

6 Conclusions

In May, 2010, the Garfield County BOCC engaged the CSPH to perform a HIA to respond to citizen concerns about natural gas drilling in Battlement Mesa, Colorado. We worked closely with the GCPH to ensure the scope of the HIA addressed the concerns outlined by the citizens in their letter to the BOCC as well as those voiced in citizen meetings. Throughout HIA process, we held several meetings with various stakeholders (the BCC and other residents, COGCC, the CDPHE, Antero, Colorado Hospital Association and West Slope Colorado Oil and Gas Association) to ensure that everyone with pertinent data and information had an opportunity to be involved in the HIA process. This revised draft of the HIA takes into account stakeholder comments received during the comment period and discussed in January and February 2011.

The stakeholder process identified eight areas of concern associated with natural gas operations that have the potential to impact health. These areas of concern include air emissions, water and soil contamination, industrial traffic, noise/vibration/light, community wellness, economic and employment changes, health infrastructure stress, and industrial accidents and malfunctions. Using the medical and social health literature, we reviewed the links between these stressors and health and then applied current conditions and Antero's natural gas development and production plans and best management practices to assess the potential future impacts of these physical, psychological and social stressors.

We conducted a longitudinal review of multiple Garfield County air and water monitoring studies as well as COGCC reports of water contamination in the county. This information was used to conduct a Human Health Risk Assessment. We also obtained demographic, physical and social health outcome data and used it in a comprehensive review described in the Battlement Mesa Baseline Health Profile. We reviewed all publicly available information on Antero's plans to drill in Battlement Mesa, as well information made available to us by request from Antero. In the revised HIA we included references to Antero's best management practices where applicable and where we had sufficient information about the use of the best management practices in Battlement Mesa.

The key findings of our study are that health of the Battlement Mesa residents will most likely be affected by chemical exposures, accidents or emergencies resulting from industry operations and stress-related community changes. We found that chemical exposures will occur primarily through air emissions during well development activities. Increased truck traffic will be a safety risk to Battlement Mesa residents; contribute to increased air and noise pollution; and impact quality of life. Increased noise may be a problem for some residents, but mitigation efforts by Antero to bring noise levels below COGCC permissible levels should decrease risk of health impacts. The impacts to community wellness will in part be determined by the success of mitigation of other concerns, such as air emissions, traffic and noise. It is not likely that the

primary water supply for Battlement Mesa will be contaminated by Antero activities; however, efforts to monitor and protect the secondary drinking water supply are needed. Industrial accidents and malfunctions occur in the industry and are likely to occur in Battlement Mesa. Most are expected to be minor incidents; however each incident should be considered a near-miss and evaluated to prevent more significant events.

The Antero project will provide benefits for some Battlement Mesa citizens. The project may provide jobs for some residents and will provide increased economic activity for local businesses, including health clinics. This increased economic activity can be positive for the community. Other aspects of community wellness may be negatively impacted; opportunities for recreation could decrease. Residents currently report decreased social cohesion and quality of life as a result of the proposed project and this could be worse once the project begins. Property values are likely to decline. While the positive effects of employment and increased economic activity will be important for some residents, it is not likely that the project will have large economic benefit for the most of the community. On the other hand, negative impacts to outdoor amenities may and other quality of life compromises, as well as decreased property values, will likely have broader impact throughout the community.

Although the HIA identified numerous information gaps, there was sufficient information to justify the key recommendations of pollution prevention, protection of public safety and increased communication through the development of a Community Advisory Board. In Section 3, we provide over 70 specific recommendations aimed at decreasing negative impacts or improving positive impacts. Central to decreasing air pollution is continued efforts to decrease all possible emission sources. To bring emissions to the lowest possible level, it is important that the best available current technology be utilized, and new technologies be developed, tested and adopted. In addition, continued ambient and well pad monitoring of emissions is needed to determine if mitigation efforts are sufficient or additional measures are needed to protect health. For the full benefit of the water storage and distribution system to be realized, the system should be fully operational before any well development activity occurs. Traffic mitigation should also be a priority and we recommend that alternate haul routes for industrial traffic be developed to remove truck traffic off residential roads and out of the PUD. In addition, a spur off Stone Quarry Road should be developed to move industry traffic away from homes backed on to that road. The development of alternate routes will address the issues of safety, air pollution, noise and quality of life related to industrial traffic on residential roads. Noise associated with Antero's project should be monitored and efforts to decrease cumulative noise due to development activities, including truck traffic, pipe installation, well maintenance, and other activities should be undertaken. Finally, efforts should be made create an active Citizen Advisory Board, which will provide all stakeholders an opportunity to bring forth and find solutions for future concerns. The Community Advisory Board will also provide Antero a means to communicate to the citizens in a timely manner.

The HIA process identified many information gaps, which limited our ability to provide precise predictions of rates and types of disease. Some gaps may have also precluded our ability to

anticipate all possible mitigations. The CSPH investigators and the BOCC recognize that further investigation is needed to document environmental exposures and subsequent health effects of the natural gas industry. To that end, the BOCC has provided funding to CSPH to design a long term Environmental Health and Monitoring Study (EHMS) in Battlement Mesa and/or Garfield County to address these issues. This long term study will: 1) further characterize air emissions associated with natural gas production; 2) characterize air emission exposure levels for persons living in close proximity to natural gas production; 3) further characterize emission sources during development and production phases; 4) develop methods to characterize surface and ground drinking water contamination; 5) conduct health surveillance of residents in areas impacted by natural gas and in similar comparison populations not affected by natural gas development and production; 6) conduct social and community health surveillance of areas impacted by natural gas development and production. 7) conduct studies to investigate health effects of ambient air quality on the general population

In Colorado, recent legislation will compel Front Range electrical plants to switch to natural gas. On the Western Slope, there are plans for several natural gas fueling stations. These and other market enhancing projects and policies will mean Colorado natural gas development and production projects will continue to grow. The recently updated COGCC rules included provisions to protect health and environment. These rules should undergo regular review and update in order to reflect new understanding and technologies as they emerge as well as develop regulations that further protect public health. The COGCC should consider rules that can be tailored to particular situations, such as residential natural gas development. The HIA team supports the CDPHE role in their consultative role to the COGCC and encourages all parties to continue efforts to address public health concerns.