APPENDIX A

Review of Information on Health Effects

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REVIEW OF INFORMATION ON HEALTH EFFECTS

Introduction

In response to the findings of ambient air quality potential impacts in the Powder River Basin of Montana and Wyoming, resulting from current and projected development, this Attachment contains a summary of published information regarding potential health effects from Particulate Matter (PM). The modeled impacts showed the potential for PM_{10} concentrations to exceed the 24-hour ambient standards. The modeled exceedances were confined to a small number of receptors generally near major source development, such as coal fired power plants and coal mines.

Air monitoring station data collected for 2004 in Montana showed no exceedances of the 24-hour PM_{10} standard.

PM10 Health Effects: The health effects of short-term particulate concentrations on the public health have been reviewed in great detail, and were again reviewed as a part of the EPA-mandated evaluation of current ambient air quality standards. The most recent review (EPA 2004: *Air Quality Criteria for Particulate Matter,* EPA/600-P-99/002aF, October 2004) focuses on the establishment of the alternate $PM_{2.5}$ standards and discussed PM levels in general. The study summarizes both morbidity and mortality of potential impacts for both short term and long term exposures. The current standards for PM_{10} (150 µg/m^3 for 24 hours and 50 µg/m^3 for annual standards) are focused on protecting against morbidity and mortality effects. The study re-iterates a previous conclusion that "Efforts to quantify the number of deaths attributable to, and the years of life lost to, ambient PM exposures are currently subject to much uncertainty."

Recently a new PM standard ($PM_{2.5}$) has been promulgated, and state regulatory agencies are currently implementing programs to address those standards. $PM_{2.5}$ levels are being measured at Lame Deer in the study area, and results show that those levels are below the established ambient standards.

The potential impacts of PM concentrations are focused on sensitive populations, including those with existing cardiopulmonary disease. Nine percent of adults and eleven percent of children are diagnosed with asthma. There is some evidence that socioeconomic status also plays a role in predicting exposure and impact of PM levels of concern.

The study concludes that "Of concentration–response functions for PM-related effects, it can generally be said that the effect estimates are small in magnitude. In historical episodes with very high air pollution levels, risks on the order of a four-fold increase in mortality were estimated, but much smaller risk estimates have been reported from recent studies at current pollution levels."

"Relative risk estimates for total mortality from the prospective cohort studies fall in the range of 7 to 13 percent increase per 10 µg/m^3 increase in $PM_{2.5}$; there are no significant associations with long-term exposure to $PM_{10-2.5}$. Risk estimates from the short-term exposure studies are considerably smaller in magnitude, on the order of 2 to 6 percent increase in mortality per 25 µg/m^3 increase in $PM_{2.5}$ and $PM_{10-2.5}$."

"Effect estimates for morbidity responses to short-term changes in PM tend to be larger in magnitude that those for mortality; those for hospitalization generally range from 4-10 percent increases for cardiovascular diseases and 5-15 percent increases for respiratory diseases per 25 µg/m^3 increase in $PM_{2.5}$ and $PM_{10-2.5}$. From the more recent studies on visits to the emergency department or physicians' offices for respiratory conditions, effect estimate sizes have been somewhat larger, ranging up to about 35 percent per 25 µg/m^3 increase in $PM_{2.5}$."

As is indicated in the referenced EPA study, the predictive impact of these studies on individual small communities is subject to much uncertainty. However, given the fact that predicted impacts that exceed the 24-hour ambient air quality standard for PM_{10} are in remote, generally unpopulated areas, and that sensitive populations would generally not be confined to these areas, it is unlikely that the modeled impacts of PM_{10} levels would lead to any actual increase in morbidity or mortality of specific receptor populations.