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February 8, 2007

Mr. Chad Schlichtemeier
Wyoming Department of Environmental Quality
Air Quality Control Division
122 West 25th Street, Herschler Building 4-W
Cheyenne, 82002

Subject: Modeling Protocols for the Medicine Bow Fuel and Power Project

Dear Mr. Schlichtemeier:

Attached, please find copies of the PSD modeling protocols for Advanced Fuels LLC's proposed Medicine Bow Fuel and Power Coal to Liquids project. These modeling protocols have incorporates verbal comments from WDEQ/AQD staff as well as our recent experience on similar projects.

If you should have any questions, or require additional information regarding this proposal, please do not hesitate to contact me at (303) 796-4663.

Sincerely,

Jerome Fiore

Jerome Fiore
Project Manager

NEAR-FIELD AIR QUALITY ANALYSIS PROTOCOL

FOR THE

MEDICINE BOW COAL TO LIQUID PLANT, WYOMING

Prepared for

Wyoming Department of Environmental Quality
Air Quality Division, 4th Floor West
122 West 25th St, Herschler Building
Cheyenne, Wyoming 82002

February, 2007

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1 Project Description

The proposed project consists of the installation of a new coal to liquid plant to be located in section 29 in T21R79 between Medicine Bow and Elk Mountain, Carbon County, Wyoming as shown in Figure 1. The facility will also include the Saddleback Hills underground coal mine that is currently permitted under the Carbon County Mines (Arch Coal). The UTM coordinate (NAD27) of the center of Section 29 is 390634 meters E and 4624013 meters N. A topographic map of the facility area indicating section 29 is shown in Figure 2. This center coordinate will be the preliminary source location and the following sources or units will be included in the proposed modeling analysis:

- Three (3) GE frame 7 gas combustion turbines
- Coal Storage and pre-treatment block
- Air separation block
- Fischer-Tropsch block
- Power block
- Product storage block

The proposed project is a 'Fuel Conversion Plants' which is one of the 28 major stationary sources, with a Prevention of Significant Deterioration (PSD) threshold of 100 tons per year for all criteria pollutants. Estimated total potential to emit for NO_2, CO, and VOCs exceed these threshold levels as indicated in Tables 4 and 5; therefore, the project is subject to PSD review.

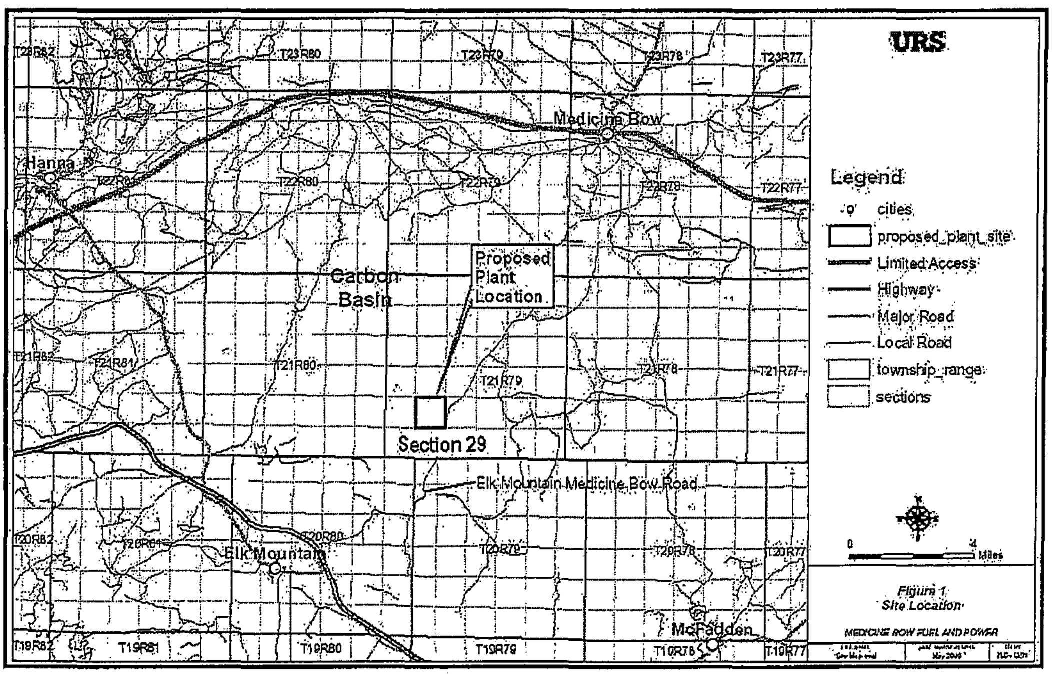


Figure 1 Project Source Location

DEQ 006053

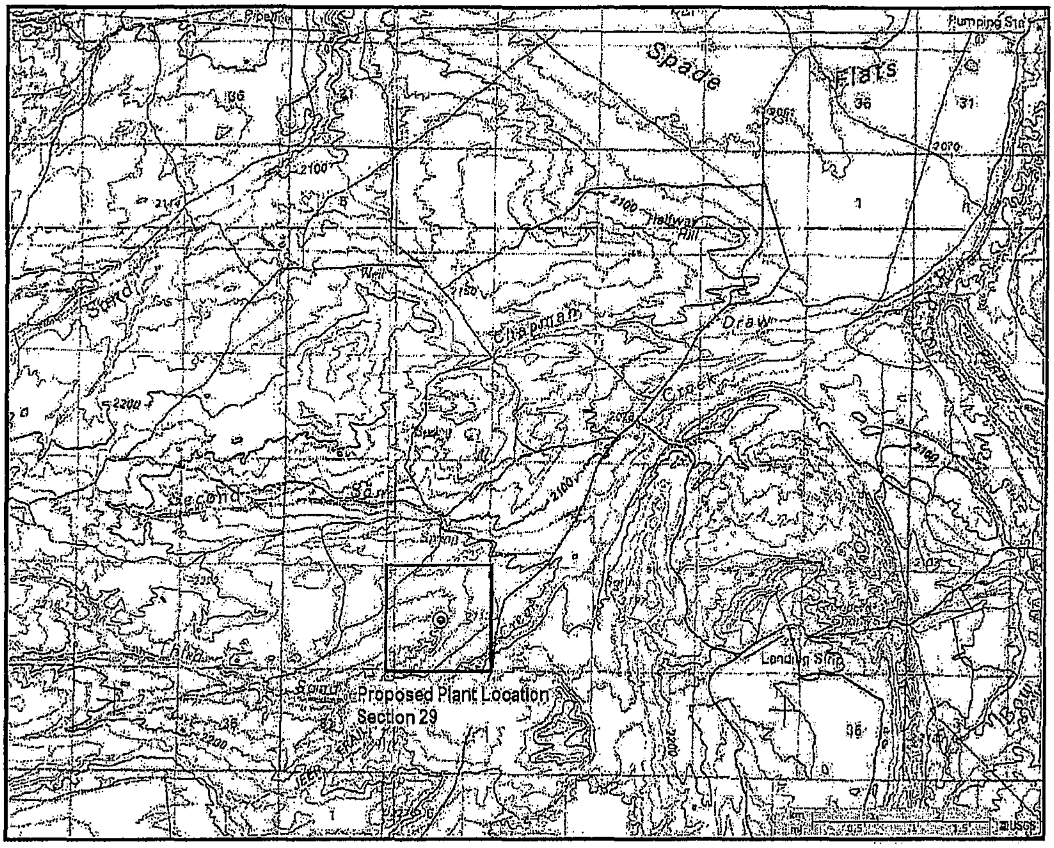


Figure 2 Topographic map of the Proposed Plant

2 Dispersion Model

Air quality impacts will be modeled at near-field receptors using the latest version of the EPA regulatory model (AERMOD) (Version 04300 or Version 06341). The AERMOD model is designed to predict ground-level pollutant concentrations from a wide variety of sources associated with industrial facility source types. AERMOD contains algorithms for: 1) dispersion in both the convective and stable boundary layers; 2) plume rise and buoyancy; 3) plume penetration into elevated inversions; 4) computation of vertical profiles of wind, turbulence, and temperature; 5) urban nighttime boundary layer; 6) treatment of receptors on all types of terrain from the surface up to and above the plume height; 7) treatment of building wake effects; 8) improved approaches for characterizing the fundamental boundary layer parameters; and 9) treatment of plume meander.

The AERMOD modeling system consists of two pre-processors; AERMET provides AERMOD with the meteorological information it needs to characterize the planetary boundary layer (PBL), and AERMAP characterizes the terrain, and generates receptor grids for AERMOD. Bee-line software's BEEST AERMOD program will be used to run AERMET/AERMAP/AERMOD.

Pursuant to Wyoming Department of Environmental Quality (WDEQ) modeling guidelines (2006a and 2006b), the regulatory default options will be used, including building and stack tip downwash, default wind speed profiles, exclusion of deposition and gravitational settling, consideration of buoyant plume rise and complex terrain. In addition, the model will be instructed to exclude periods of missing meteorological data. Rural dispersion coefficients will also be used in this analysis.

3 Meteorological Data

Hourly surface meteorological data, twice-daily upper air sounding data, and hourly nearby site-specific meteorological data will be used as input to the AERMET processing. Locations of the meteorological stations and proposed source are shown in Figure 3.

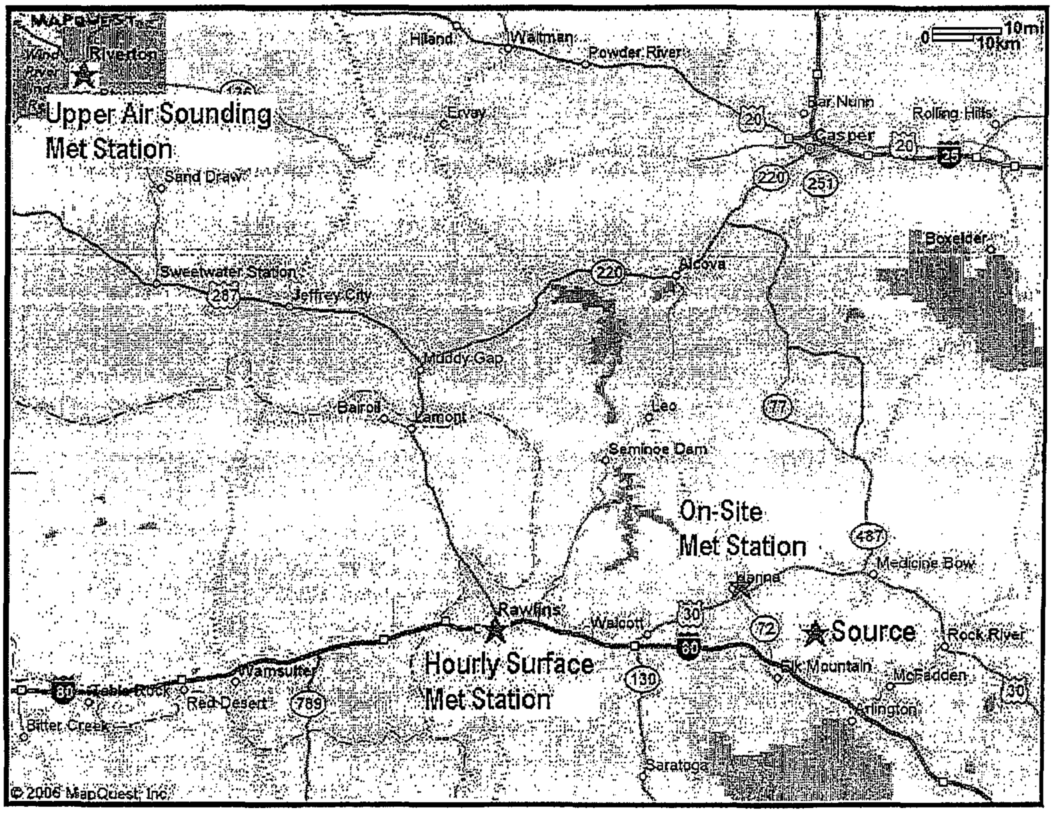


Figure 3 Locations of Proposed Source and Meteorological Stations

3.1 National Weather Service Hourly Surface Observation

Six years of hourly surface observations (2000 through 2005) obtained at the Rawlins Municipal Airport, WY were obtained from the National Climatic Data Center (NCDC) in AERMET compatible TD3505 format. The Rawlins NWS site is located approximately 70km west of the proposed facility at UTM coordinates (NAD27) 317221 meters E and 4629697 meters N.

In order to meet the completeness criteria for PSD-quality meteorological data, at least 90% of the data must have been recorded in order to be used. Therefore, the Rawlins hourly surface met data were reviewed to establish completeness. The result of the review of the Rawlins data is shown in Table 1. The normalized frequency distribution of wind speed and direction for the Rawlins data is shown in Table 2.

During the review of the nearby site-specific data it was determined that data obtained during 2002 was not satisfactory for use, and therefore, while complete at the Rawlins site, 2002 data will not be used and therefore is not shown in Table 1. As shown in Table 1, the collected Rawlins data satisfied the PSD completeness requirement. The windrose of five-year (2000, 2001, 2003, 2004 and 2005) Rawlins surface meteorological data that will be used in AERMET and AERMOD is shown in Figure 4.

Table 1 Data Completeness Evaluation – Rawlins NWS Hourly Surface Meteorological Data

Year	Number of Missing Hours	Percent Complete (%)
2000	130	98.5
2001	504	94.2
2003	567	93.5
2004	447	94.9
2005	514	94.1

Table 2 Normalized Frequency Distribution of Wind Speed and Direction of Rawlins Hourly Surface Meteorological Data (2000, 2001, 2003, 2004, and 2005)

	Wind Speed						
Wind Direction	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 11.1	>= 11.1	Total
348.75 - 11.25	0.00837	0.01295	0.01408	0.00823	0.00148	0.00064	0.04575
11.25 - 33.75	0.00394	0.00494	0.00578	0.00321	0.00104	0.00055	0.01946
33.75 - 56.25	0.00367	0.00819	0.01237	0.00989	0.00356	0.00066	0.03836
56.25 - 78.75	0.00394	0.01056	0.01534	0.01082	0.00398	0.00122	0.04586
78.75 - 101.25	0.00591	0.00896	0.00600	0.00308	0.00082	0.00038	0.02514
101.25 - 123.75	0.00471	0.00436	0.00184	0.00042	0.00009	0.00000	0.01142
123.75 - 146.25	0.00370	0.00359	0.00166	0.00058	0.00011	0.00004	0.00967
146.25 - 168.75	0.00348	0.00301	0.00201	0.00086	0.00029	0.00009	0.00974
168.75 - 191.25	0.00527	0.00569	0.00465	0.00330	0.00162	0.00091	0.02143
191.25 - 213.75	0.00343	0.00730	0.00974	0.01138	0.00755	0.00441	0.04380
213.75 - 236.25	0.00509	0.01439	0.02545	0.02579	0.02039	0.01576	0.10686
236.25 - 258.75	0.00494	0.01968	0.05686	0.07689	0.04447	0.02811	0.23094
258.75 - 281.25	0.00691	0.01753	0.03776	0.05584	0.03723	0.02663	0.18190
281.25 - 303.75	0.00421	0.00737	0.01158	0.01009	0.00425	0.00248	0.03997
303.75 - 326.25	0.00438	0.00790	0.00852	0.00460	0.00097	0.00027	0.02665
326.25 - 348.75	0.00487	0.00892	0.00779	0.00374	0.00069	0.00013	0.02614

Sub-Total:	0.07680	0.14533	0.22143	0.22873	0.12853	0.08227	0.81882
Calms:							0.12856
Missing/Incomplete:							0.05262
Total:							1.00000

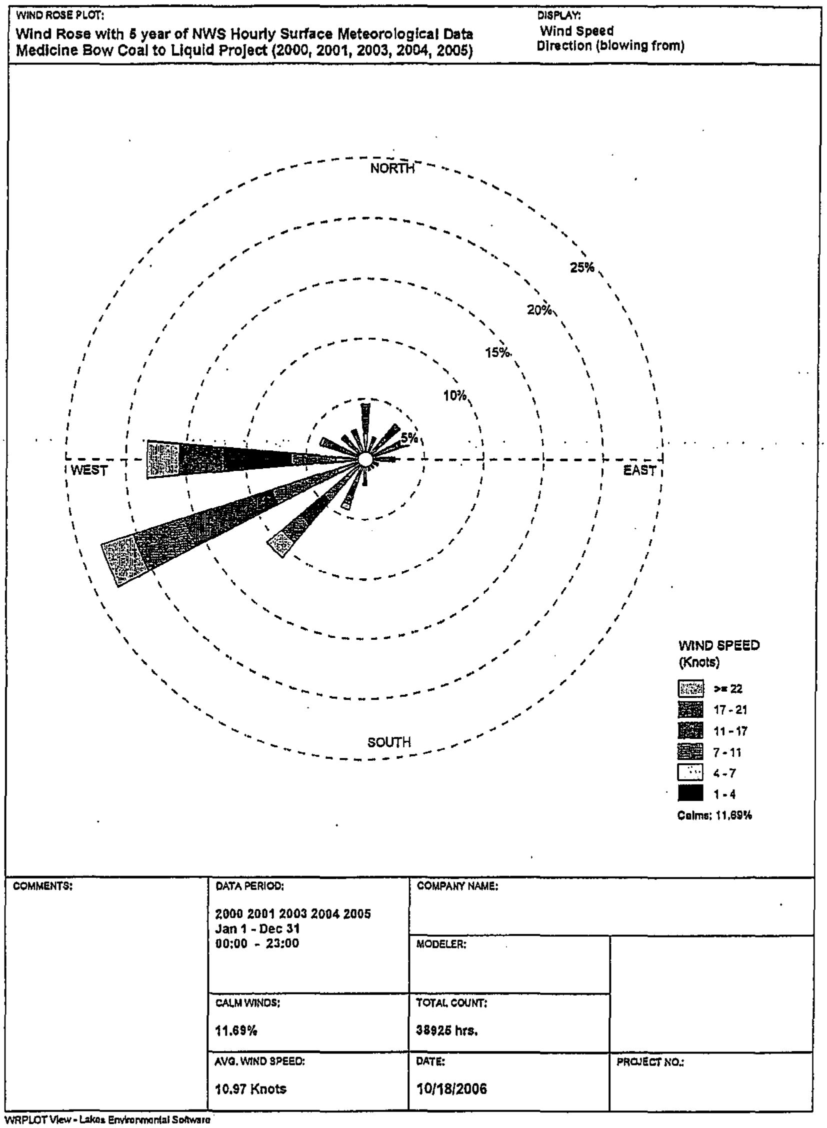


Figure 4 Windrose of Five-Year of Hourly Surface Meteorological Data Rawlins, WY

3.2 National Weather Service Twice-Daily Upper Air Sounding

Upper air data are needed to estimate hourly mixing heights, which are required inputs to the AERMOD dispersion model. There is a scarcity of upper air station in this area of Wyoming. The most suitable NWS station to the project site that routinely performs upper air soundings is the NWS station in Riverton, WY (WBAN 24061), which is located approximately 250 km northwest of the proposed project site. The UTM coordinates (NAD27) of the Riverton NWS station are 217421 meters E and 4773109 meters N. Twice-daily upper air sounding data was obtained from the National Oceanic & Atmospheric Administration (NOAA), http://raob.fsl.noaa.gov/.

So that the upper air data coincided with the surface data, and as discussed with WDEQ, the same five years (2000, 2001, 2003, 2004, and 2005) will be used for both the NWS surface and upper air data in the AERMET processing.

3.3 Site-specific Data

Six years of nearby site-specific meteorological data, 2000 through 2005, have been collected from a meteorological monitoring station outside of Elmo, WY. This site is approximately 24 km northwest of the proposed source location. The UTM coordinates (Zone 13, NAD27) of this station are 372052 meters E, 4638122 meters N. Five parameters for each hour were collected including wind direction (degree), wind speed (meters per seconds), sigma theta (degrees), temperature (Celsius), and precipitation (millimeters). Sensor elevations are 10 meters above grade level (agl) for wind speed and direction, 2 meters (agl) for temperature, and approximately 1 meter (agl) for precipitation.

As with the NWS surface data, this nearby site-specific data was reviewed for completeness, with the result shown in Table 3. Normalized frequency distributions of wind speed and direction are shown in Table 4.

As shown in Table 3, the collected 2002 nearby site-specific data do not satisfy the completeness criteria for 2002 as only 64%, 40%, and 81% of the data are available during the 2nd, 3rd, and 4th quarters of the year. Therefore, 2000, 2001, 2003, 2004, and 2005 on-site data will be used for the AERMET processing and AERMOD modeling. The windrose of the site-specific Elmo hourly surface meteorological data is shown in Figure 5. Comparing Figure 5 with Figure 4 shows that winds at the Elmo site are very similar to those measured at the Rawlins site.

Table 3 On-Site Meteorological Data Completeness Capture

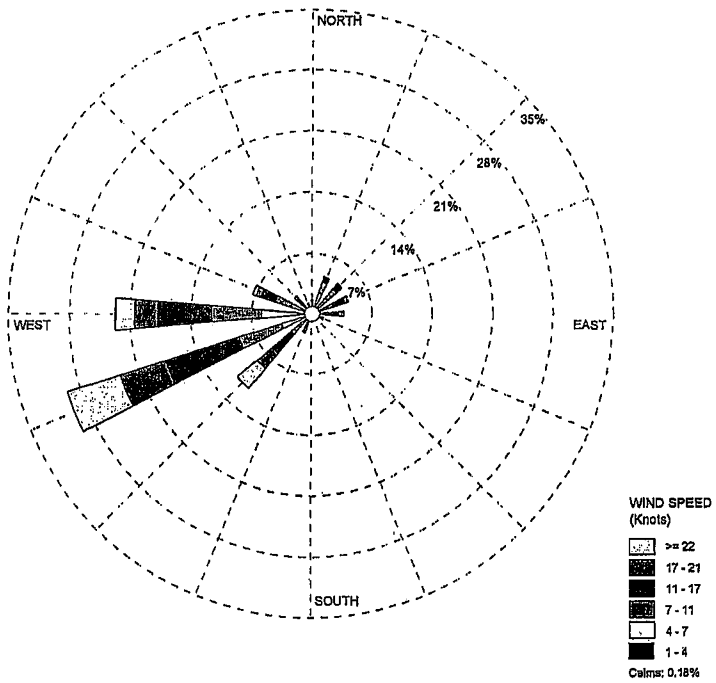
Months	Year	1st Quarter January-March	2nd Quarter April-June	3rd Quarter July-September	4th Quarter October-December
Total Hours per Quarter		2184 or 2160	2184	2208	2208
Number of Missing Hours	2000	0	193	0	1
	2001	0	2	0	1
	2002	159	787	1316	420
	2003	0	1	1	2
	2004	2	0	1	50
	2005	2	50	1	0
Percent Completed (%)	2000	100.0	91.2	100.0	100.0
	2001	100.0	99.9	100.0	100.0
	2002	92.6	64.0	40.4	81.0
	2003	100.0	100.0	100.0	99.9
	2004	99.9	100.0	100.0	97.7
	2005	99.9	97.7	100.0	100.0

Table 4 Normalized Frequency Distribution of Wind Speed and Direction of On-Site Meteorological Data (2000, 2001, 2003, 2004, and 2005)

	Wind Speed						
Wind Direction	**0.5 - 2.1**	**2.1 - 3.6**	**3.6 - 5.7**	**5.7 - 8.8**	**8.8 - 11.1**	**>= 11.1**	**Total**
348.75 - 11.25	0.004324	0.004735	0.003614	0.002471	0.000641	0.000435	0.016219
11.25 - 33.75	0.008075	0.016951	0.013451	0.005079	0.001212	0.000206	0.044975
33.75 - 56.25	0.009654	0.013909	0.01336	0.007069	0.001601	0.000046	0.045639
56.25 - 78.75	0.006657	0.007115	0.012033	0.014206	0.004118	0.001098	0.045227
78.75 - 101.25	0.005834	0.00549	0.008144	0.011438	0.004621	0.001739	0.037266
101.25 - 123.75	0.005056	0.002905	0.002173	0.002471	0.001075	0.000732	0.014412
123.75 - 146.25	0.004392	0.001899	0.001304	0.000824	0.000275	0.000069	0.008762
146.25 - 168.75	0.002494	0.001533	0.000801	0.000732	0.000046	0.000069	0.005673
168.75 - 191.25	0.003088	0.002288	0.001967	0.001167	0.000458	0.000183	0.009151
191.25 - 213.75	0.005239	0.003317	0.004049	0.005536	0.002951	0.00183	0.022922
213.75 - 236.25	0.008373	0.008487	0.014161	0.02887	0.022831	0.030037	0.112758
236.25 - 258.75	0.01384	0.022991	0.051449	0.088555	0.054515	0.063803	0.295152
258.75 - 281.25	0.017729	0.040995	0.057397	0.062133	0.026308	0.022144	0.226706
281.25 - 303.75	0.010066	0.015945	0.019399	0.017638	0.005422	0.003912	0.072381
303.75 - 326.25	0.004873	0.004026	0.008396	0.00716	0.002173	0.001167	0.027795
326.25 - 348.75	0.003797	0.002997	0.003637	0.002036	0.000572	0.00016	0.0132
Sub-Total:	0.11349	0.155583	0.215336	0.257383	0.128818	0.127628	0.995165
Calms:							0.001756
Missing/Incomplete:							0.003079
Total:							1

WIND ROSE PLOT:
On-Site Wind Rose with 5 year of Meteorological Data
Medicine Bow Coal to Liquid Project (2000, 2001, 2003, 2004, 2005)

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS: UTM NAD27, Zone 13 Easting 525670m Northing 4275819m		COMPANY NAME:	
		MODELER:	
		TOTAL COUNT: 43713 hrs.	
		DATE: 8/22/2006	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 5 Windrose of On-Site Meteorological Data

4 Building Downwash

Building downwash will be included for all point sources that could be affected. Direction-specific building dimensions will be defined based on actual building dimensions and stack locations from information provided using the BPIP-PRIME program. This program is built into the *BEEST* program.

5 Receptor Grid

The receptor grid will be centered on the proposed Medicine Bow Coal to Liquid Plant Center with 50 meter spacing along the fenceline, 100 meter spacing from the fenceline to 1.0 kilometers, 500 meter spacing from 1.0 kilometers out to 5.0 kilometers, and 1000 meter spacing from 5.0 kilometers out to 10.0 kilometers from the proposed project. The modeling domain with receptor grids is shown in Figure 6.

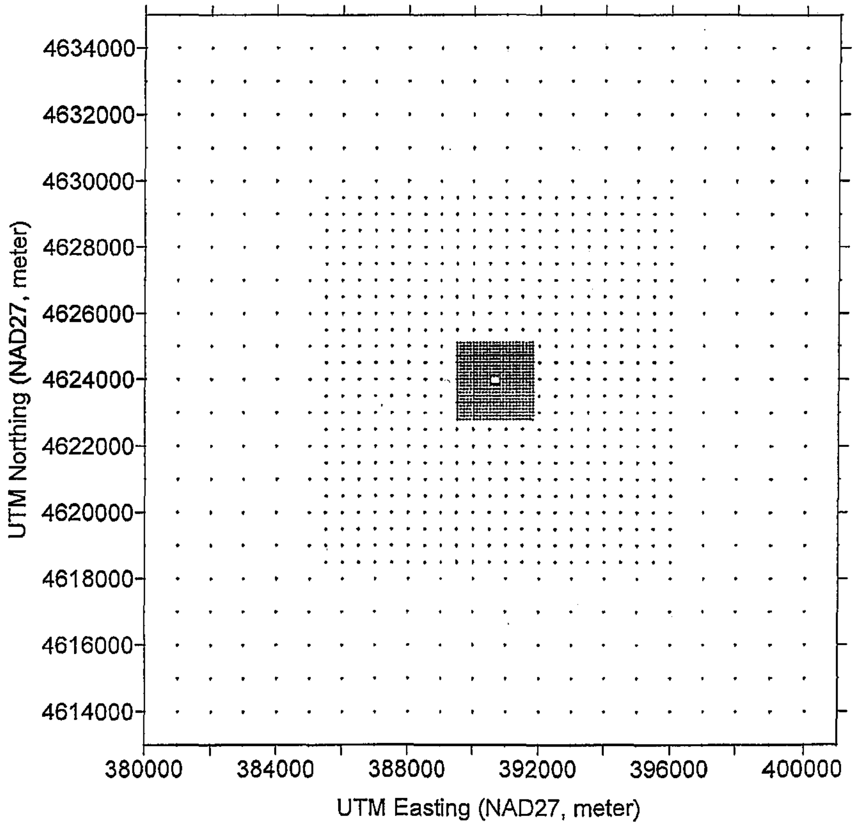


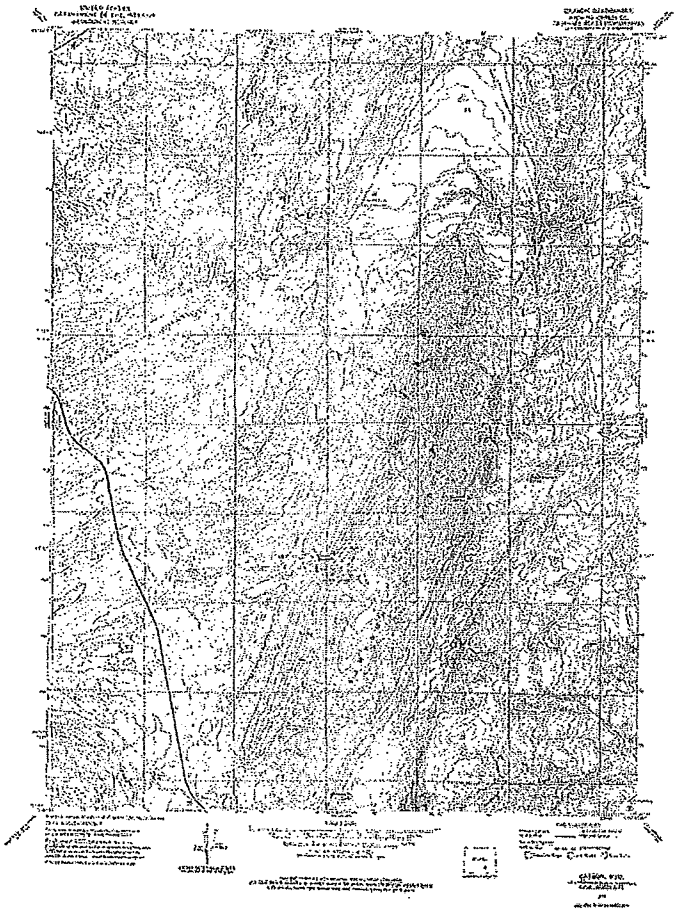
Figure 6 Preliminary Receptor Grid (fence line and source locations are not defined in detail)

DEQ 006061

6 DEM

Digital elevation model (DEM) terrain elevations (based on 7.5 minute DEM files) of Halfway Hill, Carbon, Pine Ridge, Elk Mountain, T L Ranch, and McFadden, WY were identified for the modeling domain. The 7.5 minute DEM files were obtained from Lakes Environmental's website, www.webgis.com. Terrain elevations will be specified for all receptors and sources by running AERMAP.

The DEM data and corresponding 7.5 minute Quadrangle maps are shown in Figures 7 through 12 for each of the 7.5 minute quadrangles. In each figure the quadrangle map is shown on the left side and the right side is the shaded relief depiction generated from the DEM file.



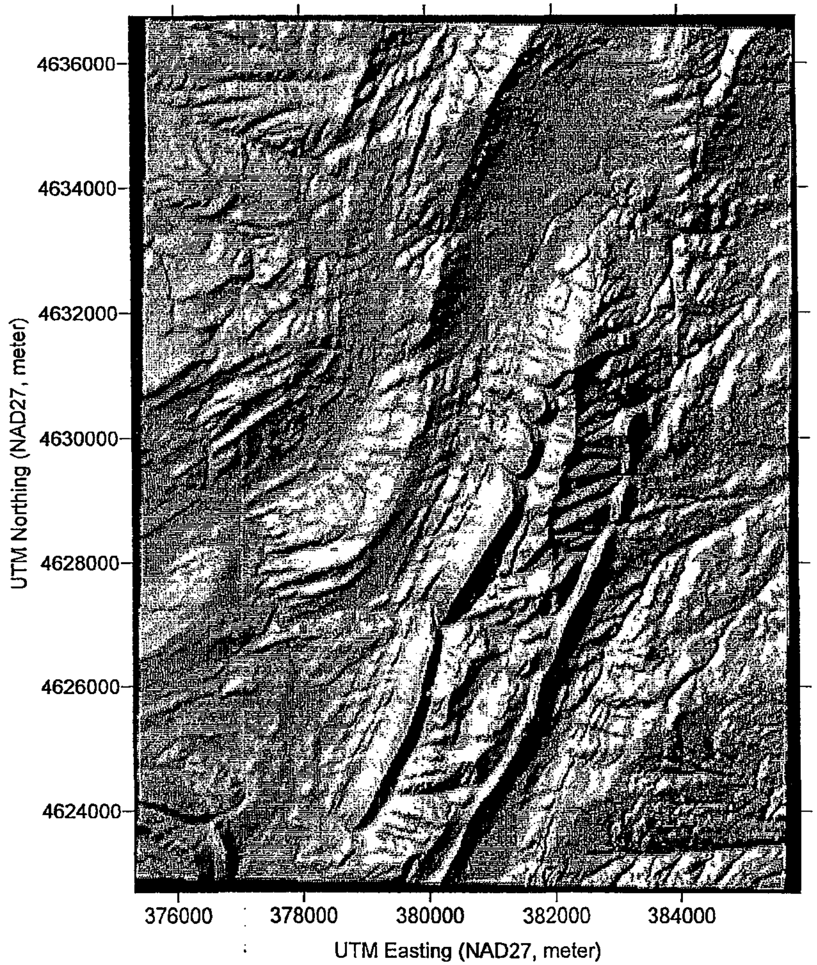
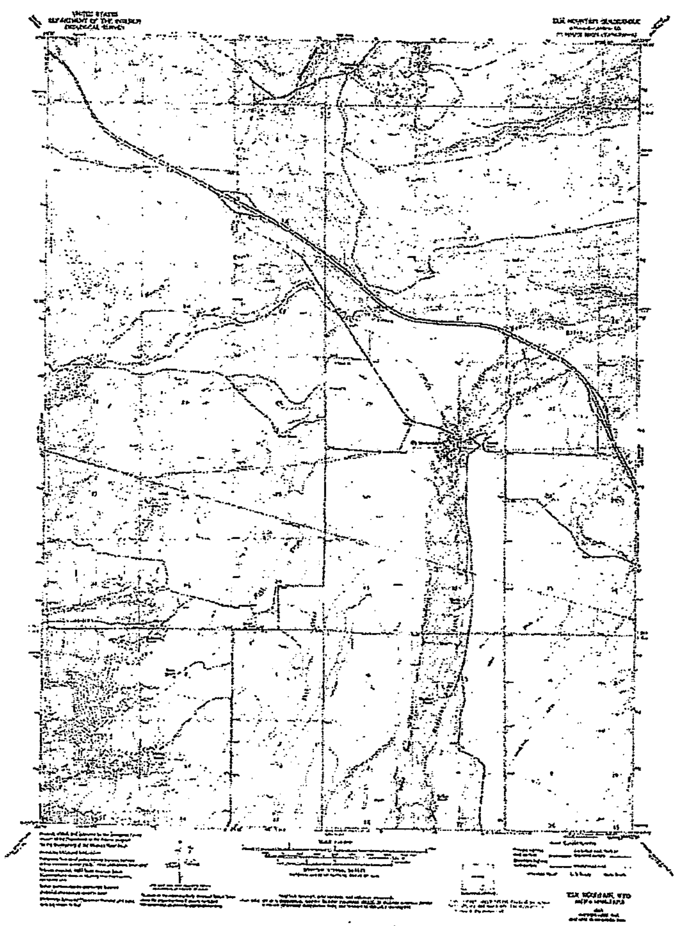


Figure 7 Carbon - 7.5 minute Quadrangle Map (left) and the Plot of DEM Data (right)



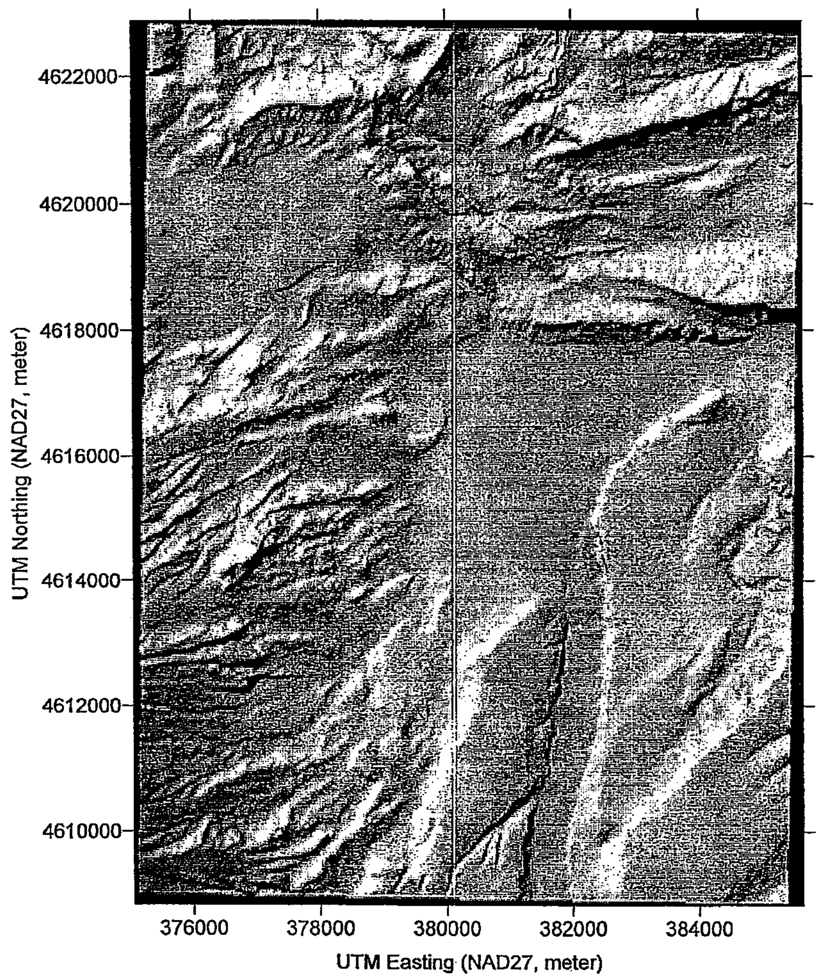


Figure 8 Elk Mountain - 7.5 minute Quadrangle Map (left) and the Plot of DEM Data (right)

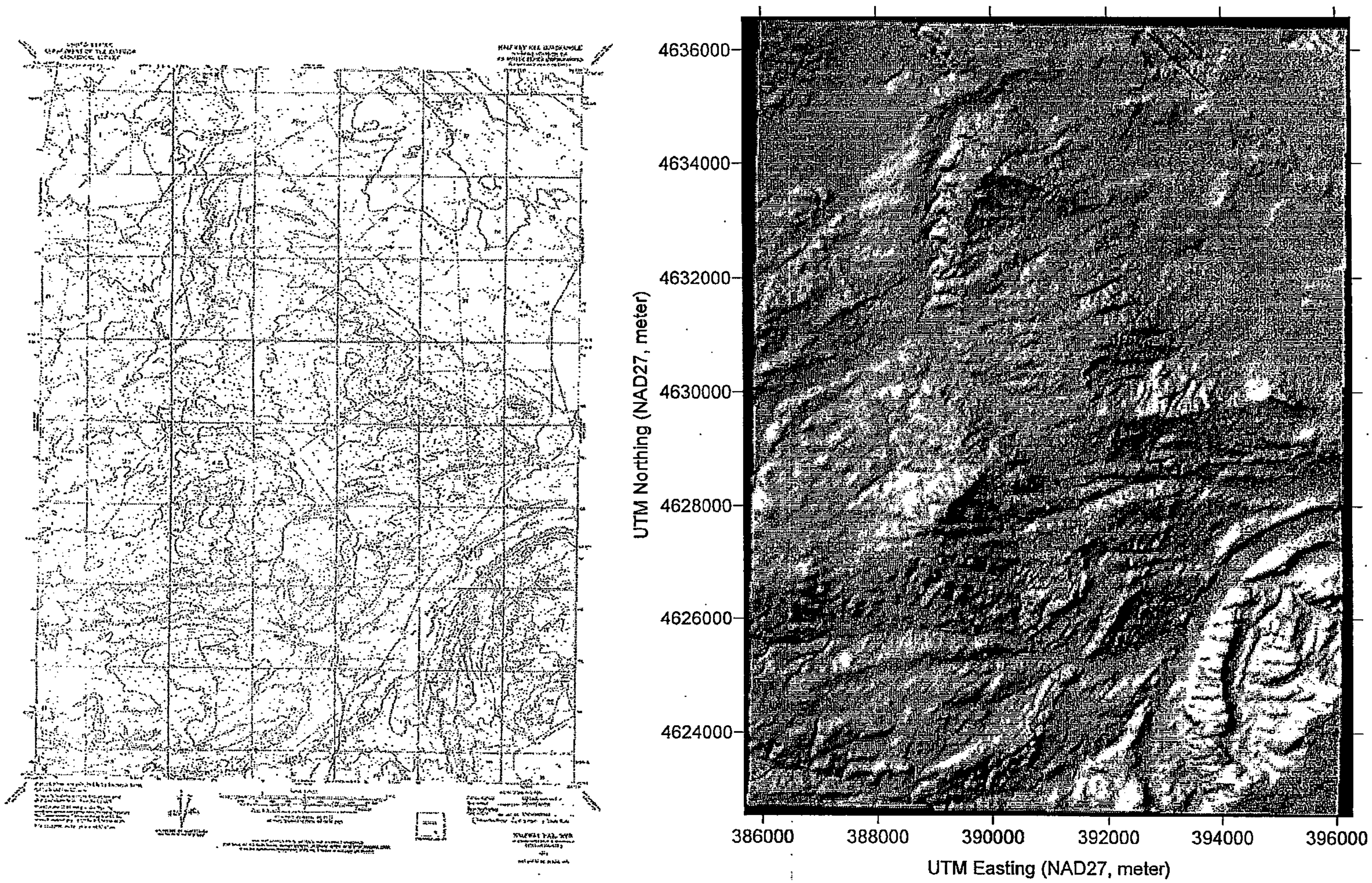


Figure 9 Halfway - 7.5 minute Quadrangle Map (left) and the Plot of DEM Data (right)

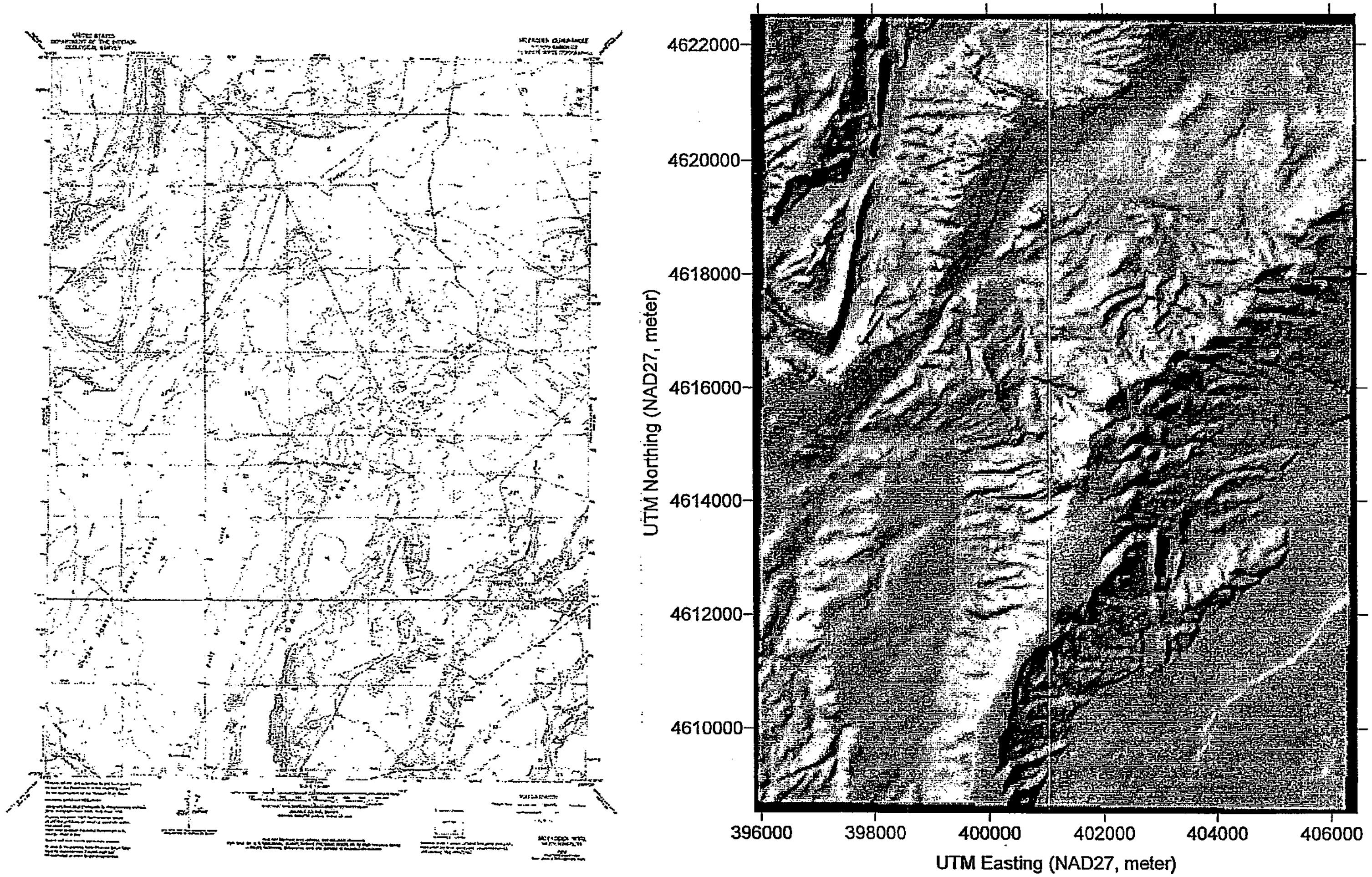


Figure 10 Mc Fadden- 7.5 minute Quadrangle Map (left) and the Plot of DEM Data (right)

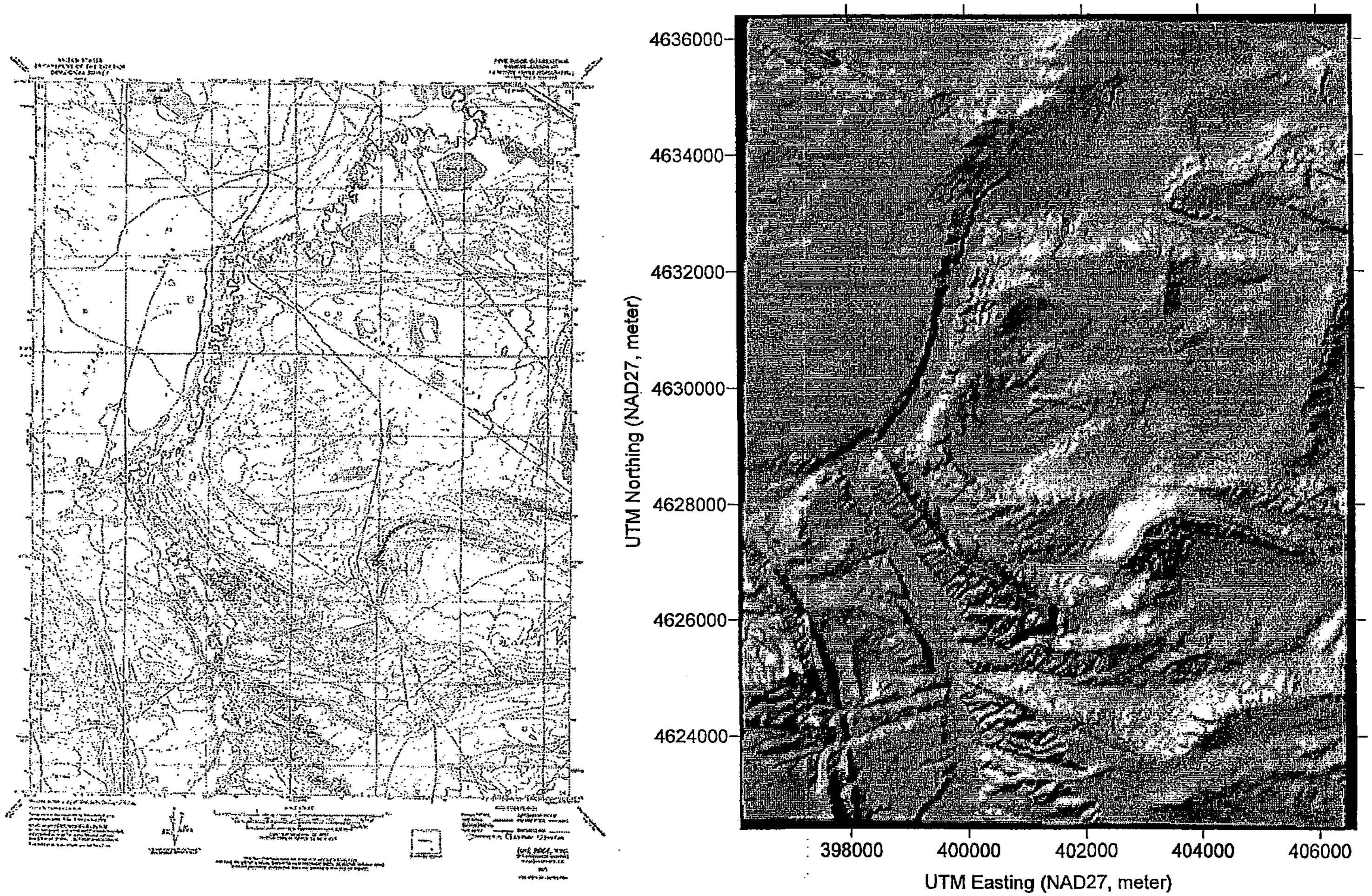
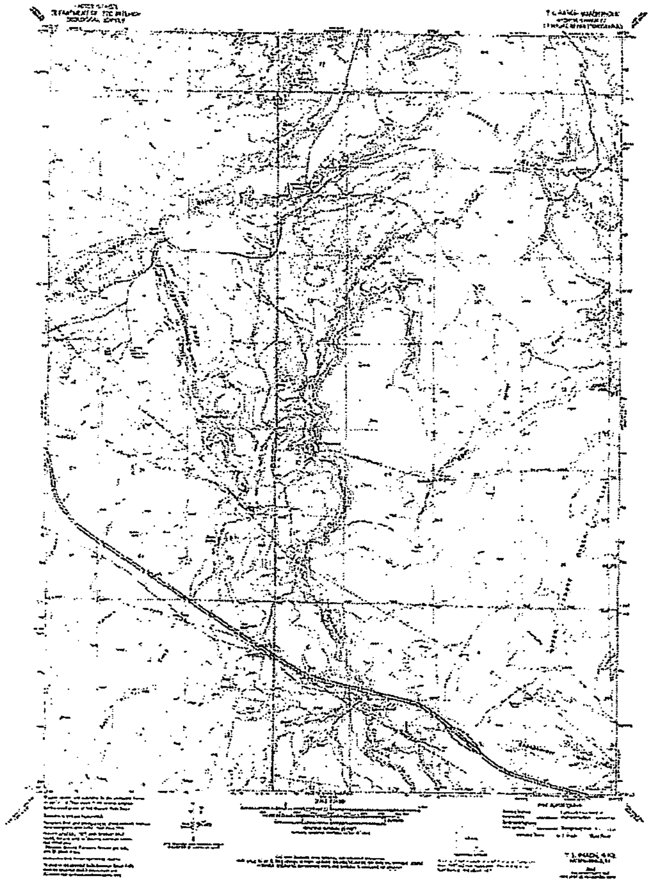


Figure 11 Pin Ridge - 7.5 minute Quadrangle Map (left) and the Plot of DEM Data (right)



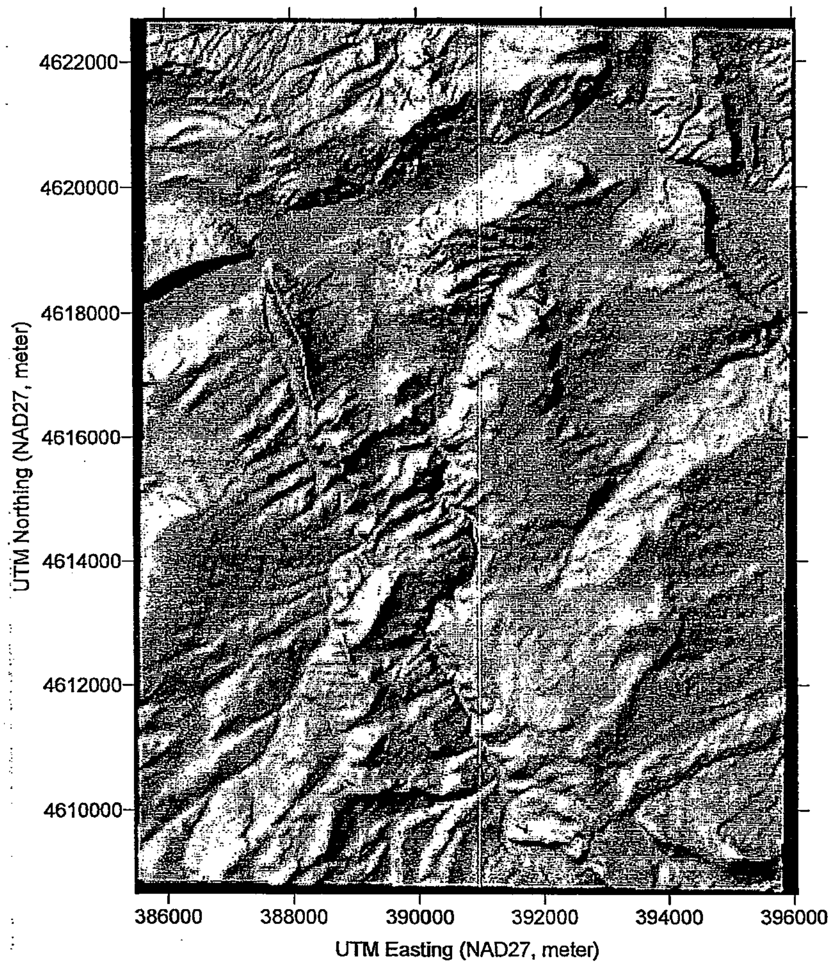


Figure 12 T L Ranch - 7.5 minute Quadrangle Map (left) and the Plot of DEM Data (right)

7 Averaging Times

Modeling will be conducted for the applicable averaging times for all criteria pollutants demonstrating emissions in excess of the Modeling Thresholds (PSD significant emission rate) and as shown in the Wyoming DEQ/Air Division Quality Requirements for Submitting Modeling Analysis (March 1, 2006). The Wyoming and National Ambient Air Quality Standards (AAQS), PSD increments, modeling significance levels, PSD monitoring de minimis concentrations and PSD significant emission rates are summarized in Table 5. Compliance with short-term AAQS is based upon demonstration that the expected number of exceedances per year at each receptor site is less than or equal to one. The averaging periods evaluated will be:

- 1 hour for CO,
- 3 hours for SO_2,
- 8 hours for CO,
- 24 hours for PM_{10} and SO_2
- Annual for PM_{10}, SO_2 and NO_2

Table 5 Comparative Standards and Threshold Values

Pollutant	Averaging Period	WAAQS (μg/m³)	Primary NAAQS (μg/m³)	PSD Increments (μg/m³) CLASS II	PSD Significant Emission Rate (TPY)	Modeling Significance Levels (μg/m³)	PSD Monitoring De Minimis Conc. (μg/m³)
Particulate Matter	Annual 24-hour	50 150	50 150	17 30	PM_{10} = 15	1 5	10
Sulfur Dioxide	Annual 24-hour 3-hour	60 260 1300	80 365 NA	20 91 512	40	1 5 25	13
Nitrogen Dioxide	Annual	100	100	25	40	1	14
Carbon Monoxide	8-hour 1-hour	10000 40000	10000 40000		100	500 2000	575
Lead	Calendar Quarter	1.5	1.5		0.6		0.1

8 Emission Inventory

The preliminary proposed facility emission inventory is provided in Table 6 and Table 7, presenting maximum potential emissions of the modeled criteria pollutants NO_x, CO, SO_2 and PM/PM_{10}.

Table 6 Preliminary PTE for IGCC Turbine

Emission Source	Maximum PTE (tons/year)					
Continuous Operation	NO_2	CO	SO_2	VOC	PM_{10}	H_2SO_4 Mist
IGCC Turbine 1	81	49	0.03	7	19	0.0005

Table 7 Preliminary PTE for Facility-wide Units

Emission Source	Maximum PTE (tons/year)					
	NO_2	CO	SO_2	VOC	PM_{10}	HAP
Coal Pre-Treatment Block	---	---	---	147	6.9	0.0004
Air Separation Block	---	---	---	---	---	---
Coal Gasification Block	25.4	550.1	2.6	0.9	2.5	---
Fischer-Tropsch Block	19	15.9	0.1	85.9	1.4	---
Power Block	106	35	0.03	7	19	---
Product Storage Block	---	---	---	2.3	---	---
Total Emissions	**149.9**	**601.4**	**2.7**	**243.3**	**29.4**	**0.0004**

This source is classified as a 'Fuel Conversion Plant' which is one of the 28 major stationary sources so that the threshold is 100 tons per year for all criteria pollutants. Estimated total potential to emit for NO_2, CO, and VOCs exceed the threshold; therefore, the project is subject to PSD review.

9 Background Concentrations

Background concentrations for the proposed modeling analyses have been obtained from the AirData website (http://www.epa.gov/air/data/geosel.html) for monitors nearest the project site. No monitors are located to the site to reflect the background concentration of the site. However, the closest available monitors to the project site will be used for background concentrations and are located as follows: NO_x monitor at Antelope Site 3, Converse County (#560090819), SO_2 monitor at 90 Gas Hill Road, Riverton, Fremont County (#560136001), CO monitor in the Yellowstone National Park, Teton County (#560391012) and PM_{10} monitor in Mountain Cement Co. Laramie, Albany County, (#560010801). The monitored values to be used as background concentrations reflect 2005 short-term second highest monitored concentrations, and 2005 annual average monitored concentrations. The background concentrations are: NO_x annual average: 0.005 ppm (9.43 ug/m^3), CO 1-hour: 1.7 ppm (1946 ug/m^3), CO 8-hour: 0.8 ppm (916 ug/m^3), PM_{10} annual average: 26 ug/m^3, PM_{10} 24-hour average: 56 ug/m^3, SO_2 annual average: 0.001ppm (2.62 ug/m^3), SO_2 24-hour average: 0.003 ppm (7.84 ug/m^3), and SO_2 3-hour average: 0.012 ppm (31.40 ug/m^3).

10 Modeling Methodology

The scenarios resulting in the maximum-modeled facility impacts will be individually developed for each pollutant and averaging period combination.

A modeling analysis will be performed to demonstrate compliance with the PSD Significant Impact Levels (SILs) for SO_2, NO_x, PM/PM_{10} and CO emissions from the proposed project sources, as well as the PSD Significant Monitoring Concentrations. The maximum averaging period specific concentrations will be compared with the modeling SILs and monitoring de minimis concentrations as shown in Table 5 to determine if the project will require a full impact analysis and/or preconstruction monitoring. If the project does require a full impact analysis for any of the pollutants being modeled, then the highest 2nd highest concentrations and annual average concentrations will be compared to the PSD Class II Increments after incorporation of a suitable nearby existing source inventory and compared to the WAAQS and NAAQS after incorporation of background concentrations and a suitable nearby existing source inventory. If needed, the nearby existing source inventories will be provided by the WDEQ based on the location of the facility for existing sources located within the SIA plus a 50 kilometer radius from the proposed coal to liquid plant.

One hundred percent (100%) conversion of NO_X to NO_2 will be assumed initially. The national default of 75% conversion will be used if necessary. Also, the 75% increment consumption restriction for PSD increments will be applied if a full impact analysis is required. If necessary, AERMOD-PVMRM or AERMOD-OLM may be used as an additional option for NO_X conversion.

11 Modeling Report

The modeling report will include a detailed description of the modeling approach as well as tables documenting modeled emission rates and stack parameters for each source. Graphics showing model results will be presented for both analyses performed for AAQS compliance demonstration and for PSD increment consumption. Plots which depict the magnitude and the location of the maximum modeled impacts for each pollutant will be provided.

Concentration isopleths showing the model results (composite maximum predicted annual concentrations) will be provided.

A summary of conclusions and tables of final model results for each year of meteorological data will also be provided.

All sources will be clearly identified in the report and in the modeling files. Modeling, building downwash analysis, and model input and output files for the near-field modeling will be submitted on CDs with the application. All modeling files (input and output) will be identified by specific file names and referenced by those file names in the discussion of results. Any deviations from the modeling protocol will be discussed with WDEQ prior to inclusion in the modeling analysis and will be fully documented in the modeling report.

LONG-RANGE TRANSPORT AIR QUALITY ANALYSIS PROTOCOL

FOR THE

MEDICINE BOW COAL TO LIQUID PLANT, WYOMING

Prepared for

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1.0 Background

Medicine Bow Fuel and Power (MBFP) proposes to obtain a Prevention of Significant Deterioration (PSD) Air Quality Construction Permit for the Coal to Liquids project in Carbon County, Wyoming. MBFP is located between the City Elk Mountain and the Town of Medicine Bow. LULC shapefile plotted in ArcGIS shows that most of the area surrounded by the facility is shrub/brush. This protocol describes the long-range transport modeling analysis that will be submitted along with the required air quality permit applications.

Class I areas and State Class I area (Sensitive Class II area) within 300 km from the facility will be selected for the long-range CALPUFF modeling analysis. The MBFP facility will be located in an area that is designated as attainment of all National Ambient Air Quality Standards (NAAQS). All of the Class I areas within 300 km from the facility will be included in this analysis and are shown in Figure 4-1. There are eight Class I areas within 300 km from the facility will be accounted for this analysis. The nearest Class I area, which is Mount Zirkel Wilderness, is located approximately 93 km southwest from the facility. Class I and sensitive Class II areas within 300 km from the facility are listed in Table 1 and are described in section 4.0 in detail. There is one sensitive Class II area within 300 km from the facility, named Savage Run, which is located approximately 60km south from the facility.

Table 1-1 Class I areas and Sensitive Class II areas within 300 km

	Areas
Class I Areas	Rocky Mountain National Park, Rawah Wilderness, Flat Tops Wilderness, Eagles nest Wilderness, Mount Zirkel Wilderness, Marron Bell-Snowmass Wilderness, Bridger Wilderness, and Fitzpatrick Wilderness
Sensitive Class II Areas	Savage Run

Following sources/units will be included for the modeling emission sources:

- Two (2) GE frame 7 gas combustion turbines;
- Coal Storage and pre-treatment block;
- Air separation block;
- Fischer-Tropsch block;
- Power block; *and*
- Product storage block

Tables 1-2 and 1-3 shows preliminary emission estimates. The turbine is expected to operate 8760 hours per year continuously. Emission estimates and dispersion modeling will assume 8,760 hours of operation per year.

This source is 'Fuel Conversion Plants' which is one of the 28 major stationary sources so that the threshold is 100 tons per year for all criteria pollutants. Estimated total Potential to Emit (PTE) for NO_2, CO, and VOCs exceed the threshold as indicated in

Tables 1-2 and 1-3; therefore, the project triggers PSD application. The project is expected to be a minor source of hazardous air pollutants (HAPs).

Table 1-2 Preliminary PTE for Combustion Turbines based on Continuous Operation

Emission Source	Maximum PTE (tons/year)					
Continuous Operation	NO_2	CO	SO_2	VOC	PM_{10}	H_2SO_4 Mist
Combustion Turbines	42	14	0.03	7.2	19	0.0005

Table 1-3 Preliminary PTE for Facility-wide Units

Emission Source	Maximum PTE (tons/year)					
	NO_2	CO	SO_2	VOC	PM_{10}	HAP
Coal Pre-Treatment Block	---	---	---	147	6.9	0.0004
Air Separation Block	---	---	---	---	---	---
Coal Gasification Block	25.4	550.1	2.6	0.9	2.5	---
Fischer-Tropsch Block	19	15.9	0.1	85.9	1.4	---
Power Block	42	14	0.03	7	19	---
Product Storage Block	---	---	---	2.3	---	---
Total Emissions	**86.6**	**580.2**	**2.7**	**243.3**	**29.4**	**0.0004**

This modeling protocol has been prepared to support a PSD air quality impact analysis as described by Wyoming DEQ/Air Division Quality requirements for Submitting Modeling Analysis (March, 2006). Specifically, this protocol addresses the technical methodology followed to assess compliance with applicable National Ambient Air Quality Standards (NAAQS), Wyoming Ambient Air Quality Standards (WAAQS), potential impacts to air quality related values (AQRVs) at Class I areas, and comparisons to applicable PSD Class I increments. Information provided in this modeling protocol is preliminary in nature and is subject to change.

This modeling protocol was prepared based on written guidance received from the WDEQ as well as phone call with representatives of the WDEQ on August 18th, 2006. The following guidance documents were also consulted:

- Wyoming DEQ/Air Division Quality requirements for Submitting Modeling Analysis (March, 2006)
- Interagency Workgroup on Air Quality Modeling Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts (IWAQM2), (EPA-454/R-98-019, 1998)
- Federal Land Managers Air Quality Related Values Work Group Phase I report (FLAG), (USFS, NPS, USFWS, 2000)

2.0 Source Location Description

MBFP is located at approximately 10 kilometer (km) northeast from the City of Elk Mountain in Carbon County, WY, and approximately 14 km southwest from the Town of Medicine Bow in Carbon County, WY. The facility will be located in section 29 in T21R79 as shown in Figure 2-1. The UTM coordinate of the center of the section 29 is 390634E meter and 4624013N meter. Topographic map of the facility area indicating section 29 is shown in Figure 2-2. The topographic map shows the project source is located in generally flat area/rolling hills.

Emission sources at the facility include three GE frame 7 gas combustion turbines, coal storage and pre-treatment block, air separation block, Fischer-Tropsch block, power block, and product storage block.

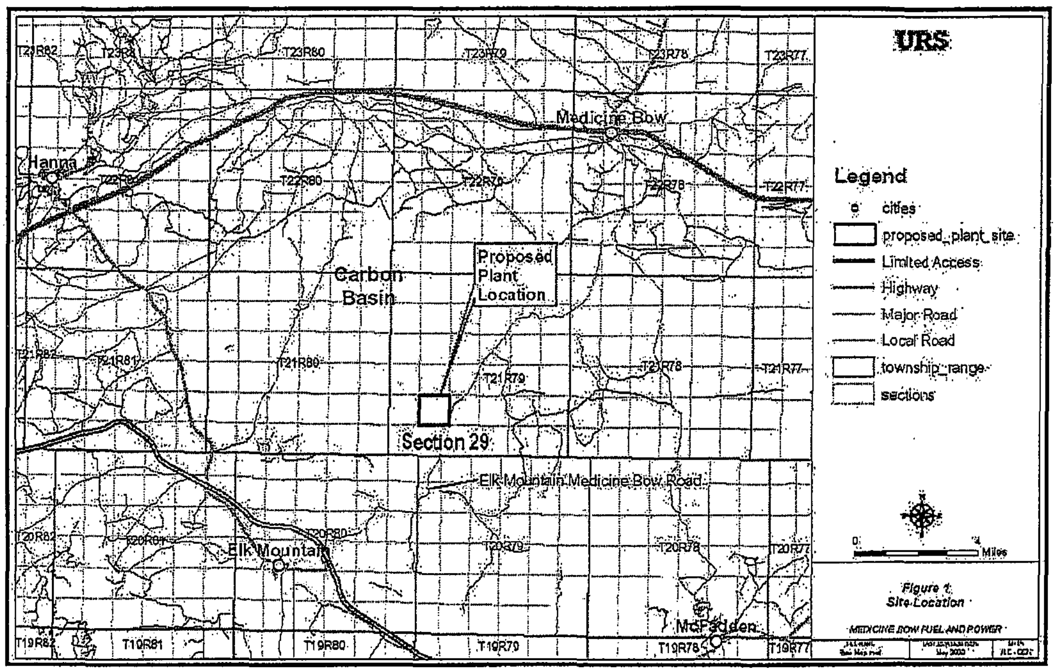

Figure 2-1 Project Source Location

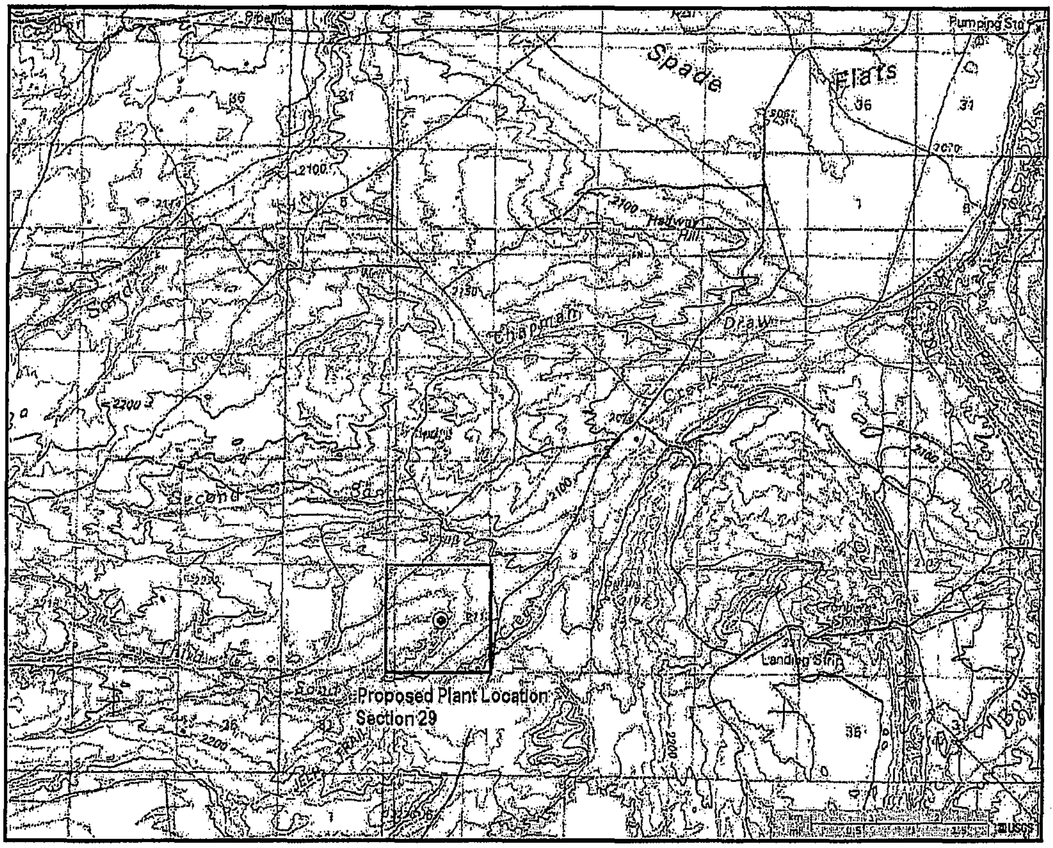

Figure 2-2 Topographic Map of the Proposed Plant

The proposed project includes the construction of a 13,000 bpd Coal to Liquid Plant adjacent to an existing coal mine (mine mouth facility), or a stand-alone facility that will receive the coal by rail. The Fischer-Tropsch technology produces liquid hydrocarbons (FT Diesel [FTD]) from synthesis gas (SynGas) derived from coal gasification.

FTD has ultra low sulfur (S), polycyclic aromatic compounds (PAH), metals, and has a high cetane number in comparison to standard diesel fuels. The cetane number, or CN, is a measure of the diesel fuel's combustion quality. CN is to diesel fuel as octane is to gasoline. FTD is a very clean burning fuel with substantially reduced air emissions, as compared to other fuels.

The facility may also incorporate cold start and emergency equipment that will run on natural gas or diesel. This equipment could include auxiliary boilers, an emergency fire pump, an emergency generator, and/or an emergency compressor. The facility can be broken down into six (6) blocks. Each block is discussed in further detail below.

2.1 Coal Pre-Treatment Block

Coal will be transported to the facility by conveyor, rail, or haul truck. Approximately 3,000,000 tons of coal will be used annually. The coal will be stored in open piles or stacking tubes with a storage capacity of approximately 40,000 to 80,000 tons. A covered emergency stockpile (dead storage) may be constructed to insure against interruptions of coal shipment due to unforeseen circumstances. The coal will be conveyed to small day silo. The coal will be crushed into a powder and transfer to the Gasifier Lock Hopper (part of the Coal Gasification Block).

Air emissions from this block could include particulates (PM) resulting from the conveying, milling, and/or storage of the coal. Included in the PM emissions are a number of inorganic hazardous air pollutants (HAPs) which are found in trace quantities in coal. These include arsenic, beryllium, cadmium, chromium, copper, mercury (Hg), manganese, nickel, lead, thorium, and uranium. These emissions will be controlled by passive dust controls (i.e., duct and conveyor design) and possibly baghouses.

2.2 Air Separation Block

The Air Separation Unit (ASU) is used to generate oxygen (O_2) and nitrogen (N_2) for use in other process blocks. There are no point source emissions of criteria or hazardous pollutants from this block.

2.3 Coal Gasification Block

Coal powder (200 mesh) from the Coal Pre-Treatment Block is fed pneumatically into the Coal Gasification Block using an inert nitrogen and carbon dioxide (CO_2) carrier gas supplied by the ASU and AGR (Acid Gas Removal) units. The coal is mixed with steam, CO_2, and O_2 to form a combustible gas (SynGas) which is primarily H_2 and CO. The SynGas is further processed to remove PM, Hg, S, and CO_2.

Air emissions under normal operation from this block could include hydrogen sulfide (H_2S) and CO_2. Excess CO_2 maybe used for enhanced oil or Coal Bed Methane (CBM) recovery for the regional oil and gas industry. A flare or thermal oxidizing unit (TOU) will be used to control H_2S and emergency releases of SynGas and other process gases. The flare or TOU would combust pipeline quality natural gas as a fuel for the pilot, which would result in minor amounts of criteria pollutants (such as oxides of nitrogen [NOx] and carbon monoxide [CO]).

Wastewater and slag steam is also generated in this Block. The slag is dewatered and returned to the mine for disposal. The water is treated and recycled or discharged to the surface drainage or evaporation pond. A mercury containing absorption mass is sent off-site to be reclaimed. The sulfur byproduct is collected and sent off-site to be used in fertilizer and other sulfur containing products.

2.4 Fischer-Tropsch Block

The Fischer-Tropsch process uses a catalyst to produce linear hydrocarbons and byproduct oxygenates, including middle distillate crude, naphtha crude, and waxes. These three products can be upgraded to FTD. The current plan is to produce approximately 9,500 bpd of FTD and approximately 3,500 bpd of naphtha for sale. The product will be transported from the site using over the road trucks, rail, and/or pipeline.

Unreacted SynGas (Tail Gas) will be sent to the Power Block to be used as a fuel for the combustion turbine.

Air emissions from this block, under normal operation, may include periodic emissions of SynGas and VOCs from the crude storage tanks. A flare or TOU will be used to control periodic and emergency releases of SynGas or other process gases. The flare or TOU combusts pipeline quality natural gas as a fuel for the pilot, which would result in minor amounts of criteria pollutants (NOx and CO).

The catalyst waste product will be a wax / catalyst mix and maybe sold as a solid fuel for cement kilns or sent off-site for disposal.

2.5 Power Block

The Power Block will consist of a combined cycle combustion and steam turbines and two (2) auxiliary boilers. The turbines will be used to generate 245 MW of electricity that is approximately 105-110% of the facility's electrical needs. Excess steam is used in various parts of the process. Two (2) auxiliary boilers (220 MMBtu/hr each) will be used during startup and when additional stream is require. The Boilers will burn SynGas for fuel, and may also be able to burn natural gas or diesel.

Air emissions from this block include criteria pollutants (NOx, CO, and VOC) and minor amounts of HAPs.

This block may also include the storage of hazardous water treatment chemicals used in the steam system.

2.6 Product Storage Block

The Product Storage Block will include tanks for approximately 60 days of storage for the FTD (570,000 barrels [bbl]) and of naphtha (210,000 bbl). This Block also includes the truck and rail loading facilities.

Air emissions from this block may include minor amounts of VOCs resulting from working and breathing losses from the tanks and loading rack emissions.

In addition, there will be a flare or TOU to combust excess CO_2. This unit would combust pipeline quality natural gas as a fuel for the pilot, which would result in minor amounts of criteria pollutants (NOx and CO)..

3.0 Standards and Criteria Levels

Long-range transport CALPUFF dispersion modeling analyses will be performed to assess impacts of major stationary sources subject to PSD rules relative to the different standards and thresholds shown in Tables 3-1 and 3-2. Table 3-1 indicates Class I PSD increment and modeling significance levels. Table 3-2 shows FLAG Class I visibility reduction threshold and US National Park Service (USNPS) and US Fish and Wildlife Service (USFWS) deposition analysis thresholds (DAT).

Table 3-1 PSD Class I Increments and Significant Impact Levels (SILs)

Pollutant	Averaging Period	PSD Class I Inc. (μg/m³)	Class I Area SILs (μg/m³)
Nitrogen Dioxide	Annual	2.5	0.1
Sulfur Dioxide	3-hour	25	1.0
	24-hour	5	0.2
	Annual	2	0.08
Particulate Matter <10 μm [PM_{10}]	24-hour	8	0.32
	Annual	4	0.16

Table 3-2 Class I Area Visibility and Deposition Thresholds

	Visibility Reduction (%)	Deposition Total N (kg/ha/yr)	Deposition Total S (kg/ha/yr)
Threshold	5	0.005 (1.5854E-11 g/m²/s)	0.005 (1.5854E-11 g/m²/s)

4.0 Long Rang Transport Modeling

4.1 Long-Range Transport Modeling

A PSD analysis of increment and AQRV impacts on Class I and sensitive Class II areas will be performed if any Class I or sensitive Class II areas are located within 300 kilometers of the proposed project location. There are eight Class I areas within 300 km from the facility will be accounted for this analysis. The nearest Class I area is the Mount Zirkel Wilderness, which is located approximately 93 km south from the project. The second nearest Class I area is the Rawah Wilderness, which is located approximately 102 km south from the project. Rocky Mountain NP and Flat Tops Wilderness Class I areas are located approximately 144 km and 192 km south from the facility, respectively. Eagles Nest Wilderness and Maroon Bell-Snowmass Wilderness Class I areas are located 214 km and 283 km south from the facility, respectively. Bridger Wilderness and Fitzpatrick Wilderness Class I areas are located 242 km and 294 km northwest from the facility, respectively. The sensitive Class II area is Savage Run which is located 60 km south from the facility. The locations of the Class I, sensitive Class II areas, and the facility are shown in Figure 4-1.

The analyses performed would include the following:

- PSD Class I Increment modeling significance levels
- Visibility reduction thresholds, and
- US National Park Service (USNPS) and US Fish and Wildlife Service (USFWS) deposition analysis thresholds (DAT)

As indicated in Wyoming DEQ/Air Division Quality Requirements for Submitting Modeling Analysis, an additional air quality impacts analysis (soils and vegetation analysis, secondary growth impacts) would also be performed. Impacts to water systems (if any are identified) are also to be included as part of the additional air quality impacts analysis. If project impacts are minor, the likelihood of additional impacts will be minor as well.

4.2 Model Selection and Setup

To estimate air quality impacts at distances greater than 50 km, the CALPUFF model will be used in conjunction with the CALMET diagnostic meteorological model. CALPUFF is a puff-type model that can incorporate three-dimensionally varying wind fields, wet and dry deposition, and atmospheric gas and particle phase chemistry.

The CALMET model is used to prepare the necessary gridded wind fields for use in the CALPUFF model. CALMET can accept as input; mesoscale meteorological data (MM4 or MM5 data), surface station, upper air, precipitation, cloud cover, and over-water meteorological data (all in a variety of input formats). These data are merged and the effects of terrain and land cover types are estimated. This process results in the generation of gridded 3-D wind field that accounts for the effects of slope flows, terrain blocking effects, flow channelization, and spatially varying land use types. Although

WDEQ provided CALMET model outputs for user's convenience, the CALMET modeling domain of this project was larger than the modeling domain that the WDEQ provided. Therefore, CALMET will be run using mm5, precipitation, and surface data provided by WDEQ.

The development of model inputs and options for CALPUFF processors will be based on guidance provided in following references:

- Wyoming DEQ/Air Division Quality Requirements for Submitting Modeling Analysis (March, 2006),
- Interagency Working Group on Air Quality Modeling (IWAQM), Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts (December 1998), and
- Permit application PSD particulate matter speciation methodology developed by Don Shepherd, National Park Service (2006).

Key inputs and model options will be discussed in the air quality impacts analysis section of the permit application. A draft CALMET and CALPUFF, preliminary inputs and model options are presented in Tables 4-1 and 4-2.

The EPA-approved version of the CALMET/CALPUFF system (Version 5) will be used. In addition, all supporting Version 5 of the pre- and post-processors will be used. Copies of all executable files used in the preparation of this modeling analysis will be provided in the final application.

Table 4-1 CALMET Model Options

CALMET Variable	Specified Value	Comment
NUSTA	1	Number of Upper Air Stations
PMAP	LCC	Map Projection – Lambert Conformal Conic
FEAST	0	False Easting (km)
FNORTH	0	False Northing (km)
RLAT0	40.5N	Latitude of Projection Origin
RLON0	106.0W	Longitude of Projection Origin
XLAT1	30.0N	Matching Parallel of Latitude for Projection
XLAT2	60.0N	Matching Parallel of Latitude for Projection
DATUM	NAS-C	Datum for Output Coordinates
NX	184	Number of Grid Cells in the X-direction
NY	157	Number of Grid Cells in the Y-direction
DGRIDKM	4	Grid Cell Spacing (km)
XORIGKM	-390	Reference Grid Coordinate of Southwest Corner of Grid Cell (1,1) X coordinate (km)
YORIGKM	-260	Reference Grid Coordinate of Southwest Corner of Grid Cell (1,1) Y coordinate (km)
NZ	10	Number of Vertical Layers (0, 20, 40, 100, 200, 350, 500, 750, 1000, 2000, 3500 m)
NOOBS	0	Use Surface, Overwater, and Upper Air Stations
NSSTA	30	Number of Surface Stations
NPSTA	108	Number of Precipitation Stations
IWFCOD	1	Diagnostic Wind Module (1 = yes)
IFRADJ	1	Froude Number Adjustment (1 = yes)
IKINE	0	Kinematic Effects (0 = no)
IOBR	0	O'Brien Vertical Velocity Adjustment (0 = no)
ISLOPE	1	Slope Flow Effects (1 = yes)
IEXTRP	-4	Surface Wind Extrapolation – similarity theory, ignore layer 1
ICALM	0	Extrapolate calm surface winds (0 = no)

Table 4-2 CALPUFF Model Options

CALPUFF Variable	Specified Value	Comment
IBTZ	7	Base Time Zone
MGAUSS	1	Vertical Distribution Used In The Near Field
MCTADJ	3	Terrain Adjustment Method
MCTSG	0	Subgrid-Scale Complex Terrain Flag
MSLUG	0	Near-Field Puffs Modeled As Elongated 0
MTRANS	1	Transitional Plume Rise Modeled
MTIP	1	Stack Tip Downwash
MBDW	2	Building Downwash (2=PRIME method)
MSHEAR	0	Vertical Wind Shear Modeled Above Stack Top
MSPLIT	0	Puff Splitting Allowed
MCHEM	1	Chemical Mechanism Flag (1 = MESOPUFF II Scheme)
MWET	1	Wet Removal Modeled

CALPUFF Variable	Specified Value	Comment
MDRY	1	Dry Deposition Modeled
MDISP	3	Method Used To Compute Dispersion Coefficients
MTURBVW	3	Sigma-V/Sigma-Theta, Sigma-W Measurements Used
MROUGH	0	PG Sigma-Y,Z Adjusted For Roughness
MPARTL	1	Partial Plume Penetration Of Elevated Inversion (per IWAQM)
MTINV	0	Strength Of Temperature Inversion Provided In PROFILE.DAT Extended Records
MPDF	0	PDF Used For Dispersion Under Convective Conditions
MSGTIBL	0	Sub-Grid TIBL Module Used For Shore Line
MBCON	0	Boundary Conditions (Concentration) Modeled
MFOG	0	Configure For FOG Model Output
MREG	1	Test Options Specified To See If They Conform To Regulatory Values
PMAP	LCC	Map Projection
FEAST	0	False Easting (km)
FNORTH	0	False Northing (km)
RLAT0	40.5N	Latitude of Projection Origin
RLON0	106.0W	Longitude of Projection Origin
XLAT1	30.0N	Matching Parallel of Latitude for Projection
XLAT2	60.0N	Matching Parallel of Latitude for Projection
DATUM	NAS-C	Datum-Region For Output Coordinates
NX	184	No. X Grid Cells
NY	157	No. Y Grid Cells
NZ	10	No. Vertical Layers
DGRIDKM	4	Grid Spacing (km)
ZFACE		0.,20.,40.,100.,200.,350.,500.,750.,1000.,2000.,3500.
XORIGKM	-390	Reference Coordinate of Southwest Corner of Grid Cell (1,1) X coordinate (km)
YORIGKM	-260	Reference Coordinate of Southwest Corner of Grid Cell (1,1) Y coordinate (km)
RCUTR	30	Reference Cuticle Resistance
RGR	10	Reference Ground Resistance
REACTR	8	Reference Pollutant Reactivity
NINT	9	Number Of Particle-Size Intervals Used To Evaluate Effective Particle Deposition Velocity
IVEG	1	Vegetation State In Unirrigated Areas
MOZ	1	Ozone Data Input Option (1 = read hourly ozone concentration from ozone.dat data file)
BCKNH3	2	Monthly Ammonia Concentrations (ppb)
MHFTSZ	0	Switch For Using Heffter Equation For Sigma Z As Above
WSCALM	.5	Minimum Wind Speed (m/s) Allowed For Non-Calm Conditions
XMAXZI	3500	Maximum Mixing Height (m).
XMINZI	50	Minimum Mixing Height (m)

4.2.1 Location and Land-Use

The CALMET and CALPUFF models incorporate assumptions regarding land-use classification, leaf-area index, and surface roughness length to estimate deposition during transport. U.S. Geological Survey (USGS) 1:250,000 scale digital elevation models (DEMs) and Land Use Land Cover (LULC) classification files will be used to develop the geophysical input files required by the CALMET model. Terrain pre-processor (TERREL) and land use pre-processor (CTGPROC) output will be combined in the geo-physical preprocessor (MAKEGEO) to prepare the CALMET geo-physical input file. The CALMET model will incorporate the necessary parameters in the CALMET output files for use in the CALPUFF model.

To provide a large enough domain to capture more than one upper air station, the modeling domain will be defined using a grid-cell arrangement that is 184 cells in X (easting) direction and 157 cells in Y (northing) direction. The grid-cells will be 4 kilometers wide. The modeling domain will be specified using the Lambert Conformal Conic (LCC) Project system. The modeling domain is shown in Figure 4-1.

4.2.2 Meteorological Data

Pursuant to FLAG guidance, a three-year meteorological data set will be developed using a combination of surface, upper-air, and mesoscale meteorological (MM) data. All of surface, upper-air, and MM data were obtained from WDEQ. Surface, upper-air, and MM data points will be combined and used in the CALMET model.

Hourly surface data from 30 different stations and precipitation data from 108 different stations will be obtained from WDEQ. Three years of MM5 data, which was used for BART modeling for Western Regional Air Partnership (WRAP), will be also obtained from WDEQ. All 2001, 2002, and 2003 data sets have a gridded resolution of 36 kilometers.

CALMET wind fields will be generated using a combination of MM data sets augmented with the surface and upper air data from the National Weather Service (NWS) described above. Per IWAQM guidance, the MM data will be interpolated to the CALMET fine-scale grid to create the initial-guess wind fields (IPROG = 14 for MM5).

4.2.3 Receptors

Receptors for each Class I area except Savage Run will be obtained from the National Park Service's *NPS Convert Class One Areas* database (provided by the NPS). No modifications to the receptor locations or heights, as provided in the database, will be made. Latitude/Longitude of the Class I receptor coordinate will be converted to Lambert Conformal Conic (LCC) coordinate based on domain setup shown in CALMET options. GIS shape file of Savage Run area was obtained from USDA Forest Service (USDAFS) and same configuration of the receptors obtained from NPS was applied for the receptors in the Savage Run area using GIS ArcMap software. The coordinate was converted to Lambert Conformal Conic (LCC) coordinate.

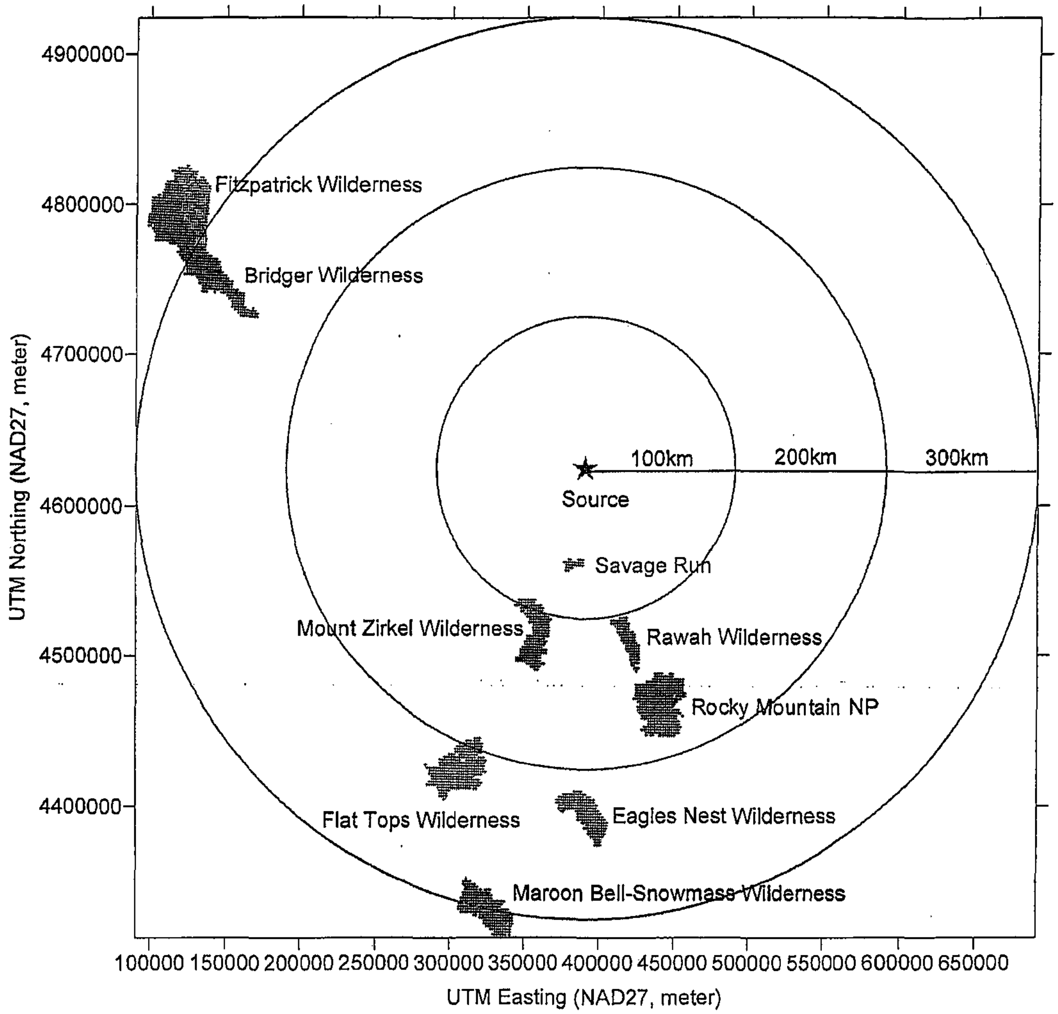

Figure 4-1 Modeling Domain and Receptors of Class I areas and Sensitive Class II area

4.2.4 Other Model Options

Hourly ozone concentration file (OZONE.DAT) will be obtained from WDEQ. Data from Centennial, WY and Rocky Mountain, CO sites for the year of 2001, 2002, and 2003 will be used in the CALPUFF model.

Size parameters for dry deposition of nitrate, sulfate, and PM_{10} particles will be based on default CALPUFF model options. Chemical parameters for gaseous dry deposition and wet scavenging coefficients will be based on default values presented in the CALPUFF User's Guide. Calculation of total nitrogen deposition will include the contribution of nitrogen resulting from the ammonium ion of the ammonium sulfate compound. For the CALPUFF runs that incorporate deposition and chemical transformation rates (i.e.

deposition and visibility), the full chemistry option of CALPUFF will be turned on (MCHEM = 1). The nighttime loss for SO_2, NO_x and nitric acid (HNO_3) will be set at 0.2 percent per hour, 2 percent per hour and 2 percent per hour, respectively. CALPUFF will also be configured to allow predictions of SO_2, sulfate (SO_4), NOx, HNO_3, nitrate (NO_3) and PM_{10} using the MESOPUFF II chemical transformation module.

4.3 PSD Class I Increment Significance Analysis

CALMET/CALPUFF (Full CALPUFF) will be used to model ambient air impacts of NO_2, PM_{10}, and SO_2 from Increment consuming emission sources to compare to PSD Class I Increments modeling significance thresholds. All NO_2 and PM_{10}, sources will be modeled at full potential-to-emit (PTE) for the CALPUFF PSD increment modeling. The facility SO_2 emission rate will be portioned into SO_2 and SO_4 emissions according to National Park Service (NPS)'s Particulate Matter Speciation (PMS) guidance for natural gas combustion turbines. The full chemistry option of CALPUFF will be turned on (MCHEM =1, MESOPUFF II scheme), and deposition options will be turned on (MWET = 1 and MDRY = 1).

4.4 Class I Area Visibility Reduction Analysis

Full CALPUFF will be used to evaluate the potential for visibility reductions. All facility sources will be modeled at full PTE for this analysis. Emissions of SO_2 and PM_{10} from the natural gas turbines will be used to estimate SO_4, Elemental Carbon (EC), and Secondary Organic Aerosol (SOA) emissions based on National Park Service (NPS)'s Particulate Matter Speciation (PMS) for natural gas combustion turbines. The total estimated SO_2 emission rate was portioned into SO_2 and SO_4 emissions according to NPS's PMS guidance. The sulfur included as primary SO_4 emissions will be deducted from the facility SO_2 emissions for visibility analysis.

Modeled impacts will be converted to visibility impacts using the CALPOST post processor. CALPOST will be used to post-process estimated 24-hour averaged ammonium nitrate, ammonium sulfate and PM_{10} concentrations into an extinction coefficient value for each day at each modeled receptor, using the five years of meteorological data. For turbines, the extinction coefficient of PM_{10} will be calculated by summing the extinction coefficients of Elemental Carbon (EC), soil, and Secondary Organic Aerosol (SOA), which are proportional to their emission rates.

Background visibility and extinction coefficient values from the Federal Land Managers Air Quality Related Values Working Group (FLAG) Phase 1 Report (December 2000) will be used for the visibility reduction analysis. Background values for hygroscopic concentration, without adjustment for relative humidity (RH), (0.6 $\mu g/m^3$) and the non-hygroscopic concentration (4.5 $\mu g/m^3$) are reported for western wilderness areas. Therefore, BKSO4 = hygroscopic 0.6/3 = 0.2 and BKSOIL = non-hygroscopic = 4.5 will be used. The FLAG RH adjustment factors (MVISBK=2) and the RHMAX = 95 % will be used as suggested by the WDEQ. Modeled visibility reductions for each modeled year will be compared to the level of acceptable change (LAC) of 0.5 percent.

4.5 Total Nitrogen and Sulfur Deposition Analysis

Full CALPUFF will be used to evaluate the potential for nitrogen and sulfur deposition. All facility sources will be modeled at full PTE for this analysis. Total deposition rates for each pollutant will be obtained by summing the modeled wet and/or dry deposition rates.

For S deposition, the wet and dry fluxes of sulfur dioxide and sulfate are calculated, normalized by the molecular weight of S, and expressed as total S. Total nitrogen deposition is the sum of N contributed by wet and dry fluxes of nitric acid (HNO_3), nitrate (NO_3^-), ammonium sulfate ($(NH_4)_2SO_4$), and ammonium nitrate (NH_4NO_3) and the dry flux of nitrogen oxides (NO_x).

Per WDEQ's recommendation, 2 parts per billion of background NH_3 will be used. The total modeled nitrogen and sulfur deposition rates will be compared to the USNPS/USFWS DATs for western states. The DAT for nitrogen and sulfur are each 0.005 kilogram per hectare per year (kg/ha-yr), which is 1.59E-11 g/m^2/s.

5.0 Modeling Report

The modeling report will include a detailed description of the modeling approach as well as tables documenting modeled emission rates and stack parameters for each source. A summary of conclusions and tables of final model results for each Class I area and each year of meteorological data will also be provided.

All sources will be clearly identified in the report and in the modeling files. Modeling, building downwash analysis, and model input and output files for the far-field (long range transport) modeling will be submitted on CDs with the application. All modeling files (input and output) will be identified by specific file names and referenced by those file names in the discussion of results. Any deviations from the modeling protocol will be discussed with WDEQ prior to inclusion in the modeling analysis and will be fully documented in the modeling report.

6.0 References

Earth Tech, 2000. A User's Guide for the CALMET Meteorological Model (Version 5)

Earth Tech, 2000. A User's Guide for the CALPUFF Dispersion Model (Version 5)

EPA, 1998. Interagency Workgroup on Air Quality Modeling Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts (EPA-454/R-98-019) (IWAQM2)

National Park Service, 2006. Permit application PSD Particulate Matter Speciation methodology developed by Don Shepherd,

USFS, NPS, USFWS, 2000. Federal Land Managers Air Quality Related Values Work Group Phase I report (FLAG)

Wyoming DEQ, March 2006. Air Division Quality requirements for Submitting Modeling Analysis