

3.0 METHODOLOGY

The research that was conducted, as described in the following sections of this report, consisted of the following tasks.

1. Analysis of BNP Monitoring Data

Data collected at the Interagency Monitoring of Protected Visual Environments (IMPROVE) site in Badlands National Park were analyzed to define average pollutant concentrations, frequency distributions of concentrations, visibility statistics, and trends over the available period of record from 1989 to 1998.

2. Compilation of Emission Inventories

Emission inventories were assembled for pollutant sources in eastern Wyoming, western South Dakota, and northwestern Nebraska. The inventories included those pollutants relevant to visibility impacts, and consisted of coal mine sources, related coal transportation (rail line) sources, permitted point (stack) sources, and area sources by county for mobile, industrial, commercial, agricultural, and residential sources.

3. CALPUFF Modeling

The CALPUFF model (version 5.4, Level 000602-1) (Earth Tech, 1998) was used to calculate hourly pollutant concentrations at BNP, for one year of meteorological data, using the complete emissions inventory data as representative of the years 1990 and 1997. Additional CALPUFF model runs were executed, using the same meteorological data, for various subsets of emissions sources, and for different input parameters as required to define pollutant characteristics and background air quality.

4. Analysis of Model Results

Model results were processed to show average predicted pollutant concentrations in BNP, concentration frequency distributions, contributions by source type, predicted concentration changes from 1990 to 1997, and predicted change in

visibility (light extinction). Statistics from the model predictions were compared to similar statistics and trends as shown by the BNP IMPROVE observations.

5. Evaluation of Predicted Visibility Impacts

Model results for mining sources and all sources were used to quantify potential increases in regional haze according to the methodologies prescribed by Federal Land Manager (FLM) guidance (FLM Air Quality Related Values Workgroup, 2000). This guidance compares new impacts to “natural” or reference visibility conditions. For comparison, incremental impacts relative to existing visibility were derived as well.

6. Analysis and Conclusions

Results of all above tasks were considered in generating overall conclusions on observed and predicted air quality trends in BNP, the likely sources and magnitude of coal production impacts, and the issues that will need to be addressed in modeling potential effects of future mining activity.