography and surface roughness are another factor that must be considered when evaluating the possible wind erosion potential. Non-vegetated lands that are relatively smooth will be significantly more prone to the affects of wind erosion. Non-vegetated surfaces that are rough or uneven serve to reduce and break the wind velocity, thus reducing the wind erosion potential.

Climatic conditions of low precipitation over an extended period of time act to dry area soils, making them more susceptible to airborne activity under high wind conditions.

Non-vegetated lands that have not experienced surface manipulation for a period of time are less prone to wind erosion as a natural surface crust is generally formed over time, which will inhibit wind erosion. New or recently disturbed lands are much more prone to the affects of wind erosion because there is an abundance of entrainable material and no natural crust to diminish the impacts of wind erosion.

Based on this historic evaluation of the NRM and BTM exceedances, it is believed that the predominant fugitive dust contributor during these events was wind erosion from non-vegetated, recently disturbed, smooth contiguous acreage. In an effort to design effective BACM measures to reduce wind erosion from these areas, it will be appropriate to apply BACM measures to areas larger than 300 acres. As the NRM case shows, under the worst-case operating conditions exceedances were not experienced when the acreage was less than 300 acres.

Jacobs Ranch Exceedance

An evaluation of the September 4, 2001 exceedance at the Jacobs Ranch Site 5 monitor determined that the exceedance was primarily caused by offsite (non-mining) related activities. WY Department of Environmental Quality, Air Quality Division issued a memorandum stating that they felt the adjacent county road was the major contributing factor to the high PM_{10} reading. [8]

[8] Coal Mine Data Analysis – Jacobs Ranch, Black Thunder, North Rochelle – Memorandum, Wyoming Department of Environmental Quality, Air Quality Division, Mike Warren, March 21, 2002.

Buckskin Mine Exceedances

The Buckskin Mine recorded an exceedance as a result of a severe windstorm that struck the Gillette area on August 16, 2002, in which they recorded a 24-hour PM_{10} concentration of 181.7 $\mu g/m^3$. The occurrence of this windstorm was well documented by Buckskin: A north-westerly wind blowing at an average hourly wind speed from 45 – 28 mph lasted for 5 hours from 3:00 PM to 8:00 PM. Several meteorological stations in the Gillette area documented maximum wind speeds in excess of 72 mph during this windstorm and there was substantial damage in Gillette. There was no mining activity upwind of this monitor and Buckskin is the most northerly mine. A full report was prepared by the Buckskin Mine and submitted to WDEQ-AQD on August 20, 2002 and the AQD deemed this event a non-exceedance.

Buckskin's other recorded exceedance on December 27, 2003 occurred during a snow storm (blizzard) with an average hourly wind speed of 28 mph. The recorded 24-hour PM_{10} concentration was 202.4 $\mu g/m^3$. Similar to the previous exceedance, Buckskin completely documented that there was no mining-related activity upwind of this monitor during the exceedance. Buckskin contended that the monitor recorded blowing ice and not blowing dust.

North Antelope Rochelle Exceedance

On December 30, 2004 the North Antelope Rochelle Mine experienced an exceedance (168 $\mu g/m^3$) of the 24-hour STP standard at the RO-1 continuous PM_{10} monitor. Weather conditions at the time of the spike indicate a strong influence from an incoming storm front as there was no mining activity occurring near the sampler. Winds during the period were predominately out of the south-southwest (over undisturbed ground with no snow cover) with an hourly average of 36 mph at 0200. Data from all samplers (NA-5, NA-6 and RO-1) showed a spike in concentrations at 0200, thus confirming the exceedance was the cause of natural events and not associated with mining activities.

Appendix C
Blowing Dust Health Advisory Brochure

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Doing their part

The mines in Campbell and Converse Counties have taken steps to reduce the amount of fugitive dust that is created in the area. Watering roads & applying chemicals to limit dust, shutting down extraneous equipment, creating wind entrapments on areas with limited topsoil, not allowing out-of-pit open coal stockpiles, controlling dust at all coal conveyor transfer points and on all coal hoppers are just some of the dust control actions that have been taken by the mines.

Wildlife utilizing reclamation

More Information

For more information please read the Natural Events Action Plan for the Coal Mines of the Powder River Basin of Campbell & Converse Counties, or contact the Wyoming Department of Environmental Quality, Air Quality Division

Loading overburden at the Belle Ayr Mine

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WYOMING MINING ASSOCIATION
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Natural Events Brochure

For the Powder River Basin in Wyoming.

Phone: (307)635-0331

Revision 1/23/07

Natural Events

Background

High winds are not uncommon in the Powder River Basin. In low soil moisture conditions, these winds entrain particulate matter into the air and cause elevated levels of particulate matter (fugitive dust, PM_{10}, dust particles having a nominal aerodynamic equal to or less than 10 microns) occasionally above the Ambient Air Standards.

There are approximately 60 PM_{10} monitors operating at the coal mines in the Powder River Basin (PRB) that measure ambient air quality. The PRB's monitoring history shows no exceedances of the annual PM10 standard of 50 ug/m3 (averaged over an annual period). From 1987 through 2000, there were no exceedances of the 24-hour PM_{10} standard of 150 ug/m3 at any of the coal mine PM_{10} monitors. However, the 24-hour PM_{10} standard of 150 ug/m3 was exceeded on several occasions from 2001 to 2005 at 12 of the 60 coal mine monitors.

Watering haulroads

Recognizing that certain uncontrollable natural events can have an effect on ambient air, the EPA issued a Natural Events Policy (NEP). The NEP sets forth procedures through the development of a Natural Events Action Plan (NEAP) for protecting public health with the implementation of Best Available Control Measures (BACM) in areas where the PM_{10} standard may be violated. These measures include watering dusty areas, shutting down extraneous equipment, creating wind entrapments and treating barren areas.

High Wind Dust Alerts

BACM will be applied. However, these actions will not eliminate all fugitive dust in the area. On days when the average wind speed is greater than 30 mph, a public warning will be issued concerning dust levels.

Precautions

People with respiratory problems, the elderly or children should limit outdoor activity in areas where exceedances have been noted until the alert has been cancelled. Please check with the local radio station for the status of the warnings.

Doing Their Part

The coal mines in Wyoming place safety and public health at the top of any project. These mines are producing coal that is consumed to create electricity and Wyoming provides over 33% of the nations coal demand. These mines are also performing activities to limit the amount of fugitive dust in the atmosphere.

The mines in Campbell and Converse Counties have taken steps to reduce the amount of fugitive dust that is created in the area.

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Revision 1/23/07

Appendix D

Statistical Analysis of the Influence of Wind Speed on PM_{10} Concentration in the Powder River Basin, Revision 2

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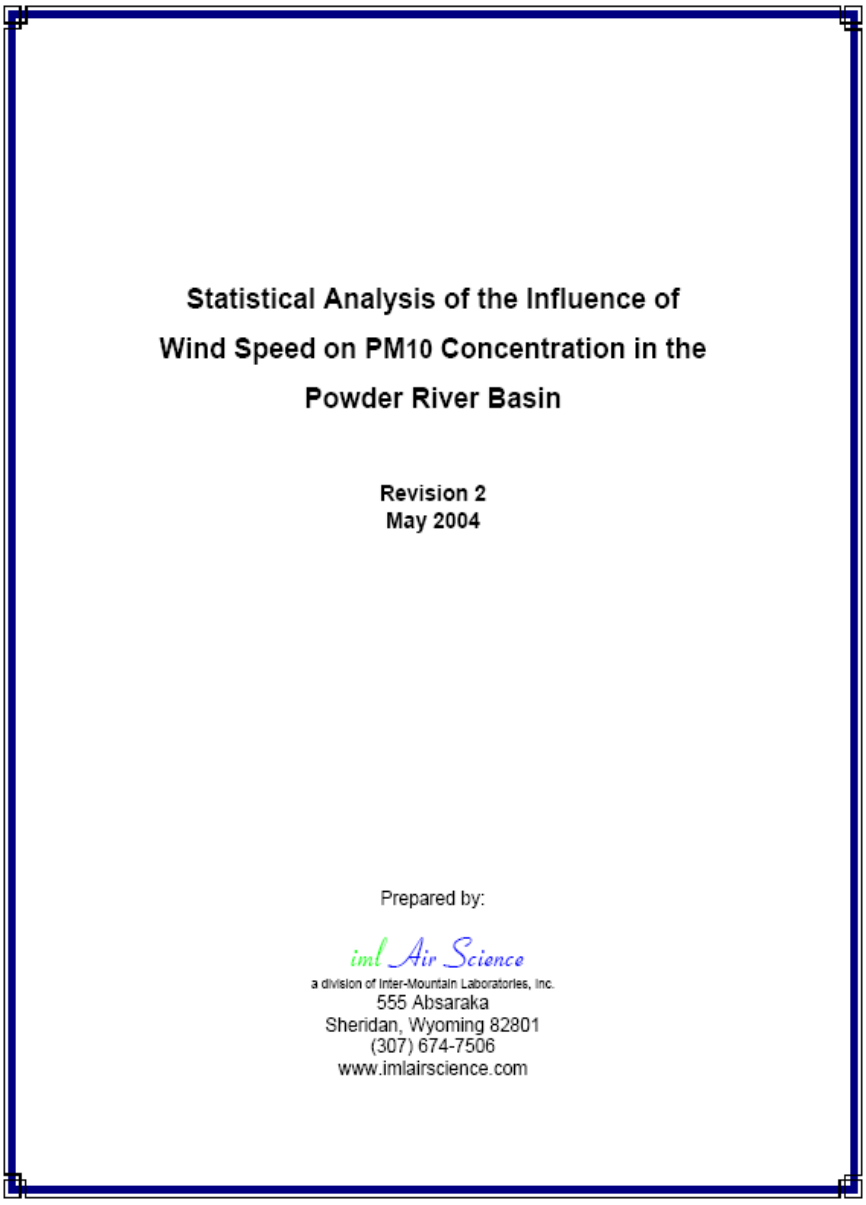

Statistical Analysis of the Influence of Wind Speed on PM10 Concentration in the Powder River Basin

Revision 2
May 2004

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